

# **Rajasthan Electricity Regulatory Commission (Investment Approval) Regulations, 2006**

RAJASTHAN

India

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### **Rule**

### **RAJASTHAN-ELECTRICITY-REGULATORY-COMMISSION-INVESTMENT of 2006**

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Rajasthan Electricity Regulatory Commission (Investment Approval) Regulations, 2006Published vide Notification No. RERC/Secy/Reg., 51, dated 18.7.2006Last Updated 21st May, 2019Notification No. RERC/Secy/Reg., 51. - In exercise of powers conferred on it by Section 181 (zp) of the Electricity Act 2003 (No. 36 of 2003) and to enable determination of capital/additional capital investment as per provisions of the Rajasthan Electricity Regulatory Commission (Terms and Conditions for Determination of Tariff) Regulations, 2004, the Rajasthan Electricity Regulatory Commission, after previous publication, hereby makes the following Regulations, namely; -

## **Part I – Preliminary**

### **1. Short title, commencement and applicability.**

(1)These regulations shall be called' The Rajasthan Electricity Regulatory Commission (Investment Approval) Regulations, 2006.(2)These regulations shall come into force from the date of their publication in the Official Gazette.(3)these regulations shall be applicable to power station, transmission system and distribution system where tariff for generation, transmission or wheeling is not determined under Sec. 63 of the Electricity Act 2003 through transparent process of competitive bidding in accordance with guidelines issued by the Central Government.

## **2. Definitions.**

- In these regulations, unless the context otherwise requires, (1) "Act" means the Electricity Act, 2003, (2) "Sub transmission" means transmission and/or distribution system of voltage equal to or higher than 11 KV but less than 132 KV. (3) "Distribution schemes" means distribution schemes of voltage below 11 KV. (4) "Transmission" means transmission system of voltage equal to higher than 132 KV. Words or expressions occurring in these regulations and not defined herein shall bear the same meaning as assigned to them in the Rajasthan Electricity Regulatory Commission (Terms and Conditions for Determination of Tariff) Regulations, 2004 and those not defined therein, as that defined in the Electricity Act 2003.

## **3. Appraisal of scheme.**

(1) Project feasibility reports of the schemes for generation, transmission or distribution of electricity having capital expenditure exceeding Rs. 10 Crores shall be submitted by the generating company or transmission licensee or distribution licensee, as the case may be, to the Commission for prudent check after these are approved by the generating company/transmission/distribution licensee. The project feasibility reports of the schemes will include their objective, technical justification, capital cost, year wise phasing of expenditure and their financing plan etc. The schemes for setting up of power station will incorporate estimated cost of generation, details in respect of dedicated transmission lines and/or sub-stations. (2) Scheme preparation will be based on guidelines given at annexure-1. (3) Power evacuation schemes, whether framed by generating company or by transmission licensee or distribution licensee, shall have the justification of the least cost of transmission satisfying the requirement of Grid Code. Other schemes shall indicate cost-benefit ratio or the least cost consideration. Schemes for setting up EHV GSS and EHV transmission lines will incorporate approval of State Planning Coordination Committee constituted under Grid Code and Cost benefit analysis as provided by respective distribution licensee proposing creation of new sub-station or augmentation of the sub-station and also cost benefit based on transmission tariff and additional transmission capability. All schemes of Distribution licensee will indicate cost benefit analysis based on tangible/intangible benefit except' for those specially mentioned otherwise. Capital expenditure on Institutional strengthening, consumer services and preliminary works shall not require cost benefit analysis. (4) The Commission shall convey its observations on the scheme within 30 days of submission and where required, scheme shall be amended accordingly. (5) Pending approval of investment plan by the Commission, scheme(s) can be posed to the State Government/Financial Institutions for approval/financing. (6) Various statutory approvals shall be obtained for each scheme and the scheme shall then be kept ready for implementation in phases, depending upon its priority and availability of finances and provisions of the regulations.

## **4. Annual Investment Plan.**

(1) By 30th November of every year, generating company/licensee shall submit in the prescribed form given at annexure-3 scheme/project wise, investment plan for the next financial year to be approved by the Commission which will categorise the investment into that for schemes as appraised by the Commission, deposit works and other capital works. (2) Overall size of the

investment proposed in a year, except deposit works, shall be based on growth of business, reduction in losses and inflation rate. Investments shall take into account the consumers'/users' contribution. Investment under various heads shall not exceed the ceiling limits specified by the commission from time to time and incorporated in the guidelines at annexure-1.(3)Investment plan shall indicate corresponding figures of investment plan and expenditure for the previous year.(4)In respect of each scheme/deposit works it shall indicate expenses already incurred by the end of previous year/anticipated to be incurred, during current year and likely to spillover to next year.(5)The annual plan shall be restricted to the overall investment proposed in a year to the extent as the company may decide from time to time and as approved by the Commission.(6)No investment will be considered towards capitals cost or additional capital cost for ARK and/or tariff determination unless it has been approved by the Commission under annual investment plan(7)No expenditure will be incurred on any scheme after the period as specified below from the year of commissioning of all units/transformers/lines covered in the scheme:

- (a) Distribution scheme 1 year
- (b) Transmission scheme 2 years
- (c) Generation scheme 3 years.

