Transmission Development Plan

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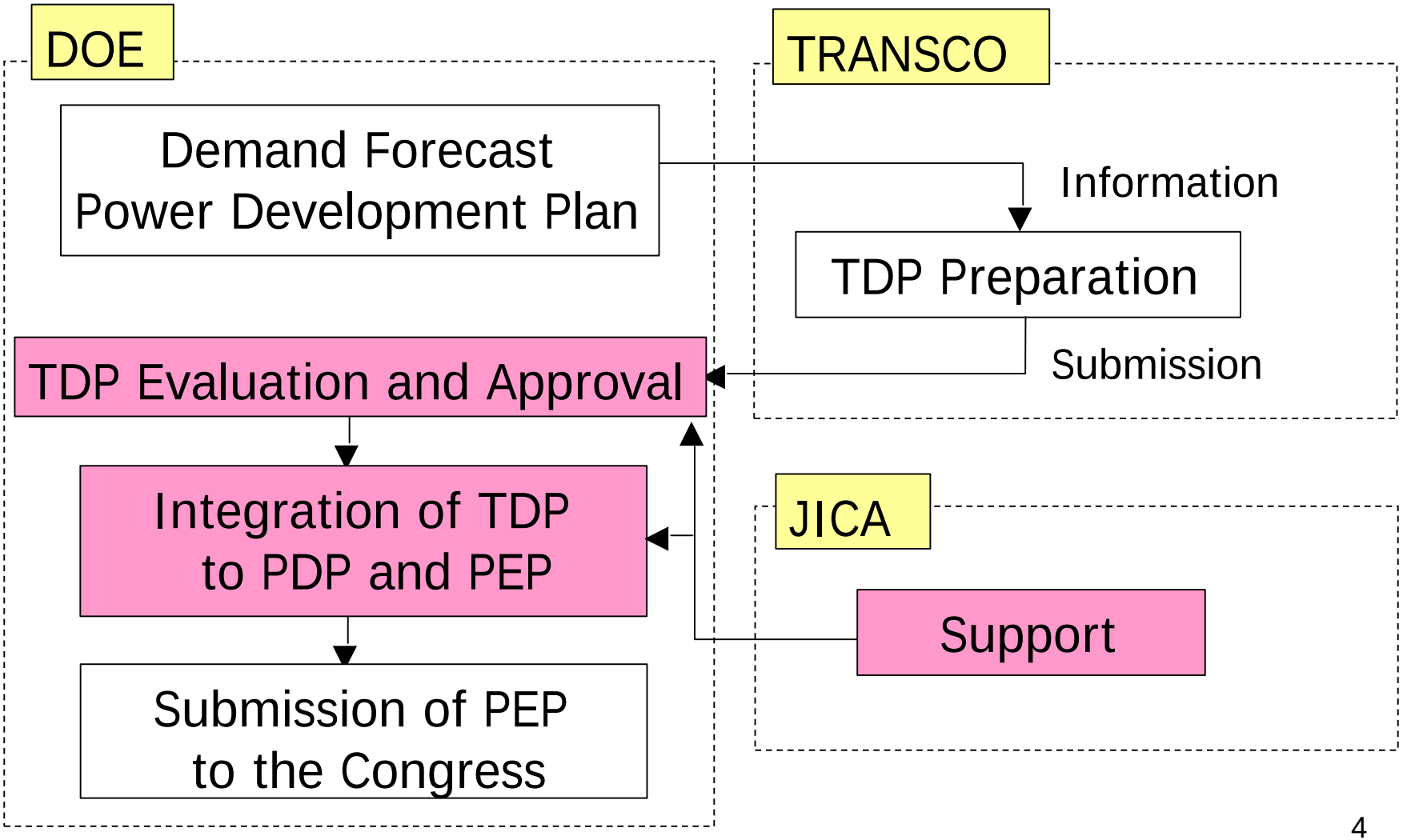
Outline of the Assistance by JICA for Evaluation and Approval of TDP

Roles of DOE and JICA regarding TDP



Collaboration Work on Evaluating TDP

- DOE and JICA conducted the following works jointly:

  - Clarification of criteria and items for evaluation
  - Review of the previous TDP (2003)
  - Technical transfer regarding PSS/E operation

- DOE and JICA will evaluate the next TDP (2004) jointly after submission.

Provision of PSS/E

- DOE needs to analyze the Philippine system.
- PSS/E is a program for system analysis,
  which is widely used in the world including TRANSCO.

PSS/E was provided for DOE to evaluate the TDP.

Review of the previous TDP (2003)

Criteria for Evaluation

Compliance with the Grid Code

1. General rule
   - Application of N-1 rule

2. Power Flow
   - No overload of the transmission facilities on normal condition
   - The power flow is under the emergency capacity rating with an N-1 contingency

3. Voltage
   - The voltage of each bus is between 0.95 and 1.05 on normal condition

Criteria for Evaluation (Continued)

Compliance with the Grid Code

4. Short circuit capacity
   - The short circuit current is under the rated capacity of the equipment
   - The short circuit current needs to be interrupted by the circuit breaker

5. Stability
   - The Grid remains stable with any Single Outage Contingency

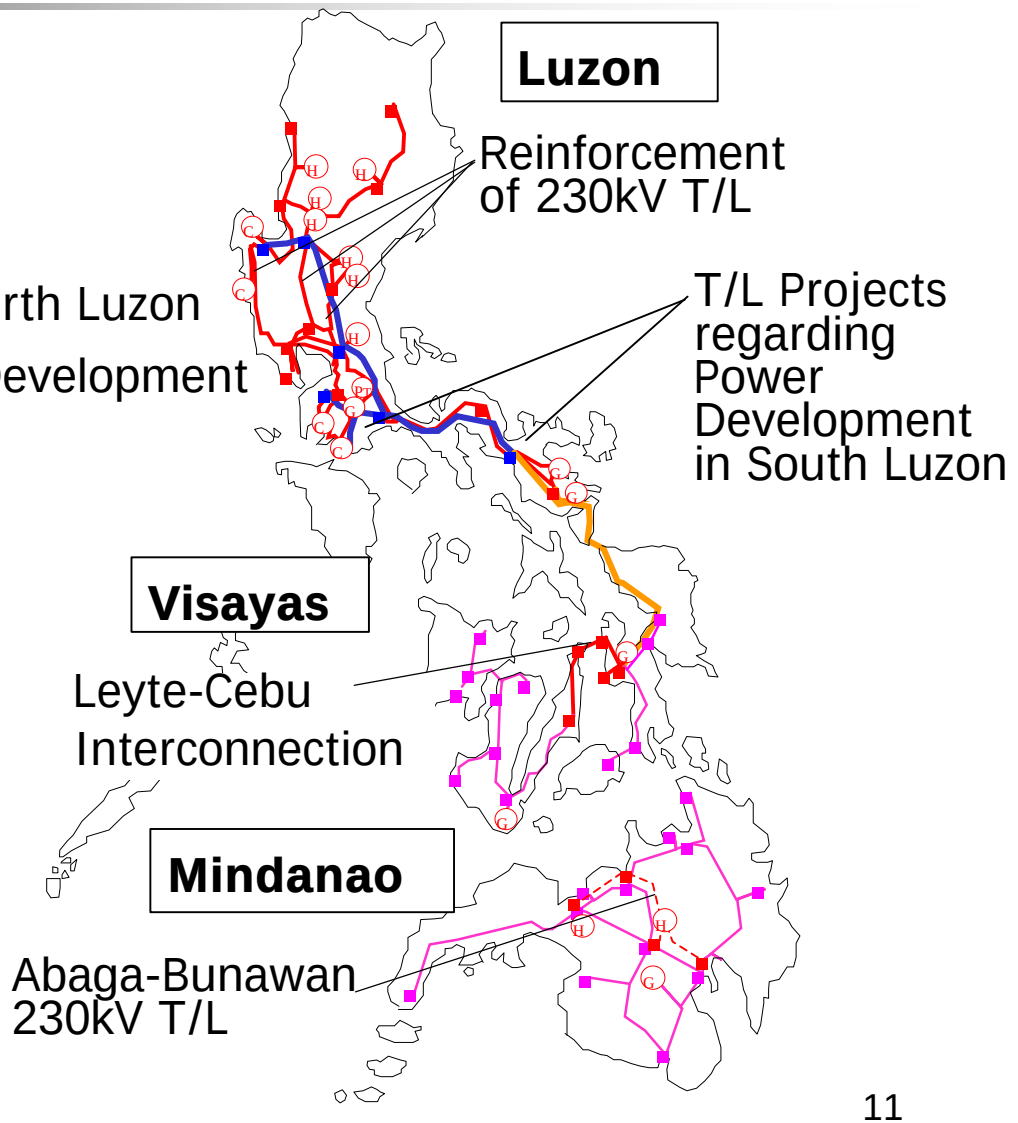
Items for Evaluation

- Consistency with PDP
- Cost Comparison
- Verification from the long-term view

Review of the previous TDP (2003)

