The Energy Conservation (Energy Consumption Norms and Standards for Designated Consumers, Form, Time within which, and Manner of Preparation and Implementation of Scheme, Procedure for issue or purchase of Energy Saving Certificate and Value of Per Metric Tonne of Oil Equivalent of Energy Consumed) Rules, 2012

UNION OF INDIA
India

The Energy Conservation (Energy Consumption Norms and Standards for Designated Consumers, Form, Time within which, and Manner of Preparation and Implementation of Scheme, Procedure for issue or purchase of Energy Saving Certificate and Value of Per Metric Tonne of Oil Equivalent of Energy Consumed) Rules, 2012

Rule THE-ENERGY-CONSERVATION-ENERGY-CONSUMPTION-NORMS-AN of 2012

- Published on 30 March 2012
- Commenced on 30 March 2012
- [This is the version of this document from 30 March 2012.]
- [Note: The original publication document is not available and this content could not be verified.]

The Energy Conservation (Energy Consumption Norms and Standards for Designated Consumers, Form, Time within which, and Manner of Preparation and Implementation of Scheme, Procedure for issue or purchase of Energy Saving Certificate and Value of Per Metric Tonne of Oil Equivalent of Energy Consumed) Rules, 2012Published vide Notification No. G.S.R. 269(E), dated 30.3.2012Last Updated 18th May, 2018Ministry of PowerG.S.R. 269(E). - In exercise of the powers conferred by clauses (f),(g), (k), (la) and (laa) of section 56, read with clauses (g) and (o) of section 14, sub-section (1) of section 14A and section 14B of the Energy Conservation Act, 2001 (52 of 2001), the Central Government hereby makes the following rules, namely :-

1. Short title and commencement.

(1)These rules may be called the Energy Conservation (Energy Consumption Norms and Standards for Designated Consumers, Form, Time within which, and Manner of Preparation and Implementation of Scheme, [Procedure for issue or purchase of Energy Saving Certificate] [Substituted 'Procedure for issue of Energy Saving Certificate' by Notification No. G.S.R. 409(E), dated 26.4.2018 (w.e.f. 30.3.2012).] and Value of Per [Metric Tonne] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).] of Oil Equivalent of Energy Consumed) Rules, 2012.(2)They shall come into force on the date of their publication in the Official Gazette.

2. Definitions.

(1)In these rules, unless the context otherwise requires.(a)"Act" means the Energy Conservation Act, 2001;(aa)["accredited energy auditor" means the accredited energy auditor firm or company or other legal entity empaneled under sub-rule (5) of rule 9;] [Inserted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).](b)"baseline year" means the year in which the base level of energy consumption is used as a reference point for establishment and assessment of performance with regard to compliance of energy consumption norms and standards under rule 4 and rule 6 respectively;(c)"certification" means the process of certifying the verification report or check verification report by the accredited energy auditor to the effect that the entitlement or requirement of energy savings certificate is quantified accurately in relation to compliance of energy consumption norms and standards by the designated consumer during the target year;(d)["check-verification" means an independent review and ex-post determination by the Bureau through the accredited energy auditor, of the energy consumption norms and standards achieved in the target year which have resulted from activities undertaken by the designated consumer with regard to compliance of the energy consumption norms and standards; [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).](da)"compliance period" means the period starting from the last date of submission of the performance assessment document in Form A and ending on the last date of submission of status of compliance to the concerned state designated agency with a copy to Bureau in Form D;](e)"cycle" means the period of three years available to a designated consumer to comply with the energy consumption norms and standards;(ea)["eligible entity" means any designated consumer registered with registry who has been issued, deemed to have been issued, entitled to purchase and such designated consumers who have just met their energy consumption norms and standards and desire to trade in energy saving certificates (ESCerts) for compliance with the energy consumption norms and standards specified under clauses (g) and (p) of section 14 of the Act.] [Inserted by Notification No. G.S.R. 409(E), dated 26.4.2018 (w.e.f. 30.3.2012).](f)"energy consumption norms and standards" means the specific energy consumption of the designated consumer for the specified year notified under clause (g) of section 14;(g)"Form" means the form annexed to these rules;(ga)["Registry" means the agency designated by the Central Government under Central Electricity Regulatory Commission (Terms and Conditions for Dealing in Energy Saving Certificates) Regulations, 2016, for the purpose of participating in the sell and purchase of ESCerts on Power exchanges and to perform such other functions as assigned to it under the said regulation.] [Inserted by Notification No. G.S.R. 409(E), dated 26.4.2018 (w.e.f. 30.3.2012).](h)"Rules 2007" means the Energy Conservation (the form and manner for submission of report on the status of energy consumption by the designated consumers) Rules, 2007 notified in the Official Gazette vide number G.S.R. 174 (E), dated the 2nd March, 2007;(i)"Rules 2008" means the Energy Conservation (Form and Manner and Time for Furnishing Information With Regard to Energy Consumed and Action Taken on Recommendations of Accredited Energy Auditor) Rules, 2008 notified in the Official Gazette vide number G.S.R. 486(E), dated the 26th June, 2008;(j)"Schedule" means the Schedule annexed to these rules:(k)"section" means a section of the Act;(l)["specific energy consumption (SEC)", for energy intensive industries and other establishments, - [Substituted by Notification No. G.S.R. 409(E), dated 26.4.2018 (w.e.f. 30.3.2012).](i)for industries: - Specific energy consumption means ratio of the net energy input into the boundary of designated consumers of Aluminium, Cement, Chlor-Alkali, Fertilizer, Iron and Steel, Pulp and Paper and Textile industries, to the total output of equivalent major product produced in the respective designated consumers boundary, calculated as per the following formula, namely: -

SEC =| net energy input into the designated consumers' boundarytotal output of equivalent major product produced in the designated consumers' boundary

and expressed in terms of the metric tonne of oil equivalent (toe)/per unit of equivalent product;(ii)for thermal power stations: - Specific energy consumption or Net Heat Rate in relation to thermal power stations or Plants means the ratio of net energy input in to the designated consumers boundary in terms of kilo calorie (kcal) to the net generation in terms of kilo Watt hour (kWh) on bus bar taking in to account the effect of the auxiliary power consumption (APC) and expressed in terms of kcal per kWh, calculated as per the following formula, namely: -

Net Heat Rate =| Gross Heat Rate[1 - APC (%)];

Where:- Gross Heat Rate is the ratio of net energy input in kcal to gross generation in kWh;- Auxiliary power consumption (APC) of thermal power stations/plant excluding energy consumption in percentage of colony;(iii)for petroleum refineries sector: - Specific energy consumption for petroleum refinery sector shall be measured in MBN which means net energy and loss of the plant calculated in Million British Thermal Unit (MMBTU) per one thousand barrels (Mbbls) per Energy factor (NRGF) and expressed by the following formula, namely: -MBN = MMBTU/Mbbls/NRGFWhere:MMBTU: Net Energy and loss of the petroleum refinery unit calculated in MMBTU (Million British Thermal Units)Mbbls : Crude processed in thousand barrelsNRGF : The NRG factor (NRGF) is the indicator of the level of complexity of a refinery and overall energy factor (dimensionless unit) calculated for the refinery based on the volume of feed in each unit and its corresponding energy factor;(iv)for railways sector:(a)zonal railways: - Specific energy consumption for zonal railways in passenger services and goods services are expressed as below:(1)for diesel traction: Specific energy consumption is the ratio of diesel consumption in litre per thousand of gross tonne kilometrage and shall be expressed as following:"Litre/1000GTKm"(2)for electrical traction: Specific energy consumption is the ratio of electrical energy consumption in kWh per thousand of gross tonne kilometrage and shall be expressed as following:"kWh/1000GTKm"(b)production units: - Specific energy consumption is the ratio of kilo gram of oil equivalent (KgOE) to the number of equivalent units produced and shall be taken in terms of KgOE /number of equivalent units produced and shall be expressed in the following formula, namely: -

SEC =| Total energy consumption in Kg of oil equivalent (KgOE)Total number of equivalent product produced

(v)for DISCOM sector: - Transmission and distribution loss in percentage shall be used to assess energy performance of electricity distribution companies and calculated as per the following formula, namely: -Transmission and distribution loss (%) = {1-(Total energy billed/Net input energy)*100}Where:- Total energy billed (Million kWh) is the Net energy billed (adjusted for energy traded);- Net input energy (Million kWh) is the energy received at distribution periphery after adjusting the transmission losses and energy traded.(vi)for commercial building or establishments: - Specific energy consumption for building means the annual energy consumption expressed in terms of tonne of oil equivalent per thousand square meter of the area wherein energy is used and includes the location of buildings and shall be expressed by the following formula, namely: -

SEC =| Annual energy consumption in tonne of oil equivalent (toe)Total built - up area excluding parking and storage (thousand square per meter)

and expressed in terms of toe / thousand square meter.Where:-storage is defined as storage of waste items.(vii)for petrochemical sector: - Specific energy consumption is measured in net energy consumed in cracker unit and secondary units producing olefin products only per total equivalent production of olefin products and expressed in terms of the metric tonne of oil equivalent (toe)per unit of equivalent product;

SEC =| Net energy consumed (toe)Equivalent quantity of olefin products produced in tonne]

(la)["State designated agency" means the agency designated and notified by a State Government under clause (d) of section 15 of the Act;](m)"target year" means the year by which a designated consumer shall achieve compliance with the energy consumption norms and standards;.(n)"verification" means a thorough and independent evaluation by the accredited energy auditor of the activities undertaken by the designated consumer for compliance with the energy consumption norms and standards in the target year compared to the energy consumption norms and standards in the baseline year and consequent entitlement or requirement of energy savings certificate;(o)"year" means the financial year beginning on the 1st day of April and ending on the 31st day of March following.(2)Words and expressions used herein and not defined but defined in the Act shall have the meanings respectively assigned to them in the Act.

3. Establishment of energy consumption norms and standards.

(1)The Central Government, in consultation with the Bureau, shall establish, amend or rescind the energy consumption norms and standards for designated consumers as notified under clause (g) of section 14.(2)The energy consumption norms and standards shall be specific for every designated consumer and shall be determined as under:-(a)[where the energy audit of the designated consumers' plant has been completed, energy saving measures and action plan for their implementation has been finalized in consultation with the energy manager of the plant under regulations 4 and 5 of the Bureau of Energy Efficiency (Manner and Intervals of Time for Conduct of Energy Audit) Regulations, 2010, the energy consumptions norms and standard shall be determined taking into account the following factors, namely:- [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).](i)timely submission of energy audit report, Form 2 and Form 3 under the Energy Conservation (Form and Manner and Time for Furnishing Information with

Regard to Energy Consumed and Action Taken on Recommendations of Accredited Energy Auditor) Rules, 2008;(i)original equipment manufacturer (OEM) design document improvements;(ii)published international journals and documents on industrial energy efficiency of respective sectors;(iii)certification of global best designated consumer sector from respective sectoral world renowned institution;(ab)for the designated consumer sector(s), other than sector(s) identified on the basis of clause (aa) above, the energy consumption norms and standards shall be determined by a technical committee constituted under sub-section (3) of section 8 of the Act through the application of the following equation:-(ii)data furnished in the said energy audit report, Forms 2 and 3;(iii)average rate of reduction in specific energy consumption across all the designated consumers sectors' determined on the basis of Form 1 submitted under the Energy Conservation (the Form and Manner for Submission of Report on the Status of Energy Consumption by the Designated Consumers) Rules, 2007 and energy audit reports submitted under the Bureau of Energy Efficiency (Manner and Intervals of Time for Conduct of Energy Audit) Regulations, 2010; and(iv)policy objectives of keeping the target of reducing the specific energy consumption a few percentage points above the average rate of reduction keeping in view the incentives provided through the issue of energy savings certificate to designated consumers who achieve beyond their targets in the target year;(aa)for the globally best designated consumer sector(s) based on comparable international benchmark, the energy consumption norms and standards shall be determined by a technical committee constituted under sub-section (3) of section 8 of the Act by taking in to account the following factors, namely:-Weighted average per cent. energy consumption norms and standards for the non-global best designated consumer sectors= (Overall percentage of norms and standards for all designated consumer sectors of respective cycle × total energy consumption of all non-global best designated consumer sector(s) (toe)) + (1/3× (Energy Savings Certificates issued - Energy Savings Certificates to be purchased, for three previous cycles irrespective of sector));(ac)the energy consumption norms and standards of the respective designated consumer, except designated consumers of thermal power plant sector, shall be determined with the approval of the technical committee constituted under sub-section (3) of section 8 of the Act as per the following conditions, and shall not be applicable for the first cycle of designated consumers, namely:-(i)if the difference of specific energy consumption between lowest specific energy consumption of designated consumers and weighted average specific energy consumption of designated consumers for sub-sector is more than 25 per cent. the energy consumption norms and standards for the first 10 per cent. of designated consumers covered in such sub-sector provided that the total numbers of such designated consumers is more than or equal to 10 numbers shall be equal to the baseline specific energy consumption determined for the respective cycle;(ii)If the difference of specific energy consumption between lowest specific energy consumption of designated consumers and weighted average specific energy consumption of designated consumers in a sub-sector is less than 25 percent.the energy consumption norms and standards for the first 10percent. designated consumers in a sector provided that the number of such designated consumers is more than or equal to 10 numbers in the a said sub-sector shall be determined based on any of the following alternative equations, namely:-If (Achieved per cent. Energy consumption norms and standards in the previous cycle of designated consumers-per cent. Energy consumption norms and standards in previous cycle of designated consumer) ? 0 then; per cent. Energy consumption norms and standards for a designated consumers = per cent. Energy consumption norms and standards in current cycle of designated consumers - (Achieved per cent.

Energy consumption norms and standards in the previous cycle of designated consumers- per cent. Energy consumption norms and standards in previous cycle of designated consumer); orIf (Achieved per cent. Energy consumption norms and standards in the previous cycle of designated consumer - per cent. Energy consumption norms and standards in previous cycle of designated consumer) < 0, the per cent. Energy consumption norms and standards shall be as per rule 3, sub-rule (2) excluding clause (ac)); orIf (Achieved per cent. Energy consumption norms and standards in the previous cycle of designated consumer - per cent. Energy consumption norms and standards in previous cycle of designated consumer) > per cent. Energy consumption norms and standards in current cycle of designated consumers, then, the energy consumption norms and standards shall be equal to the baseline specific energy consumption determined for the respective cycle;Provided that the energy consumption norms and standards for remaining designated consumers shall be as per clauses (a), (aa), and (ab) of this sub-rule;(iii)the specific energy consumption referred to in sub-clause (i) and (ii) shall be Normalized for power mix with weighted average heat rate of respective designated consumer of sub-sector and product mix;(iv)the energy consumption norms and standards for the most efficient designated consumer in a sub-sector having total numbers of designated consumers less than 10 numbers, shall be determined based on any one of the following alternative equations:-if (Achieved per cent. Energy consumption norms and standards in the previous cycle of designated consumers-percent.Energy consumption norms and standards in previous cycle of designated consumer) ? 0 then per cent. Energy consumption norms and standards for a designated consumer = (per cent. Energy consumption norms and standards in current cycle of designated consumer) - (Achieved per cent. Energy consumption norms and standards in the previous cycle of designated consumer-per cent. Energy consumption norms and standards in previous cycle of designated consumer); orIf (Achieved per cent. Energy consumption norms and standards in the previous cycle of designated consumers-per cent. Energy consumption norms and standards in previous cycle of designated consumers) <0, then the per cent. Energy consumption norms and standards shall be as per clauses (a),(aa) and (ab) of this sub-rule;orif (Achieved per cent. Energy consumption norms and standards in the previous cycle of designated consumer-per cent. Energy consumption norms and standards in previous cycle of designated consumer) > per cent. Energy consumption norms and standards in current cycle of designated consumers, then the energy consumption norms and standards shall be equal to the baseline specific energy consumption determined for the respective cycle);](b)where energy audit of the designated consumers' plant has not been completed or undertaken, the energy consumption norms and standards shall be determined taking into account the following factors, namely :-(i)average rate of reduction in specific energy consumption across all the designated consumer sectors determined on the basis of the analysis of data of [the latest three years that is available] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).];(ii)policy objectives of keeping the target of reducing the specific energy consumption a few percentage points above the average rate of reduction keeping in view the incentive provided through the issue of energy savings certificate.(c)[for the globally best designated consumer sector(s) based on comparable international benchmark, the energy consumption norms and standards shall be determined by a technical committee constituted under sub-section (3) of section 8 of the Act by taking in to account the following factors, namely:- [Inserted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).](i)original equipment manufacturer (OEM) design document improvements;(ii)published international journals and documents on industrial energy efficiency of respective sectors;(iii)certification of global best designated consumer sector from respective sectoral world renowned institution;(d)for the designated consumer sector(s), other than sector(s) identified on the basis of clause (aa) above, the energy consumption norms and standards shall be determined by a technical committee constituted under sub-section (3) of section 8 of the Act through the application of the following equation:-Weighted average per cent. energy consumption norms and standards for the non-global best designated consumer sectors= [Overall per cent. of norms and standard for all designated consumer sectors of respective cycle × total energy consumption of all non-global best designated consumer sector(s) (toe)] + [1/3× (Energy Saving Certificates issued - Energy Saving Certificates to be purchased, for three previous cycles irrespective of sector)];(e)the energy consumption norms and standards of the respective designated consumer,except designated consumers of thermal power plant sector,shall be determined with the approval of technical committee constituted under sub-section (3) of section 8 of the Act as per the following conditions, and shall not be applicable for the first cycle of designated consumers, namely:-(i)If the difference of specific energy consumption between lowest specific energy consumption of designated consumers and weighted average specific energy consumption of designated consumers for sub-sector is more than 25 per cent. the energy consumption norms and standards for the first 10 per cent. of designated consumers covered in such sub-sector provided that the total numbers of such designated consumers is more than or equal to 10 numbers shall be equal to the baseline specific energy consumption determined for the respective cycle;(ii)If the difference of specific energy consumption between lowest specific energy consumption of designated consumers and weighted average specific energy consumption of designated consumers in a sub-sector is less than 25 per cent. the energy consumption norms and standards for the first 10 per cent. designated consumers in a sector provided that the number of such designated consumers is more than or equal to 10 numbers in the a said sub-sector shall be determined based on any of the following alternative equations, namely:-if (Achieved per cent. Energy consumption norms and standards in the previous cycle of designated consumers - per cent. Energy consumption norms and standards in previous cycle of designated consumer) ? 0; per cent. Energy consumption norms and standards for a designated consumers = per cent. Energy consumption norms and standards in current cycle of designated consumers - (Achieved per cent. Energy consumption norms and standards in the previous cycle of designated consumers - per cent. Energy consumption norms and standards in previous cycle of designated consumer); orIf (Achieved per cent. Energy consumption norms and standards in the previous cycle of designated consumer-per cent. Energy consumption norms and standards in previous cycle of designated consumer) < 0, then the per cent. Energy consumption norms and standards shall be as per clauses (b), (c) and (d) of this sub-rule; orif (Achieved per cent. Energy consumption norms and standards in the previous cycle of designated consumer-per cent. Energy consumption norms and standards in previous cycle of designated consumer) > per cent. Energy consumption norms and standards in current cycle of designated consumers, then the energy consumption norms and standards shall be equal to baseline specific energy consumption determined for the respective cycle provided that the Energy consumption norms and standards for remaining designated consumers shall be as per clause (b), (c) and (d) of this sub-rule;(iii)the specific energy consumption referred to in sub-clause (i) and (ii) shall be Normalized for power mix with weighted average heat rate of respective designated consumer of sub-sector and product mix;(iv)the energy consumption norms and standards for the most efficient designated consumer in a sub-sector having total numbers of designated consumers less than 10 numbers, shall be determined based on any one of the following alternative equations:-If (Achieved per cent. Energy consumption norms and standards in the previous cycle of designated consumers-per cent. Energy consumption norms and standards in previous cycle of designated consumer) ☐0 then per cent. Energy consumption norms and standards for a designated consumer = (per cent. Energy consumption norms and standards in current cycle of designated consumer) - (Achieved per cent. Energy consumption norms and standards in the previous cycle of designated consumer-per cent. Energy consumption norms and standards in previous cycle of designated consumer); orIf (Achieved per cent. Energy consumption norms and standards in the previous cycle of designated consumers-per cent. Energy consumption norms and standards in previous cycle of designated consumers) <0, then the per cent. Energy consumption norms and standards shall be as per clauses (b), (c) and (d) of this sub-rule; orif (Achieved per cent. Energy consumption norms and standards in the previous cycle of designated consumer-per cent. Energy consumption norms and standards in previous cycle of designated consumer) > per cent. Energy consumption norms and standards in current cycle of designated consumers, then the energy consumption norms and standards shall be equal to the baseline specific energy consumption determined for the respective cycle).](3)Where the energy consumption norms and standards have been determined in accordance with clause (a) or clause (b) of sub-rule (2), the said methodology shall not be reviewed after the commencement of the energy consumption norms and standard notified under clause (g) of section 14.(4)The designated consumers shall achieve compliance with the energy consumption norms and standards as notified under clause (g) of section 14 within a period of three years from the date of commencement of the said notification.

4. Procedure for establishment of energy consumption norms and standards.

(1)For the purpose of establishment of energy consumption norms and standards, the technical committee set up by the Bureau shall-(a)calculate specific energy consumption in the baseline year and projected specific energy consumption in the target year covering different forms of net energy going into the boundary of the designated consumers' plant and the products leaving it over the relevant cycle on a gate-to-gate basis;(b)in calculating the net energy input to the plant -(i)convert the calorific values of all forms of energy sources into a single unit, namely, ton of oil equivalent using the conversion formulae specified in the Government of India, Ministry of Power notification number S.O.394(E), dated the 12th March, 2007;(ii)consider all forms of energy that is, electricity, solid fuel, liquid fuel, gaseous fuel, or any other form of energy imported into the plant for consumption as energy for production of output;(iii)not take into account energy consumed in the colony attached to the plant, temporary or major construction work, and for outside transportation system or energy consumed through renewable energy sources not connected to the grid;[Explanation. - For the purpose of sub-clause (iii), connected to the grid shall mean 'synchronized with the grid';] [Inserted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).](iv)take into account the energy exported out of the designated consumers' boundary(v)[the designated consumer shall ensure that the reported data are collected from metered sources;] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).]Provided that the said designated consumer shall give adequate reasons that it was not feasible to make adjustment for energy consumed in the colony, temporary or major construction work:Provided further that such designated consumer shall make necessary arrangements for disaggregation of data for energy consumption to ensure that actual energy consumed for production is considered in the next cycle:(vi)where more than one product is produced, select the main product produced or an equivalent product worked out from the product mix as per standard practice prevalent in the concerned designated consumers sector:Provided that where the production of the said main product is stopped, the designated consumer shall inform the necessary details in that regard to the Bureau and the concerned state designated agency;(c)calculate the specific energy consumption for the baseline year as well as for the target year and normalize it by taking into account the capacity utilization, mix of grid and captive electricity, and any other factor [which affects specific energy consumption] [Substituted 'which affects energy consumption' by Notification No. G.S.R. 409(E), dated 26.4.2018 (w.e.f. 30.3.2012).] as specified in the [Schedule I and Schedule II] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).];(d)calculate the annual specific energy consumption in the baseline year by verifying the data in the previous three years, year-wise, using the data submitted by the designated consumers', under Rules 2007 and if verified, under Rules 2008;[* * *] [Omitted '(e) calculate the effect of capacity utilization and other factors if any, on the specific energy consumption for the previous three years;' by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).](f)calculate the specific energy consumption, production, capacity utilization, in the baseline year by taking the [data] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).] of the previous three years in the first cycle and for subsequent cycles, the provisions of rule 14 shall apply;(g)take into consideration the effect on capacity utilization or the [plant loading, factor] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).] or average energy consumption in the target year on account of any of the following factors, namely :-(i)[Force majeure;] [Substituted 'natural disaster; or' by Notification No. G.S.R. 409(E), dated 26.4.2018 (w.e.f. 30.3.2012).](ii)rioting or social unrest; or(iii)major change in the Government policy including environmental standards; or(iv)impact of market (shortage of raw material or sales) in any of the previous three years.(2)The said technical committee shall prepare a report containing designated consumer-specific basis of methodology referred to in sub-rule 2 of rule 3, consultation with the designated consumers, and submit the said report to the Bureau.(3)The Bureau shall examine the report submitted under sub-rule (2) and finalize its report containing its recommendation regarding the energy consumption norms and standards for each designated consumers' plant.(4)The details regarding methodology used, formulas adopted, exceptions considered, principles adopted, for preparation of energy consumption norms and standards shall be as specified in the [Schedule I and Schedule II] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).].(5)The Bureau shall submit the report referred to in sub-rule (3) to the Central Government.(6)The Central Government after considering the said report shall by notification,-(a)establish and specify the energy consumption norms and standards for every designated consumers' plant under clause (g) of section 14;(b)give direction to all designated consumers for compliance with the energy consumption norms and standards under clause (n) of section 14 and inform the Bureau and all the State designated agencies.

5. Form, manner and time for preparation of scheme for implementation of efficient use of energy and its conservation.

(1)Every designated consumer, within three months of the issue of notification under sub-rule (6) of rule 4 shall submit a scheme to State designated agency with a copy to Bureau, which may include -(a)action plan containing inter-alia, a brief description of identified energy saving measures to comply energy consumption norms and standards by the target year;(b)the estimated cost of each identified energy saving measures;(c)implementation plan to achieve energy consumption norms and standards through implementation of energy saving measures or through purchase of energy savings certificates.

6. Assessment of performance.

(1)Every designated consumer, within [four months] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).] of the conclusion of the target year from the baseline year shall submit to the State designated agency, with a copy to the Bureau, the performance assessment document in Form 'A' covering the performance for the relevant cycle specifying the compliance with energy consumption norms and standards, duly verified together with certificate in [Form 'B' along with verification report] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).] given by the accredited energy auditor and accompanied by the following documents, namely:-(a)copy of unique number of registration given to the designated consumer;(b)proof of timely submission of reports in Form 1 under Rules 2007 for the previous three years;(c)proof of timely submission of reports in Form I, [Form 2 and Form 3] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).] under Rules 2008 along with copies thereof including the reports for the target year;(d)details of energy savings measures implemented for compliance with the energy consumption norms and standards in [Form 2 and Form 3] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).] of Rules 2008, for each year, covering the relevant cycle enclosing therewith, a brief about the year-wise energy savings measures, details of investment made, photographs in support of measures implemented in each year, if feasible, and percentage improvement in energy savings achieved in every year following the baseline year until the target year;(e)details of energy consumption norms and standards of the designated consumers in the baseline year, achievement made in every year following the baseline year and upto the target year together with the opinion of the accredited energy auditor on the achievement of energy consumption norms and standards, entitlement or requirement of energy savings certificates along with the details of calculation and correctness of entitlement or requirement duly certified by the accredited energy auditor;(f)name and particulars of the energy manager, his date of appointment, details of duties performed including initiatives undertaken for improvement in energy conservation and energy efficiency(1A)[If the Central Government is of the opinion that it is necessary or expedient so to do in the public interest, it may, by order, in consultation with the Bureau and subject to such conditions as may be specified in the said order, extend the time specified in sub-rule (1) for submission of Performance assessment document by class of designated consumers, for a period not exceeding two months.] [Inserted by Notification No. G.S.R. 528(E), dated 30.6.2015 (w.e.f. 30.3.2012).][* * *] [Deleted '(2) The designated consumer, within three months after the end of first or second year of the relevant cycle, may submit performance assessment document in Form 'A' to the State designated agency, with a copy to the Bureau, for issuance of proportionate energy savings certificates covering the performance for a period of not less than one year from the date of notification specifying the energy consumption norms and standards, duly verified together with certificate in Form 'B' given by accredited energy auditor alol1g with the documents mentioned in sub-rule (1).' by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).](3)The accredited energy auditor shall independently evaluate each activity undertaken by the designated consumer for compliance with the energy consumption norms and standards and entitlement or requirement of energy savings certificate, to ensure that they meet with the requirements of these rules.(4)The accredited energy auditor, in order to assess the correctness of the information provided by the designated consumer regarding the compliance with energy consumption norms and standards shall-(a)apply standard auditing techniques;(b)follow the rules and regulation framed under the Act;(ba)[follow the guidelines issued by the Bureau from time to time;] [Inserted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).](c)integrate all aspects of verification, and certification functions;(d)make independent technical review of the opinion and decision of the verification team;(e)[also take into consideration, [Substituted by Notification No. G.S.R. 409(E), dated 26.4.2018 (w.e.f. 30.3.2012).](iii)for ensuring compliance with the energy consumption norms and standards, the sector specific guidelines specified in the Schedule I and Schedule II to these rules;(A)Document review, involving -(i)review of data and its source, and information to verify the correctness, credibility and interpretation of presented information;(ii)cross checks between information provided in the audit report and, if comparable information is available from sources other than those used in the audit report, the information from those other sources and independent background investigation;(B)follow up action, involving-(i)site visits, interviews with personal responsible in the designated consumers plant;(ii)cross-check of information provided by interviewed personnel to ensure that no relevant information has been omitted or, over or under valued;(iii)review of the application of formulae and calculations, and reporting of the findings in the verification report.](iv)the procedure for assessment which shall include but not limited to the following, -(5)The accredited energy auditor shall report the results of his assessment in a verification report and the said report shall contain,-(a)the summary of the verification process, results of assessment and his opinion along with the supporting documents;(b)the details of verification activities carried out in order to arrive at the conclusion and opinion, including the details captured during the verification process and conclusion relating to compliance with energy consumption norms and standards, increase or decrease in specific energy consumption with reference to the specific energy consumption in the baseline year;(c)the record of interaction, if any, between the accredited energy auditor and the designated consumer as well as any change made in his assessment because of the clarifications, if any given by the designated consumer.(6)If the accredited energy auditor records a positive opinion in his verification report, the Bureau shall consider that all the requirements with regard to the compliance with energy consumption norms and standards, entitlement about issue or liability to purchase energy savings certificate have been met.(7)After submission of duly verified Form 'A' by designated consumer, state designated agency may convey its comments, if any, on Form 'A' to the Bureau [within forty-five days] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).] of the last date of submission of Form 'A'.(8)[The designated consumer shall make necessary arrangement for taking "as fired basis" samples from auto-sampler installed at solid fuel feeding points for the purpose of fuel sampling.(9)The designated consumer shall ensure that coal samples are picked up from the auto-sampler at least once in a month and get such samples tested at the internal lab of the designated consumer and external National Accreditation Board for Testing and Calibration

Laboratories (NABL)accredited lab for Gross Calorific Value (GCV) and proximate analysis of coal.(10)The designated consumer shall ensure that coal samples are picked up from the auto-sampler at least once in a quarter and get the same sample tested at external National Accreditation Board for Testing and Calibration Laboratories (NABL) accredited lab for ultimate analysis.(11)The State designated agency shall ensure that coal samples are picked up at random through an independent agency engaged by it from the auto-sampler and get the same sample tested at the internal lab of the designated consumer and external National Accreditation Board for Testing and Calibration Laboratories (NABL) accredited lab for GCV and proximate analysis of coal.] [Inserted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).]

7. Procedure for monitoring and verification.

(1)The designated consumer in consultation with the accredited energy auditor, shall put in place transparent, independent and credible monitoring and verification arrangements for energy consumption and production based on the Bureau of Energy Efficiency (Manner and Intervals of Time for Conduct of Energy Audit [and the Guidelines issued by the Bureau from time to time] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).] for compliance with the energy consumption norms and standard, and the said arrangements shall include,-(a)preparation and maintenance of quarterly data reports by the designated consumers-(i)on the performance of the plant and production processes;(ii)on the internal field audits of plant and production processes for the purpose of identification of factors inhibiting improvements in energy efficiency and conservation, and taking of measures to reduce energy consumption and to improve energy efficiency.(b)preparation and maintenance of yearly data reports by the designated consumers-(i)on the performance of plant and production processes(ii)on the outcome of internal field audits of plant and production processes identifying factors inhibiting improvements in energy efficiency and its conservation, and taking of measures to reduce energy consumption and improve energy efficiency and measures taken to improve the efficiency of the production processes during each year;(iii)regarding a year-wise report on production achieved, energy consumed, and specific energy consumption achieved, specific energy consumption reduction achieved, measures adopted for energy conservation and quantity of energy saved;(c)preparation and maintenance of the end of the cycle data reports on production achieved, energy consumed, specific energy consumption achieved, specific energy consumption reduction achieved, measures adopted for energy conservation and quantity of energy saved.(2)All the activities undertaken by the designated consumers under these rules shall be scrutinized by the accredited energy auditor for the purpose of preparation of verification report and the designated consumer shall furnish the full and complete data, provide necessary documents and other facilities required by the accredited energy auditor for the purpose of performing the function of verification under these rules.

8. Check-verification.

(1)The Bureau may on its own, or on receipt of a complaint regarding any error or inconsistency or misrepresentation, within one year from the date of submission of the compliance report [* * *] [Omitted 'or within six months from the date of issue of energy savings certificates, whichever is later' by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).], shall initiate action for review of compliance report in accordance with the provision of [sub-rule (2) and (2A)] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).].(2)[Where the Bureau decides to undertake check-verification on its own, it shall appoint an accredited energy auditor, who has not performed the verification functions with respect to the concerned designated consumer, to conduct the check-verification and in any other case, the Bureau shall initiate action in accordance with the following procedure, namely:-] [Substituted 'The Bureau shall initiate action in accordance with the following procedure, namely' by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).](a)a notice shall be issued to the designated consumer as well as to the accredited energy auditor who had submitted the verification report with a copy to relevant state designated agency, to provide comments in reply to the said notice [within two months] [Substituted 'within ten working days' by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).] from the date of receipt of aforesaid notice;(b)the comments furnished by the designated consumer and accredited energy auditor shall clearly state that-(i)they stand by the compliance report and verification report submitted by them and submit a confirmation report giving point wise replies with necessary documents in response to the said notice; or(ii)they accept the errors or inconsistencies or misrepresentation pointed out in the aforesaid notice and shall give detailed explanations in respect of each point in the notice and work out the impact of such errors or inconsistencies or misrepresentation on the submitted compliance report;(c)within ten working days from the date of the receipt of the comments referred to in clause (b), Bureau shall after taking into consideration the said comments, decide to undertake or not to undertake review and the Bureau shall record the reasons in writing for its decision;(d)where the Bureau, in consultation with state designated agency, decides to undertake review,(i)it shall appoint an accredited energy auditor, who has not performed the verification functions with respect to the concerned designated consumer, to conduct the check-verification;(ii)on a complaint, the said check-verification shall be carried out at the cost of the complainant;(e)where the Bureau decides not to undertake the said review, the designated consumer, his accredited energy auditor, and the complainant shall be informed in that regard in writing.(2A)[Where check-verification has been decided to be undertaken, it shall be competent for the State designated agency to supervise the completion of check-verification through its Inspecting Officer, who shall, if need be, may submit his inspection report under the Energy Conservation (Inspection), Rules, 2010 to the State designated agency, who shall take further necessary action under intimation to the Bureau.] [Inserted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).](3)The check-verification process shall involve assessment to ensure that.-(a)the activities relating to the compliance with energy consumption norms and standards have been performed and the issue or purchase of energy savings certificate are in accordance with the provisions of these rules;(b)the monitoring and verification process are in accordance with the provisions of [rule 7] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).];(c)[the details of the data and the activities referred to in rule 7 are evaluated and conclusion made that errors, omissions or misrepresentations or aggregation by way of errors, and sums thereof shall not exceed ±0.5 percent. which shall be the permissible error in terms of metric tonne of oil equivalent for the energy consumption norms and standards achieved by the activities or issue or purchase of energy savings certificate.] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).](4)The said accredited energy auditor shall assess and verify that the activities performed by the designated consumer for compliance with the energy consumption norms and standards are in accordance with these rules, and the assessment and check-verification process shall involve-(a)a review of the documents as well as the on-site assessment referred to in rule 6 to verify that the activities performed to comply with the energy consumption norms and standards are in accordance with these rules and in case the aforesaid accredited energy auditor decides that it was not possible or appropriate to make a site visit, then he shall record reasons in writing in this regard;(b)a review of both quantitative and qualitative information on the energy consumption norms and standards, the quantitative information comprising of the reported data in 'Form A', and the qualitative information comprising of information on internal management controls, calculation procedures, procedures for transfer of data, frequency of energy consumption norms and standards achieved every year following the baseline year until the target year, reports and review of internal field audit of calculations or data transfers;(c)a review of previous verification reports;(d)a review of any other information and documents relevant to or having a bearing on the activities performed under these rules;(e)a review of the monitoring and verification process referred to in rule 7.(5)The designated consumer shall furnish full and complete data, provide necessary documents and other facilities required by the accredited energy auditor for the purpose of performing the function of check-verification under these rules.(6)The accredited energy auditor in-charge of check-verification function shall report the results of his assessment in a check-verification report and the said report shall contain,-(a)the summary of the verification process, results of his assessment and his opinion along with the supporting documents;(b)the details of check-verification activities carried out in order to arrive at the conclusion and opinion including the details captured during the verification process and conclusion relating to compliance with energy consumptions norms and standards, increase or decrease in specific energy consumption with reference to the specific energy consumption in the baseline year, entitlement about the issue or liability to purchase energy savings certificate.(7)If the accredited energy auditor records in his check-verification report, a positive opinion, it shall be concluded that all the requirements with regard to the compliance with energy consumption norms and standards ans the issue or purchase or energy savings certificates have been met.(8)If the accredited energy auditor records in his check-verification report, a negative opinion, the effect of such opinion on the energy consumption norms and standards, issue or purchase of energy savings certificate the liability of the accredited energy auditor in giving the verification report and amount of the unfair gain gained by the designated consumer as a result of such verification report shall be calculated by the accredited energy auditor conducting the check-verification.(9)The accredited energy auditor in-charge of check-verification shall submit his report with due certification in Form 'C' to the Bureau and the concerned State Designated Agency.(10)Where the verification report given by the accredited energy auditor secures an unfair or undue gain due to the deficiencies or inconsistencies or errors or misrepresentation by the designated consumer, the quantum of such gain shall be calculated having regard to the following factors, namely-(a)the value of the amount payable by such designated consumer shall be as worked out in the verification report plus twenty-five per cent of such value because of unfair practice used by the said designated consumer for obtaining unfair advantage:(b)[the amount of metric tonne of oil equivalent of energy on account of unfair gain identified due to check-verification and the price of the said amount of energy shall be calculated as per rule 16 based on the assessment year of the respective cycle.] [Substituted by Notification No. G.S.R. 409(E), dated 26.4.2018 (w.e.f. 30.3.2012).](ba)[the value of per metric tonne of oil equivalent of energy shall be taken from notified value of the respective target year under these rules;] [Inserted by

Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).](c)cost of check-verification.(11)The State designated agency may furnish its comments on the report within [one month] [Substituted 'ten days' by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).] from the receipt of the report from the said accredited energy auditor and in case no comments are received from the concerned state designed agency, it shall be presumed that they have no comments to offer in the matter.(12)The Bureau after the expiry of ten days referred to in sub-rule (11), shall issue show cause notice to the designated consumer as well as to his accredited energy auditor specifying the deficiencies or inconsistencies or errors or misrepresentation noticed against the designated consumer and his accredited energy auditor.(13)The designated consumer as well as his accredited energy auditor shall submit their replies to the said show cause notice within a period of fifteen working days to the officer of the Bureau who has issued that show cause notice.(14)The Bureau after examining the said replies to the show cause notice referred to in sub-rule (13), shall forward the report to the concerned State designated agency specifying the following details for the purpose of initiating the penalty proceedings, namely:-(a)the number of energy savings certificates wrongfully obtained by the designated consumer on the basis of verification report found to be wrong and false on check-verification;(b)the number of energy savings certificates which the designated consumer was liable to purchase for non-compliance with the energy consumption norms and standards as found in the check-verification report;(c)details of the misrepresentation, if any and the unfair gain due to such misrepresentation;(d)the cost of check-verification.(15)The State designated agency within two months from the date of the receipt of the report referred to in [sub-rule (14)] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).] shall initiate-(a)action to recover from the designated consumer the loss to the Central Government by way of unfair gain to the designated consumer;(b)penalty proceedings against the persons mentioned in the said report, under intimation to the Bureau;(c)register complaint for such fraudulent unfair gain if designated consumer does not pay penalty and loss to the exchequer in the specified time mentioned in the penalty proceedings.(16)Where the check-verification has been initiated on the basis of a complaint received by the Bureau, the cost of check-verification shall be borne by the complainant, in case it was found on check-verification that the designated consumer has submitted correct information in Form 'A'.(17)Where the check-verification has been initiated on the basis of a complaint received by the Bureau, the cost thereof shall be borne by the designated consumer in case it was found on check-verification that the designated consumer has submitted false and incorrect information in Form 'A'.

9. Procedure regarding compliance with energy consumption norms and standards and issue of energy savings certificate.

(1)A firm registered under the Indian Partnership Act, 1932 (9 of 1932) or a company incorporated under the Companies Act, 1956 (1 of 1956) or any other legal entity competent to sue or to be sued or enter into contracts shall be entitled to undertake verification and check-verification regarding compliance with the energy consumption norms and standards and issue or purchase of energy savings certificate if it,-(a)has at least one accredited energy auditor whose name is included in the list of the accredited energy auditors maintained by the Bureau under regulation 7 of the Bureau of Energy Efficiency (Qualifications for Accredited Energy Auditors and Maintenance of their List)

Regulations, 2010;(b)[has at least three certified energy auditors certified by the Bureau;] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).](ba)[has at least one sector expert with experience of more than ten years in the said sector applied for, if Accredited Energy Auditor has the required experience in a specific sector, the same shall be treated as sector specific experience; [Inserted by Notification No. G.S.R. 409(E), dated 26.4.2018 (w.e.f. 30.3.2012).](bb)The Empanelment of the AEA firm shall be sector specific based on the experience of sector experts engaged by the firm.](c)has adequate expertise of field studies including observations, probing skills, collection and generation of data, depth of technical knowledge and analytical abilities for undertaking verification and check-verification;(d)has a minimum turnover of ten lakhs rupees per annum in at least one of the previous three years or in case of a newly formed organization, a net worth of ten lakhs rupees.(2)The Bureau shall invite applications from the firms, companies and other legal entities to undertake the work of verification and check-verification for the purpose of preparing a panel of such firms, companies and other legal entities.(3)The applications referred to in sub-rule (2) shall be accompanied by a certificate of registration or incorporation as the case may be.(4)[The applications so received shall be scrutinised in accordance with the provisions of sub-rule(1) and interaction shall be held covering the duties, responsibilities and obligations specified in rule 10 having regard to their associates and sector experts, and a panel of eligible applicants shall be prepared which shall be displayed on the website of the Bureau.] [Substituted by Notification No. G.S.R. 409(E), dated 26.4.2018 (w.e.f. 30.3.2012).](5)The selected applicants shall be issued a certificate of empanelment in support their selection to undertake the function of verification and check-verification as accredited energy auditor [and shall be renewed after every five years based on the extant provisions in force.] [Added by Notification No. G.S.R. 409(E), dated 26.4.2018 (w.e.f. 30.3.2012).](6)A unique identification number shall be issued to the accredited energy auditors referred to in sub-rule (5).(7)[(a) The Bureau shall cancel the empanelment of the firm referred to in sub-rule (5), if it fails to comply with any of the provisions specified in the Act or in these rules during the course of performing the function of verification or check verification, and if such non-compliance is concomitant with -(i)any commission or omission amounting to professional misconducts; or(ii)any misrepresentation of fact or data or reports on energy consumption; or(iii)any act amounting to fraud; or(iv)the empaneled firm fails to maintain its empaneled team in case in any of the team members has left the said firm and the resultant vacancy has not been filled within a period of three months from the date of the said vacancy:Provided that no such cancellation shall be done by the Bureau without giving an opportunity of being heard to such firm.(b)Every such person borne on the strength of the firm, referred to in clause (a), who at the time of such non-compliance was in charge of, and was responsible to the said firm for the conduct of the business of that firm, the said firm as well as the said person who directly or indirectly helped the designated consumer in contravention of any of the provision of section 26 of the Act shall be deemed to have acted in contravention of the said provision and shall be liable to proceeded against for imposition of penalty specified in that section.(c)The Bureau shall cancel the accreditation of Accredited energy auditor, certification of certified energy auditor or certified energy manager under the respective regulations, namely the Bureau of Energy Efficiency (Qualifications for Accredited Energy Auditors and Maintenance of their List) Regulations, 2010 and the Bureau of Energy Efficiency (Certification Procedures for Energy Managers) Regulations, 2010 if any of them was involved in any of the activities referred to clauses (a) and (b):Provided that no such cancellation shall be done by the Bureau without giving an opportunity of being heard to such persons.] [Inserted by Notification No. G.S.R. 409(E), dated 26.4.2018 (w.e.f. 30.3.2012).]

10. Obligations of accredited energy auditor.

(1)For the work of verification or check verification, the accredited energy auditor shall constitute a team comprising of a team head and other members including experts:Provided that a person who was in the employment of a designated consumer within the previous four years, shall not be eligible to perform the work of verification or check-verification for such designated consumer;Provided further that any person or firm or company or other legal entity, who was involved in undertaking energy audit in any of the designated consumer within the previous four years, shall not be eligible to perform the work of verification or check-verification for such designated consumer.(2)The accredited energy auditor shall ensure that persons selected as team head and team members must be independent, impartial and free of potential conflict of interest in relation to activities likely to be assigned to them for verification or check-verification.(3)The accredited energy auditor shall have formal contractual conditions to ensure that each team member of verification and check-verification teams and technical experts act in an impartial and independent manner and free of potential conflict of interest.(4)The accredited energy auditor shall ensure that the team head, team members and experts prior to accepting the assignment inform him about any known, existing former or envisaged link to the activities likely to be undertaken by them regarding verification and check verification.(5)The accredited energy auditor must have documented system for determining the technical or financial competence needed to carry out the functions of verification and check-verification and in determining the capability of the persons referred to in sub-rule (2), the accredited energy auditor shall consider and record among other things the following aspects, namely:-(a)complexity of the activities likely to be undertaken;(b)risks associated with each project activity;(c)technological and regulatory aspects;(d)size and location of the designated consumer;(e)type and amount of field work necessary for the verification or check-verification.(6)The accredited energy auditor shall have documented system for preparing the plan for verification or check-verification functions and the said plan shall contain all the tasks required to be carried out in each type of activity, in terms of man days in respect of designated consumers for the purpose of verification and check-verification.(7)The names of the verification or check-verification team members and their bio-data shall be provided by the accredited energy auditor to the concerned designated consumer in advance.(8)The verification or check-verification team shall be provided by the accredited energy auditor with the concerned working documents indicating their full responsibilities with intimation to the concerned designated consumer.(9)The accredited energy auditor shall have documented procedure-(i)to integrate all aspects of verification or check-verification functions;(ii)for dealing with the situations in which an activity undertaken for the purpose of compliance with the energy consumption norms and standards or issue of energy savings certificate shall not be acceptable as an activity for the said purposes.(10)The accredited energy auditor shall conduct independent review of the opinion of verification or check-verification team and shall form an independent opinion and give necessary directions to the said team if required.(11)In preparing the verification and check-verification reports, the accredited energy auditor shall ensure transparency, independence and safeguard against conflict of interest.(12)The accredited energy auditor shall ensure the confidentiality of all information and data obtained or created during the verification or check verification report.(13)In assessing the compliance with the energy consumption norms and standards and issue of energy savings certificates, the accredited energy auditor shall follow the provisions of the Act, rules and regulations made thereunder.(13A)[Any deviation from rules 6, 7, 8 and rule 9, and required professional conduct for verification or check verification by accredited energy auditor shall attract action under the relevant provisions of the Bureau of Energy Efficiency (Qualifications for Accredited Energy Auditors and Maintenance of their List) Regulations, 2010.] [Inserted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).](14)After completion of the check-verification, the accredited energy auditor shall submit the check-verification report, together with the certificate in Form-'C', to the Bureau.

11. Recommendation for issue of energy savings certificates.

(1)The Bureau on satisfying itself about the correctness of verification report, and check-verification report, wherever sought by it, send its recommendation under clause (aa) of sub-section (2) of section 13 to the Central Government, based on the claim raised by the designated consumer in Form 'A', within ten working days from the last date of submission of said Form 'A' by the concerned state designated agency, for [issue or to purchase] [Substituted 'issuance' by Notification No. G.S.R. 409(E), dated 26.4.2018 (w.e.f. 30.3.2012).] of energy savings certificates under section 14A and the recommendation shall specify. -(a)the exact number of energy savings certificates to be issued to the designated consumer and the entitlement for such energy savings certificates after determining by the following formula:(i)for thermal power plant sector:number of energy savings certificates =(heat rate notified for the target year- heat rate as achieved in the target year)x production in the baseline year in million kwh/lo(ia)[for petroleum refinery sector :[Inserted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).]Number of energy savings certificates =(MBN notified for the target year- MBN as achieved in the target year)× crude processed in the baseline year in thousand barrelsx NRGF x 2.52 x 10-2;(ib)for Railway sector :(A)Zonal Railways (Traction)a = (specific energy consumption (Diesel traction - passenger) notified for target year- specific energy consumption (diesel traction - passenger) as achieved in target year)x 1000 GTkm (diesel traction - passenger) of baseline year.b = (specific energy consumption (Diesel traction - goods) notified for target year- specific energy consumption (diesel traction goods) as achieved in target year)x 1000 GTkm ([diesel traction - goods]) of baseline year.c = (specific energy consumption (electrical traction - passenger) notified for target year- specific energy consumption (electrical traction - passenger) achievedin target year)x 1000 GTkm (electrical traction - passenger) of baseline year.d = (specific energy consumption (electrical traction-goods) for target year- specific energy consumption (electrical traction-goods) achieved in target year)x 1000 GTkm (electrical traction-goods) of baseline year.Then Energy Saving Certificates (ESCerts)=((a+b)/1022) + ((c+d)/11630)(B)[for Production factories: [Substituted by Notification No. G.S.R. 409(E), dated 26.4.2018 (w.e.f. 30.3.2012).]

=| Number of energy saving certificates[{SEC notified for target year - SEC achieved in target year} Xnumber of equivalent units produced in baseline year]1000]

(ic)for Electricity Distribution Company sectorNumber of energy savings certificates =(per cent % Transmission and Distribution Loss notified for the target year- per cent % Transmission & Distribution Loss as @ achieved in the target year)

(* Oil Equivalent Conversion Factor (OEC)) EC| x| 86100]
(id)[for Commercial Buildings or establishments: [Inserted by Notification No. G.S.R. 409(E), dated 26.4.2018 (w.e.f. 30.3.2012).]Number of energy savings certificates ={Specific energy consumption notified for the target year - Specific energy consumption achieved in the target year} X total built up area excluding parking and storage (thousand-meter square) in the baseline year.(ie)for petrochemical sector:Number of energy savings certificates ={Specific energy consumption notified for the target year - Specific energy consumption achieved in the target year} X total equivalent production of olefin products in the baseline year.](ii)for other sectors:number of energy savings certificates =(specific energy consumption notified for the target year- specific energy consumption as achieved in the target year)x production in the baseline year(b)the identity of the concerned designated consumers;(c)the certification that all the requirements for issue of energy savings certificates have been complied with, by the designated consumer and his entitlement has been certified in the verification report by the accredited energy auditor.(2)[The designated consumer may seek issue of energy saving certificates based on performance achieved during the target year with respect to compliance with the energy consumption norms and standards, and the Bureau on satisfying itself about the correctness of verification report, and check-verification report, wherever sought by it, send its recommendations under clause (aa) of sub-section (2) of section 13 of the Act to the Central Government, based on the claim made by the designated consumer in Form 'A' for issue of energy saving certificates under section 14A of the Act.] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).](3)The total amount of energy savings certificates recommended under sub rule (2) shall be adjusted against the entitlement on conclusion of the target year as per the following formulae:-(A)for thermal power plant sector:(i)energy savings certificate to be issued after year 1 ={[heat rate in the baseline year - (heat rate in the baseline year - heat rate notified for the target year) ÷ 3] -heat rate achieved in year 1} x 80% xproduction in million kwh in the baseline year/10;(ii)adjusted heat rate after year 1 =heat rate notified for target year -(energy savings certificates issued in year 1 ÷production in million kwh in the baseline year) x 10;(iii)energy savings certificate to be issued after year 2 ={[heat rate in the baseline year - (heat rate in the baseline year -heat rate adjusted after year 1) x 2 ÷ 3] - heat rate achieved in year 2} x

80.

% x production in million unit in the baseline year/ 10;(iv)adjusted heat rate after year 2 = heat rate adjusted after year 1 -(energy savings certificates issued in year 2 ÷production in million in the baseline year) x 10(v)energy savings certificate to be issued in the target year ={[heat rate in the baseline year - (heat rate in the baseline year -heat rate adjusted after year 2)] -heat rate achieved in the target year} xproduction in million kWh in the baseline year/ 10;(vi)total number of energy savings certificates issued in the cycle =energy savings certificates issued in year 1 +energy savings certificates issued in year 2 +energy savings certificates issued in target year.(B)for other sectors:(i)energy savings certificate to be issued after year 1 ={[specific energy consumption in the baseline year -(specific energy consumption in the baseline year -specific energy consumption notified for the target year) ÷ 3] -specific energy consumption achieved in year 1} x 80% xproduction in the baseline year;(ii)adjusted specific energy consumption after year 1 =specific energy consumption notified for target year -(energy savings certificates issued in year 1

÷production in the baseline year);(iii)energy savings certificate to be issued after year 2 ={[specific energy consumption in the baseline year -(specific energy consumption in the baseline year -specific energy consumption adjusted after year 1) x 2 ÷ 3] -specific energy consumption achieved in year 2} x 80% xproduction in the baseline year;(iv)adjusted specific energy consumption after year 2 =specific energy consumption adjusted after year 1 -(energy savings certificates issued in year 2 ÷production in the baseline year)(v)energy savings certificate to be issued in the target year ={[specific energy consumption in the baseline year -(specific energy consumption in the baseline year -specific energy consumption adjusted alter year 2)] -specific energy consumption achieved in the target year} xproduction in the baseline year;(vi)total number of energy savings certificates issued in the cycle =energy savings certificates issued in year 1 +energy savings certificates issued in year 2 +energy savings certificates issued in target year.

12. Procedure for issue of energy savings certificate.

- [(1) The Central Government, on the receipt of recommendation from the Bureau under rule 11, shall on satisfying itself in this regard, [issue or entitled to purchase] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).] energy savings certificates of required value to the concerned designated consumer within forty-five days from the date of receipt of such recommendation from the Bureau.](2)The energy savings certificate shall be issued in electronic form.(3)[The value of one energy savings certificate shall be equal to one metric tonne of oil equivalent of energy consumed and shall be rounded off to nearest whole number as per IS 2 : 1960.] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).](4)The designated consumer who has been issued energy savings certificates may sell them through the power exchange.(5)[The designated consumer who has been issued energy savings certificates during the current cycle may use them for the purpose of banking and the energy savings certificates issued shall remain valid till the completion of the compliance period of their next cycle.] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).](6)[The designated consumers may use the banked energy saving certificates, if any, referred to in sub-rule (5) for the purpose of compliance of the next cycle or may sell them to any other designated consumer for the compliance within the validity period.] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).](6a)[The designated consumer, -(i)whose specific energy consumption is more than the prescribed norm and standards shall be eligible to purchase the energy saving certificates to ensure compliance with the prescribed norms and standard specified under clause (g) and clause (p) of the section 14 of the Act;(ii)who have achieved the energy consumption norms and standards but has not been issued energy saving certificates shall also be eligible to purchase energy saving certificates during the trading sessions for meeting their compliance of next compliance cycle.](7)The energy savings certificates purchased by a designated consumer for the purpose of compliance with the energy consumption norms and standards shall after their submission to the Bureau stand expired.(8)[The Central Electricity Regulatory Commission shall function as the Market Regulator to promote market for development of energy saving certificates (ESCerts) including trading on power exchange(s) and discharge such other functions as may be considered necessary for the purpose.] [Inserted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).]

13. Compliance of energy consumption norms and standards.

(1)The designated consumer for the purpose of achieving the compliance with the energy consumption norms and standards during the target year, in the relevant cycle shall take the following action and after completing the said action, furnish the status of compliance to the concerned state designated agency with a copy to the Bureau in Form 'D' [eight months from the last date of submission of Form 'A']. [Substituted 'by the end of one month from the completion of trading of the respective cycle as may be specified by the Central Electricity Regulatory Commission' by Notification No. G.S.R. 409(E), dated 26.4.2018 (w.e.f. 30.3.2012).](a)by implementation of energy conservation and energy efficiency improvement measures or;(b)where the measures implemented in terms of clause (a) are found inadequate for achieving compliance with the energy consumption norms and standards, the designated consumer shall purchase the energy savings certificates equivalent in full satisfaction of the shortfall in the energy consumption norms and standards worked out in terms of [metric tonne] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).] of oil equivalent.(2)[The designated consumer may use balanced energy saving certificates after the compliance, if any, for the purpose of banking and such banked energy saving certificates may be used for the compliance of the next cycle.] [Inserted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).]

14. Establishment of new baseline for next cycle.

- The energy consumption norms and standards achieved by the designated consumer on the completion of the target year, as mentioned in the compliance report in [Form A and Form B] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).] shall be the baseline for establishment of new plant specific energy consumption norms and standards for designated consumers for the next cycle.

15. Obligations of the designated consumers.

- The designated consumers shall,-(a)for assessment of their performance for compliance with the energy consumption norms and standards, get the work of verification done through accredited energy auditors;(b)take all measures including implementation of energy efficiency projects recommended by the accredited energy auditor and good practices prevalent or in use in the concerned industrial sector so as to achieve the optimum use of energy in their plant;(c)furnish the full and complete data, provide necessary documents and other facilities required by the accredited energy auditor for the purpose of performing the function of verification and check-verification.

16. Specification of value of energy.

- [(1) The value of per metric tonne of oil equivalent of energy consumed, as on the 1st day of April of the year for which value of energy is being specified, shall be determined by applying the following formula, namely:-P = Wc x Pc+Wo x Po+Wg x Pg + We x PeWhere,-P = price of one metric tonne of oil equivalent for the specified year (1toe);Pc = average price of delivered coal in terms of rupees per tonne of oil equivalent, from the data made available by the designated consumers for the last financial year;Po = average price of fuel oil in terms of rupees per tonne of oil equivalent from the data made available by the designated consumers for the last financial year;Pg = average price of gas in terms of rupees per tonne of oil equivalent from the data made available by the designated consumers for the last financial year;Pe = average price of electricity in terms of rupees per tonne of oil equivalent for industrial sector in the States of Chattisgarh, Gujarat, Maharashtra, Madhya Pradesh and Tamil Nadu as specified by the respective State Electricity Regulatory Commission;all prices shall be as on the 1st day of April of the year for which value of energy is being specified.

Weightage of coal (Wc) =| amount of coal consumed across all designated consumers in the baseline year (in toe)total energy consumption across all designated consumers in the baseline year (in toe)

Weightage of oil (Wo) =| amount of oil consumed across all designated consumers in the baseline year (in toe)total energy consumption across all designated consumers in the baseline year (in toe)

Weightage of gas (Wg) =| amount of gas consumed across all designated consumers in the baseline year (in toe)total energy consumption across all designated consumers in the baseline year (in toe)

Weightage of electricity (We) =| amount of electricity consumed across all designated consumers in the baseline year (in toe)total energy consumption across all designated consumers in the baseline year (in toe)]

[Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).](2)The value of per [metric tonne] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).] of oil equivalent of energy consumed for the purpose of these rules shall be rupees 10154 for the year 2011-12.(2A)[The value of per metric tonne of oil equivalent of energy consumed for the purpose of these rules shall be ten thousand nine hundred and sixty eight rupees(Rs. 10968) for the year 2014-15 and shall be such as may be specified by the Central Government, by notification in the Official Gazette, for the succeeding target years.] [Inserted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).](3)The value of per [metric tonne] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).] of oil equivalent of energy consumed shall be reviewed every year for the purpose of sub-rule (2).[Form-A] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).][See rule 6 (1)]Performance Assessment Document(To be filled by designated consumer)

1.	Name of designated consumer
2.	Registration number
3.	Sector
4.	Sub-sector
5.	Accredited Energy Auditor
a	Name of the Empaneled

	Accredited Energy Auditor Firm		
b	Registration number of Firm		
6.	List of documents submitted (Attach a copy self attested byEnergy Manager and counter signed by Accredited Energy Auditor)		
a.	Baseline data	Submitted/Not submitted	Date of submission
b.	Form 1 of Rules, 2007 or Rules, 2008 ( ) Specify the year inthe bracket	Submitted/Not submitted	Date of submission
c.	Form 1 of Rules, 2007 or Rules, 2008 ( ) Specify the year inthe bracket	Submitted/Not submitted	Date of submission
d.	Form 1 of Rules, 2007 or Rules, 2008 ( ) Specify the year inthe bracket	Submitted/Not submitted	Date of submission
e.	Form 2 of Rules, 2008	Submitted/Not submitted	Date of submission
f.	Form 3 of Rules, 2008	Submitted/Not submitted	Date of submission
7.	Specific energy consumption		
a.	Specific energy consumption (baseline) as notified		toe/tonne or Net Heat Rate, kcal/kWh or

		Energy PerformanceIndex, as specified for a particular sector
b.	Production (baseline) as notified	Tonne or Million kWh
c.	Target specific energy consumption (SEC) as Notified	Toe/ tonne or Net Heat Rate, kcal/kWh or Energy PerformanceIndex, as specified for a particular sector
d.	Difference of Baseline specific energy consumption (SEC) andTarget specific energy consumption (SEC) as notified	Toe/ tonne or Net Heat Rate, kcal/ kWh or Energy PerformanceIndex, as specified for a particular sector (a-c)
e.	Normalized specific energy consumption (Achieved in the targetyear)	Toe/ tonne or Net Heat Rate, kcal/ kWh or Energy PerformanceIndex, as specified for a particular sector
f.	Energy savings certificates to be issued or deficit	Nos [(c-e)xb] or [(ce) xb]/ 10

8.

Energy Efficiency Project implemented during current cycle(Mention cycle period: ....)

S. No	Project	Year of Implementation	Annual Energy Savings in Lakh kWh	Annual Energy Saving in toe*	Annual Energy consumption (before) in toe	Annual Energy consumption (after) in toe	Energy cost (Rs. per kWh or toe)	Investme (Rs. crores)
a.								
b.								
c.								
d.								
e.								
f.								

* Please indicate the weighted average Gross Calorific Value (GCV) of coal considered for calculation of toe : .... kcal/kg.Note 1: Form A may be filled in accordance with the following guidelines, namely:-Guidelines

1. Name of designated consumer: As per notification under clause (g) of section 14.

2. Registration No: As provided by Bureau of Energy Efficiency

3. Sector: As specified in Form 1 of Rules, 2007 or Rules, 2008.

4. Sub-sector: As specified in Form 1 of Rules, 2007 or Rules, 2008.

5. Name of accredited energy auditor: As selected by designated consumer from list of accredited energy auditor empaneled by Bureau of Energy Efficiency.

6. List of documents submitted:

(a)Baseline data: Submitted to Bureau of Energy Efficiency for Target Calculations(b)Form 1 of Rules, 2007 or Rules, 2008 mention the year ( ): As per filing, attach acknowledgement of submission i.e. after completion of 1st year after notification(c)Form 1 of Rules, 2007 or Rules, 2008.mention the year ( ): As per filing, attach acknowledgment of submission i.e. after completion of 2nd year after notification(d)Form 1 of Rules, 2007 or Rules, 2008.mention the year ( ): As per filing, attach acknowledgment of submission i.e. after completion of target year(e)Form 2 of Rules 2008: As per filing, attach acknowledgment of submission(f)Form 3 of Rules 2008: As per filing, attach acknowledgment of submission

7. Specific energy consumption (SEC)

(a)Specific energy consumption (Baseline): As notified by Government of India as aforesaid.(b)Production (Baseline): As notified by Government of India as aforesaid.(c)Target specific energy consumption as notified: notified by Government of India(d)Normalized specific energy consumption (Achieved): Normalized specific energy consumption (Achieved) in the target year from Form 1 of Rules, 2007 and Rules, 2008.(e)Energy savings certificates: Calculate as per formulae provided in the rule 11.Enter +ve value if energy savings certificates to be issued to designated consumer or enter -ve value in case recommended for purchase of energy savings certificates

8. Project implemented during current cycle: Energy efficiency projects implemented by designated consumers during last three years. Attach photograph of energy savings projects implemented.

UndertakingI/ We undertake that the information supplied in this Performance Assessment Document is accurate to the best of my knowledge and if any of the information supplied is found to be incorrect and such information result into loss to the Central Government or State Government or any of the authority under them or any other person affected, I/we undertake to indemnify such loss.I/ We agree to extend necessary assistance in case of any inquiry to be made in the matter.SignatureNameDesignationFor and behalf ofName of the Firm/ Company/ OrganizationSEAL of the Firm/ Company/ OrganizationForm B[See rule 6(1)] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).]Certificate of Verification.M/s ______________________ the accredited energy auditor, [(Name of the Empaneled Accredited Energy Auditor Firm)] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).] have undertaken a thorough independent evaluation of the activities undertaken by M/s. ____________ ,a designated consumer for compliance with the energy consumption norms and standards specified under the Government of India Ministry of Power notification number _____________, dated the ______________ during the target year compared to the baseline year and consequent entitlement or requirement of energy savings certificates and certify that-(a)the verification of the data collection in relation to energy consumed and specific energy consumption per unit of production in the baseline year and in the target year in Form 1 under Rules 2007 or Rules 2008, has been carried out diligently and truthfully;(b)the verification of the identified energy efficiency measures, and the progress of their implementation given in [Form 2 and Form 3] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).] under Rules 2008 has been carried out diligently and truthfully;(c)the verification of the compliance with energy consumption norms and standards during the target year has been carried out diligently and truthfully;(d)the verification of the total amount of energy saved, year-wise, after the baseline year and until target year or otherwise and request made by the designated consumer, the entitlement of __________ (Nos) energy savings certificate (s) required to be issued or purchased by him have been carried out diligently and truthfully;(e)all reasonable professional skill, care, and diligence have been taken in verifying the various verification activities, findings and conclusions, documents, reports, preparing the documents including the performance assessment document in Form 'A' and verification report and the contents thereof are a true representation of the facts.