(8)After the specified period, scheme will be closed and uncompleted works will be got completed by merger into new scheme. For all closed schemes, provisions for pending liabilities of payment will be made as 'carried over liability'.(9)For the purpose as sub clauses (7) & (8), each phase of the scheme/project will be treated as separate scheme.

## **5. Implementation and progress report.**

(1)Implementation of annual investment plan will normally follow the priority criterion of the enclosed guidelines.(2)If capital expenditure during a year is not incurred as per Investment plan approved by the Commission there shall be prorata deduction of depreciation interest and financial charges and O&M charges in the tariff at the time of truing up.Annexure IIInvestment GuidelinesA. Identification:

### **1. Generation Schemes. - 1.1. The projects for capacity additions of conventional generation shall be formulated based on the net long term (i.e. at least next 5 years), requirement i.e. gap between demand of energy and availability projections by distribution licensees/Vitran Nigams after accounting for the following:-**

(a)Non-conventional energy generation capacity available in the State or its percentage share specified by the Commission, whichever is less.(b)Capacity Share in generation capacity of projects through competitive bidding.(c)Available generation capacity from intra state and inter state conventional generation projects.1.2Total Generation Capacity within the State shall be at least 50% of the demand.1.3Dedicated transmission system shall conform to requirement of design criteria as given at annexure-2.

**2. Transmission Scheme. - Transmission Schemes of 132 KV and higher voltage shall be identified by predominance of one or more of the following factors and shall be selected for implementation in the order of preference as under:-**

(1)Power Evacuation. - These schemes shall include the transmission and sub transmission system required for evacuating power from a generating station to the licensees' transmission and distribution system on account of either generating capacity addition or inadequate evacuation capability of the system. Such schemes for power evacuation of generation capacity addition shall be so scheduled that their commencing synchronizes with the generation capacity addition schedule.(2)Loss Reduction (132 KV and above Level). - These schemes shall consist of laying of new -100 and 220 KV transmission lines and installation of sub-stations to meet growing demand and now 132 KV of 220 KV sub-stations on existing 132 KV & 220 KV lines and to contain/reduce the losses within the prescribed limit separately.(3)Loss Reduction (at 132 KV Level on Discom). - To meet the requirement of Dis-coms by way of -(a)Creation of new sub-station near the load center of 33 kV network where strengthening of 33 kV system is techno-economically not feasible. Such schemes shall normally be initiated at the request of concerned Discom.(4)System Strengthening/Reliability. - These are the schemes required to maintain system stability or to minimize restoration time in the event of outage or to effect is landing.(5)Augmentation. - Augmentation of transmission lines (like change of conductor, laying Second circuit, series compensation, etc.) and of sub-station capacity to obviate excessive loading on the system which is affecting or likely to affect adversely the transformer loading or voltage regulation or losses. These may be initiated at the request of concerned Discom or suo-moto by Prasaran Nigam (eg. Parallel circuiting, capacitor installation, formation of ring, additional transformer etc.); and to facilitate interstate/interstate open access.(6)The normative availability of the transmission system shall be 98%.

**3. Sub transmission and distribution Schemes. - Sub transmission and distribution schemes shall be identified by pre-dominance of one or more of the following, factors and selected for implementation as under:-**

(1)Power Evacuation. - From any generating station to the licensee's sub transmission system. These shall include the sub transmission system required due to either the addition of generation capacity addition or inadequate evacuation capability of the system. Such schemes shall be so scheduled that their commissioning synchronizes with the generation capacity addition.(2)Supply to PHED or State Government lift irrigation schemes or defence/strategic installations.(3)Rural electrification. - Electrification of un-electrified villages, hamlets or area with an objective to make electricity available to all within the area of supply. Targets for such electrification shall not be less than the targets of National policy on Rural electrification and/or State Government policy in this respect.(4)Supply to Agricultural Pump sets or Community Lift Irrigation Schemes. - transmission and distribution schemes required to meet targets of agriculture pump sets energizing in consonance with National policy on Rural electrification or State Governments policy in this respect.(5)Supply to other consumers. - This shall be as per electricity supply code i under Sections