Main Projects

- Luzon Grid
  - 230kV T/L Reinforcement in North Luzon
  - T/L Projects regarding Power Development in South Luzon
- Visayas Grid
  - Leyte-Cebu Interconnection
- Mindanao Grid
  - 230kV T/L between Abaga S/S and Bunawan S/S

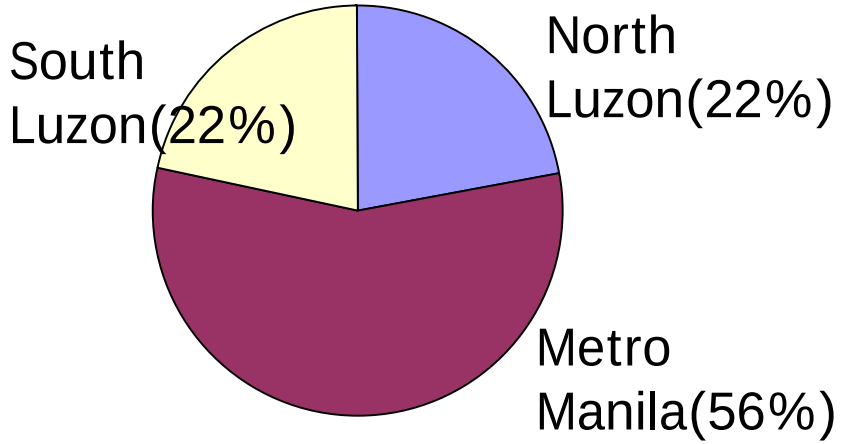


Review of the previous TDP (Luzon Grid)

Characteristics of Luzon Grid

Demand

(2002)



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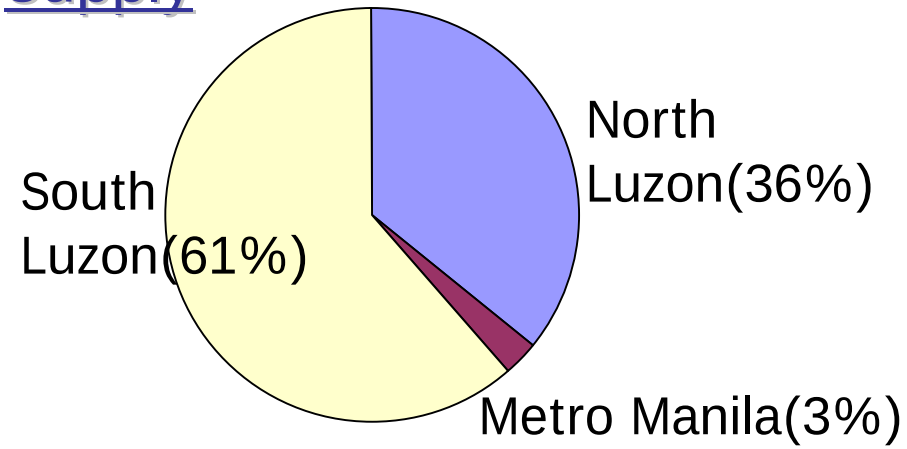
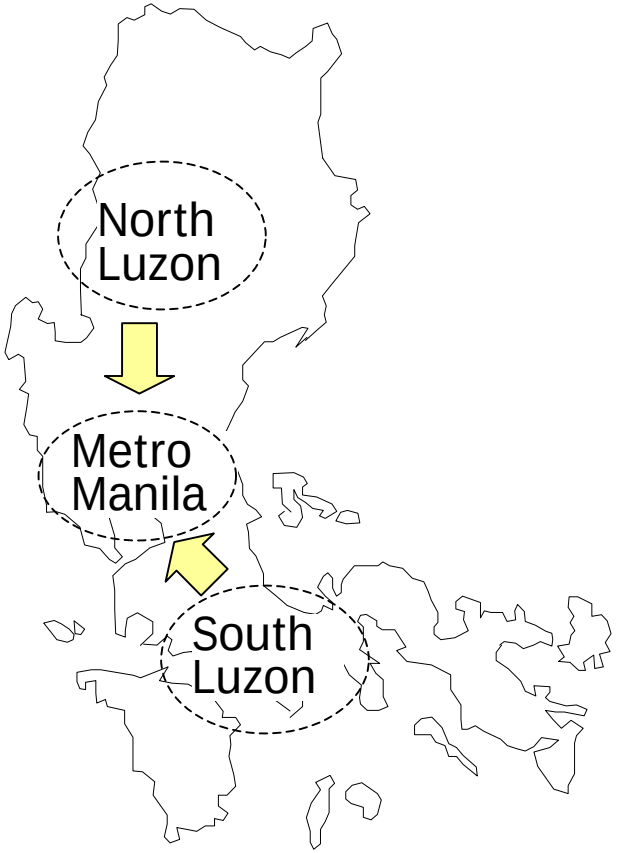




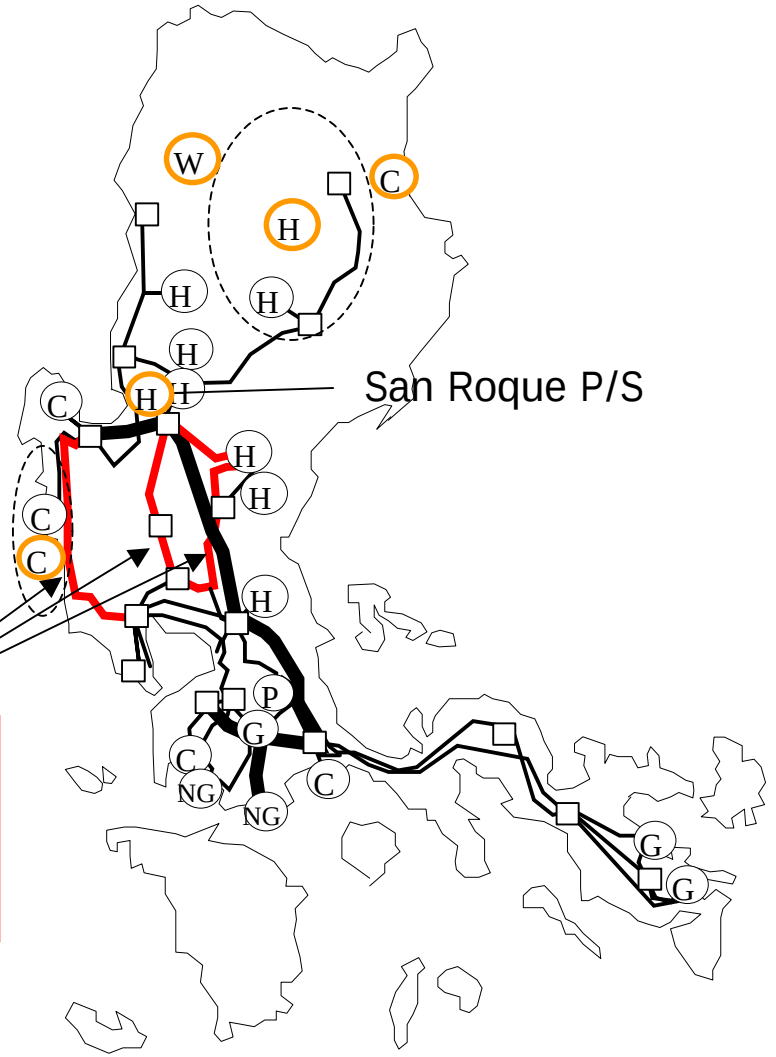
Electric power is transmitted from North and South Luzon to Metro Manila.

