



Operation and Maintenance of XESET 1 & XESET 2 Hydropower Plants



Presented by:

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Outline

1. Background, Capacity, and Clients of XESET 1&2 Hydropower Plants
2. Location Maps of XESET 1-2
3. EDL Generation Public Company
4. Structure of XESET 1 - 2 Hydropower Plants
5. Maintenance
6. Generator Monitoring



1. Background, Capacity, and Clients of XESET 1&2

- ❑ Xeset 1 and 2 Hydropower Plants are owned by Electricite du Laos (EDL) and now by EDL GEN

Following are the brief of XESET 1 and 2.

XESET 1 Hydropower Plant

Location	Xeset River, Saravan Province, Laos
Operation Date	01/11/1990
Contractor	ADB and Venene Thai & Italy
Install Capacity	45 MW
Average Annual Energy	180 GWh/year
Turbines	3x13 MW Francis 2x3 MW Francis
Project Type	Run-of-River
Catchment Area	325 Km2
Reservoir Area	10 ha
Clients/Consumers	

XESET 2 Hydropower Plant

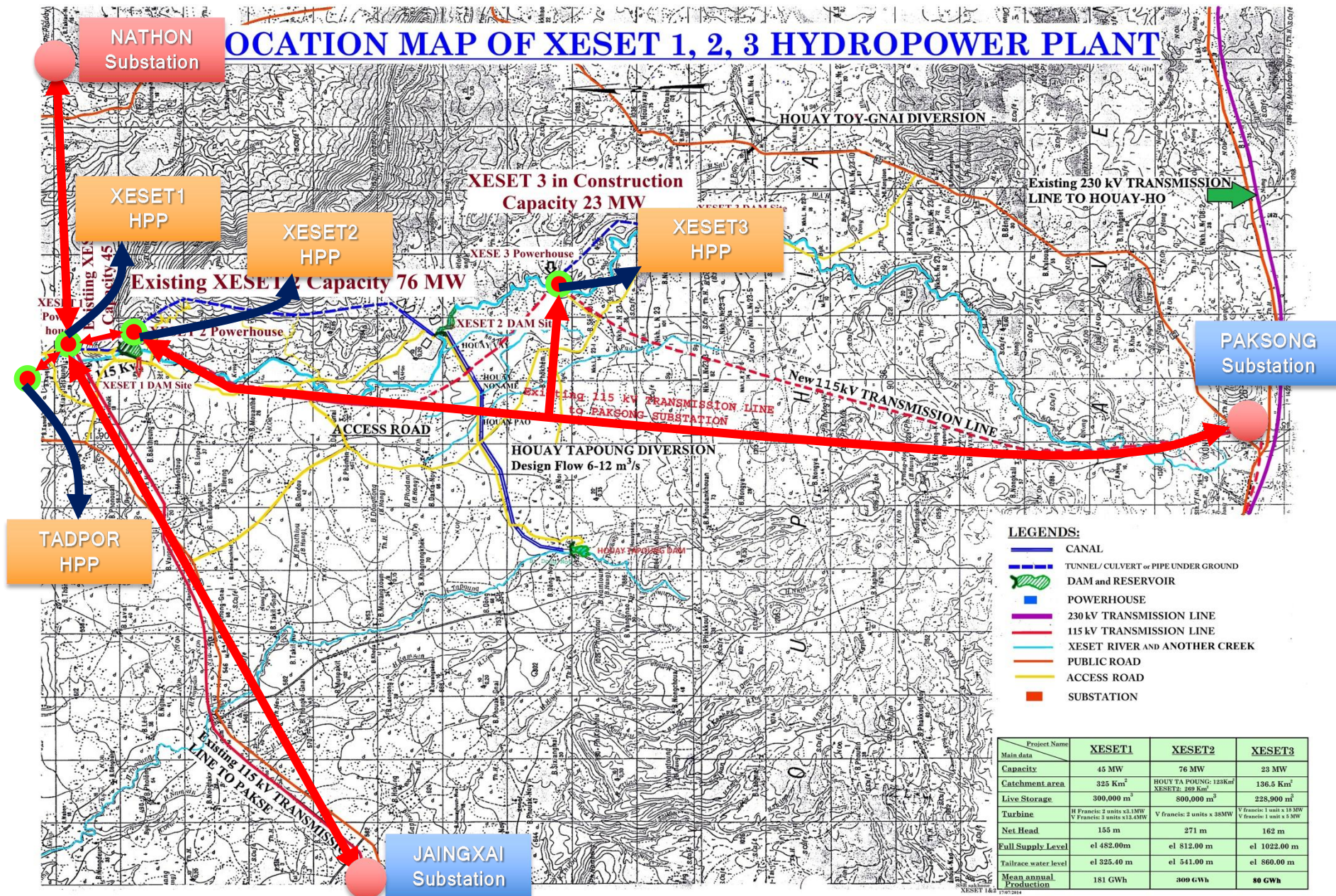
Location	Xeset River, Saravan Province, Laos
Operation Date	09/09/2009
Contractor	Main: NORINCO ...
Install Capacity	76 MW
Average Annual Energy	309 GWh/year
Turbines	2 x 38 MW Francis ...
Project Type	Run-of-River
Catchment Area	391.5 Km2
Reservoir Area	20 ha
Clients/Consumers	

