Greening the Grid: Solar and Wind Grid Integration Study of the Luzon-Visayas System of the Philippines

Session 2: Renewable Energy In Power System Planning: Meeting Climate and Access Objectives (Auditorium Zone B)
2017 Asia Clean Energy Forum (ACEF)
6 June 2017
ADB HQ, Ortigas Centre, Pasig City, Philippines

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OUTLINE

- Brief review of the coverage of the study
- Result of the study
- Summary and Implication to Policy makers
- Way Forward

PHL RE Grid Integration Study
Objectives

- Assess the impact of increasing variable renewable energy (vRE) in the existing system;
- Guide the policy; and
- Direct the operations, market changes, and technologies that can support the integration of vRE to the grid.
  - At what solar and wind penetrations do major operational issues start to occur?
  - Where are the best locations of solar and wind generators to minimize integration impacts?
  - How will higher VRE penetrations impact the operation of the conventional generation fleet?
  - Will the system be reliable? (Will we have enough reserves?)
  - Will new transmission be necessary?

PHL RE Grid Integration Study
Organizational Structure

A) In Partnership with USAID & BLEADERS

B) Technical Advisory Committee (TAC)

Core TAC

- **Department of Energy (DOE) – Lead Agency**
- National Grid Corporation of the Philippines (NGCP)
- Philippine Electricity Market Corporation (PEMC)
- Energy Regulatory Commission (ERC)
- Grid Management Committee (GMC)
- Distribution Management Committee (DMC)
- National Transmission Corporation (TransCo)
- National Renewable Energy Board (NREB)
- National Electrification Administration (NEA)
- Philippine National Oil Company – Renewable Corporation (PNOC-RC)

Ad Hoc TAC

- Philippine Independent Power Producer Ass'n (PIPPA)
- Philippine Electric Power Owners Ass'n (PEPOA)
- MERALCO
- Retail Electric Suppliers Association (RESA)
- RE Developers Ass'n
  - PSPA, WEDAP, BREA, PASSHYDRO
- Philippine Rural Electric Cooperative Ass'n Inc. (PHILRECA)
- Affiliated Renewable Energy Centers (ARECs)
- National Economic and Development Authority (NEDA)
- University of the Philippines – National Engineering Center (UP-NEC)
- International Grid Experts
  - Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

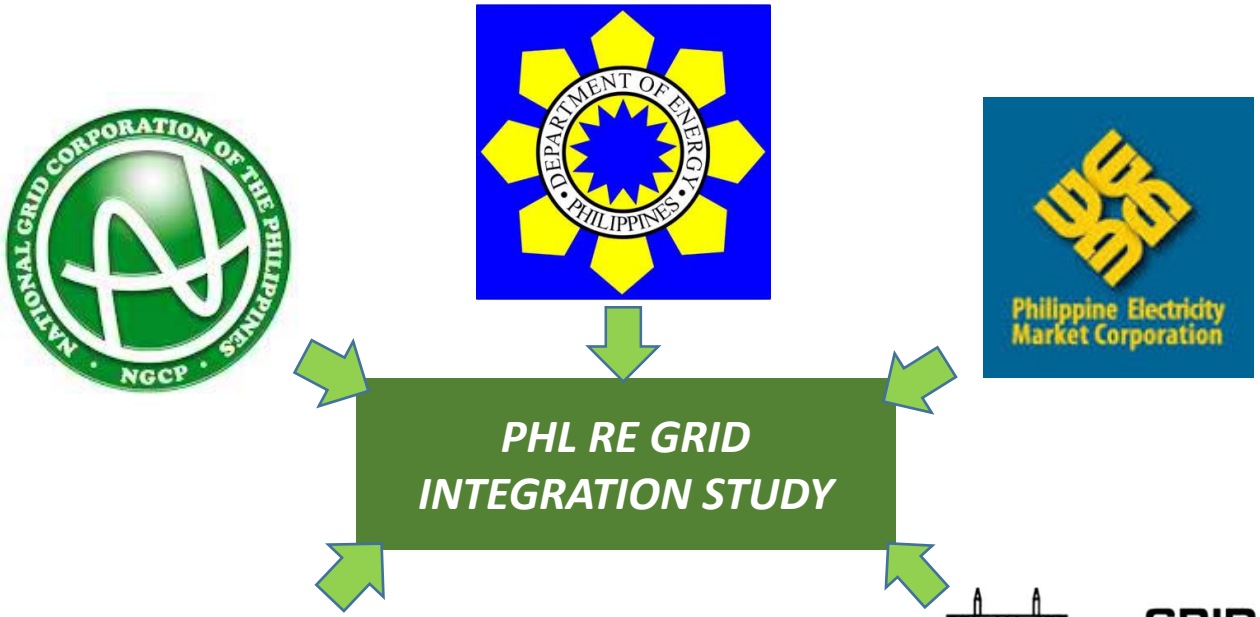
Source: DOE DEPARTMENT CIRCULAR NO. Dc2015-11-0017 "Creating a technical advisory committee and modelling working group to enable variable renewable energy integration and installation targets"