Review of the previous TDP (Luzon Grid)

Measures to accommodate Power Development in North Luzon

Power Development in North Luzon

- San Roque P/S (345MW:2004)
- Wind P/S (65MW:2006)
- Coal Fired P/S
- Hydroelectric P/S



Problem

The 230kV transmission lines from North Luzon to Metro Manila will be overloaded.

Review of the previous TDP (Luzon Grid)

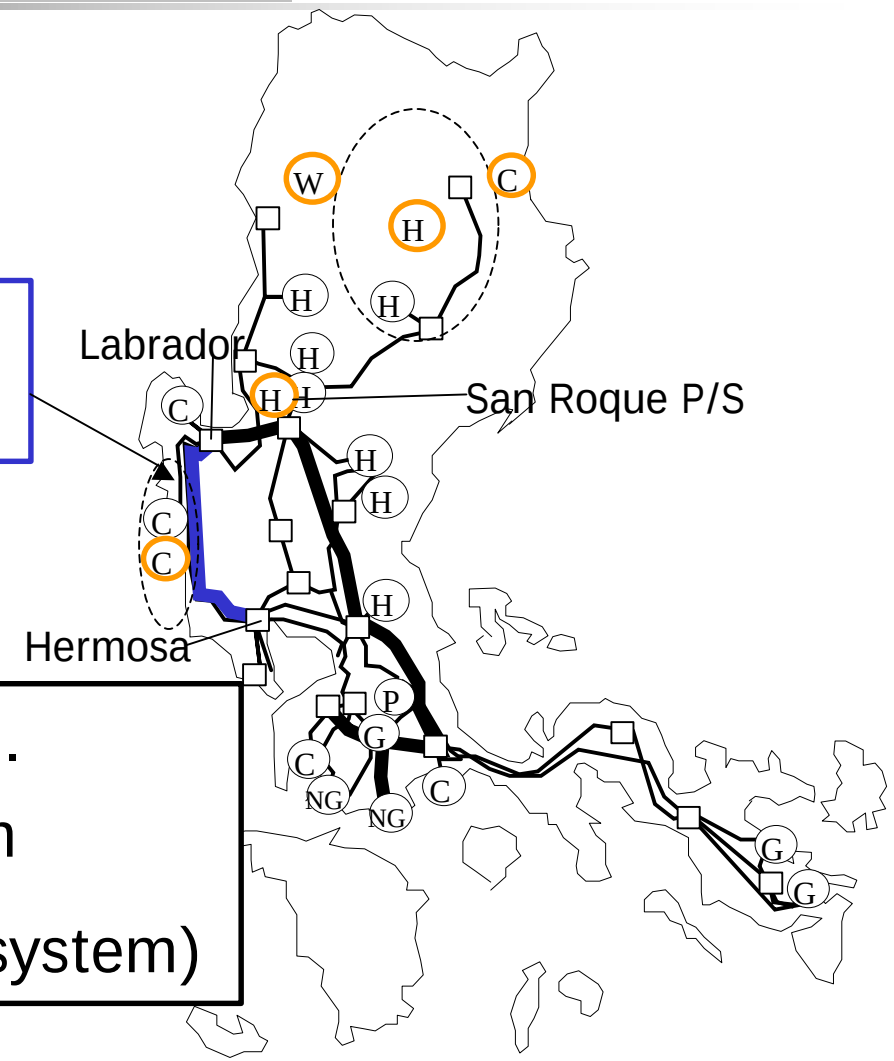
Measures to accommodate Power Development in North Luzon

TDP(2003)

Measure

New 500kV Transmission Line

1. Labrador to Hermosa (2006)



Issues

- Initial investment is very large.
- Reliability of the 230kV system will become low. (Split operation of the 230kV system)

Review of the previous TDP (Luzon Grid)

Measures to accommodate Power Development in North Luzon

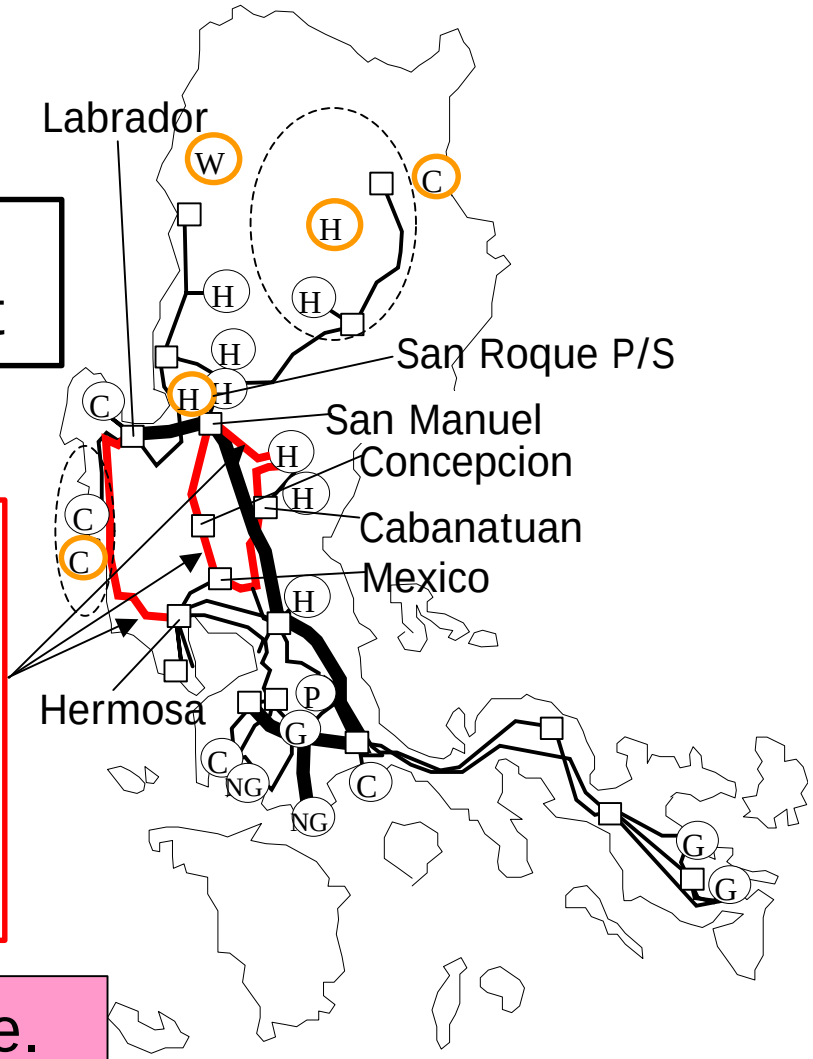
Alternative Plan

Transmission development in accordance with power development

Measures

Reinforcement of the existing 230kV Transmission Lines

1. San Manuel - Concepcion – Mexico (2006)
2. Labrador - Hermosa (2008) (500kV Design)
3. San Manuel - Cabanatuan – Mexico (2010)



The Alternative Plan is less expensive.

Review of the previous TDP (Luzon Grid)

Measures to accommodate Power Development at Sta.Rita, San Lorenzo and Ilijan.

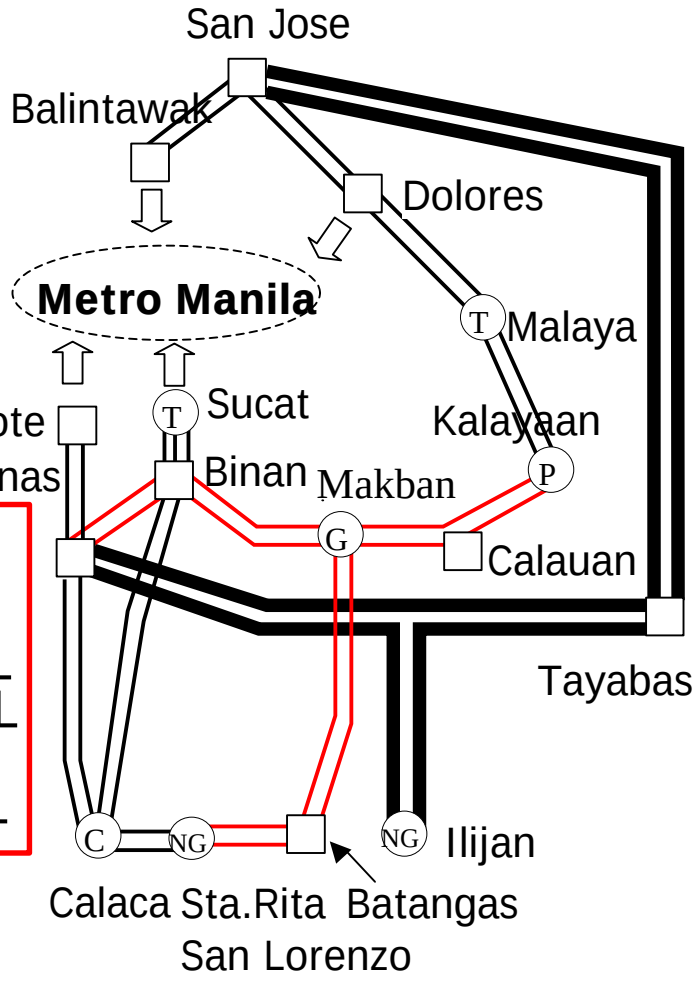
Power development at, Sta.Rita (1000MW), San.Lorenzo (500MW) and Ilijan (1200MW)

The 230kV transmission lines are overloaded.