SignatureName of accredited energy auditor forverificationDesignation:

Form C[See rule 8(9) and 10(14)] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).]Certificate of Check - Verification[M/s] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).] ____________ the accredited energy auditor [(Name of the Empaneled Accredited Energy Auditor Firm)] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).], have undertaken a through independent evaluation of the activities undertaken by M/s. _________ ,a designated consumer for compliance to the energy consumption norms and standards specified under the Government of India Ministry of Power notification numbers ___________, dated the _____________ dating the target year compared to the baseline year and consequent entitlement or requirement of energy savings certificates, mentioned in the Performance Assessment Document in Form 'A' and compliance of energy consumption norms and standard document in Form 'D' and certify that-(a)the check-verification of the data collection in relation to energy consumed and specific energy consumption per unit of production in the baseline year and in the target year in Form 1 under Rules 2007 or Rules 2008, has been carried out diligently and truthfully;(b)the check-verification of the identified energy efficiency measures, and the progress of their implementation given in [Form 2 and Form 3] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).] under Rules 2008 has been carried out diligently and truthfully;(c)the check-verification of the compliance with energy consumption norms and standards during the target year has been carried out diligently and truthfully;(d)the check-verification of the total amount of energy saved, year-wise, after the baseline year and until target year or otherwise and request made by the designated consumer, the entitlement of ___________ (Nos) energy savings certificate (s) required to be issued or purchased by him have been carried out diligently and truthfully;(e)all reasonable professional skill, care, and diligence have been taken in check-verifying the various verification activities, findings and conclusions, documents, reports, preparing the documents including the information given in the Performance Assessment Document in Form 'A' and verification report submitted by the accredited energy auditor appointed by the designated consumer .... for verification and the contents thereof are a true representation of the facts.

SignatureName of accredited energy auditor forverificationDesignation:[Name of the Empaneled Accredited Energy Auditor Firm:] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).]

Form-D[(See rule 13 and 14)] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).]Compliance of Energy Consumption Norms and Standard Document(To be filled in designated consumer)

1. Name of designated consumer

2.	Registration number		
3.	Sector		
4.	Sub-sector		
5.	List of documents submitted		
a.	PerformanceAssessment Document (Form 'A')	Submitted/ Not submitted	Date of submission
6.	Compliance		
a.	EnergySavings Certificates		Issued/ Recommended for purchase
b.	EnergySavings Certificates submitted for compliance		If recommended for purchase
c.	BalanceEnergy Savings Certificates		Nos

Note 1: Form D may be filled in accordance with the following guidelines:-Guidelines

1. Name of designated consumer: As per notification from Government of India (GoI) under clause (g) of section 14

2. Registration number: As per E-filing

3. [Sector: As specified in Form - A

4. Sub-sector: As specified in Form-A.] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).]

Sector	Basis for Sub-sector	Sub-sector
Thermal Power Plant	Fuel Based	Coal, Gas, Oil
Cement	Process Based	Dry, Wet
Iron and Steel	Operation Based	Integrated Sponge Iron
Fertilizer	Feedstock Based	Natural Gas, Naptha
Aluminum	Product Based	Refinery Smelter
Pulp and Paper	Raw Material Based	Wood, Agro, Recycled Fibre
Textile	Operation Based	Spinning Processing Composite, Fiber yarn
Chlor-Alkali	Technology based	Membrane cell, Mercury

5. List of Documents submitted:

(a)Performance assessment document: Submitted to Bureau of Energy Efficiency for issue of energy savings certificates.

6. Compliance

(a)Energy savings certificates: Enter +ve value if energy savings certificates issued to designated consumer or enter -ve value in case recommended for purchase of energy savings certificates(b)Energy savings certificates submitted for compliance: If designated consumer is recommended for purchase of energy savings certificates, then enter value of energy savings certificates submitted by designated consumer for compliance of energy consumption norms and standards saving target of designated consumer.(c)Balance energy savings certificates: Numbers of energy savings certificates balance. If balance is Zero than DC is in accordance for compliance of energy saving target and if balance is -ve than DC will be recommended for penalty.UndertakingI/We undertake that the information supplied in compliance with energy consumption and standard documents in this Form 'D' is accurate to the best of my/our knowledge and if any of the information supplied is found to be incorrect and such information result into loss to the Central Government or State Government or any of the authority under them or any other person affected, I/we undertake to indemnify such loss.I/we agree to extend necessary assistance in case of any enquiry is made in the matterSignatureNameDesignationFor and behalf ofName of the Firm/Company/OrganizationSeal of the Firm/Company/Organization[Schedule I] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).][See rules 2(j) and 4(4)]

1. Determination of specific energy consumption.-

1.1Specific energy consumption (See rule 2(l))(a)The specific energy consumption (SEC) gives the indication of efficient utilization of different sources of energy in a plant operational boundary to produce one unit of product, which is defined as the ratio of total energy input to plant boundary and the quantity of products produced and specific energy consumption of an industry shall be calculated based on Gate-to-Gate concept with the following formula:-

Specific Energy Consumption =| Net energy input into the designated consumers' boundaryTotal quantity of output exported from the designated consumers' boundary

and expressed in terms of the metric ton of oil equivalent (toe)/per unit of product;Note: For first cycle, value to be rounded to three decimal places except for cement sector and refinery sector for which value to be rounded to four decimal places. For second cycle, the value to be rounded to four decimal places except for thermal plant sector, electricity distribution companies and railways sector for which value to be rounded to two decimal places.Table 1: Definition of product to calculate specific energy consumption

Sector	Main product	Unit
Cement	Cement	Tonne
Fertilizer	Urea	Tonne
Iron and Steel (Integrated)	Crude Steel	Tonne
Iron and Steel (Sponge Iron)	Sponge Iron	Tonne
Aluminum (Refinery)	Alumina	Tonne
Aluminum (Smelter)	Molten Aluminum	Tonne

Aluminum (Integrated)	Molten Aluminum	Tonne
Pulp and Paper (Pulping)	Pulp	Tonne
Pulp and Paper (Only PaperMaking)	Paper	Tonne
Pulp and Paper (Pulp and Paper)	Paper	Tonne
Textile (Spinning)	Yarn	Kg
Textile (Composite)	Yarn/ Fabric	Kg
Textile (Fibre)	Fibre	Kg
Textile (Processing)	Fabric	Kg
Chlor-Alkali	Equivalent Caustic Soda	Tonne
Power Plant	Electricity	Million kWh
Petroleum Refineries	Crude/ Petroleum Products	Thousands BBLs
Railways-Traction	Transportation	GTKM
Railways – ProductionFactories	Locomotives/ Coaches/ Wheels etc.	Numbers
Electricity DistributionCompanies	Electricity	Million kWh

1.2Gate-to-Gate designated consumer boundary (sector-specific)(a)As the specific energy consumption (SEC) is calculated on a Gate-to-Gate concept, the entire designated consumers' plant boundary shall be selected in such a manner that the total energy input and the above products defined in Table 1 are fully captured.(b)Once the designated consumers' boundary has been fixed, the same boundary shall be considered for entire cycle, and any change in the said boundary such as capacity expansion, merger of two plants, division of operation etc. shall be duly intimated to the Bureau of Energy Efficiency.(c)The following designated consumers' boundaries will be considered in the first cycle:-Case -I: All energy purchased and consumed:-Electricity is purchased from the gridCase -II: Electricity partially generated by diesel generating (DG) set, other energy purchased and consumed:-Electricity is purchased from the grid and generated by DG setCase -III: Electricity generated by captive power plant and other energy purchased and consumed, electricity partially sold to grid:-Electricity is generated by coal based captive power plant, partially sold to grid-Case -IV: Electricity generated by captive power plant (CPP), other energy purchased and consumed, electricity partially sold to grid from captive power plant:-Electricity is generated by coal based captive power plant, partially sold to grid and captive power plant is in separate boundary-Case -V: Energy purchased and consumed, electricity and heat partially generated through co-generation plantElectricity and heat are generated by co-generation Plant-Case-VI: Energy purchased and consumed, heat energy partially met by waste or by-product of the process-1.3Methodology for calculating baseline specific energy consumption for cycle 2012-13 to 2014-15.-(a)During the first cycle designated consumer having more than five years life, data for the previous three years, namely, 2007-08, 2008-09, 2009-10 shall be considered provided the capacity Utilization is uniform. Normalization, in a suitable statistical approach, shall be done in case of abnormality in capacity utilization in any of the aforesaid three year (s).(b)During the first cycle designated consumer having more than five years life and less than three years data has been reported, the same shall be considered provided the capacity utilization is uniform and if the capacity utilization is abnormally low in any of the aforesaid three year(s), the same shall not be considered.(c)During the first cycle, designated consumer having less than five years life and less than three years data has been reported, the available year's data shall be considered provided the capacity utilization is uniform. If the capacity utilization is abnormally low in any of the year(s), the same shall not be considered.(d)During the first cycle, in case of new designated consumer, the data shall be considered for those years where the capacity utilization is greater than seventy percent (70%) and if only one year data is reported, the same shall be considered irrespective of the capacity utilization.(e)In the next cycle, baseline specific energy consumption shall be calculated in accordance with the provisions of rule 14.(f)few additional sector specific information like process technology, process flow, raw material, product mix etc. shall also be collected.(g)All forms of energy shall be converted into a single form i.e. metric ton of oil equivalent (toe) by the use of standard engineering conversion formula and the following general guiding principle shall be used in this regard:-(i)The reported gross calorific value (GCV) of fuels by the designated consumer shall be considered for estimating the equivalent thermal energy.(ii)If gross calorific value (GCV) is not reported, then the values mentioned in the Government of India, Ministry of Power, notification number S.O 394(E), dated the 12th March, 2007 shall be considered. Any other information as required shall be taken from standard industrial practice.(iii)The equivalent thermal energy of the electricity supplied to the grid shall be deducted from the total energy input to the designated consumers' boundary. The following expression shall be used:-a. Equivalent thermal energy (kcal) = Electricity supplied to grid (kWh) x national average heat rate in kcal/kWh in the baseline year.b. National average heat rate in year 2009-10 was 2717 kcal/kWh.(iv)Total energy input to the designated consumers' boundary shall be estimated with the following expression:-

(a) Energy input (toe) =| Fuel consumed quantity (kg) x gross calorific value (kcal/kg)10^7

(v)Once the total energy input to the designated consumers' boundary is estimated, the specific energy consumption shall be calculated by dividing the product quantity.1.4Methodology proposed for calculating baseline specific energy consumption for subsequent cycles beyond 2014-15, where baseline specific energy consumption is not available as per rule 14.(a)During the first cycle of designated consumer having more than three years life, data for the previous three years shall be considered.(b)During the first cycle of designated consumer having more than three years life and less than three years data has been reported, the same shall be considered.(c)During the first cycle of designated consumer having less than three years life and less than three years data has been reported, the available year's data shall be considered.(d)During the first cycle of designated consumer, the data shall be considered for those years where the capacity utilization is greater than seventy percent (70%) and if only one year data is reported, the same shall be considered provided the capacity Utilization is greater than seventy percent (70%) and if capacity Utilization is less than 70% for all reported years, average of all these years shall be considered.(e)Baseline Specific Energy Consumption shall be calculated based on the last financial year data, if any conditions mentioned in clause (a) or (b) or (c) and conditions mentioned in clause(d) are satisfied for the last financial year. In case, conditions are not satisfied for the last financial year, average of all those years where above mentioned conditions are satisfied shall be considered for calculating baseline specific energy consumption.(f)The Capacity Utilization referred to in this rule is the ratio of actual production(s) per unit of time, to maximum potential installed or established production capacity per unit time of a unit/major process of plant/establishment for the operating period(s).(g)The Capacity Utilization and Plant Loading Factor shall be calculated as per following equations:(i)Capacity Utilization: Capacity Utilization % (CU %) = (C1 x ICU1+C2 x ICU2+.......Cn x ICUn)*100/(C1+C2+....Cn);Where: ICU1...n = (P 1..n x 8760)/(Hr1..n x C 1..n)C 1..n = Installed or Established Production capacity in tonne per annum for 1..nth productP 1...n = Actual Production in tonne per anuum for 1..nth productHr1..n = Nos of operating hours in hours per annum for 1..nth productICU 1..n = Intermediate Capacity utilization of 1..nth product for the operating period(ii)Plant Loading Factor: The plant loading factor for a unit referred to in the said rule is defined as the ratio of total generation (MU) to the maximum available generating potential (MU) for the period under review.

Plant Loading Factor (%) =| G1xULF1 + G2xULF2 + ... GnxULFaG1 + G2 + ... Gn

Where:G1,2...n = Generation (MU) for Unit #1,2..nULF 1,2...n = Unit Loading Factor for Unit #1,2..nFor Individual Unit 1, 2,...n

Unit Loading Factor, (ULF1,2..n) (%) =| Average Operating Load in MWC| x 100

Average Operating Load in MW =| Energy generated during the period in MU X 1000(H - h)

C = Capacity of individual Unit in MWH = Total No. of operating hours in a year (8760 hrs)h = Total non-operating hours (hrs)Total non-operating hours = Forced Outage (FO), Planned Maintenance (PM), Fuel Unavailability, etc.Thus, the Plant Loading Factor is the percentage ratio of Plant Load Factor (PLF) and Plant Availability Factor (PAF) on bar.(h)In the next cycle, baseline specific energy consumption shall be calculated in accordance with the provisions of rule 14.(i)few additional sector specific information like process technology, process flow, raw material, product mix etc. shall also be collected.(j)All forms of energy shall be converted into a single form i.e. metric ton of oil equivalent (toe) by the use of standard engineering conversion formula and the following general guiding principle shall be used in this regard:-(i)The reported gross calorific value (GCV) of fuels by the designated consumer shall be considered for estimating the equivalent thermal energy.(ii)If gross calorific value (GCV) is not reported, then the values mentioned in the Government of India, Ministry of Power, notification number S.O 394(E), dated the 12th March, 2007 shall be considered. Any other information as required shall be taken from standard industrial practice.(iii)The equivalent thermal energy of the electricity supplied to the grid shall be deducted from the total energy input to the designated consumers' boundary. The following expression shall be used:-Equivalent thermal energy (kcal)=Electricity supplied to grid(kWh) x net heat rate of captive power plant or weighted heat rate of other power generation such as cogeneration etc.(iv)Total energy input to the designated consumers' boundary shall be estimated with the following expression:-

Energy input (toe) =| Fuel consumed quantity (kg) x gross calorific value (kcal/kg)107

(v)Once the total energy input to the designated consumers' boundary is estimated, the specific energy consumption shall be calculated by dividing the product quantity.1.5Procedure for Normalization of specific energy consumption.-(a)Variable factors as described in rule 4 may affect the energy consumption and 'Normalization Factors' shall be considered in those cases. The reported specific energy consumption(SEC) shall be Normalized after incorporating the Normalization factor.Normalized specific energy consumption = f (Reported SEC, Normalization factors).(b)The specific energy consumption shall be Normalized, during baseline and target periods, based on statistical procedures.(c)The Normalization procedure is proposed to be applied if the capacity utilization or Plant Loading Factor decreases from the baseline condition. It shall be applied only if capacity utilization or Plant Loading Factor has deviated from Baseline year due to uncontrollable factors described in rule 4, and duly declared by the designated consumer with authentic proof.(d)The Normalization shall be done by performing a statistical analysis of the specific energy consumption and production data by-(i)plotting the production versus energy consumption curves;(ii)performing statistical analysis to represent the relationship between the production and energy consumption;(iii)extrapolating the above relationship to generate capacity utilization versus energy consumption and capacity utilization versus specific energy consumption data for a suitable range of capacity utilization values;(iv)the average capacity utilization shall be used to identify the corresponding specific energy consumption value;(v)the Normalized specific energy consumption shall be the value as computed in the previous step.(e)The "capacity utilization" referred to in clauses (c) to (d) shall be replaced by "Plant Loading Factor" in case of designated consumers in the thermal power plant sector.(f)The above calculation determines the normalized specific energy consumption for the designated consumers.1.6Validation of fuel quality tested from external and internal labs and reproducibility of same samples:(a)The mean of the results of duplicate determinations carried out in each of two laboratories on representative portions taken from the same sample at the last stage of sample preparation, should not differ by more than 71.7 kcal/kg as per ISO 1928:1995(E)(b)If the difference in GCV from internal and external lab test report is greater than 71.7 kcal/kg, the difference will be added to the gross calorific value (GCV) of the test result obtained in DC's lab for that particular month.

2. Thermal power plant sector.-

2.1The designated consumers for the thermal power plant sector shall be grouped based on the fuel used and they are as under:-2.2The energy consumption norms and standards for power stations shall be specified in terms of specific percentage of their present deviation of net operating heat rate, based on the average of previous three years, namely, 2007-08, 2008-09, 2009-10 for the first cycle, and for cycles thereafter in accordance with the provision of rule 14 from the net design heat rate. The power stations shall be grouped into various bands according to their present deviations, of operating heat rate from design heat rate and for power stations with higher deviations the energy consumption norms and standards shall be established at lower level and shall be grouped taking into account percentage deviation as under:-

Deviation in net station heat rate from design net heatrate	Reduction target for percentage deviation in the netstation heat rate
Upto five per cent.	Ten per cent (10%)
More than five per cent and upto ten percent	Seventeen per cent. (17%)
More than ten per cent. and upto twenty percent	Twenty-one per cent. (21%)
More than twenty per cent.	Twenty-four per cent. (24%)

2.3For the subsequent cycle, various bands according to this deviations and conditions as per rule 3 may be formulated and applied with the approval of technical committee.2.4Correction factor considered for effect on heat rate due to coal quality: Average "ash", moisture, and gross calorific value for the previous three years in case of baseline for first cycle and as per rule 14 for consequent cycles and specified year in case of target year, shall be taken into account for the baseline year and correction factor shall be worked out based on the following boiler efficiency formula:-

Boiler Efficiency =| 92.5 -| [50 * A + 630 (M + 9 H)]G.C.V

Where,-A= Ash percentage in coalM= Moisture percentage in coalH= Hydrogen percentage in coalG.C.V= Gross calorific value in kcal/kgStation heat rate (Kcal/kWh) = Turbine heat rate/Boiler efficiency

3. Cement sector.-

3.1For establishment of energy consumption norms and standards for designated consumers in the cement sector, the designated consumers shall be grouped based on similar major output or product with the available data to arrive at a logical and acceptable spread of specific energy consumption among the designated consumers which shall be grouped as under:-3.2Equivalent major grade of cement production.-The various product mixes shall be converted in to equivalent major grade of cement product by the designated consumer by using the following formulae:-(i)Conversion of Ordinary Portland Cement (OPC) production equivalent to major product

Equivalent major product =| OPC produced (Lakh tonne) X Conversion factor of OPCConversion factor of major product| [Lakh tonne]

(ii)Conversion of Portland Pozzolana (PPC) production equivalent to major product

Equivalent major product =| PPC produced (Lakhtonne) X Conversion factor of PPCConversion factor of major product| [Lakh tonne]

(iii)Conversion of Portland Slag Cement (PSC) or any other variety of cement production equivalent to major product

Equivalent major product =| PSC or any other variety cement produced Lakh tonne X Conversion factor of PSC or any other variety cementConversion factor of major product| [Lakh tonne]

(iv)Conversion of total exported clinker to major product

Equivalent major product =| Total exported clinker (Lakh tonne)Conversion factor of major product| [Lakh tonne]

(v)Conversion of total imported clinker to major product

Equivalent major product =| Total imported clinker (Lakh tonne)Conversion factor of major product| [Lakh tonne]

(vi)Total equivalent major product of cementIt can be arrived at by summing up all the different grades of cements equivalent to major product calculated above:Total Equivalent major product of Cement = [a(i) +a(ii) +a(iii) + a(iv)] [Lakh tonne]Note: S.no. a (v) is already accounted in major product.3.3Calculation for Gate to Gate specific energy consumption (SEC)(i)Total thermal energy consumptionTotal thermal energy consumption is to be calculated as:-Total thermal energy consumption= [Fuel consumed (Lakh ton) X Gross calorific value of respected fuel (kcal/kg) X 100] [Million kcal];(ii)Total electrical energy consumptionTotal electrical energy consumption is to be calculated as:-Total electrical energy consumption= [{(Total electricity purchased from grid (Lakh kWh) X 860(kcal/kWh)-electricity exported to grid (Lakh kWh) X 2717 (kcal/kWh)}/10] [Million kcal];Where: - 2717 kcal/kWh is national average heat rate.(iii)Notional/ Normalization energy for imported electricity from gridNotional energy for imported electricity= [Imported electricity (lakh kWh) x (3208-860) (kcal/kWh)] /10 [Million kcal];Where: - 3208 kcal/kWh is weighted average heat rate of all designated consumers in cement sector.(iv)Notional/ Normalization energy Required for grinding of exported clinker.It is calculated by using following formula:Notional energy required

= {Total exported clinker to major product (Lakh tonne) x Electrical SEC of cement grinding (kWh/ton of cement) x Weighted average heat rate (kcal/kWh)}/10 [Million kcal];Where: - Weighted average heat rate (kcal/kWh) = [{Imported electricity (Lakh kWh) X 3208 (kcal/kWh)} + {diesel generation (lakh kWh) x diesel generator heat rate (kcal/kWh)} + {Captive power plant generation (lakh kWh) x Captive power plant heat rate (kcal/kWh)}] / [Imported electricity (Lakh kWh) +diesel generation (Lakh kWh) +Captive power plant generation (Lakh kWh)];(v)Notional/ Normalization energy required for clinkerisation of imported clinkerIt is calculated by using following formula:Notional energy required = [Total clinker imported (Lakh tonne) x {Thermal SEC of clinkerization kcal/kg clinker) x 1000+electrical SEC of clinkerization (kWh/tonne of clinker) x Weighted average heat rate (kcal/kWh)}/10] [Million kcal];(vi)Gate to Gate (GtG) energy consumptionGtG energy consumption = [b(i) +b(ii) +b(iii) +b(iv) +b(v)] [Million kcal](vii)Gate to Gate (GtG) specific energy consumption

GtG SEC =| GtG energy consumption (Million kCal)Total equivalent major product of cement (Lakh tonne) X 100| [kcal/kg of equivalent cement]

4. Aluminum sector.-

4.1For establishment of energy consumption norms and standards for designated consumers in the Aluminum sector, the designated consumers shall be grouped based on similar major output or product with the available data to arrive at a logical and acceptable spread of specific energy consumption among the designated consumers which shall be grouped as under:-

5. Iron and Steel sector.-

5.1For Establishment of Energy consumption norms and standards in the Iron and Steel sector, the designated consumers are grouped based on similar characteristics with the available data to arrive at a logical and acceptable spread of specific Energy consumption among the designated consumers which may be grouped as under:-5.2The entire sector can be sub-divided in the following eight sub-sectors as detailed below:5.3Integrated Steel Plant(A)Integrated Steel Plant. - The energy indices of the major integrated steel plants captured from the annual reports and reported during the baseline audits have been taken for the below calculations. The Gate to Gate Specific Energy Consumption may be calculated as follows-Gate to Gate Specific Energy Consumption (SEC) = toe/tonne of crude steelAs regards the total energy consumed in plant for these major integrated steel plants,the following formula can be given-Total Energy Consumed in PlantTotal Energy Consumption (Mkcal) = [Total Thermal Energy (Mkcal) +{Purchased Electricity from Grid (MkWh) *grid Heat Rate (kcal/kWh)} - {Exported Electricity to grid (MkWh) X Captive Power Plant Heat Rate kcal/kWh}].Where,Total Thermal Energy (Mkcal) = [Fuel Quantity used (tonne) X Gross Calorific Value of Fuel (kcal/kg)]/10005.4Sponge Iron(B)Sponge Iron. - for this sub sector only those plants are considered which are standalone sponge Iron plants with no downstream products. The gate to gate SEC may be given as follows:Gate to Gate Specific Energy Consumption (toe/ tonne) = Total Energy Consumption (toe) / Production of Sponge Iron (tonne)5.5Sponge Iron with Steel Melting Shop(C)Sponge Iron with Steel Melting Shop. - for this sub sector those plants are considered which are sponge Iron plants with SMS (Steel Melting Shop). The gate to gate SEC may be given as follows:In this Group first we convert sponge iron to Steel melting shop and again equivalent Steel Melting Shop to sponge iron as follows:Specific Energy Consumption of Coal for sponge Iron = Tonne of Coal Consumption/Tonne of sponge ironElectrical Specific Energy Consumption for sponge Iron = kWh/Tonne of Sponge Iron.Thermal Specific Energy Consumption for Sponge Iron = {(Tonne/Tonne X Gross Calorific Value of Coal)+(kWh/tonne)XCPP Heat Rate kcal/kWh)}Electrical Specific Energy Consumption for Steel Melting Shop = kWh/tonne of Steel Melting Shop.Steel Melting Shop Equivalent to Sponge Iron Production= [{(kWH/tonne) XCPP Heat Rate} X Production of Steel melting shop] / (Total Specific Energy Consumption of Sponge Iron)Total Equivalent Sponge Iron Production (tonne) = Production of Sponge Iron (tonne) + Steel Melting Shop production equivalent to sponge iron (tonne)(Gate to Gate SEC) Gate to Gate Specific Energy Consumption (Mkcal/tonne) = Total Energy consumed (Mkcal)/ Total Equivalent Sponge Iron Production (tonne)5.6Sponge Iron with Steel Melting shops and other(D)Sponge Iron with Steel Melting Shop and others. - for this sub sector those plants are considered which are sponge Iron plants with SMS (Steel Melting Shop) and other products like Ferro Manganese, Silicon Manganese, Pig Iron etc. . The gate to gate SEC may be given as follows:In this sub-sector first we convert equivalent Steel melting shop to Sponge Iron and thereafter equivalent Ferro Alloy is converted to sponge Iron by given formulae.Equivalent Ferro Alloy Manganese to Sponge Iron = [{Electrical Specific energy consumption (SEC) of Ferro Manganese (kWh/tonne) x Heat Rate} x Production of Ferro Alloy Ferro Manganese} / (Total Specific Energy Consumption of Sponge Iron)Equivalent Ferro Alloy Sponge Iron Manganese to Sponge Iron = [{Electrical Specific energy consumption (SEC) of Sponge iron Manganese (kWh/tonne) X Heat Rate} X production of Ferro Alloy Sponge iron Manganese}/(Total Specific Energy Consumption of Sponge Iron)(Pig Iron to Sponge Iron) Equivalent Pig Iron to Sponge Iron = [{Electrical SEC of Pig Iron (kWh/tonne) X CPP Heat Rate} X production of Ferro Alloy Pig Iron} / (Total Specific Energy Consumption of Sponge Iron)(Total Sponge Iron) Total Equivalent Sponge Iron Production = Total energy Sponge Iron +Ferro Manganese to Sponge Iron + Sponge Iron Manganese to Sponge Iron + Pig Iron to Sponge IronGtG SEC, Gate to Gate Specific Energy Consumption = Total Energy consumed/ Total Equivalent Sponge Iron Production5.7Ferro Alloy(E)Ferro Alloy. - In this Group we have converted all products as regards equivalent to Ferro alloy (Silicon Manganese) by given formula-Equivalent Ferro Alloy Manganese to Ferro Alloy Silicon manganeseManganese = (Electrical Specific energy consumption (SEC) of Ferro Manganese * Production of Ferro Manganese)/ Electrical Specific energy consumption (SEC) of silicon Manganese)Equivalent Ferro alloy silicon Manganese to Ferro Alloy silicon manganese = (Electrical SEC of silicon Manganese * Production of silicon manganese)/ Electrical SEC of Silicon Manganese)Equivalent Ferro Chrome to Ferro Alloy silicon manganese Manganese = (Electrical SEC of Ferro Chrome X Production of Ferro Chrome)/ Electrical SEC of Silicon Manganese)Equivalent Pig Iron to Ferro Alloy silicon manganese Manganese = (Electrical SEC of Pig Iron X Production of Pig Iron)/ Electrical SEC of silicon Manganese)Total Equivalent Ferro Alloy Silicon Manganese Production = (Ferro Manganese to Ferro silicon Manganese) +(Fe Sponge iron Manganese equivalent to Ferro silicon manganese) +(Ferro Chrome equivalent to Ferro silicon manganese) + (Pig Iron to Ferro silicon manganese)Gate to Gate Specific Energy Consumption =Total Energy consumption (Mkcal))/ Total Equivalent Ferro Alloy silicon manganese Production5.8Ferro Chrome(F)Ferro Chrome:-The Gate to Gate Specific energy consumption (SEC) for this sub-sector is given as follows-Gate to Gate Specific Energy Consumption of Ferro Chrome =Total Energy Consumption (Mkcal)/Total Ferro Chrome Production (Tonne).5.9Mini Blast Furnace(G)Mini Blast Furnace. - The G to G Specific energy consumption (SEC) for this sub-sector is given as followsGate to Gate Specific Energy Consumption of Mini Blast Furnace =Total Energy

Consumption (Mkcal)/Total Production (Tonne).5.10Steel Processing Unit(H)Steel Processing Units:- This sub-sector contributes towards the many such steel processing plants like rerolling, wire drawing, cold rolling, hot rolling etc.The Gate to Gate Specific energy consumption (SEC) for this sub-sector is given as follows-Gate to Gate Specific Energy Consumption of Steel Processing Unit = Total Energy Consumption (Mkcal)/ Total Production of Steel Processing Unit (Tonne).

6. Chlor-Alkali sector.-

6.1For establishment of energy consumption norms and standards in the Chlor-Alkali sector, the designated consumers shall be grouped based on similar characteristics with the available data to arrive at a logical and acceptable spread of specific energy consumption among the designated consumers which may be grouped as under:-6.2Correction factors developed for variability:a. Product Mix:

Caustic Soda	1.0 of Equivalent Caustic Soda
Liquefied Chlorine (T)	0.0615 of Equivalent Caustic Soda
Compressed Hydrogen (Lac NM3)	13.889 of Equivalent Caustic Soda
Solid Flakes (T)	0.219 of Equivalent Caustic Soda

Note: Above Product mix shall be applicable in first cycle only.b. All the products in plant boundary shall be converted into Equivalent Caustic Soda w.r.t. specific energy consumption of respective products.c. Membrane and Electrode Life. - 60 kWh/tonne per year is added into specific energy consumption in the baseline year for each plant. For example:Addition of 60 kWh per year: 60 kWh x 860 kcal (In case of Non CPP plants) x 3 years / 10^7 MTOE/tonneAddition of 60 kWh per year: 60 kWh x 2717kCal (In case of CPP plants) x 3 years / 10^7 MTOE/tonneNote: Above shall be applicable in first cycle only.d. Notional/Normalization Energy for imported electricity from GridNotional energy for imported electricity = [Imported electricity (lakh kWh) x (3394-860) (kcal/kWh)]/10[Million kcal]Where: - 3394 kCal/kWh is weighted average heat rate of all designated consumers in Chlor-Alkali sector

7. Pulp and Paper sector.-

7.1For establishment of energy consumption norms and standards in the Pulp and Paper sector, the designated consumers shall be grouped based on similar characteristics with the available data to arrive at a logical and acceptable spread of specific energy consumption among the designated consumers and the following guidelines shall be applied to group the designated consumers based on similarity in input raw material and product output on the basis of availability of consistent data:-(i)The input raw materials are Wood, Agro and Recycled Fibre (RCF);(ii)The process outputs are of Chemical Pulping, Chemi-mechanical Pulping and 100% market pulping(iii)The product output of specialty paper, non-specialty paper and newsprint.7.2The groups made for Pulp and Paper sector under are: -

8. Textile sector.-

8.1For establishment of energy consumption norms and standards in the Textile sector, the designated consumers shall be based on similar characteristics with the available data to arrive at a logical and acceptable spread of specific energy consumption among the designated and the group made are as under:-8.2The designated consumers whose production is measured in meters of cloth, the average grams per square meter (GSM) as 125 and average width as 44 inches shall be assumed for weight calculations.

9. Fertilizer sector.-

9.1In Fertilizer Sector, for manufacturing of Urea fertilizer, out of total energy consumed at designated consumer plant boundary, stoichiometric energy of 2.53 [Gcal/MT] [Substituted 'Million Gcal/MT' by Notification No. G.S.R 409(E), dated 26.4.2018 (w.e.f 30.3.2012).] Urea is contained in urea product and goes out as such. Thus, the net energy utilized in urea manufacture is total energy input at designated consumers' boundary reduced by 2.53 [Gcal/MT] [Substituted 'Million Gcal/MT' by Notification No. G.S.R. 409(E), dated 26.4.2018 (w.e.f. 30.3.2012).] Urea. The figure is worked out by considering heat energy of ammonia as 4.46 [Gcal/MT] [Substituted 'Million Gcal/MT' by Notification No. G.S.R. 409(E), dated 26.4.2018 (w.e.f. 30.3.2012).] Ammonia and specific consumption 0.567 MT of Ammonia / MT Urea.

10. Petroleum Refinery:-

10.1In Petroleum Refinery sector, the process includes up gradation of undesirable components of the crude oil into more valuable products, such as gasoline, diesel, and jet fuel and other low value by-products, such as fuel oils and lubricants. Specific energy consumption may not be a appropriate indicator of the energy performance of the refineries as it does not account for differences in complexities, output slates, or type of crude processed. The energy performance of refineries is expressed in terms of specific energy consumption, measured in [Million British Thermal Units (BTU) per one thousand barrel per Energy Factor (MMBTU/Mbbls/NRGF)] [Substituted 'Million British Thermal Units (BTU) per thousand barrel per Energy Factor per NRGF (MBTU/Mbbls/NRGF)' by Notification No. G.S.R. 409(E), dated 26.4.2018 (w.e.f. 30.3.2012).]. This unit, commonly referred to as MBN, was developed by the Centre for High Technology, Ministry of Petroleum & Natural Gas to provide a basis for comparing energy performance of refineries of different configurations and accounting of the throughput of secondary units.10.2"MBN" means Million British Thermal Units (BTU) per Thousand barrel of crude processed per Energy Factor (NRGF), calculated as per the following formula adopted by CHT:MBN = Energy consumption (Million BTU) / crude throughput in Thousand Barrels / NRGF

10. [3. The NRG factor (NRGF) is the indicator of the level of complexity of a refinery and overall energy factor (dimensionless unit) shall be calculated for the refinery based on the volume of feed in each unit and its corresponding energy factor.] [Substituted by Notification No. G.S.R. 409(E), dated 26.4.2018

(w.e.f. 30.3.2012).]

11. Railway Sector. - For establishment of energy consumption norms and standards in the Railway sector, the designated consumers shall be grouped based on similar characteristics with the available data to arrive at a logical and acceptable spread of specific energy consumption among the designated consumers which may be grouped as under:-

(a)Zonal Railways. - Each zonal railway provides transport services for both passenger and goods. The energy input for the mentioned services is in the form of diesel or electricity. In view of the above scenario specific fuel consumption or specific energy consumption of zonal railways for services (both passenger and Goods) shall be taken in terms of Diesel (L/1000GTKM) and Electrical Energy (kWh/1000GTKm). Four performance metrics are identified for each zonal Railway as shown below:-

Zonal Railway (Traction)			
Diesel		Electrical	
Passenger(L/1000GTKm)	Goods(L/1000GTKm)	Passenger(kWh/1000GTKm)	Goods(kWh/1000GTKm)

Note:-

1. For conversion calorific value of diesel shall be: 11840 kcal/Kg and density: 0.8263 Kg/litre

2. 1kWh shall be equivalent to 860 kcal.

For calculating specific fuel consumption or specific energy consumption for a specific service (passenger or goods), the total amount of fuel input in liters or kWh shall be divided by the total gross tonne kilometrage in thousand's for the respective service.(b)[Production Units: - Production units of Indian Railways manufacture variety of products like Locomotives, coaches, wheels, axles etc. Specific Fuel Consumption or Specific Energy Consumption of production units of Indian Railways shall be taken in terms of KgOE / number of equivalent unit product produced. For production units manufacturing more than one variety of product under same category, equivalent number of units will be taken to calculate specific energy consumption or specific fuel consumption (for example under category of coach there may be both AC and Non-AC coaches having different energy demand hence they will be converted into equalised units to measure specific energy consumption).] [Substituted by Notification No. G.S.R. 409(E), dated 26.4.2018 (w.e.f. 30.3.2012).](c)Workshops: - Specific Fuel Consumption or Specific Energy Consumption of Workshops units of Indian Railways shall be taken in terms of KgOE / units worked upon or maintained. For Workshop Units maintaining or working upon more than one variety of product under same category, equalized no of units will be taken to calculate SEC or SFC (for ex under category of coach there can be both AC and Non AC coaches having different energy demands hence they will be converted into equalized units to measure specific energy consumption).

12. Electricity Distribution Company:- Transmission & Distribution (T&D) loss in percentage will be a sole parameter to assess energy performance of electricity distribution companies under PAT scheme, calculated as per the following formula:

T&D loss (Million kWh) = Net Input Energy (Million kWh) - Net sale of energy (Million kWh)Net Input Energy (Million kWh) = Total input energy (adjusted for transmission losses and energy traded)Net sale of Energy (MkWh) = Total energy sold (adjusted for energy traded)[13. Petrochemical sector: -Petrochemical sector include petrochemical units having gas crackers, Naphtha crackers or both which include only olefin units producing products like LDPE, LLDPE, HDPE, PP, PVC/VCM, Glycols, etc. inside the plant boundary.Specific energy consumption for petrochemical sector is measured in net energy consumed in cracker unit and secondary units producing olefin products only per total equivalent olefin product production quantity.(i)Net energy consumed is the total thermal energy and electrical energy consumed in terms of kilo calorie (kcal) in following units and related utility units:(a)Cracker unit along with associated units i.e. Butadiene extraction unit, Benzene extraction unit, C4 Hydrogenation unit, Pyrolysis Gasoline Hydrogenation unit;(b)Polyolefin units (LLDPE/HDPE/LDPE/PP);(c)EO/EG/Glycols;(d)VCM/PVC;(e)Butene - 1;Note: - Energy consumption of both units i.e. VCM unit and PVC unit to be added in total energy consumption.(ii)Equivalent quantity of olefin products produced in tonne includes following products for calculating the total quantity of final products produced:(a)liner low density Polyethylene (LLDPE)(b)equivalent ethylene of Glycols, following expression may be used for conversion Equivalent Ethylene of Ethylene Oxide = Eq. E.O X ((28/44)/0.85=0.7486)Where:• Eq. MEG of DEG (DEG to MEG)= DEG production x (62/106)• Eq. MEG of TEG (TEG to MEG)= TEG production x (62/150)• Eq.MEG of Mixed Glycol (Mixed Glycol to MEG) = Mixed Glycol Production X (62/ Molecular weight of Mixed Glycol)• Eq MEG= MEG + [Eq. MEG of DEG (DEG to MEG)]+ [Eq. MEG of TEG (TEG to MEG)]• Eq Ethylene Oxide (EO) = Sale Quantity of E.O + [Tot. Eq. MEG quantity X (44/62])• (0.85 selectivity considered)(c)high density polyethylene (HDPE)(d)low density polyethylene (LDPE)(e)equivalent ethylene of Vinyl Chloride Monomer (VCM)/Polyvinyl Chloride (PVC), following expression may be used for conversion:Eq. Ethylene of PVC= [Actual production of PVC - actual production of PVC] X (35.5/62.5);Eq. Ethylene of VCM = [Actual production of VCM Actual production of VCM] X (35.5/62.5);(f)Polypropylene;(g)Butadiene;(h)Benzene.][Schedule II] [Substituted by Notification No. G.S.R. 373(E), dated 31.3.2016 (w.e.f. 30.3.2012).][See rules 2(j) and 4(4)]Normalization Equations. - During Monitoring & Verification phase, the accredited auditors would verify the results from all activities that occurred during the assessment year and include the contributions from all existing relevant variables: the total amount of energy consumed, electricity generated and sold by a designated consumer; the volume of different products produced while taking into the account of intermediary products; and any other defined factors which could have caused a change in the operating conditions between the baseline and the target years and affected the specific energy consumption. These conditions leads to determination of the performance change resulting from specific selected activities and conditions as distinct from the effect of certain variables and thus calls for Normalization; which were well conceived in the sector specific supporting pro-forma for Form I of rules, 2007 or rules, 2008.The equations for calculating normalization in all the sectors have been developed to homogenize and fix the formulae in the assessment year. This will regulate the calculation in the pro-forma through minimum effort. These equations have been comprehended through examples in the sector specific Normalization Documents for better understanding. In order to stream line the process of M&V, these equations have been accumulated in one place for all the sectors.

1. Sa1 Aluminum: Refinery and Smelter

Normalization factors for the following areas have been developed in Aluminum Sector1.1Fuel Quality in Captive Power Plant (CPP) and Combined Heat and Power Generation (Co-Gen)1.2Low Pant Load Factor (PLF) in CPP1.3Smelter Capacity Utilization1.4Bauxite Quality1.5Carbon Anode (Import & Export)1.6Product Mix (Equivalent product)1.7Power Mix (Import & Export from/to the grid and self-generation from the captive power plant)1.8Normalization Others1.8.1. Start/Stop1.8.2. Environmental Concern (Additional Environmental Equipment requirement due to major change in government policy on Environment)1.8.3. Biomass/Alternate Fuel Unavailability1.8.4. Construction Phase or Project Activities1.8.5. Addition of New Line/Unit (In Process & Power Generation)1.8.6. Unforeseen Circumstances1.8.7. Renewable Energy1.9Gate to Gate Specific Energy Consumption1.10Normalized Gate to Gate Specific Energy Consumption1.1Fuel Quality in CPP and Co-Gen. - The Boiler Efficiency will be calculated for the baseline as well as assessment year with the help of Coal analysis constituents like Gross Calorific Value (GCV), per cent Ash, per cent Moisture, per cent Hydrogen (H) and Boiler Efficiency Equation provided to calculate the Boiler efficiency.Hence, by keeping the Turbine heat rate constant for both the years, the CPP heat hate will be calculated for the respective year. The Thermal Energy for the difference in heat rate of CPP will be deducted from the total energy consumption of the plant as under:1.1.1. Notional Energy for fuel quality in CPP & Co. - Gen (toe) = (Total National energy for Coal Quality deterioration to be sub rated w.e.t fuel quality (Million kcal))/101.1.2. Total National energy for Coal Quality deterioration to be subtracted w.r.t. fuel quality (Million kcal) = Energy to be subtracted w.r.t. Fuel Quality in Co. Gen (Million Kcal) + Energy to be subtracted w.r.t. Fuel Quality in CPP (Million Kcal)1.1.3. Energy to be subtracted w.r.t. fuel quality in CPP (Million kcal) = (Difference in CPP Heat rate from BY to AY (kcal/kWh) X CPP Generation (lakh kWh)/101.1.4. Difference CPP Heat rate from BY to AY (kcal/kWh) = Actual CPP Heat Rate BY (kcal/kWh)

1.1.5.CPP Heat Rate due to Fuel Quality in AY (kcal/kWh) =| Actual CPP Heat Rate for DY (kcal/kWh)Boiler efficiency for AY (%)

1.1.6.Boiler efficiency for BY =| ☐10n=1[(U#n Capacity (MW) X U#n Boiler Efficiency for BY)]☐10n=1[U#n Capacity (MW)]| [Lakh tonne]

1.1.7.Boiler efficiency for AY =| ☐10n=1[(U#n Capacity (MW) X U#n Boiler Efficiency for AY)]☐10n=1[U#n Capacity (MW)]| [Lakh tonne]

1.1.8. Boiler efficiency for AY and BY (U#1, 2.......10)

Individual Boiler efficiency =| 92.5 - {50 * A + 630 * (M + 9 * H)}GCV of Coal

Where,GCV = Gross Calorific value (Kcal/ Kg)M = Moisture (in %)H = Hydrogen (in %)A = Ash (in

%)1.1.9. Energy to be subtracted w.r.t. Fuel Quality in Co-Gen (Million kcal) = [Difference in Specific Steam from BY to AY (kcal/kg) X {(Steam Generation at Boiler 6 to 10 (Tonnes) X Weighted Percentage of Coal Energy Used in steam Generation (Co - Gen Boilers))}]/10001.1.10. Difference in Specific Steam from BY to AY (kcal/kg of steam) = Normalized Specific Energy Consumption for Steam Generation (kcal/kg of steam) - Weighted Average Specific Steam Consumption (kcal/kg of steam)

1.1.11.Normalized Specific Energy Consumption for Steam Generation (kcal/kg of steam) =| Weighted Average Specific Steam Consumption (kcal/kg of steam) X Boiler Efficiency for BYBoiler Efficiency for AY

1.1.12. Weighted Average Specific Steam Consumption = ((Specific Energy Consumption for Steam Generation in Cogen Boiler 1 to 5 X Steam Generation at Boiler 1 to 5) + (Specific Energy Consumption for Steam Generation in Cogen Boiler 6 to 10 X Steam Generation at Boiler 6 to 10))/(Steam Generation at Boiler 1 to 5 + Steam Generation at Boiler 6 to 10)

1.1.13.Indian Boiler Efficiency =| 92.5 - (50 - A + 630 (M + 9 + H))CCV of Coal

Where, -GCV = Gross Calorific value (Kcal/ Kg)M = Moisture (in %)H = Hydrogen (in %)A = Ash (in %)1.2Low PLF Compensation in CPP. - Due to decreased loading, the Plant load Factor (PLF) will be worsened and affects the unit heat rate. The comparison between baseline year and assessment year will be carried out based on the following calculation.Notional Energy for PLF in CPP (toe) = (Total Notional Energy to be subtracted due to Low PLF (Million kcal))/ 101.2.1. Total Notional Energy to be subtracted due to Low PLF (Million kcal) + Energy to be subtracted in U # 2 for AY (Million kcal) + ...1.2.2. Energy to be subtracted per unit = (Difference of THR between AY and BY (kcal/ kWh) X Gross Unit Generation (Lakh Unit))/101.2.3. Difference of Turbine Heat Rate between AY and BY = Normalized Design Turbine Heat rate due to external factor for AY - Normalized Design Turbine Heat rate due to external factor for BY1.2.4. Normalized Design Turbine due to external factor (kcal/kWh) for BY and AY = ((Design Turbine Heat Rate after Curve correction and difference correction (kcal/kwh) X Average Operating hours Low ULF) + (Design Turbine Heat Rate @ 100% Load (OEM)(kcal/kwh) X Operating hours at full load))/Total Operating hours in year as per Unit Availability factor1.2.5. Design Turbine Heat Rate after Curve correction and difference correction = Turbine Heat Rate as per Load Vs Heat Rate Equation due to external factor X {(1 + % Difference between Design Turbine Heat Rate and Design Curve or HBD Turbine Heat rate)/100}1.2.6. Turbine Heat Rate as per Load Vs Heat Rate Equation due to external factor (kcal/kwh) = ax2 - bx + cWhere,-a = Equation Constant 1b = Equation Constant 2c = Equation Constant 3x = Average Operating Load (MW) caused by low ULF due to external factor1.2.7. Percentage Difference between Design Turbine Heat Rate and Design Curve or HBD Turbine Heat rate = ({Design Turbine Heat Rate @ 100% Load (OEM)(kcal/kwh)} X 100)/ (Design Turbine Heat Rate @ 100% Load (OEM)(kcal/kwh))1.2.8. Total Operating hours in year as per Unit Availability factor = 8760 X Plant Availability Factor1.2.9. Plant Availability Factor = (8760 - [Forces Outage or Unavailability (hrs) - Planned Maintenance Outage or Planned Unavailability])/ 87601.3Smelter Capacity Utilization

Notional Energy for Smelter capacity =| Electrical Energy to be deducted due to lower capacity utilization (Million kcal)10

1.3.1. Electrical Energy to be deducted due to lower capacity utilization = Total Electrical Energy to be deducted due to lower capacity utilization (Million kWh) X Weighted Heat Rate (kcal.kWh)1.3.2. Total Electrical Energy to be deducted due to lower capacity utilization (Million kWh) = Electrical Energy to be deducted due to lower capacity utilization for AY of Line 1 + Electrical Energy to be deducted due to lower capacity utilization for AY of Line 2 + ... Line 10

1.3.3.Electrical Energy to be deducted due to lower capacity utilization (Million kWh) =| Notional Specific Energy Consumption (kwh/ Ton) X Production (Tonne)1000000

1.3.4. Notional Specific Energy Consumption (kwh/ Ton) = SEC Design at CU % for AY - SEC Design at CU % for BYWhereSEC = Specific Energy ConsumptionCU = Capacity Utilization

SEC Design at CU % (kwh/ton) =| K1Capacity Utilization| + K2

Where, -

K1 = Constant 1 =| (Design Bus Bar Voltage Drop (DnEV) + No of Pots/ Potline (NOPP) X Dead pot voltage (DPV) X 298000}{No. of Pots/ Potline (NOPP) X Current Efficiency of Pots(CE)}

K2 = Constant 2 =| Design Pot Voltage Drop (DnPV) - Dead pot voltage (DPV) X 2980Current Efficiency of Pots(CE)

Capacity Utilization (%) =| No. of operating Pot (NOP) X 100No. of Pots/ Pot-line (NOPP)

1.4Bauxite Quality. - Due to deterioration of bauxite quality (moisture, TAA, Fe, mud) , the thermal energy should be normalized in the assessment year based on the following calculation:-

1.4.1.Notional energy to be subtracted in (Million kCal) =| Notional energy for moisture (kcal/ tonne) X hydrate alumina production (tonne) in AY1000000

1.4.2.Notional energy for moisture (kcal/ tonne) =| Excess steam (tonne/tonne) X Actual steam enthalpy (kcal/ kg) in AY X 1000Boiler efficiency (%) in AY

1.4.3.Excess steam (Tonne/ Tonne) =| Excess moisture (tonne) + Excess wash water (tonne)Steam Economy (t/t)

1.4.4. Excess Moisture (Tonne) = (SBCAY - SBCBY) X MBAYWhere,-SBCAY - Specific bauxite factor (Bauxite Tonne/ alumina Tonne) for AYSBCBY - Specific bauxite factor (Bauxite Tonne/ alumina Tonne) for BYMBAY - Moisture content in Bauxite (%) for AY1.4.5. Excess Moisture (Tonne) = wash water (Tonne) for AY - wash water (Tonne) for BY1.4.6. Wash water for AY (Tonne) = SBCAY X (100 - MBAY)% X MFAY X WWAYWhere,-SBCAY - Specific bauxite factor (Bauxite Tonne/ alumina Tonne) in assessment yearMBAY - Moisture content in Bauxite (%) in assessment yearMFAY - Mud Factor (Tonne of mud / Tonne of Bauxite)WWAY - Tonne of wash water required for cleaning one Tonne of mud (Tonne of wash water/Tonne of mud)1.4.7. Wash water for BY (Tonne) = SBCBY X (100 - MBBY)% X MFBY X WWBYWhere,-SBCBY - Specific bauxite factor (Bauxite Tonne/ alumina Tonne) in assessment yearMBBY - Moisture content in Bauxite (%) in assessment yearMFBY - Mud Factor (Tonne of mud/ Tonne of Bauxite)WWBY - Tonne of wash water required for cleaning one Tonne of mud (Tonne of wash water/ Tonne of mud)

1.4.8.Mud Factor (Tonne of (mad/ Tonne) of Bauxite) for AY and BY =| Fe in Bauxite(%)Fe in Mud (%)

1.4.9. Specific Bauxite factor (Bauxite Tonne/ alumina in tonnes) = 1/ (TAA X (100 - MB) X OR)Where,-TAA - Total Available Alumina in Bauxite (%)MB - Moisture content in Bauxite (%)OR - Overall Recovery from Bauxite (%)1.5Carbon Anode (Import and Export)1.5.1. Notional energy to be subtracted for carbon anode import and export (Million kcal) for AY = Net energy for carbon anode import and export for AY (Million kcal) - Net energy for carbon anode import and export for BY (Million kcal)1.5.2. Net Energy for carbon anode Export in AY and BY (Million kcal) = Notional energy for carbon anode exported (million kcal) - Notional energy for carbon anode imported (million kcal)1.5.3. Notional energy for carbon anode imported (million kcal) = SEC of carbon anode Production (Million kcal/ Tonne) X Total Carbon anode imported (Tonne)1.5.4. Notional energy for carbon anode exported (million kcal) = SEC of carbon anode Production (Million kcal/ Tonne) X Total Carbon anode exported (Tonne)1.5.5. Total Carbon anode imported (Tonne) = Imported Carbon anode (tonne) - Carbon anode stock (tonne)1.5.6. Total Carbon anode exported (Tonne) = Exported Carbon anode (tonne) - Carbon anode stock (tonne)1.5.7. Carbon anode stock (tonne) = Closing carbon anode stock (tonne) - opening carbon anode stock1.6Product Mix (Equivalent Product). - The baseline year product energy factor (Energy Factor) will be maintained for equivalent major product in the assessment year.(i)Equivalent production (In Major Product) in the Baseline Year (BY) will beEqMPBY =PP1BY + (PP2BY * EFP2BY) + (PP3BY*EFP3BY)Major Product: Product 1 in the baseline year (Tonnes)WhereEqMPBY = Total equivalent product in Major Product in BY (Tonne)PP1BY = Total Product 1 production in BY (Tonne)PP2BY = Total Product 2 production in BY (Tonne)EFP2BY = Product 2 energy factor with respect to Product 1 in BYPP3BY = Total Product 3 production in BY (Tonne)EFP3BY = Product 3 energy factor with respect to Product 1 in BYBY= Baseline Year(Note: Any addition in series or parallel product will attract the same fraction and to be included in the above equation asPPiBY x EFPiBY)The Energy factor for the baseline will be calculated asEFP2BY = SECP2BY/SECP1BYEFP3BY = SECP3BY/SECP1BY......EFPiBY = SECPiBY/SECP1BYWhere,-EFP2BY = Product 2 energy factor with respect to Product 1 in BYEFP3BY = Product 3 energy factor with respect to Product 1 in BYEFPiBY = Product ith energy factor with respect to Product 1 in BYSECP1BY = Specific Energy Consumption of Product 1 in BYSECP2BY = Specific Energy Consumption of Product 2 in BYSECP3BY = Specific Energy Consumption of Product 3 in BYSECPiBY = Specific Energy Consumption of Product ith in BY(ii)Condition 1, No new product is introduced in the assessment year i.e., if PPiBY □0 and PPiAY □0 then Equivalent production (In Major Product) in the Assessment Year (AY) will beEqMPAY =PP1AY + (PP2AY * EFP2BY) + (PP3AY * EFP3BY)Major Product: Product 1 in the baseline year (Tonnes) and will remain same in the assessment yearWhere,-EqMPAY = Total equivalent product in Major Product in AY (Tonne)PP1AY = Total Product 1 production in AY (Tonne)PP2AY = Total Product 2 production in AY (Tonne)EFP2BY = Product 2 energy factor with respect to Product 1 in BYPP3AY = Total Product 3 production in AY (Tonne)EFP3BY = Product 3 energy factor with respect to Product 1 in BYAY= Assessment Year(iii)Condition 2, Due to introduction of new product in the assessment year, the production of new introduced product in the baseline year will be 0 i.e., if PPiBY =0 and PPiAY □0 thenEquivalent production (In Major Product) in the Assessment Year (AY) with 4th new introduced product will beEqMPAY =PP1AY + (PP2AY * EFP2BY) + (PP3AY * EFP3BY) + (PP3AY * EFP4AY)Major Product: Product 1 in the baseline year (Tonnes) and will remain same in the assessment yearWhere,-PP4AY = Total Product 4 production in AY (Tonne)EFP4AY = Product 4 energy factor with respect to Product 1 in AYEFP4AY = SECP4AY / SECP1BYAY= Assessment Year1.6.1. Refinery1.6.1.1. Equivalent Product with major product as Standard Calcined Alumina. - All products other than Standard Calcined Alumina are converted to the Equivalent Standard Calcined Alumina in baseline as well as assessment year(i)Total Equivalent Standard Calcined Alumina Production (Tonne) in the baseline year = SCABY +EqSHCBY +EqSHMBY +EqSHMdBY + EqSCACBY + EqSCAMBY + EqSCAMdBY(ii)Total Equivalent Standard Calcined Alumina Production (Tonne) in the assessment year = SCAAY +EqSHCAY +EqSHMAY +EqSHMdAY + EqSCACAY + EqSCAMAY +EqSCAMdAYWhere,-SCA =Standard Calcined Alumina (t) as Major ProductEqSHA =Equivalent Standard Hydrate Alumina Production (t)EqSHC = Equivalent Special Hydrate Course Production (t)EqSHM = Equivalent Special Hydrate Microfined Production (t)EqSHMd = Equivalent Special Hydrate Milled Production (t)EqSCAC = Equivalent Special Calcined Alumina Course Production (t)EqSCAM = Equivalent Special Calcined Alumina Microfined Production (t)EqSCAMd = Equivalent Special Calcined Alumina Milled Production (t)BY = Baseline YearAY =Assessment Year1.6.1.2. Equivalent Major Product. - Calcined Alumina for Baseline year(i)Special Calcined Alumina Milled (Tonne) to Equivalent Major Product- Calcined AluminaEqSCAMdBY = SCAMdPBY x EFSCAMdBYWhere,-SCAMdPBY =Special Calcined Alumina Milled Production (t)EFSCAMdBY =Energy Factor Special Calcined Alumina Milled(ii)Special Calcined Alumina Micro fined (Tonne) to Equivalent Major Product- Calcined AluminaEqSCAMBY = SCAMPBY x EFSCAMBYWhere,-SCAMPBY = Calcined Alumina Micro fined Production (t)EFSCAMBY = Energy Factor Special Calcined Alumina Micro fined(iii)Special Calcined Alumina Course (Tonne) to Equivalent Major Product- Calcined AluminaEqSCACBY = SCACPBY x EFSCACBYWhere,-SCACPBY =Calcined Alumina Course Production (t)EFSCACBY =Energy Factor Special Calcined Alumina course(iv)Special Hydrate Milled (Tonne) to Equivalent Major Product- Calcined AluminaEqSHMdBY = SHMdPBY x EFSHMdBYWhere,-SHMdPBY =Special Hydrate Milled Production (t)EFSHMdBY =Energy Factor Special Hydrate Milled(v)Special Hydrate Micro fined (Tonne) to Equivalent Major Product- Calcined AluminaEqSHMBY = SHMPBY x EFSHMBYWhere,-SHMPBY =Special Hydrate Micro fined Production (t)EFSHMBY = Energy Factor Special Hydrate Micro fined(vi)Special Hydrate Course (Tonne) to Equivalent Major Product- Calcined AluminaEqSHCBY = SHCPBY x EFSHCBYWhere,-SHCPBY =Special Hydrate Course Production (t)EFSHCBY = Energy Factor Special Hydrate Course(vii)Standard Hydrate Alumina (Tonne) to Equivalent Major Product- Calcined AluminaEqSHABY = SHAPBY x EFSHABYWhere,-SHAPBY =Standard Hydrate Alumina Production (t)EFSHABY =Energy Factor Standard Hydrate Alumina1.6.1.3. Energy Factors(i)Special Calcined Alumina MilledEFSCAMdBY = SECSCAMdBY / SECSCABYWhere,-SECSCAMdBY = Specific Energy Consumption Special Calcined Alumina Milled (Million kcal/Tonne)SECSCABY = Specific Energy Consumption Standard/Calcined Alumina (Million kcal/Tonne)(ii)Special Calcined Alumina MicrofinedEFSCAMBY = SECSCAMBY / SECSCABYWhere,-SECSCAMBY = Specific Energy Consumption Special Calcined Alumina Microfined (Million kcal/Tonne)SECSCABY = Specific Energy Consumption Standard/ Calcined Alumina (Million kcal/ Tonne)(iii)Special Calcined Alumina courseEFSCACBY = SECSCACBY / SECSCABYWhere,-SECSCACBY = Specific Energy Consumption Special Calcined Alumina Course (Million kcal/Tonne)SECSCABY = Specific Energy Consumption Standard/Calcined Alumina (Million kcal/Tonne)(iv)Special Hydrate MilledEFSHMdBY = SECSHMdBY / SECSCABYWhere,-SECSHMdBY = Specific Energy Consumption Special Hydrate Milled (Million kcal/Tonne)SECSCABY = Specific Energy Consumption Standard/Calcined Alumina (Million kcal/Tonne)(v)Special Hydrate Micro-finedEFSHMBY = SECSHMBY / SECSCABYWhere,-SECSHMBY = Specific Energy Consumption Special HydrateMicrofined (Million kcal/Tonne)SECSCABY = Specific Energy Consumption Standard/Calcined Alumina (Million kcal/Tonne)(vi)Special Hydrate Course to Calcined AluminaEFSHCBY = SECSHCBY / SECSCABYWhere,-SECSHCBY = Specific Energy Consumption Special Hydrate Course (Million kcal/Tonne)SECSCABY = Specific Energy Consumption Standard/Calcined Alumina (Million kcal/Tonne)(vii)Standard Hydrate Alumina into Calcined AluminaEFSHABY = SECSHABY / SECSCABYWhere,-SECSHABY = Specific Energy Consumption Standard Hydrate Alumina (Million kcal/Tonne)SECSCABY = Specific Energy Consumption Standard/Calcined Alumina (Million kcal/Tonne)1.6.1.4. Equivalent Major Product- Calcined Alumina for Assessment year(i)Special

Calcined Alumina Milled (Tonne) to Equivalent Major Product- Calcined AluminaEqSCAMdAY = SCAMdPAY x EFSCAMdAYWhere,-SCAMdPAY = Special Calcined Alumina Milled Production (t)EFSCAMdAY = Energy Factor Special Calcined Alumina Milled = EFSCAMdAY(ii)Special Calcined Alumina Microfined (Tonne) to Equivalent Major Product- Calcined AluminaEqSCAMAY = SCAMPAY x EFSCAMAYWhere,-SCAMPAY = Calcined Alumina Micro-fined Production (t)EFSCAMAY = Energy Factor Special Calcined Alumina Micro-fined = EFSCAMBY(iii)Special Calcined Alumina Course (Tonne) to Equivalent Major Product- Calcined AluminaEqSCACAY = SCACPAY x EFSCACAYWhere,-SCACPAY = Calcined Alumina Course Production (t)EFSCACAY = Energy Factor Special Calcined Alumina course = EFSCACBY(iv)Special Hydrate Milled (Tonne) to Equivalent Major Product- Calcined AluminaEqSHMdAY = SHMdPAY x EFSHMdAYWhere,-SHMdPAY = Special Hydrate Milled Production (t)EFSHMdAY = Energy Factor Special Hydrate Milled = EFSHMdBY(v)Special Hydrate Micro fined (Tonne) to Equivalent Major Product- Calcined AluminaEqSHMAY = SHMPAY x EFSHMAYWhere,-SHMPAY = Special Hydrate Micro fined Production (t)EFSHMAY = Energy Factor Special Hydrate Micro fined = EFSHMBY(vi)Special Hydrate Course (Tonne) to Equivalent Major Product- Calcined AluminaEqSHCAY = SHCPAY x EFSHCAYWhere,-SHCPAY = Special Hydrate Course Production (t)EFSHCAY = Energy Factor Special Hydrate Course = EFSHCBY(vii)Standard Hydrate Alumina (Tonne) to Equivalent Major Product- Calcined AluminaEqSHAAY = SHAPAY x EFSHAAYWhere,-SHAPAY =Standard Hydrate Alumina Production (t)EFSHAAY = Energy Factor Standard Hydrate Alumina = EFSHABYNote: For Assessment year, the Energy factor of baseline will be used to calculate the Equivalent product for respective product. However, any introduction of new product in the assessment year will draw the SEC of the newly introduced product into the Energy factor and equivalent product is to be calculated accordingly. Thus, the Numerator SEC of the above calculation of energy factor of baseline will change to SEC of the respective product in the assessment year asEFPiAY = SECPiAY / SECP1BY . Rest of the calculation remain same.1.6.2. Smelter1.6.2.1. Equivalent Product with major product as Molten Aluminum. - All products other than Molten Aluminum are converted to the Equivalent Molten Aluminum in baseline as well as assessment year(i)Total Equivalent Molten Aluminum Production (Tonne) in the baseline year = MABY + EqBiBY + EqInBY + EqBaBY + EqPFBY + EqWiRBY + EqStBY + EqOpBY(ii)Total Equivalent Molten Aluminum Production (Tonne) in the assessment year = MABY + EqBiAY + EqInAY + EqBaAY + EqPFAY + EqWiRAY + EqStAY + EqOpAYWhere,MA = Molten Aluminum Production (t) as Major ProductEqBi = Equivalent Billet production (t)EqIn = Equivalent Ingots production (t)EqBi = Equivalent Bars production (t)EqPF = Equivalent Primary Foundry production (t)EqWiR = Equivalent Wire Rods production (t)EqSt = Equivalent Strips production (t)EqOp = Equivalent Others Product production (t)BY = Baseline YearAY =Assessment Year1.6.2.2. Equivalent Product- Molten Aluminum for Baseline year(i)Others Product to Equivalent molten aluminum product (Tonne)EqOpBY = OpPBY x EFOPBYWhere,-OpPBY =Other Products Production (t)EFOPBY = Energy factor of other product(ii)Strips to Equivalent molten aluminum product (Tonne)EqStBY = StPBY x EFStBYWhere,-StPBY = strips production (t)EFStBY = Energy factor of Strips(iii)Wire rods to Equivalent molten aluminum product (Tonne)EqWiRBY = WiRPBY x EFWiRBYWhere,-WiRPBY = Total Wire rod Production (t)EFWiRBY = Energy factor of wire rods(iv)Primary foundry to Equivalent molten aluminum product(Tonne)EqPFBY = PFPBY X EFPFBYWhere,-PFPBY = Primary foundry alloys production (t)EFPFBY = Energy factor of primary foundry(v)Bars to Equivalent molten aluminum product (Tonne)EqBaBY = BaPBY x

