


WASTE HEAT RECOVERY POWER GENERATION (WHRPG)

CENTER OF ENGINEERING (COE)

SEMEN INDONESIA

Edition : Aug 29rd, 2016

SEMEN INDONESIA GROUP

Together We Build A Better Future

Towards World Class Engineering Company on 2024

TECHNICAL & CONSULTANCY SERVICES

OUTLINE

1. Company Profile
2. Road Map Emission Reduction
3. Project Description (WHRPG Tuban)

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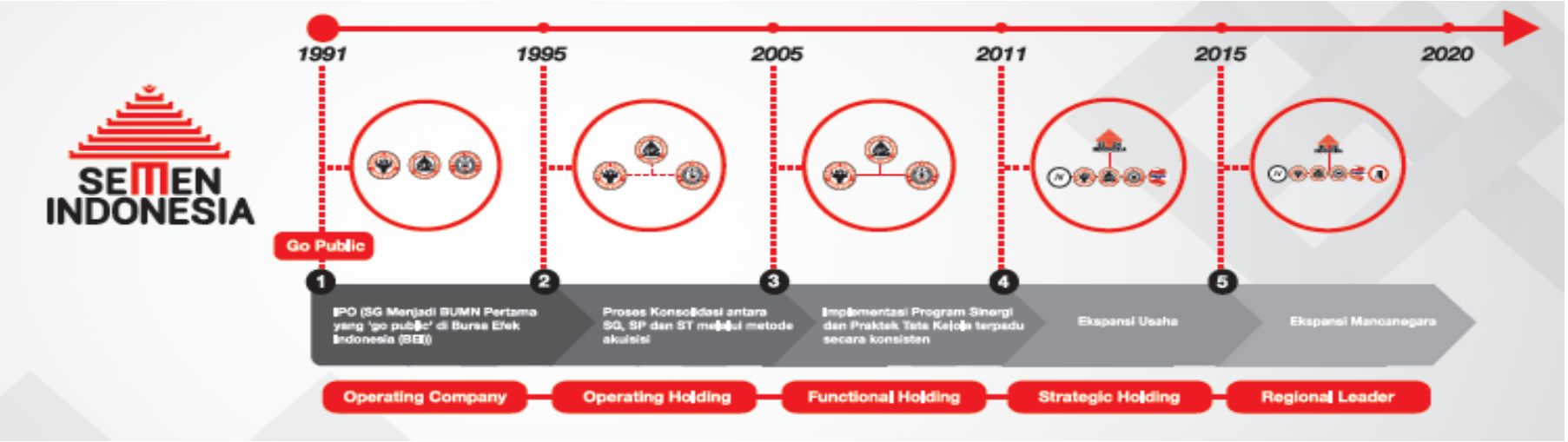
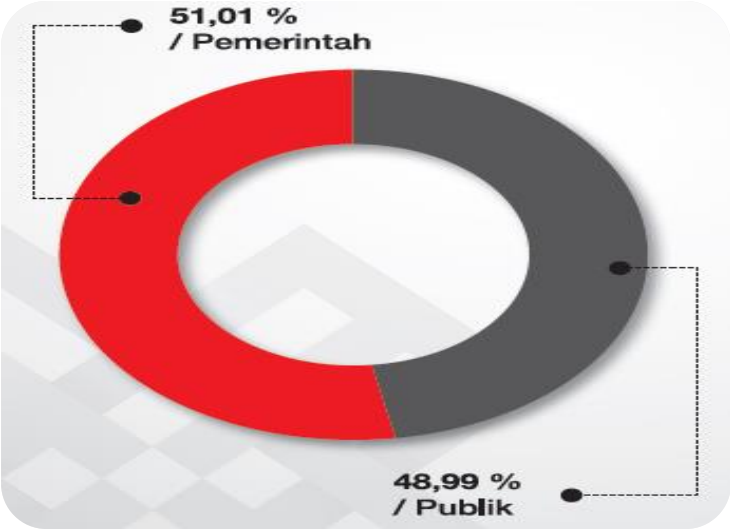
COMPANY PROFILE

BRIEF HISTORY



OWNERSHIP STRUCTURE



CEMENT COMPANY

SG	SP	ST	TLCC
99,9%	99,9%	99,9%	70,0%

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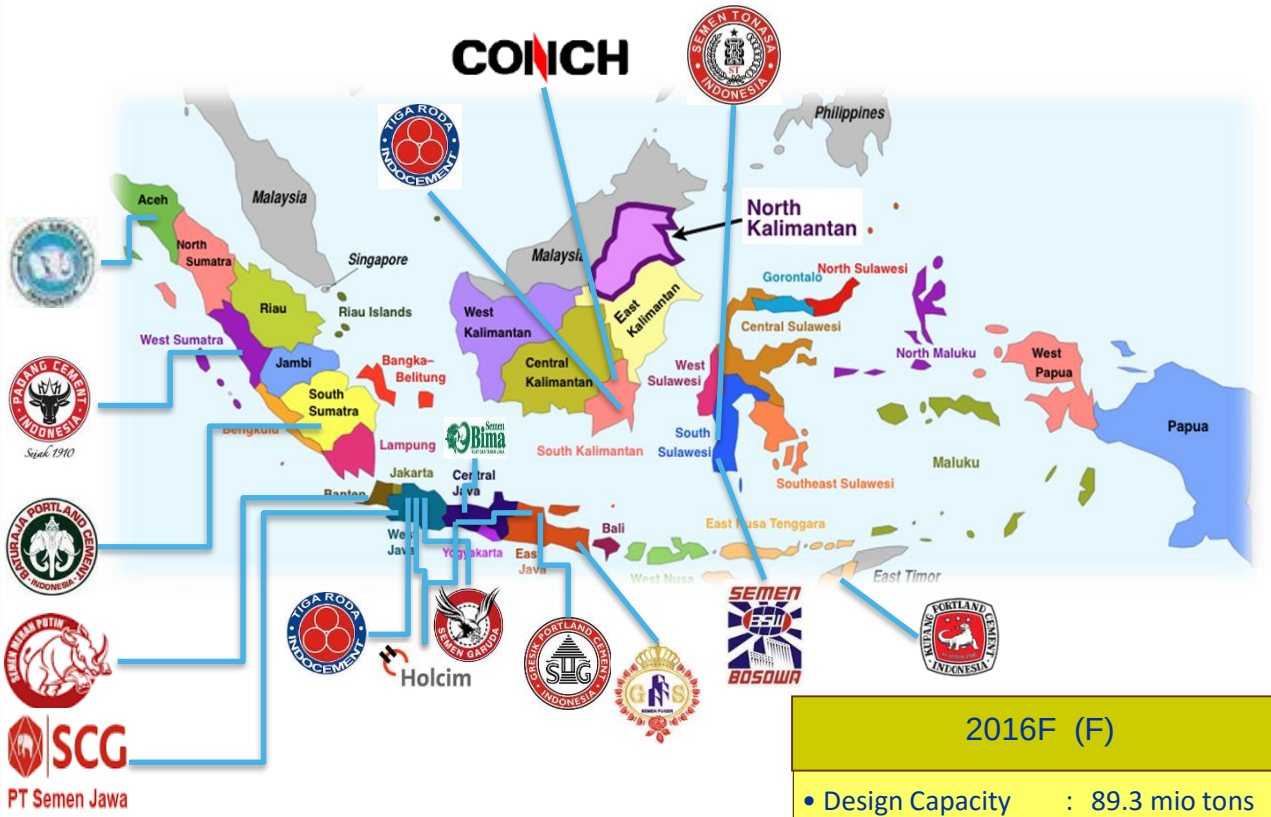
PRODUCTION CAPACITY, SUPPLY, GROWTH & SHARE CAPACITY DOMESTIC CEMENT INDUSTRY 2016



SHARE CAPACITY
- Perusahaan BUMN : 36%
- Asing dan Swasta : 64%

2016F (F)

- Design Capacity : 89.3 mio tons
- Production Capacity : 75.5 mio tons
- Domestic Growth : 8.0%
- Domestic Utilization : 86%
- Supply
  - Domestic : 65.0 mio tons
  - Export : 4.0 mio tons
  - Import : 1.5 mio tons[2)]

DOMESTIC CAPACITY 2016

1. Semen Indonesia	31.1 mio ton
2. Semen Andalas	1.6 mio ton
3. Semen Baturaja	2.0 mio ton
4. Indocement TP	25.9 mio ton
5. Holcim Indonesia	12.1 mio ton
6. Semen Bosowa	6.0 mio ton
7. Semen Kupang	0.5 mio ton
8. Semen Jui Shin	2.0 mio ton
9. Semen Puger	0.3 mio ton