2. Location Maps of Xeset 1&2

Xeset 1&2 Hydropower Plans are located in Saravan, a southern province of the Lao PDR



LOCATION MAP OF XESET 1, 2, 3 HYDROPOWER PLANT



Project Name	XESET1	XESET2	XESET3
Main data			
Capacity	45 MW	76 MW	23 MW
Catchment area	325 Km²	HOUAY TAPOUNG: 123Km² XESET2: 255 Km²	136.5 Km²
Live Storage	300,000 m³	800,000 m³	228,900 m³
Turbine	H Francis: 2 units x 1.3MW V Francis: 3 units x 13.14MW	V Francis: 2 units x 385MW	V Francis: 1 unit x 19.5MW V Francis: 1 unit x 5.5MW
Net Head	155 m	271 m	162 m
Full Supply Level	el 482.00m	el 812.00 m	el 1022.00 m
Tailrace water level	el 325.40 m	el 541.00 m	el 860.00 m
Mean annual Production	181 GWh	309 GWh	80 GWh

3. EDL-Generation Public Company



Location: Lao-Thai Friendship Road, P.O. Box 2392,
Thongkang Village, Sisattanak District.
Vientiane Capital. Lao PDR

Tel: **+856 21 316142**. Fax: **+856 21 316141**

Email: edlgenhq@edlgen.com.la.

Website: www.edlgen.com.la



Nam ngum 1 HPP 155 MW



Nam Leuk HPP 60 MW



Nam Mang 3 HPP 40 MW



Xeset 1 HPP 45 MW



Xeset 2 HPP 76 MW



Nam song HPP 6 MW



Nam Khan HPP 130 MW



Huoy lam pan yai
HPP 88 MW



Nam Sana HPP 14 MW



Xelabum 3HPP 5 MW



Theun hinboun HPP
60% (500 MW)



Nam Ngum 2 HPP
25% (615 MW)



Houy Ho HPP
20% (150 MW)



Nam Ngum 5 HPP
15% (120 MW)



Nam Lik 1-2 HPP
10% (100 MW)