EFBaBYWhere,-BaPBY = Total Bars production (t)EFBaBY = Energy factor of Bars(vi)Ingots to Equivalent molten aluminum product (Tonne)EqInBY = InPBY x EFInBYWhere,-InPBY = Ingot Production (t)EFInBY = Energy factor of ingots(vii)Billet to Equivalent molten aluminum productEqBiBY = BiPBY x EFBiBYWhere,-BiPBY = Billet Production (t)EFBiBY = Energy factor of Billet1.6.2.3. Energy Factors(i)Other ProductEFOPBY = SECOPBY / SECMABYWhere,-SECOPBY = SEC of Other Products (if any) after Molten Aluminum (Million kcal/Tonne)SECMABY = SEC of Molten Aluminum (Million kcal/Tonne)(ii)StipsEFStBY = SECStBY / SECMABYWhere,-SECStBY = SEC of Strips (Million kcal/Tonne)SECMABY = SEC of Molten Aluminum (Million kcal/Tonne)(iii)Wire RodsEFWiRBY = SECWiRBY / SECMABYWhere,-SECWiRBY = SEC of wire Rods (Million kcal/Tonne)SECMABY =SEC of Molten Aluminum (Million kcal/Tonne)(iv)Primary FoundryEFPFBY = SECPFBY / SECMABYWhere,-SECPFBY = SEC of Primary Foundry Alloys(Million kcal/Tonne)SECMABY = SEC of Molten Aluminum (Million kcal/Tonne)(v)BarsEFBaBY = SECBaBY / SECMABYWhere,-ECBaBY = SEC of Bars (Million kcal/Tonne)SECMABY =SEC of Molten Aluminum (Million kcal/Tonne)(vi)IngotsEFInBY = SECInBY / SECMABYWhere,-SECInBY = SEC of Ingot (Million kcal/Tonne)SECMABY =SEC of Molten Aluminum (Million kcal/Tonne)(vii)BilletEFBiBY = SECBiBY / SECMABYWhere,-SECBiBY = SEC of Billet (Million kcal/Tonne)SECMABY = SEC of Molten Aluminum (Million kcal/Tonne)1.6.2.4. Equivalent Product- Molten Aluminum for Assessment year(i)Others Product to Equivalent molten aluminum product (Tonne)EqOpAY = OpPAY x EFOPAYWhere,-OpPAY = Other Products Production (t)EFOPAY = Energy factor of other product = EFOPBY(ii)Strips to Equivalent molten Aluminum product (Tonne)EqStAY = StPAY x EFStAYWhere,-StPAY = strips production (t)EFStAY = Energy factor of Strips = EFStBY(iii)Wire rods to Equivalent molten Aluminum product (Tonne)EqWiRAY = WiRPAY x EFWiRAYWhere,-WiRPAY = Total Wire rod Production (t)EFWiRAY = Energy factor of wire rods= EFWiRBY(iv)Primary foundry to Equivalent molten Aluminum product(Tonne)EqPFAY = PFPAY X EFPFAYWhere,-PFPAY = Primary foundry alloys production (t)EFPFAY = Energy factor of primary foundry = EFPFBY(v)Bars to Equivalent molten Aluminum product (Tonne)EqBaAY = BaPAY x EFBaAYWhere,-BaPAY = Total Bars production (t)EFBaAY = Energy factor of Bars = EFBaBY(vi)Ingots to Equivalent molten Aluminum product (Tonne)EqInAY = InPAY x EFInAYWhere,-InPAY = Ingot Production (t)EFInAY =Energy factor of ingots = EFInBY(vii)Billet to Equivalent molten aluminum productEqBiAY = BiPAY x EFBiAYWhere,-BiPAY = Billet Production (t)EFBiAY = Energy factor of Billet= EFBiBYNote: For Assessment year, the Energy factor of baseline will be used to calculate the Equivalent product for respective product. However, any introduction of new product in the assessment year will draw the SEC of the newly introduced product into the Energy factor and equivalent product is to be calculated accordingly. Thus, the Numerator SEC of the above calculation of energy factor of baseline will change to SEC of the respective product in the assessment year asEFPiAY = SECPiAY / SECP1BY . Rest of the calculation remains same.1.7Power Mix(a)Power Mix Normalization for Power SourcesThe baseline year power mix ratio will be maintained for Assessment year for Power Source and import. The Normalized weighted heat rate calculated from the baseline year Power mix ratio will be compared with the assessment year Weighted Heat Rate and the Notional energy will be deducted from the Total energy assessed.The Thermal Energy difference of electricity consumed in plant in baseline year and electricity consumed in plant during assessment year shall be subtracted from the total energy, considering the same % of power sources consumed in the baseline year.However, any efficiency increase (i.e. reduction in Heat Rate) in Assessment year in any of the power sources will give benefit to the plant.Notional Energy to be subtracted from the total Energy of Plant in the assessment year is calculated as(i)Energy Correction for all power source in the assessment year [Million kcal]= TECPSAY x (A-WHRAY - N-WHRAY)Where,-TECPSAY : Total energy consumption from all the Power sources (Grid, CPP, DG etc) for AY in Million kwhA-WHRAY : Actual Weighted Heat Rate for the Assessment Year in kcal/kwhN-WHRAY : Normalized Weighted Heat Rate for the Assessment Year in kcal/kwh(ii)Normalized Weighted Heat Rate for Assessment year (kcal/kwh):N-WHRAY = A x (D/G) + B x (E/G) + C x (F/G)Where,-A: Grid Heat Rate for Assessment year (AY) in kcal/kwhB: CPP Heat Rate for AY in kcal/kwhC: DG Heat Rate for AY in kcal/kwhD: Grid Energy consumption for Base Line Year (BY) in Million kwhE: CPP Energy consumption for BY in Million kwhF: DG Energy consumption for BY in Million kwhG: Energy Consumed from all Power sources (Grid, CPP, DG) for BY in Million kwh(Note: Any addition in the power source will attract the same fraction to be included in the above equation as PSiHRAY x (PSiECBY /TECBY)PSiHRAY = Power Source (ith) Heat rate for AY in kcal/kwhPSiECBY = Power Source (ith) Energy Consumption for BY in Million kWhTECBY = Total Energy consumption for BY in Million kWhThe Electricity Consumption from WHR is not being considered for Power Mix Normalization)(b)Power Mix Normalization for Power Export. - Net Heat Rate of CPP to be considered for export of Power from CPP instead of 2717 kCal/kWh. Actual CPP heat rate would be considered for the net increase in the export of power from the baseline. The exported Energy will be normalized in the assessment year as per following calculation(iii)Notional energy for Power export to be subtracted in the assessment year [Million kcal] =(EXPAY - EXPBY) * [{(GHRAY / (1-APCAY / 100)} - 2717)]/ 10Where,-GHRAY : CPP Gross Heat Rate for AY in kcal/kwhEXPAY : Exported Electrical Energy in AY in Lakh kwhEXPBY : Exported Electrical Energy in BY in Lakh kwhAPCAY : Auxiliary Power Consumption for AY in %1.8Other Normalizations1.8.1. Start/Stop. - The Normalization takes place in the assessment year due to Cold start or Hot stop major section like calciner in Aluminum refinery. The additional Thermal and electrical Energy to be deducted after taking care of energy used in the production during these period in the assessment year as compared to the baseline year. The energy is to be excluded from the input energy as calculated belowAdditional Notional Electrical and Thermal Energy consumed due to Calciner/Major section start/stop (due to external factor) [Million kcal] = Electrical and Thermal Energy consumed due to Calciner/Major section start/stop (due to external factor) in the assessment year - Electrical and Thermal Energy consumed due to Calciner/Major section start/stop (due to external factor) in the baseline yearElectrical and Thermal Energy consumed due to Calciner/Major section start/stop (due to external factor) in the assessment year [Million kcal] = {Calciner/ Major Section Hot to Cold stop due to external factor (Electrical Energy Consumption) in assessment year (Lakh kWh) + Calciner/ Major Section Cold to Hot start due to external factors taking production into account (Electrical Energy Consumption) in assessment year (Lakh kWh)} xWeighted Heat Rate (kcal/kwh)/10 + Calciner/Major Section Cold to Hot start due to external factors taking production into account (Thermal Energy Consumption) in the assessment year (Million kcal)Electrical and Thermal Energy consumed due to Calciner/Major section start/stop (due to external factor) in the baseline year [Million kcal] = {Calciner/ Major Section Hot to Cold stop due to external factor (Electrical Energy Consumption) in baseline year (Lakh kWh) + Calciner/ Major Section Cold to Hot start due to external factors taking production into account (Electrical Energy Consumption) in baseline year (Lakh kWh)} x Weighted Heat Rate (kcal/kwh)/10 + Calciner/Major Section Cold to Hot start due to external factors taking production into account (Thermal Energy Consumption) in the baseline year (Million kcal)1.8.2. Environmental Concern. - Additional Environmental Equipment requirement due to major change in government policy on EnvironmentThe Normalization takes place in the assessment year for additional Equipment's Energy Consumption only if there is major change in government policy on Environment Standard. The Energy will be normalized for additional Energy consumption details from Energy meters. This is to be excluded from the input energy as calculated belowNotional Thermal Energy to be deducted in the assessment year due to Environmental Concern [Million kcal] = Additional Electrical Energy Consumed (Lakh kwh) x Weighted Heat Rate (kcal/kwh)/10+ Additional Thermal Energy Consumed (Million kcal)1.8.3. Biomass/ Alternate Fuel Unavailability w.r.t Baseline Year. - The Normalization for Unavailability for Biomass or Alternate Fuel is applied in the baseline year. The energy contained by the fossil fuel replacement will be deducted in the assessment yearNotional Thermal Energy to be deducted in the assessment year due to Biomass/Alternate Fuel Unavailability [Million kcal] = FFBAY GCVBBY /1000 + FFSAAY x GCVSABY / 1000 + FFBAY x GCVLABY / 1000Where,-FFBAY = Biomass replacement with Fossil fuel due to un-availability used in the process in Assessment Year (Tonnes)GCVBBY : Gross Calorific Value of Biomass in Baseline Year (kcal/kg)FFSAAY = Solid Alternate Fuel replacement with Fossil fuel due to un-availability used in the process in Assessment Year (Tonnes)GCVSABY : Gross Calorific Value of Solid Alternate Fuel in Baseline Year (kcal/kg)FFBAY = Liquid Alternate Fuel replacement with Fossil fuel due to un-availability used in the process in Assessment Year (Tonnes)GCVLABY : Gross Calorific Value of Biomass in Baseline Year (kcal/kg)1.8.4. Construction Phase or Project Activities. - The energy consumed during construction phase or project activities are non-productive energy and hence will be subtracted in the assessment year. The energy consumed by the equipment till commissioning will also be deducted in the assessment yearNotional Thermal Energy to be deducted in the assessment year due to Construction Phase or Project Activities [Million kcal] = Electrical Energy Consumed due to commissioning of Equipment (Lakh kwh) x Weighted Heat Rate (kcal/kwh)/10+ Thermal Energy Consumed due to commissioning of Equipment (Million kcal)1.8.5. Addition of New Line/Unit (In Process and Power Generation). - In case a DC commissions a new line/production unit before or during the assessment/target year, the production and energy consumption of new unit will be considered in the total plant energy consumption and production volumes once the Capacity Utilization of that line has touched / increased over 70 per cent. However, the energy consumption and production volume will not be included till it attains 70 per cent.of Capacity Utilization. Energy consumed and production made (if any) during any project activity during the assessment year, will be subtracted from the total energy and production in the Assessment year. Similarly, the same methodology is applied on a new unit installation for power generation (CPP) within the plant boundary.The Energy reduction will take place in the assessment year for addition of new line/unit Normalization as per following calculation:(i)Thermal Energy Consumed due to commissioning of New process Line/Unit till it attains 70 percent of Capacity Utilization to be subtracted in assessment year (Million kcal) = (Electrical Energy Consumed due to commissioning of New process Line/Unit till it attains 70 percent. of Capacity Utilization (Lakh kWh) x Weighted Average Heat rate in AY (kcal/kwh)/10) + Thermal Energy Consumed due to commissioning of New Process Line/Unit till it attains 70 percent. of Capacity Utilization (Million kcal)The Production during commissioning of New Process Line/Unit will be subtracted from the total production of plant and added in the import of intermediary product (Calcined Alumina for Refinery, Molten Alumina for Smelter and Integrated Plant))(ii)Thermal Energy Consumed from external source due to commissioning of New Line/Unit till it attains 70 percent. of Capacity Utilization in Power generation to be subtracted in the assessment year (Million kCal) = (Electrical Energy Consumed from external source due to commissioning of New Line/Unit till it attains 70 percent. of Capacity Utilization in Power generation (Lakh kWh) x Weighted Average Heat rate in AY (kcal/kwh)/10) + Thermal Energy Consumed due to commissioning of New Line/Unit till it attains 70 percent. of Capacity Utilization in Power generation (Million kcal)(iii)Thermal Energy to be added in the assessment year for Power generation of a line /unit till it attains 70 percent.of Capacity Utilization (Million kcal)=Net Electricity Generation till new Line/Unit attains 70 percent. Capacity Utilization (Lakh kWh) x Weighted Heat Rate (kcal/kwh)/10Where,-AY: Assessment Year1.8.6. Unforeseen Circumstances. - The Normalization is required for Energy system of a plant, if the situation influences the Energy Consumption, which cannot be controlled by Plant Management and is termed as unforeseen circumstances. The Energy consumed due to unforeseen circumstances to be deducted in the assessment year(i)Thermal Energy consumed due to unforeseen (Million kcal) = (Electrical Energy to be Normalized in AY x Weighted Average Heat rate in AY (kcal/kWh)/10) + Thermal Energy to be Normalized (Million kcal)1.8.7. Renewable Energy. - The quantity of exported power (partially or fully) on which Renewable Energy Certificates have been earned by Designated Consumer in the assessment year under Renewable Energy Certificates (REC) mechanism shall be treated as Exported power and Normalization will apply. However, the normalized power export or deemed injection will not qualify for issue of Energy Saving Certificates under Perform, Achieve &Trade (PAT) Scheme.The quantity of exported power (partially or fully) from Renewable energy which has been sold at a preferential tariff by the Designated consumer in the assessment year under Renewable Energy Certificates (REC) mechanism shall be treated as Exported power. However, the normalized power export will not qualify for issue of Energy Saving Certificates under Perform, Achieve & Trade (PAT) Scheme.(i)Target Saving to be achieved (Perform, Achieve & Trade (PAT) obligation) (Tonne of Oil Equivalent(TOE)) = Equivalent Major Product Output as per PAT scheme Notification (Tonnes) in BY x Target Saving to be achieved (PAT obligation) (TOE/Te)(ii)Target Saving achieved in assessment year (TOE)= [Gate to Gate Specific Energy Consumption in BY (TOE/Te)-normalized Gate to Gate Specific Energy Consumption in AY (TOE/Te)] x Equivalent Major Product Output in Tonnes as per PAT scheme Notification (Tonnes)(iii)Additional Saving achieved (After PAT obligation) (TOE) = Target Saving Achieved in AY (TOE) - Target Saving to be achieved (PAT obligation) in BY (TOE)A. Thermal Energy Conversion for REC and Preferential Tariff, if Steam Turbine Heat Rate in assessment year = 0(iv)Thermal energy conversion for REC and Preferential tariff (Million kcal)= [Quantum of Renewable Energy Certificates (REC) obtained as a Renewal Energy Generator (Solar & Non-Solar)(MWh) + Quantum of Energy sold under preferential tariff (MWh)] x 2717/1000(a)Thermal Energy Conversion for REC and Preferential Tariff, if Steam Turbine Heat Rate in assessment year ? 0(v)Thermal energy conversion for REC and Preferential tariff (TOE)= [Quantum of Renewable Energy Certificates (REC) obtained as a Renewal Energy Generator (Solar & Non-Solar)(MWh) + Quantum of Energy sold under preferential tariff (MWh)] x Steam Turbine Net Heat Rate in AY (kcal/kwh)/10000(vi)If, Additional Saving achieved (After PAT obligation) (TOEl)<= 0,

1. Thermal Energy to be normalized for REC and preferential tariff power sell under REC mechanism (TOE) = 0,

(vii)If, Additional Saving achieved (After PAT obligation) (TOEl)>0, and Thermal energy conversion for REC and Preferential tariff (TOE)>Additional Saving achieved (After PAT obligation) (TOE) then

1. Thermal Energy to be normalized for REC and preferential tariff power sell under REC mechanism (TOE) =Additional Saving achieved (After PAT obligation) (TOE)

(viii)If, Additional Saving achieved (After PAT obligation) (TOE)>0, and Thermal energy conversion for REC and Preferential tariff (TOE)< Additional Saving achieved (After PAT obligation) (Million kcal) then

1. Thermal Energy to be normalized for REC and preferential tariff power sell under REC mechanism (TOE) =Thermal energy conversion for REC and Preferential tariff (TOE)

1.9Gate to Gate Specific Energy Consumption1.9.1. Refinery Process Gate to Gate Specific Energy Consumption for BY and AY

Gate to Gate SEC of equivalent Calcined alumina (TOE/ Tone) =| Total Notional Energy Consumed (TOE)Total equivalent calcined alumina production (Tonne)

1.9.1.1. Total Notional Energy Consumed considering Intermediary product Import and Export with stock difference in BY and AYTotal Notional energy consumed (TOE) for BY and AY = Total energy consumed (Million kcal)/10 - Notional energy exported for hydrate alumina (Million kcal)/10+ Notional energy for imported hydrate alumina (Million kcal)/10 -Energy consumed by By products (Million kcal)/10(i)Notional energy for exported hydrate alumina (Million kcal) for BY and AY = SECSHA * TSHAExWhere,-SECSHA = Specific Energy Consumption of Standard Hydrate Alumina for BY and AY (Million kcal/Tonne)TSGAEx = Total Standard Hydrate Alumina Export for BY and AY (Tonne)a. Total Standard Hydrate Alumina Export for BY and AY (if Hydrate Alumina Stock >0) = Actual Hydrate Alumina Export (Tonne) + Hydrate Alumina Stock difference (Tonne)b. Hydrate Alumina Stock difference for BY and AY Closing Hydrate Alumina Stock (Tonne) - Opening Hydrate Alumina Stock (Tonne)c. Total Standard Hydrate Alumina Export for BY and AY (if Hydrate Alumina Stock <0) = Actual Hydrate Alumina Export(ii)Notional energy for imported hydrate alumina (Million kcal) for BY and AY = SECSHA * TSHAImWhere,-SECSHA = Specific Energy Consumption of Standard Hydrate Alumina for BY and AY (Million kcal/Tonne)TSGAIm = Total Standard Hydrate Alumina Import for BY and AY (Tonne)a. Total Standard Hydrate Alumina Import for BY and AY (if Hydrate Alumina Stock <0) = Actual Hydrate Alumina Import (Tonne) - Hydrate Alumina Stock difference (Tonne)b. Hydrate Alumina Stock difference for BY and AY Closing Hydrate Alumina Stock (Tonne) - Opening Hydrate Alumina Stock (Tonne)c. Total Standard Hydrate Alumina Import for BY and AY (if Hydrate Alumina Stock >0) = Actual Hydrate

Alumina Import1.9.2. Smelter Process

Gate to Gate SEC of equivalent Molten Aluminum (TOE/ Tone) =| Total Notional Energy Consumed (TOE)Total equivalent Molten Aluminum production (Tonne)

1.9.2.1. Total Notional Energy Consumed considering Intermediary product Import and Export with stock difference in BY and AYTotal Notional energy consumed (TOE) = Total energy consumed (Million kCal)/10- Notional energy exported calcined alumina for integrated process (Million kcal)/10+ Notional energy imported calcined alumina for integrated process (Million kcal)/ 10(i)Notional energy for exported calcined alumina (Million kcal) for BY and AY = SECCA * TCAExWhere,-SECCA = Specific Energy Consumption of Calcined Alumina for BY and AY (Million kcal/Tonne)TCAEx = Total Calcined Alumina Export for BY and AY (Tonne)(a)Total Calcined Alumina Export for BY and AY (if Calcined Alumina Stock >0) = Actual Calcined Alumina Export (Tonne) + Calcined Alumina Stock difference (Tonne)(b)Calcined Stock difference for BY and AY Closing Calcined Alumina Stock (Tonne) - Opening Calcined Alumina Stock (Tonne)(c)Total Calcined Hydrate Alumina Export for BY and AY (if Calcined Alumina Stock<0) = Actual Calcined Alumina Export(ii)Notional energy for imported calcined alumina (Million kcal) for BY and AY = SECCA * TCAImWhere,-SECCA = Specific Energy Consumption of Calcined Alumina for BY and AY (Million kcal/Tonne)TCAIm = Total Calcined Alumina Import for BY and AY (Tonne)(a)Total Calcined Alumina Import for BY and AY (if Calcined Alumina Stock <0) = Actual Calcined Alumina Import (Tonne) - Calcined Alumina Stock difference (Tonne)(b)Calcined Stock difference for BY and AY Closing Calcined Alumina Stock (Tonne) - Opening Calcined Alumina Stock (Tonne)(c)Total Calcined Hydrate Alumina Import for BY and AY (if Calcined Alumina Stock>0) = Actual Calcined Alumina Import1.10Normalized Gate to Gate Specific Energy Consumption

Gate to Gate SEC of equivalent Molten Aluminum (TOE/ Tone) =| Total Notional Energy Consumed (TOE)Total equivalent Molten Aluminum production (Tonne)

Normalized Gate to Gate Specific Energy Consumption after REC Compliance in assessment year =| Normalized Total Energy Consumption after REC Compliance (TOE)Total equivalent production (Tonnes)

i. Normalized Total Energy Consumption in the assessment year (TOE) = Total Energy Consumption in the assessment year(TOE)- Notional Energy for Bauxite Quality(TOE)- Notional Energy for fuel quality in CPP & Co-Gen(TOE) - Notional Energy for PLF in CPP(TOE)- Notional Energy for Power Mix(TOE)-Notional Energy for Carbon Anode production(TOE)- Notional Energy for Smelter capacity Utilization(TOE)-Notional Energy for others (Environmental Concern+ Biomass/Alternate Fuel Availability+ Project Activities+ NewLine/Unit Commissioning+ Unforeseen Circumstances) (TOE) - Energy for Power generation of a line /unit till it attains 70 per cent. of Capacity Utilizationii. Normalized Total Energy Consumption after REC compliance in the assessment year (Million kcal) = Normalized Total Energy Consumption in the assessment year (Million kcal)+ Renewable Energy Certificates Compliance under PAT Scheme (Million kcal)iii. Baseline Normalization (TOE/tonne) = Gate to Gate Specific Energy Consumption in Baseline year (TOE/tonne) - Notified Specific Energy Consumption in Baseline Year (TOE/tonne)iv. Normalized GtG SEC after SEC complianceNormalized Gate to Gate Specific Energy Consumption after REC Compliance in assessment year = Total Equivalent Production (Tonnes) - Baseline Normalization (TOE/ Tonne)

2. Sa2 Aluminum: Aluminum Cold Sheet

Normalization factors for the following areas have been developed in Aluminum Cold Sheet Sector.2.1Product Mix (Equivalent product)2.2Import product Normalization2.3Other Normalizations2.3.1. Environmental Concern (Additional Environmental Equipment requirement due to major change in Government policy on Environment)2.3.2. Biomass/Alternate Fuel Unavailability2.3.3. Construction Phase or Project Activities2.3.4. Addition of New Line/Unit (In Process and Power Generation)2.3.5. Unforeseen Circumstances2.3.6. Renewable Energy2.4Gate to Gate Specific Energy Consumption2.5Normalized Gate to Gate Specific Energy Consumption2.1Product Mix (Equivalent Product). - The baseline year product mix ratio will be maintained for Assessment year for equivalent major product. The equivalent major product is calculated from the baseline year product mix ratio will be compared with the both baseline year and assessment year production2.1.1. Total Equivalent Product Cold Sheet. - All products v.i.z Alloy Ingot, Rolling Ingot, Hot Rolled product, different Cold rolled products etc other than major product shall be converted to equivalent major product.Equivalent major product = ☐PGCVSAi: Gross Calorific Value of Solid Alternate Fuel in Baseline Year (kcal/kg) x CFiConversion factor CFi = SECi ÷ SECMWhere,-Pi = Tonnage of Product iSECi = SEC of Product i in Baseline yearSECM = SEC of Product M in Baseline yearThe conversion factor will be kept same in assessment year as of baseline year2.1.1.1. Total Equivalent Product Cold Sheet BY (Tonne) = AIMP | RIMP | HRCMP | CSMPWhere,-AIMP = Alloy Ingot to Major Product (Tonne)RIMP = Rolling Ingot to Major Product (Tonne)HRCMP = Hot Rolled to Major Product (Tonne)CSMP = Cold Sheet to Major Product (Tonne)2.1.1.2. Total Equivalent Product Cold Sheet AY (Tonne) =AIMP + RIMP + HRCMP + CSMPWhere,-AIMP = Alloy Ingot to Major Product (Tonne)RIMP = Rolling Ingot to Major Product (Tonne)HRCMP = Hot Rolled to Major Product (Tonne)CSMP = Cold Sheet to Major Product (Tonne)2.1.2. Equivalent Product2.1.2.1. Cold Sheet to major Product: CSMP(BY/ AY) = CSCF X CRCWhere,-CSCF = Cold Sheet to major Product-Conversion FactorCRC = Cold Rolled Coil (Tonne)2.1.2.2. Hot Rolled Coil to major Product (HRCMP)(a)Hot Rolled Coil to major Product: HRCMP BY = HRCFF X THRCExWhere,-HRCCF = Hot Rolled Coil to major Product-Conversion FactorTHRCEx = Total Hot Rolled Coil Export (Tonne)(b)Hot Rolled Coil to major Product HRCMPAY = AY = HRCFF X THRCExWhere,-HRCCF = Hot Rolled Coil to major Product-Conversion FactorTHRCEx = Total Hot Rolled Coil Export (Tonne)2.1.2.3. Rolling Ingot to major Product(a)Rolling Ingot to major Product RIMPBY = RICF X TRIExWhere,-RICF =Rolling Ingot to major Product-Conversion factorTRIEx =Total Rolling Ingot (RI) Export (Tonne)(b)Rolling Ingot to major Product RIMPAY = RICF X TRIExWhere,-RICF = Rolling Ingot to major Product-Conversion factorTRIEx = Rolling Ingot Export (Tonne)2.1.2.4. Alloy Ingot to major Product(a)Alloy Ingot to major Product AIMPBY = AICF X TAIEPWhere,-AICF = Alloy Ingot to major Product-Conversion factorTAIEEx = Total Alloy Ingot (AI) Export (Tonne)(b)Alloy Ingot to major Product AIMPAY = AICF X TAIExWhere,-AICF = Alloy Ingot to major Product-Conversion factorTAIEx = Alloy Ingot Export (Tonne)2.1.3. Conversion Factor for Minor to Major Product2.1.3.1. Cold Sheet to major Product Conversion Factor(a)Cold Sheet to major Product CSCF(BY) = CSSECBY/ SECMPBYWhere,-CSSECBY = Cold Sheet-Specific Energy Consumption (Million kcal/Tonne) for BYSECMP BY = Specific Energy Consumption of Major Product (Million kcal/Tonne) for BYBY = Baseline Year(b)Cold Sheet to major Product(AY) = CSSECBY/ SECMPBYWhere,-CSSECBY = Major product-Specific Energy Consumption (Million kcal/Tonne)SECMPBY = Specific Energy Consumption of Major Product (Million kcal/Tonne)2.1.3.2. Hot Rolled Coil to major Product Conversion Factor(a)Hot Rolled Coil to major Product HRCCF(BY) = HRCSEBY/ SECMPBYWhere,-HRCSECBY = Hot Rolled Coil-Specific Energy Consumption (Million kcal/Tonne) in BYSECMPBY = Specific Energy Consumption of Major Product (Million kcal/Tonne) in BY(b)If Hot Rolled Coil Production in BY= 0, thenHot Rolled Coil to major Product HRCCF(AY) = HRCSEAY/ SECMPBY(c)If Hot Rolled Coil Production in BY ☐0, thenHot Rolled Coil to major Product HRCCF(AY) = HRCSEBY/ SECMPBYWhere,-HRCSECBY = Hot Rolled Coil-Specific Energy Consumption (Million kcal/Tonne) in BYHRCSECAY = Hot Rolled Coil-Specific Energy Consumption (Million kcal/Tonne) in AYSECMPBY = Specific Energy Consumption of Major Product (Million kcal/Tonne) in BY2.1.3.3. Rolling Ingot to major Product Conversion Factor(a)Rolling Ingot to major Product RICF(BY) = RISECBY/ SECMPBYWhere,-RISECBY = Rolling Ingot-Specific Energy Consumption (Million kcal/Tonne) in BYSECMPBY = Specific Energy Consumption of Major Product (Million kcal/Tonne) in BY(b)If Hot Rolling Ingot Production in BY = 0, thenRolling Ingot to major Product RICF(AY) = RISECAY/ SECMPBY(c)If Hot Rolling Ingot Production in BY ☐0, thenRolling Ingot to major Product RICF(AY) = RISECBY/ SECMPBYWhere,-RISECBY = Rolling Ingot-Specific Energy Consumption (Million kcal/Tonne) in BYRISECAY = Rolling Ingot-Specific Energy Consumption (Million kcal/Tonne) in AYSECMPBY = Specific Energy Consumption of Major Product (Million kcal/Tonne) in BY2.1.3.4. Alloy Ingot to major Product Conversion Factor(a)Alloy Ingot to major Product AICF(BY) = AISECBY/ SECMPBYWhere,-AISECBY = Alloy Ingot-Specific Energy Consumption (Million kcal/Tonne) in BYSECMPBY = Specific Energy Consumption of Major Product (Million kcal/Tonne) in BY(b)If Alloy Ingot Production in BY = 0, thenAlloy Ingot to major Product AICF(AY) = AISECAY/ SECMPBY(c)If Alloy Ingot Production in BY ☐0, thenAlloy Ingot to major Product AICF(AY) = AISECBY/ SECMPBYWhere,-AISECBY = Alloy Ingot-Specific Energy Consumption (Million kcal/Tonne) in BYAISECAY = Alloy Ingot-Specific Energy Consumption (Million kcal/Tonne) in AYSECMPBY = Specific Energy Consumption of Major Product (Million kcal/Tonne) in BYAY = Assessment YearBY = Baseline Year2.1.4. Major Product2.1.4.1. SEC of Major Product = SECMPWhere,-SECMP = Specific Energy Consumption of Major Product (Million kcal/Tonne)2.1.4.2. Major Product = CRCWhere,-CRC = Cold Rolled Coil Production (Tonne)2.1.5. Specific Energy Consumption up to per ton of product for BY and AY2.1.5.1. Major product (Million kcal/Tonne)CRCSEC = RISP + HRCSP + CRCSPWhere,-AISP = Alloy Ingot -SEC for per tonne of product (Million kcal/Tonne)RISP = Rolling Ingot- SEC for per tonne of product (Million kcal/Tonne)HRCSP = Hot Rolled Coil- SEC for per tonne of product (Million kcal/Tonne)CRCSP = Cold Rolled Coil-SEC for per tonne of product (Million kcal/Tonne)2.1.5.2. Hot Rolled Coil (Million kcal/Tonne) HRCSEC = RISP +HRCSPWhere,-AISP = Alloy Ingot -SEC for per tonne of product (Million kcal/Tonne)RISP = Rolling Ingot- SEC for per tonne of product (Million kcal/Tonne)HRCSP = Hot Rolled Coil- SEC for per tonne of product (Million kcal/Tonne)2.1.5.3. Rolling Ingot (Million kcal/Tonne) RISEC= RISPWhere,-RISP = SEC of Rolling Ingot (Recycling + Remelting Furnace) per tonne of product (Million kcal/Tonne)= [(Thermal Energy for Alloy Ingot + Thermal Energy for Rolling Ingot-Thermal Energy for Alloy Ingot Production)/Rolling Ingot Production]+ [(Electrical Energy for Alloy Ingot + Electrical Energy for Rolling Ingot-Electrical Energy for Alloy Ingot Production)/Rolling Ingot Production]2.1.5.4. Alloy Ingot (Million kcal/Tonne) AISEC = AISPWhere,-AISP = Alloy Ingot -SEC for per tonne of product (Million kcal/Tonne)2.1.6. Stock and Stock difference2.1.6.1. Cold Rolled Coil (CRC)If Stock Difference > 0, Total Cold Rolled Coil (CRC) Export (T) = Export (T)+ Stock Difference (T)If Stock Difference < 0, Total Cold Rolled Coil (CRC) Import (T) = Import (T) - Stock Difference (T)Stock Difference (T) = Closing Stock (T)-Opening Stock (T)2.1.6.2. Hot Rolled Coil (HRC)If Stock Difference > 0, Total Hot Rolled Coil (HRC) Export (T)= Export (T) +Stock Difference (T)If Stock Difference < 0, Total Hot Rolled Coil (HRC) Import (T)= Import (T) -Stock Difference (T)Stock Difference (T) = Closing Stock (T)-Opening Stock (T)2.1.6.3. Rolling Ingot (RI)If Stock Difference > 0, Total Rolling Ingot (RI) Export (T)= Export (T) +Stock Difference (T)If Stock Difference < 0, Total Rolling Ingot (RI) Import (T)= Import (T) -Stock Difference (T)Stock Difference (T) = Closing Stock (T)-Opening Stock (T)2.1.6.4. Alloy Ingot (AI)If Stock Difference > 0, Total Alloy Ingot (AI) Export (T)= Export (T) +Stock Difference (T)If Stock Difference < 0, Total Alloy Ingot (AI) Import (T)= Import (T) -Stock Difference (T)Stock Difference (T) = Closing Stock (T)-Opening Stock (T)2.2Import Product Normalization2.2.1. Notional Energy for Import to be added in the baseline and assessment year(Million kcal) = IEAI + IERI + IEHRC + IECRCWhere,-IEAI = Import Energy for Alloy ingot (Million kcal)IERI = Import Energy for Rolling ingot (Million kcal)IEHRC = Import Energy for Hot Rolled Coil (Million kcal)IECRC = Import Energy for Cold Rolled Coil (Million kcal)2.2.2. Notional Energy for Import2.2.2.1. Import Energy for Cold Rolled Coil (Million kcal) IECRC for BY and AY = CSSEC X TCRCImWhere,-CSSEC = SEC up to Cold Sheet Production (Million kcal/Tonne)TCRCIm = Total Cold Rolled Coil Import (Tonne)2.2.2.2. Import Energy for Hot Rolled Coil (Million kcal) = SECHRC X THRCImWhere,-HRCSEC = SEC up to Hot Rolled Coil Production (Million kcal/ Tonne)THRCIm = Total Hot Rolled Coil Import (Tonne)2.2.2.3. Import Energy for Rolling ingot (Million kcal) = SECRI X TRIImWhere,-RISEC = SEC up to Rolling ingot Production (Million kcal/Tonne)TRIIm = Total Rolling ingot Import (Tonne)2.2.2.4. Import Energy for Alloy ingot(Million kcal) = SECAI X TAIImWhere,-AISEC = SEC up to Alloy Ingot Production (Million kcal/Tonne)TAIIm = Total Alloy Ingot Import (Tonne)2.3Other Normalizations2.3.1. Environmental Concern. - Additional Environmental Equipment requirement due to major change in government policy on EnvironmentThe Normalization takes place in the assessment year for additional Equipment's Energy Consumption only if there is major change in government policy on Environment Standard. The Energy will be normalized for additional Energy consumption details from Energy meters. This is to be excluded from the input energy as calculated belowNotional Thermal Energy to be deducted in the assessment year due to Environmental Concern [Million kcal] = Additional Electrical Energy Consumed (Lakh kWh) x Weighted Heat Rate (kcal/kWh)/10+ Additional Thermal Energy Consumed (Million kcal)2.3.2. Biomass/ Alternate Fuel Unavailability w.r.t Baseline Year. - The Normalization for Unavailability for Biomass or Alternate Fuel is applied in the baseline year. The energy contained by the fossil fuel replacement will be deducted in the assessment yearNotional Thermal Energy to be deducted in the assessment year due to Biomass/Alternate Fuel Unavailability [Million kcal] = FFBAY GCVBBY/ 1000 + FFSAAY x GCVSABY/ 1000 + FFLAAY x GCVLABY/ 1000Where.-FFBAY = Biomass replacement with Fossil fuel due to un-availability used in the process in Assessment Year (Tonnes)GCVBBY: Gross Calorific Value of Biomass in Baseline Year (kcal/kg)FFSAAY = Solid Alternate Fuel replacement with Fossil fuel due to un-availability used in the process in Assessment Year (Tonnes)GCVSABY: Gross Calorific Value of Solid Alternate Fuel in Baseline Year (kcal/kg)FFLAAY = Liquid Alternate Fuel replacement with Fossil fuel due to un-availability used in the process in Assessment Year (Tonnes)GCVLABY: Gross Calorific Value of Biomass in Baseline Year (kcal/kg)2.3.3. Construction Phase or Project Activities. - The energy consumed during construction phase or project activities are non-productive energy and hence will be subtracted in the assessment year. The energy consumed by the equipment till commissioning will also be deducted in the assessment yearNotional Thermal Energy to be deducted in the assessment year due to Construction Phase or Project Activities [Million kcal]= Electrical Energy Consumed due to commissioning of Equipment (Lakh kwh) x Weighted Heat Rate (kcal/kwh)/10+ Thermal Energy Consumed due to commissioning of Equipment (Million kcal)2.3.4. Addition of New Line/Unit (In Process and Power Generation) In case a DC commissions a new line/production unit before or during the assessment/target year, the production and energy consumption of new unit will be considered in the total plant energy consumption and production volumes once the Capacity Utilization of that line has touched / increased over 70 percent. However, the energy consumption and production volume will not be included till it attains 70 percent.of Capacity Utilization. Energy consumed and production made (if any) during any project activity during the assessment year, will be subtracted from the total energy and production in the Assessment year.Similarly, the same methodology is applied on a new unit installation for power generation (CPP) within the plant boundary.The Energy reduction will take place in the assessment year for addition of new line/unit Normalization as per following calculation(i)Thermal Energy Consumed due to commissioning of New process Line/Unit till it attains 70 percent. of Capacity Utilization to be subtracted in assessment year (Million kcal) = (Electrical Energy Consumed due to commissioning of New process Line/Unit till it attains 70 percent. of Capacity Utilization (Lakh kWh) x Weighted Average Heat rate in AY (kcal/kwh)/10) + Thermal Energy Consumed due to commissioning of New Process Line/Unit till it attains 70 percent. of Capacity Utilization (Million kcal) The Production during commissioning of New Process Line/Unit is to be subtracted from the total production of respective plant and added in the import of intermediary product.(ii)Thermal Energy Consumed from external source due to commissioning of New Line/Unit till it attains 70 percent. of Capacity Utilization in Power generation to be subtracted in the assessment year (Million kcal) = (Electrical Energy Consumed from external source due to commissioning of New Line/Unit till it attains 70 percent. of Capacity Utilization in Power generation (Lakh kWh) x Weighted Average Heat rate in AY (kcal/kwh)/10) + Thermal Energy Consumed due to commissioning of New Line/Unit till it attains 70percent. of Capacity Utilization in Power generation (Million kcal)(iii)Thermal Energy to be added in the assessment year for Power generation of a line /unit till it attains 70 percent.of Capacity Utilization (Million kcal)= Net Electricity Generation till new Line/Unit attains 70 percent. Capacity Utilization (Lakh kWh) x Weighted Heat Rate (kcal/kWh)/10Where,-AY: Assessment Year2.3.5. Unforeseen Circumstances. - The Normalization is required for Energy system of a plant, if the situation influences the Energy Consumption, which cannot be controlled by Plant Management and is termed as Unforeseen Circumstances. The Energy consumed due to unforeseen circumstances to be deducted in the assessment yearThermal Energy consumed due to unforeseen (Million kcal) = (Electrical Energy to be normalized in AY x Weighted Average Heat rate in AY (kcal/kWh)/10) + Thermal Energy to be normalized (Million kcal)2.3.6. Renewable Energy. - The quantity of exported power (partially or fully) on which Renewable Energy Certificates have been earned by Designated Consumer in the assessment year under Renewable Energy Certificates (REC) mechanism shall be treated as Exported power and Normalization will apply. However, the normalized power export or deemed injection will not qualify for issue of Energy Saving Certificates under PAT Scheme.The quantity of exported power (partially or fully) from Renewable energy which has been sold at a preferential tariff by the Designated consumer in the assessment year under Renewable Energy

Certificates (REC) mechanism shall be treated as Exported power. However, the normalized power export will not qualify for issue of Energy Saving Certificates under Perform, Achieve and Trade (PAT) Scheme.2.3.6.1. Target Saving to be achieved (PAT obligation) (Million kcal) = Equivalent Major Product Output as per PAT scheme Notification (Tonnes) in BY x Target Saving to be achieved (PAT obligation) (TOE/Te) x 102.3.6.2. Target Saving achieved in assessment year (Million kcal)= [Gate to Gate Specific Energy Consumption in BY (TOE/Te)-normalized Gate to Gate Specific Energy Consumption in AY (TOE/Te)] x Equivalent Major Product Output in Tonnes as per PAT scheme Notification (Tonnes) x102.3.6.3. Additional Saving achieved (After PAT obligation) (Million kcal) = Target Saving Achieved in AY (Million kcal) - Target saving to be achieved (PAT obligation) in BY (Million kcal)Thermal Energy Conversion for REC and Preferential Tariff, if Steam Turbine Heat Rate in assessment year = 02.3.6.4. Thermal energy conversion for REC and Preferential tariff (Million kcal)= [Quantum of Renewable Energy Certificates (REC) obtained as a Renewal Energy Generator (Solar & Non-Solar)(MWh) + Quantum of Energy sold under preferential tariff (MWh)] x 2717 kcal/kwh /1000Thermal Energy Conversion for REC and Preferential Tariff, if Steam Turbine Heat Rate in assessment year ? 02.3.6.5. Thermal energy conversion for REC and Preferential tariff (Million kcal) = [Quantum of Renewable Energy Certificates (REC) obtained as a Renewal Energy Generator (Solar & Non-Solar)(MWh) + Quantum of Energy sold under preferential tariff (MWh)] x Steam Turbine Net Heat Rate in AY (kcal/kwh)/10002.3.6.5.1. If, Additional Saving achieved (After PAT obligation) (Million kcal) <= 0,Thermal Energy to be normalized for REC and preferential tariff power sell under REC mechanism (TOE) = 0,2.3.6.5.2. If, Additional Saving achieved (After PAT obligation) (Million kcal) >0, and Thermal energy conversion for REC and Preferential tariff (Million kcal) >Additional Saving achieved (After PAT obligation) (Million kcal) then,Thermal Energy to be normalized for REC and preferential tariff power sell under REC mechanism (TOE) = Additional Saving achieved (After PAT obligation) (Million kcal)2.3.6.5.3. If, Additional Saving achieved (After PAT obligation) (Million kcal) >0, and Thermal energy conversion for REC and Preferential tariff (Million kcal) < Additional Saving achieved (After PAT obligation) (Million kcal) then,Thermal Energy to be normalized for REC and preferential tariff power sell under REC mechanism (TOE) = Thermal energy conversion for REC and Preferential tariff (Million kcal)2.4Gate to Gate Specific Energy Consumption2.4.1. Cold Sheet ProcessGate to Gate SEC of equivalent cold sheet (TOE/ Tone) = (Total Notional Energy Consumed (TOE))/ (Total equivalent Cold Sheet production (tonne))Total Notional energy consumed (TOE) = (Total energy consumed (million kcal)+ Notional energy imported product (million kcal))/ 102.5normalized Gate to Gate Specific Energy Consumption

Gate to Gate Specific Energy Consumption in Baseline year =| Total Energy Consumption (TOE)Total equivalent production (Tonnes)

Normalized Gate to Gate Specific Energy Consumption after REC Compliance in assessment year = Normalized Total Energy Consumption after REC Compliance (TOE)/ (Total Equivalent Production (Tonnes))2.5.1. Normalized Total Energy Consumption in the assessment year (TOE) = Total Energy Consumption in the assessment year(TOE) - Notional Energy for others (Environmental Concern+ Biomass/Alternate Fuel Availability+ Project Activities+ New Line/Unit Commissioning+ Unforeseen Circumstances) (TOE) - Energy for Power generation of a line /unit till it attains 70% of Capacity Utilization2.5.2. Normalized Total Energy Consumption after REC compliance in the assessment year (Million kcal) = Normalized Total Energy Consumption in the assessment year

(Million kcal)+ Energy equivalent to Renewable Energy Certificates Compliance under PAT Scheme (Million kcal)2.5.3. Baseline Normalization (TOE/tonne) = Gate to Gate Specific Energy Consumption in Baseline year (TOE/tonne) - Notified Specific Energy Consumption in Baseline Year (TOE/tonne)2.5.4. Normalized GtG SEC after SEC complianceNormalized Gate to Gate Specific Energy Consumption after REC compliance in assessment year

=| Normalized Total Energy Consumption after REC compliance (TOE)Total equivalent production (Tonnes)| - Baseline Normalization (TOE/ tonne)

3. Sb Cement Sector

Normalization factors for the following areas have been developed in Cement Sector:3.1Capacity Utilization3.1.1. Decrease in Kiln Heat rate due to external factori. Availability of Fuel/ Raw Material3.1.2. Kiln Start/ Stopii. Natural Calamity/ Rioting/ Social Unrest/ Labor Strike/ Lockouts3.2Product Mix & Intermediary Product3.3Fuel Mix (Pet Coke Utilization in Kiln)3.4Power Mix (Imported & Exported from/ to the grid and self-generation from the captive power plant)3.5Fuel Quality in Captive Power Plant (CPP)3.6Low Plant Load Factor in CPP3.7Other Normalizations3.7.1. Environmental Concern (Additional Environmental Equipment requirement due to major change in government policy on Environment)3.7.2. Biomass/Alternate Fuel Unavailability3.7.3. Construction Phase or Project Activities3.7.4. Addition of New Line/Unit (In Process & Power Generation)3.7.5. Unforeseen Circumstances3.7.6. Renewable Energy3.8Gate to Gate Specific Energy Consumption3.9Normalized Gate to Gate Specific Energy Consumption3.1Capacity Utilization:(a)Decrease in Kiln Heat Rate due to external factor: Availability of Fuel/Raw material(i)Normalization of Thermal SEC (Kiln Heat Rate) up to Clinkerisation. - Thermal energy due to loss in kiln TPH, normalized in the assessment year for Kiln Heat Rate is to be calculated as:-Notional Thermal energy reduction due to loss in Kiln TPH w.r.t. Kiln Heat Rate [Million kcal] = [Kiln Heat Rate in AY (kcal/kg)-Kiln Heat Rate in BY (kcal/kg)] x Clinker Production in AY (Tonnes)/1000Where,-[Kiln Heat rate in AY - Kiln Heat rate in BY]= 0.4673 x (TPH BY - TPH AY)AY = Assessment yearBY = Baseline YearTPHBY) = Tonnes per hour of kiln in the baseline yearTPHAY) = Tonnes per hour of kiln in the assessment yearKiln Heat Rate = Total Thermal Energy consumed in kiln (kcal)/ Clinker Production (kg), in kcal/kg(ii)Normalization of Electrical SEC up to Clinkerisation. - Thermal energy due to loss in kiln TPH, normalized in the assessment year for Kiln specific power consumption (SPC) is to be calculated as:-Notional thermal energy reduction due to loss in kiln TPH w.r.t. kiln SPC [Million kcal] = [Kiln SPC in AY (kwh/ Ton)- Kiln SPC in BY(kwh/ Ton)] x Clinker Production of Kiln in AY (Tonnes) X Weighted Heat Rate (kcal/ kwh)/ 10^6Where,-[KilnSPC in AY- Kiln SPC in BY]= 0.0943 x (TPH BY - TPH AY)AY = Assessment yearBY = Baseline YearTPH= Tonnes per hourSPC= Specific Power Consumption in kwh/TonThe above formulae stand for individual kiln. However, the notional thermal energy for Normalization on Kiln Rate and Kiln SPC will be calculated for all the installed kiln of plant and added to get the Net notional thermal energy reduction figure.(b)Kiln Start/Stop due to external factor(i)Thermal energy due to additional Cold Start in assessment year of Kiln w.r.t. the baseline year, normalized in the assessment year for Kiln thermal energy consumption is to be calculated as:-Notional Energy to be subtracted w.r.t. additional Kiln Cold startup for Thermal Energy Consumption [Million kcal] = (0.1829 x Kiln TPH in AY + 197.41) x [Nos of Cold Startup in AY (Nos) - Nos of Cold Startup in BY (Nos)]Where,-AY = Assessment yearBY = Baseline YearTPH= Tonnes per hour(ii)Normalization of Kiln Cold Start due to external factor for Electrical energy consumption Electrical energy due to additional Cold Start in assessment year of Kiln w.r.t. the baseline year, normalized in the assessment year for Kiln electrical energy consumption is to be calculated as:-Notional Energy to be subtracted w.r.t. additional Kiln Cold startup for Electrical Energy Consumption [Million kcal] = [Electrical Energy Consumption for Cold start in AY (Lakh kwh)- Electrical Energy Consumption for Cold start in BY (Lakh kwh)] x Weighted Heat Rate (kcal/kwh)/10Where,-AY = Assessment yearBY = Baseline Year(iii)Normalization of Kiln Hot to Cold Stop due to external factor for Electrical energy consumption Electrical energy due to additional Hot to Cold Stop in assessment year of Kiln w.r.t. the baseline year, normalized in the assessment year for Kiln electrical energy consumption is to be calculated as:-Notional Energy to be subtracted w.r.t. additional Kiln Cold to Cold Stop for Electrical Energy Consumption [Million kcal] = [Electrical Energy Consumption for Cold stop in AY (Lakh kwh)- Electrical Energy Consumption for Cold stop in BY (Lakh kwh)] x Weighted Heat Rate (kcal/kwh)/10Where,-AY = Assessment yearBY = Baseline YearThe above formulae stand for individual kiln. However, the notional thermal energy for Normalization on Kiln Start/Stop will be calculated for all the installed kiln of plant and added to get the Net notional thermal energy reduction figure.3.2Product Mix and Intermediary Product(a)Normalization Condition(i)Baseline Major Product shall be considered as major product of Assessment year.(ii)The difference of Energy between Actual Cement production Vs Equivalent Cement production from Baseline year will be added in total energy in the assessment year after negating Clinker Export(iii)Notional Energy for Clinker produced due to Additive Change or Change in Clinker Factor will be deducted from total energy(iv)Baseline Clinker Factor shall be considered as Clinker Factor of Assessment year for making equivalent Cement i.e. the baseline clinker factor is to be divided after getting the actual cement (Cement produced will be multiplied by assessment year clinker factor) for making equivalent cement produced(v)If the OPC Clinker factor =0 in the baseline year, then the OPC Clinker factor of assessment year will be used in the baseline year otherwise, baseline year OPC Clinker Factor exist. The vice-versa is applicable in the assessment year(vi)If the PPC/PSC/Others production in the baseline year or assessment year=0, then PPC/PSC/Others clinker factor will become zero otherwise the existing Clinker factor of respective type of cement persist.(b)Grinding Energy Normalization. - The difference of grinding Energy between Actual Production Vs Equivalent Cement Production of Baseline and Assessment year will be subtracted in total energy in the assessment year considering Clinker Export also as per following equationNotional Energy for Grinding (Million kcal) = {[(ECPBY - RCPBY -ECPExCBY) x CSPCBY x WHRBY] - [(ECPAY - RCPAY - CPExCAY) x CSPCAY x WHRAY]}/ 10Where,-ECPAY = Equivalent Major Cement production in assessment year in TonnesRCPAY = Reported cement production in assessment year in TonnesCSPCAY = Electrical SEC of cement grinding (kWh/Ton of cement) for assessment yearWHRAY = Weighted average CPP Heat/Grid Heat Rate (kcal/kWh) in the assessment yearECPBY = Equivalent Major Cement production in baseline year in TonnesRCPBY = Reported cement production in baseline year in TonnesCSPCBY = Electrical SEC of cement grinding (kWh/Tone of cement) for baseline yearWHRBY = Weighted average CPP/Grid Heat Rate (kcal/kWh) for baseline yearECPExCAY = Equivalent major Cement production from Exported Clinker in assessment year in TonnesECPExCBY = Equivalent major Cement production from Exported Clinker in baseline year in Tonnes(c)Product Mix Additives. - The following formulae will be applied for calculating the Notional Energy for Clinker Produced due to change in Additives/ Clinker Factor. The notional energy corrections calculated will be subtracted from the total energy in the assessment yearNotional Thermal Energy for Clinker Produced due to change in

Additives/Clinker Factor [Million kcal]= ClPcf x [KTHRAY x 1000 + KSPCAY x WHRAY +]/ 10ClPcf = Clinker produced due to change in Additives / Clinker Factor (Lakh Ton)KSPCAY = Kiln Specific Power Consumption (Electrical SEC up to Clinkerisation) (kwh/ton of Clinker) in the assessment yearWHRAY = Weighted average CPP/Grid/DG Heat Rate (kcal/kWh) in the assessment yearKTHRAY = Thermal SEC of Clinker in the assessment year (kcal/kg of clinker)Where,-ClPcf = ClPcf1 + ClPcf2i. ClPcf1: Clinker produced due to change in Additives/ Clinker Factor (Lakh Ton) for PPC = PPCPrAY x {(OPCCFAY - PPCCFAY)-(OPCCFBY - PPCCFBY)}Where,-PPCPrAY = PPC Production in the assessment year (lakh Ton)OPCCFAY = OPC Clinker factor in the assessment yearPPCCFAY = PPC Clinker Factor in the assessment yearOPCCFBY = OPC Clinker factor in the baseline yearPPCCFBY = PPC Clinker Factor in the baseline yearii. ClPcf2: Clinker produced due to change in Additives/Clinker Factor (Lakh Ton) for PSC/Others = PSCOPrAY x{(OPCCFAY - PSCOCFAY)-(OPCCFBY - PSCOCFBY)}Where,-PSCOPrAY = PSC/Others Production in the assessment year (lakh Ton)OPCCFAY = OPC Clinker factor in the assessment yearPSCOCFAY = PSC/Others Clinker Factor in the assessment yearOPCCFBY = OPC Clinker factor in the baseline yearPSCOCFBY = PSC/Others Clinker Factor in the baseline year3.3Fuel Mix (Pet Coke Utilization in Kiln). - Normalization factor for %age PETCOKE usage in cement kilns is to compensate for the change in heat rate and Electrical SEC (specific power consumption) due to variation in usage of Petcoke in the kiln from the baseline. Kiln Heat Rate & Electrical SEC Normalization for higher or lower % of Pet-Coke Consumption will take place in Assessment year w.r.t. Baseline Year.The Normalization will be used for Kiln heat rate and kiln Specific Power Consumption (SPC) is calculated as per following equation Notional Thermal Energy to be deducted in the assessment year due to % use of Petcoke consumption in the kiln [Million kcal] = (N - KHRAY - KHRBY) x Total Clinker Production in Lakh Tonnes x 100 + (NKSPCAY - KSPCBY)) x Total Clinker Production in Lakh Tonnes x WHRAY/ 10i. Petcoke Utilization in Kiln: Normalization of Thermal SEC (Kiln Heat Rate)normalized Kiln Heat rate with Petcoke consumption in assessment year [kcal/kg of clinker]N - KHRAY = KHRBY + 0.0954 x (% PC ConsAY - % PC ConsBY)Where,-N-KHRAY = normalized Kiln Heat rate with effect of Petcoke consumption in assessment year in kcal/kg of clinkerKHRBY = Total Thermal Energy consumed in kiln/Clinker Production in kg, kcal/kg of clinker in the baseline yearPC ConsAY = Petro-coke Consumption in assessment year in %PC ConsBY = Petro-coke Consumption in baseline year in %AY = Assessment yearBY = Baseline YearTPH = Tonnes per hourWHRAY = Weighted Heat Rate in assessment yearii. Petcoke Utilization in Kiln: Normalization of Electrical SEC (Specific Power Consumption)normalized Electrical SEC up to clinkering in assessment year [kwh/ton of clinker]N - KSPCAY = KSPCBY + 0.022 x (% PC ConsAY - % PC ConsBY)Where,-N-KSPCAY = Normalized Kiln Specific Power Consumption with effect of Petcoke consumption up to clinkerisation in the assessment year in kwh/ton of clinkerKSPCBY = Kiln Specific Power Consumption up to clinkerisation in the baseline year in kwh/ton of clinkerPC ConsAY = Petro-coke Consumption in assessment year in %PC ConsBY = Petro-coke Consumption in baseline year in %AY = Assessment yearBY = Baseline Year3.4Power Mix(a)Power Mix Normalization for Power Sources. - The baseline year power mix ratio will be maintained for Assessment year for Power Source and import. The Normalized weighted heat rate calculated from the baseline year Power mix ratio will be compared with the assessment year Weighted Heat Rate and the Notional energy will be deducted from the Total energy assessedThe Thermal Energy difference of electricity consumed in plant in baseline year and electricity consumed in plant during assessment year shall be subtracted from the total energy, considering the same % of power sources consumed in the baseline year.However, any efficiency increase (i.e. reduction in Heat Rate) in Assessment year in any of the power sources will give benefit to the plantNotional Energy to be subtracted from the total Energy of Plant in the assessment year for Power Mix Normalization is calculated asi. Energy Correction for all power source in the assessment year [Million kcal] = TECPSAY x (A - WHRAY - N - WHRAY)Where,-TECPSAY: Total energy consumption from all the Power sources (Grid, CPP, DG etc) forAY in Million kwhA-WHRAY: Actual Weighted Heat Rate for the Assessment Year in kcal/kwhN-WHRAY: Normalized Weighted Heat Rate for the Assessment Year in kcal/kwhii. Normalized Weighted Heat Rate for Assessment year (kcal/kwh): N - WHRAY = A x (D/G)+B x (E/G)+C x (F/G)Where,-A: Grid Heat Rate for Assessment year (AY) in kcal/kwhB: CPP Heat Rate for AY in kcal/kwhC: DG Heat Rate for AY in kcal/kwhD: Grid Energy consumption for Base Line Year (BY) in Million kwhE: CPP Energy consumption for BY in Million kwhF: DG Energy consumption for BY in Million kwhG: Energy Consumed from all Power sources (Grid, CPP, DG) for BY in Million kwh(Note: Any addition in the power source will attract the same fraction to be included in the above equation as PSiHRAY x (PSiECBY/ TECBY)PSiHRAY = Power Source (ith) Heat rate for AY in kcal/kwhPSiECBY = Power Source (ith) Energy Consumption for BY in Million kwhTECBY = Total Energy consumption for BY in Million kwhThe Electricity Consumption from WHR is not being considered for Power Mix Normalization)(b)Power Mix Normalization for Power Export. - Net Heat Rate of CPP to be considered for export of Power from CPP instead of 2717 kCal/kWh. Actual CPP heat rate would be considered for the net increase in the export of power from the baseline. The exported Energy will be normalized in the assessment year as per following calculation.Notional energy for Power export to be subtracted in the assessment year [Million kcal] = (EXPAY - EXPBY)*[{(GHRAY/ (1-APCAY/ 100)} - 2717)]/ 10Where,-GHRAY: CPP Gross Heat Rate for AY in kcal/kwhEXPAY: Exported Electrical Energy in AY in Lakh kWhEXPBY: Exported Electrical Energy in BY in Lakh kWhAPCBY: Auxiliary Power Consumption for AY in percent3.5Fuel Quality in Captive Power Plant. - The Boiler Efficiency will be calculated for the baseline as well as assessment year with the help of Coal analysis constituents like GCV, %Ash, %Moisture, %H and Boiler Efficiency Equation provided to calculate the Boiler efficiency.Hence, by keeping the Turbine heat rate constant for both the years, the CPP heat hate will be calculated for the respective year. The Thermal Energy for the difference in heat rate of CPP will be deducted from the total energy consumption of the plant(i)Notional Thermal Energy to be deducted in the assessment year [Million kcal] = [CPP Heat Rate in AY (kcal/kwh)-Actual CPP Heat Rate in BY (kcal/kwh)] x CPP Generation in AY (Lakh kwh)/10(ii)CPP Heat Rate in AY= CPP Heat Rate in BY x (Boiler Efficiency in BY/Boiler Efficiency in AY)(iii)Boiler Efficiency in BY= 92.5-[{50xA+630 (M+9H) } /GCV] (Values are for baseline Year)(iv)Boiler Efficiency in AY= 92.5-[{50xA+630 (M+9H) } /GCV] (Values are for assessment Year)Where,-A: Ash in %M = Moisture in %H = Hydrogen in %GCV: Coal Gross Calorific Value in kcal/kwhAY = Assessment yearBY = Baseline YearCPP = Captive Power PlantTHR = Turbine Heat Rate3.6Low PLF compensation in CPP. - Due to decreased loading, the Plant load Factor (PLF) will be worsened and affects the unit heat rate. The comparison between baseline year and assessment year will be carried out through characteristics curve of Load Vs Heat rate for correction factor.Normalization is required to compensate for the change in heat rate of CPP due to variation in PLF from the baseline.The Thermal Energy reduction due to low PLF in CPP is calculated as below:-(i)Notional Thermal Energy deducted in the assessment year from the total energy consumption of the plant [Million kcal] = Gross Generation in Lakh kwh x [Actual Gross Heat Rate in AY (kcal/kwh)-Normalized Gross Heat Rate in AY (kcal/kwh)](ii)Normalized Gross

Heat Rate in AY [kcal/kwh]= Actual Gross Heat Rate in AY (kcal/kwh) x (1- % Decrease on % increase in Heat Rate from baseline in AY due to external factor)/100](iii)% Decrease on % increase in Heat Rate from baseline in AY due to external factor [%] = [% Increase in Heat Rate in AY - % Increase in Heat Rate in BY] x % Decrease in PLF in Assessment Year due to external factor in %(iv)% Increase in Heat Rate at PLF of Baseline Year = =0.0016 x (%Loading BY)^2- 0.3815 x %Loading BY +21.959(v)% Increase in the Heat Rate at PLF of Assessment Year = 0.0016 x (%Loading AY) ^2-0.3815 x %Loading AY + 21.959Where,-AY: Assessment YearBY = Baseline Year%Loading EXPBY = Percentage Loading (PLF) in Baseline Year%Loading AY = Percentage Loading (PLF) in Assessment Year3.7Other Normalizations3.7.1. Environmental Concern. - Additional Environmental Equipment requirement due to major change in government policy on EnvironmentThe Normalization takes place in the assessment year for additional Equipment's Energy Consumption only if there is major change in government policy on Environment Standard. The Energy will be normalized for additional Energy consumption details from Energy meters. This is to be excluded from the input energy as calculated belowNotional Thermal Energy to be deducted in the assessment year due to Environmental Concern [Million kcal] = Additional Electrical Energy Consumed (Lakh kwh) x Weighted Heat Rate (kcal/kwh)/10 + Additional Thermal Energy Consumed (Million kcal)3.7.2. Alternate Fuel Unavailability w.r.t Baseline Year. - The normalization for Unavailability for Biomass or Alternate Fuel is applied in the baseline year. The energy contained by the fossil fuel replacement will be deducted in the assessment yearNotional Thermal Energy to be deducted in the assessment year due to Biomass/ Alternate Fuel Unavailability [Million kcal] = FFBAY GCVBBY/ 1000 + FFSAAY x GCVSABY/ 1000 + FFLAAY x GCVLABY/ 1000Where,-FFBAY = Biomass replacement with Fossil fuel due to un-availability used in the process in Assessment Year (Tonnes)GCVBBY: Gross Calorific Value of Biomass in Baseline Year (kcal/kg)FFSAAY = Solid Alternate Fuel replacement with Fossil fuel due to un-availability used in the process in Assessment Year (Tonnes)GCVSABY: Gross Calorific Value of Solid Alternate Fuel in Baseline Year (kcal/kg)FFLAAY = Liquid Alternate Fuel replacement with Fossil fuel due to un-availability used in the process in Assessment Year (Tonnes)GCVLABY: Gross Calorific Value of Biomass in Baseline Year (kcal/kg)3.7.3. Construction Phase or Project Activities. - The energy consumed during construction phase or project activities are non-productive energy and hence will be subtracted in the assessment year. The energy consumed by the equipment till commissioning will also be deducted in the assessment yearNotional Thermal Energy to be deducted in the assessment year due to Construction Phase or Project Activities [Million kcal]= Electrical Energy Consumed due to commissioning of Equipment (Lakh kwh) x Weighted Heat Rate (kcal/kwh)/10+ Thermal Energy Consumed due to commissioning of Equipment (Million kcal)3.7.4. Addition of New Line/Unit (In Process and Power Generation) In case a DC commissions a new line/production unit before or during the assessment/target year, the production and energy consumption of new unit will be considered in the total plant energy consumption and production volumes once the Capacity Utilization of that line has touched / increased over 70percent. However, the energy consumption and production volume will not be included till it attains 70 percent.of Capacity Utilization. Energy consumed and production made (if any) during any project activity during the assessment year, will be subtracted from the total energy and production in the Assessment year. Similarly, the same methodology is applied on a new unit installation for power generation (CPP) within the plant boundary.The Energy reduction will take place in the assessment year for addition of new line/unit Normalization as per following calculation(i)Thermal Energy Consumed due to commissioning of

New process Line/Unit till it attains 70 per cent. of Capacity Utilization to be subtracted in assessment year (Million kcal) = (Electrical Energy Consumed due to commissioning of New process Line/Unit till it attains 70 percent. of Capacity Utilization (Lakh kWh) x Weighted Average Heat rate in AY (kcal/kwh)/10) + Thermal Energy Consumed due to commissioning of New Process Line/Unit till it attains 70 percent. of Capacity Utilization (Million kcal) The Production during commissioning of New Process Line/Unit is to be subtracted from the total production (Clinker) of plant and added in the import of intermediary product (Clinker)(ii)Thermal Energy Consumed from external source due to commissioning of New Line/Unit till it attains 70percent. of Capacity Utilization in Power generation to be subtracted in the assessment year (Million kcal) = (Electrical Energy Consumed from external source due to commissioning of New Line/Unit till it attains 70 percent. of Capacity Utilization in Power generation (Lakh kWh) x Weighted Average Heat rate in AY (kcal/kwh)/10) + Thermal Energy Consumed due to commissioning of New Line/Unit till it attains 70 percent. of Capacity Utilization in Power generation (Million kcal)(iii)Thermal Energy to be added in the assessment year for Power generation of a line /unit till it attains 70percent.of Capacity Utilization (Million kcal)= Net Electricity Generation till new Line/Unit attains 70 percent. Capacity Utilization (Lakh kWh) x Weighted Heat Rate (kcal/kwh)/10Where,-AY: Assessment Year3.7.5. Unforeseen Circumstances. - The Normalization is required for Energy system of a plant, if the situation influences the Energy Consumption, which cannot be controlled by Plant Management and is termed as Unforeseen Circumstances. The Energy consumed due to unforeseen circumstances to be deducted in the assessment year as under:Thermal Energy consumed due to unforeseen (Million kcal) = (Electrical Energy to be Normalized in AY x Weighted Average Heat rate in AY (kcal/kWh)/10) + Thermal Energy to be Normalized (Million kcal)3.7.6. Renewable Energy. - (a) The quantity of exported power (partially or fully) on which Renewable Energy Certificates have been earned by Designated Consumer in the assessment year under REC mechanism shall be treated as Exported power and normalization will apply. However, the normalized power export or deemed injection will not qualify for issue of Energy Saving Certificates under PAT Scheme.(b)The quantity of exported power (partially or fully) from Renewable energy which has been sold at a preferential tariff by the Designated consumer in the assessment year under REC mechanism shall be treated as Exported power. However, the normalized power export will not qualify for issue of Energy Saving Certificates under PAT Scheme.(i)Target Saving to be achieved (PAT obligation) (Million kcal) = Equivalent Major Product Output as per PAT scheme Notification (Tonnes) in BY x Target Saving to be achieved (PAT obligation) (TOE/Te) x 10(ii)Target Saving achieved in assessment year (Million kcal)= [Gate to Gate Specific Energy Consumption in BY (TOE/Te)-Normalized Gate to Gate Specific Energy Consumption in AY (TOE/Te)] x Equivalent Major Product Output in Tonnes as per PAT scheme Notification (Tonnes) x10(iii)Additional Saving achieved (After PAT obligation) (Million kcal) = Target Saving Achieved in AY (Million kcal) - Target Saving to be achieved (PAT obligation) in BY (Million kcal)[A] Thermal Energy Conversion for REC and Preferential Tariff, if Steam Turbine Heat Rate in assessment year = 0Thermal energy conversion for REC and Preferential tariff (Million kcal)= [Quantum of Renewable Energy Certificates (REC) obtained as a Renewal Energy Generator (Solar & Non-Solar)(MWh) + Quantum of Energy sold under preferential tariff (MWh)] x 2717 kcal/kwh /1000[B] Thermal Energy Conversion for REC and Preferential Tariff, if Steam Turbine Heat Rate in assessment year ☐ 0Thermal energy conversion for REC and Preferential tariff (Million kcal) = [Quantum of Renewable Energy Certificates (REC) obtained as a Renewal Energy Generator (Solar &

Non-Solar)(MWh) + Quantum of Energy sold under preferential tariff (MWh)] x Steam Turbine Net Heat Rate in AY (kcal/kwh)/1000a. If, Additional Saving achieved (After PAT obligation) (Million kcal) <= 0,Thermal Energy to be normalized for REC and preferential tariff power sell under REC mechanism (TOE) = 0,b. If, Additional Saving achieved (After PAT obligation) (Million kcal) > 0, and Thermal energy conversion for REC and Preferential tariff (Million kcal) > Additional Saving achieved (After PAT obligation) (Million kcal) thenThermal Energy to be normalized for REC and preferential tariff power sell under REC mechanism (TOE) = Additional Saving achieved (After PAT obligation) (Million kcal)c. If, Additional Saving achieved (After PAT obligation) (Million kcal) >0, and Thermal energy conversion for REC and Preferential tariff (Million kcal) < Additional Saving achieved (After PAT obligation) (Million kcal) thenThermal Energy to be normalized for REC and preferential tariff power sell under REC mechanism (TOE) = Thermal energy conversion for REC and Preferential tariff (Million kcal)3.8Gate to Gate Specific Energy Consumption

Gate to Gate Specific Energy Consumption in Baseline year =| Total Energy Consumption (Million kcal)Total equivalent production (Tonnes)

3.9Normalized Gate to Gate Specific Energy Consumption

Normalized Gate to Gate Specific Energy Consumption after REC Compliance in assessment year =| Normalized Total Energy Consumption after REC Compliance (Million kcal)Total equivalent production (Tonnes)

(a)Total Energy Consumption in the assessment year (Million kcal)= Total Thermal Energy Used in Power Generation (Million kcal) + Total Thermal Energy Used in Process (Million kcal) + {(Total Electricity purchased from grid (Lakh kWh) X 860)-Electricity exported (Lakh kWh) X National Heat Rate - 2717 kcal/kWh}/10](b)Normalized Total Energy Consumption in the assessment year (Million kcal) = Total Energy Consumption in the assessment year- Notional Energy Consumption for low capacity Utilization (Million kcal)- Notional Energy Consumption for Product Mix (Million kcal) - Notional Energy Consumption for Petcoke utilization (Million kcal)- Notional Energy Consumption for Power Mix (Million kcal)- Notional Energy Consumption for Coal Quality (Million kcal) - Notional Energy Consumption for Low CPP PLF(Million kcal)- Notional Energy Consumption for Other Normalizations (Environmental Concern + Biomass/ Alternate Fuel Availability + Project Activities + NewLine/ Unit Commissioning+ Unforeseen Circumstances) (Million kcal) + Energy for Power generation of a line/ unit till it attains 70% of Capacity Utilization (Million kcal)(c)Normalized Total Energy Consumption after REC compliance in the assessment year (Million kcal) = Normalized Total Energy Consumption in the assessment year (Million kcal) + Thermal Energy to be normalized for REC and preferential tariff power sell under REC mechanism (Million kcal)(d)Normalized Gate to Gate Specific Energy Consumption after REC Compliance (kcal/kg equivalent of Cement)Normalized Gate to Gate Specific Energy Consumption after REC Compliance in assessment year = (Normalized Total Energy Consumption after REC Compliance (Million kacl))/ (Total Equivalent Production (Lakh Tonnes) x 100)(e)Normalized Gate to Gate Specific Energy Consumption after REC Compliance (toe/Te of Cement) =Normalized Gate to Gate Specific Energy Consumption after REC Compliance (kcal/kg of Cement)/ 10000(f)Baseline Normalization (toe/ tonne) = Gate to Gate Specific Energy Consumption in Baseline year (toe/ tonne) - Notified Specific Energy Consumption in Baseline Year (toe/ tonne)(g)Normalized Gate to Gate Specific Energy Consumption after REC complianceNormalized Gate to Gate Specific Energy Consumption after REC Compliance in assessment year (TOE/ Tonne)

=| Normalized Total Energy Consumption after REC Compliance (Million kcal)Total equivalent production (Tonnes) x 10| - Baseline Normalization (toe/ tonne)

4. Sc Chlor-Alkali

Normalization factors for the following areas have been developed in Chlor-Alkali Sector.