PEMAIN BARU YG MULAI PRODUKSI DI TAHUN 2016

10. Semen Merah Putih	2.5 mio ton
11. Semen Anhui Conch	1.7 mio ton
12. Siam Cement	1.8 mio ton
13. Semen Pan Asia	1.8 mio ton
TOTAL	**89.3 mio ton**

VISI – MISI & KEBIJAKAN LINGKUNGAN

VISI

Menjadi Perusahaan Persemenan Terkemuka di Indonesia dan Asia Tenggara

MISI

1. Memproduksi, memperdagangkan semen dan produk terkait lainnya yang berorientasikan kepuasan konsumen dengan menggunakan teknologi ramah lingkungan
2. Mewujudkan manajemen berstandar internasional dengan menjunjung tinggi etika bisnis dan semangat kebersamaan dan inovatif
3. Maningkatkan keunggulan bersaing di domestik dan internasional
4. Memberdayakan dan mensinergikan sumber daya yang dimiliki untuk meningkatkan nilai tambah secara berkesinambungan
5. Memberikan kontribusi dalam peningkatan kesejahteraan para pemangku kepentingan (stakeholders)

PT Semen Indonesia (Persero) Tbk.

KEBIJAKAN PERUSAHAAN

6. Mengelola dan mensinergikan seluruh kegiatan sehingga dapat memberikan nilai tambah bagi para pemangku kepentingan dengan;
   - Selalu menaati peraturan & perundang-undangan yang berlaku
   - **melakukan pengelolaan lingkungan yang lebih baik guna mengendalikan dampak lingkungan yang timbul, termasuk upaya penurunan emisi CO2 dan dampak pemanasan global; pengurangan pencemar udara; pengurangan & pemanfaatan limbah B3; pengurangan & pemanfaatan limbah non B3; konservasi air; perlindungan keanekaragaman hayati; efisiensi energi; upaya pencegahan kecelakaan kerja dan penyakit akibat kerja;**
   - melakukan pengujian menggunakan peralatan yang selalu terkalibrasi, metode pengujian yang standard serta didukung sumberdaya manusia yang kompeten dan bebas tekanan;
   - secara proaktif meningkatkan komitmen terhadap masyarakat sekitar.

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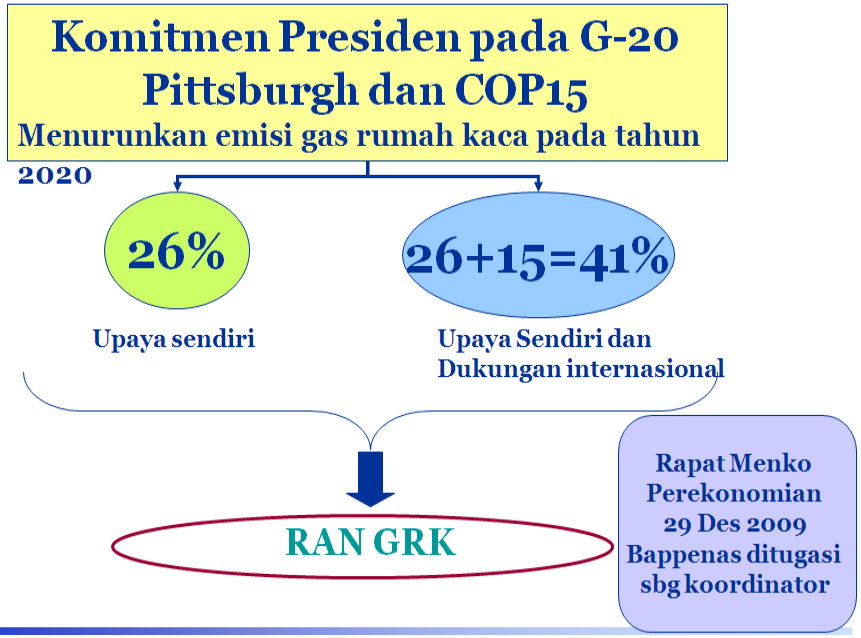
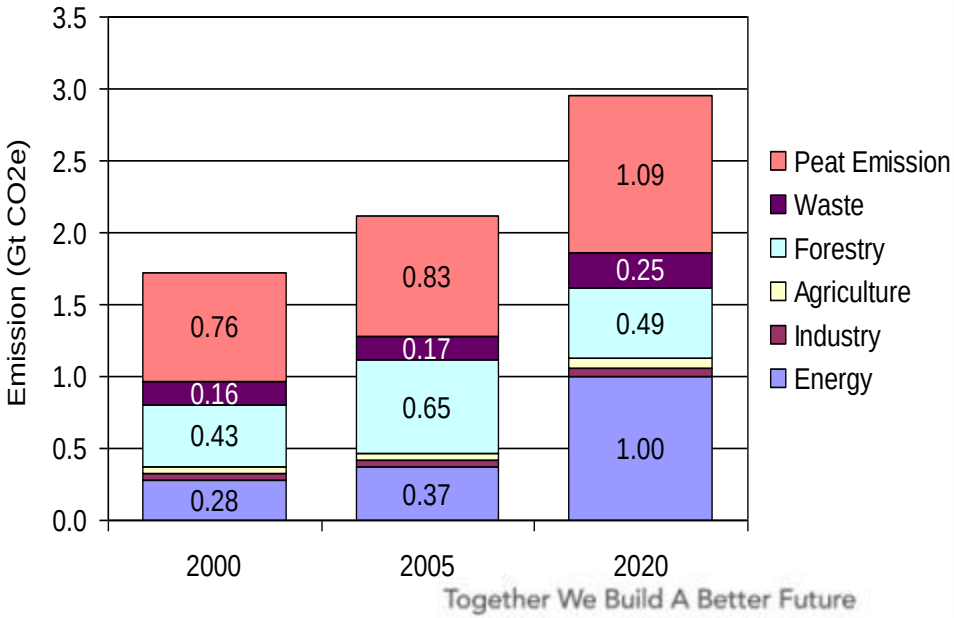
OBLIGATION AND EFFORT TO REDUCE CO2 EMISSION

- Komitmen Presiden RI G-20 Pittsburgh dan COP15 untuk menurunkan emisi gas rumah kaca sebesar 26%.
- Road Map dari Bapenas tentang penurunan emisi CO_2 untuk sektor industri.
- Peraturan Menteri Perindustrian Nomor 12/M-IND/PER/1/2012 Tahun 2012 tentang Peta Panduan (Road Map) Pengurangan Emisi CO_2 Industri Semen di Indonesia.





REFERENCE

Peraturan Menteri Perindustrian No. 12/M-IND/PER/1/2012 Tahun 2012 tentang Peta Panduan (Road Map) Pengurangan Emisi CO_2 Industri Semen di Indonesia

Pasal 1 ayat (4) :

(4) CO_2 spesifik adalah perhitungan jumlah **CO_2 yang dihasilkan per ton semen**

Pasal 4 :

Penurunan Emisi CO_2 spesifik dari **base line 2009**, adalah:

(a) Secara sukarela sebesar 2% untuk kurun waktu 2011-2015

(b) Secara wajib sebesar 3% untuk kurun waktu 2016-2020

ROAD MAP CO_2 EMISSION REDUCTION

PROGRAM PENURUNAN EMISI GAS CO_2

TUJUAN

Melakukan kegiatan penurunan emisi gas CO_2 dalam rangka menghambat laju pemanasan global

SASARAN

- Penurunan Gas Rumah Kaca CO_2 reduction (kg CO_2/ton semen)

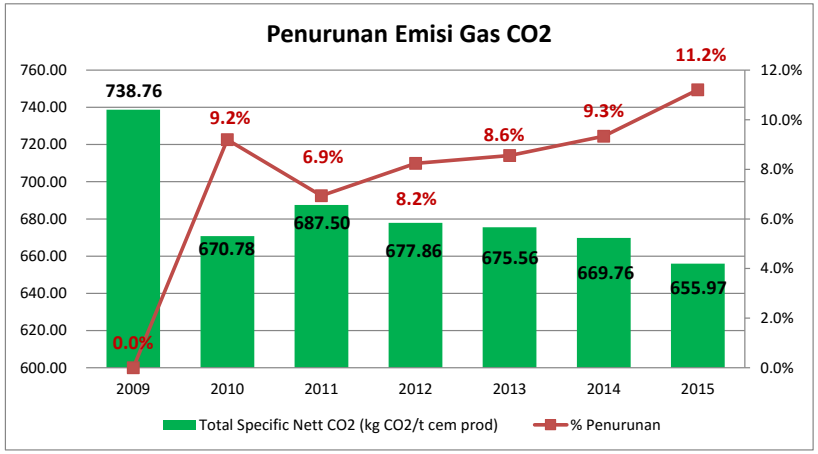
TARGET

Penurunan Emisi Gas CO2	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Indeks (kgCO2/ton semen)	745	720	705	690	680	675	668	660	655	650	645	640
% Penurunan	Baseline	-3.5%	-5.4%	-7.4%	-8.7%	-9.4%	-10.3%	-11.4%	-12.1%	-12.8%	-13.4%	-14.1%

