Philippine Variable Renewable Energy (VRE) Grid Integration Experiences

VRE Grid Integration: Issues, Enabling Policies, and Finance Measures

ADB Asia Clean Energy Forum

16 June 2015

National Grid Corporation of the Philippines

NGCP
Stronger transmission
for a stronger nation.

Outline

1. PHILIPPINE GENERATION MIX
2. NGCP'S PREDICAMENTS
   a) Remoteness of VRE
   b) Breach of Frequency Limits
   c) Forecast Errors
3. REIS RESULTS AND INTERPRETATIONS
   a) On Variability
   b) On Limited Predictability
4. A SYSTEM CONDUCIVE TO RE INTEGRATION
5. WAY FORWARD

NGCP

Stronger transmission
for a stronger nation.

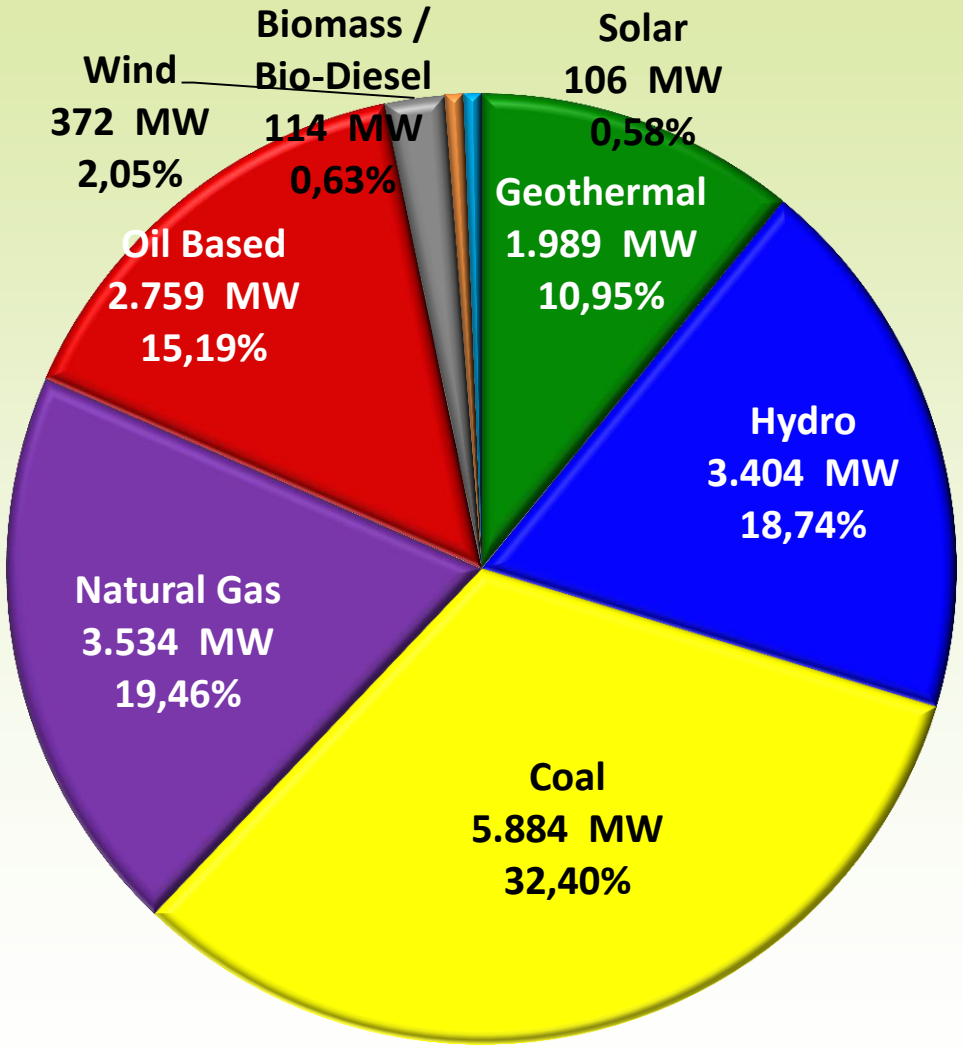
Philippine Generation Mix

Total Installed Capacity:

18,161 MW

2015 Forecasted Demand:

12,491 MW



*As of April 30, 2015

Variable Renewable Energy (VRE) Portfolio

Wind

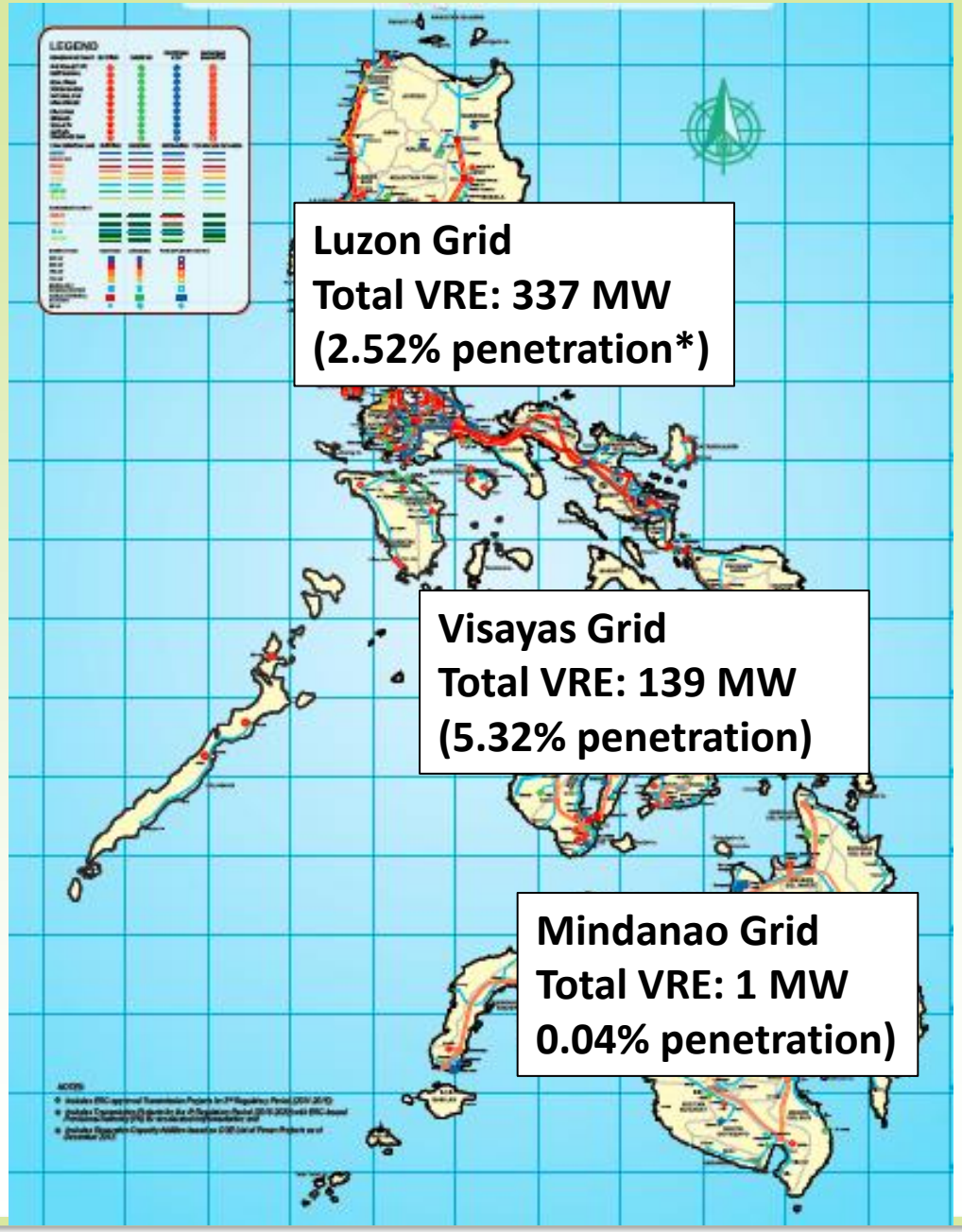
Target: 2,345 MW by 2030

Total Installed: 372 MW

Solar