Following measures are necessary.

1. The new 230kV Sta.Rita-Batangas T/L
2. Upgrading of the 230kV Batangas-Makban T/L
3. Upgrading of the 230kV Dasmarinas-Binan T/L
4. Upgrading of the 230kV Binan-Makban T/L
5. Upgrading of the 230kV Makban-Kalayaan T/L

The result is the same as the TDP.



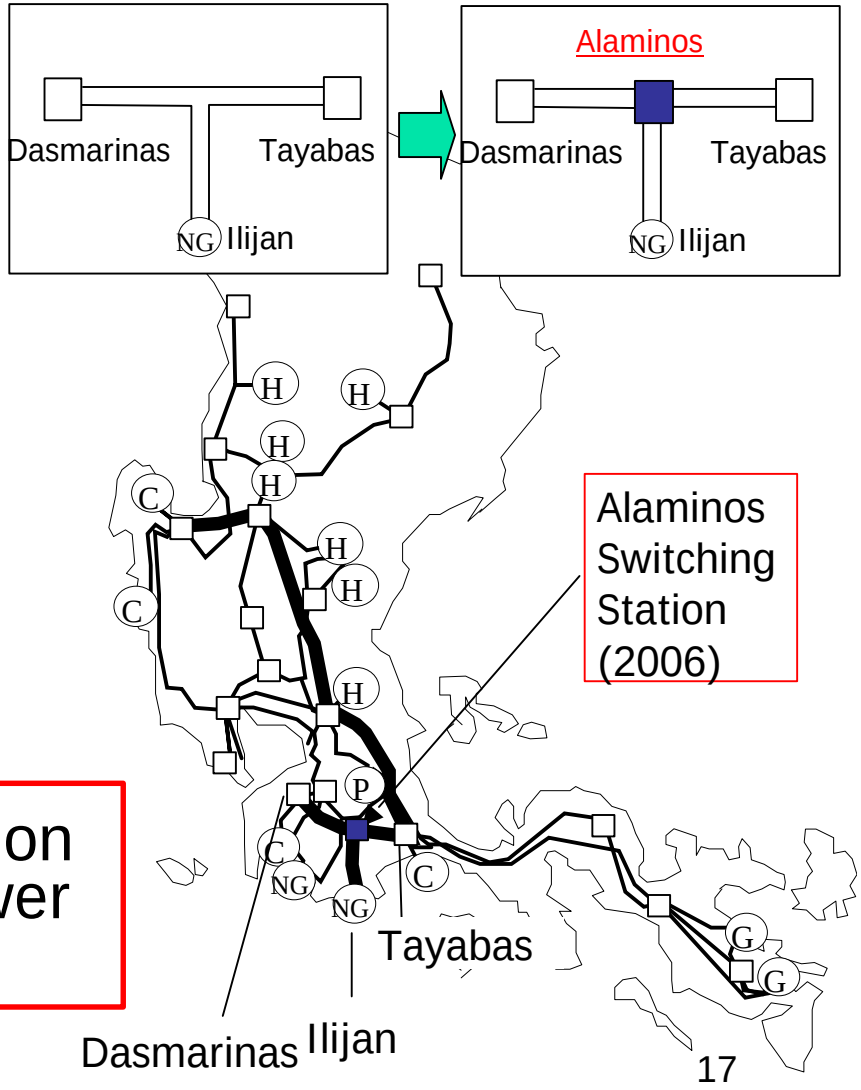
Review of the previous TDP (Luzon Grid)

500kV Alaminos Switching Station

In case of further power Development near Ilijan P/S, the Luzon system will be unstable with a fault on the 500kV T/L.

Alaminos switching station will be necessary.

However, Alaminos Switching Station could be deferred until further power development.



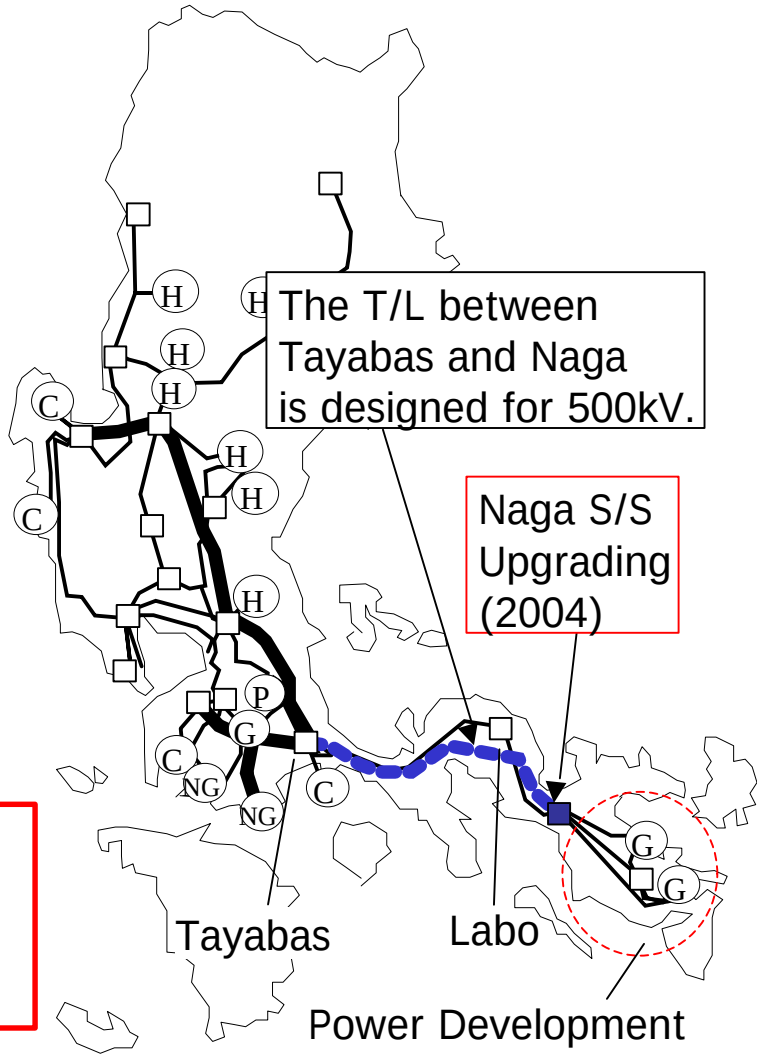
Review of the previous TDP (Luzon Grid)

500kV Upgrading of Naga S/S

In case of further power development in the South Luzon, the transformers at Tayabas S/S will be overloaded with an N-1 Contingency.

500kV upgrading of Naga S/S will be necessary.

However, 500kV upgrading of Naga S/S could be deferred until further power development.