KEBERHASILAN PROGRAM

URAIAN	SATUAN	2009	2010	2011	2012	2013	2014	2015
Clinker production	[t/yr]	7,665,606	6,660,966	7,617,213	9,540,037	10,446,515	10,217,517	7,748,277
Total cementitious products	[t/yr]	9,143,945	8,672,610	9,677,436	11,893,026	12,751,218	12,719,878	9,635,115
Direct CO2 Emissions								
CO2 from raw materials	[t CO2/yr]	4,183,158	3,634,921	4,156,750	5,206,044	5,627,916	5,480,251	4,155,854
CO2 from fossil-based kiln fuels	[t CO2/yr]	2,568,168	2,178,975	2,492,026	2,849,397	2,980,216	3,034,856	2,160,934
CO2 from equipment & on-site vehicles	[t CO2/yr]	3,861	4,155	4,455	6,322	6,113	4,198	3,528
Specific nett CO2 from calcination	[kg CO2/t cem prod]	**457**	**419**	**430**	**438**	**441**	**431**	**431**
Specific net CO2 from fuel	[kg CO2/t cem prod]	**281**	**252**	**258**	**240**	**234**	**239**	**225**
Total Specific Nett CO2	[kg CO2/t cem prod]	**739**	**671**	**687**	**678**	**676**	**670**	**656**
% Penurunan Emisi CO2	**%**	**Baseline**	**-9.2%**	**-6.9%**	**-8.2%**	**-8.6%**	**-9.3%**	**-11.2%**

TARGET AWAL PENURUNAN EMISI GAS C [kg CO2/t cem prod]	745	720	705	690	680	675	668



Perseroan telah berhasil menurunkan emisi gas CO2 sebesar 11,2 % di tahun 2015 (dengan baseline tahun 2009).

Keberhasilan penurunan ini telah melebihi target yang telah ditetapkan oleh Pemerintah.

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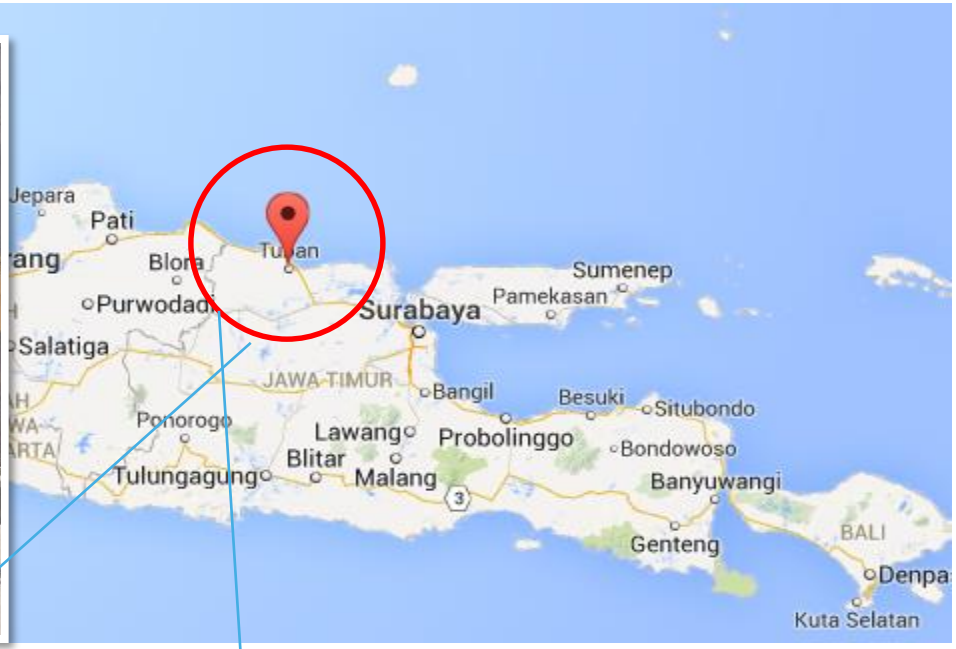
WHRPG PROJECT LOCATION



Location:

- PT Semen Indonesia (Persero) Tbk.
- Tuban Plant 1,2,3,4
- Desa Sumberarum,
- Kec. Kerek, Tuban,
- Jawa Timur, Indonesia 62356

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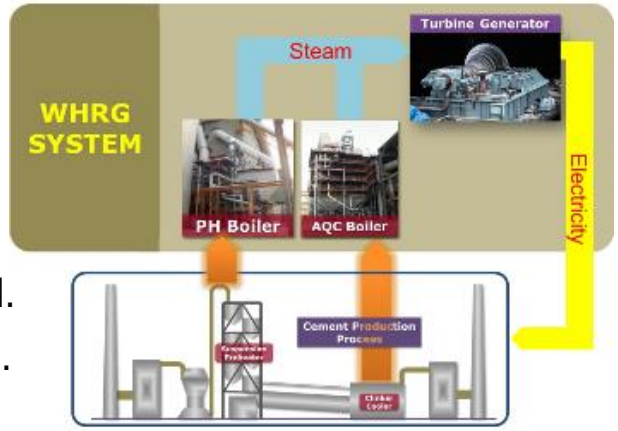
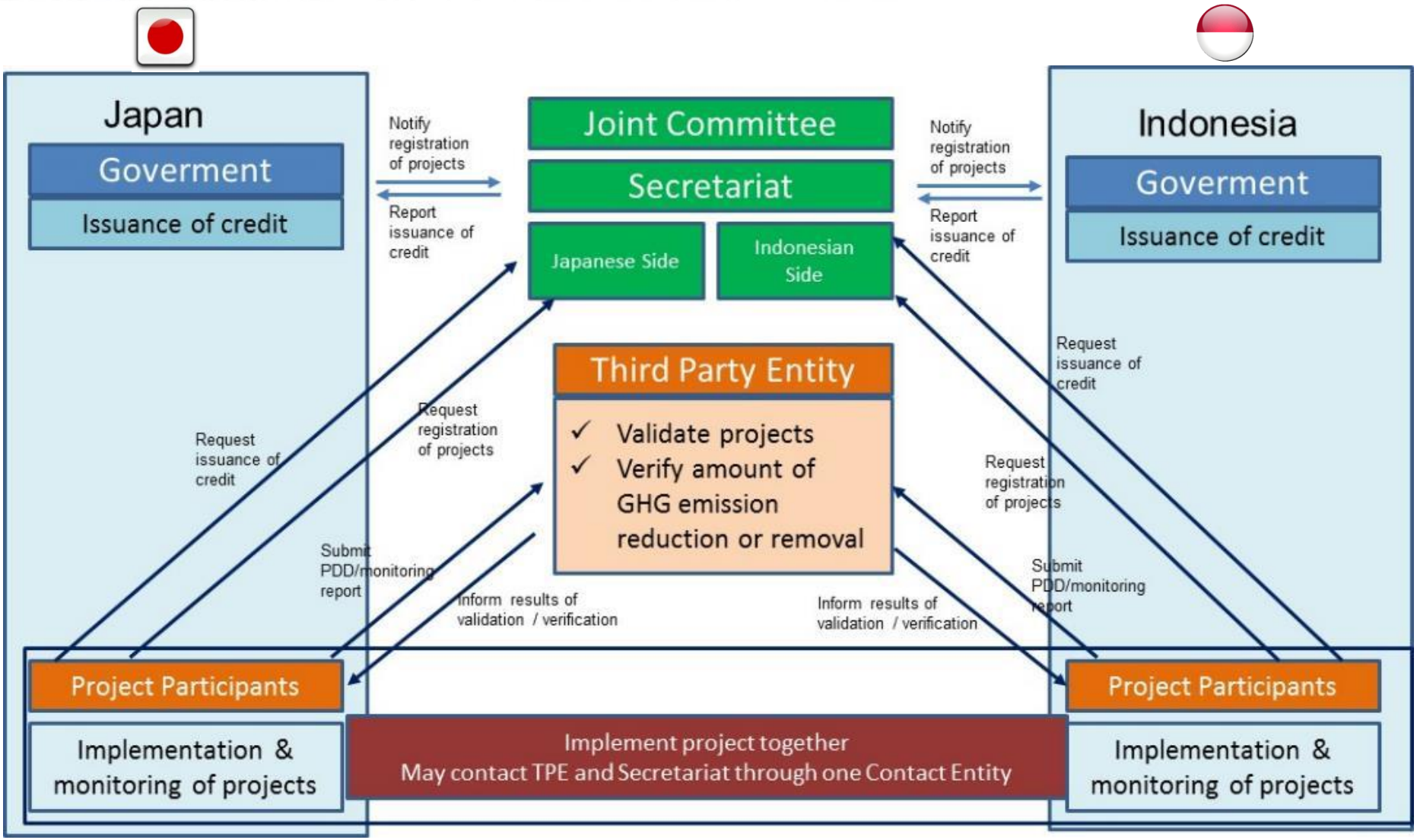
PROJECT BACKGROUND