Target: 500 MW by 2016 and 1,528 MW by 2030

Total Installed: 105 MW

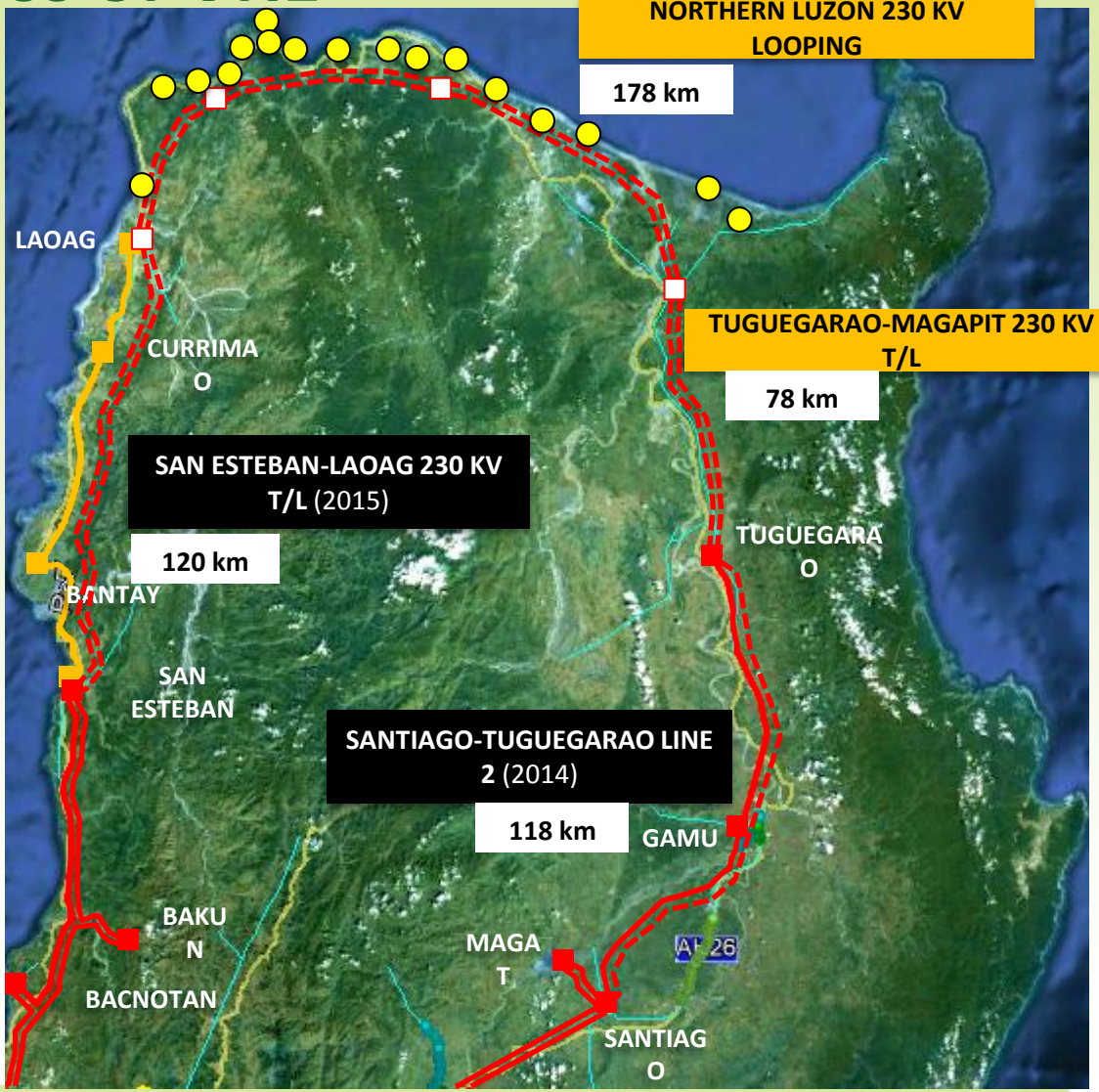


*installed capacity penetration

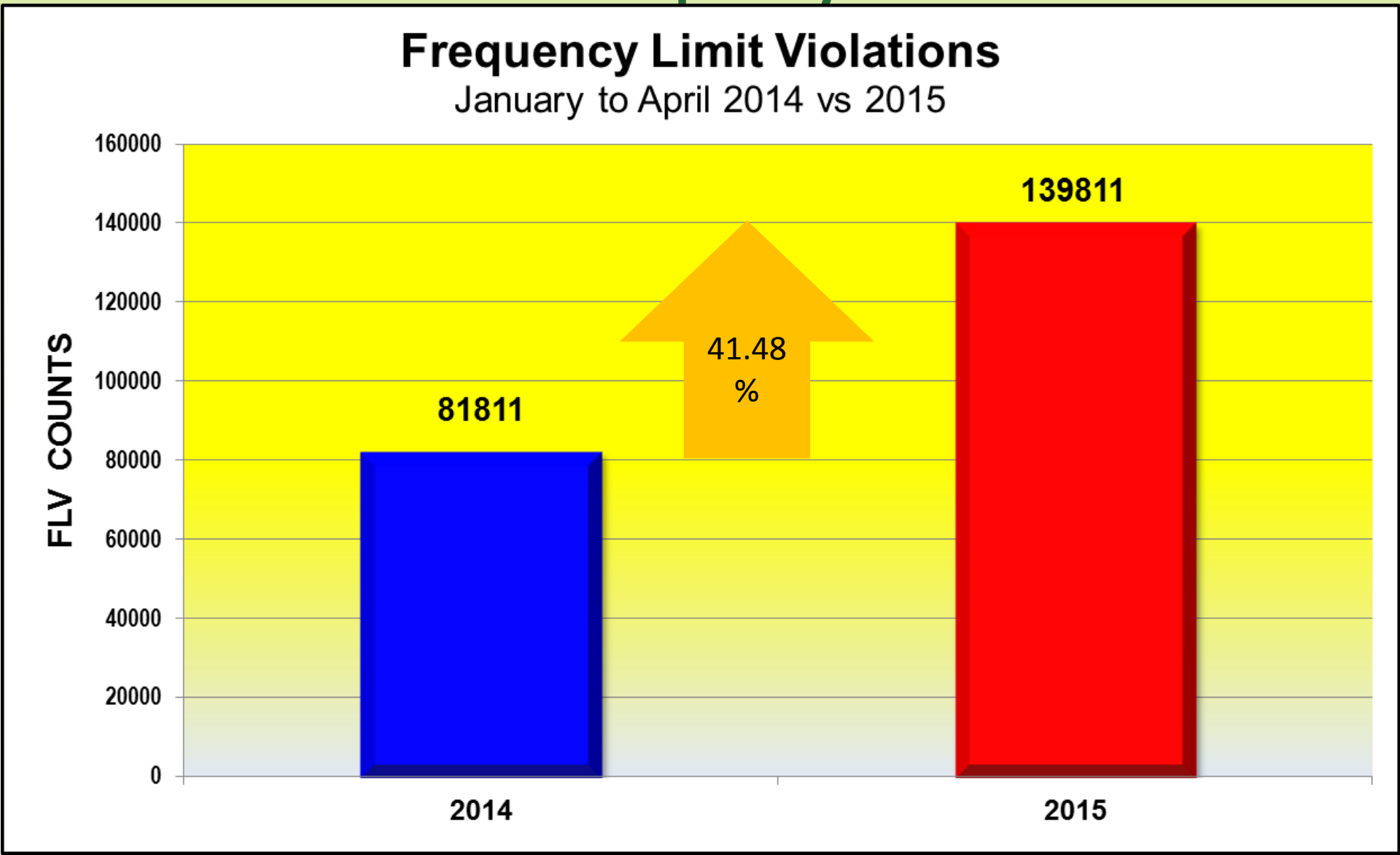
NGCP's Predicaments – Remoteness of VRE

NGCP
Stronger transmission for a stronger nation.