45 to 48 & 50 of Electricity Act, 2003.(6)Reduction of sub transmission and distribution system losses. - Such schemes shall consist of.(a)Creation of new 33 KV and 11 KV sub-station near the load center.(b)Reduction in the ratio of length of low voltage lines to high voltage lines including LT less system. The desirable ratio of Low voltage lines to high voltage lines would be as specified by the Commission.(c)Adoption of Aerial bunched conductors.(d)Capacitor installation (dealt separately at Sr. No. 4)).(e)Change of conductor or double circuiting of lines (where voltage regulation is not adverse).(7)System strengthening of sub transmission system to effect improvement in. - (a) Voltage regulation at the existing or envisaged load demand.(b)Reliability of system to reduce outage time and also to cater to outage of line and/or transformer.(8)System Augmentation schemes. - Addition of Transformation capacity at sub-station to match envisaged loading condition. (Line work under this category will be covered under (6) above.)(9)System Improvement. - To provide switchgear, control gear and protection to reduce fatal accidents and failure rate of transformers.(10)Availability shall be as specified from time to time.

**4. Capacitor Installation Schemes. - (1) In respect of transmission licensee, these scheme shall include capacitor banks to be provided to maintain grid parameters within permissible limits and kVARh flow within the limit prescribed by RERC for this purpose, based on the requirement as indicated by NREB on the basis of system study conducted by them and taking into consideration the additional generating capacity envisaged in the State. Additional system studies shall be conducted by STU to work out the capacitors banks to be provided by RVPN, distribution licensee and RVUN/other generators.**

(2)Capacitor installation schemes of distribution licensees shall be of 400 V. 11 kV or 33kV based on maintaining load power factor close to unity & specified power factor or reactive power flow.

**5. Metering Schemes (transmission). - (1) Metering scheme of transmission licensee shall conform to Metering Code for Rajasthan Grid incorporated in part - III of Grid Code and shall consists of the following:-**

(a)Metering with high degree of accuracy to have commercial settlement between (i) RVPN and Vitaran Nigams, and (ii) RVPN and RVUN. There may be check metering to have assessment about the correctness of interface metering.(b)For assessing the loadings and losses of RVPN's lines and sub-stations.Remote meter reading facility may be provided to reduce meter reading time and to effect cross checks etc. at SLDC.(2)Metering Schemes of distribution licensee shall conform to Metering Code of distribution licensee and shall include:-(a)Metering for recording sales to consumers, other distribution licensees, generators (vide sr. No. 1), traders, etc. There may be check or additional metering to have assessment in case of Main meter being defective.(b)11 KV feeder metering for energy auditing.(c)Special metering to assess 33 KV and 11KV distribution system losses or for voltage profile or for other studies.(d)Metering at distribution transformers intially in 11 KV feeders having high losses.

**6. Load Dispatch and Communication Schemes shall consist of the following.**  
**- (a) Counter part works of ULDC schemes of NRLDS for the State.**

(b)Augmentation of load dispatch facility, so as to have complete SCADA system to cover maximum stations to the extent possible providing, sub load dispatch centers and displays at distribution licensee's control room.(c)Technology up gradation to have real line load flows and other systems studies using auxiliary computer, extracting data from main computer and to have line load flow data from nearby remote station to Sub SLDC and Sub SLDC to SLDC and from SLDC to SWb SLDC.(d)Providing/augmenting load dispatch facility or power control center(s) for Vitran Nigams.(e)Technology up gradation to have real time computations of third party sales/open access consumers/traders on auxiliary computes by extracting relevant data from main computer.

**7. Institutional Strengthening Scheme. - This will include technical advisory services, consultancy services to meet institutional strengthening, including efficiency improvement in licensee's business operation & training to the personnel.**

**8. Consumer service.**

**9. Preliminary works. - shall include survey and investigations and land acquisition for new works. These shall be adjusted against the cost of scheme as soon as the same starts getting implemented.**

B. Examination and Selection:(1)All works should generally follow the design criteria as per Annexure-2.(2)The transmission and distribution schemes shall be selected based on prescribed minimum levels of cost benefit to be achieved at the end of 5th and 10th year of operation. For transmission scheme marginal cost of the power saved due to reduction in losses shall be considered. For this purpose, highest cost of purchase of power from Thermal Generating Stations other than liquid fuel, renewable energy sources and nuclear power stations (as adopted for determination of surcharge) would be considered and for distribution schemes revenue at existing tariff. For this purpose, rate of depreciation, interest charges and normative O&M expenses and annual escalation in O&M expenses shall be as per RERC (Terms & Conditions of Determination of Tariff) Regulations. The financial viability of the schemes shall be determined by internal rate of return and pay back period method.(3)The schemes of Capacitor installation will have cost benefit analysis worked out based on annual operational cost as against the saving of penalty or earning of incentive or improvement in voltage profile.(4)Load dispatch schemes shall be based on intrinsic benefits.(5)Power evacuation and metering schemes will be required to follow least cost criterion without affecting design criterion/metering code.(6)Scheme for effecting improvement of system reliability will be examined vis-a-vis target of system reliability as may be specified by the Commission.(7)All schemes of Vitran Nigam except for reduction in T&D losses, system improvement and capacitor installation, emerging out of vitran nigam's obligation to supply shall not be subjected to cost - benefit analysis. These will be governed by availability of financial