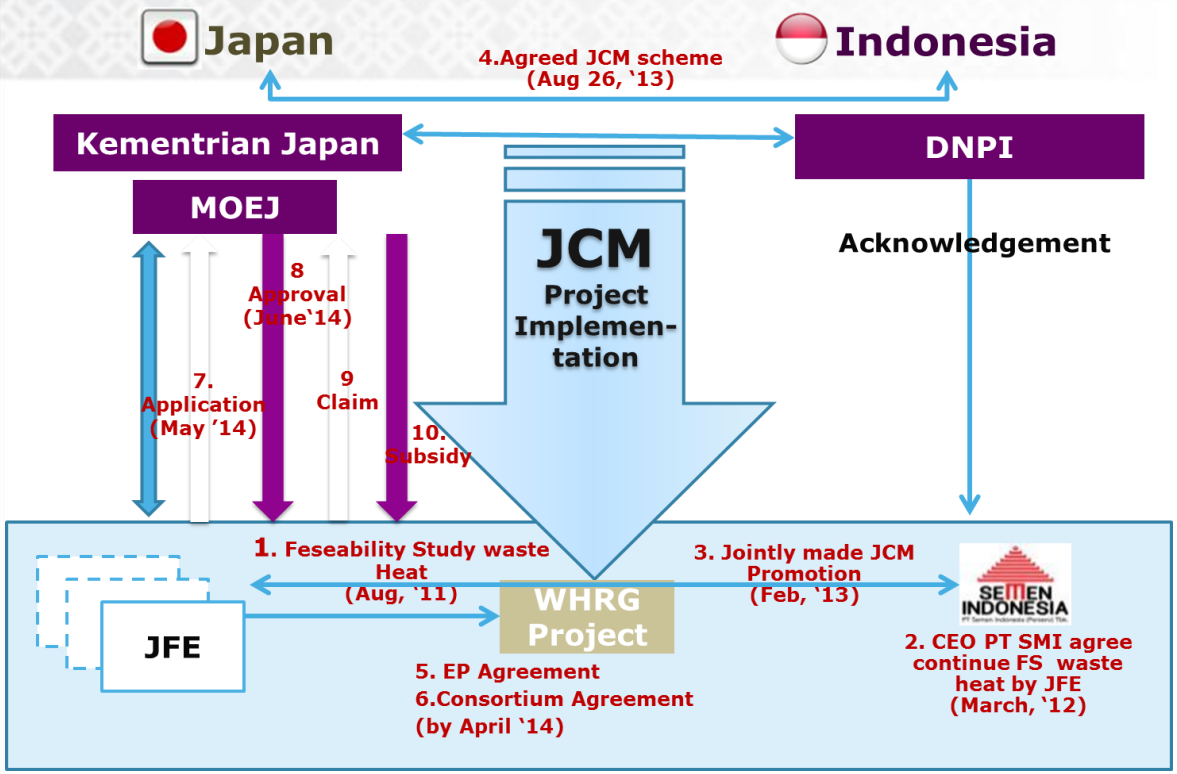


- **OBJECTIVE:**
  - ✓ In order to utilize the waste heat gases of exit Preheater and Cooler into electricity the output power capacity of 30.6 MW (Nominal); → 28.6 MW (max net) thus reducing network usage electricity supply from PLN grid.
  - ✓ Expectation of CO2 emission reduction by 122,358 ton/year.
- **Project is executed under JCM Scheme (CO2 reduction as to Kyoto Protocol)**
  - ✓ G to G (Indonesia-Japan) → Consortium Partner (EP Contract) between implementor and Partner (JFE Engineering – PT SMI)
- **Project Location:**
  - ✓ PT. Semen Indonesia (Persero) Tbk. Tuban Plant
  - ✓ Desa Sumberarum Kec. Kerek Kab. Tuban, Jawa Timur - Indonesia 62356
- **Main Purpose:**
  - ✓ Energy efficiency
  - ✓ CO2 emission reduction → Support goverment target RAN GRK (20% reduction by 2020)
  - ✓ Environmental friendly
- **Side Benefit:**
  - ✓ Produce electricity
  - ✓ Image and showing care, role and commitment of SOW Enterprise
  - ✓ Technology transfer

JCM Scheme on WHRPG Tuban Plant Project



PROJECT SCHEME (EP Contract) AND INVESTMENT COST



SMI	JFE
• All civil works (engineering and construction) • All local mechanical and elinst works (erection and construction) • Water treatment, • Dust conveying, • Project Management; • Commissioning, • MRV	• Main equipment (mechanical, elinst) engineering and supply; • Supervision;

		1 STG SYSTEM	Remarks
PRICE	Foreign	JPY 2.788 bil IDR 312.3 bil	Major Equipment Supply Portion (Boiler, Turbine Generator, Control System & Air Cooling System, etc
		IDR 4 bil	For erection and Commisioning
	Local	IDR 328.6 bil	Estimated Budget for local Mechanical & Electrical installation, Civil Buidling, Local fabrication, Dust Conveying, Water Treatment Plant
TOTAL		IDR 644.9 bil	Subsidy JPY 1,061,644,000 (IDR 118.9 bil)
Net investation = Rp 526M			

JCM MECHANISM HISTORY

1 **March 25. 2013,**
JFE - SMI Memorandum of Understanding (MoU) signed in JFE Tokyo Office, Japan

2 **Aug 26. 2013**
The Bilateral Document Signed by Indonesia and Japan

3 **October 23. 2013**
JFE-SMI has reached an agreement on "Strategic Collaboration Agreement "

4 **April 8. 2014,**
Joint Crediting Mechanism, Indonesia Joint Crediting Mechanism Secretariat in cooperation with Energy Nusantara has organized Joint Crediting Mechanism (JCM) Business Forum on Tuesday at Four Seasons Hotel, Kuningan, Jakarta

5 **21 April 2014,**
Coordinating Ministry for Economic Affairs of Indonesia (CMEA Indonesia) and Japan International Cooperation Agency (JICA) has signed the cooperation agreement document : Capacity Development Assistance for Low Carbon Development at Coordinating Ministry for Economic Affairs office, Lapangan Banteng, Central Jakarta. Beside several representatives from JICA and CMEA Indonesia, the signing event was attended by some related stakeholders such as Embassy of Japan for Indonesia and Indonesia Joint Crediting Mechanism Secretariat

6 **April 30. 2014,**
JFE-SMI Consortium Signed

7 **June 25. 2014,**
JCM Secretariat, Coordinating Ministry of Economic Affairs, and Ministry of Energy and Mineral Resources visit PT Semen Indonesia, which is located at Tuban, East Java. During the visit, discussion on the last status update of JCM projects in PT Semen Indonesia was conducted.