- Transferred asset of
10 Hydropower plant from EDL.
- Total Capacity : 619 MW

- Purchased shares of
5 IPPs from EDL.
- The Capacity of
5 IPPs: 512 MW

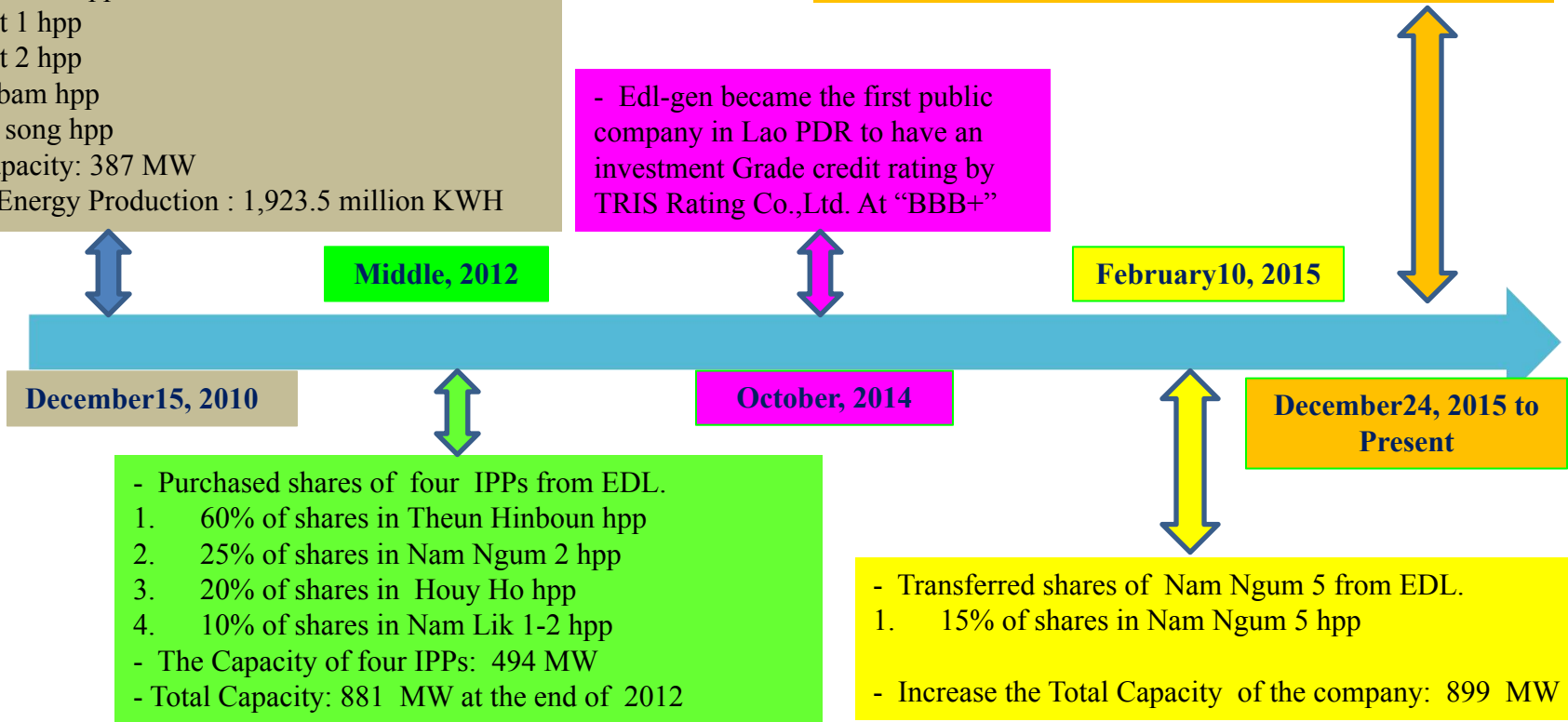
The Total Capacity of the
company: 1,131 MW

3. EDL-Generation Public Company (Cont'd.)

- Edl-Generation was established.
- Edl transferred all assets of Electricity production part of EDL to EDL-Gen:
 1. Nam Ngeum 1 hpp
 2. Nam mang 3 hpp
 3. Nam Leuk hpp
 4. Xeset 1 hpp
 5. Xeset 2 hpp
 6. Xelabam hpp
 7. Nam song hpp
- Total Capacity: 387 MW
- Annual Energy Production : 1,923.5 million KWH

- Transferred asset of 3 Hydropower plant from EDL.
 1. Nam Khan 2 hpp 130 MW
 2. Houay lamphan yai hpp 88 MW
 3. Nam sana hpp 14 MW
- Increase the Total Capacity of the company: 1,131 MW

- Edl-gen became the first public company in Lao PDR to have an investment Grade credit rating by TRIS Rating Co.,Ltd. At “BBB+”



5. Structure of XESET1 and XESET2 HPP

- XESET1 Hydropower Plant has been starting Construction in October 1988 and finishing in 1991, Total cost of Project is 45 million US dollar.
- The project is a RUN-of-River scheme, the total installation capacity is 45 MW, Annual Energy Production is 180Gwh/Year, The total Energy Supply to 4 Province's Southern of Laos and surplus sell to nearby countries.



- XESET2 Hydropower Plant has been starting Construction in 2005 and finishing in 2009, Total cost of project is 135.5 million US dollar.
- The project is a RUN-of-River scheme, the total installation capacity is 76 MW. Annual Energy Production is 309Gwh/year. Total Energy Supply to Nation Transmission Line.