- Wind power in Luzon is highly concentrated along the northern coast where local electricity demand is low
- NGCP is still toiling at the first 230kV transmission extension dedicated on the northwest tip.
- After this project, there will be further 260km remaining



NGCP's Predicaments – Breach of Frequency Limits



NGCP
Stronger transmission
for a stronger nation.

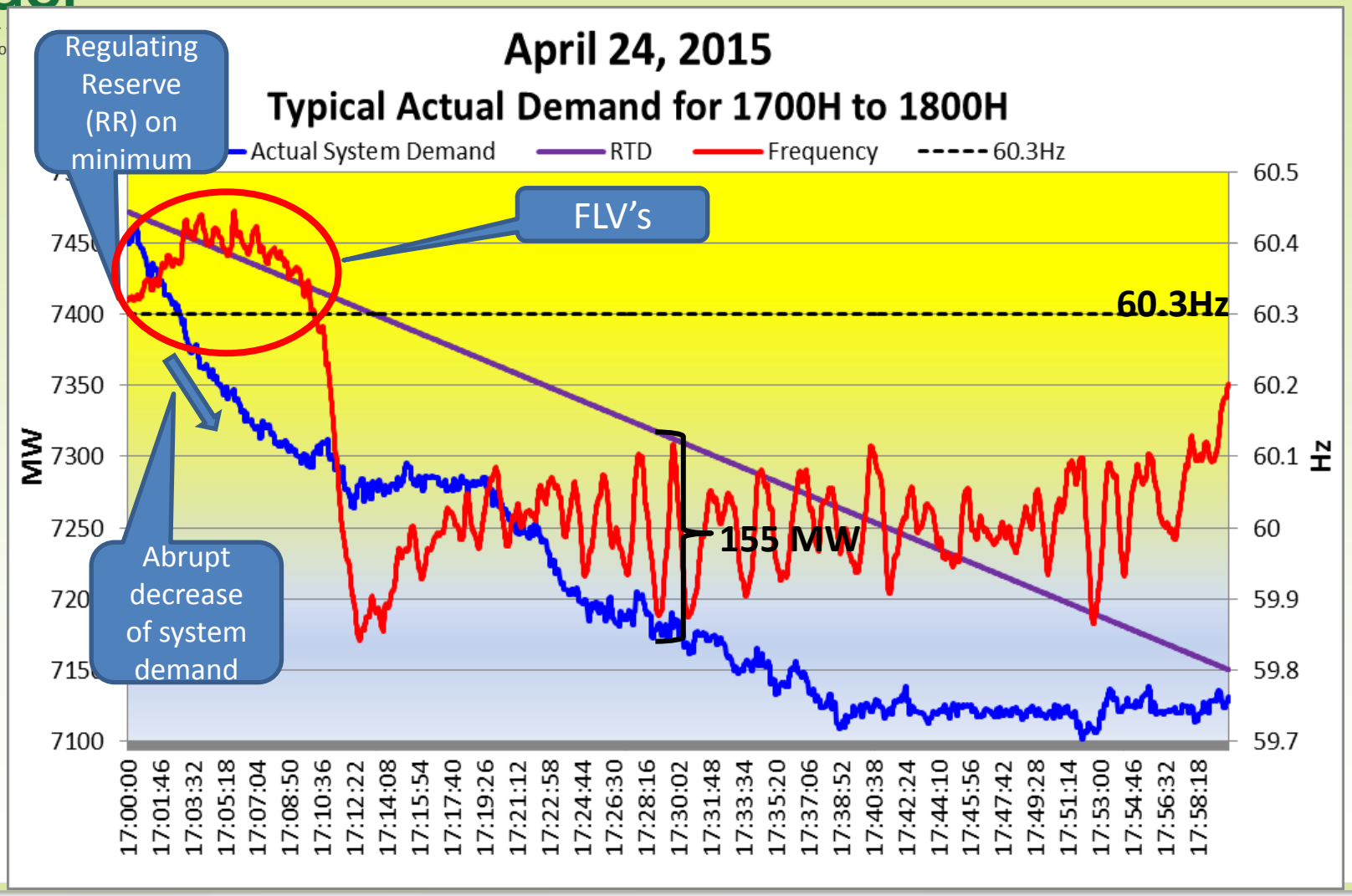
NGCP's Predicaments – Breach of Frequency Limits(cont'd)