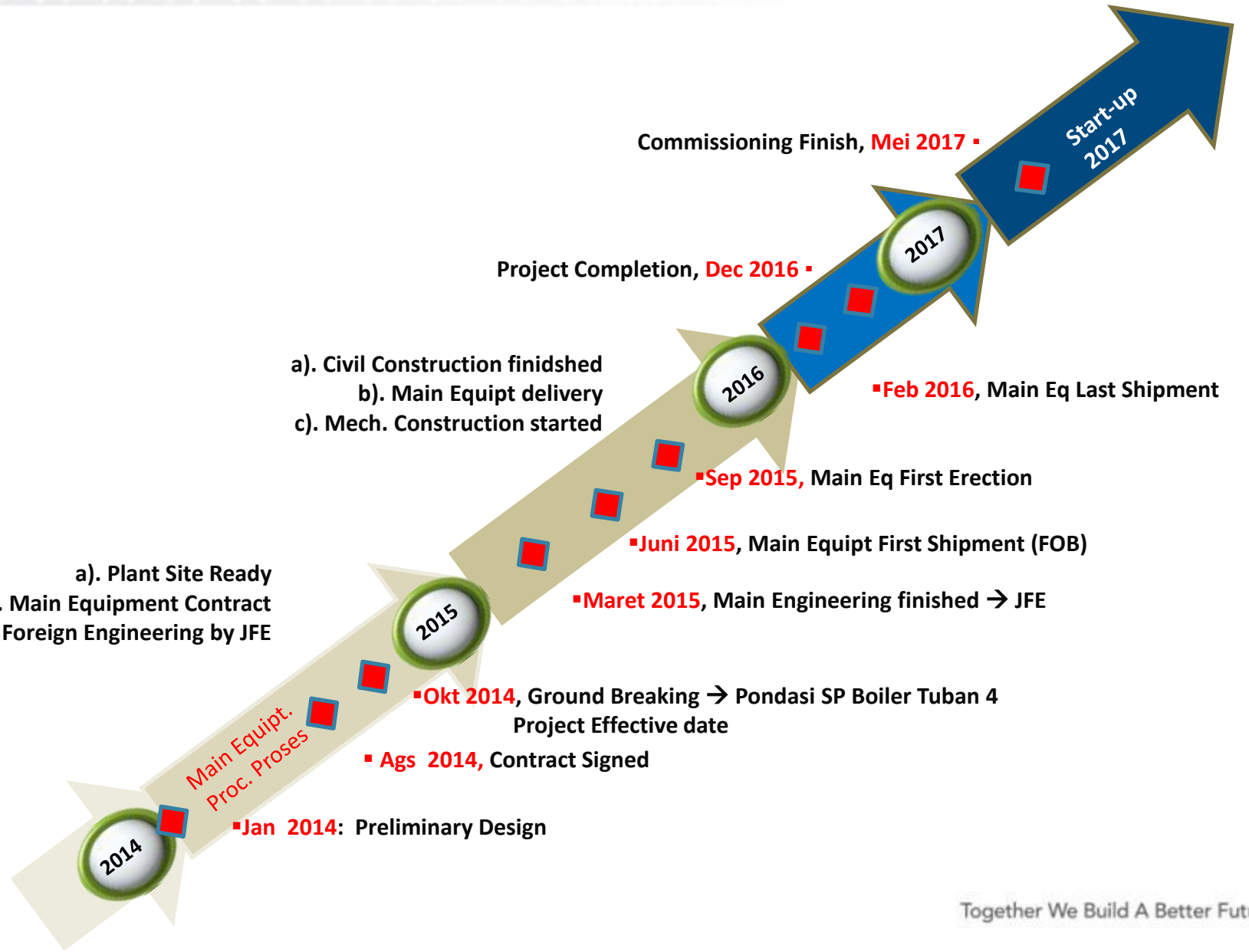
8 **July 15. 2014,**
SMI-JFE, EP Contract signed in Jakarta for (Waste Heat Recovery Power Generation / WHRPG) capacity 30,6 MW;

9 **October 22, 2014,**
Ground breaking WHRPG at Tuban Plant 4 x @ 2 Boiler per Kiln on 4 lines x 3 mio tpa Cement Plants per lines.

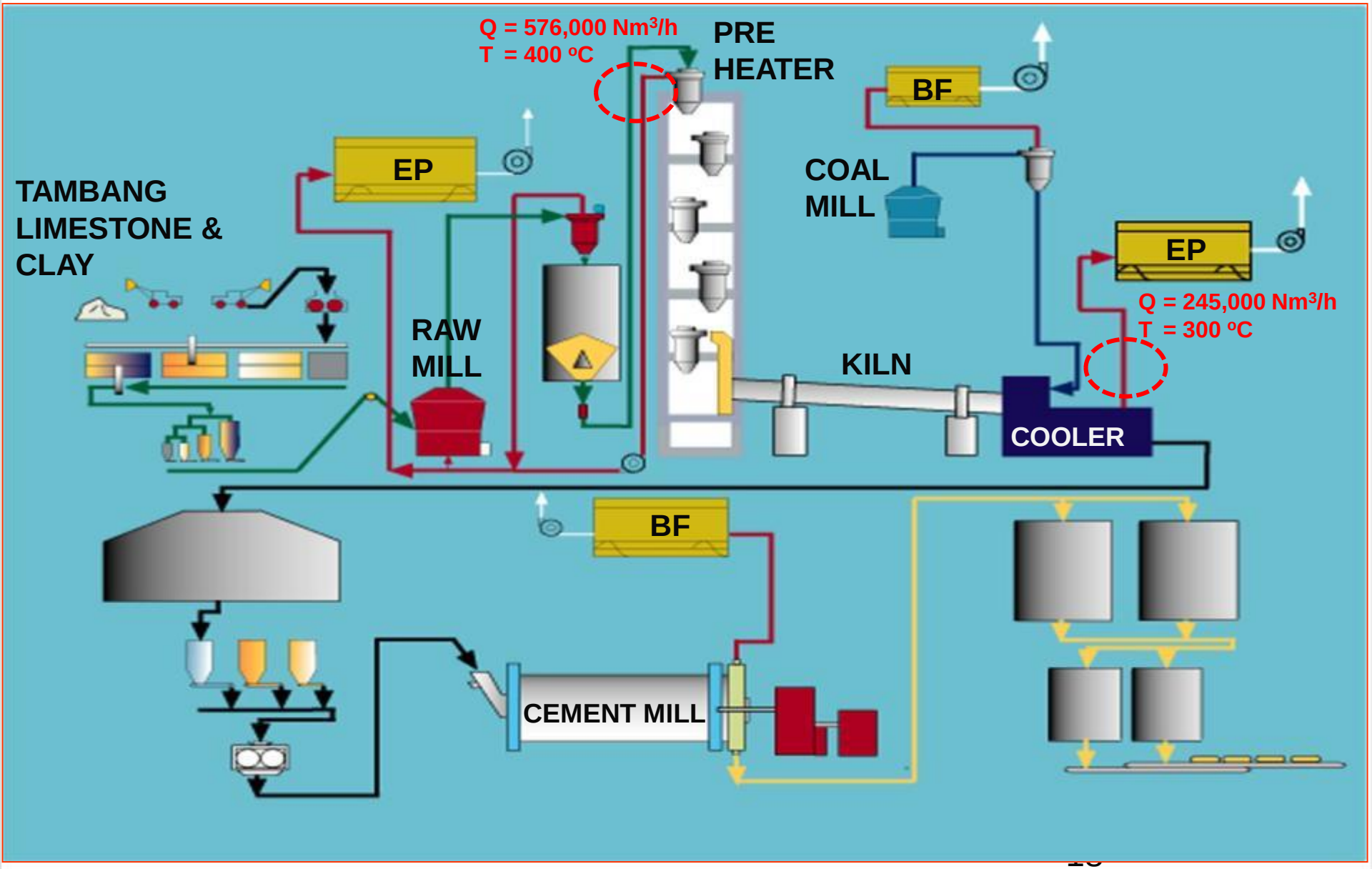
10 **October 22, 2014** - JCM Secretariat, Coordinating Ministry of Economic Affairs, and Ministry of Energy and Mineral Resources visit SMI for Project Hearing