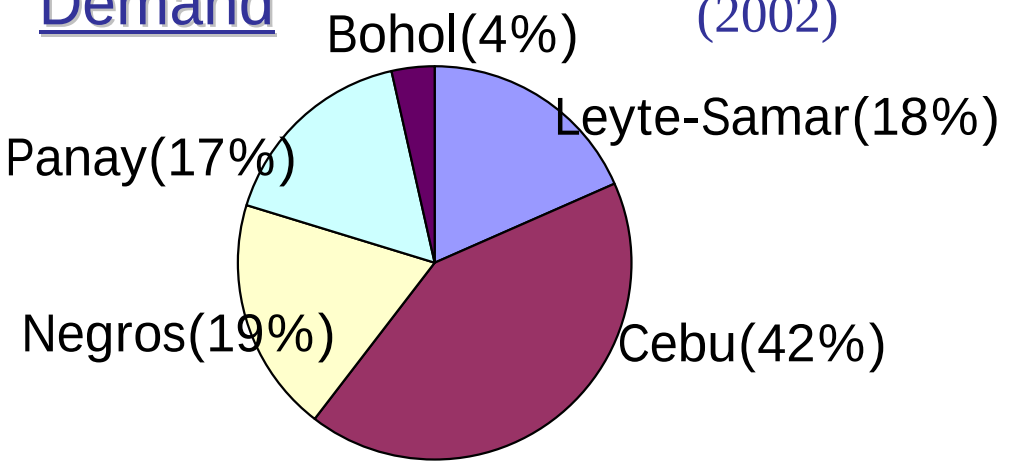


Review of the previous TDP (Visayas Grid)

Characteristics of Visayas Grid

Demand

(2002)



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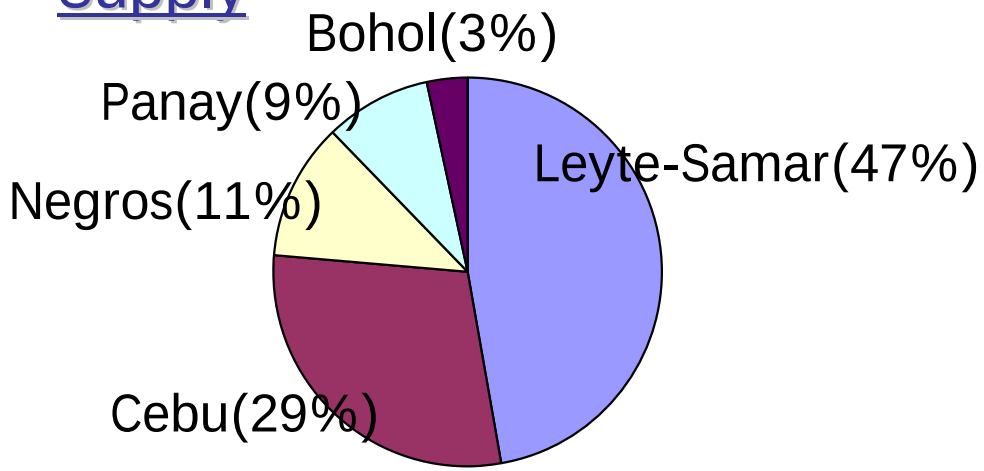
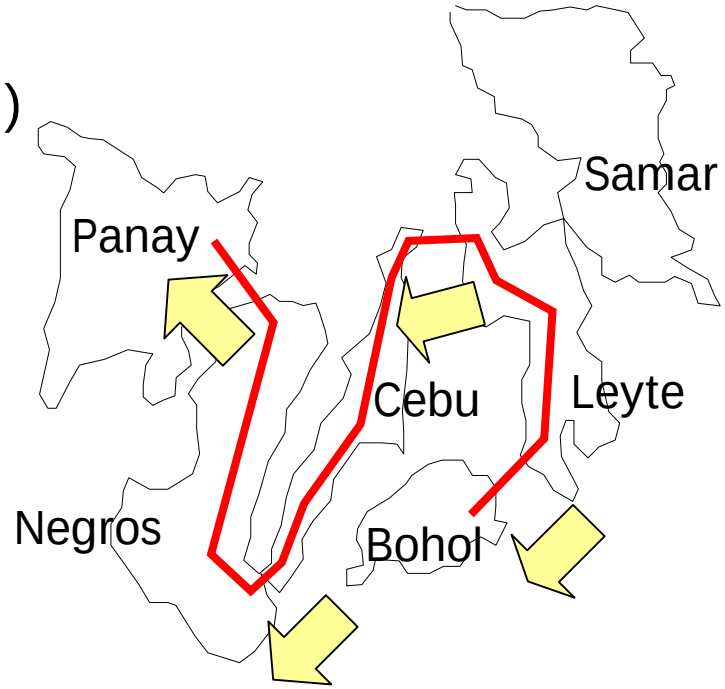
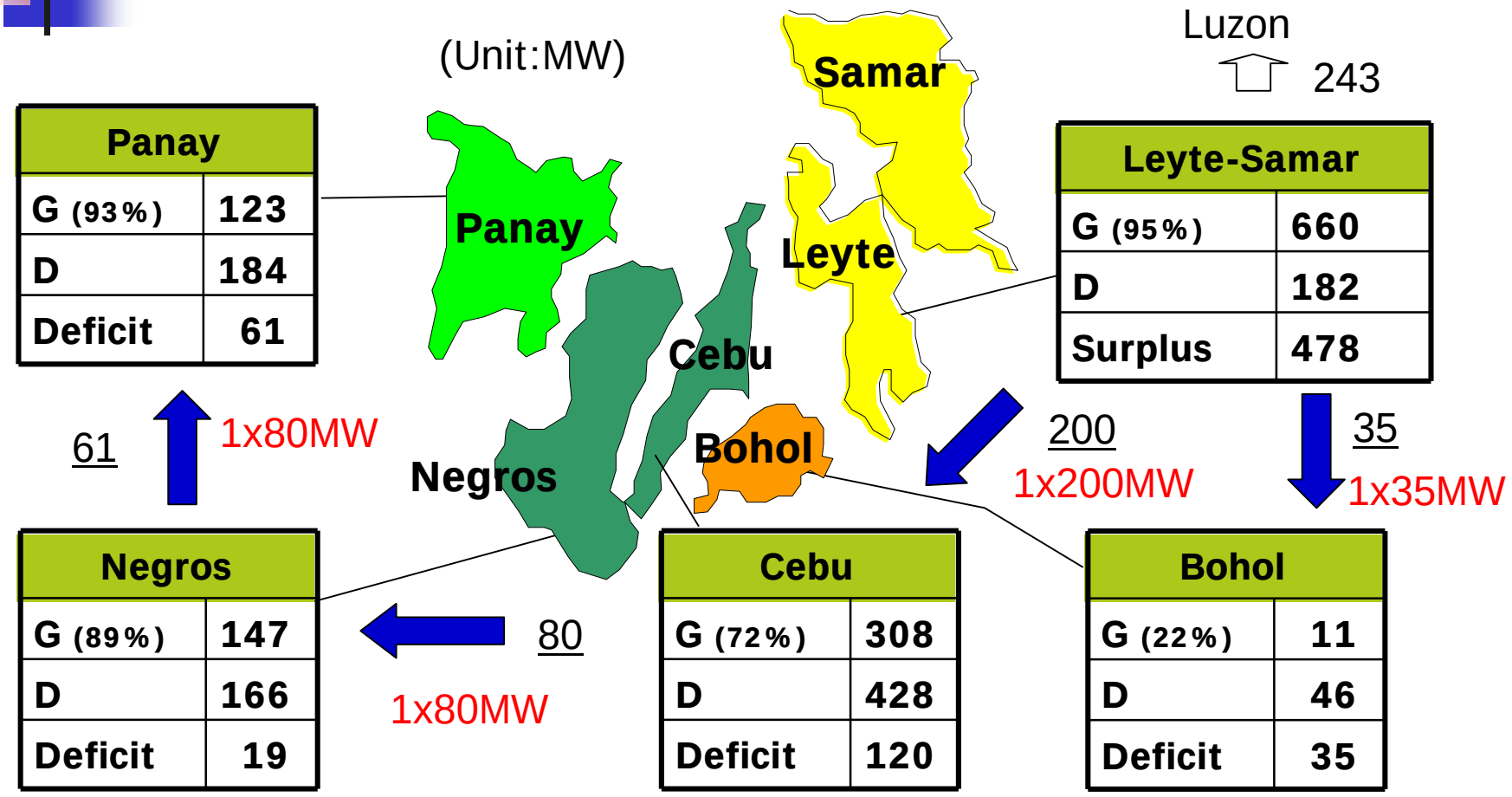