resources and criterion of least cost out of various possible alternative or maximum spread of facility among consumers with available finance. C. Deposit Works. - Details of those deposit works, which are funded by the beneficiary but maintenance of which has to be carried out by the transmission/Distribution licensee shall be given. D. Financing. - Financing of the schemes shall be by: (a) Equity capital, (b) Grants/assurances/subsidies by central and state government, (c) Loans/ from Governments (as part of budgetary support), banks, financial institutions (within/outside the country), REC, PFC and public on the terms as may be agreed. (d) Consumer's contribution. E. Implementation. - (a) Annual Plan Size. - (1) The size of the annual investment plan (including deposit works of the other agency) and consumer/user's contribution) shall not exceed the ceiling limit determined based on growth of load/sales and annual inflation rate. The deposit works shall be committed only to the extent such work do not affect annual works planned by the generation companies/Licensees. The various schemes selected in the annual investment plan shall be categorized under above heads. For schemes spreading to subsequent years, next 2 years projections shall be indicated. The annual size of investment plan will be based on criterion that with the addition of assets cost of generation, transmission and distribution shall not exceed the respective current cost by the inflation rate. For transmission and distribution licensees, it shall not exceed the following ceiling limits: - Annual plan =  $K * GFA * [1 + \text{inflation rate}] * (1 + \text{growth rate}) - 1$  Where k = constant to convert GFA at the end of previous year to current Cost of assets. Till same is worked out it shall be taken as 1.30 Inflation rate = ratio of WPI as on 1st April of previous year and current year. Growth rate = growth of sales envisaged for current year over that of Previous year. (2) Annual plan expenses subcategory wise ceilings. - (a) Generation Company. - For the implementation of the annual plan, order of priority and ceiling limit of capital expenditure shall be as under for Generation Company:-

Category Ceiling limit of outlay

1	Continuing works after COD and carried over liability	15%
2	New Generation scheme	90%
3	Dedicated transmission system	20%
4	Project preparation and preliminary works including Survey and investigation, statutory clearances and consultancy	5%
5	Institutional strengthening	2%

(b) Transmission licensee. - For the implementation of the annual plan order of priority and ceiling limit of capital expenditure shall be as under for transmission licensee:-

Category Ceiling limit of outlay

1	ongoing schemes and carried over liability	10%
2	Schemes for power evacuation, defense/strategic importance and water supply	60%
3	Other Schemes based on cost benefit analysis	60%
4	Capacitor installation, load prelin islanding open access and metering.	5%
5	Project preparation and Preliminary works including Survey and investigation, statutory clearances and consultancy	3%
6	Institutional strengthening	2%

(c) Distribution licensee. - (1) For the implementation of the annual plan order of priority and ceiling limit of capital expenditure shall be as under for transmission licensee:-

Category Ceiling limit of outlay

1	Ongoing schemes and carried over liability	5%
2	(a) Schemes for power evacuation (b) Schemes for defence/strategic importance and water supply	5% 5%
3	Rural electrification :	12.5%
4	Other schemes based on cost benefit analysis (a) Reduction of system losses : (b) System strengthening : (c) System Augmentation : (d) System Improvement :	12.5% 12.5% 12.5% 12.5%
5	(a) Capacitor installation (b) Load dispatch & Metering : (c) Consumers servicing : (d) Institutional strengthening.	7.5% 7.5% 5% 1%
6	Project preparation and preliminary works including Survey and investigation, statutory clearances and consultancy	3%
7	Supply to Consumers	10%

(2) Out of the 'Other schemes' to be taken up based on cost-benefit analysis, those having maximum benefit will be taken up first. For this purpose, for distribution licensees, schemes for water supply, industrial areas etc. shall be evaluated independently and technical parameters to be considered will be as under and accordingly, priority is to be assigned to the scheme for its inclusion in the annual Plan:- I. Percentage Voltage Regulation (in the existing feeders) II. Percentage Demand Loss (in the existing feeders) III. Load Growth of the area IV. Annual Saving in LUs V. Cost benefit ratio or Least cost or maximum benefit criterion. (3) Where the investment will be spread over the schemes for more than one year, the inter-se allocation will be decided by Generation company/licensee and shall be as approved by RERC. (4) No change will normally be effected by generation company/licensee in annual plan over and above 5% of annual investment approval by RERC. However, in case any change is required beyond 5% of the approved investment plan due to specific reason proposal with detailed justification will be furnished to RERC for its approval. Changes due to pre-ponement of schemes on account of availability of financial resources shall also be considered to this ceiling limit. (5) Minor changes in schemes due to route length, shifting of site (due to any reason) requisite matching with National Power Plan (declared subsequent to scheme formulation, unforeseen geographical conditions changes in/statutory requirements) which do not exceed 10% of the cost will not be put up for revised investment approval, RERC will be informed of such changes. Annexure 2 Design Criteria and Selection of The Transmission and Distribution Schemes All schemes/works shall comply with the provisions of Grid Code, Power survey, Electricity supply Code, Metering Code, Safety regulations under Section 53 of the Electricity Act 2003, National Electricity Plan, Electricity Policy Survey and prudent utility practices, as applicable. The transmission and distribution schemes shall be formulated with the following design criteria & selection criterion as under:-