- Total =121 MW
- Energy Production: 489Gwh/Year

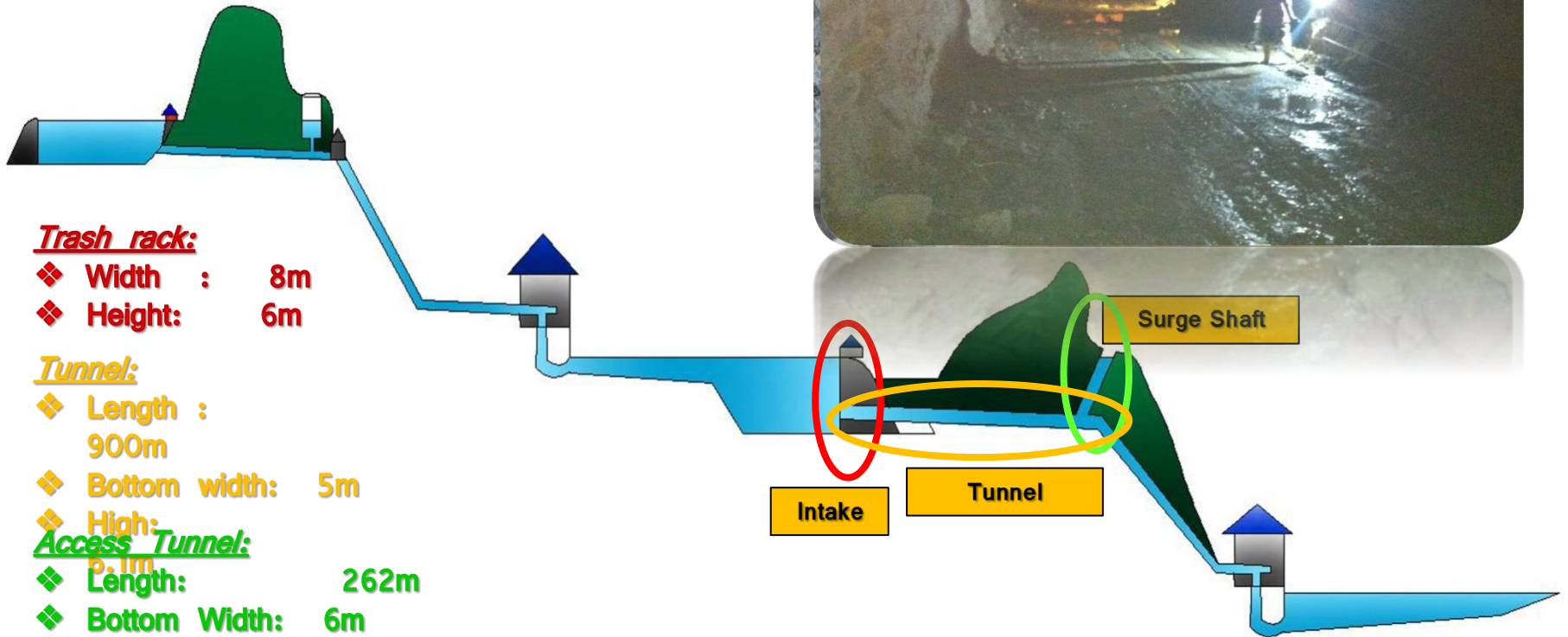
Radials Gate
4 x 6 m

Flap Gate
2x4m

Sand Flushing Gate
1 x 1.5m

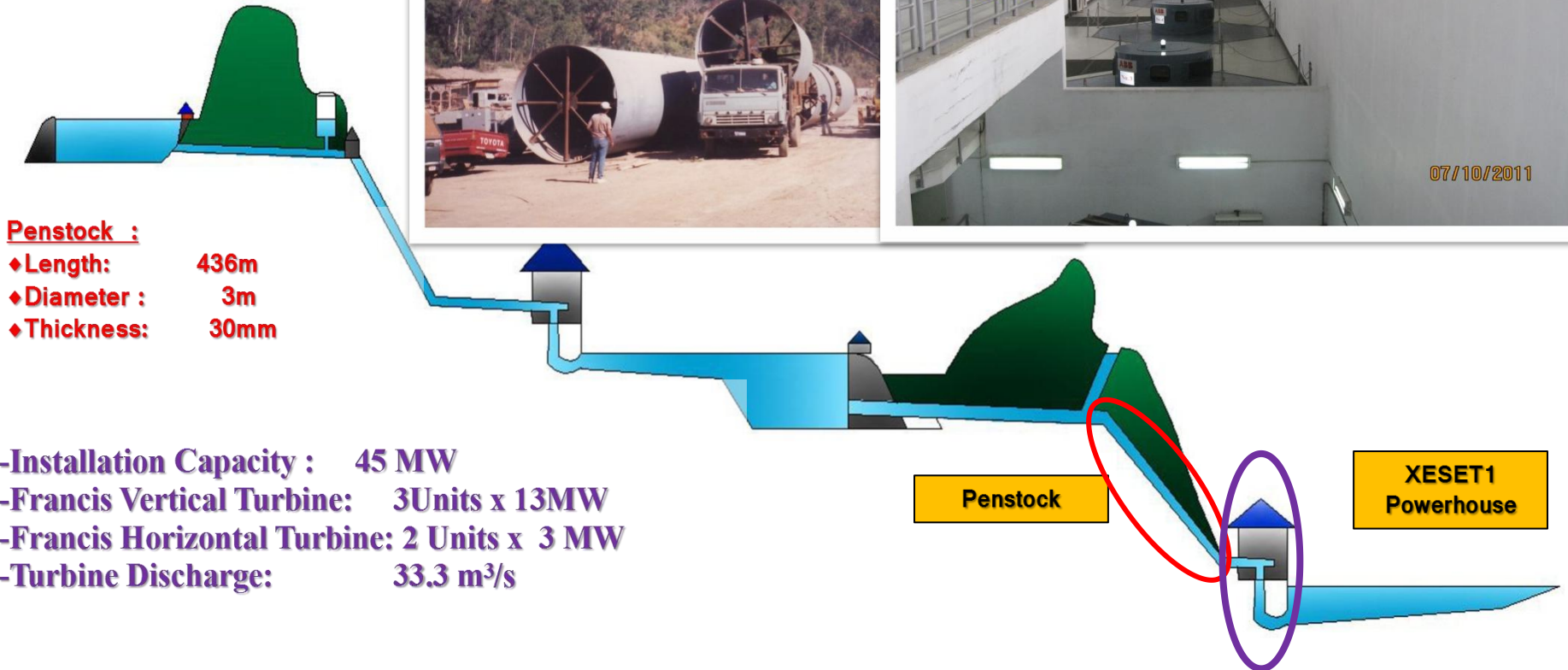


Intake, Tunnel and Surge shaft XESET1



Penstock and Powerhouse

XESET1



Penstock :

- ◆ Length: 436m
- ◆ Diameter : 3m
- ◆ Thickness: 30mm

- Installation Capacity : 45 MW
- Francis Vertical Turbine: 3Units x 13MW
- Francis Horizontal Turbine: 2 Units x 3 MW
- Turbine Discharge: 33.3 m³/s



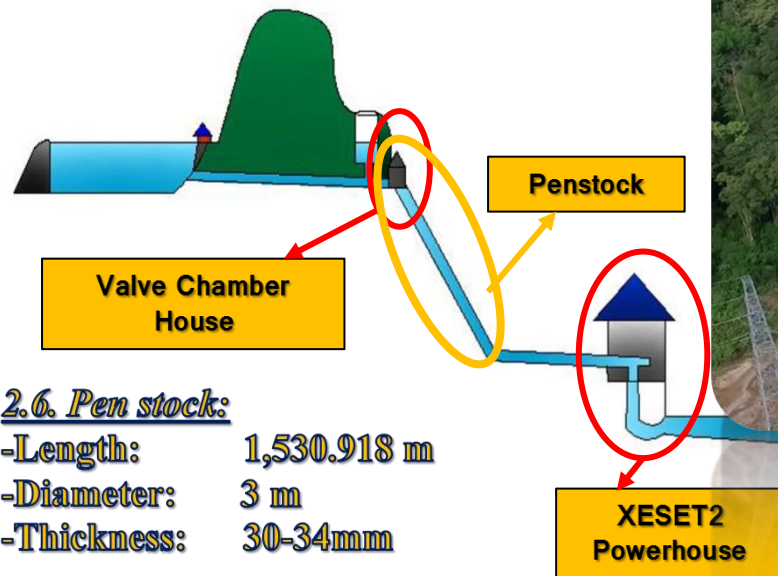
Sluice Gate 2 channel

6m x 4m

Intake, Tunnel and Surge shaft XESET2



Valve Chamber, Penstock and Powerhouse XESET2



2.6. Pen stock:

- Length: 1,530.918 m
- Diameter: 3 m
- Thickness: 30-34mm

- Installation Capacity: 76MW
- Francis Turbine: 2 Sets x 38 MW
- Turbine Discharge: 33.74 m³/s



HOUYTAPOUNG Diversion Dam



Diversion Canal

Open canal:

- Length: 9,6 km.
- Bottom width: 2 m
- Max design discharge : $12 \text{ m}^3/\text{s}$



6. Maintenance & Monitoring



Maintenance Group (Electrical, Mechanical and Civil)

Maintenance Method

Preventive (Routine) Maintenance

Daily, Weekly, Monthly and Yearly Inspection

1. Visual Inspection (Condition of Equipment)
2. Test, Measure and Record parameters for comparing to Reference value.
3. Cleaning dirty location
4. Check Function of equipment

Corrective Maintenance

1. **Equipment Failure (Emergency case)**
2. **Equipment Failure (found by Preventive inspection)**
3. **Overhaul (Life Span of Equipment)**

Yearly Maintenance

Unit	Date						Respond
	11/2015	12/2015	1/2016	2/2016	3/2016	4/2016	
Xeset 1							EDL-Gen
1	↔						
2		↔					
3		↔					
4			↔				
5				↔			
Xeset 2							EDL-Gen
6					↔		
7						↔	