1. Power Mix (Import & Export from/to the grid and self-generation from the captive power plant)

2. Fuel Quality in Captive Power Plant& Combined Heat and Power Generation (Co-Gen)

3. Low Plant Load Factor in CPP

4. Hydrogen Mix (consideration for reducing venting of Hydrogen)

5. Other Normalizations

(i)Environmental Concern(Additional Environmental Equipment requirement due to major change in government policy on Environment)(ii)Biomass/Alternate Fuel Unavailability(iii)Construction Phase or Project Activities(iv)Addition of New Line/Unit (In Process & Power Generation)(v)Unforeseen Circumstances(vi)Renewable Energy

6. Gate to Gate Specific Energy Consumption

7. Normalized Gate to Gate Specific Energy Consumption

4.1Power Mix4.1.1. Power Mix Normalization for Power Sources. - The baseline year power mix ratio will be maintained for Assessment year for Power Source and import. The Normalized weighted heat rate calculated from the baseline year Power mix ratio will be compared with the assessment year Weighted Heat Rate and the Notional energy will be deducted from the Total energy assessed.The Thermal Energy difference of electricity consumed in plant in baseline year and electricity consumed in plant during assessment year shall be subtracted from the total energy, considering the same % of power sources consumed in the baseline year.However, any efficiency increase (i.e. reduction in Heat Rate) in Assessment year in any of the power sources will give benefit to the plantNotional Energy to be subtracted from the total Energy of Plant in the assessment year is calculated as Energy Correction for all power source in the assessment year [Million kcal]= TECPSAY x (A-WHRAY - N-WHRAY)Where,-TECPSAY: Total energy consumption from all the Power sources (Grid, CPP, DG etc) for AY in Million kwhA-WHRAY: Actual Weighted Heat Rate for the Assessment Year in kcal/kwhN-WHRAY: Normalized Weighted Heat Rate for the Assessment Year in kcal/kwhi. Normalized Weighted Heat Rate for Assessment year (kcal/kwh):N-WHRAY = A x (D/G)+B x (E/G)+C x (F/G)Where,-A: Grid Heat Rate for Assessment year (AY) in kcal/kwhB:

CPP Heat Rate for AY in kcal/kwhC: DG Heat Rate for AY in kcal/kwhD: Grid Energy consumption for Base Line Year (BY) in Million kWhE: CPP Energy consumption for BY in Million kWhF: DG Energy consumption for BY in Million kWhG: Energy Consumed from all Power sources (Grid, CPP, DG) for BY in Million kwh(Note: Any addition in the power source will attract the same fraction to be included in the above equation as PSiHRAY x (PSiECBY/TECBY)PSiHRAY = Power Source (ith) Heat rate for AY in kcal/ kWhPSiECBY = Power Source (ith) Energy Consumption for BY in Million kWhTECBY = Total Energy consumption for BY in Million kWhThe Electricity Consumption from WHR is not being considered for Power Mix Normalization)4.1.2. Power Mix Normalization for Power Export. - Net Generation Heat of captive Power Sources of Plant to be considered for export of Power from Captive Power Sources instead of 2717 kcal/kWh. Actual Generation Net heat rate would be considered for the net increase in the export of power from the baseline. The exported Energy will be normalized in the assessment year as per following calculationNotional energy for Power export to be subtracted in the assessment year [Million kcal] = (EXPAY -EXPBY)*[{(GnNHRAY) - 2717}]/10Where,-GnNHRAY: Generation Net Heat Rate for AY in kcal/kwhEXPAY: Exported Electrical Energy in AY in Lakh kwhEXPBY: Exported Electrical Energy in BY in Lakh kwh4.2Fuel Quality for CPP and Co-gen(a)Coal Quality for CPP. - The Boiler Efficiency will be calculated for the baseline as well as assessment year with the help of Coal analysis constituents like GCV, %Ash, %Moisture, %H and Boiler Efficiency Equation provided to calculate the Boiler efficiency.Hence, by keeping the Turbine heat rate constant for both the years, the CPP heat hate will be calculated for the respective year. The Thermal Energy for the difference in heat rate of CPP will be deducted from the total energy consumption of the plant(i)Notional Thermal Energy to be deducted in the assessment year [Million kcal] = [CPP Heat Rate in AY (kcal/kwh)-Actual CPP Heat Rate in BY (kcal/kwh)] x CPP Generation in AY (Lakh kwh)/10(ii)CPP Heat Rate in AY= CPP Heat Rate in BY x (Boiler Efficiency in BY/Boiler Efficiency in AY)(iii)Boiler Efficiency in BY= 92.5-[{50xA+630 (M+9H) } /GCV] (Values are for baseline Year)(iv)Boiler Efficiency in AY= 92.5-[{50xA+630 (M+9H) } /GCV] (Values are for assessment Year)Where,-A = Ash in %M = Moisture in %H = Hydrogen in %GCV = Coal Gross Calorific Value in kcal/kwhAY = Assessment yearBY = Baseline YearCPP = Captive Power PlantTHR = Turbine Heat Rate(b)Coal Quality for Cogen. - (i) Boiler efficiency in baseline year = 92.5-[{50xA+630 (M+9H) } /GCV](ii)Boiler efficiency in assessment year = 92.5-[{50xA+630 (M+9H)} /GCV](iii)Weighted Percentage of Coal Energy Used in steam Generation (Process Boiler) in BY (Factor) = □5n=1{(Operating Capacity of Boilers used for Steam generation in TPH x Percentage of Coal Energy Used in steam Generation in the boilers for Steam generation in %) / □5n=1 Operating Capacity of Boilers used for Steam generation (TPH)}(iv)Weighted Percentage of Coal Energy Used in steam Generation (Process Boiler) in AY (Factor) = □5n=1 {(Operating Capacity of Boilers used for Steam generation in TPH x Percentage of Coal Energy Used in steam Generation in the boilers for Steam generation in %) / □5n=1 Operating Capacity of Boilers used for Steam generation (TPH)}(v)Weighted Percentage of Coal Energy Used in steam Generation (Co-Gen Boiler) in BY = □10n=6 {(Operating Capacity of Boilers used for Steam generation in TPH x Percentage of Coal Energy Used in steam Generation in the boilers for Steam generation in %) / □10n=6 Operating Capacity of Boilers used for Steam generation (TPH)}(vi)Weighted Percentage of Coal Energy Used in steam Generation (Co-Gen Boiler) in AY = □10n=6 {(Operating Capacity of Boilers used for Steam generation in TPH x Percentage of Coal Energy Used in steam Generation in the boilers for Steam generation in %) / □10n=6 Operating Capacity of Boilers used for Steam generation

(TPH)}(vii)Weighted Average Specific Steam Consumption in BY & AY (kCal/kg of Steam)= ∑5n=1(Total Steam Generation at Process Boiler (Tonnes) x Specific Energy Consumption for Steam Generation in Process Boilers (kcal/kg of steam) + ∑10n=6 (Total Steam Generation at Co-Gen Boiler(Tonnes) x Specific Energy Consumption for Steam Generation in Co-Gen Boiler (kcal/kg of steam)} / ∑10n=1 Total Steam generation at all process & Cogen boilers(viii)Normalized Specific Energy Consumption for Steam Generation (kCal/kg of Steam) = Weighted Average Specific Steam Consumption in BY x (Boiler efficiency in BY (%)/Boiler Efficiency in AY (%))(ix)Difference in Specific Steam from BY to AY (kCal/kg of Steam) = Normalized Specific Energy Consumption for Steam Generation in AY (kcal/kg of steam)-Weighted Average Specific Steam Consumption in BY (kcal/kg of steam)(x)Energy to be subtracted w.r.t. Fuel Quality in Co-Gen (Million kCal) = Difference in Specific Steam from BY to AY (kcal/kg of steam)x {(Total Steam Generation of all Process Boilers in AY (Tonnes) x Weighted Percentage of Coal Energy Used in steam Generation (Process Boiler) in AY)+(Total Steam Generation at Co-Gen Boiler in AY (Tonnes) x Weighted Percentage of Coal Energy Used in steam Generation (Co-Gen Boiler) in AY)}/1000Where,-A = Ash in %M = Moisture in %H = Hydrogen in %GCV = Coal Gross Calorific Value in kcal/kwhAY = Assessment yearBY = Baseline YearCPP = Captive Power PlantTPH = Tonnes Per Hour4.3Hydrogen MixNormalization for Hydrogen mix (consideration of reducing venting of Hydrogen). - Chlor-Alkali industry is having abundant of hydrogen as their by-product in the process of making Casutic Soda Lye and is being used as fuel by many DCs which is a good practice. Normalization factor is developed to reduce wastage of hydrogen which can be used as a fuel in the plant. Here under are the formulae discussed for Hydrogen Normalization:Case-I: This formulae will get trigger once percentage of Hydrogen vented is lesser than the minimum value of percentage of Hydrogen vented in any base year/target year of any PAT cycles.(i)Energy to be subtracted from total Energy Consumption (in toe) = [(% of Hydrogen vented in baseline year of hydrogen venting- % of Hydrogen vented in assessment year) x Stoichiometric Hydrogen x 3050 x 10^5] - [(% of Hydrogen used for production/others in base year) - (% of Hydrogen used for production/others in assessment year) x Stoichiometric Hydrogen x 3050 x 10^5] / 10^7.(ii)% Hydrogen vented in baseline of hydrogen venting = Min % of Hydrogen venting i.e. (Hydrogen vented/ Stoichiometric Hydrogen) in any of base/target year of all PAT cycles.(iii)% Hydrogen vented in assessment year = % of Hydrogen venting i.e. (Hydrogen vented/ Stoichiometric Hydrogen) in the assessment year of respective PAT ycle. Stoichiometric Hydrogen (Lac NM3) = Caustic soda in baseline year (ton) x 280 / 10^5(iv)% Hydrogen used for production/other in baseline year = (hydrogen used production / stoichiometric hydrogen) in base year of respective PAT cycle.(v)% Hydrogen used for production/other in assessment year = (hydrogen used production / stoichiometric hydrogen) in assessment year of respective PAT cycle.Case II: If, percentage (%) of product and other in the assessment period becomes lesser than the % of product & other of the base year then:(i)Energy to be subtracted from total Energy Consumption (in toe) = [(% of Hydrogen vented in baseline year of hydrogen venting- % of Hydrogen vented in assessment year) x Stoichiometric Hydrogen x 3050 x 10^5] / 10^7.(ii)% Hydrogen vented in baseline of hydrogen venting = Min % of Hydrogen venting i.e. (Hydrogen vented/ Stoichiometric Hydrogen) in any of base/target year of all PAT cycles.(iii)% Hydrogen vented in assessment year = % of Hydrogen venting i.e. (Hydrogen vented/ Stoichiometric Hydrogen) in the assessment year of respective PAT ycle.(iv)Stoichiometric Hydrogen (Lac NM3) = Caustic soda in baseline year (ton) x 280 / 10^54.4Low PLF compensation in CPP. - Due to decreased loading, the Plant load Factor (PLF) will be worsened and affects the unit heat rate. The comparison between baseline year and assessment year will be carried out through characteristics curve of Load Vs Heat rate for correction factor.Normalization is required to compensate for the change in heat rate of CPP due to variation in PLF from the baseline.The Thermal Energy reduction due to low PLF in CPP is calculated as below:-(i)Notional Thermal Energy reduction from the total energy consumption of the plant [Million kcal] = Total Generation in Lakh kwh x Actual Gross Heat Rate in AY (kcal/kwh)-Normalized Gross Heat Rate in AY (kcal/kwh)](ii)Normalized Gross Heat Rate in AY [kcal/kwh]= Actual Gross Heat Rate in AY (kcal/kwh) x (1- % increase in Heat Rate from Design Heat Rate in AY due to external factor/100)(iii)% increase in Heat Rate from Design Heat Rate in AY due to external factor = (% increase in Heat Rate in AY - % increase in Heat Rate in BY) x loss in PLF from Assessment Year due to external factor in %/100(iv)% increase in Heat Rate from Design Heat Rate in Baseline Year = =0.0016 x(%Loading BY)^2-0.3815 x %LoadingBY +21.959(v)% increase in the Heat Rate from Design Heat Rate in Assessment Year = =0.0016 x(%LoadingAY)^2-0.3815 x %LoadingAY + 21.959Where,-AY = Assessment YearBY = Baseline Year%LoadingBY = Percentage Loading in Baseline Year%LoadingAY = Percentage Loading in Assessment Year4.5Normalization Others.4.5.1. Environmental Concern. - Additional Environmental Equipment requirement due to major change in government policy on Environment The Normalization takes place in the assessment year for additional Equipment's Energy Consumption only if there is major change in government policy on Environment Standard. The Energy will be normalized for additional Energy consumption details from Energy meters. This is to be excluded from the input energy as calculated belowNotional Thermal Energy to be deducted in the assessment year due to Environmental Concern [Million kcal] = Additional Electrical Energy Consumed (Lakh kWh) x Weighted Heat Rate (kcal/kwh)/10+ Additional Thermal Energy Consumed (Million kcal)4.5.2. Biomass/ Alternate Fuel Unavailability w.r.t Baseline Year. - The Normalization for Unavailability for Biomass or Alternate Fuel is applied in the baseline year. The energy contained by the fossil fuel replacement will be deducted in the assessment yearNotional Thermal Energy to be deducted in the assessment year due to Biomass/Alternate Fuel Unavailability [Million kcal] = FFBAY GCVBBY /1000 + FFSAAY x GCVSABY/1000 + FFBAY x GCVLABY/ 1000Where,-FFBAY= Biomass replacement with Fossil fuel due to un-availability used in the process in Assessment Year (Tonnes)GCVBBY= Gross Calorific Value of Biomass in Baseline Year (kcal/kg)FFSAAY= Solid Alternate Fuel replacement with Fossil fuel due to un-availability used in the process in Assessment Year (Tonnes)GCVSABY= Gross Calorific Value of Solid Alternate Fuel in Baseline Year (kcal/kg)FFBAY= Liquid Alternate Fuel replacement with Fossil fuel due to un-availability used in the process in Assessment Year (Tonnes)GCVLABY= Gross Calorific Value of Biomass in Baseline Year (kcal/kg)4.5.3. Construction Phase or Project Activities. - The energy consumed during construction phase or project activities are non-productive energy and hence will be subtracted in the assessment year. The energy consumed by the equipment till commissioning will also be deducted in the assessment yearNotional Thermal Energy to be deducted in the assessment year due to Construction Phase or Project Activities [Million kcal]= Electrical Energy Consumed due to commissioning of Equipment (Lakh kwh) x Weighted Heat Rate (kcal/kwh)/10+ Thermal Energy Consumed due to commissioning of Equipment (Million kcal)4.5.4. Addition of New Line/Unit (In Process and Power Generation). - In case a DC commissions a new line/production unit before or during the assessment/target year, the production and energy consumption of new unit will be considered in the total plant energy consumption and production volumes once the Capacity Utilization of that line has touched/ increased over 70%. However, the energy consumption and production volume will not be included till it attains 70% of Capacity Utilization. Energy consumed and production made (if any) during any project activity during the assessment year, will be subtracted from the total energy and production in the Assessment year. Similarly, the same methodology is applied on a new unit installation for power generation (CPP) within the plant boundary.(i)Thermal Energy Consumed due to commissioning of New process Line/Unit till it attains 70 per cent. of Capacity Utilization to be subtracted in assessment year (Million kCal) = (Electrical Energy Consumed due to commissioning of New process Line/Unit till it attains 70 per cent. of Capacity Utilization (Lakh kWh) x Weighted Average Heat rate in AY (kcal/kwh)/10) + Thermal Energy Consumed due to commissioning of New Process Line/Unit till it attains 70 per cent of Capacity Utilization (Million kcal)The Production during commissioning of New Process Line/Unit will be subtracted from the total production of plant.(ii)Thermal Energy Consumed from external source due to commissioning of New Line/Unit till it attains 70 per cent of Capacity Utilization in Power generation to be subtracted in the assessment year (Million kcal) = (Electrical Energy Consumed from external source due to commissioning of New Line/Unit till it attains 70 per cent of Capacity Utilization in Power generation (Lakh kWh) x Weighted Average Heat rate in AY (kcal/kwh)/10) + Thermal Energy Consumed due to commissioning of New Line/Unit till it attains 70 per cent of Capacity Utilization in Power generation (Million kcal)(iii)Steam Generation till new Line/Unit attains 70 per cent. Capacity Utilization (CPP/Co-Gen) to be added in the assessment year (Million kCal) = {(Steam Generation till new Line/Unit attains 70 per cent. Capacity Utilization (Tonne) * Steam specific energy consumption (kcal/kg of steam)}/1000(iv)Thermal Energy to be added in the assessment year for Power generation of a line /unit till it attains 70 per cent. of Capacity Utilization (Million kcal)= Net Electricity Generation till new Line/Unit attains 70 per cent. Capacity Utilization (Lakh kWh) x Weighted Heat Rate (kcal/kwh)/10Where,-AY= Assessment Year4.5.5. Unforeseen Circumstances. - The Normalization is required for Energy system of a plant, if the situation influences the Energy Consumption, which cannot be controlled by Plant Management and is termed as Unforeseen Circumstances. The Energy consumed due to unforeseen circumstances to be deducted in the assessment yearThermal Energy consumed due to unforeseen (Million kcal) = (Electrical Energy to be Normalized in AY x Weighted Average Heat rate in AY (kcal/kWh)/10) + Thermal Energy to be Normalized (Million kcal)4.5.6. Renewable Energy. - The quantity of exported power (partially or fully) on which Renewable Energy Certificates have been earned by Designated Consumer in the assessment year under REC mechanism shall be treated as Exported power and Normalization will apply. However, the normalized power export or deemed injection will not qualify for issue of Energy Saving Certificates under PAT Scheme.The quantity of exported power (partially or fully) from Renewable energy which has been sold at a preferential tariff by the Designated consumer in the assessment year under REC mechanism shall be treated as Exported power. However, the normalized power export will not qualify for issue of Energy Saving Certificates under PAT Scheme.(i)Target Saving to be achieved (PAT obligation) (Million kcal) = Equivalent Major Product Output as per PAT scheme Notification (Tonnes) in BY x Target Saving to be achieved (PAT obligation) (TOE/Te) x 10(ii)Target Saving achieved in assessment year (Million kcal)= [Gate to Gate Specific Energy Consumption in BY (TOE/Te)-Normalized Gate to Gate Specific Energy Consumption in AY (TOE/Te)] x Equivalent Major Product Output in tonnes as per PAT scheme Notification (Tonnes) x10(iii)Additional Saving achieved (After PAT obligation) (Million kcal) = Target Saving Achieved in AY (Million kcal) - Target Saving to be achieved (PAT obligation) in BY (Million kcal)(a)Thermal Energy Conversion for REC and Preferential Tariff, if Steam Turbine Heat Rate in assessment year = 0Thermal energy conversion for REC and Preferential tariff (Million kcal)= [Quantum of Renewable Energy Certificates (REC) obtained as a Renewal Energy Generator (Solar & Non- Solar)(MWh) + Quantum of Energy sold under preferential tariff (MWh)] x 2717/1000(b)Thermal Energy Conversion for REC and Preferential Tariff, if Steam Turbine Heat Rate in assessment year ☐0Thermal energy conversion for REC and Preferential tariff (Million kcal)= [Quantum of Renewable Energy Certificates (REC) obtained as a Renewal Energy Generator (Solar & Non- Solar)(MWh) + Quantum of Energy sold under preferential tariff (MWh)] x Steam Turbine Net Heat Rate in AY (kcal/kwh)/1000(c)If, Additional Saving achieved (After PAT obligation) (Million kcal) <= 0,Thermal Energy to be normalized for REC and preferential tariff power sell under REC mechanism (TOE) = 0,(d)If, Additional Saving achieved (After PAT obligation) (Million kcal) >0, and Thermal energy conversion for REC and Preferential tariff (Million kcal) >Additional Saving achieved (After PAT obligation) (Million kcal) thenThermal Energy to be normalized for REC and preferential tariff power sell under REC mechanism (TOE) = Additional Saving achieved (After PAT obligation) (Million kcal)(e)If, Additional Saving achieved (After PAT obligation) (Million kcal) >0, and Thermal energy conversion for REC and Preferential tariff (Million kcal) < Additional Saving achieved (After PAT obligation) (Million kcal) thenThermal Energy to be normalized for REC and preferential tariff power sell under REC mechanism (TOE) =Thermal energy conversion for REC and Preferential tariff (Million kcal)4.6Gate to Gate Specific Energy Consumption. - Gate to Gate Specific Energy Consumption in Baseline YearTECPSAY: Total energy consumption from all the Power sources (Grid, CPP, DG etc) for AY in Million kwhA-WHRAY: Actual Weighted Heat Rate for the Assessment Year in kcal/kwhN-WHRAY: Normalized Weighted Heat Rate for the Assessment Year in kcal/kwhi. Normalized Weighted Heat Rate for Assessment year (kcal/kwh):N-WHRAY = A x (D/G)+B x (E/G)+C x (F/G)Where,-A: Grid Heat Rate for Assessment year (AY) in kcal/kwhB: CPP Heat Rate for AY in kcal/kwhC: DG Heat Rate for AY in kcal/kwhD: Grid Energy consumption for Base Line Year (BY) in Million kWhE: CPP Energy consumption for BY in Million kWhF: DG Energy consumption for BY in Million kWhG: Energy Consumed from all Power sources (Grid, CPP, DG) for BY in Million kwh(Note: Any addition in the power source will attract the same fraction to be included in the above equation as PSiHRAY x (PSiECBY/TECBY)PSiHRAY = Power Source (ith) Heat rate for AY in kcal/ kWhPSiECBY = Power Source (ith) Energy Consumption for BY in Million kWhTECBY = Total Energy consumption for BY in Million kWhThe Electricity Consumption from WHR is not being considered for Power Mix Normalization)4.1.2. Power Mix Normalization for Power Export. - Net Generation Heat of captive Power Sources of Plant to be considered for export of Power from Captive Power Sources instead of 2717 kcal/kWh. Actual Generation Net heat rate would be considered for the net increase in the export of power from the baseline. The exported Energy will be normalized in the assessment year as per following calculationNotional energy for Power export to be subtracted in the assessment year [Million kcal] = (EXPAY -EXPBY)*[{(GnNHRAY) - 2717}]/10Where,-GnNHRAY: Generation Net Heat Rate for AY in kcal/kwhEXPAY: Exported Electrical Energy in AY in Lakh kwhEXPBY: Exported Electrical Energy in BY in Lakh kwh4.2Fuel Quality for CPP and Co-gen(a)Coal Quality for CPP. - The Boiler Efficiency will be calculated for the baseline as well as assessment year with the help of Coal analysis constituents like GCV, %Ash, %Moisture, %H and Boiler Efficiency Equation provided to calculate the Boiler efficiency.Hence, by keeping the Turbine heat rate constant for both the years, the CPP

heat hate will be calculated for the respective year. The Thermal Energy for the difference in heat rate of CPP will be deducted from the total energy consumption of the plant(i)Notional Thermal Energy to be deducted in the assessment year [Million kcal] = [CPP Heat Rate in AY (kcal/kwh)-Actual CPP Heat Rate in BY (kcal/kwh)] x CPP Generation in AY (Lakh kwh)/10(ii)CPP Heat Rate in AY= CPP Heat Rate in BY x (Boiler Efficiency in BY/Boiler Efficiency in AY)(iii)Boiler Efficiency in BY= 92.5-[{50xA+630 (M+9H) } /GCV] (Values are for baseline Year)(iv)Boiler Efficiency in AY= 92.5-[{50xA+630 (M+9H) } /GCV] (Values are for assessment Year)Where,-A= Ash in %M = Moisture in %H = Hydrogen in %GCV = Coal Gross Calorific Value in kcal/kwhAY = Assessment yearBY = Baseline YearCPP = Captive Power PlantTHR = Turbine Heat Rate(b)Coal Quality for Cogen. - (i) Boiler efficiency in baseline year = 92.5-[{50xA+630 (M+9H) } /GCV](ii)Boiler efficiency in assessment year = 92.5-[{50xA+630 (M+9H)} /GCV](iii)Weighted Percentage of Coal Energy Used in steam Generation (Process Boiler) in BY (Factor) = □5n=1{(Operating Capacity of Boilers used for Steam generation in TPH x Percentage of Coal Energy Used in steam Generation in the boilers for Steam generation in %) / □5n=1 Operating Capacity of Boilers used for Steam generation (TPH)}(iv)Weighted Percentage of Coal Energy Used in steam Generation (Process Boiler) in AY (Factor) = □5n=1 {(Operating Capacity of Boilers used for Steam generation in TPH x Percentage of Coal Energy Used in steam Generation in the boilers for Steam generation in %) / □5n=1 Operating Capacity of Boilers used for Steam generation (TPH)}(v)Weighted Percentage of Coal Energy Used in steam Generation (Co-Gen Boiler) in BY = □10n=6 {(Operating Capacity of Boilers used for Steam generation in TPH x Percentage of Coal Energy Used in steam Generation in the boilers for Steam generation in %) / □10n=6 Operating Capacity of Boilers used for Steam generation (TPH)}(vi)Weighted Percentage of Coal Energy Used in steam Generation (Co-Gen Boiler) in AY = □10n=6 {(Operating Capacity of Boilers used for Steam generation in TPH x Percentage of Coal Energy Used in steam Generation in the boilers for Steam generation in %) / □10n=6 Operating Capacity of Boilers used for Steam generation (TPH)}(vii)Weighted Average Specific Steam Consumption in BY & AY (kCal/kg of Steam)= □5n=1(Total Steam Generation at Process Boiler (Tonnes) x Specific Energy Consumption for Steam Generation in Process Boilers (kcal/kg of steam) + □10n=6 (Total Steam Generation at Co-Gen Boiler(Tonnes) x Specific Energy Consumption for Steam Generation in Co-Gen Boiler (kcal/kg of steam)} / □10n=1 Total Steam generation at all process & Cogen boilers(viii)Normalized Specific Energy Consumption for Steam Generation (kCal/kg of Steam) = Weighted Average Specific Steam Consumption in BY x (Boiler efficiency in BY (%)/Boiler Efficiency in AY (%))(ix)Difference in Specific Steam from BY to AY (kCal/kg of Steam) = Normalized Specific Energy Consumption for Steam Generation in AY (kcal/kg of steam)-Weighted Average Specific Steam Consumption in BY (kcal/kg of steam)(x)Energy to be subtracted w.r.t. Fuel Quality in Co-Gen (Million kCal) = Difference in Specific Steam from BY to AY (kcal/kg of steam)x {(Total Steam Generation of all Process Boilers in AY (Tonnes) x Weighted Percentage of Coal Energy Used in steam Generation (Process Boiler) in AY)+(Total Steam Generation at Co-Gen Boiler in AY (Tonnes) x Weighted Percentage of Coal Energy Used in steam Generation (Co-Gen Boiler) in AY)}/1000Where,-A= Ash in %M = Moisture in %H = Hydrogen in %GCV= Coal Gross Calorific Value in kcal/kwhAY = Assessment yearBY = Baseline YearCPP = Captive Power PlantTPH = Tonnes Per Hour4.3Hydrogen MixNormalization for Hydrogen mix (consideration of reducing venting of Hydrogen). -
Chlor-Alkali industry is having abundant of hydrogen as their by-product in the process of making Caustic Soda Lye and is being used as fuel by many DCs which is a good practice. Normalization

factor is developed to reduce wastage of hydrogen which can be used as a fuel in the plant. Here under are the formulae discussed for Hydrogen Normalization:Case-I: This formulae will get trigger once percentage of Hydrogen vented is lesser than the minimum value of percentage of Hydrogen vented in any base year/target year of any PAT cycles.(i)Energy to be subtracted from total Energy Consumption (in toe) = [(% of Hydrogen vented in baseline year of hydrogen venting- % of Hydrogen vented in assessment year) x Stoichiometric Hydrogen x 3050 x 10^5] - [(% of Hydrogen used for production/others in base year) - (% of Hydrogen used for production/others in assessment year) x Stoichiometric Hydrogen x 3050 x 10^5] / 10^7.(ii)% Hydrogen vented in baseline of hydrogen venting = Min % of Hydrogen venting i.e. (Hydrogen vented/ Stoichiometric Hydrogen) in any of base/target year of all PAT cycles.(iii)% Hydrogen vented in assessment year = % of Hydrogen venting i.e. (Hydrogen vented/ Stoichiometric Hydrogen) in the assessment year of respective PAT ycle. Stoichiometric Hydrogen (Lac NM3) = Caustic soda in baseline year (ton) x 280 / 10^5(iv)% Hydrogen used for production/other in baseline year = (hydrogen used production / stoichiometric hydrogen) in base year of respective PAT cycle.(v)% Hydrogen used for production/other in assessment year = (hydrogen used production / stoichiometric hydrogen) in assessment year of respective PAT cycle.Case II: If, percentage (%) of product and other in the assessment period becomes lesser than the % of product & other of the base year then:(i)Energy to be subtracted from total Energy Consumption (in toe) = [(% of Hydrogen vented in baseline year of hydrogen venting- % of Hydrogen vented in assessment year) x Stoichiometric Hydrogen x 3050 x 10^5] / 10^7.(ii)% Hydrogen vented in baseline of hydrogen venting = Min % of Hydrogen venting i.e. (Hydrogen vented/ Stoichiometric Hydrogen) in any of base/target year of all PAT cycles.(iii)% Hydrogen vented in assessment year = % of Hydrogen venting i.e. (Hydrogen vented/ Stoichiometric Hydrogen) in the assessment year of respective PAT ycle.(iv)Stoichiometric Hydrogen (Lac NM3) = Caustic soda in baseline year (ton) x 280 / 10^54.4Low PLF compensation in CPP. - Due to decreased loading, the Plant load Factor (PLF) will be worsened and affects the unit heat rate. The comparison between baseline year and assessment year will be carried out through characteristics curve of Load Vs Heat rate for correction factor.Normalization is required to compensate for the change in heat rate of CPP due to variation in PLF from the baseline.The Thermal Energy reduction due to low PLF in CPP is calculated as below:-(i)Notional Thermal Energy reduction from the total energy consumption of the plant [Million kcal] = Total Generation in Lakh kwh x Actual Gross Heat Rate in AY (kcal/kwh)-Normalized Gross Heat Rate in AY (kcal/kwh)](ii)Normalized Gross Heat Rate in AY [kcal/kwh]= Actual Gross Heat Rate in AY (kcal/kwh) x (1- % increase in Heat Rate from Design Heat Rate in AY due to external factor/100)(iii)% increase in Heat Rate from Design Heat Rate in AY due to external factor = (% increase in Heat Rate in AY - % increase in Heat Rate in BY) x loss in PLF from Assessment Year due to external factor in %/100(iv)% increase in Heat Rate from Design Heat Rate in Baseline Year = =0.0016 x(%Loading BY)^2-0.3815 x %LoadingBY +21.959(v)% increase in the Heat Rate from Design Heat Rate in Assessment Year = =0.0016 x(%LoadingAY)^2-0.3815 x %LoadingAY + 21.959Where,-AY: Assessment YearBY = Baseline Year%LoadingBY = Percentage Loading in Baseline Year%LoadingAY = Percentage Loading in Assessment Year4.5Normalization Others.4.5.1. Environmental Concern. - Additional Environmental Equipment requirement due to major change in government policy on Environment The Normalization takes place in the assessment year for additional Equipment's Energy Consumption only if there is major change in government policy on Environment Standard. The Energy will be normalized for additional Energy consumption details from Energy meters. This is to be excluded from the input energy as calculated belowNotional Thermal Energy to be deducted in the assessment year due to Environmental Concern [Million kcal] = Additional Electrical Energy Consumed (Lakh kWh) x Weighted Heat Rate (kcal/kwh)/10+ Additional Thermal Energy Consumed (Million kcal)4.5.2. Biomass/ Alternate Fuel Unavailability w.r.t Baseline Year. - The Normalization for Unavailability for Biomass or Alternate Fuel is applied in the baseline year. The energy contained by the fossil fuel replacement will be deducted in the assessment yearNotional Thermal Energy to be deducted in the assessment year due to Biomass/Alternate Fuel Unavailability [Million kcal]= FFBAY GCVBBY /1000 + FFSAAY x GCVSABY/1000 + FFBAY x GCVLABY/ 1000Where,-FFBAY= Biomass replacement with Fossil fuel due to un-availability used in the process in Assessment Year (Tonnes)GCVBBY= Gross Calorific Value of Biomass in Baseline Year (kcal/kg)FFSAAY= Solid Alternate Fuel replacement with Fossil fuel due to un-availability used in the process in Assessment Year (Tonnes)GCVSABY= Gross Calorific Value of Solid Alternate Fuel in Baseline Year (kcal/kg)FFBAY= Liquid Alternate Fuel replacement with Fossil fuel due to un-availability used in the process in Assessment Year (Tonnes)GCVLABY= Gross Calorific Value of Biomass in Baseline Year (kcal/kg)4.5.3. Construction Phase or Project Activities. - The energy consumed during construction phase or project activities are non-productive energy and hence will be subtracted in the assessment year. The energy consumed by the equipment till commissioning will also be deducted in the assessment yearNotional Thermal Energy to be deducted in the assessment year due to Construction Phase or Project Activities [Million kcal]= Electrical Energy Consumed due to commissioning of Equipment (Lakh kwh) x Weighted Heat Rate (kcal/kwh)/10+ Thermal Energy Consumed due to commissioning of Equipment (Million kcal)4.5.4. Addition of New Line/Unit (In Process and Power Generation). - In case a DC commissions a new line/production unit before or during the assessment/target year, the production and energy consumption of new unit will be considered in the total plant energy consumption and production volumes once the Capacity Utilization of that line has touched/ increased over 70%. However, the energy consumption and production volume will not be included till it attains 70% of Capacity Utilization. Energy consumed and production made (if any) during any project activity during the assessment year, will be subtracted from the total energy and production in the Assessment year. Similarly, the same methodology is applied on a new unit installation for power generation (CPP) within the plant boundary.(i)Thermal Energy Consumed due to commissioning of New process Line/Unit till it attains 70 per cent. of Capacity Utilization to be subtracted in assessment year (Million kCal) = (Electrical Energy Consumed due to commissioning of New process Line/Unit till it attains 70 per cent. of Capacity Utilization (Lakh kWh) x Weighted Average Heat rate in AY (kcal/kwh)/10) + Thermal Energy Consumed due to commissioning of New Process Line/Unit till it attains 70 per cent of Capacity Utilization (Million kcal)The Production during commissioning of New Process Line/Unit will be subtracted from the total production of plant.(ii)Thermal Energy Consumed from external source due to commissioning of New Line/Unit till it attains 70 per cent of Capacity Utilization in Power generation to be subtracted in the assessment year (Million kcal) = (Electrical Energy Consumed from external source due to commissioning of New Line/Unit till it attains 70 per cent of Capacity Utilization in Power generation (Lakh kWh) x Weighted Average Heat rate in AY (kcal/kwh)/10) + Thermal Energy Consumed due to commissioning of New Line/Unit till it attains 70 per cent of Capacity Utilization in Power generation (Million kcal)(iii)Steam Generation till new Line/Unit attains 70 per cent. Capacity Utilization (CPP/Co-Gen) to be added in the assessment year (Million kCal) =

{(Steam Generation till new Line/Unit attains 70 per cent. Capacity Utilization (Tonne) * Steam specific energy consumption (kcal/kg of steam)}/1000(iv)Thermal Energy to be added in the assessment year for Power generation of a line /unit till it attains 70 per cent. of Capacity Utilization (Million kcal)= Net Electricity Generation till new Line/Unit attains 70 per cent. Capacity Utilization (Lakh kWh) x Weighted Heat Rate (kcal/kwh)/10Where,-AY: Assessment Year4.5.5. Unforeseen Circumstances. - The Normalization is required for Energy system of a plant, if the situation influences the Energy Consumption, which cannot be controlled by Plant Management and is termed as Unforeseen Circumstances. The Energy consumed due to unforeseen circumstances to be deducted in the assessment yearThermal Energy consumed due to unforeseen (Million kcal) = (Electrical Energy to be Normalized in AY x Weighted Average Heat rate in AY (kcal/kWh)/10) + Thermal Energy to be Normalized (Million kcal)4.5.6. Renewable Energy. - The quantity of exported power (partially or fully) on which Renewable Energy Certificates have been earned by Designated Consumer in the assessment year under REC mechanism shall be treated as Exported power and Normalization will apply. However, the normalized power export or deemed injection will not qualify for issue of Energy Saving Certificates under PAT Scheme.The quantity of exported power (partially or fully) from Renewable energy which has been sold at a preferential tariff by the Designated consumer in the assessment year under REC mechanism shall be treated as Exported power. However, the normalized power export will not qualify for issue of Energy Saving Certificates under PAT Scheme.(i)Target Saving to be achieved (PAT obligation) (Million kcal) = Equivalent Major Product Output as per PAT scheme Notification (Tonnes) in BY x Target Saving to be achieved (PAT obligation) (TOE/Te) x 10(ii)Target Saving achieved in assessment year (Million kcal)= [Gate to Gate Specific Energy Consumption in BY (TOE/Te)-Normalized Gate to Gate Specific Energy Consumption in AY (TOE/Te)] x Equivalent Major Product Output in tonnes as per PAT scheme Notification (Tonnes) x10(iii)Additional Saving achieved (After PAT obligation) (Million kcal) = Target Saving Achieved in AY (Million kcal) - Target Saving to be achieved (PAT obligation) in BY (Million kcal)(a)Thermal Energy Conversion for REC and Preferential Tariff, if Steam Turbine Heat Rate in assessment year = 0Thermal energy conversion for REC and Preferential tariff (Million kcal)= [Quantum of Renewable Energy Certificates (REC) obtained as a Renewal Energy Generator (Solar & Non- Solar)(MWh) + Quantum of Energy sold under preferential tariff (MWh)] x 2717/1000(b)Thermal Energy Conversion for REC and Preferential Tariff, if Steam Turbine Heat Rate in assessment year ☐0Thermal energy conversion for REC and Preferential tariff (Million kcal)= [Quantum of Renewable Energy Certificates (REC) obtained as a Renewal Energy Generator (Solar & Non- Solar)(MWh) + Quantum of Energy sold under preferential tariff (MWh)] x Steam Turbine Net Heat Rate in AY (kcal/kwh)/1000(c)If, Additional Saving achieved (After PAT obligation) (Million kcal) <= 0,Thermal Energy to be normalized for REC and preferential tariff power sell under REC mechanism (TOE) = 0,(d)If, Additional Saving achieved (After PAT obligation) (Million kcal) >0, and Thermal energy conversion for REC and Preferential tariff (Million kcal) >Additional Saving achieved (After PAT obligation) (Million kcal) thenThermal Energy to be normalized for REC and preferential tariff power sell under REC mechanism (TOE) = Additional Saving achieved (After PAT obligation) (Million kcal)(e)If, Additional Saving achieved (After PAT obligation) (Million kcal) >0, and Thermal energy conversion for REC and Preferential tariff (Million kcal) < Additional Saving achieved (After PAT obligation) (Million kcal) thenThermal Energy to be normalized for REC and preferential tariff power sell under REC mechanism (TOE) =Thermal energy conversion for REC and Preferential tariff (Million kcal)4.6Gate to Gate Specific Energy Consumption. - Gate to Gate Specific Energy Consumption in Baseline Year

Gate to Gate Specific Energy Consumption in Baseline year (Million kcal) =| Total Energy Consumption (Million kcal)Total equivalent production (Tonnes)

Gate to Gate Specific Energy Consumption in Baseline year (TOE/ T) =| Total Energy Consumption (Million kcal)Total equivalent production (Tonnes) x 10

4.7Normalized Gate to Gate Specific Energy Consumption(i)Normalized Total Energy Consumption in the assessment year (Million kcal) = Total Energy Consumption in the assessment year - Notional Energy Consumption for Power Mix (Million kcal) - Notional Energy Consumption for Coal Quality (Million kcal) - Notional Energy for Hydrogen venting reduction (Million kcal) - Notional Energy Consumption for Low CPP PLF(Million kcal)-Notional Energy Consumption for Other Normalizations (Environmental Concern+ Biomass/Alternate Fuel Availability+ Project Activities+ New Line/Unit Commissioning+ Unforeseen Circumstances) (Million kcal)(ii)Normalized Total Energy Consumption after REC compliance in the assessment year (Million kcal) = Normalized Total Energy Consumption in the assessment year (Million kcal) + Renewable Energy Certificates Assessment under PAT Scheme (Million kcal)(iii)Baseline Normalization (TOE/T) = Gate to Gate Specific Energy Consumption in Baseline year (TOE/T) - Notified Specific Energy Consumption in Baseline Year (TOE/T)Normalized Gate to Gate Specific Energy Consumption after REC Compliance in assessment year = (Normalized Total Energy Consumption after REC Compliance (Million kcal))/ (Total Equivalent Production (Tonnes))Normalized Gate to Gate Specific Energy Consumption after REC Compliance in assessment year (TOE/ Tonne)

=| Normalized Total Energy Consumption after REC Compliance (Million kcal)Total equivalent production (Tonnes) x 10| - Baseline Normalization (TOE/ T)

5. Sd Fertilizer

Normalization factors for the following areas have been developed in Fertilizer Sector.

1. Low Capacity Utilization

2. Cold Startup of the Plant after forced shutdown

3. Use of Naptha

4. Catalyst Reduction

5. Deterioration in quality of coal

6. Additional Provisions

7. Gate to Gate Specific Energy Consumption

8. Normalized Gate to Gate Specific Energy Consumption

5.1Low capacity utilization. - Lower capacity Utilization due to following reasons has been considered for Normalization (i) Shortage of raw material including feed, fuel, water, electricity etc. (ii) high cost of inputs leading to unviable urea production beyond certain capacity (iii) major equipment failure (iv) force majeure i.e. factors like shortage of raw materials (mainly the gas), decline in market demand, change in Govt. policy etc. which are beyond the control of Designated Consumers. These factors may force the plant to be operated at lower capacity, thus causing adverse effect on energy consumption. In such cases, Normalization shall be allowed as follows:(i)Pre-requisites for Normalization(a)Designated Consumers shall furnish detailed and convincing reasons with supporting documents for reduction in capacity Utilization, due to factors, beyond their control.(b)Following criteria shall be adopted:-(I)No compensation shall be allowed if the capacity Utilization of urea plant on annual basis is 95 per cent.or above.(II)Compensation shall be allowed for capacity Utilization between 70-95 per cent.(III)Below 70 per cent., the data shall be discarded.(c)The claim will be based on Technical operating data (TOP), which is being reported to Fertilizer Industry Coordination Committee (FICC) of Department of Fertilizers, Govt. of India.(d)Normalization due to low capacity Utilization will be considered only in one of the plants i.e.either ammonia or urea.(e)Subsequent to the baseline year i.e.2007-10, some DCs have carried out major revamp of their plant for capacity enhancement in line with New Investment Policy for urea notified by the Govt. in 2008. Govt. recognized enhanced capacity, while reimbursing cost of production under the pricing policy. The enhanced capacity shall be considered, while calculating capacity utilization for normalization, subject to confirmation from DoF, Government of India and also verification certificate issued by an Accredited Energy Auditor to Designated Consumer which seeks to declare their enhanced installed capacities, production and energy use. Cost of this audit will be borne by the Designated Consumer. Check tests of such verification could be carried at by BEE, if needed.(f)Some plants are having ammonia plant capacity higher than the quantity of ammonia required for urea production and thus, diverting surplus ammonia for production of other products or direct sales. In such cases, due to Govt. policy and/or market conditions, consumption of surplus ammonia for production of other products becomes unviable and under these circumstances, ammonia plant is operated at lower capacity, thus resulting in higher energy consumption per MT of ammonia, which also get transferred to urea, even if the urea plant is operated at full load; Normalization shall be allowed.(g)In case of ammonia / urea complex having ammonia capacity matching with urea Production, capacity Utilization of urea plant shall be considered.(ii)Calculation of normalization factor(a)Based on the operating data collected from plants at 100%, 85% and 70% plant load, average normalization factor works out to be 0.02 Gcal per MT of urea per percentage reduction in plant load below 95 percent.up to 70 percent.(b)Impact of Lower Capacity utilization shall be worked out as follows:-(i)Maximum permissible value (Gcal/ MT urea) = (95 - % Capacity utilization) * 0.02.(ii)Actual unproductive energy (Gcal/ MT urea) = Annual Energy, Gcal/MT of Urea - Weighted Average of Monthly Energy Consumptions, GCal/MT urea for the months with Capacity Utilization of 100% or more(iii)Lowest of the either (a) or (b) shall be considered for allowing the impact of lower capacity utilization.5.2Cold startup of the plant after forced shut down. - In case of sudden failure of a critical equipment, or external factors (as notified), ammonia plant undergoes a forced shut down. Restarting the plant from cold conditions (Cold start up), consumes unproductive energy and shall be normalized.(i)Pre-requisites for Normalization(a)List of Critical Equipment. - The list of critical equipment failure of which leads to complete shutdown of plant and consequent cold start up, allowed under this Normalization factor is given below :-(i)Primary Reformer(ii)Secondary Reformer(iii)Heat Exchange Reformer(iv)Reformed Gas Boiler(v)Carbon dioxide absorber and stripper(vi)Air, Refrigeration and synthesis compressors(vii)Synthesis converters(viii)Synthesis Gas Waste Heat Boilers(ix)High pressure urea reactor, stripper and carbamate condenser(x)Carbon dioxide compressor(xi)Utility boiler furnace(xii)Gas turbine/HRSG(xiii)Cooling Tower(xiv)Major Fire leading to complete shutdown of plant and cold startup(xv)Turbo generator along with GTG(xvi)Purifier(xvii)CO Shift Converter(b)The Designated Consumer (Designated Consumer) shall furnish a detailed report on failure of such equipment and its impact on energy consumption. The Designated Consumer shall declare with back up documentation, what portion of such unproductive consumption during the month is due to cold shutdown and startup activity.(c)This actual energy loss due to shut down and cold startup in Gcal/MT of Urea shall be compensated, subject to maximum of 0.03 Gcal/MT of Urea.(ii)Calculation of normalization factor(a)Energy loss during the month(s) for which additional cold startup is being claimed shall be calculated as follows:-(i)(Monthly Energy per MT of Ammonia during the month - Weighted Average Monthly Energy Consumption per MT of Ammonia for the months with 100% on-stream days) X Monthly Ammonia production for the month of Startup.(ii)This Energy Loss shall be divided by Annual Urea Production to identify total unproductive loss in a month.(iii)The Designated Consumer shall declare what portion of such unproductive consumption during the month is due to cold shutdown and startup activity.(iv)This actual energy loss due to shut down and cold startup in Gcal/MT of Urea shall be compensated, subject to maximum of 0.03 Gcal/MT of Urea.5.3Use of Naphtha. - 1. Using part naphtha involves additional energy consumption as follows:-(a)For each startup of facilities to use naphtha as feed including pre-reformer(b)For the period of use of naphtha as feed(c)For the period of use of naphtha as fuel

2. Designated Consumers shall furnish detailed and convincing reasons with supporting documents for use of naphtha due to non-availability of gas on account of factors, beyond their control.

(i)Pre-requisites for Normalization(a)As per directives from Department of Fertilizers, Govt. of India, use of naphtha is to be discontinued in phased manner. As such, use of naphtha is not foreseen. However, provision is being made, in case naphtha has to be used due to shortage of natural gas in future, with permission from DoF.(b)In case of use of naphtha, Designated Consumer will furnish details regarding Non-availability of gas, leading to use of naphtha.(ii)Calculation of normalization factorFollowing formula shall be usedEnergy loss (Gcal /MT Urea) = (185*S + 0.625 * Nfeed + 0.443 * Nfuel) / urea production in MTS=1 if naphtha is used as feed in startupS=0 if naphtha is not used as feed in startupNFeed= quantity of naphtha used as feed in MT.NFuel= quantity of naphtha/LSHS/FO used as fuel in MT.5.4Catalyst reduction. - Fresh catalyst is in oxidized form and needs to be reduced with synthesis gas, wherein hydrogen reacts with oxygen and gets converted into water. Whole plant is operated at 60-80% load for around 48 to 120 hours, depending upon type and quantity of catalyst.Thus, replacement/reduction of ammonia synthesis and CO shift catalysts consumes large amount of unproductive energy. Therefore, Normalization due to replacement / reduction of these catalysts will be allowed.(i)Pre-requisites for Normalization. - (a) In case of ammonia synthesis catalyst, in the older plants, oxidized form of the catalyst is used which takes around 4-5 days for reduction, causing corresponding un-productive energy consumption. Presently, "Pre-reduced catalyst" is also available, which is expansive but takes around 48 hours for reduction, thus consuming lesser un-productive energy. This aspect will be taken care,while calculating Normalization factor.(b)This will be considered subject to certification by DCs and furnishing to BEE information as follows:(I)Year in which the catalyst were last changed along with copies of purchase order, last placed with the vendor , time taken in commissioning of catalyst , facts and figures clearly indicating and quantifying rise in the energy consumption of plant due to the replacement of this catalyst.(II)Copies of purchase orders placed by units with the vendors for supply of fresh catalysts.(ii)Calculation of Normalization factor. - Adjustment shall be allowed on the basis of actual plant data, subject to a maximum of 0.04 Gcal/MT of Urea.5.5Deterioration in quality of coal. - The quality of indigenous coal has been deteriorating gradually, thus affecting boiler efficiency adversely. The reduction in boiler efficiency due to poor quality of coal shall be compensated.(i)Pre-Requisites for Normalization. - Weighted average of three years data shall be worked out. In case there is significant variation,then Normalization factor shall be applied based on the actual impact due to the variation.(ii)Calculation of Normalization factor. - (a) Quality of coal affects boiler efficiency, which shall be calculated by following empirical formula:-i. Boiler Efficiency = 92.5 - ((50*A+630(M+9H)) / GCV.Where,-A = Ash content of coal (%)M = Moisture (%)H = Hydrogen (%)GCV = Kcal/Kg(b)Boiler efficiency shall be converted into specific energy consumption, as follows: Additional Energy Consumption, Gcal/MT of Urea = Energy of Coal per MT of Urea in Target Year, Gcal/MT of Urea * (Boiler Efficiency in Base Year - Boiler Efficiency in Target Year)/Boiler Efficiency in Target Year.5.6- [***] [Omitted by Notification G.S.R. 409(E), dated 26.4.2018 (w.e.f. 30.3.2017).]5.7Gate to Gate Specific Energy Consumption. - Gate to Gate Specific Energy Consumption in Baseline Year

Gate to Gate Specific Energy Consumption in Baseline year (Gcal/ Tonne) =| Total Energy Consumption (Million kcal)Total equivalent production (Tonnes)

Gate to Gate Specific Energy Consumption in Baseline year (TOE/ T) =| Total Energy Consumption (Gcal)Total equivalent production (Tonnes) x 10

5.8Normalized Gate to Gate Specific Energy Consumption. - i. Normalized Total Energy Consumption in the assessment year (Gcal) = Total Energy Consumption in the assessment year (Gcal) - Notional Energy for Normalization (Gcal)ii. Baseline Normalization (TOE/T) = Gate to Gate Specific Energy Consumption in Baseline year (TOE/T) - Notified Specific Energy Consumption in Baseline Year (TOE/T)

Gate to Gate Specific Energy Consumption in Assessment year (TOE/ T) =| Total Energy Consumption (Gcal)Total equivalent production (Tonnes) x 10| - Baseline Normalization (TOE/ T)

6. Se1: Iron and Steel (Integrated Steel Plant)

Normalization factors for the following areas have been developed in ISP Sub Sector of Steel,

1. Raw Material Quality

1.1Coke Ash for Blast and Corex Furnaces1.2Alumina in sinter/pellet1.3Alumina in Blast Furnace/Corex burden

2. Coke Mix

3. Power Mix (Imported & Exported from/ to the grid and self-generation from the captive power plant)

4. Process Route Change

5. Product Mix

6. Start/Stop

7. Normalization Others

7.1Environmental Concern (Additional Environmental Equipment requirement due to major change in government policy on Environment)7.2Biomass/Alternate Fuel Unavailability7.3Construction Phase or Project Activities7.4Addition of New Line/Unit (In Process & Power Generation)7.5Unforeseen Circumstances7.6Renewable Energy

8. Gate to Gate Specific Energy Consumption

1. Raw Material Quality.

1.1Coke and Coke Ash for Blast and Corex Furnaces. - When high ash coals are used, energy losses increase as more moisture evaporated, and extra heat losses occur in the form of hot ash in the discharged coke as well as hot slag discharged in the Blast and Corex Furnaces. Furthermore, overall energy losses by radiation from the batteries will increase as more batteries are needed to compensate for the lower carbon yield. These radiation losses will be accompanied by further, waste gas heat losses. Energy consumption changes due to change in coal and coke ash % in Blast and Corex Furnaces, correspondingly changes the Plant Energy performance and hence require Normalization as per calculation below:Normalization Equation for ash component of coal & coke charged / injected in Blast Furnace & Corex. The SEC to be subtracted in the assessment year as per following equationN-SECCAAY = { 0.00149 x (AshCKAY - AshCKBY) x COKEHBAY x PRBFAY } + { 0.00145 x (AshCLAY - AshCLBY) x COALHBAY x PRBFAY } + { 0.0023 x (AshCLAY - AshCLBY) x COALHCAY x PRCXAY} + { 0.00236 x (AshCKAY - AshCKBY) x COKEHCAY x PRCXAY } + { 0.0142 x (AshCKAY - AshCKBY) x COKERBAY x SECSPPAY x PRBFAY } + { 0.0148 x (AshCLAY - AshCLBY) x COALRBAY x SECSPPAY x PRAY } + { 0.00671 x (AshCLAY - AshCLBY) x COALRCAY x SECSPPAY x PRCXAY } + { 0.00645 x (AshCKAY - AshCKBY) x COKERCAY x

SECSPPAY x PRCXAY } + [{ ([1 + { 0.0161 x (AshCKAY - AshCKBY) }] x [1 - { 0.00481 x (AshCKAY - AshCKBY) }]) - 1 } x SECCOAY x (PRCBAY + PRCCAY)] + [{ 0.0161 x (AshCKAY - AshCKBY) } x SECPC x (CRPBAY + CRPCAY)]N-SECCAAY = Coal & Coke Ash Normalized component of Specific Energy Consumption in Assessment Year for Ash Normalization in Gcal/tcsAshCKAY = Weighted Average of Ash in Coke charged to BF & Corex in Assessment Year in %(Weight/Weight)AshCKBY = Weighted Average of Ash in Coke charged to BF & Corex in Baseline Year in %(Weight/Weight)AshCLAY = Weighted Average Ash in Coal charged in BF & Corex in Assessment Year in %(Weight/Weight)AshCLBY = Weighted Average of Ash in Coal charged in BF & Corex in Baseline Year in %(Weight/Weight)COKEHBAY = Specific Heat input though coke in BF in Assessment Year in Gcal/tHMCOALHBAY = Specific Heat input though coal in BF in Assessment Year in Gcal/tHMCOALHCAY = Specific Heat input though coal in Corex in Assessment Year in Gcal/tHMCOKEHCAY = Specific Heat input though coke in Corex in Assessment Year in Gcal/tHMPRBFAY = Balanced Production Ratio of Blast Furnacesin Assessment Year in tHM/tcsPRCXAY = Balanced Production Ratio of Corex in Assessment Year in tHM/tcsCOKERBAY = Specific Coke input rate in Blast Furnaces in Assessment Year in tcoke/tHMCOALRBAY = Specific Coal input rate in Blast Furnaces in Assessment Year in tcoal/tHMCOALRCAY = Specific Coal input rate in Corex in Assessment Year in tcoal/tHMCOKERCAY = Specific Coke input rate in Corex in Assessment Year in tcoke/tHMSECSPPAY = Specific weighted average Energy Consumption in Sinter & Pellet Plants together in Assessment Year in Gcal/ts&p= {(PRSPAY x SECSPAY) + (PROPAYx SECOPAY)+ (CRPPAYx SECPPAY)} / (PRSPAY + PROPAY + CRPPAY)Where,-PRSPAY = Balanced Production Ratio of Sinter Plants in Assessment Year in tsinter/tcsSECSPAY = Specific energy consumption in Sinter Plants in Assessment Year in Gcal/tsinterPROPAY = Balanced Production Ratio of Own Pellet Plants in Assessment Year in tpellet/tcsSECOPAY = Specific energy consumption in Own Pellet Plants in Assessment Year in Gcal/tpelletCRPPAY = Consumption Ratio of Purchased Pellet in Assessment Year in tpellet/tcsSECPPAY = Default specific energy consumption of Purchased Pellet in Assessment Year in Gcal/tpellet (= 0.50)SECCOAY = Specific Energy Consumption in Coke Ovens in Assessment Year in Gcal/t gross cokePRCBAY = Balanced Production Ratio of Own Coke consumed in BF in Assessment Year in t gross coke/tcsPRCCAY = Balanced Production Ratio of Own Coke consumed in Corex in Assessment Year in t gross coke/tcsSECPCAY = Specific Energy Consumption of Purchased Coke in Gcal/tcoke(= 0.96)CRPBAY = Consumption Ratio of Purchased Coke used in BF in Assessment Year in t coke/tcsCRPCAY = Consumption Ratio of Purchased Coke used in Corex in Assessment Year in t coke/t1.2Alumina in Sinter/ Pellet. - The major energy is consumed in the form of solid fuel (coke breeze and anthracite coal) for agglomeration. In case, alumina in iron ore fines and lumps is increased, it results in additional energy consumption at sintering in the form of additional usage of fluxes. Increase in Alumina from 1% to 2% in Sinter results in increase in coke breeze consumption from 48 kg/t to 59 kg/t of gross sinter. The relationship of increase in Alumina in Sinter and coke breeze consumption is not linear but increases with increase in Alumina in exponential way. Thus for every 1% increase of Al2O3 in Sinter shall result in increase in carbon rate of 7.5 kg/tonne of gross sinter. This will be equated to 7.5 kg/t gross sinter x 8.08 Mcal/kg carbon = 61 Mcal/t gross sinter in energy terms Assumption: Pellet performs similar function as Sinter with same impact of alumina in Pellet on SEC Accordingly, the following formulae are proposed for Normalization of Alumina in Sinter/Pellet as below:Normalized Specific Energy Consumption for Alumina in Sinter/Pallet to be subtracted in the assessment year will be:N-SECASAY=0.061 x [(AlSAY - AlSBY) x PRSPAY + (AlPAY - AlPBY) x PROPAY]Where,-N-SECASAY = Alumina in Sinter/Pellet Normalized Component of Specific Energy Consumption during assessment year (Gcal/tcs)AlSAY = Al2O3 Contention Sinter during assessment year in % (Weight/Weight, Dry)AlSBY = Al2O3 Contention Sinter during base line year in % (Weight/Weight, Dry)AlPAY= Al2O3 Contention Pellet during assessment year in % (Weight/Weight, Dry)AlPBY= Al2O3 Contention Pellet during base line year in % (Weight/Weight, Dry)PRSPAY= Balanced Production Ratio of Sintering Plant during assessment year in tsinter/tcs calculated as per WSA methodologyPROPAY= Balanced Production Ratio of Own Pellet Plant during assessment year in tpellet/tcs calculated as per WSA methodology1.3Alumina in Blast Furnace/ Corex burden. - Increase of Alumina in BF burden due to higher Al2O3 in Sinter, Pellet and lump Iron Ore results in decline in hot metal output, high slag rate, reduced output and increased energy consumption through coke rate. Based on the above study, correlation of Alumina in Sinter with Blast Furnace carbon rate was conducted. As per the study, every 1% increase of Alumina in BF burden, carbon rate in Blast Furnaces increases by 11.5 kg/t of Hot metal. For every 1% increase in Al2O3 in BF burden shall result in carbon rate of 11.5 kg/ ton of hot metal. This will be equated to 11.5 kg/thm x 8.08 Mcal/kg carbon=93 Mcal/thm in energy terms. Assumption: Corex perform same function as the Blast Furnace with same impact if Alumina in burden on SEC The Normalization calculation for Alumina in Blast Furnace/Corex burden in terms of SEC is given below Normalized Specific Energy Consumption for Alumina in Blast Furnace/Corex burden to be subtracted in the assessment year will beN-SECABAY=0.093 x [(AlBBAY -AlBBBY) x PRBFAY + (AlCBAY -AlCBBY) x PRCXAY]Where,-N-SECABAY = Alumina in Corex/Blast Furnace burden Normalized Component of Specific Energy Consumption during assessment year (Gcal/tcs)AlBBAY= Al2O3 Contention Blast Furnace Burden from Sinter, Pellet and Lump Ore during assessment year in % (Weight/Weight, Dry)AlBBBY= Al2O3 Contention Blast Furnace Burden from Sinter, Pellet and Lump Ore during base line year in % (Weight/Weight, Dry)AlCBAY= Al2O3 Contention Corex burden from Sinter, Pellet and Lump Ore during assessment year in % (Weight/Weight, Dry)AlCBBY= Al2O3 Contentin Corex burdenfrom Sinter, Pellet and Lump Ore during base line year in % (Weight/Weight, Dry)PRBFAY= Balanced Production Ratio of Blast Furnaces during assessment year i n tHM/tcs calculated as per WS AmethodologyPRCXAY= Balanced Production Ratio of Corex during assessment year in tHM/tcs calculated as per WSA methodology

2. Coke Mix. - Certain energy is required to produce coke from coal in the Coke Ovens. This value varies widely from plant to plant, depending upon its vintage, technology used and health. For example, Indian Coke Ovens are reported to consume about 1.6+0.6 Gcal / t coke. This is OK for a plant having Coke Ovens inbuilt. But what value is to be taken if a plant instead of producing its own coke imports / purchases its total requirement? World Steel Association recommends the default coke making energy termed as 'upstream energy' to be 4 GJ / t coke (0.96 Gcal / t coke) [refer pg 16, Annexure 4 of 'CO2 Emissions Data Collection, User Guide, Version 6'' of World Steel Association], which is much less than the lowest energy consumed by an Indian plant.