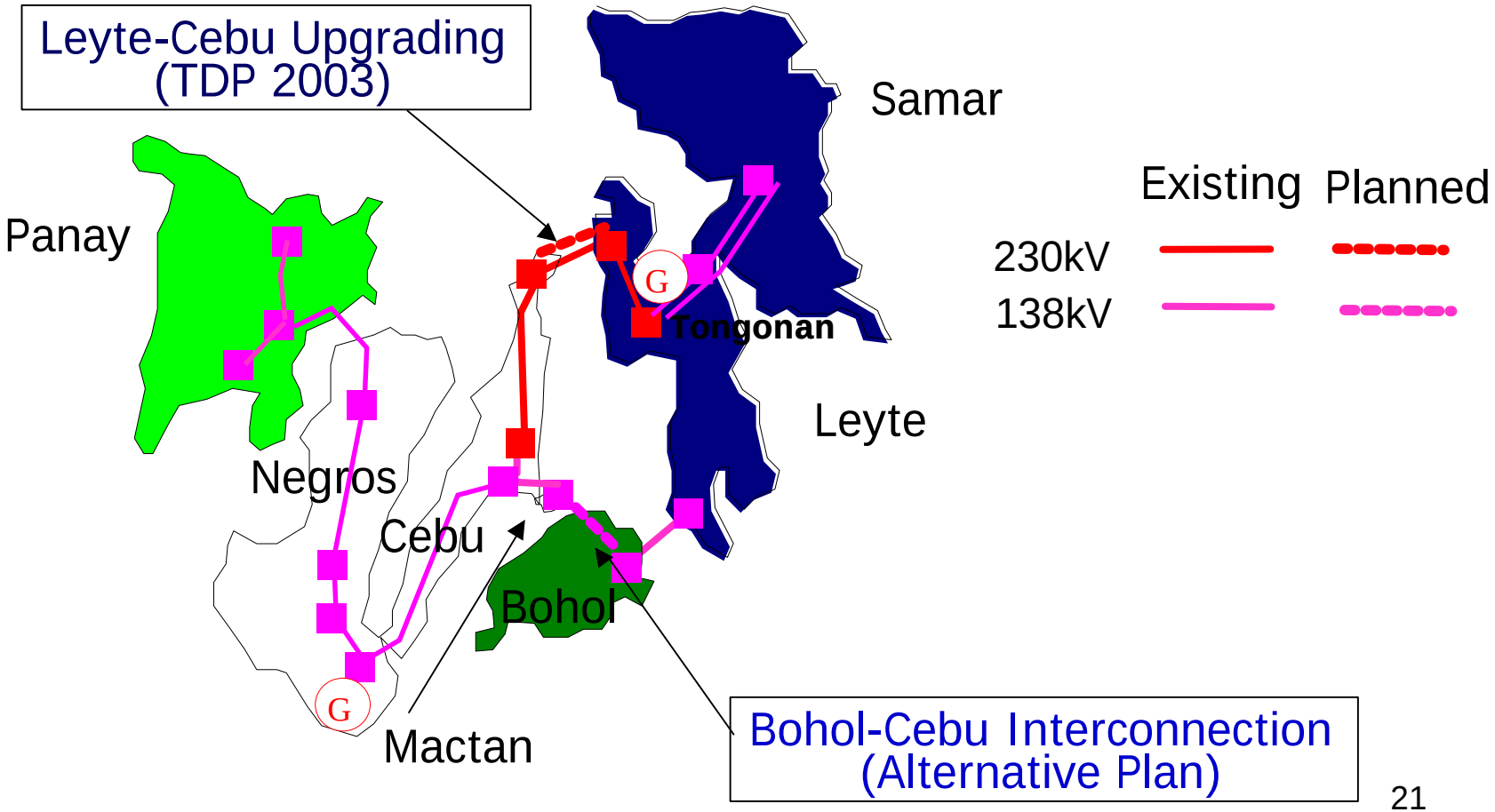
Visayas Grid Power Flow in 2003 (Result of GTMax)



The power flows of Leyte-Cebu and Cebu-Negros are restricted by the transmission limit.

Review of the previous TDP (Visayas Grid)

Route for Leyte-Cebu Interconnection

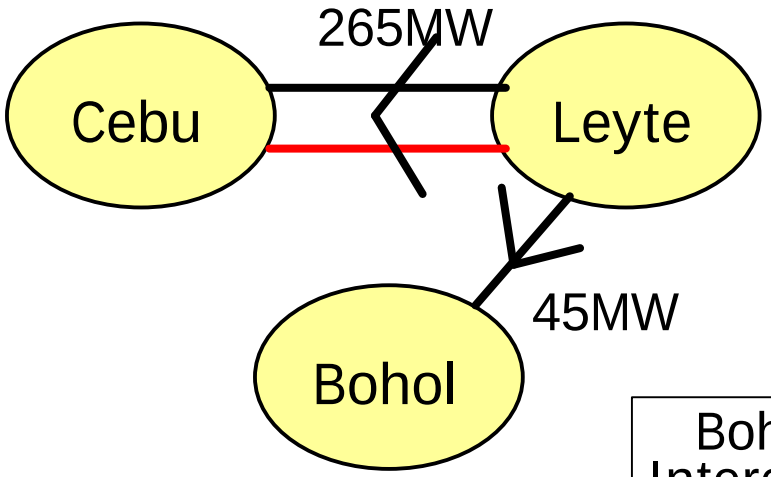


Review of the previous TDP (Visayas Grid)

Results of Power Flow Analysis (in 2006)

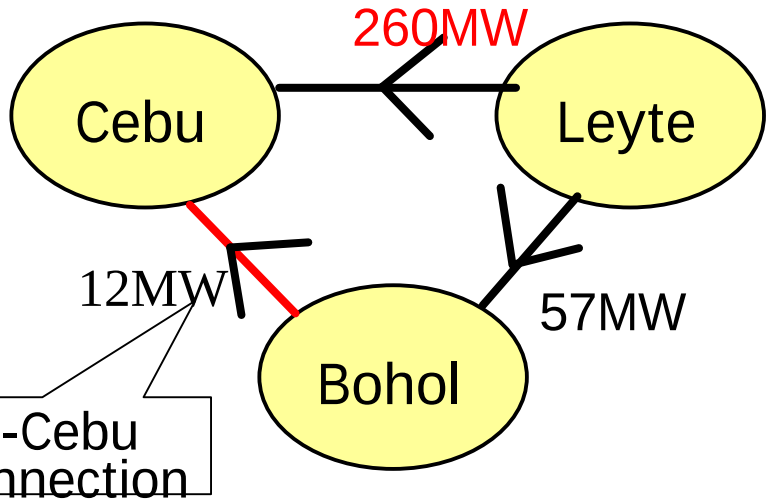
TDP 2003

Leyte-Cebu Upgrading
(200MVA - 400MVA)



Alternative Plan

Overload
(Capacity=200MVA)



Bohol-Cebu
Interconnection

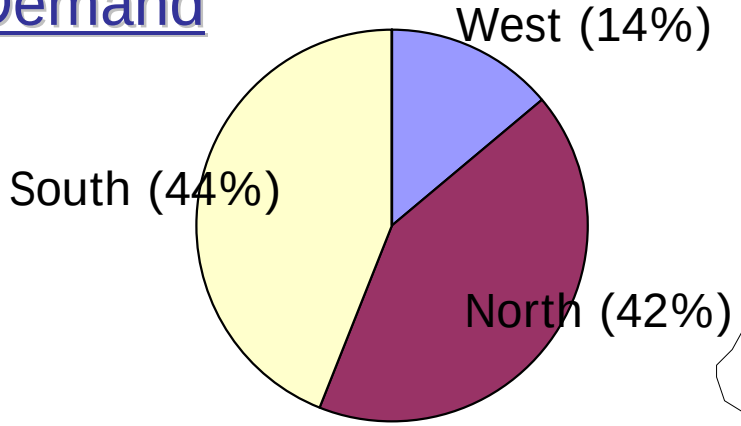
The Alternative Plan is not effective.