**1. Criteria of Selection of EHV Schemes. - 1.1 As entire EHV transmission system of the State is operated in an integrated manner with EHV transmission system of Northern Region, EHV scheme shall meet**



**connectivity criteria of C.T.U. Accordingly, the performance of (including load flows) on such integrated transmission system (including additions & augmentations) having multiple loops/grid formation shall be determined annually through load flow and other studies using digital computers. Such studies shall be conducted for the existing generating stations transmission system as well as new generating stations, transmission system as envisaged in the next five years by CTU and STU. In conducting such studies, Generating stations, transmission lines and sub-station envisaged in National Electricity Plan, notified by Central Electricity Authority as per Section 3(4) of the Electricity Act 2005, shall be considered. Load flow and other studies conducted by the Central Electricity Authority or Central Transmission Utilizing or National/or/them Regional Load Dispatch center or any other organization, shall form the base, on which the existing and envisaged state transmission system (not considered therein) shall be superimposed by STU in their studies. Such studies shall be conducted by State transmission utility for the existing system and system as envisaged in the next 5 years to develop transmission system satisfying Grid code and planning and design criterion of these guidelines. Based on such studies, the optimal intra-state transmission system shall be developed with the adequacy of transmission system tested for: peak load during summer, winter and monsoon and off-peak loads during these seasons for.**

(1)(a) Outage of any one unit at generating station or one interconnecting transformer (ICT) at sub-station not causing overloading of the line or ICT. (b) outage of one inter connecting transformer (ICT) at generating station shall not cause overloading of other ICT or rescheduling of generation. (2) Except for radial 132 kV line, outage of single circuit line or one circuit or double circuit line does not require load shedding or rescheduling of generation during steady state operation. (3) In case of the lines emanating from a generating station, outage of single circuit line or both circuit of 132kV or 220 kV Double circuit line shall not require load shedding or rescheduling of generation, while outage of both circuit of 400kV Double circuit line will not require load shedding but rescheduling of generation only. That is to say, such outage will not cause loss of transient or dynamic stability during line outage but system voltage and frequency changes may need rescheduling of generation. 1.2 General Criteria of Selection of New EHV Lines. - (i) Addition of new transmission lines or higher voltage sub station shall be considered to avoid the over loading of the existing system beyond the thermal loading as under:- Table - A

Conductor Type and Dimension	Ambient Temperature °c	Thermal Loading At 75°c Conductor Temperature
Acsr Panther Conductor 210 Sq.Mm	50	300 Amps. (71 Mva At 132 Kv)

Acsr Zebra Conductor 120 Sq. Mm	50	750 Amps (173 Mva At 132 Kv)
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Acsr Moose 520 Sq. Mm	40	837 Amps (388 Mva At 132 Kv)
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(ii) Adoption of voltage level of transmission line shall also be based on cost voltage regulation, system stability, system reliability, right of way requirements, energy losses, down time etc. & the surge impedance loading (SIL) as under:-

Line Voltage	Surge Impedance Loading
132 kV	46 MW.
220 kV	129 MW.
400 kV with 50% reactive compensation.	410 MW.
400 kV without reactive compensation.	533 MW