Thus, there is a possibility that a plant, by closing, totally or partially, its own inefficient Coke Ovens and importing / purchasing coke, can have reduced SEC in the assessment year. On the contrary, a plant which was importing / purchasing coke during the base year and started producing its own coke in its newly built Coke Ovens during the assessment year will have an increased SEC. To counter these situations, so that a plant's SEC is not reduced just by outsourcing conversion of coal to coke or a plant's SEC is not increased just by installing a coal to coke conversion plant within its premises, the coke-mix, i.e. coke produced internally and those imported, needs to be normalized.However, to encourage adoption of energy efficient technologies or practices, whereby consumption of coke to produce 1 tonne of crude steel, is reduced, the total coke (i.e. coke produced internally and those imported / purchased) required for producing 1 tonne of crude steel will not be normalized.The normalization is to be effected by only changing the ratio of coke-mix (i.e. coke that is produced internally to that imported / purchased) in the Assessment Year to that of the Base Year, while keeping the total balanced coke production ratio requirement in Assessment year same.Consider a steel plant having a total balanced coke production ratio requirement of BPCK t coke / t crude steel, of which, BPOC t coke / t crude steel is generated internally from own Coke Ovens consuming SECOC Gcal / t coke produced (on Net Calorific Value basis), while the remaining BPIC t coke / t crude steel is consumed from imported or purchased coke with default attributable upstream specific energy consumption of SECIC Gcal / t coke (which as per WSA is 0.96 GCal / t coke). Thus,BPCK = BPOC + BPICThen, the plant's SEC component for coal to coke conversion energy will be(BPOCBY x SECOCBY) + (BPICBY x SECIC) in the Base Year(BPOCAY x SECOCAY) + (BPICAY x SECIC) in the Assessment YearNote: SECIC is constant for Base Year and Assessment YearNormalization EquationN-SECCMAY = [SECOCAYx {BPOCAY - (BPOCBY x BPCKAY / BPCKBY)}] + [SECIC x {BPICAY - (BPICBY x BPCKAY / BPCKBY)}]N-SECCMAY = Coke-Mix normalized Specific Energy Consumption in Assessment Year in Gcal/tcsSECOCAY = Net Specific Energy Consumption in Own Coke Ovens in Assessment Year in Gcal / t cokeSECIC = Default Upstream Specific Energy Consumption in Coke Ovens in Gcal / t coke= 0.96 Gcal / t cokeBPOCAY = Balanced Production Ratio of own Coke Ovens in Assessment Year in t coke/tcsBPICAY = Balanced Production Ratio of imported coke in Assessment Year in t coke/tcsBPOCBY = Balanced Production Ratio of own Coke Ovens in Base Year in t coke/tcsBPICBY = Balanced Production Ratio of imported coke in Base Year in t coke/tcsBPCKAY = Total Balanced Production Ratio of coke in Assessment Year in t coke/tcs= BPOCAY + BPICAYBPCKBY = Total Balanced Production Ratio of coke in Base Year in t coke/tcs= BPOCBY + BPICBY

3. Power Mix

3.1Power Mix Normalization for Power Sources. - The baseline year power mix ratio will be maintained for Assessment year for Power Source and import. The Normalized weighted heat rate calculated from the baseline year Power mix ratio will be compared with the assessment year Weighted Heat Rate and the Notional energy will be deducted from the Total energy assessedThe Thermal Energy difference of electricity consumed in plant in baseline year and electricity consumed in plant during assessment year shall be subtracted from the total energy, considering the same % of power sources consumed in the baseline year.However, any efficiency increase (i.e. reduction in Heat Rate) in Assessment year in any of the power sources will give benefit to the plantSpecific Energy Correction in the assessment year in terms of Gcal/tcs to be subtracted in the

SEC of Plant is calculated as(i)Specific Energy Correction for all power source in the assessment year [Gcal/tcs]:N-SECPSAY= [TECAY x (AWHRAY-NWHRAY)/TCSPAYx1000]Where,-N-SECPSAY: Power Source Mix Normalized Specific Energy Consumption in Assessment Year in Gcal/tcsTECAY: Total energy consumption from all the Power sources (Grid, CPP, DG) for AY in MwhAWHRAY: Actual Weighted Gross Heat Rate for the Assessment Year in kcal/kwhNWHRAY: Normalized Weighted Gross Heat Rate for AY in kcal/kwh (As per Equation 1)TCSPAY: Total Crude Steel Production in Tonnes(ii)Normalized Weighted Heat Rate for Assessment year (kcal/kwh):N-WHRAY= A x (D/G)+B x (E/G)+C x (F/G) + H x (I/G) +J x (K/G)Where,-A: Grid Heat Rate in Assessment year (AY) in kcal/kwh = 2400 kcal/kwhB: CPP Gross Heat Rate in AY in kcal/kwhC: DG Gross Heat Rate in AY in kcal/kwhH: Gas Gross Turbine (GT) Heat Rate in AY in kcal/kwhJ: Gas Generator (GG)Gross Heat Rate in AY in kcal/kwhD: Grid Energy consumption in Base Line Year (BY) in Million kwhE: CPP Energy consumption in BY in Million kwhF: DG Energy consumption in BY in Million kwhI: GT Energy consumption in BY in Million kwhJ: GG Energy consumption in BY in Million kwhG: Energy Consumed from all Power sources (Grid, CPP, DG, GT, GG) for BY in Million kwh3.2Power Mix Normalization for Power Export. - Net Heat Rate of CPP to be considered for export of Power from CPP instead of 2400 kCal/kWh. Actual CPP heat rate would be considered for the net increase in the export of power from the baseline.The specific energy consumption to be subtracted in the assessment year in terms of Gcal/tcs as per following equationSECPEAY=[{(EXPAY x ((GHRAY/(1-APCAY/100))-2400)}/(TCSPAY x 1000)] -[{(EXPBY x ((GHRBY/(1-APCBY/100))-2400)}/TCSPBY]Where,-N-SECPEAY: Power export Normalized Specific Energy Consumption in Assessment Year in Gcal/tcsSECAY: Specific Energy Consumption in Assessment Year in Gcal/tcsGHRAY: CPP Gross Heat Rate in AY in kcal/kwhGHRBY: CPP Gross Heat Rate in BY in kcal/kwhEXPAY: Exported Electrical Energy in AY in MwhEXPBY: Exported Electrical Energy in BY in MwhAPCAY: Auxiliary Power Consumption for AY in % of gross generated before internal consumptionAPCBY: Auxiliary Power Consumption for BY in % of gross generated before internal consumptionTCSPAY : Total Crude Steel Production during AY in tTCSPBY : Total Crude Steel Production during BY in t

4. Process Route Change. - Historically, India has relied on coal to power its electricity sector, liquid fuels as feed stock and oil for its transport sector. But for environmental reasons it needed to focus on cleaner fuels. Keeping in view the shortage of natural gas in the country, domestic gas is allocated to various sectors based on the Policy Guidelines issued by the Government from time to time. In case of imported gas, the marketers are free to import LNG and sell the RLNG to customers.

During opening up of economy in 90's, a number of integrated steel plants in India started production based on alternate route of Iron making which is DRI/HBI-EAF route. Rising price of imported natural gas and projected severe shortage of it from indigenous production, turned this route costlier than conventional route. As a survival strategy these plants gradually started switching over to traditional route i.e. BF-BOF route for their future expansion and as a result, their SEC increased considerably.To normalize the impact of this process route change due to external factors, Normalized Specific Energy Consumption for Process Route Change from Midrex (gas-based HBI) to BF / Corex (only if due to external factors) for subtraction in the assessment year will beN-SECPRCAY = [{ (0.31 x PRBFAY) + (1.33 x PRCxAY) } / (PRBFAY + PRCxAY) }] x [{ PRMxBY x (PRMx AY + PRBF AY + PRCx AY) / (PRMxBY + PRBFBY + PRCxAY) } - PRMxAY]Where,-N-SECPRCAY= Normalized Specific Energy Consumption for Process Route Change during Assessment Year in Gcal/tcsPRBFAY = Balanced Production Ratio of Blast Furnace, during Assessment Year, in tHM/tcsPRBFBY = Balanced Production Ratio of Blast Furnace, during Baseline Year, in tHM/tcsPRCxAY = Balanced Production Ratio of Corex, during Assessment Year, in tHM/tcsPRCxBY = Balanced Production Ratio of Corex, during Baseline Year, in tHM/tcsPRMxAY = Balanced Production Ratio of Midrex, during Assessment Year, in t Gas-based HBI/tcsPRMxBY = Balanced Production Ratios of Midrex, during Baseline Year, in t Gas-based HBI/tcsNote: The equation has been developed based on specific plant's condition, i.e. with purchased coke & pellet and may not be suitable for other conditions.

5. Product Mix. - Different steel products require different amount of energy for its formation in different Mills. For example, an Indian Plate Mill consumes about 0.90 +0.20 Gcal/t plate while the same for an Indian Hot Strip Milll is about 0.46 +0.15 Gcal/t plate although input of both are slabs. There is a possibility that a plant, by shifting from one steel product to another, can have reduced / increased specific energy consumption. Also, some products are intermediates and are feed to the next processing unit, thereby consuming energy if processed further. For example, Hot Strips are sold as coils or processed further to Cold Rolled Coils and / or Pipes. There is a possibility that a plant may add a downstream processing unit within a PAT cycle, thereby increasing specific energy consumption. To counter these, so that production remains market driven, the product-mix after crude steel needs to be broadly normalized.

However, there are different routes producing the same product from the same inputs. For example, Slabs can be produced through the Ingot - Slabbing Mill route or directly cast. In the later case, there will be considerable saving in energy as ingots need to be cooled for ingot stripping and again heated in Slabbing Mill. Similarly, new energy efficient mills may be added producing the same product from the same inputs. To encourage, shifting from energy inefficient route / mill to energy efficient route / mill, product-route will not be normalized, while product-mix is normalized.Further, to reduce the number of products for product-mix normalization, similar energy consuming products have been clubbed together. Thus, there will be normalization for only 15 (fifteen) products viz. Ingots, Wheels, Blooms (including semi-finished Round Bars & Beam Blanks), Axles, Billets, Rails & Sections together, Bars & Wire Rods together, Skelps, Slabs, Thin Slabs, Plates, Hot Strips, Cold Strips of Non-alloyed &r Stainless Steel together, Cold Strips of Silico-electrical Steels and Pipes.Consider a steel plant producing following forms of Crude steelIngot with balanced production ratio of P1 t / tcsConcast Bloom with balanced production ratio of P2 t / tcsConcast Billet with balanced production ratio of P3 t / tcsConcast Slab with balanced production ratio of P4 t / tcsConcast Thin Slab with balanced production ratio of P5 t / tcs

Part of – Ingots from P1 with balanced production ratio P1S are then sold while the remaining are rolled into

Wheels in Wheel Mills with balanced production ratio of P11 t / tcsBlooms in Blooming Mills with balanced production ratio of P12 t / tcsSlabs in Slabbing Mills with balanced production ratio of P13 t / tcs

Part of – Blooms (concast or otherwise) from P2 & P12 with balanced production ratio P2S are then sold while the remaining are rolled into

Axles in Axle Mills with balanced production ratio of P21 t / tcsBillets in Billet Mills with balanced production ratio of P22 t / tcsBillets in Light Merchant Mills with balanced production ratio of P23 t / tcsBars in Light Merchant Mills with balanced production ratio of P24 t / tcsBars in Medium Merchant / Structural Mills with balanced production ratio of P25 t / tcsRails & Sections in Medium Merchant / Structural Mills with balanced production ratio of P26 t / tcsRails & Sections in Rail / Section / Beam / Heavy Structural Mills with balanced production ratio of P27 t / tcs

Part of – Billets (concast or otherwise) from P3, P21 & P22 with balanced production ratio P3S are then sold while the remaining are rolled into

Skelps in Skelp Mills with balanced production ratio of P31 t / tcsWire Rods in Wire Rod Mills with balanced production ratio of P32 t / tcsBars in Bar & Rod Mills with balanced production ratio of P33 t / tcsBars in Merchant Mills with balanced production ratio of P34 t / tcsRails and Sections in Merchant Mills with balanced production ratio of P35 t / tcsRails and Sections in Light Structural Mills with balanced production ratio of P36 t / tcs

Part of – Slabs (concast or otherwise) from P4 and P13 with balanced production ratio P4S are then sold while the remaining are rolled into

Plates in Plate Mills with balanced production ratio of P41 t / tcsHot Strips in Hot Strip Mills with balanced production ratio of P42 t / tcs

Part of – Thin Slabs (concast) from P5 with balanced production ratio P5S are then sold while the remaining are rolled into

Hot Strips in Compact Strip Mills with balanced production ratio of P51 t / tcs

Part of – Hot Strips (produced from Hot Strip Mill or Compact Strip Mill) from P42 & P51 with balanced production ratio P6S are then sold while the remaining are rolled into

Cold Rolled Non-alloyed & Stainless Steels in Cold Rolling Mills with balanced production ratio of P61 t / tcsCold Rolled Silico-electrical Steels in Silicon Steel Mills with balanced production ratio of P62 t / tcsPipes in Pipe Mills with balanced production ratio of P63 t / tcsAlso consider the Yield & Specific Energy Consumption (SEC) of the different mills as follows

Mills	Input material	Output material	Yield (t product/t input)	Specific Energy Consumption (Gcal/t product)
Wheel Mills	Ingots	Wheels	Y11	Sec11
Blooming Mills	Ingots	Blooms	Y12	Sec12
Slabbing Mills	Ingots	Slabs	Y13	Sec13
Axle Mills	Blooms	Axles	Y21	Sec21
Billet Mills	Blooms	Billets	Y22	Sec22
Light Merchant Mills	Blooms	Billets & Bars	Y234	Sec234
Medium Merchant/ Structural Mills	Blooms	Bars, Rails & Sections	Y256	Sec256
Rail/ Section/ Beam/ Heavy Structural Mills	Blooms	Rails & Sections	Y27	Sec27
Skelp Mills	Billets	Skelps	Y31	Sec31
Wire Rod Mills	Billets	Wire Rods	Y32	Sec32
Bar & Rod Mills	Billets	Bars	Y33	Sec33
Merchant Mills	Billets	Bars, Rails & Sections	Y345	Sec345
Light Structural Mills	Billets	Rails & Sections	Y36	Sec36
Plate Mills	Slabs	Plates	Y41	Sec41
Hot Strip Mills	Slabs	Hot Strips	Y42	Sec42
Compact Strip Mills	Thin Slabs	Hot Strips	Y51	Sec51
Cold Rolling Mills	Hot Strips	Non-alloyed & Stainless Cold Rolled Steels	Y61	Sec61

Silicon Steel Mills	Hot Strips	Silico-electrical Cold Rolled Steels	Y62	Sec62
Pipe Mills	Hot Strips	Pipes	Y63	Sec63

Notes. - 1. Balanced Production Ratio of a Product is the Ratio of the Quantum of the Product produced/ sold, per unit of Crude Steel production where there is no stocking, destocking or input of intermediary products. Thus,P1 + P2 + P3 + P4 + P5 = 1P1S + (P11/ Y11) + (P12/ Y12) + (P13/ Y13) = P1P2S + (P21/ Y21) + (P22/ Y22) + {(P23 + P24)/ Y234} + {(P25 + P26)/ Y256} + (P27/ Y27) = P2 + P12P3S + (P31/ Y31) + (P32/ Y32) + (P33/ Y33} + {(P34 + P35)/ Y345} + (P36/ Y36) = P3 + P21 + P22P4S + (P41/ Y41) + (P42/ Y42) = P4 + P13P5S + (P51/ Y51) = P5P6S + (P61/ Y61) + (P62/ Y62) + (P63/ Y63) = P42 + P51In other words, if any intermediary products like Ingots, Blooms, Billets, Slabs, Thin Slabs and Hot Strips, are not processed further in a particular year, then, the total amount of the product produced will be considered as sold.

2. Blooms include Semi-finished Round Bars and Beam Blanks

3. Bars include Rounds, Flats and Rods

Then,Cumulative SECs (Gcal/t product) for producing following from Crude Steel are as follows

Product	Symbol	Equation	
Ingots	SECIN	=	0
Wheels	SECWH	=	Sec11
Blooms	SECBL	=	{SEC12x P12/ (P12+ P2) }
Axles	SECAX	=	{ (SECBL/ Y21) + SEC21}
Billets	SECBI	=	{ ([{ (SECBL/ Y22) +SEC22} x P22] + [{ (SECBL/Y234) + SEC234} x P23])/ (P22+ P23+ P3) }
Bars	SECBA	=	{ ([{ (SECBL/ Y234) +SEC234} x P24] + [{ (SECBL/Y256) + SEC256} x P25] + [{(SECBI/ Y33) + SEC33} x P33]+ [{ (SECBI/ Y345) + SEC345} xP34])/ (P24+ P25+ P33+ P34) }
Rails & Sections	SECRS	=	{ ([{ (SECBL/ Y256) +SEC256} x P26] + [{ (SECBL/ Y27) + SEC27} x P27] + [{ (SECBI/Y345) + SEC345} x P35] + [{(SECBI/ Y36) + SEC36} x P36])/(P26+ P27+ P35+ P36)}
Skelps	SECSK	=	{ (SECBI/ Y31) + SEC31}
Wire Rods	SECWR	=	{ (SECBI/ Y32) + SEC32}
Slabs	SECSL	=	{ SEC13x P13/ (P13+ P3) }
Thin Slabs	SECTS	=	0
Plates	SECPL	=	{ (SECSL/ Y41) + SEC41}
Hot Strips	SECHS	=	{ ([{ (SECSL/ Y42) +SEC42} x P42] + [{ (SECTS/ Y51)+ SEC51} x P51])/ (P42+ P51)}

Non-alloyed/ Stainless Cold Rolled Steels	SECNS	=	{ (SECHS/ Y61) + SEC61}
Silico-electrical Cold Rolled Steels	SECSE	=	{ (SECHS/ Y62) + SEC62}
Pipes	SECPI	=	{ (SECHS/ Y63) + SEC63}

Normalization Equation. - Normalized Specific Energy Consumption for Product Mix to be subtracted in the assessment year will be

N-SECPMAY	NormalizedSpecific Energy Consumption for Product Mix to be deducted in theassessment year	
	[{ (SECINAYx P1SAY)+ (SECINBYx P1SBY)}x {P1SAY-P1SBY}/{P1SAY+ P1SBY}]	for Ingotssold
+	[{ (SECWHAYx P11AY)+ (SECWHBYx P11BY)}x {P11AY-P11BY}/{P11AY+ P11BY}]	for Wheelsproduced
+	[{ (SECBLAYx P2SAY)+ (SECBLBYx P2SBY)}x {P2SAY-P2SBY}/{P2SAY+ P2SBY}]	for Bloomssold
+	[{ (SECAXAYx P21AY)+ (SECAXBYx P21BY)}x {P21AY-P21BY}/{P21AY+ P21BY}]	for Axlesproduced
+	[{ (SECBIAYx P3SAY)+ (SECBIBYx P3SBY)}x {P3SAY-P3SBY}/{P3SAY+ P3SBY}]	for Billetssold
+	([{SECBAAYx (P24AY+ P25AY+P33AY+ P34AY) }+ {SECBABYx(P24BY+ P25BY+P33BY+ P34BY) }+ {SECWRAYxP32AY}+ {SECWRBYxP32BY}]x [{P24AY+P25AY+ P32AY+ P33AY+ P34AY}- {P24BY+P25BY+ P32AY+ P33BY+ P34BY}]/[{P24AY+P25AY+ P32AY+ P33AY+ P34AY}+ {P24BY+ P25BY+ P32AY+ P33BY+P34BY}])	for Bars &Wire Rods produced
+	([{SECRSAYx (P26AY+ P27AY+P35AY+ P36AY) }+ {SECRSBYx(P26BY+ P27BY+P35BY+ P36BY) }]x [{P26AY+P27AY+ P35AY+ P36AY}- {P26BY-P27BY- P35BY-P36BY}]/[{P26AY+P27AY+ P35AY+ P36AY}+ {P26BY-P27BY- P35BY- P36BY}])	for Rails &Sections produced
+	[{ (SECSKAYx P31AY) + (SECSKBYx P31BY) }x {P31AY-P31BY}/{P31AY+ P31BY}]	for Skelpsproduced
+	[{ (SECSLAYx P4SAY) + (SECSLBYx P4SBY) }x {P4SAY-P4SBY}/{P4SAY+ P4SBY}]	for Slabssold
+	[{ (SECTSAYx P5SAY) + (SECTSBYx P5SBY) }x {P5SAY–P5SBY}/{P5SAY+ P5SBY}]	for ThinSlabs sold
+	[{ (SECPLAYx P41AY) + (SECPLBYx P41BY) }x {P41AY–P41BY}/{P41AY+ P41BY}]	for Platesproduced
+		for HotStrips sold

	[{ (SECHSAYx P6SAY) + (SECHSBYx P6SBY) }x {P6SAY–P6SBY}/{P6SAY+ P6SBY}]	
+	[{ (SECNSAYx P61AY) + (SECNSBYx P61BY) }x {P61AY–P61BY}/{P61AY+ P61BY}]	forNon-alloyed & Stainless Cold Rolled Steels produced
+	[{ (SECNSAYx P61AY) + (SECNSBYx P61BY) }x {P61AY–P61BY}/{P61AY+ P61BY}]	forSilico-electrical Cold Rolled Steels produced
+	[{ (SECNSAYx P61AY) + (SECNSBYx P61BY) }x {P61AY–P61BY}/{P61AY+ P61BY}]	for Pipesproduced

6. Start/Stop. - Normalized Specific Energy Consumption for Start/Stop (only if due to external factor) to be subtracted in the assessment year will be

N-SECSSAY = N-SECStTAY + N-SECStEAY+ N-SECSpEAYWhere,-

N-SECSSAY	=	Normalized Specific Energy Consumption for Start/Stop of allfurnaces/ kilns producing iron (hot metal, pig iron, directreduced iron or hot briquetted iron) from its ore, like BlastFurnace, Corex, Midrex, Cored, HyL III, Iron Carbide, Finmet,SL/RN, Circofer, Inmetco, Fastmet etc., during assessment yeardue to external factor,in Gcal/tcs	
N-SECStTAY	=	Normalized Specific Thermal Energy Consumption for Cold Startof all furnaces/ kilns producing iron from its ore, like BlastFurnace, Corex, Midrex, Cored, HyL III, Iron Carbide, Finmet,SL/RN, Circofer, Inmetco, Fastmet etc., during assessment yeardueto external factor, in Gcal/tcs	
	=	(TStBFAYx PRBFAY/TPBFAY) – (TStBFBYx PRBFBY/ TPBFBY)	for Blast Furnace
	+	(TStCXAYx PRCXAY/TPCXAY) – (TStCXBYx PRCXBY/ TPCXBY)	for Corex
	+	(TStDRAYx PRDRAY/TPDRAY) – (TStDRBYx PRDRBY/ TPDRBY)	for DRI/ HBI
N-SECStEAY	=	Normalized Specific Electrical Energy Consumption for ColdStart of all furnaces/ kilns producing iron from its ore, likeBlast Furnace, Corex, Midrex, Cored, HyL III, Iron Carbide,Finmet, SL/RN, Circofer, Inmetco, Fastmet etc., during assessmentyear due to external factor, in Gcal/tcs	
	=	2.4 x { (EStBFAYx PRBFAY/TPBFAY) – (EStBFBYx PRBFBY/ TPBFBY)	for Blast Furnace
	+	(EStCXAYx PRCXAY/TPCXAY) – (EStCXBYx PRCXBY/ TPCXBY)	for Corex
	+	(EStDRAYx PRDRAY/TPDRAY) – (EStDRBYx PRDRBY/ TPDRBY) }	for DRI/ HBI
N-SECSpEAY	=	Normalized Specific Electrical Energy Consumption for Hot toCold Stop of all furnaces/ kilns producing iron from its ore,like Blast	

Furnace, Corex, Midrex, Cored, HyL III, Iron Carbide,Finmet, SL/RN, Circofer, Inmetco, Fastmet etc., during assessmentyear due to external factor, in Gcal/tcs

=	2.4 x { (ESpBFAYx PRBFAY/TPBFAY) – (ESpBFBYx PRBFBY/ TPBFBY)	for Blast Furnace
+	(ESpCXAYx PRCXAY/TPCXAY) – (ESpCXBYx PRCXBY/ TPCXBY)	for Corex
+	(ESpDRAYx PRDRAY/TPDRAY) – (ESpDRBYx PRDRBY/ TPDRBY) }	for DRI/ HBI

and

TStBFAY	=	Total thermal energy consumption due to Cold Start of allBlast Furnaces because of external factor during Assessment Yearin Gcal
EStBFAY	=	Total electrical energy consumption due to Cold Start of allBlast Furnaces because of external factor during Assessment Yearin MWh
ESpBFAY	=	Total electrical energy consumption due to Hot to Cold Stop ofall Blast Furnaces because of external factor during AssessmentYear in MWh
PRBFAY	=	Balanced production ratio of all Blast Furnaces duringAssessment Year in t hm/ t cs
TPBFAY	=	Total production of all Blast Furnaces during Assessment Yearin t hm
TStBFBY	=	Total thermal energy consumption due to Cold Start of allBlast Furnaces because of external factor during Baseline Year inGcal
EStBFBY	=	Total electrical energy consumption due to Cold Start of allBlast Furnaces because of external factor during Baseline Year inMWh
ESpBFBY	=	Total electrical energy consumption due to Hot to Cold Stop ofall Blast Furnaces because of external factor during BaselineYear in MWh
PRBFBY	=	Balanced production ratio of all Blast Furnaces duringBaseline Year in t hm/ t cs
TPBFBY	=	Total production of all Blast Furnaces during Baseline Year int hm
TStCXAY	=	Total thermal energy consumption due to Cold Start of allCorex Furnaces because of external factor during Assessment Yearin Gcal
EStCXAY	=	Total electrical energy consumption due to Cold Start of allCorex Furnaces because of external factor during Assessment Yearin MWh
ESpCXAY	=	Total electrical energy consumption due to Hot to Cold Stop ofall Corex Furnaces because of external factor during AssessmentYear in MWh
PRCXAY	=	Balanced production ratio of all Corex Furnaces duringAssessment Year in t hm/ t cs
TPCXAY	=	Total production of all Corex Furnaces during Assessment Yearin t hm
TStCXBY	=	Total thermal energy consumption due to Cold Start of allCorex Furnaces because of external factor during Baseline Year inGcal
EStCXBY	=	Total electrical energy consumption due to Cold Start of allCorex Furnaces because of external factor during Baseline Year inMWh
ESpCXBY	=	Total electrical energy consumption due to Hot to Cold Stop ofall Corex Furnaces because of external factor during BaselineYear in MWh
PRCXBY	=	Balanced production ratio of all Corex Furnaces duringBaseline Year in t hm/ t cs

TPCXBY	=	Total production of all Corex Furnaces during Baseline Year int hm
TStDRAY	=	Total thermal energy consumption due to Cold Start of allFurnaces/ Kilns producing DRI or HBI, because of external factor,during Assessment Year in Gcal
EStDRAY	=	Total electrical energy consumption due to Cold Start of allFurnaces/ Kilns producing DRI or HBI, because of external factor,during Assessment Year in MWh
ESpDRAY	=	Total electrical energy consumption due to Hot to Cold Stop ofall Furnaces/ Kilns producing DRI or HBI, because of externalfactor, during Assessment Year in MWh
PRDRAY	=	Balanced production ratio of all Furnaces/ Kilns producing DRIor HBI during Assessment Year in t DRI / t cs
TPDRAY	=	Total production of all Furnaces/ Kilns producing DRI or HBIduring Assessment Year in t DRI
TStDRBY	=	Total thermal energy consumption due to Cold Start of allFurnaces/ Kilns producing DRI or HBI, because of external factor,during Baseline Year in Gcal
EStDRBY	=	Total electrical energy consumption due to Cold Start ofall Furnaces/ Kilns producing DRI or HBI, because of externalfactor, during Baseline Year in MWh
ESpDRBY	=	Total electrical energy consumption due to Hot to Cold Stop ofall Furnaces/ Kilns producing DRI or HBI, because of externalfactor, during Baseline Year in MWh
PRDRBY	=	Balanced production ratio of all Furnaces/ Kilns producing DRIor HBI during Baseline Year in t DRI/ t cs
TPDRBY	=	Total production of all Furnaces/ Kilns producing DRI or HBIduring Baseline Year in t DRI

7. Normalization Others.

7.1Environmental Concern. - Additional Environmental Equipment requirement due to major change in government policy on Environment.The Normalization takes place in the assessment year for additional Equipment's Energy Consumption only if there is major change in government policy on Environment Standard. The Energy will be normalized for additional Energy consumption details from Energy meters. This is to be excluded from the input energy as calculated belowAdditional Environmental Equipment is sometimes required to be installed/ upgraded due to major change in Government Policy on Environment, as a result of which energy consumption increases.This Normalization takes place in the assessment year only for the additional Equipment's Energy Consumption only if there is a major change in Government Policy on Environment Standard and the additional equipment is installed/ upgraded to comply with the Government Policy on Environment Standard. The Energy will be normalized for additional Energy consumption on the basis of details from Energy meters. This is to be excluded from the input energy as calculated belowNormalized Specific Energy Consumption for Environmental Concern (only if there is a major change in Government Policy on Environment Standard and the additional equipment is installed/ upgraded to comply with the Government Policy on Environment Standard) to be subtracted in the assessment year will beN-SECECAY = N-SECShAAY + N-SECShBAY + N-SECShCAY... ...... and so on for different shopsWhere,-

N-SECECAY =

		Normalized Specific Energy Consumption for EnvironmentalConcern, during assessment year, due to major change inGovernment Policy on Environment Standard,in Gcal/tcs
N-SECShAAY	=	Normalized Specific Energy Consumption for EnvironmentalConcern, during Assessment Year by the additional installed/upgraded equipment, used to comply with the major change inGovernment Policy on Environment Standard and located inShopA, in Gcal/tcs
	=	{ TShAAY+ (2.4 x EShAAY)} x PRShAAY/ TPShAAY
N-SECShBAY	=	Normalized Specific Energy Consumption for EnvironmentalConcern, during Assessment Year by the additional installed/upgraded equipment, used to comply with the major change inGovernment Policy on Environment Standard and located inShopB, in Gcal/tcs
	=	{ TShBAY+ (2.4 x EShBAY)} x PRShBAY/ TPShBAY

... ... and so on for shops C, D...Shops A, B, C, D, E ... ... are different shops of the plant, like Coke Ovens; Pellet Plants; Sintering Plants; Blast Furnaces; Corex Furnaces; DRI Kilns; HBI Furnaces; Calcining Plants, Steel Melting & Casting Shops; Slabbing Mills; Blooming Mills; Billet & Light Merchant Mills; Medium Merchant & Structural Mills; Rail, Beam, Section & Heavy Structural Mills;Wheel Mills; Axle Mills; Skelp Mills; Merchant Mills; Bar Mills; Wire Rod Mills; Light Structural Mills; Plate Mills; Hot Strip Mills; Compact Strip Mills; Cold Rolling Mills; Pipe Mills; Silicon Steel Mills; Boilers; Power Plants; Oxygen Plants; Producer Gas Plants; Auxiliary Shops; Losses;etc., where additional equipment is installed/ upgraded to comply with the Government Policy on Environment Standardand

TShAAY	=	Total additional thermal energy consumption during AssessmentYear (as compared to Baseline Year) by the additional installed/upgraded equipment, used to comply with the major change inGovernment Policy on Environment Standard and located in Shop A,inGcal
EShAAY	=	Total additional electrical energy consumption duringAssessment Year (as compared to Baseline Year) by the additionalinstalled/ upgraded equipment, used to comply with the majorchange in Government Policy on Environment Standard and located inShop A, in MWh
PRShAAY	=	Balanced production ratio of all shops producing same productas shop A, during Assessment Year in t product of shop A/ t cs
TPShAAY	=	Total production of all shops producing same product as shopA, during Assessment Year in t product of shop A

Similarly for Shops B, C, D, E, F ... ...Superscript ShB stands for Shop B, ShC stands for Shop C, etc.7.2Biomass/ Alternate Fuel Unavailability w.r.t Baseline Year. - For the normalization for unavailability of Biomass or alternate fuel in the Assessment Year as compared to Baseline Year, the energy contained by the fossil fuel replacing the biomass or alternate fuel will be deducted in the Assessment Year.Normalized Specific Energy Consumption for Biomass/ Alternate Fuel unavailability to be subtracted in the assessment year will beN-SECBAFAY = N-SECShAAY + N-SECShBAY + N-SECShCAY... ... and so on for different shops(if N-SECShAAY + N-SECShBAY ... ... > 0)= 0 (if N-SECShAAY + N-SECShBAY ... ... □0)Where,-

N-SECBAFAY	=	Normalized Specific Energy Consumption for Biomass/ AlternateFuel Unavailability during Assessment Year in Gcal/tcs
N-SECShAAY	=	Normalized Specific Energy Consumption for Biomass/ AlternateFuel Unavailability in Shop A during Assessment Year, in Gcal/tcs
	=	[{ (BMShABYx CVBMShABY) + (SAShABYx CVSAShABY) + (LAShABYx CVLAShABY) } x0.001 x PRShABY/ TPShABY]
		- [{ (BMShAAYx CVBMShAAY)+ (SAShAAYx CVSAShAAY)+ (LAShAAYx CVLAShAAY)} x0.001 x PRShAAY/ TPShAAY]
N-SECShBAY	=	Normalized Specific Energy Consumption for Biomass/ AlternateFuel Unavailability in Shop B during Assessment Year,in Gcal/tcs
	=	[{ (BMShBBYx CVBMShBBY) + (SAShBBYx CVSAShBBY) + (LAShBBYx CVLAShBBY)} x PRShBBY/ TPShBBY]
		- [{ (BMShBAYx CVBMShBAY)+ (SAShBAYx CVSAShBAY)+ (LAShBAYx CVLAShBAY)} x PRShBAY/ TPShBAY]

... ... and so on for shops C, D...Shops A, B, C, D, E ... ... are different shops of the plant, like Coke Ovens; Pellet Plants; Sintering Plants; Blast Furnaces; Corex Furnaces; DRI Kilns; HBI Furnaces; Calcining Plants, Steel Melting & Casting Shops; Slabbing Mills; Blooming Mills; Billet & Light Merchant Mills; Medium Merchant & Structural Mills; Rail, Beam, Section & Heavy Structural Mills;Wheel Mills; Axle Mills; Skelp Mills; Merchant Mills; Bar Mills; Wire Rod Mills; Light Structural Mills; Plate Mills; Hot Strip Mills; Compact Strip Mills; Cold Rolling Mills; Pipe Mills; Silicon Steel Mills; Boilers; Power Plants; Oxygen Plants; Producer Gas Plants; Auxiliary Shops; Losses; etc., when total biomass/ alternate fuel consumption of the whole plant reduced due to its unavailabilityand

BMShABY	=	Quantum of Biomass used in Shop A during Base line Year,but notincluded in Shop A's energy consumption while calculating SEC, int (tonnes) of Biomass
SAShABY	=	Quantum of Solid Alternate Fuel used in Shop A during BaselineYear,but not included in Shop A's energy consumption whilecalculating SEC, in t (tonnes) of Solid Alternate Fuel
LAShABY	=	Quantum of Liquid Alternate Fuel used in Shop A, duringBaseline Year, but not included in Shop A's energy consumptionwhile calculating SEC, in kl (kilolitres) of Liquid AlternateFuel
CVBMShABY	=	Average Net Calorific Value of Biomass (on air-dry basis) usedin Shop A, during Baseline Year in kcal (kilocalories)/ kg(kilogram) of Biomass
CVSAShABY	=	Average Net Calorific Value of Solid Alternate Fuel (onair-dry basis) used in Shop A, during Baseline Year in kcal(kilocalories)/ kg (kilogram) of Solid Alternate Fuel
CVLAShABY	=	Average Net Calorific Value of Liquid Alternate Fuel used inShop A, during Baseline Year in kcal (kilocalories)/ l (litre) ofLiquid Alternate Fuel
PRShABY	=	Balanced production ratio of all shops producing same productas shop A, during Baseline Year in t product of shop A/ t cs
TPShABY	=	Total production of all shops producing same product as shopA, during Baseline Year in t product of shop A

BMShAAY	=	Quantum of Biomass used in Shop A, during Assessment Year, butnot included in Shop A's energy consumption while calculatingSEC, in t (tonnes) of Biomass
SAShAAY	=	Quantum of Solid Alternate Fuel used in Shop A, duringAssessment Year,but not included in Shop A's energy consumptionwhile calculating SEC,in t (tonnes) of Solid Alternate Fuel
LAShAAY	=	Quantum of Liquid Alternate Fuel used in Shop A, duringAssessment Year, but not included in Shop A's energy consumptionwhile calculating SEC,in kl (kilolitres) of Liquid Alternate Fuel
CVBMShAAY	=	Average Net Calorific Value of Biomass (on air-dry basis) usedin Shop Adjuring Assessment Year in kcal (kilocalories)/ kg(kilogram) of Biomass
CVSAShAAY	=	Average Net Calorific Value of Solid Alternate Fuel (onair-dry basis) used in Shop A during Assessment Year in kcal(kilocalories)/ kg (kilogram) of Solid Alternate Fuel
CVLAShAAY	=	Average Net Calorific Value of Liquid Alternate Fuel used inShop A, during Assessment Year in kcal (kilocalories)/ l (litre)of Liquid Alternate Fuel
PRShAAY	=	Balanced production ratio of all shops producing same productas shop A, during Assessment Year in t product of shop A/ t cs
TPShAAY	=	Total production of all shops producing same product as shopA, during Assessment Year in t product of shop A

Similarly for Shops B, C, D, E, F ... ...Superscript ShB stands for Shop B, ShC stands for Shop C, etc.7.3Construction Phase or Project Activities. - The additional energy consumed in a shop during construction/ rebuilding phase or for project activities, is nonproductive energy and hence will be subtracted in the assessment year. The energy consumed by the equipment till commissioning will also be deducted in the assessment yearFor the normalization of construction/ rebuilding phase or for project activities in the Assessment Year as compared to Baseline Year, the additional (or lower) energy consumed by the shop will be deducted (or added) in the Assessment Year.Normalized Specific Energy Consumption for construction/ rebuilding phase or for project activities to be subtracted in the assessment year will beN-SECPAAY = N-SECShAAY + N-SECShBAY + N-SECShCAY ... . and so on for different shopsWhere,-

N-SECPAAY	=	Normalized Specific Energy Consumption for construction/rebuilding phase or for project activities during assessment yearin Gcal/tcs
N-SECShAAY	=	Normalized Specific Energy Consumption for construction/rebuilding phase or for project activities inShop A, inGcal/tcs
	=	[{ TShAAY+ (2.4 x EShAAY) } x PRShAAY/ TPShAAY]
		- { TShABY+ (2.4 x EShABY) } x PRShABY/ TPShABY]
N-SECShBAY	=	Normalized Specific Energy Consumption for construction/rebuilding phase or for project activities inShop B, inGcal/tcs
	=	[{ TShBAY+ (2.4 x EShBAY) } x PRShBAY/ TPShBAY]
		- { TShBBY+ (2.4 x EShBBY) } x PRShBBY/ TPShBBY]

... ... and so on for shops C, D...Shops A, B, C, D, E ... ... are different shops of the plant, like Coke Ovens; Pellet Plants; Sintering Plants; Blast Furnaces; Corex Furnaces; DRI Kilns; HBI Furnaces;

Calcining Plants, Steel Melting & Casting Shops; Slabbing Mills; Blooming Mills; Billet & Light Merchant Mills; Medium Merchant & Structural Mills; Rail, Beam, Section & Heavy Structural Mills;Wheel Mills; Axle Mills; Skelp Mills; Merchant Mills; Bar Mills; Wire Rod Mills; Light Structural Mills; Plate Mills; Hot Strip Mills; Compact Strip Mills; Cold Rolling Mills; Pipe Mills; Silicon Steel Mills; Boilers; Power Plants; Oxygen Plants; Producer Gas Plants; Auxiliary Shops; Losses; etc., whose additional energy consumed during construction/ rebuilding phase or for project activities, is included while reporting in Form-1.and

TShAAY	=	Total additional thermal energy consumption during AssessmentYear for Construction/ Rebuilding / Project Activities andincluded in Shop A's energy consumption while reporting inForm-1, in Gcal.
EShAAY	=	Total additional electrical energy consumption duringAssessment Year for Construction/ Rebuilding / Project Activitiesand included in Shop A's energy consumption while reporting inForm-1, in MWh
PRShAAY	=	Balanced production ratio of all shops producing same productas shop A, during Assessment Year in t product of shop A/ t cs
TPShAAY	=	Total production of all shops producing same product as shopA, during Assessment Year in t product of shop A
TShABY	=	Total additional thermal energy consumption during BaselineYear for Construction/ Rebuilding/ Project Activities andincluded in Shop A's energy consumption while reporting inForm-1, in Gcal.
EShABY	=	Total additional electrical energy consumption during Baselinet Year for Construction/ Rebuilding / Project Activities andincluded in Shop A's energy consumption while reporting inForm-1, in MWh
PRShABY	=	Balanced production ratio of all shops producing same productas shop A, during Baseline Year in t product of shop A/ t cs
TPShABY	=	Total production of all shops producing same product as shopA, during Baseline Year in t product of shop A

Similarly for Shops B, C, D, E, F ... ...Superscript ShB stands for Shop B, ShC stands for Shop C, etc.7.4Addition of New Line/Unit (In Process and Power Generation). - In case a DC commissions a new/ revamped/ rebuilt process line/production unit (both in Production Process and Utility Generation) before or during the assessment/target year, the production and energy consumption of the new/ revamped / rebuilt units will be considered in the total plant energy consumption and production volumes once the Capacity Utilization of that line has touched/ increased over 70%. However, the energy consumption and production volume will not be included till it attains 70% of Capacity Utilization.For the normalization of addition of New/ Revamped/ Rebuilt Process Line/ Production Unit in the Assessment Year as compared to Baseline Year, the additional energy thus consumed by the new line/ unit and production thus made (if any) from the new line/ unit for any such project activity during the assessment year, will be subtracted from the total energy consumed and production made in the Assessment Year by the concerned shop.Normalized Specific Energy Consumption for New Line/ Unit to be subtracted in the assessment year will beN-SECNLUAY = N-SECShAAY + N-SECShBAY + N-SECShCAY ... . and so on for different shopsWhere,-

N - SECNLUAY	=	Normalized Specific Energy Consumption for new/ revamped/rebuilt process line/ production unit during assessment year, inGcal/tcs

N - SECShAAY	=	Normalized Specific Energy Consumption fornew/ revamped/rebuilt process line/ production unit in Shop A during assessmentyear,in Gcal/tcs
	=	([{ SECShAAY - ([{SECShAAYx TPShAAY}- {TShAAY+ (2.4 x EShAAY) }] / [TPShAAY- CPShAAY]) } x PRShAAY] - [{ SECShABY - ([{SECShABYx TPShABY}- {TShABY+ (2.4 x EShABY) }] / [TPShABY- CPShABY]) } x PRShABY]
N - SECShBAY	=	Normalized Specific Energy Consumption for new/ revamped/rebuilt process line/ production unit in Shop B during assessmentyear,in Gcal/tcs
	=	([{ SECShBAY - ([{SECShBAYx TPShBAY} -{TShBAY+ (2.4 x EShBAY) }] / [TPShBAY- CPShBAY]) } x PRShBAY] - [{ SECShBBY - ([{SECShBBYx TPShBBY} -{TShBBY+ (2.4 x EShBBY) }] / [TPShBBY- CPShBBY]) } x PRShBBY]

... ... and so on for shops C, D...Shops A, B, C, D, E ... ... are different shops of the plant, like Coke Ovens; Pellet Plants; Sintering Plants; Blast Furnaces; Corex Furnaces; DRI Kilns; HBI Furnaces; Calcining Plants, Steel Melting & Casting Shops; Slabbing Mills; Blooming Mills; Billet & Light Merchant Mills; Medium Merchant & Structural Mills; Rail, Beam, Section & Heavy Structural Mills; Wheel Mills; Axle Mills; Skelp Mills; Merchant Mills; Bar Mills; Wire Rod Mills; Light Structural Mills; Plate Mills; Hot Strip Mills; Compact Strip Mills; Cold Rolling Mills; Pipe Mills; Silicon Steel Mills; Boilers; Power Plants; Oxygen Plants; Producer Gas Plants; Auxiliary Shops; Losses; etc., where a new/ revamped/ rebuilt process line/ production unit is being / has been added and the additional energy consumed during its commissioning (i.e. till it attains 70% rated production) is included while reporting in Pro-forma.andSimilarly for Shops B, C, D, E, F ... ...Superscript ShB stands for Shop B, ShC stands for Shop C, etc.

SECShAAY	=	Specific Energy Consumption of the shop A during theAssessment Year, including energy consumed and product producedduring commissioning of a new/ revamped/ rebuilt process line/production unit, till it attains 70% of the capacity utilization,in Gcal/ t product of the shop A
TShAAY	=	Total thermal energy consumption during Assessment Year forcommissioning of a new/ revamped/ rebuilt process line/production unit, till it attains 70% of the capacity utilizationand the additional energy consumed is included in SECShAAY, inGcal.
EShAAY	=	Total electrical energy consumption during Assessment Year forcommissioning of a new/ revamped / rebuilt process line/production unit, till it attains 70% of the

		capacity utilizationand the additional energy consumed is included in SECShAAY, inMWh
TPShAAY	=	Total production of all shops producing same product as shopA, during Assessment Year, including the product produced duringcommissioning of a new/ revamped/ rebuilt process line/production unit, till it attains 70% of the capacity utilization,in t product of shop A
CPShAAY	=	Commissioning production of a new/ revamped/ rebuilt processline/ production unit, till it attains 70% of the capacityutilization, producing same product as shop A, during AssessmentYear, in t product of shop A
PRShAAY	=	Balanced production ratio of all shops producing same productas shop A,during Assessment Year, in t product of shop A/ t cs
SECShABY	=	Specific Energy Consumption of the shop A, during the BaselineYear, including energy consumed and product produced duringcommissioning of a new/ revamped/ rebuilt process line/production unit, till it attains 70% of the capacity utilization,in Gcal/ t product of the shop A
TShABY	=	Total thermal energy consumption during Baseline Year forcommissioning of a new/ revamped/ rebuilt process line/production unit, till it attains 70% of the capacity utilizationand the additional energy thus consumed is included in SECShABY,in Gcal.
EShABY	=	Total electrical energy consumption during Baseline Year forcommissioning of a new/ revamped/ rebuilt process line/production unit, till it attains 70% of the capacity utilizationand the additional energy thus consumed is included in SECShABY,in MWh
TPShABY	=	Total production of all shops producing same product as shopA, during Baseline Year, including the product produced duringcommissioning of a new/ revamped/ rebuilt process line/production unit, till it attains 70% of the capacity utilization,in t product of shop A
CPShABY	=	Commissioning production during Baseline Year, of a new/revamped/ rebuilt process line/ production unit, till it attains70% of the capacity utilization, producing same product as shopAand the additional production thus generated is included inSECShABY, in t product of shop A
PRShABY	=	Balanced production ratio of all shops producing same productas shop A, during Baseline Year, in t product of shop A/ t cs

7.5Unforeseen Circumstances. - Normalization is required for situations of the Energy system of a plant which are beyond the control of the Plant Management, if such situations adversely influence the plant's Specific Energy Consumption. These situations are termed as Unforeseen Circumstances.For normalization of energy consumed due to unforeseen circumstances in the Assessment Year, the additional energy consumed by the different shops and production made (if any) by the different shops during the period of unforeseen circumstances in the Assessment Year, will be subtracted from the total energy consumed and total production made by the concerned shops in the Assessment Year.Normalized Specific Energy Consumption for Unforeseen Circumstances to be subtracted in the assessment year will beN-SECUCAY = N-SECShAAY + N-SECShBAY + N-SECShCAY ... . and so on for different shopsWhere,-

N-SECUCAY = Normalized Specific Energy Consumption for unforeseencircumstances during assessment year in Gcal/tcs

N-SECShAAY = Normalized Specific Energy Consumption for unforeseencircumstances in Shop A during assessment year,in Gcal/tcs

= ([{ SECShAAY
– ([{SECShAAYx TPShAAY}-{TShAAY+ (2.4 x EShAAY) }]
/ [TPShAAY-PShAAY]) } x PRShAAY]
- [{ SECShABY
– ([{SECShABYx TPShABY}-{TShABY+ (2.4 x EShABY) }]
/ [TPShABY-PShABY]) }
x PRShABY]

N-SECShBAY = Normalized Specific Energy Consumption for unforeseencircumstances in Shop B during assessment year,in Gcal/tcs

= ([{ SECShBAY
– ([{ SECShBAYx TPShBAY}-{TShBAY+ (2.4 x EShBAY) }]
/ [TPShBAY-PShBAY]) } x PRShBAY]
- [{ SECShBBY
– ([{SECShBBYx TPShBBY}-{TShBBY+ (2.4 x EShBBY) }]
/ [TPShBBY-PShBBY]) }
x PRShBBY]

... ... and so on for shops C, D...Shops A, B, C, D, E ... ... are different shops of the plant, like Coke Ovens; Pellet Plants; Sintering Plants; Blast Furnaces; Corex Furnaces; DRI Kilns; HBI Furnaces; Calcining Plants, Steel Melting & Casting Shops; Slabbing Mills; Blooming Mills; Billet & Light Merchant Mills; Medium Merchant & Structural Mills; Rail, Beam, Section & Heavy Structural Mills;Wheel Mills; Axle Mills; Skelp Mills; Merchant Mills; Bar Mills; Wire Rod Mills; Light Structural Mills; Plate Mills; Hot Strip Mills; Compact Strip Mills; Cold Rolling Mills; Pipe Mills; Silicon Steel Mills; Boilers; Power Plants; Oxygen Plants; Producer Gas Plants; Auxiliary Shops; Losses; etc., where situations which are beyond the control of the Plant Management but adversely influencing the Specific Energy Consumption of the plant has occurred.and

SECShAAY = Specific Energy Consumption of the shop A during AssessmentYear, including energy consumed and product produced duringunforeseen circumstances, in Gcal/ t product of the shop A

TShAAY = Total thermal energy consumption during situations which arebeyond the control of the Plant Management but adverselyinfluencing the Specific Energy Consumption of the plant inAssessment Year and the additional thermal energy thus consumedis included in SECShAAY, in Gcal.

EShAAY = Total electrical energy consumption during situations whichare beyond the control of the Plant Management but adverselyinfluencing the Specific Energy Consumption of the plantinAssessment Year and the additional electrical energy thusconsumed is included in SECShAAY, in MWh

TPShAAY	=	Total production of all shops producing same product as shopA, during Assessment Year, including the product produced duringsituations which are beyond the control of the Plant Managementbut adversely influencing the Specific Energy Consumption of theplant, in t product of shop A
PShAAY	=	Production of same product as shop A during Assessment Year,in situations which are beyond the control of the PlantManagement but adversely influencing the Specific EnergyConsumption of the plant and the additional production thusgenerated is included in SECShAAY, in tproduct of shop A
PRShAAY	=	Balanced production ratio of all shops producing same productas shop A,during Assessment Year, in t product of shop A/ t cs
SECShABY	=	Specific Energy Consumption of the shop A, during the BaselineYear, including energy consumed and product produced duringunforeseen circumstances, in Gcal/ t product of the shop A
TShABY	=	Total thermal energy consumption during situations which arebeyond the control of the Plant Management but adverselyinfluencing the Specific Energy Consumption of the plantinBaseline Year and the additional thermal energy thus consumed isincluded in SECShABY, in Gcal.
EShABY	=	Total electrical energy consumption during situations whichare beyond the control of the Plant Management but adverselyinfluencing the Specific Energy Consumption of the plantinBaseline Year and the additional electrical energy thus consumedis included in SECShABY, in MWh
TPShABY	=	Total production of all shops producing same product as shopA, during Baseline Year, including the product produced duringsituations which are beyond the control of the Plant Managementbut adversely influencing the Specific Energy Consumption of theplant, in t product of shop A
PShABY	=	Production of same product as shop A during Baseline Year, insituations which are beyond the control of the Plant Managementbut adversely influencing the Specific Energy Consumption of theplant and the additional production thus generated is included inSECShABY, in t product of shop A
PRShABY	=	Balanced production ratio of all shops producing same productas shop A, during Baseline Year, in t product of shop A/ t cs

Similarly for Shops B, C, D, E, F ... ...Superscript ShB stands for Shop B, ShC stands for Shop C, etc.7.6Renewable Energy. - The quantity of exported power (partially or fully) on which Renewable Energy Certificates have been earned by Designated Consumer in the assessment year under REC mechanism shall be treated as Exported power and Normalization will apply. However, the normalized power export or deemed injection will not qualify for issue of Energy Saving Certificates under PAT Scheme.The quantity of exported power (partially or fully) from Renewable energy which has been sold at a preferential tariff by the Designated consumer in the assessment year under REC mechanism shall be treated as Exported power. However, the normalized power export will not qualify for issue of Energy Saving Certificates under PAT Scheme.(i)Target Saving to be achieved (PAT obligation) (Gcal) = Equivalent Major Product Output as per PAT scheme Notification (Tonnes) in BY x Target Saving to be achieved (PAT obligation) (TOE/Te) x 10(ii)Target Saving achieved in assessment year (Gcal)= [Gate to Gate Specific Energy Consumption in BY

(TOE/Te)-Normalized Gate to Gate Specific Energy Consumption in AY (TOE/Te)] x Equivalent Major Product Output in tonnes as per PAT scheme Notification (Tonnes) x10(iii)Additional Saving achieved (After PAT obligation) (Gcal) = Target Saving Achieved in AY (Gcal) - Target Saving to be achieved (PAT obligation) in BY (Gcal)Thermal Energy Conversion for REC and Preferential Tariff, if Steam Turbine Heat Rate in assessment year = 0(iv)Thermal energy conversion for REC and Preferential tariff (Gcal)= [Quantum of Renewable Energy Certificates (REC) obtained as a Renewal Energy Generator (Solar & Non-Solar)(MWh) + Quantum of Energy sold under preferential tariff (MWh)] x 2717/1000a. Thermal Energy Conversion for REC and Preferential Tariff, if Steam Turbine Heat Rate in assessment year ☐0(v)Thermal energy conversion for REC and Preferential tariff (Gcal)= [Quantum of Renewable Energy Certificates (REC) obtained as a Renewal Energy Generator (Solar & Non-Solar)(MWh) + Quantum of Energy sold under preferential tariff (MWh)] x Steam Turbine Net Heat Rate in AY (kcal/kwh)/1000(a)If, Additional Saving achieved (After PAT obligation) (Gcal)<= 0,Thermal Energy to be normalized for REC and preferential tariff power sell under REC mechanism (TOE) = 0,(b)If, Additional Saving achieved (After PAT obligation) (Gcal)>0, and Thermal energy conversion for REC and Preferential tariff (Gcal)>Additional Saving achieved (After PAT obligation) (Gcal) thenThermal Energy to be normalized for REC and preferential tariff power sell under REC mechanism (TOE) =Additional Saving achieved (After PAT obligation) (Gcal)(c)If, Additional Saving achieved (After PAT obligation) (Gcal)>0, and Thermal energy conversion for REC and Preferential tariff (Gcal)< Additional Saving achieved (After PAT obligation) (Gcal) thenThermal Energy to be normalized for REC and preferential tariff power sell under REC mechanism (TOE) =Thermal energy conversion for REC and Preferential tariff (Gcal)The Normalized Specific Energy Consumption to be deducted for Environmental Concern/Biomass or Alternate Fuel Unavailability/ Project Activities/Additional of Newline or Unit/Unforeseen Circumstances in the assessment year will beN-SECNOAY= N-SECECAY + N-SECBAFAY + N-SECPAAY + N-SECNLUAY + N-SECUCAY in Gcal/ tcsWhere,-

N-SECNOAY	=	Normalized Specific Energy Consumption for EnvironmentalConcern/Biomass or Alternate Fuel Unavailability/ ProjectActivities/Additional of Newline or Unit/Unforeseen Circumstances
N-SECECAY	=	Normalized Specific Energy Consumption for EnvironmentalConcern, during assessment year, due to major change inGovernment Policy on Environment Standard,in Gcal/tcs
N-SECBAFAY	=	Normalized Specific Energy Consumption for Biomass/ AlternateFuel Unavailability during Assessment Year in Gcal/tcs
N-SECPAAY	=	Normalized Specific Energy Consumption for construction/rebuilding phase or for project activities during assessment yearin Gcal/tcs
N-SECNLUAY	=	Normalized Specific Energy Consumption for new/ revamped/rebuilt process line/ production unit during assessment year, inGcal/tcs
N-SECUCAY	=	Normalized Specific Energy Consumption for unforeseencircumstances during assessment year in Gcal/tcs

8. Gate to Gate Specific Energy Consumption.

Gate to Gate Specific Energy Consumption in Baseline year =| Total Energy Consumption (Gcal)Total equivalent production (Tonnes)

N-SECAY = A-SECAY - [N-SECCAAY + N-SECCASAY + N-SECCABAY + N-SECCMAY + N-SECPSAY + N-SECPEAY + N- SECPRCAY + N-SECPMAY + N-SECSSAY + N-SECNOAY]Where,

N-SECAY	=	Normalized Specific Energy Consumption in the assessment yearin Gcal/tcs
A-SECAY	=	Actual Specific Energy Consumption in the Assessment year inGcal/tcs
N-SECCAAY	=	Normalized Specific Energy Consumption for Coal and Coke Ashin Assessment Year in Gcal/tcs
N-SECASAY	=	Normalized Specific Energy Consumption for Alumina inSinter/Pallet during assessment year (Gcal/tcs)
N-SECABAY	=	Normalized Specific Energy Consumption for Alumina in BlastFurnace Burden during assessment year (Gcal/tcs)
N-SECCMAY	=	Coke-Mix normalized Specific Energy Consumption in AssessmentYear in Gcal/tcs
N-SECPSAY	=	Power Source Mix Normalized Specific Energy Consumption inAssessment Year in Gcal/tcs
N-SECPEAY	=	Power export Normalized Specific Energy Consumption inAssessment Year in Gcal/tcs
N–SECPRCAY	=	Normalization SEC for process route change for assessment yearin Gcal/tcs
N-SECPMAY	=	Normalized Specific Energy Consumption for Product Mix to bededucted in the assessment year in Gcal/tcs
N-SECSSAY	=	Normalized Specific Energy Consumption BF Start/Stop inassessment year in Gcal/tcs
N-SECNOAY	=	Normalized Specific Energy Consumption for EnvironmentalConcern/Biomass or Alternate Fuel Unavailability/ ProjectActivities/Additional of Newline or Unit/Unforeseen Circumstances

iii. Normalized Specific Energy Consumption after REC Compliance in assessment year (TOE/ TCs) =| Normalized Energy Consumption after REC Compliance (Gcal)Total equivalent production (Tonnes) x 10

i. Normalized Total Specific Energy Consumption after REC compliance in the assessment year (toe/tcs) = N-SECAY/10 (toe/tcs) + Normalized Specific Energy Consumption after REC compliance in assessment year (toe/tcs)ii. Baseline Normalization (toe/tcs) = Gate to Gate Specific Energy Consumption in Baseline year (toe/tcs) - Notified Specific Energy Consumption in Baseline Year (toe/tcs)

vi. Normalized Gate to Gate Specific Energy Consumption after REC Compliance in assessment year (TOE/ TCs) =| Normalized Total Energy Consumption after REC Compliance (Million kcal)Total equivalent production (Tonnes) x 10

7. Se2: Iron and Steel (Sponge Iron).

Normalization factors for the following areas have been developed in Sponge Iron Sub-Sector,

1. Start/Stop

a. Kiln Start/Stop (Natural Calamity/ Rioting/ Social Unrest/ Labor Strike/ Lockouts)

2. Product Equivalent

3. Power Mix (Imported & Exported from/ to the grid and self-generation from the captive power plant)

4. Fuel Quality in CPP and Cogen.

5. Scrap Use

6. Normalization Others

6.1Environmental Concern (Additional Environmental Equipment requirement due to major change in government policy on Environment)6.2Biomass/Alternate Fuel Unavailability6.3Construction Phase or Project Activities6.4Addition of New Line/Unit (In Process & Power Generation)6.5Unforeseen Circumstances6.6Renewable Energy

7. Gate to Gate Specific Energy Consumption

7.1Start/Stop. - (i) Normalization of Kiln Cold Start due to external factor for Thermal energy consumption. - Thermal energy due to additional Cold Start in assessment year w.r.t. the baseline year, normalized in the assessment year for Kiln thermal energy consumption is to be calculated as:-Notional Energy to be subtracted w.r.t. additional Cold startup for Thermal Energy Consumption [Million kcal] =Thermal energy Consumption due to Cold Start in AY (Million kcal) - Thermal energy Consumption due to Cold Start in BY(Million kcal)Where,-AY = Assessment yearBY = Baseline YearTPH= Tonnes per hour(ii)Normalization of Kiln Cold Start due to external factor for Electrical energy consumption. - Electrical energy due to additional Cold Start in assessment year of Kiln w.r.t. the baseline year, normalized in the assessment year for Kiln electrical energy consumption is to be calculated as:-Notional Energy to be subtracted w.r.t. additional Kiln Cold startup for Electrical Energy Consumption [Million kcal] = [Electrical Energy Consumption for Cold start in AY (Lakh kWh)- Electrical Energy Consumption for Cold start in BY (Lakh kWh)] x Weighted Heat Rate (kcal/kWh)/10Where,-AY = Assessment yearBY = Baseline Year(iii)Normalization of Kiln Hot to Cold Stop due to external factor for Electrical energy consumption. - Electrical energy due to additional Hot to Cold Stop in assessment year of Kiln w.r.t. the baseline year, normalized in the assessment year for Kiln electrical energy consumption is to be calculated as:-Notional Energy to be subtracted w.r.t. additional Kiln Cold to Cold Stop for Electrical Energy Consumption [Million kcal] = [Electrical Energy Consumption for Cold stop in AY (Lakh kWh)- Electrical Energy Consumption for Cold stop in BY (Lakh kWh)] x Weighted Heat Rate (kcal/kWh)/10Where,-AY = Assessment yearBY = Baseline YearNotional Energy to be subtracted in the assessment year for Kiln Start/Stop due to external factor [Million kcal] = Notional Energy to be subtracted w.r.t. additional Cold startup for Thermal Energy Consumption [Million kcal] + Notional Energy to be subtracted w.r.t. additional Kiln Cold startup for Electrical Energy Consumption [Million kcal]+ Notional Energy to be subtracted w.r.t. additional Kiln Cold to Cold Stop for Electrical Energy Consumption [Million kcal]The above formula stand for individual kiln. However, the notional thermal energy for Normalization on Kiln Start/Stop will be calculated for all the installed kiln of plant and added to get the Net notional thermal energy reduction figureTotal Energy to be subtracted due to Start/Stop for all the kilns in the assessment year [Million kcal] = □5k=1 Notional Energy to be subtracted in the assessment year for Kiln Start/ Stop due to external factor [Million Kcal]7.2Product EquivalentConversion Factor for Minor to Major Product. - The normalization of equivalent product from minor product to major product will be taken care by considering the conversion factor for each minor product. Each minor product's conversion factors will be same in Baseline Year (BY) and Assessment Year (AY) will be considered same and is given as:A. SI or (SI with SMS) or (SI with+Others) Plant. - The Major product for such type of plant = Sponge Iron (SI)

1. Sponge Iron to Equivalent Major Product Conversion. - Conversion Factor for BY(CFBY) = SEC of SI in BY(kcal/tonne)/SEC of Major Product in BY (kcal/tonne)

Conversion Factor for AY(CFAY) = SEC of SI in BY(kcal/tonne)/SEC of Major Product in BY (kcal/tonne)(i)SI to Major Product in BY (Tonnes) = CFBY X Production of SI in BY (Tonnes)(ii)SI to Major Product in AY (Tonnes) = CFAY X Production of SI in AY (Tonnes)Where,-CFBY = Conversion Factor for Baseline YearCFAY = Conversion Factor for Assessment YearBY = Baseline YearAY = Assessment YearSI = Sponge Iron