PHL RE Grid Integration Study
Organizational Structure

greening the grid

B) Modeling Working Group (MWG)

Composed of representatives from:



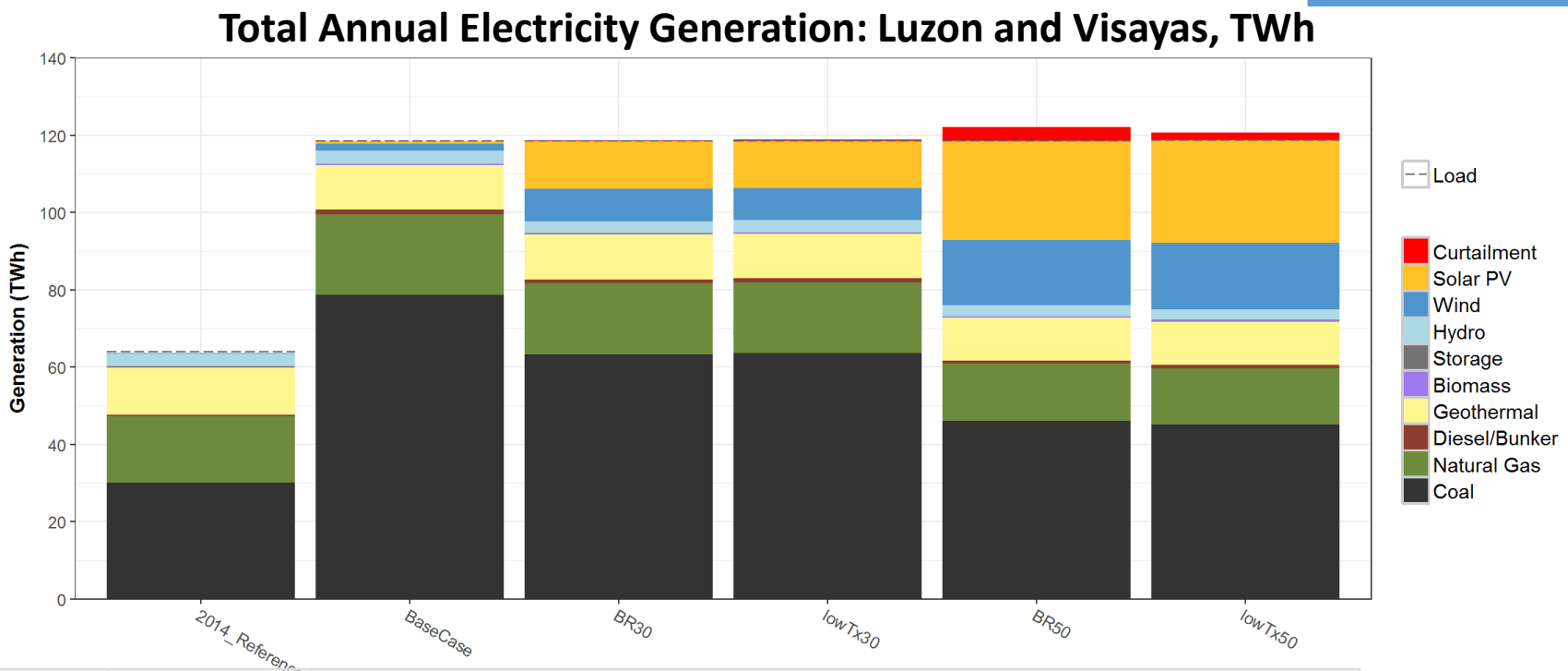
Study scenarios

Scenario	Year	Renewable energy penetration (as a percentage of annual electricity demand)	Solar and wind siting strategy
Reference Case	2014	25%	Existing locations in 2014
Base Case	2030	15%	Existing (in 2016) and planned locations
"BR30"	2030	30%	+ Best resource
"lowTX30"	2030	30%	+ Minimize new transmission
"BR50"	2030	50%	+ Best resource
"lowTX50"	2030	50%	+ Minimize new transmission

- 5 2030 scenarios with 1 basecase at 15% RE Penetration
  - 4 Scenarios are the cases that were simulated to look into the RE penetration that will result to the highest integration of vRE to a reliable transmission system