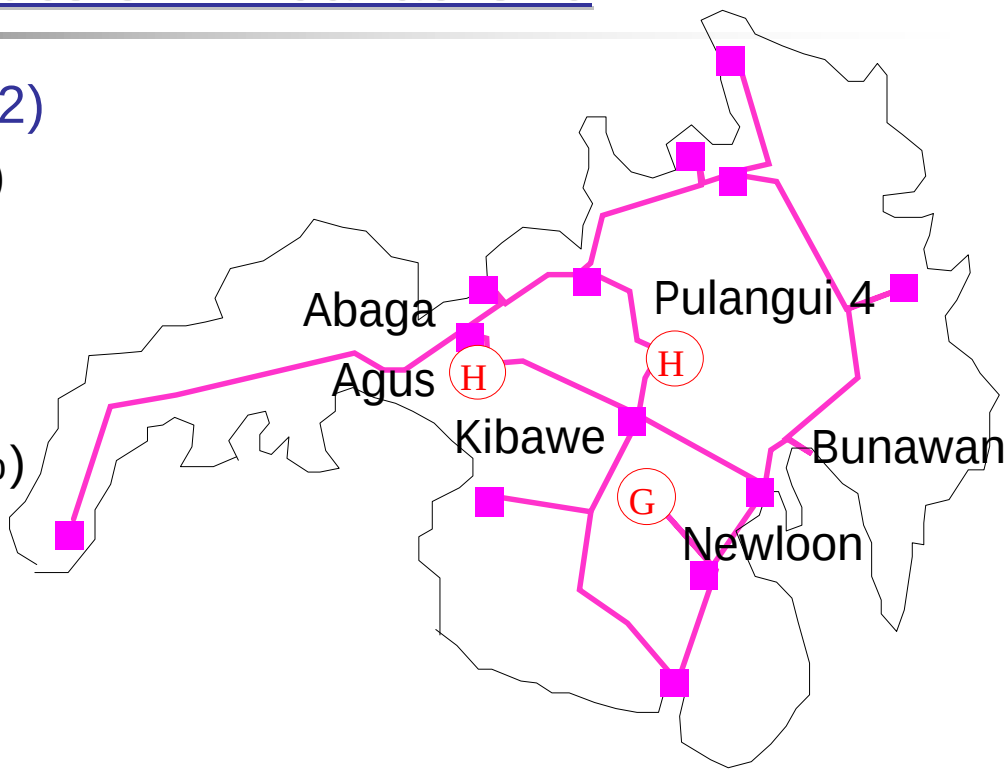
Review of the previous TDP (Mindanao Grid)

Characteristics of Mindanao Grid

Demand

(2002)





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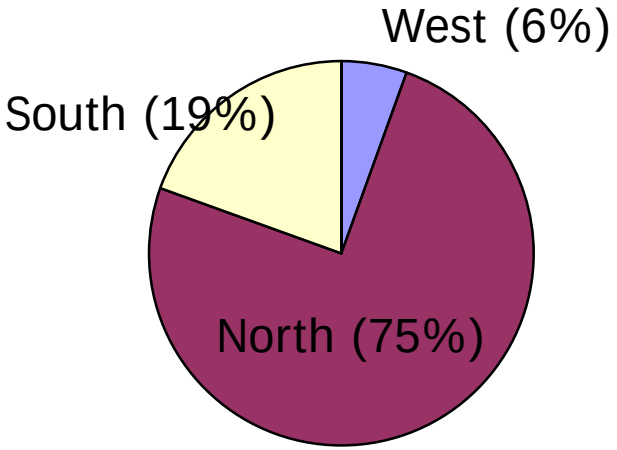


CASE Study

	Power Development	138kV Agus2-Kibawe T/L
Case 1	All new generators are located in North Mindanao. *(1) 2006* Coal (200MW) : North *(2) 2012* Agus 3(225 MW) : North Coal (200 MW) : North	In service
Case 2	HVDC(400 MW) : North	Out of service
Case 3	New generators (470MW) are located in South Mindanao *(1) 2006* Coal (100MW) : North Davao (70MW)) : South *(2) 2012* Agus 3 (225MW) : North Coal (200MW) : North Davao (200MW) : South Bubunawan (100MW) : South	In Service
Case 4	General Santos (100MW) : South	Out of service

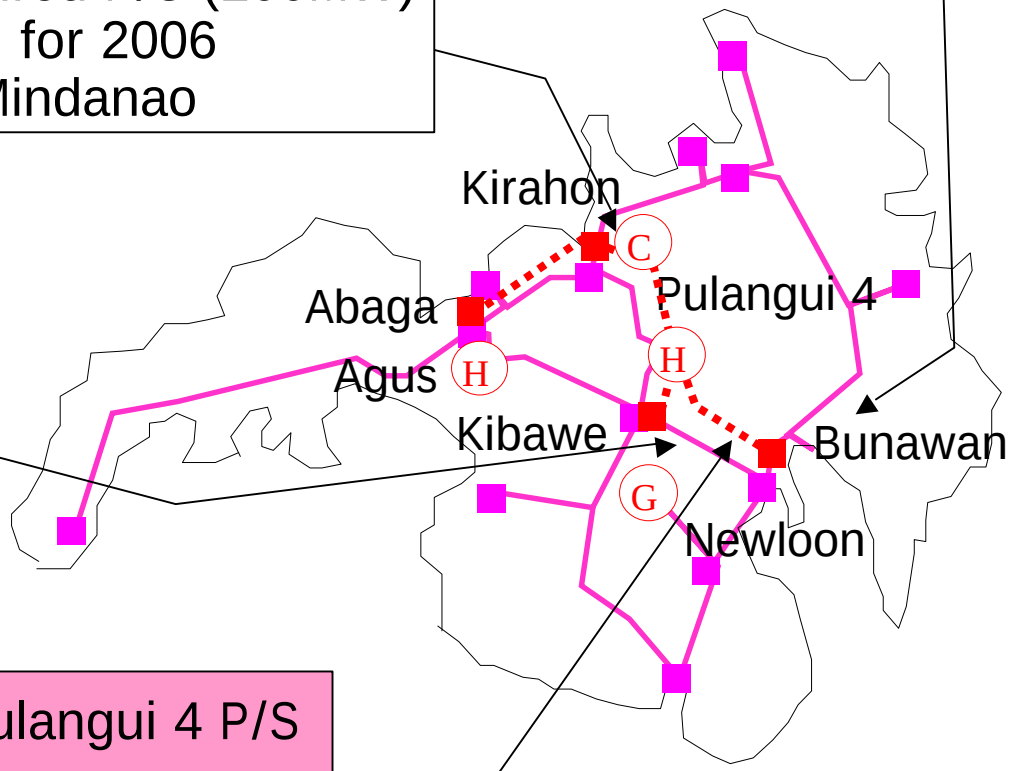
Case 1-2006

Demand increase
in South Mindanao

The coal-fired P/S (200MW)
is planned for 2006
in North Mindanao

The 138kV Kibawe-Newloon T/L
will be overloaded with a fault
of one circuit.

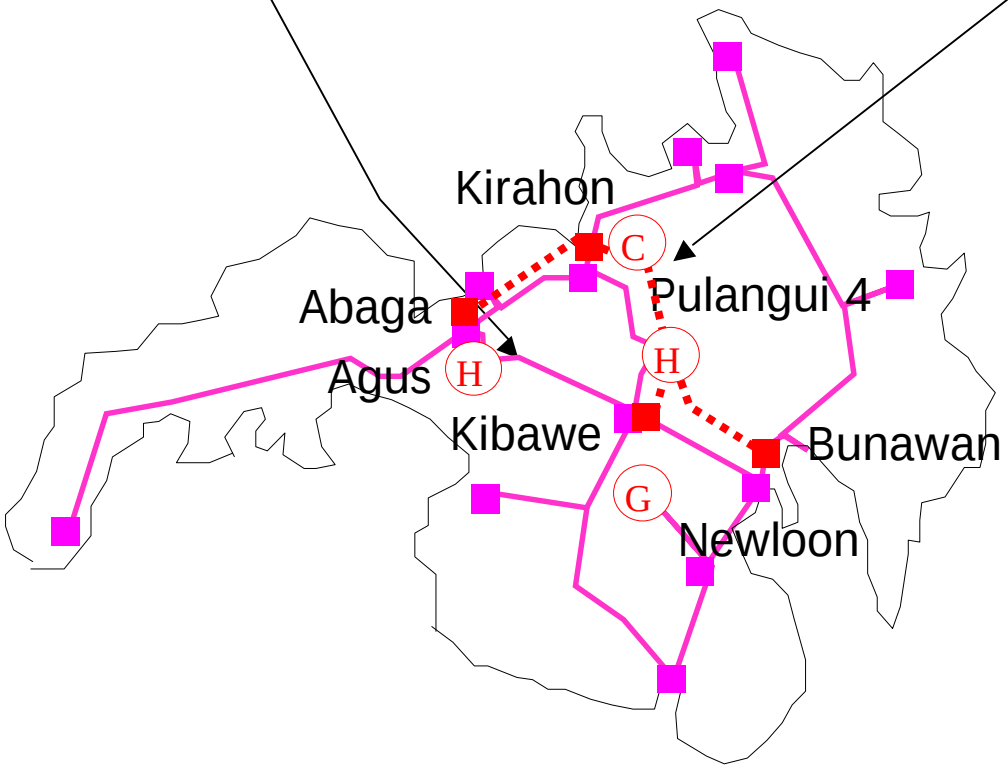
New transmission line between Pulangui 4 P/S
and Bunawan S/S will be necessary.