2. Steel Melting Shop Equivalent to Major Product Conversion. - Conversion Factor in BY(CFBY) = SEC of SMS in BY (kcal/tonne) /SEC of Major Product in BY(kcal/tonne)

Conversion Factor in AY(CFAY) = SEC of SMS in AY (kcal/tonne) /SEC of Major Product in BY (kcal/tonne)i. SMS to Major Product in BY (Tonnes) = CFBY X Production of SMS in BY (Tonnes)If SMS production in BY = 0; thenii. SMS to Major Product in AY (Tonnes) = CFAY X Production of SMS in AY (Tonnes)If SMS Production in BY □0, theniii. SMS to Major Product in AY (Tonnes) = CFBY X Production of SMS in AY (Tonnes)Where-,CFBY = Conversion Factor in Baseline YearCFAY = Conversion Factor in Baseline YearBY = Baseline YearAY = Assessment YearSMS = Steel Melting Shop

3. Ferro Chrome to Equivalent Major Product Conversion. - Conversion factor in BY(CFBY) = SEC of FeCh in BY (kcal/tonne)/ SEC of Major Product in BY (kcal/tonne)

Conversion Factor in AY (CFAY) = SEC of FeCh in AY (kcal/tonne)/ SEC of Major Product in BY (kcal/tonne)(i)FeCh to Major Product in BY (Tonnes) = CFBY X Production of FeCh in BY (Tonnes)If Ferro Chrome Production in BY = 0; then(ii)FeCh to Major Product in AY (Tonnes) = CFAY X Production of FeCh in AY (Tonnes)If FeCh Production in BY □0, then(iii)FeCh to Major Product in AY (Tonnes) = CFBY X Production of FeCh in AY (Tonnes)Where,-CFBY = Conversion Factor in Baseline YearCFAY = Conversion Factor in Baseline YearBY = Baseline YearAY = Assessment YearFeCh = Ferro Chrome

4. FeMn to Equivalent Major Product Conversion. - Conversion factor in BY (CFBY) = SEC of FeMn in BY (kcal/tonne)/ SEC of Major Product in BY(kcal/tonne)

Conversion Factor in AY (CFAY) = SEC of FeMn in AY (kcal/tonne)/ SEC of Major Product in BY (kcal/tonne)(i)FeMn to Major Product in BY (Tonnes) = CFBY X Production of FeMn in BY (Tonnes)If FeMn Production in BY = 0; then(ii)FeMn to Major Product in AY (Tonnes) = CFAY X Production of FeMn in AY (Tonnes)If FeMn Production in BY □0, then(iii)FeMn to Major Product in AY (Tonnes) = CFBY X Production of FeMn in AY (Tonnes)Where,-CFBY = Conversion Factor in Baseline YearCFAY = Conversion Factor in Baseline YearBY = Baseline YearAY = Assessment YearFeMn = Ferro Manganese

5. SiMn to Equivalent Major Product Conversion. - Conversion factor in BY (CFBY) = SEC of SiMn in BY (kcal/tonne)/ SEC of Major Product in BY (kcal/tonne)

Conversion Factor in AY (CFAY) = SEC of SiMn in AY (kcal/tonne)/ SEC of Major Product in BY (kcal/tonne)(i)SiMn to Major Product in BY(Tonnes) = CFBY X Production of SiMn in BY (Tonnes)If SiMn Production in BY = 0; then(ii)SiMn to Major Product in AY (Tonnes) = CFAY X Production of SiMn in AY (Tonnes)If SiMn Production in BY □0, then(iii)SiMn to Major Product in AY (Tonnes) = CFBY X Production of SiMn in AY (Tonnes)Where,-CFBY = Conversion Factor in Baseline YearCFAY = Conversion Factor in Baseline YearBY = Baseline YearAY = Assessment YearSiMn = Silico Manganese

6. Pig Iron to Equivalent Major Product Conversion. - Conversion factor in BY (CFBY) = SEC of PI in BY (kcal/tonne)/ SEC of Major Product in BY (kcal/tonne)

Conversion Factor in AY (CFAY) = SEC of PI in AY (kcal/tonne)/ SEC of Major Product in BY (kcal/tonne)(i)PI to Major Product in BY (Tonnes) = CFBY X Production of PI in BY (Tonnes)If Pig iron Production in BY = 0; then(ii)Pig Iron to Major Product in AY (Tonnes) = CFAY X Production of Pig Iron in AY (Tonnes)If Pig Iron Production in BY □0, then(iii)Pig iron to Major Product in AY (Tonnes) = CFBY X Production of Pig Iron in AY (Tonnes)Where,-CFBY = Conversion Factor in Baseline YearCFAY = Conversion Factor in Baseline YearBY = Baseline YearAY = Assessment YearPI = Pig Iron

7. Ferro Silicon to Equivalent Major Product Conversion. - Conversion factor in BY (CFBY) = SEC of FeSi in BY (kcal/tonne)/ SEC of Major Product in BY (kcal/tonne)

Conversion Factor in AY (CFAY) = SEC of FeSi in AY (kcal/tonne)/ SEC of Major Product in BY (kcal/tonne)(i)FeSi to Major Product in BY (Tonnes) = CFBY X Production of FeSi in BY (Tonnes)If Ferro Silicon Production in BY = 0; then(ii)FeSi to Major Product in AY (Tonnes) = CFAY X Production of FeSi in AY (Tonnes)If Ferro Silicon Production in BY □0, then(iii)FeSi to Major Product in AY (Tonnes) = CFBY X Production of FeSi in AY (Tonnes)Where,-CFBY = Conversion Factor in Baseline YearCFAY = Conversion Factor in Baseline YearBY = Baseline YearAY = Assessment YearFeSi = Ferrous Silicon

8. Rolling Mill to Equivalent Major Product Conversion. - Conversion factor in BY (CFBY) = SEC of RM in BY (kcal/tonne)/ SEC of Major Production BY (kcal/tonne)

Conversion Factor in AY (CFAY) = SEC of RM in AY (kcal/tonne)/ SEC of Major Product in BY (kcal/tonne)(i)RM to Major Product in BY (Tonnes) = CFBY X Production of RM in BY (Tonnes)If Rolling Mill Production in BY = 0; then(ii)RM to Major Product in AY (Tonnes) = CFAY X Production of RMi in AY (Tonnes)If Rolling Mill Production in BY □0, then(iii)RM to Major Product in AY (Tonnes) = CFBY X Production of RM in AY (Tonnes)Where,-CFBY = Conversion Factor in Baseline YearCFAY = Conversion Factor in Baseline YearBY = Baseline YearAY = Assessment YearRM = Rolling Mill

9. Total Equivalent Major Product (Sponge Iron) for AY and BY.

TotalEquivalent Product (SI) for BY

=SI to EMP in BY + SMS to EMP in BY + FeCh to EMP in BY + FeMnto EMP in BY + SiMn to EMP in BY + PI to EMP in BY + FeSi to EMPin BY + Rolling Mill to EMP in BY

TotalEquivalent Product (SI) for AY

=SI to EMP in AY + SMS to EMP in AY + FeCh to EMP in AY + FeMnto EMP in AY + SiMn to EMP in AY + PI to EMP in AY + FeSi to EMPin AY + Rolling Mill to EMP in AY

Where,-SI = Sponge Iron (Tonnes)EMP = Equivalent Major Product (Tonnes)[Sponge Iron]SMS = Steel Melting Shop (Tonnes)FeCh = Ferro Chrome (Tonnes)FeMn = Ferro Manganese (Tonnes)SiMn = Silico Manganese (Tonnes)PI = Pig Iron (Tonnes)FeSi = Ferro Silicon (Tonnes)B. Ferro Alloys Plant. - The Major product for such type of plant = SiMn

1. Ferro Chrome to Equivalent Major Product. - Conversion Factor in BY (CFBY) = SEC of FeCh in BY (kcal/ tonne)/ SEC of Major Product in BY (kcal/ tonne)

Conversion Factor in AY (CFAY) = SEC of FeCh in AY (kcal/ tonne)/ SEC of Major Product in BY (kcal/ tonne)(i)FeCh to Equivalent Major Product in BY(Tonnes) = CFBY X Production of FeCh in BY(Tonnes)If Ferro Chrome Production in BY =0; then(ii)FeCh to Major Product in AY (Tonnes)= CFAY X Production of FeCh in AY (Tonnes)If Ferro Chrome Production in BY □0, then(iii)FeCh to Major Product in AY (Tonnes) = CFBY X Production of FeCh in AY (Tonnes)Where,-CFBY = Conversion Factor in Baseline YearCFAY = Conversion Factor in Baseline YearSEC = Specific Energy Consumption (kcal/Tonne)FeCh = Ferro Chrome (Tonne)

2. FeMn to Equivalent Major Product. - Conversion Factor in BY (CFBY) = SEC of FeMn in BY (kcal/tonne) /SEC of Major Product in BY (kcal/tonne)

Conversion Factor in AY (CFAY) = SEC of FeMn in AY (kcal/tonne) /SEC of Major Product in BY (kcal/tonne)(i)FeMn to Equivalent Major Product in BY(Tonnes) = CF X Production of FeMn in BY(Tonnes)If FeMn Production in BY = 0; then(ii)FeMn to Major Product in AY (Tonnes) = CFAY X Production of FeMn in AY (Tonnes)If FeMn Production in BY □0, then(iii)FeMn to Major Product in AY (Tonnes) = CFBY X Production of FeMn in AY (Tonnes)Where,CFBY = Conversion Factor in Baseline YearCFAY = Conversion Factor in Baseline YearSEC = Specific Energy Consumption (kcal/Tonne)FeMn = Ferro Manganese (Tonne)

3. SiMn to Equivalent Major Product. - Conversion Factor in BY (CFBY) = SEC of SiMn in BY (kcal/tonne) /SEC of Major Product in BY (kcal/tonne)

Conversion Factor in AY (CFAY) = SEC of SiMn in AY (kcal/tonne) /SEC of Major Product in BY (kcal/tonne)(i)SiMn to Equivalent Major Product in BY(Tonnes) = CF X Production of SiMn in BY(Tonnes)If SiMn Production in BY = 0; then(ii)SiMn to Major Product in AY (Tonnes)= CFAY X Production of SiMn in AY (Tonnes)If FeMn Production in BY □0, then(iii)SiMn to Major Product in AY (Tonnes) = CFBY X Production of SiMn in AY (Tonnes)Where,-CFBY = Conversion Factor in Baseline YearCFAY = Conversion Factor in Baseline YearSEC = Specific Energy Consumption (kcal/Tonne)SiMn = Silico Manganese (Tonne)

4. Ferro Silicon to Major product. - Conversion Factor in BY (CFBY) = SEC of FeSi in BY (kcal/tonne) /SEC of Major Product in BY (kcal/tonne)

Conversion Factor in AY (CFAY) = SEC of FeSi in AY (kcal/tonne) /SEC of Major Product in BY (kcal/tonne)(i)FeSi to Equivalent Major Product in BY(Tonnes) = CF X Production of FeSi in BY(Tonnes)If FeSi Production in BY =0; then(ii)FeSi to Major Product in AY (Tonnes)= CFAY X Production of FeSi in AY (Tonnes)If FeSi Production in BY □0, then(iii)FeSi to Major Product in AY (Tonnes) = CFBY X Production of FeSi in AY (Tonnes)Where,-CFBY = Conversion Factor in

Baseline YearCFAY = Conversion Factor in Baseline YearSEC = Specific Energy Consumption (kcal/Tonne)FeSi = Ferro Silicon (Tonne)

5. Pig Iron to Major Product = [(SEC of PI/ SEC of MP) X Production of PI]

Conversion Factor in BY (CFBY) = SEC of PI in BY (kcal/tonne)/ SEC of Major Product in BY (kcal/tonne)Conversion Factor in AY (CFAY) = SEC of PI in AY (kcal/tonne)/ SEC of Major Product in BY (kcal/tonne)(i)PI to Equivalent Major Product in BY (Tonnes) = CF X Production of PI in BY(Tonnes)If Pig Iron Production in BY = 0; then(ii)PI to Major Product in AY (Tonnes)= CFAY X Production of PI in AY (Tonnes)If Pig Iron Production in BY □0, then(iii)PI to Major Product in AY (Tonnes) = CFBY X Production of PI in AY (Tonnes)Where,-CFBY = Conversion Factor in Baseline YearCFAY = Conversion Factor in Baseline YearSEC = Specific Energy Consumption (kcal/Tonne)PI = Pig Iron (Tonne)Total Equivalent Major Product (SiMn) for BY and AY

TotalEquivalent Product (SiMn) in the Baseline Year (Tonnes)

=FeCH to EMP in BY + FeMn to EMP for BY + SiMn to EMP for BY + FeSi toEMP for BY + PI to EMP for BY

TotalEquivalent Product (SiMn) in the Baseline Year (Tonnes)

=FeCH to EMP in AY + FeMn to EMP for AY + SiMn to EMP for AY + FeSitoEMP for AY + PI to EMP for AY

Where,-SiMn = Silico ManganeseFeCh = Ferro ChromeEMP = Equivalent Major Product[SiMn]FeMn = Ferro ManganeseSiMn = Silicon ManganeseFeSi = Ferro SiliconPI = Pig IronC. Mini Blast Furnace Plant. - The Major product for such type of plant = Hot Metal

1. Steel Melting Shop to Equivalent Major Product. - Conversion Factor in BY (CFBY) = SEC of SMS in BY (kcal/tonne) /SEC of Major Product in BY (kcal/tonne)

Conversion Factor in AY (CFAY) = SEC of SMS in AY (kcal/tonne) /SEC of Major Product in BY (kcal/tonne)(i)SMS to Equivalent Major Product in BY(Tonnes) = CF X Production of SMS in BY(Tonnes)If SMS Production in BY = 0; then(ii)SMS to Major Product in AY (Tonnes) = CFAY X Production of SMS in AY (Tonnes)If SMS Production in BY □0, then(iii)SMS to Major Product in AY (Tonnes) = CFBY X Production of SMS in AY (Tonnes)Where,-CFBY = Conversion Factor in Baseline YearCFAY = Conversion Factor in Baseline YearSEC = Specific Energy Consumption (kcal/Tonne)SMS = Steel Melting Shop (Tonne)

2. Rolling Mill to Equivalent Major Product. - Conversion Factor in BY (CFBY) = SEC of RM in BY (kcal/tonne) /SEC of Major Product in BY (kcal/tonne)

Conversion Factor in AY (CFAY) = SEC of RM in AY (kcal/tonne) /SEC of Major Product in BY (kcal/tonne)(i)RM to Equivalent Major Product in BY(Tonnes) = CF X Production of RM in BY(Tonnes)If Rolling Mill Production in BY = 0; then(ii)RM to Major Product in AY (Tonnes)=

CFAY X Production of RM in AY (Tonnes)If Rolling Mill Production in BY □0, then(iii)RM to Major Product in AY (Tonnes) = CFBY X Production of RM in AY (Tonnes)Where,-CFBY = Conversion Factor in Baseline YearCFAY = Conversion Factor in Baseline YearSEC = Specific Energy Consumption (kcal/Tonne)RM = Rolling Mill (Tonne)

3. Hot Metal to Equivalent Major Product. - Conversion Factor in BY (CFBY) = SEC up to HM/PI in BY (kcal/tonne) /SEC of Major Product in BY (kcal/tonne)

Conversion Factor in AY (CFAY) = SEC up to HM/PI in AY (kcal/tonne) /SEC of Major Product in BY (kcal/tonne)(i)HM/PI to Equivalent Major Product in BY(Tonnes) = CF X Production of HM/PI in BY(Tonnes)If Hot Metal/Pig Iron Production in BY = 0; then(ii)HM/PI to Major Product in AY (Tonnes) = CFAY X Production of HM/PI in AY (Tonnes)If Hot Metal/Pig Iron Production in BY □ 0, then(iii)HM/PI to Major Product in AY (Tonnes) = CFBY X Production of HM/PI in AY (Tonnes)Where,-CFBY = Conversion Factor in Baseline YearCFAY = Conversion Factor in Baseline YearSEC = Specific Energy Consumption (kcal/Tonne)HM = Hot Metal Mill (Tonne)Total Equivalent Product (Hot Metal/Pig Iron) for BY and AY

TotalEquivalent Major Product (Hot Metal/ Pig Iron) for BY (Tonnes)

=SMS to EMP for BY + RM to EMP for BY + HM to EMP for BY

TotalEquivalent Major Product (Hot Metal/ Pig Iron) for AY (Tonnes)

=SMS to EMP for AY + RM to EMP for AY + HM to EMP for AY

Where,-SMS = Steel Melting Shop (Tonne)PI = Pig Iron (Tonne)RM = Rolling Mill (Tonne)HM = Hot Metal (Tonne)EMP = Equivalent Major Product[4. Sponge Iron (SI) to Equivalent Major Product:Conversion Factor in BY (CFBY) = SEC of SI in BY (kcal/tonne) /SEC of Major Product in BY (kcal/tonne);Conversion Factor in AY (CFAY) = SEC of SI in AY (kcal/tonne) /SEC of Major Product in BY (kcal/tonne);(iii)SI to Equivalent Major Product in BY(Tonnes) = CF X Production of SI in BY(Tonnes)If SI Production in BY =0; then(ii)SI to Major Product in AY (Tonnes)= CFAY X Production of SI in AY (Tonnes)If SI Production in BY□0, then(iii)SI to Major Product in AY (Tonnes) = CFBY X Production of SI in AY (Tonnes)Where:CFBY = Conversion Factor in Baseline YearCFAY = Conversion Factor in Assessment YearSEC = Specific Energy Consumption (kcal/Tonne)SI = Sponge Iron;

5. Ferro Chrome to Equivalent Major Product:

Conversion Factor in BY (CFBY) = SEC of FeCh in BY (kcal/tonne) /SEC of Major Product in BY (kcal/tonne);Conversion Factor in AY (CFAY) = SEC of FeCh in AY (kcal/tonne) /SEC of Major Product in BY (kcal/tonne);(i)FeCh to Equivalent Major Product in BY(Tonnes) = CF X Production of FeCh in BY(Tonnes)If FeCh Production in BY =0; then(ii)FeCh to Major Product in AY (Tonnes)= CFAY X Production of FeCh in AY (Tonnes)If SMS Production in BY□0, then(iii)FeCh to Major Product in AY (Tonnes) = CFBY X Production of FeCh in AY (Tonnes)Where:CFBY = Conversion Factor in Baseline YearCFAY = Conversion Factor in Assessment YearSEC = Specific Energy Consumption (kcal/Tonne)FeCh = Ferro Chrome (Tonne)Total Equivalent Product (Hot Metal/Pig Iron) for BY and AYFor Baseline Year

Total Equivalent Major Product (Hot Metal/PigIron) for BY (Tonnes)=SI to EMP + FeCh to EMP + SMS to EMP for BY+ RM to EMP for BY+HM to EMP for BY

For Assessment Year

Total Equivalent Major Product (Hot Metal/Pig Iron) for AY (Tonnes) = SI to EMP + FeCh to EMP +SMS to EMP for AY + RM to EMP for AY+ HM to EMP for AY

Where:BY= Baseline YearAY=Assessment YearSI = Sponge IronFeCh = Ferro ChromeSMS = Steel Melting Shop (Tonne)PI = Pig Iron (Tonne)RM = Rolling Mill (Tonne)HM = Hot Metal (Tonne)EMP = Equivalent Major Product.] [Inserted by Notification G.S.R. 409(E), dated 26.4.2018 (w.e.f. 30.3.2017).]D. Rolling Mill Plant. - The Major product for such type of plant = Rolling Mill I ProductionThe higher production among the Rolling Mills 1-3 should be filled in Rolling Mill-1 for making it as a major product

1. Rolling Mill-1 to Equivalent Major Product = [(SEC of RM-1 / SEC of MP) X Production of RM- 1

Conversion Factor in BY (CFBY) = SEC of RM-1 in BY (kcal/tonne) /SEC of Major Product in BY (kcal/tonne)Conversion Factor in AY (CFAY) = SEC of RM-1 in AY (kcal/tonne) /SEC of Major Product in BY (kcal/tonne)(i)RM-1 to Equivalent Major Product in BY (Tonnes)= CF X Production of RM-1 in BY(Tonnes)If Rolling Mill-1 Production in BY = 0; then(ii)Rolling Mill-1 to Major Product in AY (Tonnes)= CFAY X Production of RM-1 in AY (Tonnes)If Rolling Mill-1 Production in BY ☐0; then(iii)RM-1 to Major Product in AY (Tonnes) = CFBY X Production of RM-1 in AY (Tonnes)Where,-CFBY = Conversion Factor in Baseline YearCFAY = Conversion Factor in Assessment YearSEC = Specific Energy Consumption (kcal/Tonne)RM-1 = Rolling Mill-1 (Tonne)

2. Rolling Mill-2 to Major Product. - Conversion Factor in BY (CFBY) = SEC of RM-2 in BY (kcal/tonne)/ SEC of Major Product in BY (kcal/tonne)

Conversion Factor in AY (CFAY) = SEC of RM-2 in AY (kcal/tonne) /SEC of Major Product in BY (kcal/tonne)(i)RM-2 to Equivalent Major Product in BY(Tonnes) = CF X Production of RM-2 in BY(Tonnes)If Rolling Mill-2 Production in BY = 0; then(ii)Rolling Mill-2 to Major Product in AY (Tonnes)= CFAY X Production of RM-2 in AY (Tonnes)If Rolling Mill-2 Production in BY ☐0; then(iii)RM-2 to Major Product in AY (Tonnes) = CFBY X Production of RM-2 in AY (Tonnes)Where,-CFBY = Conversion Factor in Baseline YearCFAY = Conversion Factor in Assessment YearSEC = Specific Energy Consumption (kcal/Tonne)RM-2 = Rolling Mill-2 (Tonne)

3. Rolling Mill-3 to Major Product. - Conversion Factor in BY (CFBY) = SEC of RM-3 in BY (kcal/tonne) /SEC of Major Product in BY (kcal/tonne)

Conversion Factor in AY (CFAY) = SEC of RM-2 in AY (kcal/tonne) /SEC of Major Product in BY (kcal/tonne)(i)RM-3 to Equivalent Major Product in BY(Tonnes) = CF X Production of RM-3 in BY (Tonnes)If Rolling Mill-3 Production in BY = 0; then(ii)Rolling Mill-3 to Major Product in AY (Tonnes) = CFAY X Production of RM-3 in AY (Tonnes)If Rolling Mill-3 Production in BY ☐0; then(iii)RM-3 to Major Product in AY (Tonnes) = CFBY X Production of RM-3 in AY

(Tonnes)Where,-CFBY = Conversion Factor in Baseline YearCFAY = Conversion Factor in Assessment YearSEC = Specific Energy Consumption (kcal/Tonne)RM-3 = Rolling Mill-3 (Tonne)Total Equivalent Rolling Mill Product for BY and AY

TotalEquivalent Rolling Mill Product for BY (Tonnes)

=RMI-1 to EMP for BY + RMI-1 to EMP for BY + RMI-1 to EMP for BY + ...

TotalEquivalent Rolling Mill Product for AY (Tonnes)

=RMI-1 to EMP for AY + RMI-1 to EMP for AY + RMI-1 to EMP for AY + ...

Where,-RM-1 = Rolling Mill-1RM-2 = Rolling Mill-2RM-3 = Rolling Mill-3EMP = Equivalent Major ProductNote: Additional Mill data sheets are to be attached in the excel form as per above data entry format7.3Intermediary Product.A. Sponge iron (SI)A.1. Stock. - a. Stock in BY = SI Closing Stock in BY - SI Opening Stock in BYb. Stock in AY = SI Closing Stock in AY - SI Opening Stock in AYWhere,BY = Baseline YearAY = Assessment YearSI = Sponge IronA.2. Total Sponge Iron Import. - 1. In Baseline Yeara. If, Stock in BY < 0, Total SI Import in BY = Import SI in BY - Stock in BYb. If , Stock in BY > 0, Total SI Import in BY = Import SI in BY

2. In Assessment Year.

a. If, Stock in AY < 0, Total SI Import in AY = Import SI in AY - Stock in AYb. If , Stock in AY > 0, Total SI Import in AY = Import SI in AYWhere,-BY = Baseline YearAY = Assessment YearSI = Sponge IronA.3. Total Sponge Iron Export. - (1) In Baseline Yeara. If, Stock in BY > 0, Total SI Export in BY = Export SI in BY + Stock in BYb. If, Stock in BY < 0, Total SI Export in BY = Export SI in BY(2)In Assessment Yeara. If, Stock in AY > 0, Total SI Export in AY = Export SI in AY + Stock in AYb. If, Stock in AY < 0, Total SI Export in AY = Export SI in AYWhere,-BY = Baseline YearAY = Assessment YearSI = Sponge IronB. Dolachar:B.1. Stock. - (a) Stock in BY = Dolachar Closing Stock in BY - Dolachar Opening Stock in BY(b)Stock in AY = Dolachar Closing Stock in AY - Dolachar Opening Stock in AYWhere,-BY = Baseline YearAY = Assessment YearSI = Sponge IronB.2. Total Dolachar Import. - (i) In Baseline Year (BY)a. If, Stock in BY < 0, Total Dolachar Import in BY = Import Dolachar in BY - Stock in BYb. If , Stock in BY > 0, Total Dolachar Import in BY = Import Dolachar in BY(ii)In Assessment Year (AY)a. If, Stock in AY < 0, Total Dolachar Import in AY = Import Dolachar in AY - Stock in AYb. If , Stock in AY > 0, Total Dolachar Import in AY = Import Dolachar in AYB.3. Total Dolachar Export. - (i) In Baseline Year (BY)(a)If, Stock in BY > 0, Total Dolachar Export in BY = Export Dolachar in BY + Stock in BY(b)If, Stock in BY < 0, Total Dolachar Export in BY = Export Dolachar in BY(ii)In Assessment Year (AY)(a)If, Stock in AY > 0, Total Dolachar Export in AY = Export Dolachar in AY + Stock in AY(b)If, Stock in AY < 0, Total Dolachar Export in AY = Export Dolachar in AYB.4. Notional Energy for Dolachar Import/Export/ - 1. During Baseline Year (BY)Notional Energy for Dolachar Import/Export in BY = Export Energy for Dolachar in BY - Import Energy for Dolachar in BYWhere,-i. Export Energy for Dolachar in BY = Total Dolachar Export in BY X Dolachar Gross calorific value in BY/1,000ii. Import Energy for Dolachar in BY = Total Dolachar Import in BY X Dolachar Gross calorific value in BY/1,000

2. During Assessment Year (AY)

Notional Energy for Dolachar Import/Export in AY = Export Energy for Dolachar in AY - Import Energy for Dolachar in AYWhere,-iii. Export Energy for Dolachar in AY = Total Dolachar Export in AY X Dolachar Gross calorific value in AY/1,000iv. Import Energy for Dolachar in AY = Total Dolachar Import in AY X Dolachar Gross calorific value in AY/1,000C. Steel Melting Shop (SMS).C.1. Stock. - (a) Stock in BY = Ingot Closing Stock in BY - Ingot Opening Stock in BY(b)Stock in AY = Ingot Closing Stock in AY - Ingot Opening Stock in AYWhere,-BY = Baseline YearAY = Assessment YearC.2. Total Pig Iron ImportC.2.1. In Baseline Year. - (a) If, Stock in BY < 0, Total PI Import in BY = Import PI in BY - Stock in BY(b)If , Stock in BY > 0, Total PI Import in BY = Import PI in BYC.2.2. In Assessment Year. - (a) If, Stock in AY < 0, Total PI Import in AY = Import PI in AY - Stock in AY(b)If , Stock in AY > 0, Total PI Import in AY = Import PI in AYWhere,-BY = Baseline YearAY = Assessment YearPI = Pig IronC.3. Total Pig Iron Export.C.3.1. in Baseline Year (BY). - (a) If, Stock in BY > 0, Total PI Export in BY = Export PI in BY + Stock in BY(b)If, Stock in BY < 0, Total PI Export in BY = Export PI in BYC.3.2. in Assessment Year (AY). - (a) If, Stock in AY > 0, Total PI Export in AY = Export PI in AY + Stock in AY(b)If, Stock in AY < 0, Total PI Export in AY = Export PI in AYWhere,-BY = Baseline YearAY = Assessment YearPI = Pig IronD. Notional Energy for Import/Export of IngotD.1. Net Energy for Ingot in Baseline Year (BY). - Net Energy for Ingot (Mkcal) = Export Energy for Ingot in BY - Import Energy for Ingot in BYWhere,-Export Energy for Ingot = Total PI Export in BY X SMS SEC in BY /1000Import Energy for Ingot = Total PI Import in BY X SMS SEC in BY /1000D.2. Net Energy for Ingot in Assessment Year (AY). - Net Energy for Ingot (Mkcal) = Export Energy for Ingot in AY - Import Energy for Ingot in AYWhere,-Export Energy for Ingot = Total PI Export in AY X SMS SEC in AY /1000Import Energy for Ingot = Total PI Import in AY X SMS SEC in AY /1000D.3. Total Notional Energy to be subtracted in Assessment Year for Intermediary Product. - Total Notional Energy to be subtracted in Assessment Year for Intermediary Production = Net Energy for Ingot in BYWhere,-AY = Assessment YearBY = Baseline YearSMS = Steel Melting ShopPI = Pig IronSEC = Specific Energy ConsumptionE. Pellet PlantE.1. Total Pellet Plant Energy in BY = Total PP SEC in BY X Total PP Production in BY X 1000E.2. Total Pellet Plant Energy in AY = Total PP SEC in AY X Total PP Production X 1000Where,-BY = Baseline YearAY = Assessment YearPP = Pellet PlantSEC = Specific Energy ConsumptionF. Net Energy for Sponge Iron (SI)F.1. In Baseline Year. - Net Energy for Sponge Iron (SI) in BY = Export Energy for SI in BY - Import Energy for SI in BYWhere,-a. Export Energy for SI in BY = Total SI Export in BYX SI SEC in BY/1000b. Import Energy for SI in BY = Total SI Import in BY X SI SEC in BY/1000F.2. In Assessment Year. Net Energy for Sponge Iron (SI) in AY = Export Energy for SI in AY - Import Energy for SI in AYWhere,-a. Export Energy for SI in AY = Total SI Export in BYX SI SEC in AY/1000b. Import Energy for SI in AY = Total SI Import in BY X SI SEC in AY/1000Where,-BY = Baseline YearAY = Assessment YearSI = Sponge IronSEC = Specific Energy Consumption7.4Power Mix7.4.1. Power Mix Normalization for Power Sources - The baseline year power mix ratio will be maintained for Assessment year for Power Source and import. The Normalized weighted heat rate calculated from the baseline year Power mix ratio will be compared with the assessment year Weighted Heat Rate and the Notional energy will be deducted from the Total energy assessedThe Thermal Energy difference of electricity consumed in plant in baseline year and electricity consumed in plant during assessment year shall be subtracted from the total energy, considering the same % of power sources consumed in the baseline year.However, any efficiency increase (i.e.

reduction in Heat Rate) in Assessment year in any of the power sources will give benefit to the plantNotional Energy to be subtracted from the total Energy of Plant in the assessment year is calculated as(i)Energy Correction for all power source in the assessment year [Million kcal] = TECPSAY x (A-WHRAY - N-WHRAY)Where,-TECPSAY: Total energy consumption from all the Power sources (Grid, CPP, DG etc) for AY in Million kWhA-WHRAY: Actual Weighted Heat Rate for the Assessment Year in kcal/kWhN-WHRAY: Normalized Weighted Heat Rate for the Assessment Year in kcal/kWh(ii)Normalized Weighted Heat Rate for Assessment year (kcal/kWh):N-WHRAY = A x (D/G)+B x (E/G)+C x (F/G)Where,-A: Grid Heat Rate for Assessment year (AY) in kcal/kWhB: CPP Heat Rate for AY in kcal/kWhC: DG Heat Rate for AY in kcal/kWhD: Grid Energy consumption for Base Line Year (BY) in Million kWhE: CPP Energy consumption for BY in Million kWhF: DG Energy consumption for BY in Million kWhG: Energy Consumed from all Power sources (Grid, CPP, DG) for BY in Million kWh(Note: Any addition in the power source will attract the same fraction to be included in the above equation as PSiHRAY x (PSiECBY/ TECBY)PSiHRAY = Power Source (ith) Heat rate for AY in kcal/kWhPSiECBY = Power Source (ith) Energy Consumption for BY in Million kWhTECBY = Total Energy consumption for BY in Million kWhThe Electricity Consumption from WHR is not being considered for Power Mix Normalization)7.4.2.3.2Power Mix Normalization for Power Export. - Net Heat Rate of CPP to be considered for export of Power from CPP instead of 2717 kcal/kWh. Actual CPP heat rate would be considered for the net increase in the export of power from the baseline. The exported Energy will be normalized in the assessment year as per following calculationiii. Notional energy for Power export to be subtracted in the assessment year [Million kcal] = (EXPAY -EXPBY)*[(WNHRGAY-2717)]/10Where,-WNHRGAY: Weighted Net Heat Rate of Generation for AY in kcal/kWhEXPAY: Exported Electrical Energy in AY in Lakh kWhEXPBY: Exported Electrical Energy in BY in Lakh kWhAPCAY: Auxiliary Power Consumption for AY in %7.5Fuel Quality in CPP and Cogen.7.5.1. Coal Quality for CPP. - The Boiler Efficiency will be calculated for the baseline as well as assessment year with the help of Coal analysis constituents like GCV, %Ash, %Moisture, %H and Boiler Efficiency Equation provided to calculate the Boiler efficiency.Hence, by keeping the Turbine heat rate constant for both the years, the CPP heat hate will be calculated for the respective year. The Thermal Energy for the difference in heat rate of CPP will be deducted from the total energy consumption of the plant.(i)Notional Thermal Energy to be deducted in the assessment year [Million kcal] = [CPP Heat Rate in AY (kcal/kWh)-Actual CPP Heat Rate in BY (kcal/kWh)] x CPP Generation in AY (Lakh kWh)/10(ii)CPP Heat Rate in AY= CPP Heat Rate in BY x (Boiler Efficiency in BY/Boiler Efficiency in AY)(iii)Boiler Efficiency in BY= 92.5-[{50xA+630 (M+9H) } /GCV] (Values are for baseline Year)(iv)Boiler Efficiency in AY= 92.5-[{50xA+630 (M+9H) } /GCV] (Values are for assessment Year)Where,-A = Ash in %M = Moisture in %H = Hydrogen in %GCV = Coal Gross Calorific Value in kcal/kWhAY = Assessment yearBY = Baseline YearCPP = Captive Power PlantTHR = Turbine Heat Rate7.5.2. Coal Quality for Cogen. - (i) Boiler efficiency in baseline year = 92.5-[{50xA+630 (M+9H) } /GCV](ii)Boiler efficiency in assessment year = 92.5-[{50xA+630 (M+9H)} /GCV](iii)Weighted Percentage of Coal Energy Used in steam Generation (Process Boiler) in BY (Factor) = ☐6n=13 {Operating Capacity of Process Boilers used for Steam generation in TPH x Percentage of Coal Energy Used in steam Generation in all the boilers for Steam generation in %)/ ☐6n=13 Operating Capacity of Process Boilers used for Steam generation (TPH)}(iv)Weighted Percentage of Coal Energy Used in steam Generation (Process Boiler) in AY (Factor) = ☐6n=13 {(Operating Capacity of Boilers used for Steam generation in TPH x Percentage of Coal Energy Used in steam Generation in all the boilers for Steam generation in %)/ □6n=13 Operating Capacity of Boilers used for Steam generation (TPH)}(v)Normalized Specific Energy Consumption for Steam Generation (kcal/kg of Steam) = Weighted Average Specific Steam Consumption in BY x (Boiler efficiency in BY (%)/Boiler Efficiency in AY (%))(vi)Difference in Specific Steam from BY to AY (kcal/kg of Steam) = Normalized Specific Energy Consumption for Steam Generation (kcal/kg of steam)- Specific Energy Consumption for Steam Generation Boiler BY (kcal/kg of steam)(vii)Energy to be subtracted w.r.t. Fuel Quality in Co-Gen (Million kcal) = Difference in Specific Steam from BY to AY (kcal/kg of steam) x {(Total Steam Generation of all Process Boilers in AY (Tonnes) x Weighted Percentage of Coal Energy Used in steam Generation (Process Boiler) in AY)}/ 1000Where,-A = Ash in %M = Moisture in %H = Hydrogen in %GCV = Coal Gross Calorific Value in kcal/kWhAY = Assessment yearBY = Baseline YearCPP = Captive Power PlantTPH = Tonnes Per Hour7.6Scrap Use. - The Specific Power Consumption for SMS w.r.t. Scrap is calculated by using the following equation given as:y = -2.1161x + 807.08 with R^2 = 0.9971i. Specific Power Consumption for SMS w.r.t. Scrap use in BY (kWh/tonne) = -2.1161 X % Scrap in BY + 807.08ii. Specific Power Consumption for SMS w.r.t. Scrap use in AY (kWh/tonne) = -2.1161 X % Scrap in AY + 807.08iii. Difference of Specific Power Consumption between BY and AY = Specific Power Consumption for SMS w.r.t. Scrap use in AY (kWh/tonne) - Specific Power Consumption for SMS w.r.t. Scrap use in BY (kWh/tonne)Where,-BY = Baseline YearAY = Assessment YearTotal Energy to be subtracted w.r.t. Scarp use in Steel Melting Shop (SMS) during AY(in Million kcal) = Difference of SPC between BY and AY (KWh/tonne) X SMS Production (tonnes) X Weighted Heat Rate (kcal/kWh) /10^6Where,-SPC = Specific Power ConsumptionBY = Baseline YearAY = Assessment YearSMS = Steel Melting Shop7.7Normalization others7.7.1. Environmental Concern. - Additional Environmental Equipment requirement due to major change in government policy on EnvironmentThe Normalization takes place in the assessment year for additional Equipment's Energy Consumption only if there is major change in government policy on Environment Standard. The Energy will be normalized for additional Energy consumption details from Energy meters. This is to be excluded from the input energy as calculated belowNotional Thermal Energy to be deducted in the assessment year due to Environmental Concern [Million kcal] = Additional Electrical Energy Consumed (Lakh kWh) x Weighted Heat Rate (kcal/kWh)/10+ Additional Thermal Energy Consumed (Million kcal)7.7.2. Biomass/ Alternate Fuel Unavailability w.r.t Baseline Year. - The Normalization for Unavailability for Biomass or Alternate Fuel is applied in the baseline year. The energy contained by the fossil fuel replacement will be deducted in the assessment yearNotional Thermal Energy to be deducted in the assessment year due to Biomass/Alternate Fuel Unavailability [Million kcal] = FFBAYGCVBBY/ 1000 + FFSAAY x GCVSABY/ 1000 + FFBAY x GCVLABY/ 1000Where,-FFBAY = Biomass replacement with Fossil fuel due to un-availability used in the process in Assessment Year (Tonnes)GCVBBY = Gross Calorific Value of Biomass in Baseline Year (kcal/kg)FFSAAY = Solid Alternate Fuel replacement with Fossil fuel due to un-availability used in the process in Assessment Year (Tonnes)GCVSABY = Gross Calorific Value of Solid Alternate Fuel in Baseline Year (kcal/kg)FFBAY = Liquid Alternate Fuel replacement with Fossil fuel due to un-availability used in the process in Assessment Year (Tonnes)GCVLABY = Gross Calorific Value of Biomass in Baseline Year (kcal/kg)7.7.3. Construction Phase or Project Activities. - The energy consumed during construction phase or project activities are non-productive energy and hence will be subtracted in the assessment year. The energy consumed by the equipment till commissioning will also be deducted in the assessment yearNotional Thermal Energy to be deducted in the assessment year due to Construction Phase or

Project Activities [Million kcal]= Electrical Energy Consumed due to commissioning of Equipment (Lakh kWh) x Weighted Heat Rate (kcal/kWh)/10+ Thermal Energy Consumed due to commissioning of Equipment (Million kcal)7.7.4. Addition of New Line/Unit (In Process and Power Generation). - In case a DC commissions a new line/production unit before or during the assessment/target year, the production and energy consumption of new unit will be considered in the total plant energy consumption and production volumes once the Capacity Utilization of that line has touched / increased over 70%. However, the energy consumption and production volume will not be included till it attains 70% of Capacity Utilization. Energy consumed and production made (if any) during any project activity during the assessment year, will be subtracted from the total energy and production in the Assessment year.Similarly, the same methodology is applied on a new unit installation for power generation (CPP) within the plant boundary.(i)Thermal Energy Consumed due to commissioning of New process Line/Unit till it attains 70per cent. of Capacity Utilization to be subtracted in assessment year (Million kcal) = (Electrical Energy Consumed due to commissioning of New process Line/Unit till it attains 70 per cent. of Capacity Utilization (Lakh kWh) x Weighted Average Heat rate in AY (kcal/kWh)/10) + Thermal Energy Consumed due to commissioning of New Process Line/Unit till it attains 70 per cent. of Capacity Utilization (Million kcal)The Production during commissioning of New Process Line/Unit will be subtracted from the total production of plant.(ii)Thermal Energy Consumed from external source due to commissioning of New Line/Unit till it attains 70 per cent. of Capacity Utilization in Power generation to be subtracted in the assessment year (Million kcal) = (Electrical Energy Consumed from external source due to commissioning of New Line/Unit till it attains 70 per cent. of Capacity Utilization in Power generation (Lakh kWh) x Weighted Average Heat rate in AY (kcal/kWh)/10) + Thermal Energy Consumed due to commissioning of New Line/Unit till it attains 70 per cent. of Capacity Utilization in Power generation (Million kcal).(iii)Thermal Energy to be added in the assessment year for Power generation of a line /unit till it attains 70 per cent.of Capacity Utilization (Million kcal)= Net Electricity Generation till new Line/Unit attains 70 per cent. Capacity Utilization (Lakh kWh) x Weighted Heat Rate (kcal/kWh)/10(iv)Thermal Energy Steam Generation From Co-Gen till New Line /Unit attains 70% of Capacity Utilization's (Million kcal)=Steam Generation From Co-Gen till New Line /Unit attains 70 per cent of Capacity Utilization's (Tonne)*Steam Specific Energy Consumption (kcal/kg of steam)/1000Where,-AY = Assessment Year7.7.5. Unforeseen Circumstances. - The Normalization is required for Energy system of a plant, if the situation influences the Energy Consumption, which cannot be controlled by Plant Management and is termed as Unforeseen Circumstances. The Energy consumed due to unforeseen circumstances to be deducted in the assessment year.(i)Thermal Energy consumed due to unforeseen (Million kcal) = (Electrical Energy to be Normalized in AY x Weighted Average Heat rate in AY (kcal/kWh)/10) + Thermal Energy to be Normalized (Million kcal)7.7.6. Renewable Energy. - The quantity of exported power (partially or fully) on which Renewable Energy Certificates have been earned by Designated Consumer in the assessment year under REC mechanism shall be treated as Exported power and Normalization will apply. However, the normalized power export or deemed injection will not qualify for issue of Energy Saving Certificates under PAT Scheme.The quantity of exported power (partially or fully) from Renewable energy which has been sold at a preferential tariff by the Designated consumer in the assessment year under REC mechanism shall be treated as Exported power. However, the normalized power export will not qualify for issue of Energy Saving Certificates under PAT Scheme.(i)Target Saving to be achieved (PAT obligation) (TOE) = Equivalent Major

Product Output as per PAT scheme Notification (Tonnes) in BY x Target Saving to be achieved (PAT obligation) (TOE/Te)(ii)Target Saving achieved in assessment year (TOE)= [Gate to Gate Specific Energy Consumption in BY (TOE/Te)-Normalized Gate to Gate Specific Energy Consumption in AY (TOE/Te)] x Equivalent Major Product Output in tonnes as per PAT scheme Notification (Tonnes)(iii)Additional Saving achieved (After PAT obligation) (TOE) = Target Saving Achieved in AY (TOE) - Target Saving to be achieved (PAT obligation) in BY (TOE)A. Thermal Energy Conversion for REC and Preferential Tariff, if Steam Turbine Heat Rate in assessment year = 0(iv)Thermal energy conversion for REC and Preferential tariff (TOE)= [Quantum of Renewable Energy Certificates (REC) obtained as a Renewal Energy Generator (Solar & Non-Solar)(MWh) + Quantum of Energy sold under preferential tariff (MWh)] x 2717/10000B. Thermal Energy Conversion for REC and Preferential Tariff, if Steam Turbine Heat Rate in assessment year ? 0(v)Thermal energy conversion for REC and Preferential tariff (TOE)= [Quantum of Renewable Energy Certificates (REC) obtained as a Renewal Energy Generator (Solar & Non-Solar)(MWh) + Quantum of Energy sold under preferential tariff (MWh)] x Generation Net Heat Rate in AY (kcal/kWh)/ 10000(vi)If, Additional Saving achieved (After PAT obligation) (TOE) <= 0,

1. Thermal Energy to be normalized for REC and preferential tariff power sell under REC mechanism (TOE) = 0,

(vii)If, Additional Saving achieved (After PAT obligation) (TOE) >0, and Thermal energy conversion for REC and Preferential tariff (TOE) >Additional Saving achieved (After PAT obligation) (TOE) then

1. Thermal Energy to be normalized for REC and preferential tariff power sell under REC mechanism (TOE) = Additional Saving achieved (After PAT obligation) (TOE)

(viii)If, Additional Saving achieved (After PAT obligation) (TOE) >0, and Thermal energy conversion for REC and Preferential tariff (TOE) < Additional Saving achieved (After PAT obligation) (TOE) thenThermal Energy to be normalized for REC and preferential tariff power sell under REC mechanism (TOE) = Thermal energy conversion for REC and Preferential tariff (TOE)7.8Gate to Gate Specific Energy Consumption.A. Specific Energy Consumption calculation. - i. Weighted Average Heat Rate (WAHR) of Plant in BY = Total Energy (kcal/kWh) Consumed in BY/ Total Electricity (MU) in BYii. Weighted Average Heat Rate (WAHR) of Plant in AY = Total Energy (kcal/kWh) in AY/ Total Electricity (MU) in AYTotal Energy (kcal/kWh) Consumed in BY and AY will be calculated separately as given below = [{GHR of DG Set (kcal/kWh) X Generation (MU)from DG Set}+ {GHR of CPP (Steam Turbine) X Generation (MU) from CPP} + {GHR of WHRB Turbine X Generation (MU) from WHRB Turbine} + {GHR of Gas Generator (GG)X Generation from Gas Generator (MU)} + {GHR of Co-Gen (Condensing) X Generation from Co-Gen (Condensing)} + {GHR of Co-Gen (Back Pressure)Generation (MU) from Co-Gen (Back Pressure)}+ {Total Electricity Purchased (MU) from Grid/ others X 860}]Total Electricity Generated and Purchased in BY and in AY will be calculated separately as given below = [Generation (MU) from DG Set + Generation (MU) from CPP + Generation (MU) from WHRB Turbine + Generation from Gas Generator (MU) +

Generation from Co-Gen (Condensing) + Generation from Co-Gen (Back Pressure) + Total Electricity Purchased from Grid/ othersWhere,-WAHR = Weighted Average Heat RateGHR = Gross Heat Rate (kcal/kWh)CPP = Captive Power PlantWHRB = Waste Heat Recovery BoilerCo-Gen = Combined Generationiii. SEC of Sponge Iron = WAHR of Plant X Electrical SEC of SI + Thermal SEC of SI

1. In BY = {WAHR of Plant X Elec. SEC of SI) in BY + Th SEC of SI in BY

2. In AY = {WAHR of Plant X Elec. SEC of SI) in AY + Th SEC of SI in AY

Where,-WAHR = Weighted Average Heat Rate (kcal/kWh)SEC = Specific Energy Consumption (kcal/Tonne)SI = Sponge IronElec = ElectricalTh = Thermaliv. SEC of Steel Melting Shop = WAHR of Plant X Electrical SEC of SMS + Thermal SEC of SMS

1. In BY = {WAHR of Plant X Elec. SEC of SMS) in BY + Th SEC of SMS in BY

2. In AY = {WAHR of Plant X Elec. SEC of SMS) in AY + Th SEC of SMS in AY

Where,-WAHR = Weighted Average Heat Rate (kcal/kWh)SEC = Specific Energy Consumption (kcal/Tonne)SMS = Steel Melting Shop (Tonne)Elec = ElectricalTh = Thermalv. SEC of Ferro Chrome = WAHR of Plant X Electrical SEC of SMS + Thermal SEC of SMS

1. In BY = {WAHR of Plant X Elec. SEC of FeCh) in BY + Th SEC of FeCh in BY

2. In AY = {WAHR of Plant X Elec. SEC of FeCh) in AY + Th SEC of FeCh in AY

Where,-WAHR = Weighted Average Heat Rate (kcal/kWh)SEC = Specific Energy Consumption (kcal/Tonne)FeCh = Ferro Chrome (Tonne)Elec = ElectricalTh = Thermalvi. SEC of FeMn = WAHR of Plant X Electrical SEC of FeMn+ Thermal SEC of FeMn

1. In BY = {WAHR of Plant X Elec. SEC of FeMn) in BY + Th SEC of FeMn in BY

2. In AY = {WAHR of Plant X Elec. SEC of FeMn) in AY + Th SEC of FeMn in AY

Where,-WAHR = Weighted Average Heat Rate (kcal/kWh)SEC = Specific Energy Consumption (kcal/Tonne)FeMn = Ferro Manganese (Tonne)Elec = ElectricalTh = Thermalvii. SEC of SiMn = WAHR of Plant X Electrical SEC of SiMn+ Thermal SEC of SiMn

1. In BY = {WAHR of Plant X Elec. SEC of SiMn) in BY + Th SEC of SiMn in BY

2. In AY = {WAHR of Plant X Elec. SEC of SiMn) in AY + Th SEC of SiMn in AY

Where,-WAHR = Weighted Average Heat Rate (kcal/kWh)SEC = Specific Energy Consumption (kcal/Tonne)SiMn = Silico Manganese (Tonne)Elec = ElectricalTh = Thermalviii. SEC of Pig Iron = WAHR of Plant X Electrical SEC of PI + Thermal SEC of PI

1. In BY = {WAHR of Plant X Elec. SEC of PI) in BY + Th SEC of PI in BY

2. In AY = {WAHR of Plant X Elec. SEC of PI) in AY + Th SEC of PI in AY

Where,-WAHR = Weighted Average Heat Rate (kcal/kWh)SEC = Specific Energy Consumption (kcal/Tonne)PI = Pig Iron (Tonne)Elec = ElectricalTh = Thermalix. SEC of Ferro Silicon = WAHR of Plant X Electrical SEC of FeSi + Thermal SEC of FeSi

1. In BY = {WAHR of Plant X Elec. SEC of FeSi) in BY + Th SEC of FeSi in BY

2. In AY = {WAHR of Plant X Elec. SEC of FeSi) in AY + Th SEC of FeSi in AY

Where,-WAHR = Weighted Average Heat Rate (kcal/kWh)SEC = Specific Energy Consumption (kcal/Tonne)FeSi = Ferro Silicon (Tonne)Elec = ElectricalTh = Thermalx. SEC of Rolling Mill = WAHR of Plant X Electrical SEC of RM + Thermal SEC of RM

1. In BY = {WAHR of Plant X Elec. SEC of RM) in BY + Th SEC of RM in BY

2. In AY = {WAHR of Plant X Elec. SEC of RM) in AY + Th SEC of RM in AY

Where,-WAHR = Weighted Average Heat Rate (kcal/kWh)SEC = Specific Energy Consumption (kcal/Tonne)RM = Rolling Mill (Tonne)Elec = ElectricalTh = ThermalB. Energy Details for Import & Export. - 1. Total Energy Consumption of Plant (TOE)In BY = Total Energy Consumed (Thermal+Electrical) (Mkcal) in BY/10In AY = Total Energy Consumed (Thermal+Electrical) (Mkcal) in AY/10Where,Total Energy Consumed (Thermal + Electrical) in Million kcal = [Total Thermal Energy Consumption (Mkcal) + {Electricity Purchased from Grid (Million kWh X 860 kcal/kWh)} - {(Electricity Exported to Grid (Million kWh) X 2717 kcal/kWh)}](a)Total Thermal Energy Consumption (Million kcal) = Total Thermal Energy (Mkcal) Used in Power Generation + Total Thermal Energy (Mkcal) Used in Process(b)Total Thermal Energy (Mkcal) Used in Power Generation = [Quantity used for Power Generation (GT) + Quantity used for Power Generation (GG) + Quantity used for Power Generation (Co-Gen) + Total Liquid Energy Used in Power Generation (DG Set) + Total Liquid Energy Used in Power Generation (CPP) + Thermal Energy Used in Power Generation (WHRB) + Thermal Energy Used in Power Generation (Co-Gen) + Total Solid Energy Used in Power Generation (CPP) + Total Solid Energy Used in Power Generation (WHRB) + Total Solid Energy Used in Power Generation (Co-Gen)](c)Total Thermal Energy (Mkcal) Used in Process

= Total Gaseous Energy Used in Process + Total Liquid Energy Used in Process + Total Solid Energy Used in ProcessC. Gate to Gate SEC of Equivalent Product. - 1. Gate to Gate SEC of Equivalent Sponge IronIf, Type of Product is defined as Sponge Iron (SI)or SI with SMS or SI with SMS + Others, Gate to Gate SEC of Equivalent Sponge Iron (TOE/Tonne) for BY and AY = [{Total Energy Consumed (Thermal+Electrical) in (Mkcal) /Total Equivalent Product (SI+SMS+Others) (in Tonne)} / 10]Where,-Total Energy Consumed (Thermal + Electrical) = Total Energy Consumed (Thermal+Electrical) of plant (in Mkcal) - Notional Energy for Intermediary Product (Mkcal)

2. Gate to Gate SEC of Equivalent SiMn

If, Type of Product is defined as Ferro Alloy, Gate to Gate SEC of Equivalent SiMn (TOE/Tonne) for BY and AY = [{Total Energy Consumed (Thermal + Electrical) in (Mkcal) / Total Equivalent Product SiMn (Tonne)}/10]Where,-Total Energy Consumed (Thermal + Electrical) in Mkcal = Total Energy Consumed (Thermal +Electrical) of the plant (in Mkcal)-Notional Energy for Intermediary Product (in Mkcal)

3. Gate to Gate SEC of Equivalent Ferro Chrome

If, Type of Product is defined as Ferro Chrome, Gate to Gate SEC of Equivalent Ferro Chrome (TOE/Tonne) for BY and AY = [{Total energy Consumed (Thermal + Electrical) in (Mkcal) / Total Equivalent Product Ferro Chrome (Tonne)}/10]Where,-Total energy Consumed (Thermal+Electrical) (in Mkcal) = Total Energy Consumed (Thermal+Electrical) of the Plant (in Mkcal) - Notional Energy for Intermediary Product (in Mkcal)

4. Gate to Gate SEC of Equivalent Crude Steel

If, Type of Product is defined as Mini Blast Furnace, Gate to Gate SEC of Equivalent Mini Blast Furnace (TOE/Tonne) for BY and AY = [{Total energy Consumed (Thermal+Electrical) in (Mkcal) / Total Equivalent product Crude Steel (Tonne)}/10]Where,-Total energy Consumed (Thermal+Electrical) (in Mkcal) = Total Energy Consumed (Thermal + Electrical) of the Plant (in Mkcal) - Notional Energy for Intermediary Product (in Mkcal)

5. Gate to Gate SEC of Equivalent SPU

If, Type of Product is defined as SPU, Gate to Gate SEC of Equivalent SPU (TOE/Tonne) for BY and AY = [{Total Energy Consumed (Thermal + Electrical) (in Mkcal) / Total Equivalent Product SPU (Tonne)}/10]Where,-Total Energy Consumed (Thermal + Electrical) (in Mkcal) = Total Energy Consumed (Thermal + Electrical) of the Plant (in Mkcal) - Notional Energy for Intermediary Product (Mkcal)D. Gate to Gate(GtG) Energy Consumption. - 1. If, Type of Product is defined as Sponge Iron (SI) or SI with SMS or SI with SMS + Others, GtG Energy Consumption (Mkcal) in Sponge Iron (SI) or SI with SMS or SI with SMS +Others, for BY and AY = {Total Energy Consumed (Thermal + Electrical) in Si or SI+SMS or SI+SMS + Others Production} - {Notional Energy for Power Mix + Notional Energy for Fuel Quality + Notional Energy for Scrap Use Factors + Notional

Energy for Start Stop Factors + Notional Energy for others Factors}]

2. If, Type of Product is defined as Ferro Alloy, GtG Energy Consumption (Mkcal) for BY and AY = {Total Energy Consumed (Thermal + Electrical) in Ferro Chrome Production} - {National Energy for Power Mix + National Energy for Fuel Quality + National Energy for Scrap Use Factors + National Energy for Start Stop Factors + National Energy for others Factors}]

3. If, Type of Product is defined as Ferro Chrome, GtG Energy Consumption (Mkcal) for BY and AY = {Total Energy Consumed (Thermal + Electrical) in Ferro Chrome Production} - {National Energy for Power Mix + National Energy for Fuel Quality + National Energy for Scrap Use Factors + National Energy for Start Stop Factors + National Energy for others Factors}]

4. If, Type of Product is defined as Mini Blast Furnace (MBF), GtG Energy Consumption (Mkcal) for BY and AY = [{Total Energy Consumed (Thermal + Electrical) in Mini Blast Furnace} - {National Energy for Power Mix + National Energy for Fuel Quality + National Energy for Scrap Use Factors + National Energy for Start Stop Factors + National Energy for others Factors}]

5. If, Type of Product is defined as SPU, GtG Energy Consumption (Mkcal) for BY and AY = [{Total Energy Consumed (Thermal + Electrical) in SPU} - {National Energy for Power Mix + National Energy for Fuel Quality + National Energy for Scrap Use Factors + National Energy for Start Stop Factors + National Energy for others Factors}]

E. Normalized GtG SEC (Mkcal/Tonne). - 1. If, Type of Product of Plant is defined as Sponge Iron (SI) or SI with SMS or SI with SMS + Others, BY and AY

Normalized GtG SEC (Mkcal/ Tonne) of Plant =| GtG Energy Consumption (Mkcal) in Sponge Iron (SI) or SI with SMS or SI with SMS - OthersTotal equivalent product Sponge Iron (SI) or SI with SMS or SI with SMS + Others

or

Normalized GtG SEC (TOE/ Tonne) of Plant =| Normalized GtG SEC (Mkcal/ Tonne) of Plant10

2. If, Type of Product of Plant is defined as Ferro Alloy, BY and AY

Normalized GtG SEC (Mkcal/ Tonne) of Plant =| GtG Energy Consumption (Mkcal) in Ferro Alloy ProductionTotal equivalent product SiMn

or

Normalized GtG SEC (TOE/ Tonne) of Plant =| Normalized GtG SEC (Mkcal/ Tonne) of Plant10

3. If, Type of Product is defined as Ferri Chrome, BY and AY

Normalized GtG SEC (Million kcal/ Tonne) of Plant =| GtG Energy Consumption (Million kcal) in Ferrow Chrome ProductionTotal equivalent product Ferro Chrome

or

Normalized GtG SEC (TOE/ Tonne) of Plant =| Normalized GtG SEC (Mkcal/ Tonne) of Plant10

4. If, Type of Product is defined as Mini Blast Furnace (MBF), BY and AY

Normalized GtG SEC (Million kcal/ Tonne) of Plant =| GtG Energy Consumption (Mkcal) in Mini Blast Furnace ProductionTotal equivalent product Crude Steel

or

Normalized GtG SEC (TOE/ Tonne) of Plant =| Normalized GtG SEC (Mkcal/ Tonne) of Plant10

5. If, Type of Product is defined as SPU, BY and AY

Normalized GtG SEC (Million kcal/ Tonne) of Plant =| GtG Energy Consumption (Mkcal) in Mini Blast Furnace ProductionTotal equivalent product SPU

or

Normalized GtG SEC (TOE/ Tonne) of Plant =| Normalized GtG SEC (Mkcal/ Tonne) of Plant10

F. Renewable Energy Certificates Compliance under PAT Scheme. - Thermal Energy to be normalized for REC and preferential tariff power sell under REC mechanism in AYG. Gate to Gate Energy Consumption after REC compliance = Renewable Energy Certificates Compliance under PAT Scheme in AY + GtG Energy Consumption in AYH. Normalized Gate to Gate Specific Energy Consumption of Product after REC Compliance. - 1. If, Type of Product of Plant is defined as Sponge Iron (SI) or SI with SMS or SI with SMS + Others, AY

i. Gate to Gate Specific Energy Consumption in Baseline Year (TOE/T) =| Total Energy Consumption (Million kcal)Total equivalent production (Sponge Iron (SI) or SI with SMS or SI with SMS + Others)(Tonnes) x 10

ii. Normalized Gate to Gate Specific Energy Consumption after REC Compliance (TOE/T) =| Gate to Gate Energy Consumption after REC Compliance (Million kcal)(Total equivalent product Sponge Iron (SI) or SI with SMS or SI with SMS (Tonnes) + Others) x 10

iii. Baseline Normalization (TOE/Tonne) = Gate to Gate Specific Energy Consumption in Baseline year (TOE/Tonne) - Notified Specific Energy Consumption in Baseline Year (TOE/Tonne)iv. Normalized Gate to Gate Specific Energy Consumption after REC Compliance in assessment year(TOE/ Tonne)

=| Normalized Total Energy Consumption after REC Compliance (Million kcal)(Total equivalent product Sponge Iron (SI) or SI with SMS or SI with SMS + Others) (Tonnes) x 10| - Baseline Normalization (TOE/Tonne)

2. If, Type of Product of Plant is defined as Ferro Alloy, AY

i. Gate to Gate Specific Energy Consumption in Baseline Year (TOE/T) =| Total Energy Consumption (Million kcal)Total equivalent production (SiMn)(Tonnes) x 10

ii. Normalized Gate to Gate Specific Energy Consumption after REC Compliance (TOE/T) =| Gate to Gate Energy Consumption after REC Compliance (Million kcal)Total equivalent product (SiMn) (Tonnes) x 10

iii. Baseline Normalization (TOE/Tonne) = Gate to Gate Specific Energy Consumption in Baseline year (TOE/Tonne) - Notified Specific Energy Consumption in Baseline Year (TOE/Tonne)iv. Normalized Gate to Gate Specific Energy Consumption after REC Compliance in assessment year (TOE/ Tonne)

=| Normalized Total Energy Consumption after REC Compliance (Million kcal)Total equivalent product (SiMn) (Tonnes) x 10| - Baseline Normalization (TOE/Tonne)

3. If, Type of Product is defined as Ferro Chrome, AY

i. Gate to Gate Specific Energy Consumption in Baseline Year (TOE/T) =| Total Energy Consumption (Million kcal)Total equivalent production (Ferro Chrome)(Tonnes) x 10

ii. Normalized Gate to Gate Specific Energy Consumption after REC Compliance (TOE/T) =| Gate to Gate Energy Consumption after REC Compliance (Million kcal)Total equivalent product (Ferro Chrome) (Tonnes) x 10

iii. Baseline Normalization (TOE/Tonne) = Gate to Gate Specific Energy Consumption in Baseline year (TOE/Tonne) - Notified Specific Energy Consumption in Baseline Year (TOE/Tonne)iv. Normalized Gate to Gate Specific Energy Consumption after REC Compliance in assessment year (TOE/ Tonne)

=| Normalized Total Energy Consumption after REC Compliance (Million kcal)Total equivalent product (Ferro Chrome) (Tonnes) x 10| - Baseline Normalization (TOE/Tonne)

4. If, Type of Product is defined as Mini Blast Furnace (MBF), AY

i. Gate to Gate Specific Energy Consumption in Baseline Year (TOE/T) =| Total Energy Consumption (Million kcal)Total equivalent production (Hot Metal or Pig Iron)(Tonnes) x 10

ii. Normalized Gate to Gate Specific Energy Consumption after REC Compliance (TOE/T) =| Gate to Gate Energy Consumption after REC Compliance (Million kcal)Total equivalent product (Hot Metal or Pig Iron) (Tonnes) x 10

iii. Baseline Normalization (TOE/Tonne) = Gate to Gate Specific Energy Consumption in Baseline year (TOE/Tonne) - Notified Specific Energy Consumption in Baseline Year (TOE/Tonne)iv. Normalized Gate to Gate Specific Energy Consumption after REC Compliance in assessment year (TOE/ Tonne)

=| Normalized Total Energy Consumption after REC Compliance (Million kcal)Total equivalent product (Hot Metal or Pig Iron)(Tonnes) x 10| - Baseline Normalization (TOE/Tonne)

5. If, Type of Product is defined as SPU, AY

i. Gate to Gate Specific Energy Consumption in Baseline Year (TOE/T) =| Total Energy Consumption (Million kcal)Total equivalent production (SPU)(Tonnes) x 10

ii. Normalized Gate to Gate Specific Energy Consumption after REC Compliance (TOE/T) =| Gate to Gate Energy Consumption after REC Compliance (Million kcal)Total equivalent product (SPU)(Tonnes) x 10

iii. Baseline Normalization (TOE/Tonne) = Gate to Gate Specific Energy Consumption in Baseline year (TOE/Tonne) - Notified Specific Energy Consumption in Baseline Year (TOE/Tonne)iv. Normalized Gate to Gate Specific Energy Consumption after REC Compliance in assessment year (TOE/ Tonne)

=| Normalized Total Energy Consumption after REC Compliance (Million kcal)Total equivalent product (SPU)(Tonnes) x 10| - Baseline Normalization (TOE/Tonne)

8. Sf Pulp and Paper

Normalization factors for the following areas have been developed in Pulp & Paper sector, which will ultimately affect the gate to gate specific energy consumption in the assessment year. A broad categorization of the factors are presented here

1. Equivalent Product.

2. Intermediary Products.

3. Fuel quality in CPP and Co-gen.

4. Power Mix (Imported & Exported from/ to the grid and self-generation from the captive power plant).

5. Normalization others

5.1Environmental concern (Additional Environmental Equipment requirement due to major change in government policy on Environment)5.2Biomass/Alternate Fuel Unavailability5.3Construction Phase or Project Activity Phase5.4Addition of new line/units (in process and power generation)5.5Unforeseen circumstances5.6Renewable Energy Certificate Normalization