Note. - for shorter length of 132 kV and 220 kV lines loading up to 1.4 times SIL can be considered, provided voltage variation between no load and full load does not exceed 5% or angular separation does not exceed 5 degree. (iii) Transmission system shall be designed so as to be capable of sustaining outage as specified above. (iv) The scheme for the creation of new sub-station or augmentation of sub-station shall provide adequate shunt capacitor compensation so as to improve the power factor of load under peak/inductive load conditions to be around unity. The scheme for 400 KV transmission line shall have adequate shunt reactive compensation to avoid dynamic over voltage under outage condition. Series capacitor compensation or dynamic shunt compensation of transmission line will be considered where system parameters can not be controlled within the permissible limits or system stability can not be maintained by shunt compensation. No series capacitor compensation will be provided on transmission line emanating from thermal power station. (v) Closed loop operation of the transmission system shall be considered to the extent possible. (vi) Steady State Voltage shall be maintained within the limits specified in the grid code. 1.3 General Criteria of Selection of EHV sub-station. - For the creation of a new EHV sub-station, other than for evacuation of power and system reliability, load demand & voltage profile of lower voltage system shall be the main consideration. The following are general consideration:- (1) New 132 KV sub-stations. - (i) New 132 KV sub station may be considered only when: (a) The voltage regulation exceeds 9% and demand losses exceeds 5% in the existing 33 kV system and augmentation of 33 kV system (by additional feeder or higher conductor size) is not technically feasible. VR shall be determined considering kV system only and taking sending end 33 kV voltage as 1.0 p.u. (b) Loads on 33 kV sub-station should be such that on the creation of a 132 kV sub-station, there will be a load of at least 6 MVA on 132 kV sub-station on commissioning. In rural area, distance between new 132 KV sub-station on commissioning. In rural area, distance between new 132 kV sub-station from the existing sub-station shall normally be not less than 30 km, unless load concentration so warrants. (ii) After creation of a new 132 KV sub-station, there must be a saving in the annual energy loss to the tune of at least 8 LUs per annum. (2) New 220 kV sub-station. - A new 220 KV sub station may be considered only when - (i) Either the load at 132 kV sub-station exceeds 50 MVA or the load on a 132 kV line exceeds 70 MVA per circuit under outage condition and/or (ii) On creation of 220 KV sub-station, load on heavily loaded 132 kV line is reduced and 220 KV sub-station carries about 10 MVA. (3) New 400 KV sub-station. - A new 400 kV sub-station may be considered only when: (i) Either the loading on 220 KV sub-station exceeds 150 MVA or the load on a circuit of 220 kV line crosses 180 MVA under outage condition and (ii) On installation of a

sub-station 400 KV lines, load on 220 KV lines reduces and 400 KV sub-station carries at least 250 MVA load.(4)Transmission capacity does not exceed the capacity specified at SI. No. 6.

**2. Criteria of Selection of Distribution Schemes. - 2.1 As sub transmission and distribution system of the Vitran Nigam is operated in an integrated manner with transmission system of RVPN and also of Northern region, it must meet the connectivity criteria of STU & CTU.**

2.2Sub transmission & Distribution system shall be conceived based on load demand and sources of generation/receipt of power.2.3General Criteria of Selection of New sub transmission and distribution Lines are as under:-I. Adoption of voltage level shall be based on cost, reliability, right of way requirement, energy losses, down time, surge impedance loading (SIL) and 5% voltage regulation. SIL to be considered shall be 46,000 kVA for 132 kV; 2,750 kW for 33 KV and 300 KW for 11 KV. However, line loading upto 1.4,2.0,2.5 times of SIL may be considered for 132 KV, 33 KV & 11 KV lines respectively.II. Evacuation system shall be capable of sustaining outage of one circuit.III. The sub transmission and distribution system shall be developed based on field conditions. The options considered for creation of the sub transmission and distribution system are summarized below:-(a)For agricultural services, Low voltage line shall not normally exceed 5 spans.(b)New transmissions/distribution line shall be considered to avoid congestion of the existing system. Wherever three or more circuits of the same voltage class are envisaged between two sub-stations, then the next higher system voltage shall also be considered.(c)In case of evacuation system of generating stations, two single circuits shall be preferred to a double circuit line.(d)The permissible normal loading of line shall be based on KVA-KM at 5% voltage regulation (VR) calculated by the formula  $VR \text{ (in \%)} = (KVA \times KM / \text{diversity factor} / 1000) \times \text{constants as per the table given below:-}$

Conductor	Constant for 11 KV line	Constant for 33 KV Line
Squirrel	0.9925	-
Weasel	0.8525	0.09575
Farret	0.6756	0.07619
Rabbit	0.5881	0.0665
Mink	0.5006	0.05681
Dog	0.4303	0.04922
Raccoon	0.3613	0.04131
Leopard	-	0.03381
Wolf	-	0.03222
Panther	-	0.03063

2.4General Criteria of Selection of New 33 KV and 11 KV sub-station. - (1) For the creation of a 33 KV or 11 KV sub-station, load demand & voltage profile of lower voltage system shall be the main consideration.(2)A new 33 KV sub-station may be considered only when:(a)the voltage regulation exceeds 8% & demand losses exceed 5% in the existing 11 KV system with diversity factor of