7. Generator Monitoring

Air gap monitoring

5/5/2016

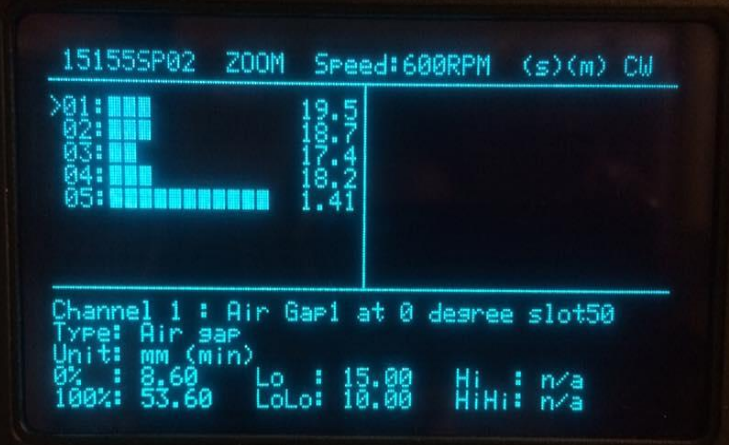


Unit 3



Generator Monitoring

Unit 4



Unit 5



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Channel 1 : Air Gap1 at 0 degree slot50
Type: Air gap
Unit: mm (min)
0%: 8.60 Lo : 15.00 Hi : n/a
100%: 53.60 LoLo: 10.00 HiHi: n/a
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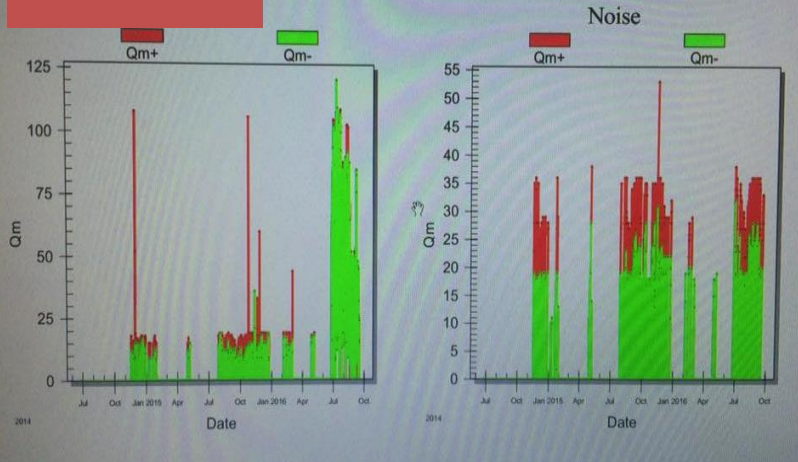
Generator Monitoring