11 **November 17, 2014**
EP Contract comes into force

Project Milestone



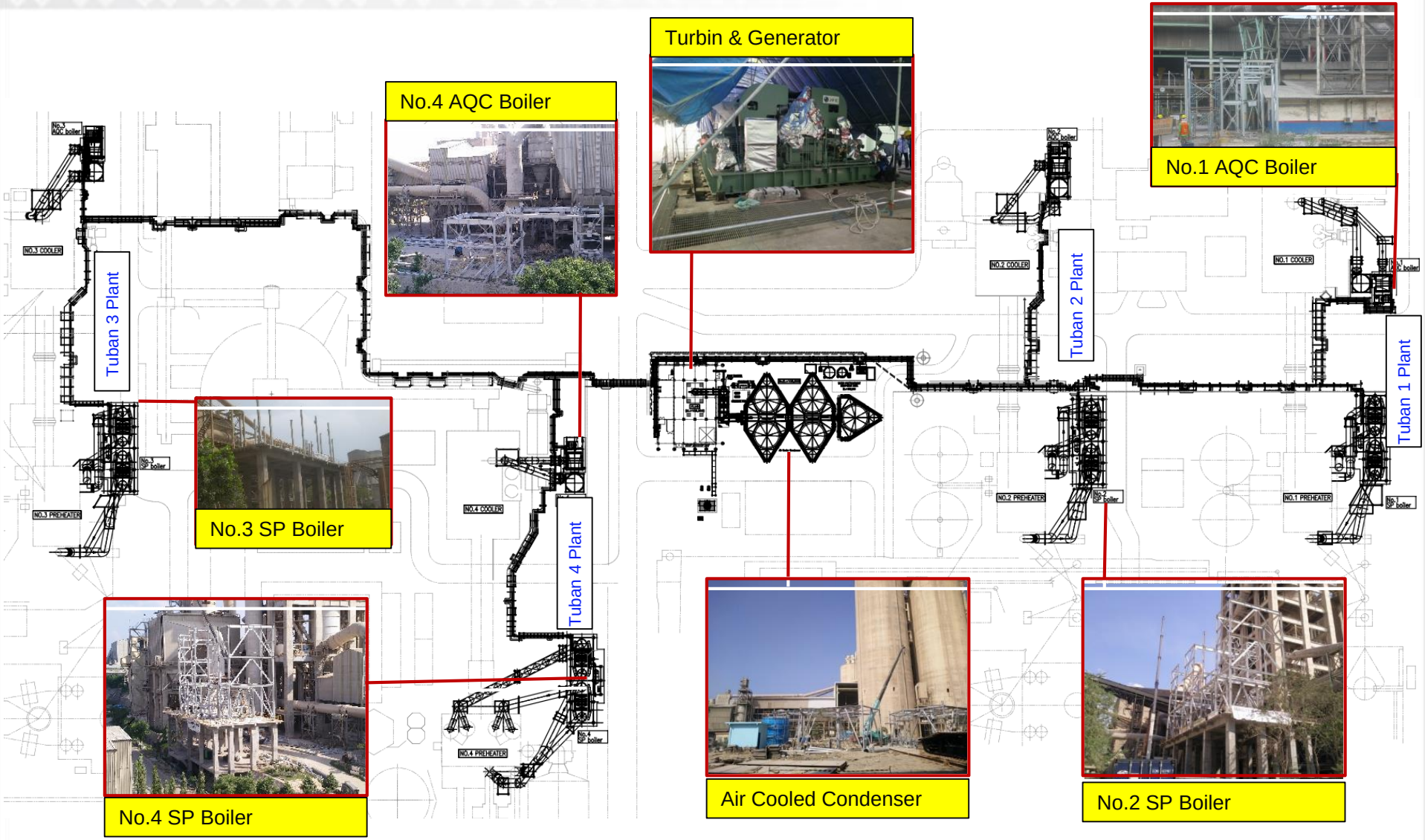
CEMENT PROCESS PRODUCTION



MAIN EQUIPTMENT to be installed

- **4 set PH Boiler**
- **4 set AQC Boiler**
- **1 set Condencing Steam Turbine & Auxiliary**
- **1 set Steam Turbine & Electric Generator**
- **1 set Cooling Water System & Auxiliary**