1.2.(b) augmentation of 11 kV system either by additional circuit or double/multi circuit line or higher conductor size is not technically feasible. (c) the load at one of the 11 KV feeder exceed 750 KVA and load on all 11 KV feeders, envisaged to be connected to 33 KV sub-station 5000 KVA or total transformation capacity, whichever is less. The aim will be that on the creation of a 33 KV sub-station, there will be a load of at least 2.5 MVA. (i) In rural area, distance between a new 33 KV sub-station and the existing sub-station shall normally be not less than 2.3 km, unless load concentration so warrants. (ii) Normally, after creation of a new 33 KV sub-station, there must be a saving in the annual energy loss to the tune of atleast 1 lakh units per annum. (iii) Transformation capacity of 33 KV sub-station must be 3.15 MVA and 5 MVA or combination thereof and number of transformers at a sub-station must not exceed 2. (3) A new 11 KV sub-station may be considered only when: (i) The voltage regulation exceeds 8% & demand losses exceed 5% in the existing low voltage system with diversity factor of 1.2 and (ii) Augmentation of low voltage system either by additional circuit or double/multi circuit line or higher conductor size is not technically feasible. (iii) Voltage regulation shall be considered for low voltage system only. (iv) High voltage consumer has maximum demand exceeding 50 MVA. (v) Connected load exceeds 112 KW and ratio of connected load to transformation capacity exceeds 1.5 for domestic, non-domestic, mixed load, small industrial services and 0.8 for agricultural and other services. (vi) Transformation capacity shall be selected out of 15, 25, 40, 50 & 63 KVA for rural area and also out of 250 & 500 KVA capacities for urban area.

### **3. General Criteria For Capacity Augmentation of Transformers on EHV Grid Sub-stations. - The General Criterion for capacity augmentation of transformers on EHV Grid Sub-station shall be as under: -**

3.1 To avoid overloading of transformer if new sub-station or augmentation of the same planned or commissioned in the nearby area does not effect relief. 3.2 Based on techno-economic solution to the specific problems faced by the field officers. 3.3 To improve system reliability by additional transformer capacity of multiple feeding arrangements for a particular area looking to its importance. 3.4 On the basis of power assurance issued to large prospective industrial consumer, augmentation is planned in advance.

### **4. General design criteria for strengthening of transmission system:**

4.1 Wherever three or more circuits of the same voltage class are envisaged between two sub-stations, then the next transmission voltage should also be considered. 4.2 In case of evacuation system of generating stations, two single circuits may be preferred instead of a double circuit line, wherever feasible.

### **5. Shunt reactor compensation**

(5.1) 400 kV shunt reactor are 50, 63 and 75.MV Ar. Shut capacitive compensation may vary-from 40-50% of line capacitance. Shunt reactor may not be provided where either compensation as above requires shunt compensation less than 50 MVA or due to series capacitor compensation voltage rise due to ferranti effect is less than 5%.

## 6. Transformation Capacity

6.1 The transformation capacity at any single sub-station (other than generating station) should not normally exceed the limits specified in the table given below:-

Normal Voltage Capacity (MVA) proposed by CEA

400 kV	1000
220 kV	400
132 kV	150

6.2 400 KV transformers will be designed to have 150% overloading (OLTC will be specifically designed). For such a planning, the maximum MVA loading of power transformers to be considered should not exceed 70% of its continuous overloading capacity or if no continuous overloading capacity, then 70% of rated capacity. In case, it exceeds at a sub-station, an additional transformer may be proposed at such sub-station provided it does not exceed the aforesaid sub-station capacity limit.

**4. Shunt Capacitor Compensation at Sub-Station. - (1) For developing an optimal power system, the power factor of the load of distribution licensee at 220 kV and 132 kV voltage level shall be above 0.85. However, for 132 KV sub-stations feeding to predominantly agricultural load, power factor, if below 0.7, shall be improved by distribution licensee to 0.85 during peak agricultural demand by 31.3.2007 or within 2 years of the commissioning of the sub-station, whichever is later.**

(2) Further, static or dynamic compensation to limit the voltage variation within the permissible limits as mentioned hereinafter shall be provided by transmission licensee. (3) Capacity of shunt capacitive compensation on 132/33 kV and 132/11 kV transformer at a EHV sub-station shall not exceed 40% of transformation capacity toward against harmonic resonance. (4) Adequate shunt compensation will be provided at EHV sub-station to improve the power factor of load under peak/inductive load conditions from 0.85 to unity. (5) Initially, low voltage or 11 KV shunt capacitor shall be provided equal to 110% of that worked out based on power factor to be improved from minimum specified in the tariff schedule to 0.85 (0.94 of HT consumer). Shunt capacitors so provided initially shall be increased/decreased as per actual operating conditions so as to bring the load power factor as close to unity as possible.

**5. Protection schemes (distribution system). - Priority of providing protection for electric line as per metering and protection code shall be in descending order of system voltage and for sub-station shall be in descending order of system voltage and transformation capacity.**

Form-1-A.....Vitran/Utpadan/Prasaran Nigam Limited

Investment proposals for the financial year.....