6. Gate to gate Specific Energy Consumption

8.1Equivalent Product8.1.1. Pulp Production. - In the Pulp & Paper Sector pulp can be produced by following raw materials:Wood (chiper + digestor + WSC + bleach plant)Agro (depither,cutter + digestor + WSC + bleach plant)RCF (hydrapulper+deinking+bleach plant)Pulp mills based on the above will have different process to produce the pulp. Hence, there will be variation in the specific energy consumption for process specific.In assessment year with respect to Baseline year, there is a need to develop and impose proper Normalization factors, so that any change in the process to prepare pulp and final product produced could be nullified and the concerned plant should not suffer / or gain advantage due to this change only.8.1.1.1. Equivalent Product (Pulp) for BY [Tonnes]= WPm (CFWBY x PPWBY) + APm (CFABY x PPABY) + RCFm (CFRBY x PPRBY)Where,-WPm = wood pulp to main productAPm = Agro pulp to main productRCFm = RCF pulp to main productCFWBY = Conversion factor for wood pulp in Baseline YearCFABY = Conversion factor for Agro pulp in Baseline YearCFRBY = Conversion factor for RCF pulp in Baseline YearPPWBY = Pulp production of Wood Pulp (Tonne) in BYPPABY = Pulp production of Agro Pulp (Tonne) in BYPPRBY = Pulp production of RCF Pulp (Tonne) in BY8.1.1.2. Conversion Factors for Base line Year

CFWBY=| SEC for Wood pulp (BY)SEC of Major Product (BY)

CFABY=| SEC for Agro pulp (BY)SEC of Major Product (BY)

CFRBY=| SEC for RCF pulp (BY)SEC of Major Product (BY)

8.1.1.3. Equivalent Product (Pulp) for AY [Tonnes]= WPm (CFWAY x PPWAY) + APm (CFAAY x PPAAY) + RCFm (CFRAY x PPRAY)Where,-CFWAY = Conversion factor for wood pulp in Assessment YearCFAAY = Conversion factor for Agro pulp in Assessment YearCFRAY = Conversion factor for RCF pulp in Assessment YearPPWAY = Pulp production of Wood Pulp (Tonne) in Assessment YearPPAAY = Pulp production of Agro Pulp (Tonne) in Assessment YearPPRAY = Pulp production of RCF Pulp (Tonne) in Assessment Year8.1.1.4. Conversion Factors for Assessment Year. - Applicable only in case baseline production = 0 for concern product otherwise the baseline conversion factor is considered

CFWAY=| SEC for Wood pulp (AY)SEC of Major Product (BY)

CFAAY=| SEC for Agro pulp (AY)SEC of Major Product (BY)

CFRAY=| SEC for RCF pulp (AY)SEC of Major Product (BY)

Applicable only in case baseline production □0 for concern product (baseline conversion factor is considered)

CFWAY=| SEC for Wood pulp (BY)SEC of Major Product (BY)

CFAAY=| SEC for Agro pulp (BY)SEC of Major Product (BY)

CFRAY=| SEC for RCF pulp (BY)SEC of Major Product (BY)

Major Product of baseline would be considered for the assessment year for calculating Equivalent product in the assessment year. Major product could be from Wood, Agro or RCF pulp depending on Maximum productionWhere,-AY: Assessment YearBY: Baseline YearSEC: Specific Energy Consumption8.1.1.5. SEC calculation for Baseline and Assessment Year. - SECWP = SEC of Wood Pulp (kcal/Tonne) = Specific Steam Consumption -MP for Wood Pulp (kcal/Tonne) + Specific Steam Consumption -LP for Wood Pulp (kcal/Tonne) + Specific Energy Consumption (Power) for Wood Pulp (kcal/Tonne)Specific Steam Consumption -MP for Wood Pulp (kcal/Tonne) = [{MP-Steam Consumption for Wood Pulp (Tonne)/Wood Pulp Production (Tonnes)} x Enthalpy of MP-Steam (kcal/kg)] x 1000Specific Steam Consumption - LP for Wood Pulp (kcal/Tonne) = [{LP-Steam Consumption for Wood Pulp (Tonne)/Wood Pulp Production (Tonnes)} x Enthalpy of LP-Steam (kcal/kg)] x 1000Specific Energy Consumption (Power) for Wood Pulp (kcal/Tonne)= {Power Consumption for Wood Pulp (kwh)/ Wood Pulp Production (Tonnes)} x Heat Rate (kcal/kwh)SECAP = SEC of Agro (kcal/Tonne) = Specific Steam Consumption -MP for Agro (kcal/Tonne) + Specific Steam Consumption - LP for Agro(kcal/Tonne) + Specific Energy Consumption (Power) for Agro(kcal/Tonne)Specific Steam Consumption -MP for Agro (kcal/Tonne) = [{MP-Steam Consumption for Agro (Tonne)/ Agro Production (Tonnes)} x Enthalpy of MP-Steam (kcal/kg)] x 1000Specific Steam Consumption -LP for Agro (kcal/Tonne) = [{LP-Steam Consumption for Agro (Tonne)/ Agro Production (Tonnes)} x Enthalpy of LP-Steam (kcal/kg)] x 1000Specific Energy Consumption (Power) for Agro (kcal/Tonne)= {Power Consumption for Agro (kwh)/ Agro Production (Tonnes)} x Heat Rate (kcal/kwh)SECRP = SEC of RCF (kcal/Tonne) = Specific Steam Consumption -MP for RCF (kcal/Tonne) + Specific Steam Consumption -LP for RCF(kcal/Tonne) + Specific Energy Consumption (Power) for RCF(kcal/Tonne)Specific Steam Consumption -MP for RCF (kcal/Tonne) = [{MP-Steam Consumption for RCF (Tonne)/RCF Production (Tonnes)} x Enthalpy of MP-Steam (kcal/kg)] x 1000Specific Steam Consumption -LP for RCF (kcal/Tonne) = [{LP-Steam Consumption for RCF (Tonne)/RCF Production (Tonnes)} x Enthalpy of LP-Steam (kcal/kg)] x 1000Specific Energy Consumption (Power) for RCF (kcal/Tonne) = {Power Consumption for RCF (kwh)/ Agro Production (Tonnes)} x Heat Rate (kcal/kwh)8.1.2. Paper Production. - The pulp is further processed to prepare the paper. Various types of paper can be manufactured using the pulp and the specific energy consumption varies with product specific. The products considered for normalization are:[Inserted by Notification No. G.S.R. 409(E), dated 26.4.2018 (w.e.f. 30.3.2012).] Writing Printing PaperPaper Board & kraft PaperSpecialty PaperNewsprintWriting Printing Coated PaperCoated Board8.1.2.1. Equivalent Product (Paper) for BY (Tonnes) = FPWP (CFWPBY x PWPBY) + FPPB (CFPBBY x PPBBY) + FPSP (CFSPBY x PSPBY) + FPNP (CFNPBY x PNPBY) + FPWPC (CFWPCBY x PWPCBY) + FPBC (CFCBBY x PCBBY)FPWP = Writing Printing Paper to Final ProductFPPB = Paper Board to Final ProductFPSP = Specialty Paper to Final ProductFPNP = Newsprint to Final ProductFPWPC = Writing Printing Coated paper to Final ProductFPCB = Coated Board to Final ProductCFWPBY = Conversion factor for writing printing paper in Baseline YearCFPBBY = Conversion factor for Paper Board & Kraft Paper in Baseline YearCFSPBY = Conversion factor for Specialty Paper in Baseline YearCFNPBY = Conversion factor for News Print in Baseline YearCFWPCBY = Conversion factor for Writing Printing Coated paper in Baseline YearCFCBBY = Conversion factor for Coated Board in Baseline YearPWPBY = Total Writing Printing Paper production in Baseline Year (Tonnes)PPBBY = Total Paper Board Paper production in Baseline Year (Tonnes)PSPBY = Total Specialty Paper production in Baseline Year (Tonnes)PNPBY = Total Newsprint paper production in Baseline Year (Tonnes)PWPCBY = Total Writing Printing Coated Paper production in Baseline Year (Tonnes)PCBBY = Total Coated Board Paper production in Baseline Year (Tonnes)8.1.2.2. Conversion Factors for Baseline Year

(i) CFWPBY=| SEC for Writing Paper (BY)SEC of Major Product (BY)

(ii) CFPBBY=| SEC for Paper Board (BY)SEC of Major Product (BY)

(iii) CFSPBY=| SEC for Specialty Paper (BY)SEC of Major Product (BY)

(iv) CFNPBY=| SEC for News Print (BY)SEC of Major Product (BY)

(v) CFWPCBY=| SEC for Writing Printing Coated Board (BY)SEC of Major Product (BY)

(vi) CFCBBY=| SEC for Coated Board (BY)SEC of Major Product (BY)

8.1.2.3. Equivalent Product (Paper) for AY (Tonnes) = FPWP (CFWPAY x PWPAY) + FPPB (CFPBAY x PPBAY) + FPSP (CFSPAY x PSPAY) + FPNP (CFNPAY x PNPAY) + FPWPC (CFWPCAY x PWPCAY) + FPBC (CFCBAY x PCBAY)Where,-CFWPAY = Conversion factor for writing printing paper in Assessment YearCFPBAY = Conversion factor for Paper Board & Kraft Paper in Assessment YearCFSPAY = Conversion factor for Specialty Paper in Assessment YearCFNPAY = Conversion factor for News Print in Assessment YearCFWPCAY = Conversion factor for Writing Printing Coated paper in Assessment YearCFCBAY = Conversion factor for Coated Board in Assessment YearPWPAY = Total Writing Printing Paper production in Assessment Year (Tonnes)PPBAY = Total Paper Board Paper production in Assessment Year (Tonnes)PSPAY = Total Specialty Paper production in Assessment Year (Tonnes)PNPAY = Total Newsprint paper production in Assessment Year (Tonnes)PWPCAY = Total Writing Printing Coated Paper production in Assessment Year (Tonnes)PCBAY = Total Coated Board Paper production in Assessment Year (Tonnes)8.1.2.4. Conversion Factors for Assessment Year. - Applicable only in case baseline production = 0 for concern product otherwise the baseline conversion factor is considered

(i) CFWPAY=| SEC for Writing Paper (AY)SEC of Major Product (BY)

(ii) CFPBAY=| SEC for Paper Board (AY)SEC of Major Product (BY)

(iii) CFSPAY=| SEC for Specialty Paper (AY)SEC of Major Product (BY)

(iv) CFNPAY=| SEC for News Print (AY)SEC of Major Product (BY)

(v) CFWPCAY=| SEC for Writing Printing Coated Board (AY)SEC of Major Product (BY)

(vi) CFCBAY=| SEC for Coated Board (AY)SEC of Major Product (BY)

Applicable only in case baseline production ☐0 for concern product (baseline conversion factor is considered)

(i) CFWPAY=| SEC for Writing Paper (BY)SEC of Major Product (BY)

(ii) CFPBAY=| SEC for Paper Board (BY)SEC of Major Product (BY)

(iii) CFSPAY=| SEC for Specialty Paper (BY)SEC of Major Product (BY)

(iv) CFNPAY=| SEC for News Print (BY)SEC of Major Product (BY)

(v) CFWPCAY=| SEC for Writing Printing Coated Board (BY)SEC of Major Product (BY)

(vi) CFCBAY=| SEC for Coated Board (BY)SEC of Major Product (BY)

Major Product of baseline would be considered for the assessment year for calculating Equivalent product in the assessment year. Major product could be from Wood, Agro or RCF pulp depending on Maximum production.Where,-AY: Assessment YearBY: Baseline YearSEC: Specific Energy Consumption8.1.2.5. SEC calculation for Baseline and Assessment Year. - SEC for Writing and Printing Paper (kcal/Tonne) = Writing Printing Grade Paper Specific Steam Consumption-MP (kcal/Tonne) + Writing Printing Grade Paper Specific Steam Consumption-LP + Writing Printing Grade Paper Specific Energy Consumption for Power (kcal/Tonne)Writing Printing Grade Paper Specific Steam Consumption-MP (kcal/Tonne) = [{MP-Steam Consumption for Writing Printing Grade (Tonne)/ Writing Printing Grade Production (Tonnes)} x Enthalpy of MP-Steam (kcal/kg)] x 1000Writing Printing Grade Paper Specific Steam Consumption-LP (kcal/Tonne) = [{LP-Steam Consumption for Writing Printing Grade (Tonne)/ Writing Printing Grade Production (Tonnes)} x Enthalpy of LP-Steam (kcal/kg)] x 1000Writing Printing Grade Paper Specific Energy Consumption for Power (kcal/Tonne) = {Power Consumption for Writing Printing Grade (kwh)/ Writing Printing Grade Production (Tonnes)} x Heat Rate (kcal/kwh)SEC for Paper Board Grade (kcal/Tonne) = Paper Board Grade Paper Specific Steam Consumption-MP (kcal/Tonne) + Paper Board Grade Paper Specific Steam Consumption-LP + Paper Board Grade Paper Specific Energy Consumption for Power (kcal/Tonne)Paper Board Grade Paper Specific Steam Consumption-MP (kcal/Tonne) =

[{MP-Steam Consumption for Paper Board Grade (Tonne)/ Paper Board Grade Production (Tonnes)} x Enthalpy of MP-Steam (kcal/kg)] x 1000Paper Board Grade Paper Specific Steam Consumption-LP (kcal/Tonne) = [{LP-Steam Consumption for Paper Board Grade (Tonne)/ Paper Board Grade Production (Tonnes)} x Enthalpy of LP-Steam (kcal/kg)] x 1000Paper Board Grade Paper Specific Energy Consumption for Power (kcal/Tonne) = {Power Consumption for Paper Board Grade (kwh)/ Paper Board Grade Production (Tonnes)} x Heat Rate (kcal/kwh)SEC for Specialty Paper Grade (kcal/Tonne) = Specialty Paper Grade Paper Specific Steam Consumption-MP (kcal/Tonne) + Specialty Paper Grade Paper Specific Steam Consumption-LP + Specialty Paper Grade Paper Specific Energy Consumption for Power (kcal/Tonne)Specialty Paper Grade Paper Specific Steam Consumption-MP (kcal/Tonne) = [{MP-Steam Consumption for Specialty Paper Grade (Tonne)/ Specialty Paper Grade Production (Tonnes)} x Enthalpy of MP-Steam (kcal/kg)] x 1000Specialty Paper Grade Paper Specific Steam Consumption-LP (kcal/Tonne) = [{LP-Steam Consumption for Specialty Paper Grade (Tonne)/ Specialty Paper Grade Production (Tonnes)} x Enthalpy of LP-Steam (kcal/kg)] x 1000Specialty Paper Grade Paper Specific Energy Consumption for Power (kcal/Tonne) = {Power Consumption for Specialty Paper Grade (kwh)/ Specialty Paper Grade Production (Tonnes)} x Heat Rate (kcal/kwh)SEC for News Print Grade (kcal/Tonne) = News Print Grade Paper Specific Steam Consumption-MP (kcal/Tonne) + News Print Grade Paper Specific Steam Consumption-LP + News Print Grade Paper Specific Energy Consumption for Power (kcal/Tonne)News Print Grade Paper Specific Steam Consumption-MP (kcal/Tonne) = [{MP-Steam Consumption for News Print Grade (Tonne)/ News Print Grade Production (Tonnes)} x Enthalpy of MP-Steam (kcal/kg)] x 1000News Print Grade Paper Specific Steam Consumption-LP (kcal/Tonne) = [{LP-Steam Consumption for News Print Grade (Tonne)/ News Print Grade Production (Tonnes)} x Enthalpy of LP-Steam (kcal/kg)] x 1000News Print Grade Paper Specific Energy Consumption for Power (kcal/Tonne) = {Power Consumption for News Print Grade (kwh)/ Paper Board Grade Production (Tonnes)} x Heat Rate (kcal/kwh)SEC for Writing Printing Coated Grade (kcal/Tonne) = Writing Printing Coated Grade Paper Specific Steam Consumption-MP (kcal/Tonne) + Writing Printing Coated Grade Paper Specific Steam Consumption-LP + Writing Printing Coated Grade Paper Specific Energy Consumption for Power (kcal/Tonne)Writing Printing Coated Grade Paper Specific Steam Consumption-MP (kcal/Tonne) = [{MP-Steam Consumption for Writing Printing Coated Grade (Tonne)/ Writing Printing Coated Grade Production (Tonnes)} x Enthalpy of MP-Steam (kcal/kg)] x 1000Writing Printing Coated Grade Paper Specific Steam Consumption-LP (kcal/Tonne) = [{LP-Steam Consumption for Writing Printing Coated Grade (Tonne)/ Writing Printing Coated Grade Production (Tonnes)} x Enthalpy of LP-Steam (kcal/kg)] x 1000Writing Printing Coated Grade Paper Specific Energy Consumption for Power (kcal/Tonne) = {Power Consumption for Writing Printing Coated Grade (kwh)/ Writing Printing Coated Grade Production (Tonnes)} x Heat Rate (kcal/kwh)SEC for Coated Board Grade (kcal/Tonne) = Coated Board Grade Paper Specific Steam Consumption-MP (kcal/Tonne) + Coated Board Grade Paper Specific Steam Consumption-LP + Coated Board Grade Paper Specific Energy Consumption for Power (kcal/Tonne)Coated Board Grade Paper Specific Steam Consumption-MP (kcal/Tonne) = [{MP-Steam Consumption for Coated Board Grade (Tonne)/ Coated Board Grade Production (Tonnes)} x Enthalpy of MP-Steam (kcal/kg)] x 1000Coated Board Grade Paper Specific Steam Consumption-LP (kcal/Tonne) = [{LP-Steam Consumption for Coated Board Grade (Tonne)/ Coated Board Grade Production (Tonnes)} x Enthalpy of LP-Steam (kcal/kg)] x 1000Coated Board

Grade Paper Specific Energy Consumption for Power (kcal/Tonne) = {Power Consumption for Coated Board Grade (kwh)/ Coated Board Grade Production (Tonnes)} x Heat Rate (kcal/kwh)8.2Intermediary Product. - Partially processed product (Intermediary Product) import by the plant (for which part of the energy is not required to be used by the plant) and export from the plant for which energy has been used but it is not taken into account in the final product.In case of the paper plant, pulp can be imported and exported which is an intermediary product but no the final product. Pulp mills based on the below process will have different specific energy consumption to produce the pulp.Wood (chiper+digestor+WSC+bleach plant)Agro (depither,cutter+digestor+WSC+bleach plant)RCF (hydrapulper+deinking+bleach plant)8.2.1. Net Import/Export Energy for bleached pulp to be deducted in the assessment year [Million kcal] = {[(SECWP X PEWP)/10^6 - (SECWP X PIWP)/10^6] + [(SECAP X PEAP)/10^6 - (SECAP X PIAP)/10^6] + [(SECRP X PERP)/10^6 - (SECRP X PIRP)/10^6]}PEWP is Total Export of the Wood Pulp (Tonne)PIWP is Total Import of the Wood Pulp (Tonne)PEAP is Total Export of the Agro Pulp (Tonne)PIAP is Total Import of the Agro Pulp (Tonne)PERP is Total Export of the RCF Pulp (Tonne)PIRP is Total Import of the RCF Pulp (Tonne)SECWP Total Specific Energy Consumption of sale-able Wood Pulp in kcal/tonneSECAP Total Specific Energy Consumption of sale-able Agro Pulp in kcal/tonneSECRP Total Specific Energy Consumption of sale-able RCF Pulp in kcal/tonneSECWP, SECAP & SECRP will be calculated as per Sr. No 1.1.5 for Assessment and Baseline year.8.2.2. Pulp Import/Export as Intermediary Product calculation8.2.2.1. Pulp Stock. - 1. BSWP = Wood bleached pulp stock [Tonnes] = Closing Stock of Total wood Bleached sale-able Pulp (Tonnes)- Opening Stock of Total wood Bleached sale-able Pulp (Tonnes)

2. BSAP = Agro bleached pulp stock [Tonnes] = Closing Stock of Total Agro Bleached sale-able Pulp (Tonnes) - Opening Stock of Total Agro Bleached sale-able Pulp (Tonnes)

3. BSRP = RCF bleached pulp stock [Tonnes] = Closing Stock of Total RCF Bleached sale-able Pulp (Tonnes) - Opening Stock of Total RCF Bleached sale-able Pulp (Tonnes)

8.2.2.2. Pulp Export. - 1. If BSWP > 0, following calculation will be used for Total Wood bleached ExportPEWP = Total Wood bleached Export [Tonnes] = Export Wood Bleached Pulp (Tonnes) + Wood bleached pulp stock (Tonnes)

2. If BSWP < 0, following calculation will be used for Total Wood bleached Export

PEWP = Total Wood bleached Export [Tonnes] = Export Wood Bleached Pulp (Tonnes)

3. If BSAP> 0, following calculation will be used for Total Agro bleached Export

PEAP = Total Agro bleached Export [Tonnes] = Export Agro Bleached Pulp (Tonnes) + Agro bleached pulp stock (Tonnes)

4. If BSAP < 0, following calculation will be used for Total Agro bleached Export

PEAP = Total Agro bleached Export [Tonnes] = Export Agro Bleached Pulp (Tonnes)

5. If BSRP > 0, following calculation will be used for Total RCF bleached Export

PERP = Total RCF bleached Export [Tonnes] = Export RCF Bleached Pulp (Tonnes) + RCF bleached pulp stock (Tonnes)

6. If BSAP < 0, following calculation will be used for Total RCF bleached Export

PERP = Total RCF bleached Export [Tonnes] = Export RCF Bleached Pulp (Tonnes)8.2.2.3. Pulp Import for BY. - 1. If BSWP > 0, following calculation will be used for Total Wood bleached ImportPIWP = Total Wood bleached Import [Tonnes] = Import Wood Bleached Pulp (Tonnes)

2. If BSWP < 0, following calculation will be used for Total Wood bleached Export

PIWP = Total Wood bleached Import [Tonnes] = Import Wood Bleached Pulp (Tonnes) - Wood bleached pulp stock (Tonnes)

3. If BSAP > 0, following calculation will be used for Total Agro bleached Import

PIAP Total Agro bleached Import [Tonnes] = Import Agro Bleached Pulp (Tonnes)

4. If BSWP< 0, following calculation will be used for Total Agro bleached Export

PIAP Total Agro bleached Import [Tonnes] = Import Agro Bleached Pulp (Tonnes) - Agro bleached pulp stock (Tonnes)

5. If BSAP > 0, following calculation will be used for Total RCF bleached Import

PIRP = Total RCF bleached Import [Tonnes] = Import RCF Bleached Pulp (Tonnes)

6. If BSWP < 0, following calculation will be used for Total Agro bleached Export

PIRP = Total RCF bleached Import [Tonnes] = Import RCF Bleached Pulp (Tonnes) - RCF bleached pulp stock (Tonnes)8.2.2.4. Pulp Import for AY. - 1. If BSWP > 0, following calculation will be used for Total Wood bleached ImportPIWP = Total Wood bleached Import [Tonnes] = Import Wood Bleached Pulp (Tonnes) + Wood Pulp Production till new line attains 70% of Capacity utilization

2. If BSWP < 0, following calculation will be used for Total Wood bleached Export

PIWP = Total Wood bleached Import [Tonnes] = Import Wood Bleached Pulp (Tonnes) + Wood Pulp Production till new line attains 70% of Capacity utilization - Wood bleached pulp stock (Tonnes)

3. If BSAP > 0, following calculation will be used for Total Agro bleached Import

PIAP Total Agro bleached Import [Tonnes] = Import Agro Bleached Pulp (Tonnes) + Agro Pulp Production till new line attains 70% of Capacity utilization (Tonnes)

4. If BSWP < 0, following calculation will be used for Total Agro bleached Export

PIAP Total Agro bleached Import [Tonnes] = Import Agro Bleached Pulp (Tonnes) + Agro Pulp Production till new line attains 70% of Capacity utilization (Tonnes) - Agro bleached pulp stock (Tonnes)

5. If BSAP > 0, following calculation will be used for Total RCF bleached Import

PIRP = Total RCF bleached Import [Tonnes] = Import RCF Bleached Pulp (Tonnes) + RCF Pulp Production till new line attains 70% of Capacity utilization (Tonnes)

6. If BSWP < 0, following calculation will be used for Total Agro bleached Export

PIRP Total RCF bleached Import [Tonnes] = Import RCF Bleached Pulp (Tonnes) + RCF Pulp Production till new line attains 70% of Capacity utilization (Tonnes) - RCF bleached pulp stock (Tonnes)8.3Fuel quality of Coal in CPP and Co-Gen. - (a) Coal Quality for CPP. - The Boiler

Efficiency will be calculated for the baseline as well as assessment year with the help of Coal analysis constituents like GCV, %Ash, %Moisture, %H and Boiler Efficiency Equation provided to calculate the Boiler efficiency.Hence, by keeping the Turbine heat rate constant for both the years, the CPP heat hate will be calculated for the respective year. The Thermal Energy for the difference in heat rate of CPP will be deducted from the total energy consumption of the plant(i)Notional Thermal Energy to be deducted in the assessment year [Million kcal] = [CPP Heat Rate in AY (kcal/kwh)-Actual CPP Heat Rate in BY (kcal/kwh)] x CPP Generation in AY (Lakh kwh)/10(ii)CPP Heat Rate in AY = CPP Heat Rate in BY x (Boiler Efficiency in BY/Boiler Efficiency in AY)(iii)Boiler Efficiency in BY = 92.5-[{50xA+630 (M+9H) } /GCV] (Values are for baseline Year)(iv)Boiler Efficiency in AY = 92.5-[{50xA+630 (M+9H) } /GCV] (Values are for assessment Year)Where,-A = Ash in %M = Moisture in %H = Hydrogen in %GCV = Coal Gross Calorific Value in kcal/kwhAY = Assessment yearBY = Baseline YearCPP = Captive Power PlantTHR = Turbine Heat Rate(b)Coal Quality for Cogen(i)Boiler efficiency in baseline year = 92.5-[{50xA+630 (M+9H) } /GCV](ii)Boiler efficiency in assessment year = 92.5-[{50xA+630 (M+9H)} /GCV](iii)Weighted Percentage of Coal Energy Used in steam Generation (Process Boiler) in BY (Factor) = □6n=13{Operating Capacity of Process Boilers used for Steam generation in TPH x Percentage of Coal Energy Used in steam Generation in all the boilers for Steam generation in %)/ □6n=13 Operating Capacity of Process Boilers used for Steam generation (TPH)}(iv)Weighted Percentage of Coal Energy Used in steam Generation (Process Boiler) in AY (Factor) = □6n=13{(Operating Capacity of Boilers used for Steam generation in TPH x Percentage of Coal Energy Used in steam Generation in all the boilers for Steam generation in %) / □6n=13Operating Capacity of Boilers used for Steam generation (TPH)}(v)Weighted Percentage of Coal Energy Used in steam Generation (Co-Gen Boiler) in BY = □2n=1{(Operating Capacity of Boilers used for Steam generation in TPH x Percentage of Coal Energy Used in steam Generation in all the boilers for Steam generation in %) / □2n=1Operating Capacity of Boilers used for Steam generation (TPH)}(vi)Weighted Percentage of Coal Energy Used in steam Generation (Co-Gen Boiler) in AY = □2n=1{(Operating Capacity of Boilers used for Steam generation in TPH x Percentage of Coal Energy Used in steam Generation in all the boilers for Steam generation in %) / □2n=1Operating Capacity of Boilers used for Steam generation (TPH)}(vii)Weighted Average Specific Steam Consumption in BY & AY (kCal/kg of Steam) = □6n=13(Total Steam Generation in Process Boiler (Tonnes) x Specific Energy Consumption for Steam Generation in Process Boilers (kcal/kg of steam) + □2n=1(Total Steam Generation in Co-Gen Boiler (Tonnes) x Specific Energy Consumption for Steam Generation in Co-Gen Boiler (kcal/kg of steam)} / □6n=13 Steam generation in Co-gen + process boilers(viii)Normalized Specific Energy Consumption for Steam Generation (kCal/kg of Steam) = Weighted Average Specific Steam Consumption in BY x (Boiler efficiency in BY (%)/Boiler Efficiency in AY (%))(ix)Difference in Specific Steam from BY to AY (kCal/kg of Steam) = Normalized Specific Energy Consumption for Steam Generation in AY(kcal/kg of steam) - Weighted Average Specific Steam Consumption in BY (kcal/kg of steam)(x)Energy to be subtracted w.r.t. Fuel Quality in Co-Gen (Million kCal) = Difference in Specific Steam from BY to AY (kcal/kg of steam)x {(Total Steam Generation of all Process Boilers in AY (Tonnes) x Weighted Percentage of Coal Energy Used in steam Generation (Process Boiler) in AY)+(Total Steam Generation at Co-Gen Boiler in AY (Tonnes) x Weighted Percentage of Coal Energy Used in steam Generation (Co-Gen Boiler) in AY)}/1000Where,-A = Ash in %M = Moisture in %H = Hydrogen in %GCV = Coal Gross Calorific Value in kcal/kwhAY = Assessment yearBY = Baseline YearCPP = Captive Power PlantTPH = Tonnes per Hour8.4Power

Mix. - (a) Power Mix Normalization for Power Sources. - The baseline year power mix ratio will be maintained for Assessment year for Power Source and import. The Normalized weighted heat rate calculated from the baseline year Power mix ratio will be compared with the assessment year Weighted Heat Rate and the Notional energy will be deducted from the Total energy assessed.The Thermal Energy difference of electricity consumed in plant in baseline year and electricity consumed in plant during assessment year shall be subtracted from the total energy, considering the same % of power sources consumed in the baseline year.However, any efficiency increase (i.e. reduction in Heat Rate) in Assessment year in any of the power sources will give benefit to the plant.Notional Energy to be subtracted from the total Energy of Plant in the assessment year is calculated asEnergy Correction for all power source in the assessment year [Million kcal] = TECPSAY x (A-WHRAY - NWHRAY)Where,-TECPSAY: Total energy consumption from all the Power sources (Grid, CPP, DG etc) for AY in Million kWhA-WHRAY: Actual Weighted Heat Rate for the Assessment Year in kcal/kWhN-WHRAY: Normalized Weighted Heat Rate for the Assessment Year in kcal/ kWhNormalized Weighted Heat Rate for Assessment year (kcal/ kWh):N-WHRAY = A x (D/G)+B x (E/G)+C x (F/G)Where,-A: Grid Heat Rate for Assessment year (AY) in kcal/ kWhB: CPP Heat Rate for AY in kcal/ kWhC: DG Heat Rate for AY in kcal/ kWhD: Grid Energy consumption for Base Line Year (BY) in Million kWhE: CPP Energy consumption for BY in Million kWhF: DG Energy consumption for BY in Million kWhG: Energy Consumed from all Power sources (Grid, CPP, DG) for BY in Million kWh(Note: Any addition in the power source will attract the same fraction to be included in the above equation as PSiHRAY x (PSiECBY/ TECBY)PSiHRAY = Power Source (ith) Heat rate for AY in kcal/ kWhPSiECBY = Power Source (ith) Energy Consumption for BY in Million kWhTECBY = Total Energy consumption for BY in Million kWhThe Electricity Consumption from WHR is not being considered for Power Mix Normalization)b. Power Mix Normalization for Power Export. - Net Generation Heat of captive Power Sources of Plant to be considered for export of Power from Captive Power Sources instead of 2717 kcal/kWh. Actual Generation Net heat rate would be considered for the net increase in the export of power from the baseline. The exported Energy will be normalized in the assessment year as per following calculation:Notional energy for Power export to be subtracted in the assessment year [Million kcal]= (EXPAY -EXPBY)*[{(GnNHRAY)-2717)}]/10Where,-GnNHRAY: Generation Net Heat Rate for AY in kcal/kwhEXPAY: Exported Electrical Energy in AY in Lakh kwhEXPBY: Exported Electrical Energy in BY in Lakh kwh8.5Normalization Others.8.5.1. Environmental Concern. - Additional Environmental Equipment requirement due to major change in government policy on EnvironmentThe Normalization takes place in the assessment year for additional Equipment's Energy Consumption only if there is major change in government policy on Environment Standard. The Energy will be normalized for additional Energy consumption details from Energy meters. This is to be excluded from the input energy as calculated belowNotional Thermal Energy to be deducted in the assessment year due to Environmental Concern [Million kcal] = Additional Electrical Energy Consumed (Lakh kwh) x Weighted Heat Rate (kcal/kwh)/10+ Additional Thermal Energy Consumed (Million kcal)8.5.2. Biomass/ Alternate Fuel Unavailability w.r.t Baseline Year. - The Normalization for Unavailability for Biomass or Alternate Fuel is applied in the baseline year. The energy contained by the fossil fuel replacement will be deducted in the assessment yeari. Notional Thermal Energy to be deducted in the assessment year due to Biomass/Alternate Fuel Unavailability [Million kcal] = FFBAY GCVBBY/ 1000 + FFSAAY x GCVSABY /1000 + FFBAY x GCVLABY/1000Where,-FFBAY = Biomass replacement with Fossil fuel due to un-availability used in the process in Assessment Year (Tonnes)GCVBBY = Gross Calorific Value of Biomass in Baseline Year (kcal/kg)FFSAAY = Solid Alternate Fuel replacement with Fossil fuel due to un-availability used in the process in Assessment Year (Tonnes)GCVSABY = Gross Calorific Value of Solid Alternate Fuel in Baseline Year (kcal/kg)FFBAY = Liquid Alternate Fuel replacement with Fossil fuel due to un-availability used in the process in Assessment Year (Tonnes)GCVLABY = Gross Calorific Value of Biomass in Baseline Year (kcal/kg)8.5.3. Construction Phase or Project Activities. - The energy consumed during construction phase or project activities are non-productive energy and hence will be subtracted in the assessment year. The energy consumed by the equipment till commissioning will also be deducted in the assessment yeari. Notional Thermal Energy to be deducted in the assessment year due to Construction Phase or Project Activities [Million kcal] = Electrical Energy Consumed due to commissioning of Equipment (Lakh kwh) x Weighted Heat Rate (kcal/kwh)/10+ Thermal Energy Consumed due to commissioning of Equipment (Million kcal).8.5.4. Addition of New Line or Unit (In Process and Power Generation). - In case a DC commissions a new line/production unit before or during the assessment/target year, the production and energy consumption of new unit will be considered in the total plant energy consumption and production volumes once the Capacity Utilization of that line has touched / increased over 70 per cent. However, the energy consumption and production volume will not be included till it attains 70 per cent.of Capacity Utilization. Energy consumed and production made (if any) during any project activity during the assessment year, will be subtracted from the total energy and production in the Assessment year.Similarly, the same methodology is applied on a new unit installation for power generation within the plant boundary.(i)Thermal Energy Consumed due to commissioning of New process Line/Unit till it attains 70 per cent. of Capacity Utilization to be subtracted in assessment year (Million kcal) = (Electrical Energy Consumed due to commissioning of New process Line/Unit till it attains 70 per cent. of Capacity Utilization (Lakh kWh) x Weighted Average Heat rate in AY (kcal/kwh)/10) + Thermal Energy Consumed due to commissioning of New Process Line/Unit till it attains 70 per cent.of Capacity Utilization (Million kcal).The Production during commissioning of New Process Line/Unit will be subtracted from the total production of plant and added in the import of intermediary product (Wood Pulp, Agro Pulp and RCF Pulp as applicable).(ii)Thermal Energy Consumed from external source due to commissioning of New Line/Unit till it attains 70 per cent. of Capacity Utilization in Power generation to be subtracted in the assessment year (Million kcal) = (Electrical Energy Consumed from external source due to commissioning of New Line/Unit till it attains 70 per cent. of Capacity Utilization in Power generation (Lakh kWh) x Weighted Average Heat rate in AY (kcal/kwh)/10) + Thermal Energy Consumed due to commissioning of New Line/Unit till it attains 70 per cent of Capacity Utilization in Power generation (Million kcal).(iii)Steam Generation till New Line/Unit till it attains 70 per cent. of Capacity Utilization (CPP/Co-Gen) to be added in the assessment year (Million kcal) = {[Steam Generation From Co-gen till New Line/Unit till it attains 70 per cent. of Capacity Utilization (Tonne) * Steam specific Energy Consumption (kcal/kg of Steam)]} / 1000.(iv)Thermal Energy to be added in the assessment year for Power generation of a line /unit till it attains 70 per cent.of Capacity Utilization (Million kcal) = Net Electricity Generation till new Line/Unit attains 70 per cent. Capacity Utilization (Lakh kWh) x Weighted Heat Rate (kcal/kwh)/10Where,-AY: Assessment Year8.5.5. Unforeseen Circumstances. - The Normalization is required for Energy system of a plant, if the situation influences the Energy Consumption, which cannot be controlled by Plant Management and is termed as Unforeseen Circumstances. The Energy consumed due to unforeseen circumstances to be deducted in the assessment year.Thermal Energy consumed due to unforeseen (Million kcal) = (Electrical Energy to be Normalized in AY x Weighted Average Heat rate in AY (kcal/kWh)/10) + Thermal Energy to be Normalized (Million kcal)8.5.6. Renewable Energy. - The quantity of exported power (partially or fully) on which Renewable Energy Certificates have been earned by Designated Consumer in the assessment year under REC mechanism shall be treated as Exported power and Normalization will apply. However, the normalized power export or deemed injection will not qualify for issue of Energy Saving Certificates under PAT Scheme.The quantity of exported power (partially or fully) from Renewable energy which has been sold at a preferential tariff by the Designated consumer in the assessment year under REC mechanism shall be treated as Exported power. However, the normalized power export will not qualify for issue of Energy Saving Certificates under PAT Scheme.(i)Target Saving to be achieved (PAT obligation) (TOE) = Equivalent Major Product Output as per PAT scheme Notification (Tonnes) in BY x Target Saving to be achieved (PAT obligation) (TOE/Te)(ii)Target Saving achieved in assessment year (TOE) = [Gate to Gate Specific Energy Consumption in BY (TOE/Te)-Normalized Gate to Gate Specific Energy Consumption in AY (TOE/Te)] x Equivalent Major Product Output in tonnes as per PAT scheme Notification (Tonnes)(iii)Additional Saving achieved (After PAT obligation) (TOE) = Target Saving Achieved in AY (TOE) - Target Saving to be achieved (PAT obligation) in BY (TOE)A. Thermal Energy Conversion for REC and Preferential Tariff, if Steam Turbine Heat Rate in assessment year = 0(iv)Thermal energy conversion for REC and Preferential tariff (TOE) = [Quantum of Renewable Energy Certificates (REC) obtained as a Renewal Energy Generator (Solar & Non-Solar)(MWh) + Quantum of Energy sold under preferential tariff (MWh)] x 2717/10000B. Thermal Energy Conversion for REC and Preferential Tariff, if Steam Turbine Heat Rate in assessment year □0(v)Thermal energy conversion for REC and Preferential tariff (TOE) = [Quantum of Renewable Energy Certificates (REC) obtained as a Renewal Energy Generator (Solar & Non-Solar)(MWh) + Quantum of Energy sold under preferential tariff (MWh)] x Generation Net Heat Rate in AY (kcal/kwh)/10000(vi)If, Additional Saving achieved (After PAT obligation) (TOE) < = 0,Thermal Energy to be normalized for REC and preferential tariff power sell under REC mechanism (TOE) = 0,(vii)If, Additional Saving achieved (After PAT obligation) (TOE) >0, and Thermal energy conversion for REC and Preferential tariff (TOE) >Additional Saving achieved (After PAT obligation) (TOE) then,Thermal Energy to be normalized for REC and preferential tariff power sell under REC mechanism (TOE) = Additional Saving achieved (After PAT obligation) (TOE)(viii)If, Additional Saving achieved (After PAT obligation) (TOE) >0, and Thermal energy conversion for REC and Preferential tariff (TOE) < Additional Saving achieved (After PAT obligation) (TOE) then,

1. Thermal Energy to be normalized for REC and preferential tariff power sell under REC mechanism (TOE) = Thermal energy conversion for REC and Preferential tariff (TOE)

8.6Gate to Gate Specific Energy Consumption. - i. Total Energy with intermediary product Normalization for AY and BY (Million kcal) = Total Energy Consumed (Million kcal) + Notional Energy for Intermediary Product (Million kcal)ii. GtG for Equivalent product for AY & BY (Million/Te) = Total Energy with intermediary product Normalization for AY and BY (Million kcal) / Total Equivalent Production (Tonne)

i. Gate to Gate Specific Energy Consumption in Baseline Year (Million kcal/ Tonne) =| Total Energy Consumption (Million kcal)Total equivalent production (Tonnes)

ii. Gate to Gate Specific Energy Consumption in Baseline Year (TOE/ T) =| Total Energy Consumption (Million kcal)Total equivalent production (Tonnes) x 10

iii. Normalized Total Energy Consumption in the assessment year (Million kcal) = Total Energy Consumption with intermediary product Normalization in the assessment year (Million kcal) - Notional Energy Consumption for Power Mix (Million kcal)- Notional Energy Consumption for CPP and Cogen Coal Quality (Million kcal)- Notional Energy Consumption for Other Normalizations (Environmental Concern+ Biomass/Alternate Fuel Availability+ Project Activities+ New Line/Unit Commissioning+ Unforeseen Circumstances) (Million kcal)iv. Normalized Total Energy Consumption after REC compliance in the assessment year (Million kcal) = Normalized Total Energy Consumption in the assessment year (Million kcal) +Renewable Energy Certificates Compliance under PAT Scheme (Million kcal)v. Baseline Normalization (TOE/T) = Gate to Gate Specific Energy Consumption in Baseline year (TOE/T) - Notified Specific Energy Consumption in Baseline Year (TOE/ T)i. Normalized Gate to Gate Specific Energy Consumption after REC Compliance in Assessment Year (Million/ Tonne)

=| Normalized total Energy Consumption after REC Compliance (Million kcal)Total equivalent production (Tonnes)

ii. Normalized Gate to Gate Specific Energy Consumption after REC Compliance in Assessment Year (TOE/ Tonne)

=| Normalized total Energy Consumption after REC Compliance (Million kcal)Total equivalent production (Tonnes) x 10| - Baseline Normalization (TOE/ Tonne)

9. Sg Textile

Normalization factors for the following areas have been developed in Textile Sector, which will ultimately affect the gate to gate specific energy consumption in the assessment year:

1. Import and Export of Intermediary product

2. Value added product

3. Product Mix

4. Power Mix (Imported & Exported from/ to the grid and self-generation from the captive power plant)

5. Yarn Products and Open End Products

6. SEC calculation of Spinning Sub-group

7. Finished Fabric for Composite Sub-group

8. SEC calculation of Composite Sub-group

9. Weaving Production

10. Knitting Production

11. CPP PLF Normalization

12. Fuel Quality Normalization

13. Normalization for Start and Stop of the Plant

14. Other Normalizations Factors

14.1Environmental concern (Additional Environmental Equipment requirement due to major change in government policy on Environment)14.2Fuel replacements14.3Project Activity Phase14.4Unforeseen circumstances14.5Thermal Energy used in Waste heat recovery14.6Renewable Energy Certificate Normalization

15. Total Normalized energy consumption

16. Total Equivalent production

17. Normalized specific energy consumption

18. Gate to Gate energy consumption after REC compliance

19. Normalized gate to gate SEC after REC compliance

20. Baseline Normalization

21. Normalized gate to gate SEC after REC compliance

9.1Import and Export of Intermediary Products (Applicable in Composite, Fiber & Spinning Sub-Group). - Import of intermediary product for production of final product is common practice in Textile industry along with export of intermediary product or job work also undertaken as per market demand. The change in the proportion of import or export during baseline year to target year may affect the SEC of the plantFig 1: Process flow of a Typical Textile IndustryIn Textile sector, there are several processes running in the plant either in series or in parallel flow. The Intermediary import and Export is incorporated in following ways for different sub groups under Textile sector:9.1.1. Composite Sub Group. - (A.1) Yarn/Fiber Purchased from market for BY and AY1.1Intermediary Yarn Purchased from market for TFO = P1 (Tonne)1.2Intermediary Yarn Purchased from market for Doubling = P2 (Tonne)1.3Intermediary Yarn Purchased from market for Dyeing = P3 (Tonne)1.4Intermediary Yarn Purchased from market for Weaving = P4 (Tonne)1.5Intermediary Yarn Purchased from market for Knitting = P5 (Tonne)1.5.1Intermediary Dyed Fiber Purchased from Market = P51 (Tonne)1.5.2. Intermediary Dyed Yarn Purchased from Market = P52 (Tonne)1.5.3. Intermediary Weaved/Knitted Purchased from Market = P53 (Tonne)1.5.4. Weaving Production = P54 (Tonne)1.5.4. Knitting Production Production = P55 (Tonne)(A.2) Yarn/Fiber/Facbric Sold to market for BY and AY1.6Dyed Fiber sold to market = P6 (Tonne)1.7Ring Frame Yarn Sold to Market = P7 (Tonne)1.8Open End Yarn Sold to market = P8 (Tonne)1.9TFO Production Sold to market = P9 (Tonne)1.10Doubling Production sold to market = P10 (Tonne)1.11Dyed Yarn Sold to Market = P11 (Tonne)1.12Weaved Fabric Sold to market = P12 (Tonne)1.13Knitted Fabric Sold to market = P13 (Tonne)1.14Other Product 1 sold to market = P14 (Tonne)1.15Other Product 2 Sold to market = P15 (Tonne)1.16Other Product 3 Sold to market = P16 (Tonne)(A.3) Yarn/Fiber/Fabric Stocks for BY and AY1.17Ring Frame Yarn Stock = P17 (Tonne) = Closing Stock RFY-Opening Stock RFY1.18Open End Stock = P18 (Tonne) = Closing Stock OEY - Opening Stock OEY1.19Dyed Fiber Stock = P19 (Tonne) = Closing Stock DFi - Opening Stock DFi1.20Weaved fabric Stock = P20 (Tonne) Closing Stock WFa - Opening Stock WFa1.21Knitted Fabric Stock = P21 (Tonne) = Closing Stock KFa - Opening Stock KFaWhere,-RFY = Ring Frame YarnOEY = Open End YarnDFi = Dyed FiberWFa = Weaved FiberKFa = Knitted Fabric(A.4) Specific Energy Consumption for Product in kcal/kg for BY and AY1.22SEC of Ring Frame Yarn (up to Winding) = S1 (kcal/kg) = Electrical SEC (kWh/kg) x WAHR (kcal/kwh) + Thermal SEC (kcal/kg)1.23SEC of Open End OE = S2 (kcal/kg) = Electrical SEC (kWh/kg) x WAHR (kcal/kwh) + Thermal SEC (kcal/kg)1.24SEC of TFO = S3 (kcal/kg) = Electrical SEC (kWh/kg) x WAHR (kcal/kwh) + Thermal SEC (kcal/kg)1.25SEC of Doubling = S4 (kcal/kg) = Electrical SEC (kWh/kg) x WAHR (kcal/kwh) + Thermal SEC (kcal/kg)1.26SEC of Yarn Dyeing = S5 (kcal/kg) = Electrical SEC (kWh/kg) x WAHR (kcal/kwh) + Thermal SEC (kcal/kg)1.27SEC of Fiber Dyeing = S6 (kcal/kg) = Electrical SEC (kWh/kg) x WAHR (kcal/kwh) + Thermal SEC (kcal/kg)1.28SEC of Weaving = S7 (kcal/kg) = Electrical SEC (kWh/kg) x WAHR (kcal/kwh) + Thermal SEC (kcal/kg)1.29SEC of Knitting = S8 (kcal/kg) = Electrical SEC (kWh/kg) x WAHR (kcal/kwh) + Thermal SEC (kcal/kg)1.30SEC of Cotton Based Product = S9 (kcal/kg) = Electrical SEC (kWh/kg) x WAHR (kcal/kwh) + Thermal SEC (kcal/kg)1.31SEC of Polyester Cotton Based Product = S10 (kcal/kg) = Electrical SEC (kWh/kg) x WAHR (kcal/kwh) + Thermal SEC (kcal/kg)1.32SEC of Lycra Product = S11 (kcal/kg) = Electrical SEC (kWh/kg) WAHR (kcal/kwh) + Thermal SEC (kcal/kg)1.33SEC of Non Cellulosic (100% Synthetic) Product = S12 (kcal/kg) = Electrical SEC (kWh/kg) x WAHR (kcal/kwh) + Thermal SEC (kcal/kg)1.34SEC of Wool based Product = S13 (kcal/kg) = Electrical SEC (kWh/kg) x WAHR (kcal/kwh) + Thermal SEC (kcal/kg)1.35SEC of OP1 = S14 (kcal/kg) = Electrical SEC (kWh/kg) x WAHR (kcal/kwh) + Thermal SEC (kcal/kg)1.36SEC of OP2 = S15 (kcal/kg) = Electrical SEC (kWh/kg) x WAHR (kcal/kwh) + Thermal SEC (kcal/kg)1.37SEC of OP3 = S16 (kcal/kg) = Electrical SEC (kWh/kg) x WAHR (kcal/kwh) + Thermal SEC (kcal/kg)Where,-WAHR(kcal/kg) = Weighted Average Heat Rate of Power sources in kcal/kWhOp1..3 = Other Product 1..3SEC = Specific Energy Consumption in kcal/kgBY = Baseline YearAY = Assessment Year(A.5) Notional Energy for Import and Export Intermediary Product in BY and AY1.38Notional Energy for Export =NEEx (Million kcal) = [(P6 x S6) + (P7 xS1) + (P9 x (S1+S3)) + (P10 x (S1+S4)) + (P11 x(S1+S5)) + (P12 x(S1+S7)) + (P13 x(S1+S8)) + (P14 x S14) + (P15 x S15) + (P16 x S16)]/10001.39Notional Energy for Import= NEIm (Million kcal) = [(P1 x S1) + (P2 x (S1) + (P3 x S1) + (P4 x S1) + (P5 x S1)+(P51 x S6) +(P52 x (S5) +[S1+ {(P54 x S7+P55 x S8)/(P54+P55)}] x P53]/10001.40Notional Energy for Stocks = NESt (Million kcal) = [(P17 x S1) + (P18 x S2) + (P19 x S6) + (P20 x S7)+(P21 x S8)]/10001.41Total Notional Energy for Intermediary Import & Export in BY(Million kcal) = NEIm - NEEx - NESt for BY1.42Total Notional Energy for Intermediary Import & Export in AY (Million kcal) = NEIm - NEEx - NESt for AY9.1.2. For Spinning Sub Group.1.43Notional Energy for Export Ee (Million kcal) = [(P6 x S6) + (P19 x S6)]/10001.44Notional Energy for Import Ei (Million kcal) = 01.45Total Notional Energy for Intermediary Import & Export (Million kcal) = Ei - Ee {BY}1.46Total Notional Energy for Intermediary Import & Export (Million kcal) = Ei - Ee {AY}9.1.3. For Fiber Sub Group.1.47Total Major Product Sold to Market = P1 (Tonne)1.48Total Other Product 1 Sold to Market = P2 (Tonne)1.49Total Other Product 2 Sold to Market = P3 (Tonne)1.50Total Other Product 3 Sold to Market = P4 (Tonne)1.51Total Other Product 4 Sold to Market = P5 (Tonne)1.52Total Other Product 5 Sold to Market = P6 (Tonne)1.53Total Product Purchased as intermediary Major Product = P7 (Tonne)1.54Total Product Purchased from market as intermediary Product 1 = P8 (Tonne)1.55Total Product Purchased from market as intermediary Product 2 = P9 (Tonne)1.56Total Product Purchased from market as intermediary Product 3 = P10 (Tonne)1.57Total Product Purchased from market as intermediary Product 4 = P11 (Tonne)1.58Total Product Purchased from market as intermediary Product 5 = P12 (Tonne)1.59Stock of Major Product = P13 (Tonne) = Opening Stock - Closing Stock1.60Stock of Product 1 = P14 (Tonne) = Opening Stock - Closing Stock1.61Stock of Product 2 = P15 (Tonne) = Opening Stock - Closing Stock1.62Stock of Product 3 = P16 (Tonne) = Opening Stock - Closing Stock1.63Stock of Product 4 = P17 (Tonne) = Opening Stock - Closing Stock1.63Stock of Product 5 = P18 (Tonne) = Opening Stock - Closing Stock1.64SEC up to Major Product (Form Initial Process to Major Product) = Sm (kcal/kg) =Electrical SEC (kWh/kg) x weighted average heat rate of the Plant (kcal/kwh) + Thermal SEC (kcal/kg)1.65SEC up to Other Product 1 (Form Initial Process to Product 1) = S1 (kcal/kg) = Electrical SEC (kWh/kg) x weighted average heat rate of the Plant (kcal/kwh) + Thermal SEC (kcal/kg)1.66SEC up to Other Product 2 (Form Initial Process to Product 2) = S2 (kcal/kg) = Electrical SEC (kWh/kg) x weighted average heat rate of the Plant (kcal/kwh) + Thermal SEC (kcal/kg)1.67SEC up to Other Product 3(Form Initial Process to Product 3) = S3 (kcal/kg) = Electrical SEC (kWh/kg) x weighted average heat rate of the Plant (kcal/kwh) + Thermal SEC (kcal/kg)1.68SEC up to Other Product 4 (Form Initial Process to Product 4) = S4 (kcal/kg) = Electrical SEC (kWh/kg) x weighted average heat rate of the Plant (kcal/kwh) + Thermal SEC (kcal/kg)1.69SEC up to Other Product 5 (Form Initial Process to Product 5) = S5 (kcal/kg) = Electrical SEC (kWh/kg) x weighted average heat rate of the Plant (kcal/kwh) + Thermal SEC (kcal/kg)1.70Notional Energy for Import Ei (Million kcal) = [(P7 x Sm) + (P8 x S1) + (P9 x S2) + (P10 x S3) + (P11 x S4) + (P12 x S5)]/10001.71Notional Energy for Stocks Es (Million kcal) = [(P14 x S1) + (P15 x S2) + (P16 x S3) + (P17 x S4) + (P18 x S5)]/10001.72Total Notional Energy for Intermediary Import & Export (Million kcal) = Ei - Es {BY}1.73Total Notional Energy for Intermediary Import & Export (Million kcal) = Ei - Es {AY}9.2Value added product (Applicable in Spinning, Processing & Composite Sub-Group). - Many Textile Industries due to demand of their customers or by their own, do the work of value addition in their product. Value addition sometimes also increases the quality of the products. These value additions are of different types. The impact of the value addition results in the increase in the SEC of the plant. It may also be noted that the value addition Normalization shall be applicable to the should not suffer / or gain advantage due to this changesTaking reference from Fig 1Let Process B1, B2 and C is the Value addition process.Let the major product of the Plant =P (Tonne)SEC of the Major Product (kcal/kg) S2 = Electrical SEC (kWh/kg) x weighted average heat rate of the Plant (kcal/kwh) + Thermal SEC (kcal/kg)Value added product of the Plant= P1 & P2 (Tonne)SEC of P1 = S3 (kcal/kg)SEC of P2 = S4(kcal/kg)

Equivalent Product = P + P1 x (S3/ S2) + P2 x (S4/ S2)(Tonnes)

9.3Product Mix. - The Product Mix Normalization will be applicable to all the Sub-Group of the Textile sector. In order to calculate the Product mix in the assessment year we have to calculate the Product mix in the Baseline year first. The calculation methodology shall be same for both baseline year and assessment year. The Major product shall be same in the baseline year as well as assessment year irrespective of the change in the ration or the output of the major product. The available products in the assessment year shall be converted into the equivalent major product using the multiplication of the product to the ration of the SECs of the other product to the Major product.9.3.1. For Composite Sub Group. - (A.1) Specific Energy Consumption for Product in kcal/kg for BY and AY3.1SEC of Ring Frame Yarn = S1 (kcal/kg) = Electrical SEC (kWh/kg) x weighted average heat rate of the Plant (kcal/kwh) + Thermal SEC (kcal/kg)3.2SEC of Open End OE = S2 (kcal/kg) = Electrical SEC (kWh/kg) x weighted average heat rate of the Plant (kcal/kwh) + Thermal SEC (kcal/kg)3.3SEC of TFO = S3 (kcal/kg) = Electrical SEC (kWh/kg) x weighted average heat rate of the Plant (kcal/kwh) + Thermal SEC (kcal/kg)3.4SEC of Doubling = S4 (kcal/kg) = Electrical SEC (kWh/kg) x weighted average heat rate of the Plant (kcal/kwh) + Thermal SEC (kcal/kg)3.5SEC of Yarn Dyeing = S5 (kcal/kg) = Electrical SEC (kWh/kg) x weighted average heat rate of the Plant (kcal/kwh) + Thermal SEC (kcal/kg)3.6SEC of Fiber Dyeing = S6 (kcal/kg) = Electrical SEC (kWh/kg) x weighted average heat rate of the Plant (kcal/kwh) + Thermal SEC (kcal/kg)3.7SEC of Weaving Production = S7 (kcal/kg) = Electrical SEC (kWh/kg) x weighted average heat rate of the Plant (kcal/kwh) + Thermal SEC (kcal/kg)3.8SEC of Knitting Production = S8 (kcal/kg) = Electrical SEC (kWh/kg) x weighted average heat rate of the Plant (kcal/kwh) + Thermal SEC (kcal/kg)3.9SEC of Cotton Based Product = S9 (kcal/kg) = Electrical SEC (kWh/kg) x weighted average heat rate of the Plant (kcal/kwh) + Thermal SEC (kcal/kg)3.10SEC of Polyester Cotton Based Product = S10 (kcal/kg) = Electrical SEC (kWh/kg) x weighted average heat rate of the Plant (kcal/kwh) + Thermal SEC (kcal/kg)3.11SEC of Lycra Product = S11 (kcal/kg) = Electrical SEC (kWh/kg) x weighted average heat rate of the Plant (kcal/kwh) + Thermal SEC (kcal/kg)3.12SEC of Non Cellulosic (100% Synthetic) Product = S12 (kcal/kg) = Electrical SEC (kWh/kg) x weighted average heat rate of the Plant (kcal/kwh) + Thermal SEC (kcal/kg)3.13SEC of Wool based Product = S13 (kcal/kg) = Electrical SEC (kWh/kg) x weighted average heat rate of the Plant (kcal/kwh) + Thermal SEC (kcal/kg)3.14SEC of OP1 = S14 (kcal/kg) = Electrical SEC (kWh/kg) x weighted average heat rate of the Plant (kcal/kwh) + Thermal SEC (kcal/kg)3.15SEC of OP2 = S15 (kcal/kg) = Electrical SEC (kWh/kg) x weighted average heat rate of the Plant (kcal/kwh) + Thermal SEC (kcal/kg)3.16SEC of OP3 = S16 (kcal/kg) = Electrical SEC (kWh/kg) x weighted average heat rate of the Plant (kcal/kwh) + Thermal SEC (kcal/kg)(A.2.) Yarn/ Fabric/ Composite production in BY and AY3.17Yarn Production on 40s Count = P1 (Tonne)3.18Open End Production [10s Count] = P2 (Tonne)3.19TFO Production = P3 (Tonne) = Total TFO yarn Production - Yarn Production Up to

TFO till new line attains 70% of Capacity Utilisation3.20Doubling Production = P4 (Tonne) =Total doubling yarn Production - Yarn Production Up to Doubling till new line attains 70% of Capacity Utilisation3.21Dyed Yarn Production = P5 (Tonne) = Total dyeing yarn Production - Yarn Production Up to Dyeing till new line attains 70% of Capacity Utilisation3.22Dyed Fiber Production = P6 (Tonne)3.23Weaving Production = P7 (Tonne) = Total weaving Production - Yarn Production Up to Weaving till new line attains 70% of Capacity Utilisation3.24Knitting Production = P8 (Tonne) = Total knitting Production - Yarn Production Up to Knitting till new line attains 70% of Capacity Utilisation3.25Cotton Based Product = P9 (Tonne)3.26Polyester Cotton Based Product = P10 (Tonne)3.27Lycra Product = P11 (Tonne)3.28Non Cellulosic (100% Synthetic) Product = P12 (Tonne)3.29Wool based Product = P13 (Tonne)3.30Other Product 1 = P14 (Tonne)3.31Other Product 2 = P15 (Tonne)3.32Other Product 3 = P16 (Tonne)(A.3.) Major Product in Composite Sub-Sector in BY3.33Major Product Pm (Tonne) = the major Product can be any product from 3.23 to 3.29 depending on the quantity of production3.34SEC of Major Product Sm (kcal/kg) = the SEC of the Product Pm(A.4.) Equivalent product for Composite in BY and AY3.35Equivalent Weaving Production to Major Product (Tonne) = P7 x (S7/Sm)3.36Equivalent Knitting Production to Major Product (Tonne) = P8 x (S8/Sm)3.37Equivalent Cotton Based Product to Major Product (Tonne) = P9 x (S9/Sm)3.38Equivalent Polyester Cotton Based Product to Major Product (Tonne) = P10 x (S10/Sm)3.39Equivalent Lycra Product to Major Product (Tonne) = P11 x (S11/Sm)3.40Equivalent Non Cellulosic (100% Synthetic) Product to Major Product (Tonne) = P12 x (S12/Sm)3.41Equivalent Wool based Product to Major Product (Tonne) = P13 x (S13/Sm)3.42Total Equivalent Product P (Tonne) = 3.35 + 3.36 + 3.37 + 3.38 + 3.39+ 3.40 + 3.419.3.2. For Spinning Sub Group. - Equivalent product for spinning in BY and AY3.43Equivalent Open End Prod to Ring Frame (Tonne) = P2 x (S2/S1)3.44Equivalent TFO Prod to Ring Frame (Tonne) = P3 x (S3/S1)3.45Equivalent Doubling Prod. to Ring Frame (Tonne) = P4 x (S4/S1)3.46Equivalent Dyed Yarn Prod to Ring Frame (Tonne) = P5 x (S5/S1)3.47Equivalent OP1 to Ring Frame (Tonne) = P14 x (S14/S1)3.48Equivalent OP2 to Ring Frame (Tonne) = P15 x (S15/S1)3.49Equivalent OP3 to Ring Frame (Tonne) = P16 x (S16/S1)3.50Total Equivalent Product in Ring Frame Yarn on 40s count P (Tonne) = 3.43 + 3.44 + 3.45 + 3.46 + 3.47+ 3.48 + 3.49 + 3.179.3.3. For Fiber & Processing Sub Group. - (C.1) Production in BY and AY3.51Total Major Production = Pm (Tonne)3.52Total Other Product 1 Sold to Market = P1 (Tonne)3.53Total Other Product 2 Sold to Market = P2 (Tonne)3.54Total Other Product 3 Sold to Market = P3 (Tonne)3.55Total Other Product 4 Sold to Market = P4 (Tonne)3.56Total Other Product 5 Sold to Market = P5 (Tonne)(C.2) Specific Energy Consumption up to product in BY and AY3.57SEC up to Major Product (Form Initial Process to Major Product) = Sm (kcal/kg) = Electrical SEC (kWh/kg) x weighted average heat rate of the Plant (kcal/kwh) + Thermal SEC (kcal/kg)3.58SEC up to Other Product 1 (Form Initial Process to Product 1) = S1 (kcal/kg) = Electrical SEC (kWh/kg) x weighted average heat rate of the Plant (kcal/kwh) + Thermal SEC (kcal/kg)3.59SEC up to Other Product 2 (Form Initial Process to Product 2) = S2 (kcal/kg) = Electrical SEC (kWh/kg) x weighted average heat rate of the Plant (kcal/kwh) + Thermal SEC (kcal/kg)3.60SEC up to Other Product 3 (Form Initial Process to Product 3) = S3 (kcal/kg) = Electrical SEC (kWh/kg) x weighted average heat rate of the Plant (kcal/kwh) + Thermal SEC (kcal/kg)3.61SEC up to Other Product 4 (Form Initial Process to Product 4) = S4 (kcal/kg) = Electrical SEC (kWh/kg) x weighted average heat rate of the Plant (kcal/kwh) + Thermal SEC (kcal/kg)3.62SEC up to Other Product 5 (Form Initial Process to Product 5) = S5 (kcal/kg) = Electrical SEC (kWh/kg) x weighted average heat rate of the Plant (kcal/kwh) + Thermal SEC (kcal/kg)(C.3) Equivalent product for Fiber in BY and AY3.63Equivalent Other Product 1 to Major Product (Tonne) = P1 x (S1/Sm)3.64Equivalent Other Product 2 to Major Product (Tonne) = P2 x (S2/Sm)3.65Equivalent Other Product 3 to Major Product (Tonne) = P3 x (S3/Sm)3.66Equivalent Other Product 4 to Major Product (Tonne) = P4 x (S4/Sm)3.67Equivalent Other Product 5 to Major Product (Tonne) = P5 x (S5/Sm)3.68Total Equivalent Product P (Tonne) = Pm + 3.63 + 3.64 + 3.65 + 3.66 + 3.67Note: For Assessment year, the Energy factor of baseline will be used to calculate the Equivalent product for respective product. However, any introduction of new product in the assessment year will draw the SEC of the newly introduced product into the Energy factor and equivalent product is to be calculated accordingly. Thus, the Numerator SEC of the above calculation of energy factor of baseline will change to SEC of the respective product in the assessment year as EFPiAY = SECPiAY/ SECPmBY. Rest of the calculation remain same.Where,-EFPiAY = Energy Factor in Assessment Year (Si/Sm)SECPiAY = Specific Energy Consumption of a product in assessment year (kcal/kg)SECPmBY = Sm = Specific Energy Consumption of major product in baseline year (kcal/kg)9.4Power Mix Normalization (Applicable in all Sub-Groups).9.4.1. Power Mix Normalization for Power Sources. - The baseline year power mix ratio will be maintained for Assessment year for Power Source and import. The Normalized weighted heat rate calculated from the baseline year Power mix ratio will be compared with the assessment year Weighted Heat Rate and the Notional energy will be deducted from the Total energy assessedThe Thermal Energy difference of electricity consumed in plant in baseline year and electricity consumed in plant during assessment year shall be subtracted from the total energy, considering the same % of power sources consumed in the baseline year.However, any efficiency increase (i.e. reduction in Heat Rate) in Assessment year in any of the power sources will give benefit to the plantNotional Energy to be subtracted from the total Energy of Plant in the assessment year is calculated as(i)Energy Correction for all power source in the assessment year [Million kcal] = TECPSAY x (A-WHRAY - N-WHRAY)Where,-TECPSAY: Total energy consumption from all the Power sources (Grid, CPP, DG etc) for AY in Million kwhA-WHRAY: Actual Weighted Heat Rate for the Assessment Year in kcal/kwhN-WHRAY: Normalized Weighted Heat Rate for the Assessment Year in kcal/kwh(ii)Normalized Weighted Heat Rate for Assessment year (kcal/kwh): N-WHRAY = A x (D/G)+B x (E/G)+C x (F/G)Where,-A: Grid Heat Rate for Assessment year (AY) in kcal/kwhB: CPP Heat Rate for AY in kcal/kwhC: DG Heat Rate for AY in kcal/kwhD: Grid Energy consumption for Base Line Year (BY) in Million kwhE: CPP Energy consumption for BY in Million kwhF: DG Energy consumption for BY in Million kwhG: Energy Consumed from all Power sources (Grid, CPP, DG) for BY in Million kwh(Note: Any addition in the power source will attract the same fraction to be included in the above equation as PSiHRAY x (PSiECBY/ TECBY)Where,-PSiHRAY = Power Source (ith) Heat rate for AY in kcal/kwhPSiECBY = Power Source (ith) Energy Consumption for BY in Million kwhTECBY = Total Energy consumption for BY in Million kwhThe Electricity Consumption from WHR is not being considered for Power Mix Normalization)9.4.2. Power Mix Normalization for Power Export. - Net Generation Heat of captive Power Sources of Plant to be considered for export of Power from Captive Power Sources instead of 2717 kCal/kWh. Actual Generation Net heat rate would be considered for the net increase in the export of power from the baseline. The exported Energy will be normalized in the assessment year as per following calculationNotional energy for Power export to be subtracted in the assessment year [Million kcal] =(EXPAY - EXPBY)*[GnNHRAY: - 2717)]/10Where,-GnNHRAY: Generation Net Heat Rate for AY in kcal/ kWhEXPAY: Exported Electrical Energy in AY in Lakh kWhEXPBY: Exported Electrical

Energy in BY in Lakh kWhAPCAY: Auxiliary Power Consumption for AY in %9.5Yarn Products and Open End Products. - In order to normalize the variation caused due to the change in the count, BEE has fixed 40's Count as a standard count for giving production value of the spinning yarn production and 10's Count as standard for giving the production of Open end (OE)Yarn.All the plants who are producing Single yarn at different count may convert their production into 40's equivalent yarn production by using SITRA documents.