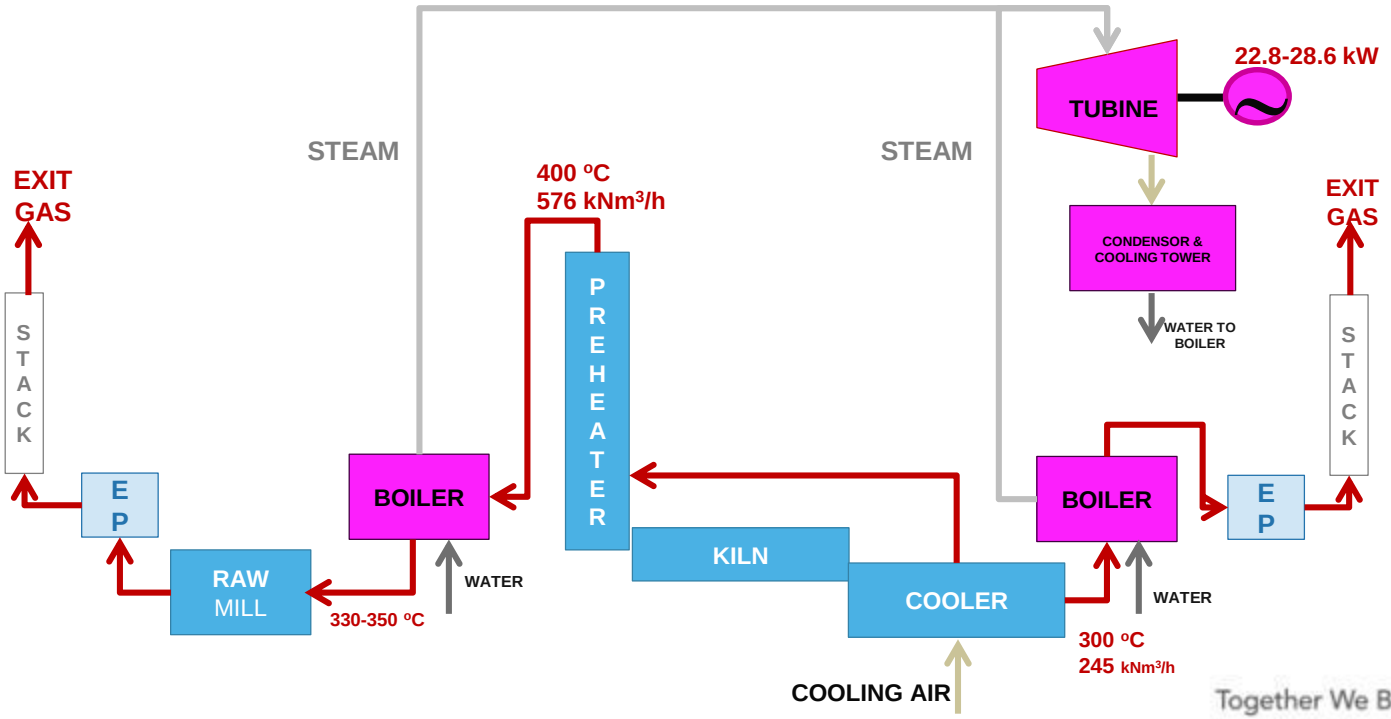
PROGRESS OVERVIEW



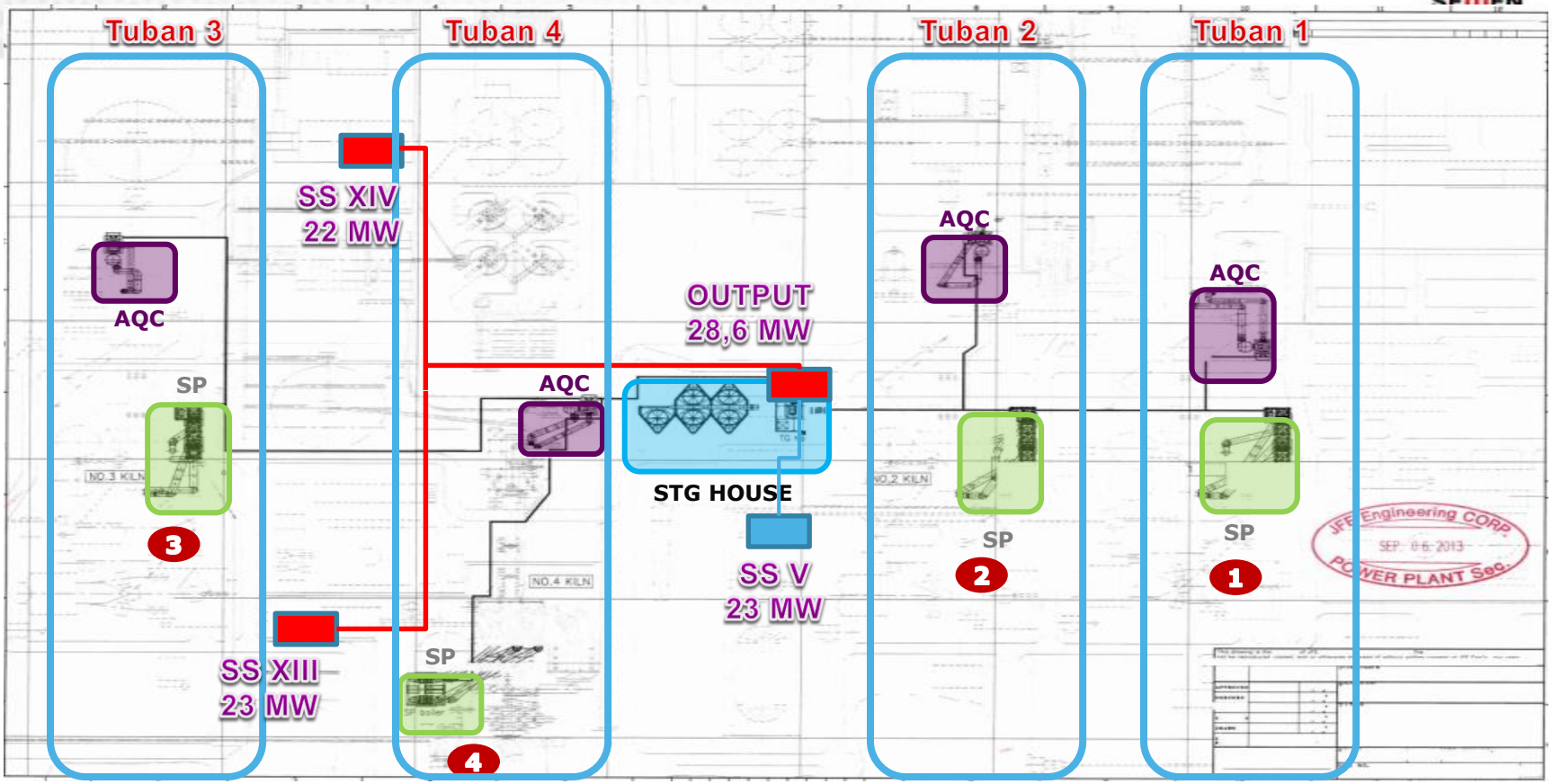
To

WASTE HEAT RECOVERY POWER GENERATION (CEMENT PLANT)

- Expected CO_2 emission reduction : 122,358 ton /year
- Low temperatur exit gas from stack
- Water consumption reduction for Conditioning Tower & Cooler water spray
- Corporate image
- Community benefit :
  - Jobs for construction
  - CSR alocation

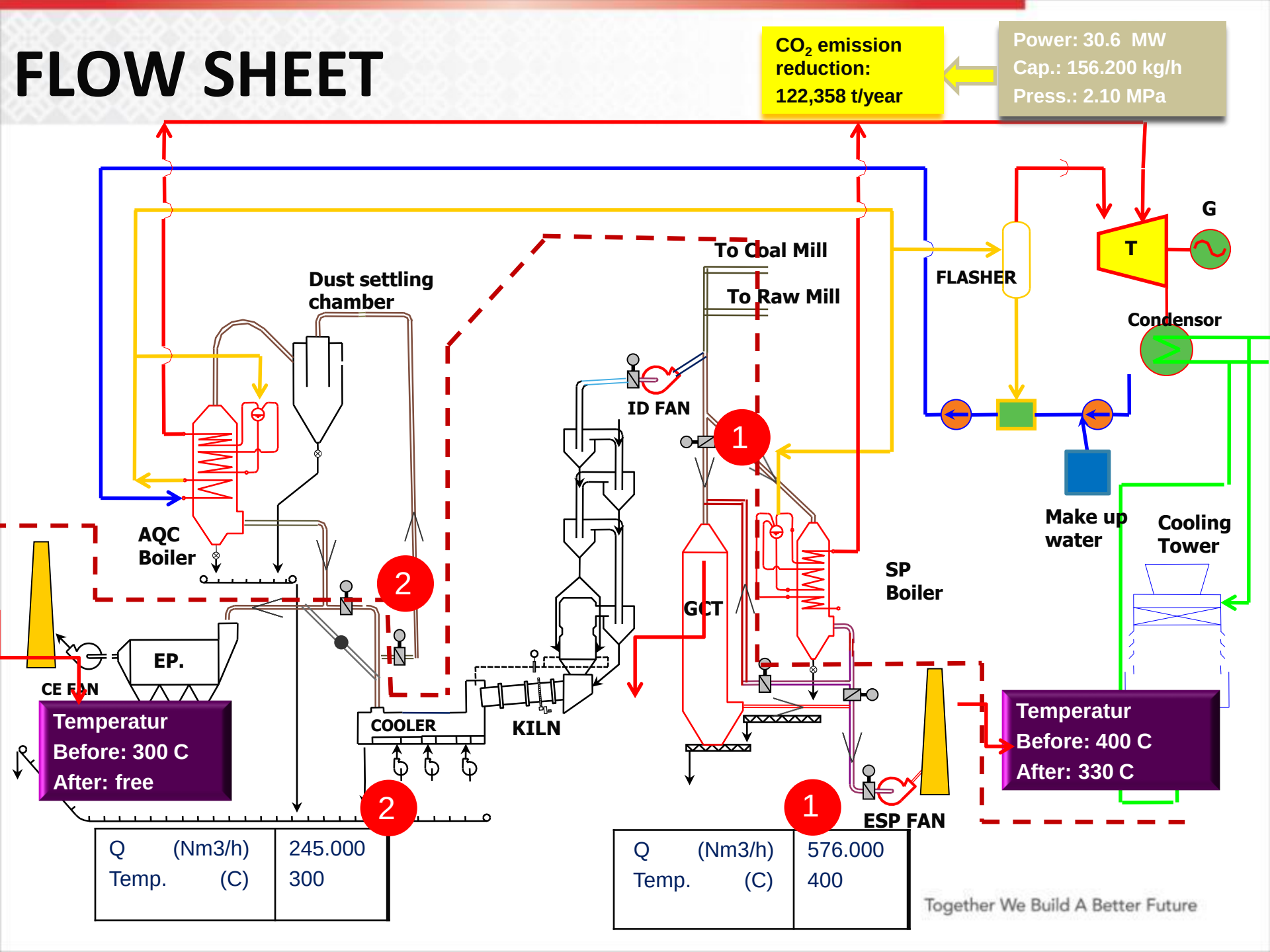


WHRPG PLANT LAYOUT POWER DISTRIBUTION



	Unit	PH	AQC	Remarks
Gas Condition	Nm³/h	576,000	245,000	▸ Per Boiler ▸ Per 1 Line
	deg-C (In)	400	300	
	deg-C (Out)	350 (Wet Season) 330 (Dry Season)	Free	
Power Output (4 lines)	Dry Season	30,600kW(Gross)		Note: One STG System
	Wet Season	22,800kW (Gross)		

FLOW SHEET


CO_2 emission reduction: 122,358 t/year
Power: 30.6 MW
Cap.: 156.200 kg/h
Press.: 2.10 MPa
G
T
FLASHER
Condensor
To Coal Mill
To Raw Mill
Dust settling chamber
ID FAN
1
AQC Boiler
2
Make up water
Cooling Tower
SP Boiler
GCT
EP.
CE FAN
COOLER
KILN
Temperatur
Before: 300 C
After: free
Temperatur
Before: 400 C
After: 330 C
2
1
ESP FAN
Q (Nm3/h) 245.000
Temp. (C) 300
Q (Nm3/h) 576.000
Temp. (C) 400
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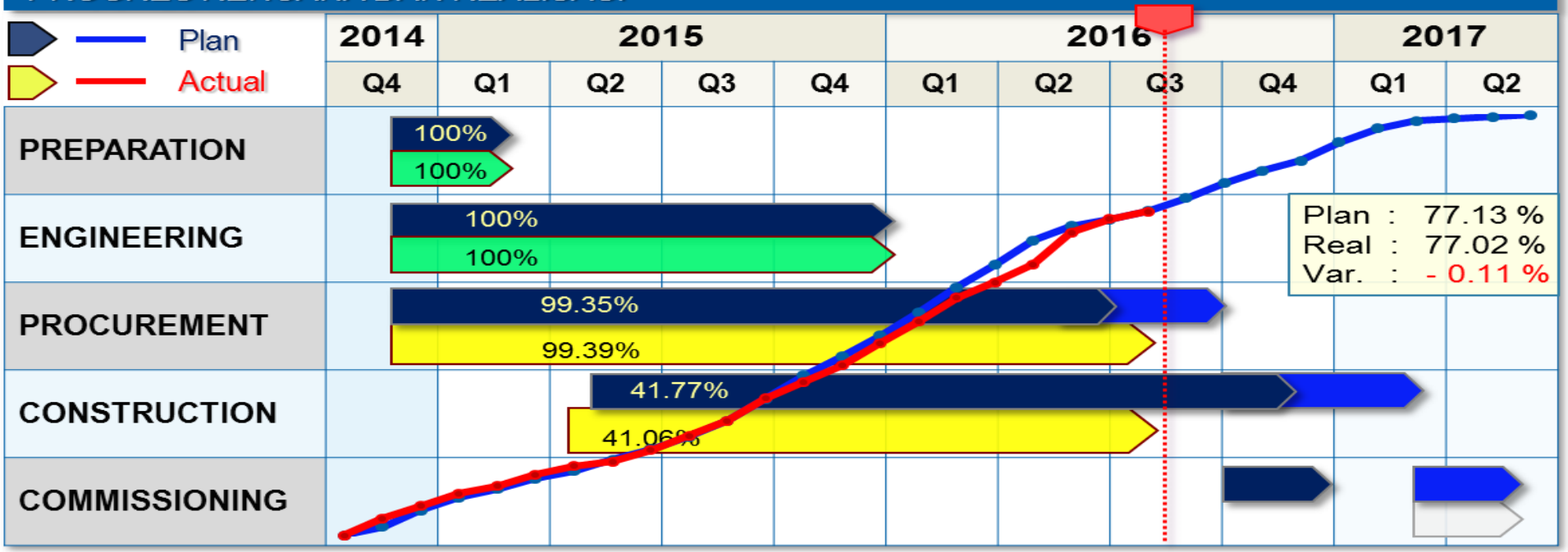
PROJECT PROGRESS (UP TO JULY 2016)