Partial discharge monitoring 11/2014

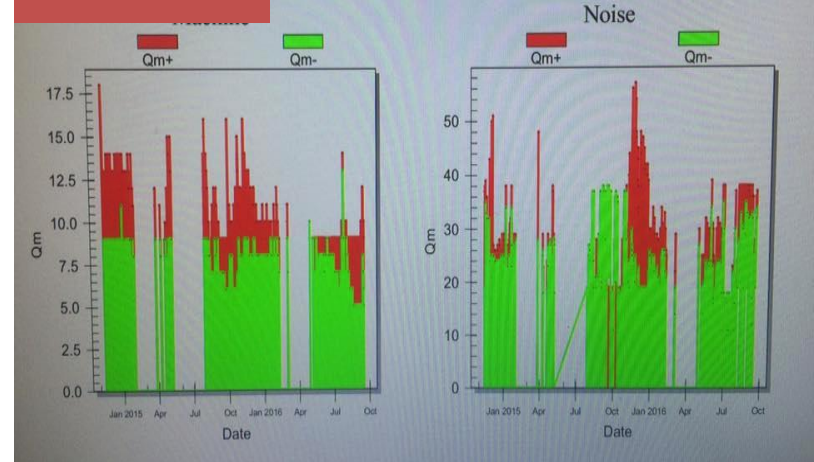


Generator Monitoring

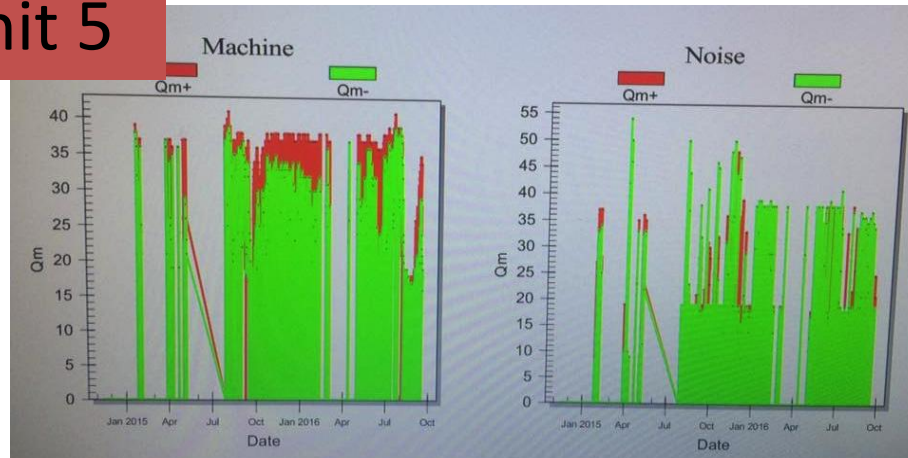
Unit 3



Unit 4



Unit 5



Overhaul

Turbine



Generator



Overhaul

Control System Unit 1, 2, 3, 4 & 5
Siemen S7-400



Overhaul

Excitation Control System

Gx 300P



Unit 1 & 2



Unitrol 1020



