OSCE Expert Workshop

GO15. Reliable and Sustainable Power Grids

Sharing Best Practices to Protect Electricity Networks from Natural Disasters

Vienna, Austria – 2nd of July 2014

GO15 Members

Voluntary initiative of the world's 16 largest Power Grid Operators (PGOs)

Representing together more than 70% of the world's electricity demand

Providing electricity to 3.4 billion consumers on the 6 continents

Responsible for integration of 2 518 GW of generation capacity into the grid,

Of which 21% is from renewable ener gy sources.

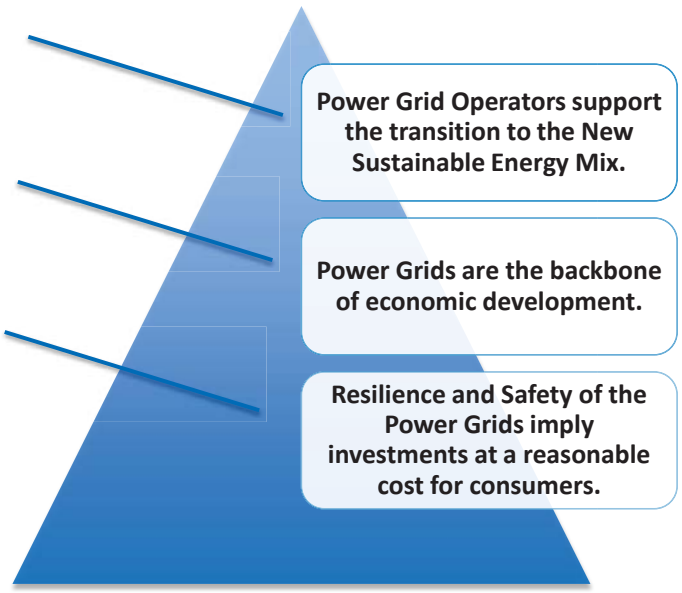
Key Statistics

- Founded in 2004
- Largest grid operators – six continents
- Total peak load: 1,758 GW
- End-use consumers: 3.4 billion
- Transmission lines: 2,271,000 kms
- Energy: 10,210 TWh/Year

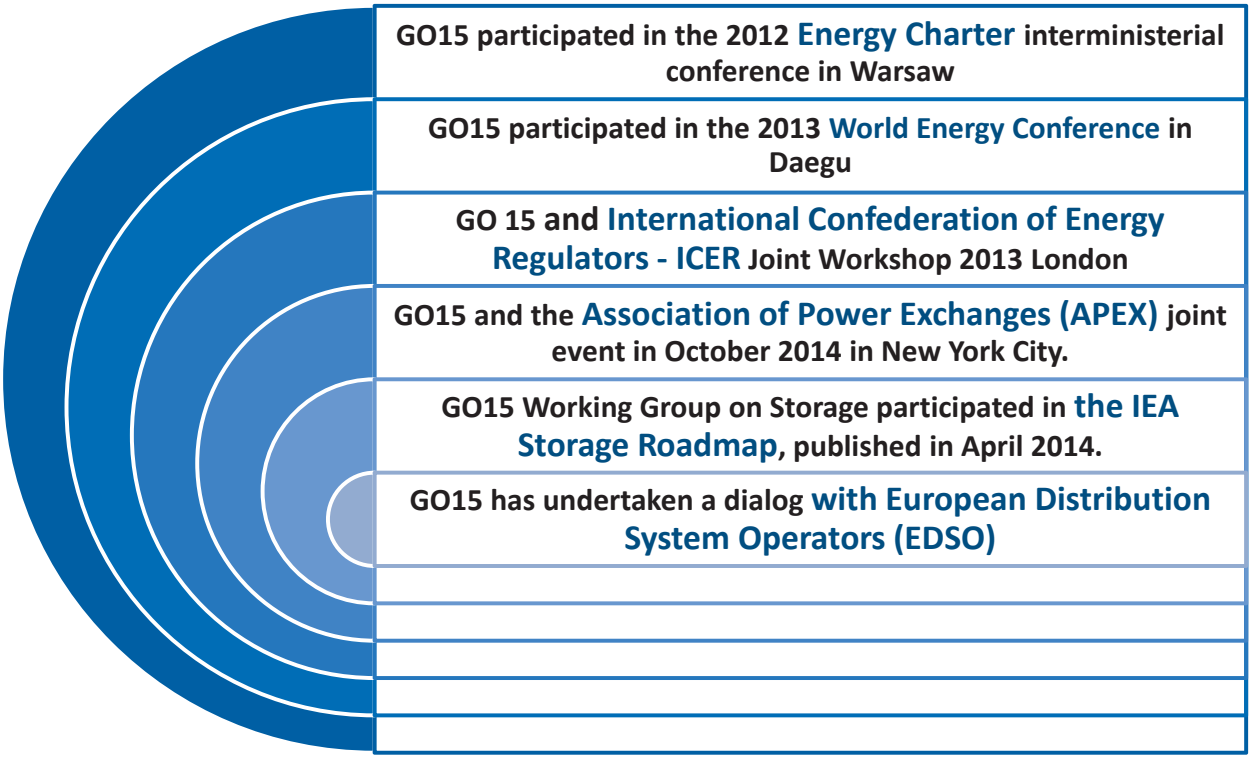
RELIABLE AND SUSTAINABLE POWER GRIDS
CELEBRATING 10 YEARS
October 29th, 2014 - Guangzhou, CHINA

GO15 members Vision & Objectives

To be a leader and a catalyst in the transition of the electric power industry to the power grid of the 21st century.