Productionat 40s Count = Production at actual count x factor from SITRA guidelines(Tonnes)

Productionof OE Yarn at 10s Count = Production at actual count x factor from SITRA guidelines(Tonnes)

9.6Specific Energy Consumption of Spinning Sub-group. - To calculate the Specific energy consumption of the Spinning DCs, equivalent product is required which will be calculated by converting the entire product into Ring Frame equivalent Yarn.6.1Let E be the Total Energy Consumed by the plant including Notional Energy for Import and Export of intermediary product.(TOE)6.2Let P1 be the Ring Frame Production at 40s count (Tonne)6.3S1 is the SEC of Ring Frame (kcal/kg)6.4P2 = Production of TFO (Tonne)6.5S2 = SEC of TFO (kcal/kg)6.6P3 = Production of OE (Tonne)6.7S3 = SEC of OE (kcal/kg)6.8Equivalent Product Pe = P1 + {P2 x (S2/S1)} + {P3 x (S3/S1)} (Tonne)6.9SEC of Spinning DC (S) = Please refer NF 179.7Finished Fabric of Composite sub group. - The Technical committee has finalized five products for the Composite Sub group. These products are:CottonPolyester CottonLycraNon Cellulosic Product (100% Synthetic)Wool based productThe DCs which belongs to Composite Sub-group have to convert their products into these five products and have to mention the Major product among these five products. All the other 4 products shall be converted to equivalent major product by using the ration of the SECs of the Products.Let,Pc, Sc = Production and SEC of cotton based product respectively (Tonne), (kcal/kg)Ppc, Spc = Production and SEC of Polyster cotton based product respectively (Tonne), (kcal/kg)Pl, Sl = production and SEC of Lycra based product respectively (Tonne), (kcal/kg)Pnc, Snc = Production and SEC of Non Cellulosic Product respectively (Tonne), (kcal/kg)Pw, Sw = Production and SEC of Wool based product respectively (Tonne), (kcal/kg)If Major Product = Pc (Tonne)Then,

TotalFinished Fabric P = Pc + {Ppc x (Spc/ Sc) + {PI x (SI/ Sc)} + {Pnc x (Snc/ Sc)} + {Pw x (Sw/ Sc)}(Tonne)

9.8Specific Energy Consumption calculation of Composite Sub-group. - From above,Total Finished Fabric = P (Tonne)Total Energy of the DC including energy for import and Export of intermediary product = E(Million kcal)SEC S(TOE/Tonne) = Please refer NF 179.9Weaving Production. - In case of weaving, 60 PPI (Picks per Inch) has been finalized as standard value and all the DCs should convert their weaving production at different picks to production at 60 PPI.9.10Knitting Process. - In case of Knitting, all the production must be on weight basis not in the length basis.9.11Plant Load Factor of Captive Power Plant. - Calculation of PAF, PLF and % of loss due to External factor:9.11.1. Plant Availability Factor (PAF) in Base line year = (Total Available hours in a year in BY - Internal Planned Shutdown, Breakdown/ Outages hrs in BY External Planned Shutdown, Breakdown/Outages hrs in BY)/ Total Available hours in a year in BY9.11.2. Plant Availability Factor (PAF) in Assessment year = (Total Available hours in a year in AY-Internal Planned Shutdown, Breakdown/Outages hrs in AY-External Planned Shutdown, Breakdown/Outages hrs in AY)/ Total Available hours in a year in AY9.11.3. Plant Load Factor (PLF) in Baseline Year = (Gross Generation in Lakh kwh in BY)/(Installed capacity in MW in BY x8760 x PAF in BY)9.11.4. Plant Load Factor

(PLF) in Assessment Year = (Gross Generation in Lakh kwh in AY)/(Installed capacity in MW in AY x8760 x PAF in AY)9.11.5. % loss of PLF due to external factor in Assessment Year = (Plant low load hrs due to External Factors in AY)/(Plant low load hrs due to External Factors in AY + Plant low load hrs due to Internal Factors/ Breakdown in Plant in AY)9.11.6. Percentage increase in the Heat Rate at PLF in Baseline Year = 0.0016 x (% PLF)^2-0.3815 x (% PLF) +21.9599.11.7. Percentage increase in the Heat Rate at PLF in Assessment Year = 0.0016 x (% PLF)^2-0.3815 x (% PLF) +21.9599.11.8. Difference of % increase in Heat Rate of Assessment Year and Baseline Year = % increase in Heat Rate of Assessment Year - % increase in Heat Rate of Baseline Year9.11.9. Loss in PLF from Assessment Year due to external factor is 70 % (Assume)9.11.10. Percentage Decrease on % increase in Heat Rate from baseline due to external factor = Difference of % increase in Heat Rate * % loss in PLF in Assessment year9.11.11. The Normalized Gross Heat Rate of Assessment Year = Actual Gross Heat Rate X (1-0.590 %)

Totalnotional energy subtracted from the total energy due to loss of PLF(Million kcal)

=Gross generation of CPP X (Actual gross Heat Rate - Normalized gross Heat Rate)/ 10

9.12Normalization on Fuel Quality.9.12.1. For CPP9.12.1.1. Boiler efficiency in baseline year=92.5-[{50xA+630 (M+9H)} / GCV]9.12.1.2. Boiler efficiency in assessment year=92.5-[{50xA+630 (M+9H)} / GCV]9.12.1.3. The CPP heat rate in assessment year due to fuel quality-----(i) = CPP heat rate in baseline year x (Boiler Efficiency in baseline year / Boiler Efficiency in assessment year)(kcal/kWh)9.12.1.4. Increase in the CPP heat rate of assessment year due to fuel quality = (i) - Actual CPP heat rate in Baseline Year

9.12.15 Notional energy to be subtracted from total energy(Million kcal)

=CPP generation in assessment year X increase in CPP heat rate

9.12.2. For Co-Gen9.12.2.1. Boiler efficiency in baseline year = 92.5 - [{50 x A + 630 (M + 9H) }/ GCV]9.12.2.2. Boiler efficiency in assessment year = 92.5 - [{50 x A + 630 (M + 9H)}/ GCV]9.12.2.3. Weighted Percentage of Coal Energy Used in steam Generation (Process Boiler) in BY = {□5n=1 (Operating Capacity of all Boilers used for Steam generation in TPH x Percentage of Coal Energy Used in steam Generation in all the boilers for Steam generation in %)/ □5n=1 Operating Capacity of all Boilers used for Steam generation}9.12.2.4. Weighted Percentage of Coal Energy Used in steam Generation (Process Boiler) in AY = {□5n=1 (Operating Capacity of all Boilers used for Steam generation in TPH x Percentage of Coal Energy Used in steam Generation in all the boilers for Steam generation in %)/ □5n=1 Operating Capacity of all Boilers used for Steam generation}9.12.2.5. Weighted Percentage of Coal Energy Used in steam Generation (Co-Gen Boiler) in BY = {□10n=6 (Operating Capacity of all Boilers used for Steam generation in TPH x Percentage of Coal Energy Used in steam Generation in all the boilers for Steam generation in %)/ □10n=6 Operating Capacity of all Boilers used for Steam generation}9.12.2.6. Weighted Percentage of Coal Energy Used in steam Generation (Co-Gen Boiler) in AY = {□10n=6 (Operating Capacity of all Boilers used for Steam generation in TPH x Percentage of Coal Energy Used in steam Generation in all the boilers for Steam generation in %)/ □10n=6 Operating Capacity of all Boilers used for Steam generation}9.12.2.7. Weighted Average Specific Steam Consumption in BY & AY(kcal/kg of Steam) = □5n=1 (Total Steam Generation at Process Boiler x Specific Energy Consumption for Steam Generation in Process Boilers) + □10n=6 (Total Steam Generation at Co-Gen Boiler x Specific Energy Consumption for Steam Generation in Co-Gen Boiler)}/ □10n=1 Total Steam generation at all the boilers9.12.2.8. Normalized Specific Energy Consumption for Steam Generation(kcal/kg of

Steam) = Weighted Average Specific Steam Consumption in BY x (Boiler efficiency at BY/Boiler Efficiency at AY)9.12.2.9. Difference Specific Steam from BY to AY(kcal/kg of Steam) = Normalized Specific Energy Consumption for Steam Generation in AY - Weighted Average Specific Steam Consumption in BY

9.12.2.10. Energy to be subtracted w.r.t. Fuel Quality in Co-Gen(Million kcal)=Difference Specific Steam from BY to AY x {(Total Steam Generation at Process Boiler in AY x Weighted Percentage of Coal Energy Used in steam Generation (Process Boiler) in AY) + (Total Steam Generation at Co-Gen Boiler in AY x Weighted Percentage of Coal Energy Used in steam Generation (Co-Gen Boiler) in AY)}/ 1000

Where,-A = Ash in %M = Moisture in %H = Hydrogen in %GCV = Coal Gross Calorific Value in kcal/kwhAY = Assessment yearBY = Baseline YearCPP = Captive Power PlantTPH = Tonnes Per Hour9.13Normalization for Start and Stop.9.13.1. Energy to be subtracted w.r.t. Cold startup for Thermal Energy Consumption (Million kcal) = Cold to Hot start due to external factors (Thermal Energy Consumption) {AY-BY}9.13.2. Energy to be subtracted w.r.t. Cold start up for Electrical Energy Consumption (Million kcal) = Cold to Hot start due to external factors (Electrical Energy Consumption) {AY-BY} x Weighted average heat Rate in AY/109.13.3. Energy to be subtracted w.r.t. Hot to Cold Stop (Million kcal) = Hot to Cold stop due to external factor (Electrical Energy Consumption) {AY-BY} x Weighted average heat Rate in AY/10

9.13.4. Total Energy to be subtracted w.r.t. Electrical and Thermal Energy Consumption (Million kcal) = 13.1 + 13.2 + 13.3

9.14Other Normalizations Factors. - These Normalization factors shall be applicable in following cases9.14.1. Environmental Concerns.9.14.1.1. Installation due to Environmental concern. - Additional Electrical & Thermal Energy Consumed due to Environmental Concern (Million kcal) = (Additional Electrical Energy Consumed (Lakh kWh) x Weighted Average heat rate in AY/ 10) + Additional Thermal Energy Consumed9.14.1.2. Biomass replacement with Fossil fuel due to un-availability (Million kcal) = Biomass replacement with Fossil fuel due to Biomass un-availability (used in the process) x Biomass Gross Calorific Value/ 10^39.14.2. Fuel Replacements.9.14.2.1. Alternate Solid Fuel replacement with Fossil fuel due to un-availability (Million kcal) = Alternate Solid Fuel replacement with Fossil fuel due to Alternate Solid Fuel un-availability (used in the process) (in Tonne) x Solid Alternate Fuel Gross Calorific Value/ 10^39.14.2.2. Alternate Liquid Fuel replacement with Fossil fuel due to un-availability (Million kcal) = Alternate Liquid Fuel replacement with Fossil fuel due to Alternate Liquid Fuel un-availability (used in the process) (in Tonne) x Liquid Alternate Fuel Gross Calorific Value / 10^39.14.3. Project Activity Phase. - Additional Electrical & Thermal Energy Consumed due to commissioning of Equipment (Construction Phase)(Million kcal)= (Electrical Energy Consumed due to commissioning of Equipment x Weighted Average Heat rate in AY/ 10) + Thermal Energy Consumed due to commissioning of Equipment9.14.4. Addition of New Line/ Unit (In Process and Power Generation). - In case a DC commissions a new line/ production unit before or during the assessment/ target year, the production and energy consumption of new unit will be considered in the total plant energy consumption and production volumes once the Capacity Utilization of that line has touched/ increased over 70 per cent. However, the energy consumption and production volume will not be included till it attains 70 per cent. of Capacity Utilization. Energy consumed and production made (if any) during any project activity during the assessment year, will be subtracted from the total energy and production in the Assessment year. Similarly, the same methodology is applied on a new unit installation for power generation within the plant boundary.9.14.4.1. Electrical & Thermal Energy Consumed due to commissioning of New process Line/ Unit till it attains 70 per cent. of Capacity Utilization(Million kcal) = (Electrical Energy Consumed due to commissioning of New process Line/ Unit till it attains 70 per cent. of Capacity Utilization(Lakh kWh) x Weighted Average Heat rate in AY/ 10) + Thermal Energy Consumed due to commissioning of New Process Line/ Unit till it attains 70% of Capacity UtilizationThe Production during commissioning of New Process Line/ Unit will be subtracted from the total production of plant and added in the import of intermediary product.9.14.4.2. Electrical & Thermal Energy Consumed from external source due to commissioning of New Line/ Unit till it attains 70 per cent. of Capacity Utilization in Power generation (Million kcal) = (Electrical Energy Consumed from external source due to commissioning of New Line/ Unit till it attains 70 per cent. of Capacity Utilization in Power generation (Lakh kWh) x Weighted Average Heat rate in AY/ 10) + Thermal Energy Consumed due to commissioning of New Line/ Unit till it attains 70 per cent.of Capacity Utilization in Power generation9.14.4.3. Energy to be added for Power generation of a line/ unit till it attains 70% of Capacity Utilization (Million kcal) = (Net Electricity Generation till new line/ unit attains 70per cent. Capacity Utilization(Lakh kWh) x Generation Net Heat Rate in AY/ 10)9.14.4.4. Energy to be added for Steam generation of a line/ unit till it attains 70 per cent.of Capacity Utilization (Million kcal) = (Steam Generation from Co-Gen till new line/ Unit attains 70 per cent. of Capacity Utilization(Lakh kWh) x Steam Specific Energy Consumption in AY/ 1000)9.14.5. Unforeseen circumstances. - Electrical & Thermal Energy to be normalized consumed due to unforeseen circumstances (Million kcal) = (Electrical Energy to be Normalized in AY x Weighted Average Heat rate in AY/ 10) + Thermal Energy to be Normalized9.14.6. Normalization for Thermal Energy used in Waste heat recovery. Thermal Energy to be normalized for WHR (Million kcal) = [(Steam Generation for Process through WHR (Tonne per annum) x Percentage conversion to conventional steam generation x Steam Enthalpy/ 1000) + (Total TR Production from Chiller for Process x Percentage conversion to conventional Chiller x 3024/ 1000)] {BY-AY}9.14.7. Renewable Energy Certificate Normalization.9.14.7.1. Additional Saving achieved (After PAT obligation)(TOE/ Ton) = Target Saving Achieved in AY (TOE/ Ton) - Target Saving to be achieved (PAT obligation) in BY (TOE/ Ton)9.14.7.2. Additional Saving achieved (After PAT obligation)(TOE) = Target Saving Achieved in AY (TOE) - Target Saving to be achieved (PAT obligation) in BY (TOE)9.14.7.3. Thermal energy conversion for REC and Preferential tariff (TOE) = If Steam Turbine Net Heat Rate in AY = 0, then Quantum of Renewable Energy Certificates (REC) obtained as a Renewal Energy Generator (Solar & Non-Solar)(MWh) + Quantum of Energy sold under preferential tariff(MWh) x 2.717, otherwise Quantum of Renewable Energy Certificates (REC) obtained as a Renewal Energy Generator (Solar & Non-Solar)(MWh) + Quantum of Energy sold under preferential tariff(MWh) x Generation Net Heat Rate in AY/ 10^49.14.7.4. Thermal Energy to be normalized for REC and preferential tariff power sell under REC mechanism (TOE) = If 9.14.7.1 < = 0 then 0, Else if, Thermal energy conversion for REC and Preferential tariff (TOE) is greater than Additional Saving achieved (After PAT obligation) (TOE) than Additional Saving achieved (After PAT obligation)(TOE) else Thermal energy conversion for REC and Preferential tariff(TOE)9.15Total Normalized energy consumption of the DC (E)(TOE) = [(Total Electricity purchased from Grid (Lakh kWh) x 860/ 10) + (Fuel Consumed (Tonne) X GCV of Fuel(Kcal/ Kg) X 1000) - (Electricity Exported to Grid/ Others(Million kWh) x 2717) + Notional Energy for Import (Ei) - Notional Energy for Export (Ee) - Notional Energy for Power Mix - Notional energy for PLF of CPP - Notional energy for Fuel quality in CPP - Notional Energy for Fuel quality in Co-Gen - Notional Energy for Start-Stop - Notional Energy for Other Normalization Factors]/ 109.16Total Equivalent Production:

9.16.1.	In Spinning Sub Group	:	PS(Tonnes).......... Refer NF 2, 3 and 5
9.16.2.	In Composite Sub Group	:	PC(Tonnes).......... Refer NF 2, 3 and 7
9.16.3.	In Processing Sub Group	:	PP(Tonnes).......... Refer NF 2 and 3
9.16.4.	In Fiber Sub Group	:	PF(Tonnes).......... Refer NF 3

9.17Normalized Specific Energy Consumption (SEC) Calculation(TOE/ Tonne):

SECSpinning	=	Total Normalized energy consumption of the DC (15)/ PS(16.1)
SECComposite	=	Total Normalized energy consumption of the DC (E)/ PC(16.2)
SECProcessing	=	Total Normalized energy consumption of the DC (E)/ PP(16.3)
SECFiber	=	Total Normalized energy consumption of the DC (E)/ PF(16.4)

9.18Gate to Gate Energy Consumption after REC compliance(TOE) =9.14.7.4 + 159.19Normalized Gate to Gate SEC after REC compliance(TOE/Tonne) = 18/169.20Baseline Normalization(TOE/Tonne) = Gate to Gate Specific Energy Consumption in Baseline year(TOE/Tonne) - Notified Specific Energy Consumption in Baseline Year(TOE/Tonne)9.21Normalized Gate to Gate SEC after REC compliance(TOE/Tonne)=(18/16)-Baseline Normalization(TOE/Tonne)

10. Sh Thermal Power Plant

The improvement target was given considering various factors that affected the generation. However, there were still certain factors that needed to be addressed. In line with this, the following document has been notified considering all such aspects which were overlooked on a broader scale. The new modified form-1 addressed all the issues known as the Normalization factors.Thermal Power Plant Normalized Net Operating Heat Rate10.1Coal Based Thermal Power Plant.

Coal BasedThermal Power plant Normalized Net Operating Heat Rate (kcal/kWh)	=	Coal Based Thermal Power Plant Station NetOperating Heat Rate without Normalization (kcal/ kWh)	-	Coal Quality Normalization (kcal/ kWh)	-	PLF Normalization (kcal/ kWh)	-	APC Normalization due to Low PLF (kcal/ kWh)	-	APC Normalization due to Coal Quality deterioration	-	Othe Norn (kcal

Where,-PLF = Plant Load FactorAPC = Auxiliary Power Consumption10.2Gas Based Thermal Power Plant.

	=		-		-		-		-		-	

Gas Based Thermal Power plant Normalized NetOperating Heat Rate (kcal/ kWh)	Gas Based Thermal Power Plant Station NetOperating Heat Rate without Normalization (kcal/ kWh)	Gas Fuel Mix Normalization (kcal/ kWh)	PLF Normalization (kcal/ kWh)	Gas OC Cycle Normalization (kcal/ kWh)	APC Normalization (kcal/ kWh)	Gas (Norn (kcal

Where,-PLF = Plant Load FactorAPC = Auxiliary Power Consumption10.3Formula for Target Setting.10.3.1. Formula for target setting for Coal based Thermal Power Plant.10.3.1.1. Design Net Heat Rate(a)Station installed capacity (MW) = [U#1 capacity (MW) + U#2 Capacity (MW)+......](b)Station Design Boiler Efficiency = ([{U#1 Installed Capacity(MW) X U#1 Boiler Efficiency (%)} + {U#2 Installed Capacity(MW) X U#2 Boiler Efficiency (%)} + ...])/ (Station Installed Capacity (MW))(c)Station THR (kcal/ kWh) = ([{U#1 THR X U#1 Installed Capacity(MW)} + {U#2 THR X U#2 (kcal/ kWh) Installed Capacity(MW)} + ...])/ (Station Installed Capacity (MW))(d)Unit DGHR (kcal/ kWh) = Unit THR (kcal/ kWh)/ Boiler Efficiency (%)(e)Station DGHR (kcal/ kWh) = ([{U#1 DGHR X U#1 Installed Capacity(MW)} + {U#2 DGHR X U#2 (kcal/ kWh) Installed Capacity(MW)} + ...])/ (Station Installed Capacity (MW))

(f) Station Design Net Heat Rate (kcal/ kWh) =| Station DGHR (kcal/ kWh)(1 - % Operating APC/ 100)

Where,-DGHR = Design Gross Heat Rate (kcal/kWh)THR = Turbine Heat Rate (kcal/kWh)DNHR = Design Net Heat Rate (kcal/kWh)APC = Auxiliary Power Consumption (%) [Operating APC in Baseline Year]10.3.1.2. Operating Net Heat Rate(a)Station Operating Load (MW) = [U#1 Operating Load (MW) + U#2 Operating Load (MW) + ...](b)Operating Load (MW) = Unit Gross Generation (MWh) + U# 2 Operating Load (MW) + ...(c)Station Loading Factor (%) = ([{U#1 loading factor (%) X U#1 Gross Generation (MU)} + {U#2 loading factor (%) X U#2 Gross Generation (MU) + ...])/ (Station Gross Generation (MU))}(d)State Gross Generation (MU) = (U# 1 Gross Generation (MU) + U# -2 Gross Generation (MU) + ...)(e)Station Net Generation (MU) = Station Gross Generation (MU) X [1 - APC (%)/100](f)Station OGHR (kcal/ kWh) = ([{U# 1 OGHR (kcal/ kWh) X U# 1 Gross Generation (MU)} + {U# 1 OGHR (kcal/ kWh) X U# 1 Gross Generation (MU)} + ...])/ (Station Gross Generation (MU))

(g) Station ONHR (kcal/kWh) =| Station OGHR (kcal/ kWh)(1 - % Operating APC/ 100)

Where,-OGHR = Operating Gross Heat RateONHR = Operating Net Heat RateAPC = Auxiliary Power Consumption [Operating APC in Baseline Year]10.3.1.3. Heat Rate Reduction Target. - The target in Thermal Power Sector under PAT Scheme is set by taking the deviation of NHR of Baseline year and design NHR. Based on the deviation percentage (to design), the target values for Heat Rate reduction are set in the slab.Let the deviation percentage be "X", thenIf X is <= 5(five), then the HR reduction target is 10% of the deviation.If X is >5, but <=10, then the HR reduction target is 17% of the deviation.If X is >10, but <=20, then the HR reduction target is 21% of the deviation.If X is >20, then the HR reduction target is 24% of the deviation.10.3.1.4. Target Net Operating Heat Rate without Normalization. - The Station Net Operating Heat Rate without Normalization is the ONHR of basement year minus the heat rate reduction target given to it.Target Station ONHR (kcal/ kWh) = Station Operating NHR for BY - Heat Rate Reduction TargetWhere,-OGHR = Operating Gross

Heat RateONHR = Operating Net Heat RateAPC = Auxiliary Power Consumption10.3.2. Formula for target setting for Gas based Thermal Power Plant10.3.2.1. Design Parameters(a)Station Design Module Efficiency = ([{U#1 Installed Capacity (MW) X U#1 Module Efficiency} + {U#2 Installed Capacity (MW) X U#2 Module Efficiency} + ...])/ (Station Installed Capacity (MW))(b)Station Module Heat Rate (Gross Heat Rate)(kcal/kWh) = ([{U#1 THR X U#1 Installed Capacity (MW)} + {U#2 THR X U#2 (kcal/kWh) Installed Capacity (MW)} + ...])/ (Station Installed Capacity (MW))

(c) Station Design Net Heat Rate (kcal/kWh) =| Station DGHR (kcal/ kWh)(1 - % Operating APC/ 100)

10.3.2.2. Operating parameters(a)Station Operating Load (MW) = U#1 Operating Load (MW) + U#2 Operating Load (MW) + ...(b)Station Gross Generation (MU) = U#1 Gross Generation (MU) + U# - 2 Gross Generation (MU) + ...(c)Station OGHR (kcal/kWh) = ([{U#1 OGHR (kcal/kWh) X U#1 Gross Generation (MU)} + {U#2 OGHR (kcal/kWh) X U#2 Gross Generation (MU)} + ...])/ (Gross Generation (MU))

(d) Station ONHR (kcal/kWh) =| Station OGHR (kcal/ kWh)(1 - % Operating APC/ 100)

Where,-OGHR = Operating Gross Heat RateONHR = Operating Net Heat RateAPC = Auxiliary Power Consumption10.3.2.3. Heat Hate Reduction Target. - The target in Thermal Power Sector under PAT Scheme is set by taking the deviation of NHR of Baseline year and design NHR. Based on the deviation percentage (to design), the target values for Heat Rate reduction are set in the slab.Let the deviation percentage be "X", thenIf X is <= 5(five), then the HR reduction target is 10% of the deviation.If X is >5, but <=10, then the HR reduction target is 17% of the deviation.If X is >10, but <=20, then the HR reduction target is 21% of the deviation.If X is >20, then the HR reduction target is 24% of the deviation.10.3.2.4. Target Station Net Operating Heat Rate without Normalization for AY. - The Station Net Operating Heat Rate without Normalization is the ONHR of basement year minus the heat rate reduction target given to it.Target Station UNHR (kcal/kWh) = Station Operating NHR for BY - Heat Rate Reduction TargetWhere,-OGHR = Operating Gross Heat RateONHR = Operating Net Heat RateAPC = Auxiliary Power ConsumptionThis Heat Rate has to be attained by the Station. If the station fails to meet its target, i.e., operates on a Heat Rate higher than the target, penalty will be levied on the Station. On the other hand, if the station over achieves its target, i.e., operates at a Heat Rate lesser than the target, it will be granted E-Certs, which can be traded in open market.10.4Formulas for Normalization. - Common Calculations for Normalization(a)Station average operating load (MW) caused by low ULF/MLF due to fuel unavailability /scheduling/backing down/any other factor = [U#1 AOL (MW) + U#2 AOL (MW) + ...]Where,-ULF = Unit Load FactorMLF = Module Load FactorAOL = Average Operating Load

(b) Station Average Operating Hour (Hr) Caused by low ULF/ MLF due to Fuel Unavailability =| [U#1 AOHr X U#1 AOL (MW)] + U#2 AOHr X U#2 AOL (MW) + ...]Station AOL (MW) due to Fuel Unavailability

Where,-ULF = Unit Load FactorMLF = Module Load FactorAOHr = Average Operating HourAOL = Average Operating Load

(c) Station Average Operating Hour (Hr) Caused by low ULF/ MLF due to Scheduling =| [U#1 AOHr X U#1 AOL (MW)] + U#2 AOHr X U#2 AOL (MW) + ...]Station AOL (MW) due to Scheduling

Where,-ULF = Unit Load FactorMLF = Module Load FactorAOHr = Average Operating HourAOL =

Average Operating Load

(d) Station Average Operating Hour (Hr) Caused by low ULF/ MLF due to Backing down =| [U#1 AOHr X U#1 AOL (MW)] + U#2 AOHr X U#2 AOL (MW) + ...]Station AOL (MW) due to Backing down

Where,-ULF = Unit Load FactorMLF = Module Load FactorAOHr = Average Operating HourAOL = Average Operating Load

(e) Station Average Operating Hour (Hr) Caused by low ULF/ MLF due to any other external factor =| [U#1 AOHr X U#1 AOL (MW)] + U#2 AOHr X U#2 AOL (MW) + ...]Station AOL (MW) due to Backing down

Where,-ULF = Unit Load FactorMLF = Module Load FactorAOHr = Average Operating HourAOL = Average Operating LoadExternal factors = Fuel Unavailability/ Scheduling/ backing down/ any other external factor etc.(f)Unit Average Operating Load (MW) Caused by low ULF/MLF due to External factors = Total Station Generation (MWHr) caused by Low ULF/MLF due to external factors / Total Operating Hours for low ULF/MLF due to external factors (Hr)Where,-Total Station Generation (MWHr) caused by Low ULF/MLF due to external factors = [(Unit AOL (MW) X Unit AOHr) due to Fuel Unavailability + (Unit AOL (MW) X Unit AOHr) due to Scheduling + (Unit AOL (MW) X Unit AOHr) due to Backing Down + (Unit AOL (MW) X Unit AOHr) due to any other external factor]Total Operating Hours for low ULF/MLF due to external factors (Hr) = [Unit AOHr due to Fuel Unavailability + Unit AOHr due to Scheduling + Unit AOHr due to Backing Down + Unit AOHr due to any other external factor]Where,-ULF = Unit Load FactorMLF = Module Load FactorAOHr = Average Operating HourAOL = Average Operating LoadExternal factors = Fuel Unavailability/ Scheduling/ backing down/ any other external factor etc.(g)Unit Average Operating Hours at Low ULF/MLF due to external Factors = Total Station Generation (MWHr) caused by Low ULF/MLF due to external factors/ Total Average Operating load (MW) for Low ULF/MLF due to external factors (MW)Where,-Total Station Generation (MWHr) caused by Low ULF/MLF due to external factors = (Unit AOL (MW) X U# AOHr) due to Fuel Unavailability + (Unit AOL (MW) X Unit AOHr) due to Scheduling + (Unit AOL (MW) X Unit AOHr) due to Backing Down + (Unit AOL (MW) X Unit AOHr) due to any other external factor]Total Average Operating load (MW) for Low ULF/MLF due to external factors (MW) = [{Unit AOL (MW) due to Fuel Unavailability + Unit AOL (MW)} due to Scheduling + Unit AOL (MW) to Backing Down + Unit AOL (MW) due to any other external factor]ULF = Unit Load FactorMLF = Module Load FactorAOHr = Average Operating HourAOL = Average Operating LoadExternal factors = Fuel Unavailability/ Scheduling/ backing down/ any other external factor etc.(h)Station Average Operating Load (MW) caused by low ULF/MLF due to external Factors = ([U#1 AOL (MW) at Low ULF/MLF due to external factor + U#2 AOL (MW) at Low ULF/MLF due to external factor + ...])Where,-ULF = Unit Load FactorMLF = Module Load FactorAOHr = Average Operating HourAOL = Average Operating LoadExternal factors = Fuel Unavailability/ Scheduling/ backing down/ any other external factor etc.(i)Station Average Operating Hours at Low ULF/MLF due to external Factors = ([U#1 AOL (MW) X U#1 AOHr) at Low ULF/MLF due to external factor + U#2 AOL (MW) X U#2 AOHr) at Low ULF/MLF due to external factor + ...])/ (Station AOL (MW) caused by low ULF/MLF due to external factors)Where,-ULF = Unit Load FactorMLF = Module Load FactorAOHr = Average Operating HourAOL = Average Operating LoadExternal factors = Fuel Unavailability/ Scheduling/ backing down/ any other external factor etc.(j)Unit Availability factor = [Hours in a Year - (RSHr + FC or Unavailability hour + PMO or Planned Unavailability hour)]/ Hours in a Year]Where,-RSHr =

Reserve Shutdown HourFO = Forced OutagePMO = Planned Maintenance Outage(k)Station Availability Factor = 1- [Station RSHr + Station FO or Unavailability hour + Station PMO or Planned Unavailability]Where,-RSHr = Reserve Shutdown HourFO = Forced OutagePMO = Planned Maintenance Outage

(l) Station RSHr =| [U#1 RSHr X U#1 Capacity (MW)] + U#2 RSHr X U#2 Capacity (MW) + ...]Total Station capacity X Hours in a Year

(m) Station FO or Unavailability Hour =| [U#1 FO X U#1 Capacity (MW)] + U#2 FO X U#2 Capacity (MW) + ...]Total Station capacity X Hours in a Year

(n) Station PMO or Planned Unavailability =| [U#1 PMO X U#1 Capacity (MW)] + U#2 PMO X U#2 Capacity (MW) + ...]Total Station capacity X Hours in a Year

10.5Normalizations for Coal Based Thermal Power Plant. - Coal Quality Normalization. - Boiler Efficiency has been calculated using the formula considering elements of coal. Average "Ash, Moisture, Hydrogen and GCV" contents in the coal during the baseline period as well as for Design Coal could be considered for Normalization and the correction factor has to be worked out based on the following boiler efficiency formula. The Operating Coal quality of assessment year and baseline year are compared with the design coal to arrive the Normalization of Boiler efficiency in assessment year.

(a) Units Boiler Efficiency (For Design, BY and AY Coal) = 92.5 -| [50 + A + 630 + (M + 9 - H)]CCV of Coal

Where,-BY = Baseline YearAY = Assessment YearGCV = Gross Calorific value (Kcal/ Kg)M = Moisture (in %)H = Hydrogen (in %)A = Ash (in %)(b)Percentage Decrease in Efficiency from calculated Boiler Operating Efficiency w.r.t. Boiler Design Efficiency in BY

=| (Calculated Boiler Design Efficiency (%) - Calculated Boiler Operating Efficiency (%) in BY) X 100Calculated Boiler Design Efficiency (%)

Where,-BY = Baseline Year(c)Percentage Decrease in Efficiency from calculated Boiler Operating Efficiency w.r.t. Boiler Design Efficiency in AY

=| (Calculated Boiler Design Efficiency (%) - Calculated Boiler Operating Efficiency (%) in AY) X 100Calculated Boiler Design Efficiency (%)

Where,-AY = Assessment Year

(d) Degradation/ Upgradation of Actual Boiler Design Efficiency in BY =| {Actual Design Boiler Efficiency of Unit (%) (As per OEM) X % Decrease in Efficiency (%) in BY}100

Where,-BY = Baseline YearOEM = Original Equipment Manufacturer

(e) Degradation/ Upgradation of Actual Boiler Design Efficiency in AY =| {Actual Design Boiler Efficiency of Unit (%) (As per OEM) X % Decrease in Efficiency (%) in AY}100

Where,-AY = Assessment YearOEM = Original Equipment Manufacturer(f)Normalized Design Boiler Efficiency (%) for Unit in BY w.r.t. DBE - (Actual Design Boiler Efficiency (%) of Unit (As per OEM) - Degradation or Upgradation of Actual Design Boiler Efficiency (%) in BY)Where,-BY = Baseline YearDBE = Design Boiler EfficiencyOEM = Original Equipment Manufacturer(g)Normalized Design Boiler Efficiency (%) for Unit in AY w.r.t. DBE - (Actual Design Boiler Efficiency (%) of Unit (As per OEM) - Degradation or Upgradation of Actual Design Boiler Efficiency (%) in AY)Where,-AY = Assessment YearDBE = Design Boiler EfficiencyOEM = Original Equipment Manufacturer(h)Difference in Normalized Boiler Efficiency between BY and BY = Normalized Boiler Design Efficiency in BY - Normalized Boiler Efficiency in AY(i)Normalized Boiler

Efficiency Design for Unit for the AY as compared to the BY. - If the difference in Normalized Boiler Efficiency between BY and AY is less than or equal to zero, then No NormalizationIf the difference in Normalized Boiler Efficiency between BY and AY is greater than zero, then the Normalization is as below: = Actual Design Boiler Efficiency of Unit (as per OEM) - Difference in Normalized Boiler Efficiency between BY and AYWhere,-BY = Baseline YearAY = Assessment YearOEM = Original Equipment Manufacturer(j)Normalized Boiler Efficiency Design for Station = [{U# 1 Capacity (MW) X Normalized Boiler Efficiency Design for U# 1 for the AY as compared to the BY} + {U# 2 Capacity (MW) X Normalized Boiler Efficiency Design for U# 2 for the AY as compared to the BY} + ...] / Station total installed Capacity (MW)Where,-BY = Baseline YearAY = Assessment Year

(k) Normalized Unit GHR (kcal/kWh) for AY =| Design THR (kcal/kWh) X 100Normalized Design Boiler Efficiency (%) for Unit in AY

Where,-THR = Turbine Heat RateAY = Assessment YearBY = Baseline Year(l)Heat Rate to be Normalized in the Unit Operating Heat Rate. - If the difference in Normalized Boiler Efficiency between BY and AY is less than or equal to zero, Then Turbine Heat Rate to be Normalized is 0If the difference in Normalized Boiler efficiency between BY and AY is greater than zero, then the Normalization is as below:(m)Turbine Heat Rate to be normalized (kcal/kWh) = Normalized Unit Gross Heat Rate (kcal/kWh) in AY - Unit Design Turbine Heat Rate (kcal/kWh) x100/ Normalized Design Boiler Efficiency (%) for Unit in BY(n)Turbine Heat Rate to be normalized or subtracted from the operating Station NHR in AY = ([{HR to be normalized in U#1 THR X U#1 Gross Generation (MU)} + {HR to be normalized in U#1 THR X U#1 Gross Generation (MU)} + ...])/ [U#1 Gross Generation (MU) + U#2 Gross Generation (MU) + ...]Where,-HR = Heat Rate(kcal/kWh)THR = Turbine Heat Rate(kcal/kWh)Coal Quality Normalization (kcal/kWh) = THR to be subtracted from the ONHR (kcal/kWh) in AY10.6PLF Normalization for Coal/ Gas/ Diesel based Thermal Power. - Due to fuel non-availability, plant may opt to reduce the load on turbine leading to low efficiency of units and Station. Due to decreased loading, the Plant load Factor will be worsened and affects the unit heat rate. The comparison between baseline year and assessment year will be carried out through characteristics curve of Load Vs Heat rate for correction factorThere is a difference between the Unit DTHR given by OEM and DTHR drawn from the Characteristic curve between THR and Load or Equation drawn from the HBD data at different load condition. The difference is to be normalized to arrive the DTHR as per Curve equation.(a)Percentage Difference between Design Turbine/Module Heat Rate and Design Curve or HBD Turbine/Module Heat Rate for AY and BY

=| Design THR @ 100% Load (OEM) - Design THR @ 100% Load (Curve or HBD) X 100Design THR @ 100% Load (OEM)

Where,-DTHR = Design Turbine Heat Rate(kcal/kWh)THR = Turbine Heat Rate(kcal/kWh)OEM = Original Equipment ManufacturerHBD = Heat Balance DiagramCurve = Load or ULF Vs THR curveThe calculation for Plant Availability Factor, Average Operating Load (MW) caused by low ULF/MLF dueto external factor, Average Operating hours at Low ULF/MLF are calculated above sections(b)Total Operating hours in year as per Unit Availability factor (hrs/annum) for AY and BY = Total hour in a year (Hrs) X Plant Availability Factor(c)Operating hours at full load (hrs/annum) for AY and BY = Total Operating hours in a year as per Unit Availability Factor (Hrs)- AOHrs at Low ULF/MLFWhere,-AOHr = Average Operating Hours (hr)[Calculated under Section 4]ULF = Unit Load FactorMLF = Module Load FactorLoading Vs Heat Rate Equation given as y = ax2 - bx + c will be used to calculate the Turbine Heat Rate as per Load Vs Heat Rate Equation due to external factor.y = ax2 - bx + c (kcal/kWh)Where,-x = Average Operating Load (MW) caused by low ULF/MLF due to external factora = Equation Constant 1b = Equation Constant 2c = Equation Constant 3(d)THR as per Load Vs HR Equation due to external factor (kcal/kWh) for AY and BY = Equation Constant 1 * (Average Operating Load (MW) caused by low ULF, MLF due to external factor) 2 - Equation Constant 2 * Average Operating Load (MW) caused by low ULF, MLF due to external factor + Equation Constant 3(e)Design THR after Curve correction and difference correction (kcal/kWh) for AY and BY = THR as per Load Vs HR Equation due to external factor X [1 + % Difference between Design Turbine or Module HR and Design Curve or HBD Turbine or Module HR/ 100]Where,-THR = Turbine Heat Rate (kcal/kWh)Load Vs HR = Loading Vs Heat RateHBD = Heat balance Diagram(f)Normalized Design Turbine Heat rate due to external factor (kcal/kWh) for AY and BY = [Design THR @ 100% Load (OEM) X Operating hours at full load + Design THR after Curve correction and difference correction X AOHrs at Low ULF/MLF] / Total Operating hours in year as per UAFWhere,-THR = Turbine Heat Rate (kcal/kWh)OEM = Original Equipment ManufacturerAOHr= Average Operating HoursUAF = Unit Availability Factor(g)Difference of Turbine Heat Rate due to external factor between AY and BY (kcal/kWh) = Normalized Design THR due to external factor in AY - Normalized Design THR due to external factor in BYWhere,-THR = Turbine Heat Rate (kcal/kWh)AY = Assessment YearBY = Baseline Year(h)Normalized Design Turbine Heat rate due to external factor w.r.t. BY in AY = Design THR @ 100% Load (OEM) + Difference of THR due to external factor between AY and BYWhere,-THR = Turbine Heat Rate (kcal/kWh)AY = Assessment YearBY = Baseline YearOEM = Original Equipment Manufacturer(i)Normalized Designed Station Turbine Heat Rate due to ULF w.r.t BY in AY = [Normalized U# 1 Design THR due to external factor as compared to BY X U# 1 Capacity + Normalized U# 2 Design THR due to external factor as compared to BY X U# 2 Capacity + ...] / Station installed Total Capacity (MW)Where,-THR = Turbine Heat Rate (kcal/kWh)BY = Baseline Year(j)Weighted Design Turbine Heat Rate of Station (kcal/kWh) for AY and BY = [U# 1 Capacity X U# 1 Design THR @ 100% Load (OEM) + U# 2 Capacity X U# 2 Design THR @ 100% Load (OEM) + ...] / Station installed Total Capacity (MW)Where,-THR = Turbine Heat Rate (kcal/kWh)OEM = Original Equipment Manufacturer(k)Difference of THR between Normalized Design Station THR and Design THR = Normalized Design Station THR due to ULF as compared to BY - Station Weighted Design THRWhere,-ULF = Unit Load FactorTHR = Turbine Heat Rate (kcal/kWh)BY = Baseline Year(l)Weighted Station Boiler Efficiency= [U# 1 Capacity x U#1Boiler Design Efficiency + U# 2 Capacity x U#2Boiler Design Efficiency+........]/ Station installed Total Capacity (MW)(m)PLF Normalization (kcal/kWh) to be subtracted in NHR in AY= [Difference of THR between Normalized Design HR and Design HR (kcal/kWh)]/Weighted Station Boiler Efficiency10.7APC Normalization for Coal/Gas/Diesel based Thermal Power Station10.7.1. APC Normalization due to external factors. - The APC of Thermal Power Plant is not fully dependent on the loading of plant. Due to decrease in PLF, the APC will not decrease with same ratio. Hence, a trend line equation could be generated from the normal operating condition of the Plant taking the data of APC and Plant loading for a station.(a)Auxiliary Power Trend line Equation. - y = ax2 - bx + c will be used to calculate the Turbine Heat Rate as per Load Vs Heat Rate Equation due to external factor.y = ax2 - bx + cWhere,-X = Operating Load (MW)A = Equation Constant 1b = Equation Constant 2c = Equation Constant 3(b)Operating Hours at full load = [(Total hours in a year X PAF) - Weighted AOHr at Low loading due to external factor - Weighted AOHr at Low loading due to internal factor] (Hrs)Where,-PAF = Plant Availability FactorAOHr = Average Operating

Hours(c)Weighted Operating Station Load = [{Station Capacity (MW) X Operating Hours at Full Load (hrs)} + {Station AOL (MW) caused by low loading due to external factor X Weighted AOHr at Low loading due to external factor} + {Station AOL (MW) caused by low loading due to internal factor X Weighted AOHr at Low loading due to internal factor}] / [Weighted AOHr at Low loading due to external factor + Weighted AOHr at Low loading due to internal factor+ Operating Hours at full load]Where,-AOHr = Average Operating Hours (Hrs)AOL = Average Operating Load (MW)Refer Section 10.4 for calculation on individual parameter of above equation of section 10.7

(d) Actual Loading Factor (%) =| Weighted Operating Station Load X 100Station Capacity

Weighted Average Operating hours at Low loading due to internal factor(e)Weighted Station Load without internal factor (MW) = [{Station Capacity X Weighted AOHr at Low loading due to internal factor} + {Station Capacity X Operating hours at full Load} + {AOL (MW) caused by low loading due to external factor X Weighted AOHr at Low loading due to external factor}] / [Weighted AOHr at Low loading due to external factor+ Weighted AOHr at Low loading due to internal factor + Operating hours at full Load]Where,-AOHr = Average Operating Hours (Hrs)AOL = Average Operating Load (MW)

Normalized Loading Factor for BY and AY =| Weighted Station Load without internal factor (MW) X 100Station Capacity (MW)

(f)Percentage APC as per Trend Line for AY and BY. - This shall be calculated by the % APC Trend Line equation mentioned above for Assessment Year and baseline year individually.= Constant 1 *(Normalized Loading Factor) ^2-Constant 2*Normalized Loading Factor + Constant 3Where,-APC = Auxiliary Power ConsumptionBY = Baseline YearAY = Assessment Year(g)Difference in APC of AY From BY= % APC as per trend line in AY -% APC as per trend line in BYWhere,-APC =Auxiliary Power ConsumptionBY = Baseline YearAY = Assessment Year(h)Normalized APC. - If the difference in APC of AY From BY is less than or equal to zero, then Normalized APC will be same as operating station APC.If the difference in APC of AY From BY is greater than zero, then normalized APC is as below:Normalized APC = Station Operating APC - Difference in APC of AY From BYWhere,-APC = Auxiliary Power ConsumptionBY = Baseline YearAY = Assessment Year(i)APC Normalization due to external factors (kcal/kWh) = ((Operating GHR in AY)/ (1 - % APC of AY) - O (Operating GHR in AY)/ (1 - % normalized APC))Where,-GHR = Gross Heat Rate (kcal/kWh)AY = Assessment YearAPC = Auxiliary Power Consumption10.7.2. APC Normalization for PA Fan loading due to change in coal quality. - (a) Total Coal Consumption per unit (AY and BY) (Tonnes/Hr) = (GHR X Operating Load)/ Coal GCVWhere,-GHR = Gross Heat Rate (kcal/kWh)GCV = Gross Calorific Value (kcal/kg)(b)Normalized Total Coal Consumption per unit(Tonnes/Hr) = Total Coal Consumption X Coal GCV for BY/ Coal GCV for AYWhere,-GHR = Gross Heat Rate (kcal/kWh)GCV = Gross Calorific Value (kcal/kg)(c)Increase in coal consumption due to change in GCV of coal in AY (Tonnes/Hr) = Normalized Coal Consumption (tonne/hr) - Total consumption of BY (tonnes/hr)(d)Total Primary Air requirement per tonne of coal Trendline equationy = 6.048x-0.2055Where,-Y = total PA requirement /tonne of coal (Tonnes)x = operating load (MW)(e)Total Primary Air requirement (Tonnes/hr) = Normalized coal consumption (TPH) X PA requirement per tonne of coal as per Trendline equation(tonne)Where,-TPH = Tonnes per hourPA = Primary Air(f)Volume of Primary Air (m3/hr) = Total PA requirement (TPH) X 1000 / 1.233Where,-TPH = Tonnes per hourPA = Primary Air(g)Power Consumption from PA Fans (kW) for AY and BY = 2.725 X Volume of PA X 1000/ (0.95 X 0.8 X106)Where,-AY = Assessment YearBY = Basement YearPA = Primary Air(h)Increase in energy consumption due to change in GCV of coal in AY (kW/hr) = Power Consumption from PA fans in AY with Normalized coal consumption -Power Consumption from PA fans in BYWhere,-AY = Assessment YearBY = Basement YearPA = Primary Air(i)Normalized Thermal Energy due to change in GCV of coal per unit (million kcal) = Increase in energy consumption due to change in GCV of coal in AY (kW/hr) X GHR of AY X Operating Hours of AY/10^6Where,-AY = Assessment YearGHR = Gross Heat Rate (kcal/kWh)GCV = Gross Calorific Value (kcal/kg)(j)Normalized Thermal Energy due to change in GCV of coal for station (million kcal) = NTE U#1 + NTE U#2 + NTE U#3 +.......Where,-NTE = Normalized Thermal Energy due to change in GCV of coal per unit (million kcal)GCV = Gross Calorific Value (kcal/kg)10.7.3. APC Normalization for Coal Grinding Mill, ID Fan and Ash Handling Plant loading due to change in coal quality. - (a) Operating Hours (hrs) = Gross Generation (Million Units) X 1000/Operating load (MW)(b)Total Coal Consumption per unit (AY and BY) (Tonnes/Hr) = (GHR X Operating Load)/ Coal GCVWhere,-GHR = Gross Heat Rate (kcal/kWh)GCV = Gross Calorific Value (kcal/kg)(c)Normalized Total Coal Consumption per unit(Tonnes/Hr) = Total Coal Consumption X Coal GCV for BY/ Coal GCV for AYWhere,-GHR = Gross Heat Rate (kcal/kWh)GCV = Gross Calorific Value (kcal/kg)(d)Increase in coal consumption due to change in GCV of coal in AY (Tonnes/Hr) = Normalized Coal Consumption (tonne/hr) - Total consumption of BY (tonnes/hr)(e)Total Electrical Energy consumption for Coal Grinding mills (VRM/Ball), ID Fan and Ash Handling Plant per hour (kW/hr) = TEEC for Coal Grinding mills (VRM/Ball), ID Fan and Ash Handling Plant (Million Units) X 10^6/Operating Hours (hrs)Where,-TEEC = Total Electrical Energy Consumption(f)Specific energy consumption per tonne of coal (kWh/Tonne) = TEEC for Coal Grinding mills, ID Fan and Ash Handling Plant per hour (kW/hr)/ Total Coal ConsumptionWhere,-TEEC = Total Electrical Energy Consumption(g)Increase in energy consumption due to change in GCV of coal in AY (kW/hr) = Increase in coal consumption due to change in GCV of coal in AY (Tonnes/hr) X Specific energy consumption per tonne of coal in BY (kWh/Tonne)(h)Normalization due to change in GCV of coal per unit (Million Units) = Increase in energy consumption due to change in GCV of coal in AY (kW/hr) X GHR of AY X Operating Hours of AY/10^6Where,-AY = Assessment YearBY = Basement YearGHR = Gross Heat rate (kcal/kWh)GCV = Gross Calorific Value (kcal/kg)(i)Normalization for station due to change in GCV of coal for Station (Million Units) = NMC U#1 + NMC U#2 + NMC U#3 +...........Where,-NMC = Normalization due to change in GCV of coal (Million Units)(j)APC Normalization for PA Fan + Coal Grinding Mill, ID Fan and Ash Handling Plant loading due to change in coal quality = {Normalized Thermal Energy due to change in GCV of coal for station for PA Fans (million kcal) + Normalization for station due to change in GCV of coal for Station for Coal Mills, , ID Fan and Ash Handling Plant (Million Units)}/ Gross Generation of AY(k)APC Normalization (kcal/kWh) = APC Normalization due to external factors (kcal/kWh) + APC Normalization for PA Fan, Coal Grinding Mill, ID Fan and Ash Handling Plant loading due to change in coal quality (kcal/kWh)10.8Other Normalization. - It covers miscellaneous Normalization of Thermal Plant like Start-ups, Environmental Concern or any other unforeseen circumstances10.8.1. Startups. - The regulation of the turbine start up state is defined in the Turbine OEM document as per the turbine wall temperature range for different startups like Cold, Warm and Hot Startup(a)Oil Consumption under various type start-ups (In Oil consumption per startup)For Cold Start-up (Per Startup)If capacity <= 250 MW, Oil Consumption is 50 KLIf capacity > 250 MW, but <= 500 MW, Oil Consumption is 90 KLIf capacity >500 MW, <=660MW, Oil Consumption is 110 KLFor Warm Start-up (Per Startup)If capacity <= 250 MW, Oil Consumption is 30 KLIf capacity > 250 MW, but <= 500 MW, Oil Consumption is 50 KLIf capacity

>500 MW, <=660MW, Oil Consumption is 60 KLFor Hot Start-up (Per Startup)If capacity <= 250 MW, Oil Consumption is 20 KLIf capacity > 250 MW, but <= 500 MW, Oil Consumption is 30 KLIf capacity >500 MW, <=660MW, Oil Consumption is 40 KL(b)KL Oil Consumption= (Difference between number of start-ups in AY and BY) X (Oil Consumption as per above start-up slab)(c)Thermal Energy to be subtracted due to Cold/Warm/Hot Start up due to External Factor (Million kcal) = [KL oil Consumption in cold Start up + KL oil Consumption in warm start up + KL oil Consumption in Hot Start up] X 1010.8.2. Environmental concern/ Plant Shut down due to external factor/ Unforeseen Circumstances. - (a) Electrical Energy for AY. -Total Electrical Energy for Environmental concern/Shutdown/Unforeseen Circumstances (Million kcal) to be subtracted from Plant Energy Consumption in AY = [Electrical Energy to be subtracted due to Shutdown (External Factor) in AY (MU)+Electrical Energy to be subtracted due to Environmental concern (External Factor) in AY (MU)+Electrical Energy to be subtracted due to Unforeseen Circumstances (External Factor) in AY(MU)] X GHR of Station in AYWhere,-GHR = Gross Heat rate (kcal/kWh)AY = Assessment Year(b)Electrical Energy for BYTotal Electrical Energy for Shutdown/Unforeseen Circumstances (Million kcal) in BY = [Electrical Energy to be subtracted due to Shutdown (External Factor) in BY (MU+Electrical Energy to be subtracted due to Unforeseen Circumstances (External Factor) in AY(MU)] X GHR of Station in BYWhere,-GHR = Gross Heat rate (kcal/kWh)BY = Baseline Year(c)Thermal Energy in AYTotal Thermal Energy for Environmental concern /Unforeseen Circumstances in AY (Million kcal) = Thermal Energy to be subtracted due to Environmental concern (External Factor) in AY +Thermal Energy to be subtracted due to Unforeseen Circumstances (External Factor) in AYWhere,-AY = Assessment Year(d)Thermal Energy in BYTotal Thermal Energy for Unforeseen Circumstances (Million kcal) in BY = Thermal Energy to be subtracted due to Unforeseen Circumstances (External Factor) in BYWhere,-BY = Baseline Year(e)Total Energy to be subtracted in the AY for Normalization othersTotal Energy to be Subtracted or normalized (Million kcal) = [Total Electrical Energy for Environmental concern/Shutdown/Unforeseen Circumstances AY (Million kcal) + Total Thermal Energy for Environmental concern/Unforeseen Circumstances for AY (Million kcal) + Total Thermal Energy for Cold/Worm/Hot Startfor AY (Million kcal)] - [(Total Electrical Energy for Shutdown/Unforeseen Circumstances (Million kcal) in BY+ Total Thermal Energy for Unforeseen Circumstances (Million kcal) in BY)]Where,-AY = Assessment YearBY = Baseline Year

(f) Other Normalization (kcal/kWh) =| Total Energy to be subtracted or normalized in AY (MU)Gross Generation in AY

Where,-AY = Assessment YearMU = Million Unit10.9Station Net Operating Heat Rate with Normalizations.Station Net Operating Heat Rate (kcal/kWh) = Station Net Operating Heat Rate (of AY) without Normalization - Coal Quality Normalization (kcal/kWh) - PLF Normalization (kcal/kWh) - APC Normalization (kcal/kWh) - Other Normalization (kcal/kWh)10.10Normalizations for Gas Based Thermal Power Plant.10.10.1. Gas Fuel Mix Normalization.(a)Gross Generation from Fuel Mix (Million Unit) = Actual Gross Generation from Gas+ Actual Gross Generation from Naptha + Actual Gross Generation from Oil/Other Fuel(b)Module Heat Rate with Fuel Mix (kcal/kWh) = [(Design Module HR @ 100% Load (OEM) for Gas X Actual Gross Generation from Gas) + (Design Module HR @ 100% Load for Naphtha X Actual Gross Generation from Naphtha) + (Design Module HR @ 100% Load (OEM) for Oil/Other Fuel X Actual Gross Generation from Oil/Other Fuel)] / [Actual Gross Generation from Gas (MU) + Actual Gross Generation from Naphtha (MU) + Actual Gross Generation from Oil/Other Fuel

(MU)]Where,-HR = Heat Rate (kcal/kWh)(c)Difference of Module Heat Rate with Fuel Mix in AY w.r.t. BY (kcal/kWh) = Module HR with Fuel Mix in AY - Module HR with Fuel Mix in BYWhere,-HR = Heat rate (kcal/kWh)AY = Assessment YearBY = Baseline Year(d)Notional energy for Fuel Mix to be Normalized for Module (Million kcal) = Difference of Module Heat Rate with Fuel Mix in AY w.r.t. BY X Gross Generation from Fuel MixWhere,-AY = Assessment YearBY = Baseline Year(e)Notion energy for Fuel Mix to be Normalized for station (Million kcal) = [Notion energy for Fuel Mix to be Normalized for Module 1 + Notion energy for Fuel Mix to be Normalized for Module 2 + Notion energy for Fuel Mix to be Normalized for Module 3 + ...](f)Gas fuel Mix Normalization (kcal/kWh) = (Notion energy for Fuel Mix to be Normalized for station (Million kcal))/ (Gross Generation (Million Units))10.10.2. Gas OC cycle Normalization.(a)Gross Generation during Open Cycle (External Factor) and Closed Cycle Operation (Million Units)= Actual Gross Generation during Closed Cycle (MU)+ Actual Gross Generation during Open Cycle due to external factor(MU)(b)Module Heat Rate for Open and Closed cycle operation (kcal/kWh) = [(Design Module HR @ 100% Load (OEM) for Closed Cycle X Actual Gross Generation during Closed Cycle) + (Design Module HR @ 100% Load for Open Cycle X Actual Gross Generation during Open Cycle due to external factor) / [Actual Gross Generation during Closed Cycle (MU) + Actual Gross Generation during Open Cycle due to external factor (MU))]Where,-HR = Heat Rate (kcal/kWh)(c)Difference in Module HR with Open and Closed cycle operation in AY w.r.t. BY (kcal/kWh) = Module HR for Open and Closed cycle operation in AY - Module HR for Open and Closed cycle operation in BYWhere,-HR = Heat Rate (kcal/kWh)AY = Assessment YearBY = Baseline Year(d)Notional energy for Gas OC Cycle to be Normalized for Module (Million kcal) = Difference in Module HR with Open and Closed cycle operation in AY w.r.t. BY (kcal/kWh) X Gross Generation from Open and Closed cycle operation (MU)Where,-HR = Heat Rate (kcal/kWh)AY = Assessment YearBY = Baseline Year(e)Notional energy for Gas OC Cycle to be Normalized for station (Million kcal) = [Notion energy for Fuel Mix to be Normalized for Module 1 + Notion energy for Fuel Mix to be Normalized for Module 2 + Notion energy for Fuel Mix to be Normalized for Module 3 + ...](f)Gas OC Cycle Normalization (kcal/kWh) = Notional energy for Gas OC Cycle to be Normalized for station (Million kcal)/ (Gross Generation (MU)10.10.3. Gas Quality Normalization.(a)NHR Trendline equation (kcal/kWh)y = -10^-7x^2 + 0.0051x + 1490.5Where,-Y = Net Heat Rate (kcal/kWh)X = Net Calorific Value (kcal/kg)(b)Difference in NHR as per Trend-line Equation between AY and BY (kcal/kWh) = NHR as Per Trend line Equation for AY - NHR as per Trend line Equation for BYWhere,-NHR = Net Heat Rate (kcal/kWh)AY =Assessment YearBY =Baseline year(c)Normalization due to change in Gas Quality (Million kcal) = Difference in NHR as per Trendline Equation between AY and BY (kcal/kWh) X Gross Generation in AYWhere,-NHR = Net Heat Rate (kcal/kWh)AY = Assessment YearBY = Baseline year(d)Normalization due to Change in Gas Quality for Station (kcal/kWh) = Normalization due to change in Gas Quality (Million kcal) / OGHR in AY (kcal/kWh)Where,-OGHR = Gross Operating Heat Rate (kcal/kWh)10.11PLF Normalization for Coal/ Gas/ Diesel based Thermal Power. - Normalization for PLF is same as that of Coal Based Thermal Power Plant mentioned in section 10.6.10.12APC Normalization for Coal/ Gas/ Diesel based Thermal Power Station. - Normalization for APC is same as that of external factors for Coal Based Thermal Power Plant mentioned in section 10.7.110.13Other Normalization. - Normalization for other factors is same as that of Coal Based Thermal Power Plant mentioned in section 10.8.10.14Station Net Operating Heat Rate with Normalizations.Station Net Operating Heat Rate (kcal/kWh) = Station Net Operating Heat Rate (of

AY) without Normalization - Gas Fuel Mix Normalization (kcal/kWh) - Gas OC Cycle Normalization (kcal/kWh) - Gas Quality Normalization (kcal/kWh) - PLF Normalization (kcal/kWh) - APC Normalization (kcal/kWh) - Other Normalization (kcal/kWh)10.15Summary.10.15.1. Coal based Thermal Power Plant. - Station Operating Net Heat Rate (kcal/kWh) without Normalization in AY = Station Operating Gross Heat Rate (kcal/kWh)/(1-APC% (Operating)/100)Normalized Station Operating Net Heat Rate (kcal/kWh) in AY= Station Operating Net Heat Rate (kcal/kWh) without Normalization (kcal/kWh) -Heat Rate Normalization due to Coal Quality (kcal/kWh) - Heat Rate Normalization due to Low PLF (kcal/kWh) - Heat Rate Normalization due to APC linked with PLF and Coal Quality (kcal/kWh) - Heat Rate Normalization due to others (Startups +Shutdown + Environmental Concern+ Unforeseen Circumstances)Baseline Normalization (kcal/kWh) = Station Operating Net Heat Rate in Baseline year (kcal/kWh)- Notified Station Operating Net Heat Rate in Baseline Year (kcal/kWh)-[{(Station Operating Net Heat Rate in Baseline year (kcal/kWh)- Station Design Net Heat Rate in Baseline year (kcal/kWh)} x Reduction Target for Deviation in Net Station Heat Rate (%) as in baseline year/100]Normalized Station Operating Net Heat Rate (kcal/kWh) in AY= Normalized Station Operating Net Heat Rate (kcal/kWh) in AY - Baseline Normalization (kcal/kWh)10.15.2. Gas based Thermal Power Plant. - Station Operating Net Heat Rate (kcal/kWh) without Normalization in AY = Station Operating Gross Heat Rate (kcal/kWh)/(1-APC% (Operating)/100)Normalized Station Operating Net Heat Rate (kcal/kWh) in AY= Station Operating Net Heat Rate (kcal/kWh) without Normalization (kcal/kWh) -Heat Rate Normalization due to Low PLF (kcal/kWh) - Heat Rate Normalization due to APC linked with PLF (kcal/kWh) - Heat Rate Normalization due to Fuel Mix (kcal/kWh)- Heat Rate Normalization due to OC Cycle (kcal/kWh) -Heat Rate Normalization due to others (Shutdown +Environmental Concern+ Unforeseen Circumstances) - Heat rate Normalization due to Gas Quality (kcal/kWh)Baseline Normalization (kcal/kWh) = Station Operating Net Heat Rate in Baseline year (kcal/kWh)- Notified Station Operating Net Heat Rate in Baseline Year (kcal/kWh)-[{(Station Operating Net Heat Rate in Baseline year (kcal/kWh)- Station Design Net Heat Rate in Baseline year (kcal/kWh)} x Reduction Target for Deviation in Net Station Heat Rate (%) as in baseline year/100]Normalized Station Operating Net Heat Rate (kcal/kWh) in AY= Normalized Station Operating Net Heat Rate (kcal/kWh) in AY - Baseline Normalization (kcal/kWh)10.15.3. Diesel based Thermal Power Plant. - Station Operating Net Heat Rate (kcal/kWh) without Normalization in AY = Station Operating Gross Heat Rate (kcal/kWh)/(1-APC% (Operating)/100)Baseline Normalization (kcal/kWh) = Station Operating Net Heat Rate in Baseline year (kcal/kWh)- Notified Station Operating Net Heat Rate in Baseline Year (kcal/kWh)-[{(Station Operating Net Heat Rate in Baseline year (kcal/kWh)- Station Design Net Heat Rate in Baseline year (kcal/kWh)} x Reduction Target for Deviation in Net Station Heat Rate (%) as in baseline year/100]Normalized Station Operating Net Heat Rate (kcal/kWh) in AY= Normalized Station Operating Net Heat Rate (kcal/kWh) in AY - Baseline Normalization (kcal/kWh).Any error modification or correction shall be rectified in consultation with technical committee.[Inserted by Notification No. G.S.R. 409(E), dated 26.4.2018 (w.e.f. 30.3.2012).]