SEMEN INDONESIA

2014 — 2015 — 2016 — 2017

- Contract Sign - 07
- Effective Date -11
- Civil Started - 03
- Last Shipment - 02
- Mech. Started - 05
- Performance Test -05
- Project Completion - 02
- 30.6 MW

PROGRES RENCANA DAN REALISASI



Pembangunan Waste Heat Recovery Power Generation (WHRPG) :

- Memanfaatkan panas gas buang dari Pabrik Tuban 1,2,3,4,
- Menghasilkan listrik sebesar ±28.6 MW
- Mengurangi emisi gas CO_2 sebesar 122,358 ton/tahun.

PROGRES FISIK		
❑ Project duration : 31 Bulan		
❑ Schedule in progress : 21 Bulan		
❑ SPI : 0.988	❑ CPI : 1.004	
PV	EV	AC
395 M	396 M	396 M

DOKUMENTASI

TUBAN I

SP I

AQC I

TUBAN II

SP II

AQC II

DOKUMENTASI

TUBAN III

SP III

AQC III

TUBAN IV

SP IV

AQC IV

DOKUMENTASI

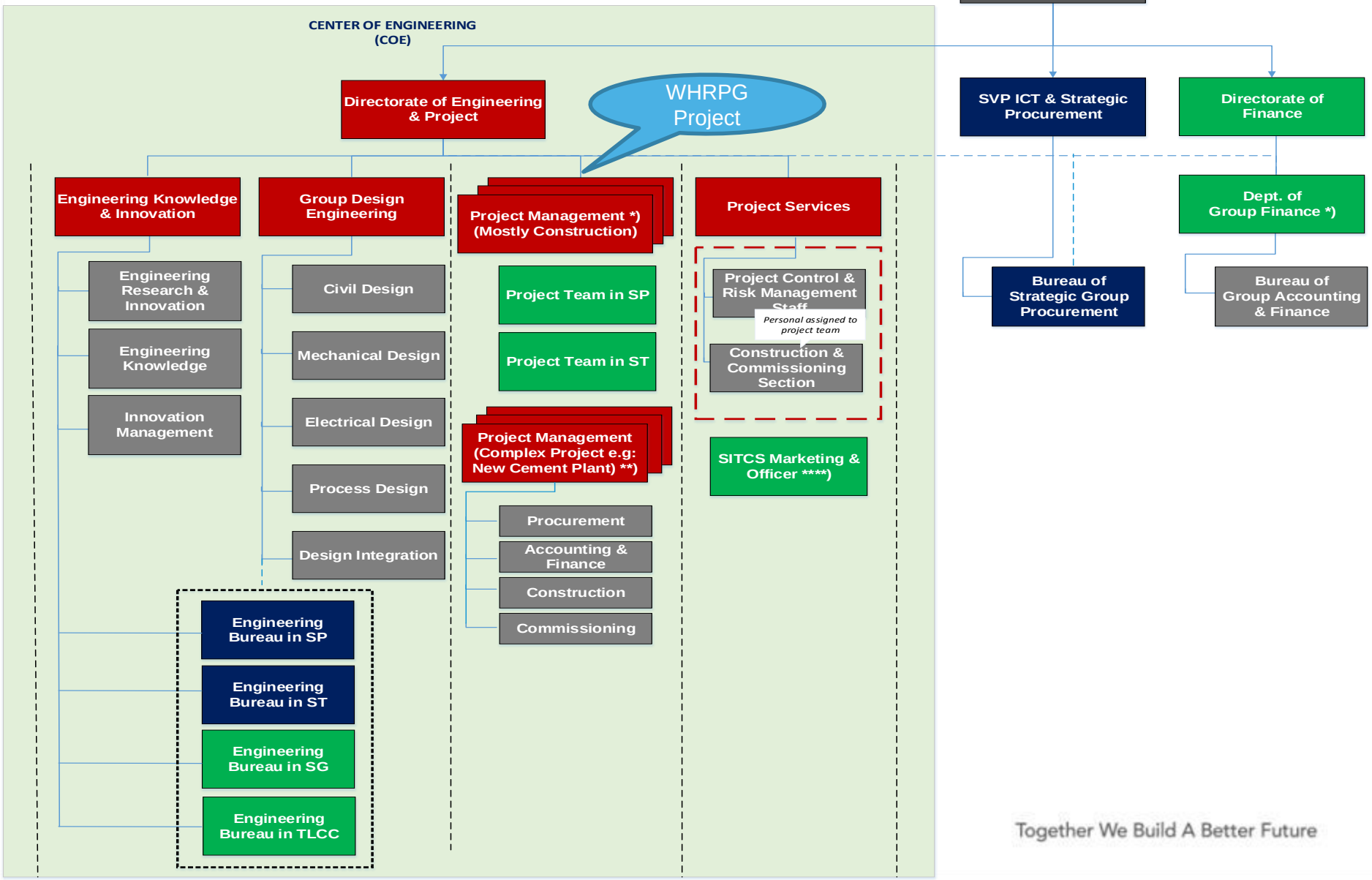
T/G HOUSE

Turbine Generator

Air Cooled Condensate

ORGANIZATIONAL STRUCTURE

Agar aktifitas dapat dieksekusi dan diimplementasikan dengan baik, dibentuk Tim Project



Need Supports (Discussion)

No.	Issues	Impact to eliminate	Need support from JCM
1.	Amount of subsidy could be reduced. Real amount of subsidy is obtained by reducing invoice of Main Equipmentsinvoice (as much as ¥ 1,007,258,000 still provisional), depend on project completion in accordance with the schedule approved by the Government of Japan	Subsidy reduction or cancellation due to project delay	Request to GEC and Government of Japan to fix the subsidy with no reason related to the delay of equipment installation. Alignment of tie-in schedule with annual shutdown of existing plants can not be avoided as SMI priority is plant operation continuity.
2.	MRV Scheme, Vendor List, Budget, etc	As this MRV will be lasted for 9 years, sharing cost between parties (consortium) should be considered	Balance of cost; SMI has not budgeted the MRV cost for this project
3.	Operation and Maintenance Training for SMI Staff	SMI has the risk (lacking of knowledge and experience) regarding the Boiler, Turbine and Generator O & M. These are new equipment for SMI (Tuban Plant)	Training provider with limited cost or training provided by JFEE
4.	Syncronize issue of electricity from WHRPG to PLN (grid). PLN has a regulation that obligates SMI (paraller power), or party that produce electricity to be charged due to synchronization to PLN grid	Minimum benefit for SMI and will discourage participant to run the similar project	JCM provide or bridge discussion with PLN → as this JCM WHRPG Project model is not merely to produce electricity to get profit. Electricity synchronisation can not be avoided in order obtain the optimum project purpose. Synchronisation cost paid to PLN will be unfavorable for SMI


TERIMA KASIH