By 2030, 30% and 50% RE is achievable, assuming planned system evolution

BR50 | lowTx50
BR30 | lowTx30
BaseCase

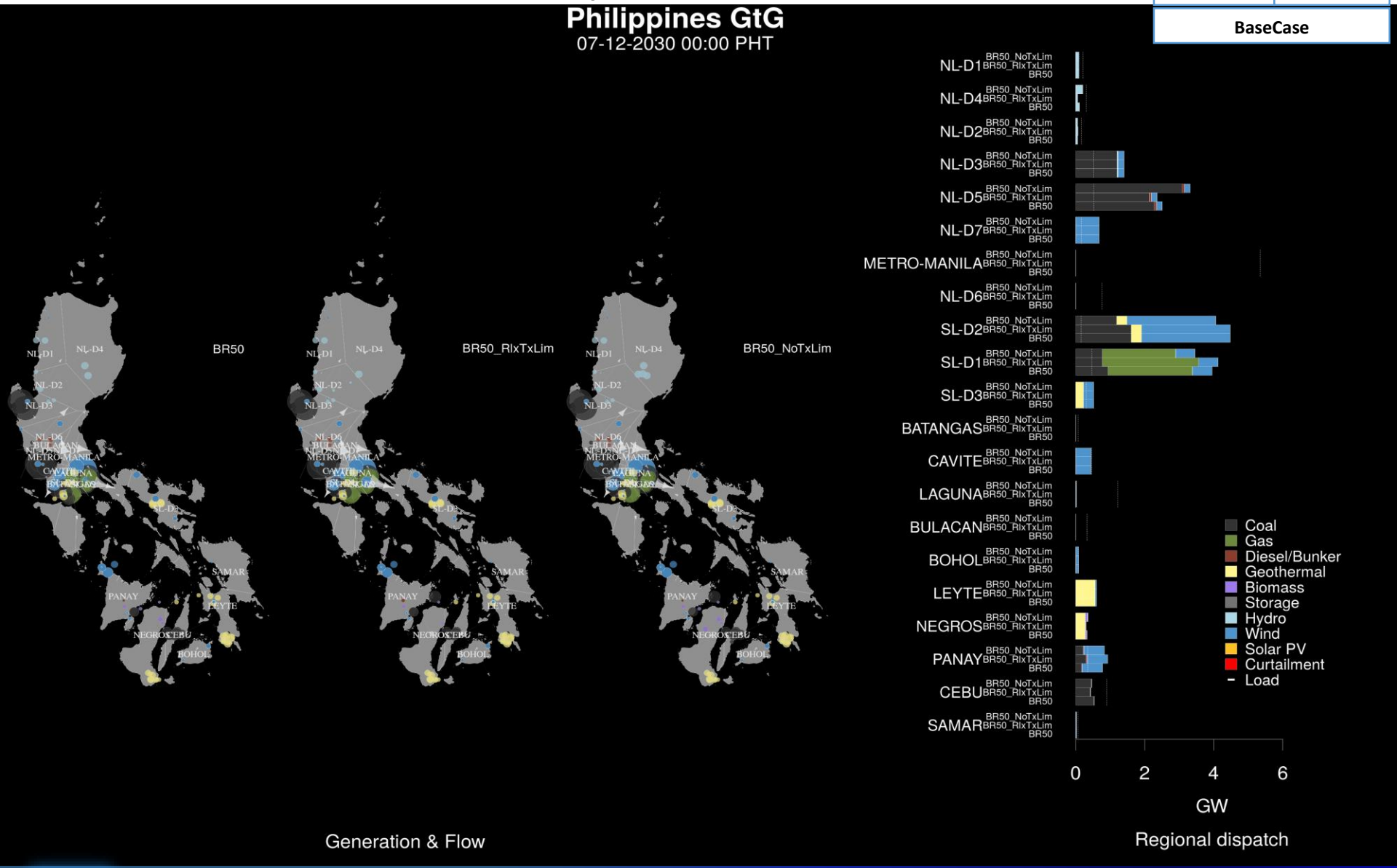


	2014	2030				
		Base Case	BR30	lowTx30	BR50	lowTx50
Total RE	25%	15%	30%	30%	48%	49%
Variable RE	<1%	2%	17%	17%	36%	37%

No technical barriers to high RE penetrations; hourly balancing is achievable under the 30% and 50% RE scenarios. The modeled 2030 Luzon-Visayas System includes existing and new power generation facilities.

Transmission Sensitivity

BR50 | lowTx50
BR30 | lowTx30
BaseCase



PHL RE Grid Integration Study

Summary and Implication to Policy Makers

1. **RE targets of 30% and 50% are achievable** under the assumed power system evolution. However, achieving high RE targets will likely involve **significant changes to power system operations.**
2. Achieving high levels of solar and wind on the grid will benefit from **careful and coordinated planning of generation and transmission development.**
3. **System flexibility can help minimize solar and wind curtailment.** Additionally, strategic curtailments can enhance system flexibility.

PHL RE Grid Integration Study
Summary and Implication to Policy Makers

4. Accessing the **inherent flexibility of the conventional fleet, and procuring new flexible resources**, will contribute to cost-effective integration of variable RE.
5. **Reserve provision may become an issue regardless of RE penetration.** Additional Qualifying Facilities, and/or enhanced sharing of ancillary services between the Luzon and Visayas interconnections will likely be needed.

PHL RE Grid Integration Study
Way Forward

- Web Posting of the Final Report (Summer 2017)
  - DOE and NREL website

- Ongoing initial discussion and preparatory works for the Phase 2 study of the **Greening the Grid Project on Renewable Energy (RE) Zoning**
  - to support the Philippine power sector in planning transmission infrastructure upgrades and/or extensions (i.e., transmission enhancements) in a way that cost-effectively delivers the electricity generated in regions with abundant RE resources to load.

PHL RE Grid Integration Study with the other DOE initiatives

Way Forward

- Classifying Energy Projects as Projects of National Significance
- Integration and Efficiency in the entire energy supply chain (Energy Resource Development, Renewable Energy and Power Concerns, Oil Industry Management and Energy Efficiency & Conservation)
- Spatial planning for energy resources and facilities (including RE Zoning)
- Energy Market Development (RCOA, CSP, Auction, NMS, BTM, ICT and other technologies)
- Resiliency

MARAMING SALAMAT PO

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