Unit 3, 4 & 5



Unitrol 6080

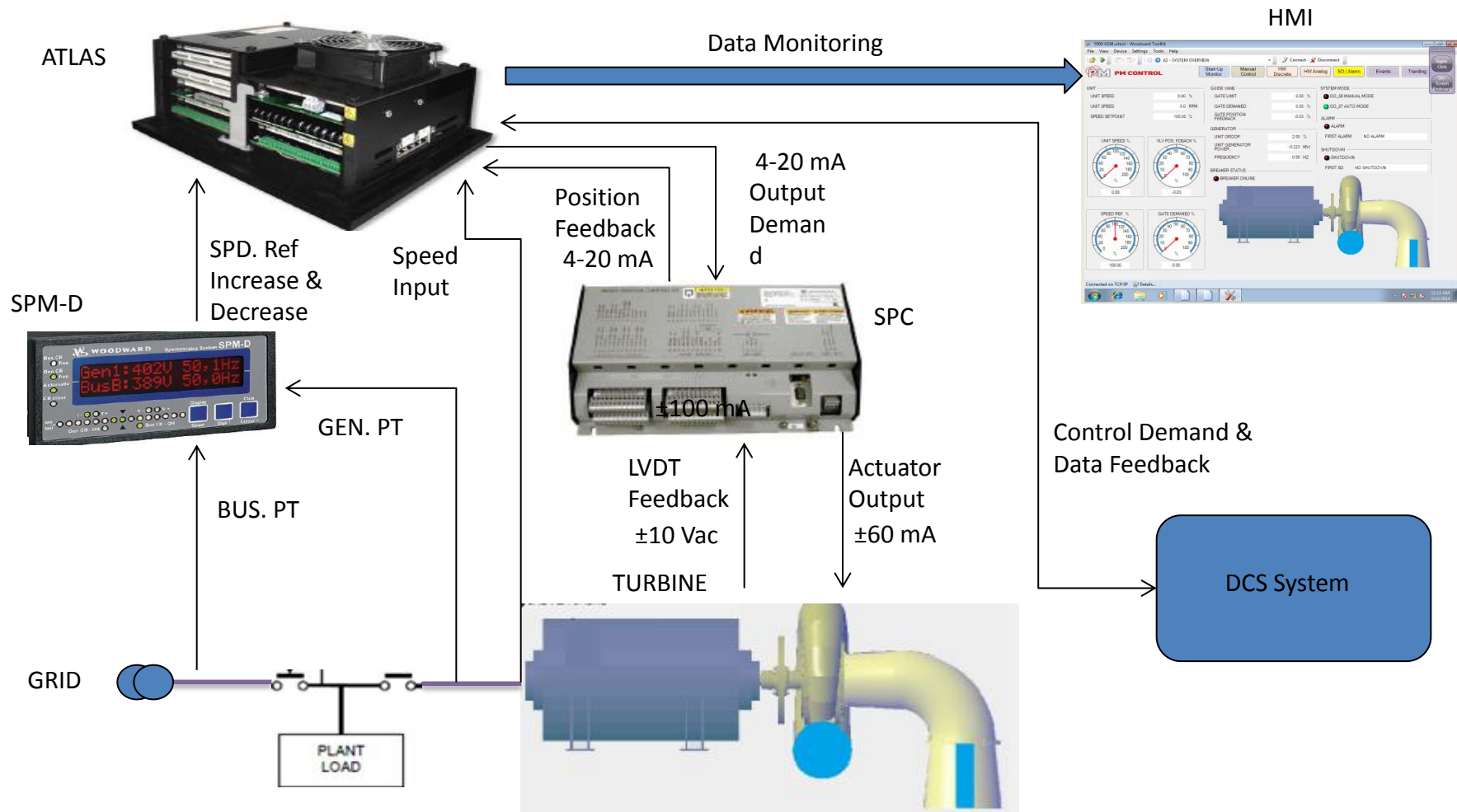


Overhaul

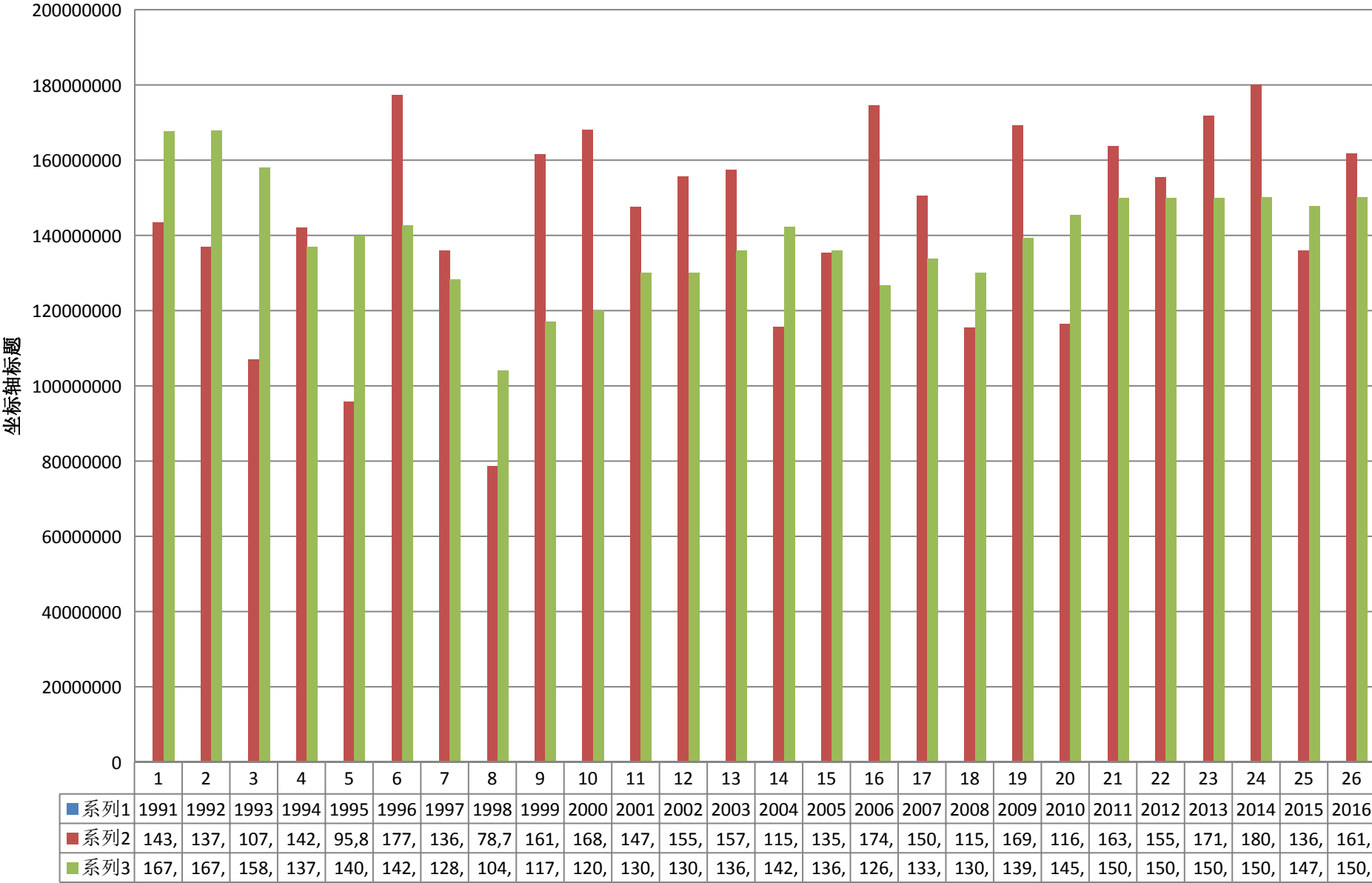
Governor Control Unit 1, 2, 3, 4 & 5



Governor Control Overview



Energy Production Xeset 1



Thank You Very Much for Your Attention!



For more information, please contact us:

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