Possibly causes:

- HVDC is affecting the power quality in Luzon
- VRE generation
- Cyclic operation of Steel Mills
- Tripping of KSPP as pump
- Number of ALD incidents
- Higher peak demand and lower off-peak demand
- Synchronization of Sual unit with higher Pmin

Although most VREs entered in the start of CY 2015 and the Frequency Limit Violations significantly increased in the first four (4) months compared to CY 2014, a comprehensive assessment is still ongoing to identify the root cause.

NGCP's Predicaments – Forecast Errors



NGCP

Stronger transmission
for a stronger nation.

REIS Results and Interpretations -Variability

1. At low VRE capacity percentage relative to total installed generators, there is no discernible difference between load variability and net-load variability.

2. At higher share, the variability will be a more salient issue if VREs are geographically concentrated, for example, the case in northern Luzon.

NGCP

Stronger transmission
for a stronger nation.

REIS Results and Interpretations -Limited Predictability

1. Limited predictability of VREs has stronger influence on the additional amount of required operational reserve than their variability.

2. Thus, the required operational reserves usually increase along with the growth of VRE

NGCP

Stronger transmission
for a stronger nation.

A System Conducive to RE Integration -RE Transmission Corridors

1. “Northern Luzon 230kV Looping” is a strategic project for RE developers to exploit the largest wind resources in Philippines.

2. “Cebu-Negro-Panay 230kV Backbone” is a critical infrastructure for Cebu to embrace green energy from her two sister provinces where wind farms and solar farms are mushrooming.

NGCP

Stronger transmission
for a stronger nation.

A System Conducive to RE Integration -Adequacy of Regulating Reserve

1. "Free governor" or primary reserve shall be rendered mandatory wherever applicable.

2. Refining of reserve market mechanism shall have a strong bias towards AGC and tertiary reserve for real-time balancing.

3. VREs should be encouraged to be grid-friendly by providing energy storage and frequency response.

NGCP

Stronger transmission
for a stronger nation.

A System Conducive to RE Integration -Joint Efforts in VRE Forecast

1. The key to a high quality forecast is the wider and more detailed meteorological data

2. The real-time VRE generation data shall be made available and accessible to SO for its short-term forecast

3. The responsibility of VRE forecast shall be effectively shared by VRE operators and system operator.

NGCP
Stronger transmission
for a stronger nation.

Way Forward – Balanced Approach

- Feed-In Tariff, transmission expansion for VRE, additional regulating reserve, generation curtailment, generation reduction of fossil-fuel based plants, and all the changes due to VRE, will contribute to the financial impacts on all the players in the industry, especially the end-user.

- The DOE's balanced approach to RE development shall be kept firm to achieve the long-term sustainability of Philippines going green.

NGCP

Stronger transmission
for a stronger nation.

Way Forward – Balanced Approach

- Overall, VRE integration is more of an economic matter than a technical one.

End of Presentation