Write up on investment proposal (including justification of high capital cost, capital additions and cost over runs)

Form 1-B..... Vitran/Prasaran Nigam Limited Investment proposals for the financial year..... (Calculations of overall cost of generation/Transmission/Average cost of supply with and without approval of investment plan)

Generation	Variable Charges (In Rs./ KWh)	Capacity Charges (in Rs./ Kwh)
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Transmission	Charge per KW per Month (in Rs.)
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Distribution	Consumer Service/KWh	Net Work Charges/ KWh.	Energy Cost/Kwh
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Form 2..... Vitran/Utpadan/Prasaran Nigam Limited Investment proposals for the financial year..... (Physical and financial targets and achievements)

S. No.	Particular of work	Total cost of scheme/works (Rs. in Lakhs)	Year of start of scheme	Date/Year of Commissioning	Cost-Benefit Ratio in \$(%) by Net present Value Method
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At the end of 5 10 Years  
Years

1	2	3	4	5	6	7
	Approved schemes					
	@1. Ongoing 2. New 3.					
A.	Carried over liability of closed schemes 4.					
	Total					
	Other works (excluding deposit works) 1.					
B.	Ongoing 2. New 3.					
	Carried over liability of closed schemes 4.					
	Total					

Deposit Works1.		ongoing2. New3.		Total			
C.	Physical targets	Expenditure 1 incurred (its, in Lakhs)	Remarks				
	Unit	For Prev. year	During current year	Upto the Prev. Year	During Prev. Year	During current year	Proposed to be incurrent in nextyear(s)
8	9	10	11	12	13	14	15

Note. - 1. Sub categorisation for each category shall be as per investment guidelines.

**2. @ details will be shown for each scheme, prepared by Nigam and submitted to Commission/Financial Institution/Governments for approval.**

**3. Specify appropriate unit e.t. KW, KVA, KVAR, KVARh, Nr., Km.**

**4. \$ Specify LCA (lest cost alternative VNA where cost benefit ratio in inapplicable.**

Form 3.....VitranAJtpadan/Prasaran Nigam LimitedInvestment proposals for the financial year.(Sources of funding)

S. No.	Particulars of work	Total cost of Scheme/ Works (Rs. In Lacs)	Sources of cost to be funded by (Rs. in Lakhs)	Sources of cost to be funded by in Currentyear (Rs. In lakhs)	Equity Debt	Consumer contribution	Grants/Subsidy
A.							





- 1 Generation schemes/works
- 2 Power evacuation schemes/works
- 3 Loss reduction schemes/work
- 4 System improvement/stability/reliability schemes/works
- 5 Rural electrification schemes/works
- 7 Works/schemes related to supply to consumers
- 8 Load dispatch/SCADA/Communication schemes/works
- 9 Metering schemes
- 10 Reactive compensation schemes/works
- 11 Institutional Strengthening
- 12 Project preparation and Preliminary works

B.	Physical targets	Upto previous year	During Previous Year	Proposed for Current Year			
1	Generation Capacity	MW		MW		MW	
2	Transmission/ Distribution Lines	ckt.Kms	Av.cost/km	ckt.Kms	Av.cost/ Km	ckt.Kms	Av.cost/ Km
(a) 400 KV lines							
(b) 220 KV lines							
(c) 132 KV lines							
(d) 33 KV lines							
(e) 11 KV lines							
(f) LT lines							
(g) Other lines @							

C.	Sub- stations	Upto Previous Year	During Previous Year	Proposed for Current Year	
Num- bers	Tranforma- tion Capacity (in KVA)	Num- bers	Transfro- mer Capacity (In KVA)	Num- bers	Transormer Capacity (In KVA)

New	Augmentation	New	Augmentation	New	Augmentation
1	(a) 400 KV				
2	(b) 220 KV				
3	(c) 132 KV				
4	(d) 33 KV				
5	(e) 11 KV				
D. Reactive Compensation		KVAr.	Av. Cost/ kVAr.	KVAr.	Av. Cost/ kVAr.
1	Shunt Reactor				
	(a) at 400 KV s/s				
	(b) at 220 KV s/s				
	(c) at Other KV s/s				
2	Shunt Capacitors				
	(a) at 400 KV s/s				
	(b) at 220 KV s/s				
	(c) at 132 KV s/s				
	(d) at 33 KV s/s				
	(e) at 11 KV s/s				
	(f) at LT				
3	Series Capacitors (Specify details)				
4	Dynamic Compensation (Specify details)				
		Upto Previous year	For Current Year	For Previous year	
E. Meters	Number	Av. Cost/ Meter	Number	Av. Cost/ Meter	Number Av. Cost/ Meter
1	ABT complaint				
2	HT meters				
3	3 phase trivector				
4	3 phase LT				
5	I Phase LT				
F.	Release of Service connections (tariffcategory wise)	For Current Year	For Previous year		
No. of connections	Total Expenditure	Av. Cost/ Connection	No. of connections	Total Expenditure	A. Cost/ Connection