Case 2-2006

The 138kV Agus 2 - Kibawe is sometimes damaged by the terrorist activities.

The new transmission line between Abaga S/S and Kibawe S/S will be necessary.
(Considering N-2 contingency)



Case 3 and 4 (2006-2012)

To avoid the construction of Pulangui 4-Bunawan T/L

By 2006 (Case 3 and 4)

- Power development of 70MW or more is necessary in South Mindanao.

By 2012 (Case 3 and 4)

- Power development of 470MW or more is necessary in South Mindanao.
(Considering the retirement of the existing Diesel P/S)

Summary of Results

Year	Case	Power Development in South Mindanao	Agus2-Kibawe T/L	Necessary T/L
2006	Case 1	None	In service	138kV Pulangui 4-Bunawan
	Case 2	None	Out of service	138kV Abaga-Kirahon 138kV Kirahon-Pulangui 4 138kV Pulangui 4-Kibawe 138kV Pulangui 4-Bunawan
	Case 3	70MW	In service	None
	Case 4	70MW	Out of service	138kV Abaga-Kirahon 138kV Kirahon-Pulangui 4 138kV Pulangui4-Kibawe
2012	Case 1	None	In service	138kV Abaga-Kirahon 138kV Kirahon-Pulangui 4 138kV Pulangui 4-Bunawan
	Case 2	None	Out of service	138kV Abaga-Kirahon 138kV Kirahon-Pulangui 4 138kV Pulangui 4-Kibawe 138kV Pulangui 4-Bunawan
	Case 3	470MW	In service	None
	Case 4	470MW	Out of service	138kV Abaga-Kirahon 138kV Kirahon-Pulangui 4 138kV Pulangui 4-Kibawe

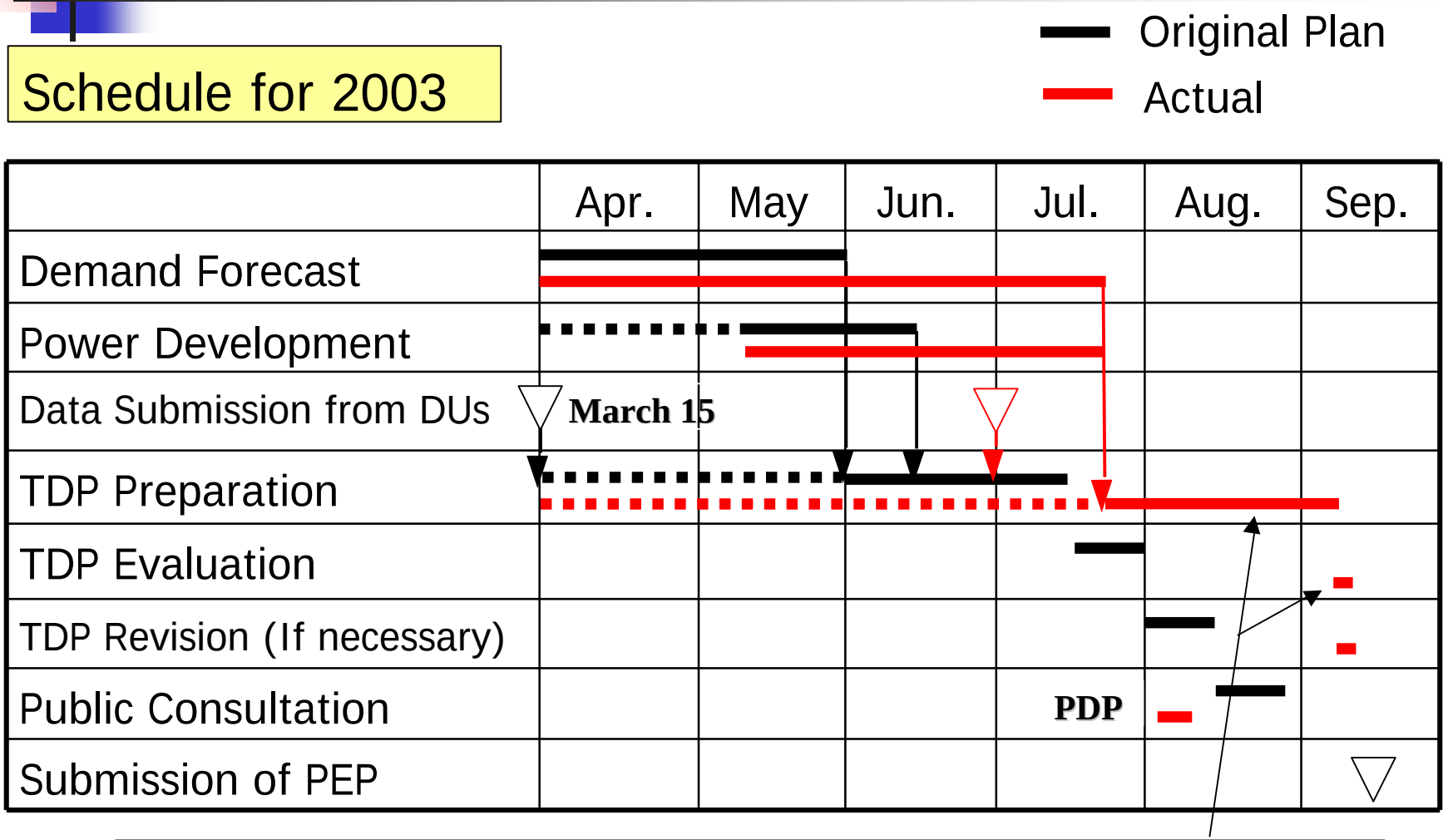
Issues and Recommendations

Issues

- Schedule of TDP Preparation and TDP Evaluation
- Coordination between Power Development and Transmission Development
- Planning of Interconnections between Main Islands

Schedule of TDP Preparation and TDP Evaluation

Schedule for 2003



Schedule of TDP Preparation and TDP Evaluation is very tight.

Schedule of TDP Preparation and TDP Evaluation

Recommendations

- Demand forecast should be finalized by the beginning of June.
- TRANSCO should request the DUs submission of the planning data be at the same time as their DDP submission to DOE (March 15).

Coordination between Power Development and Transmission Development

Countermeasures against Demand Increase

Power Development (DOE) ⟷ Transmission Development (TRANSCO)

Coordination between Power Development Plan and Transmission Development Plan is necessary.

Coordination between Power Development and Transmission Development

Recommendation

DOE should provide direction for future power development regarding committed and indicative projects .

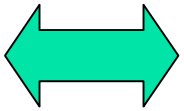
(Siting, fuel type, capacity, commissioning year, etc)

Planning of Interconnections between Main Islands

Responsibilities

DOE

1. Demand Forecast
2. Power Development Planning
3. Cost Comparison
4. Policy Making



TRANSCO

1. Transmission Planning
   - Power Flow Analysis
   - Feasibility Study
   - Schedule and Cost
   - Reliability

Planning of Interconnections between Main Islands

Power Development in the island ⟺ Construction of Interconnection

Economical option should be adopted.

However

- TRANSCO is no longer responsible for power development.
- IPPs will develop power.

⇩

Issue

If the power development plan is not implemented by IPPs, power deficit would occur.

Planning of Interconnections between Main Islands

Recommendation

For planning of interconnection between main islands

It is desirable to consider the risk of the delay or no implementation of the power development plan in the island, as well as cost comparison.

Thank you