GO15 Cooperation



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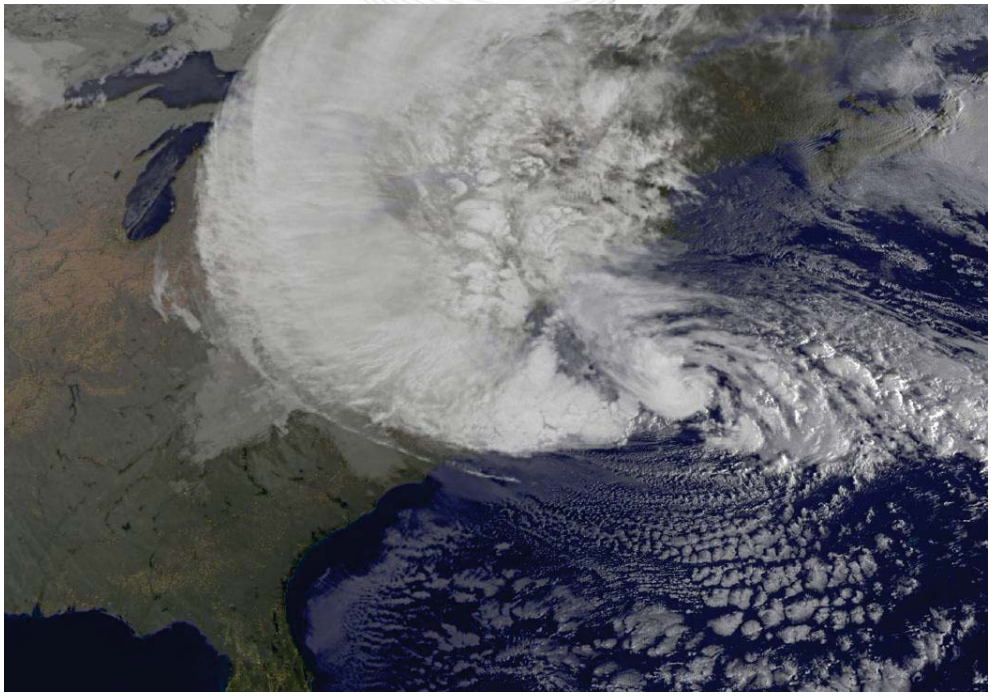
POWER SYSTEM RESILIENCE

Sandy – October 29, 2012



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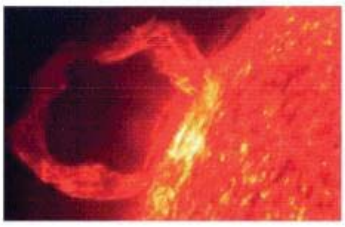
High-Impact/Low-Frequency Events

March 2011
Fukushima

Solar Cycle
Peak 2013



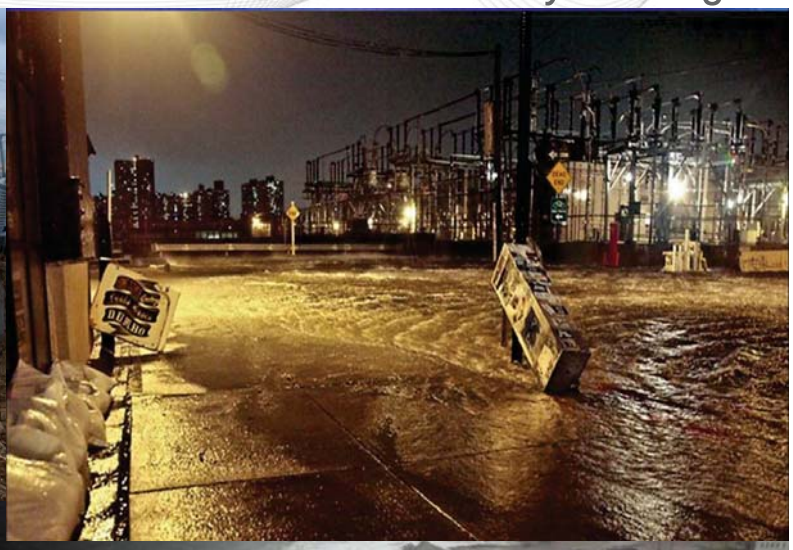
Oct 2011
October Surprise

EMP Threat

Cyber
Security

June 2012
Derecho

Opportunities to Improve Grid Resiliency



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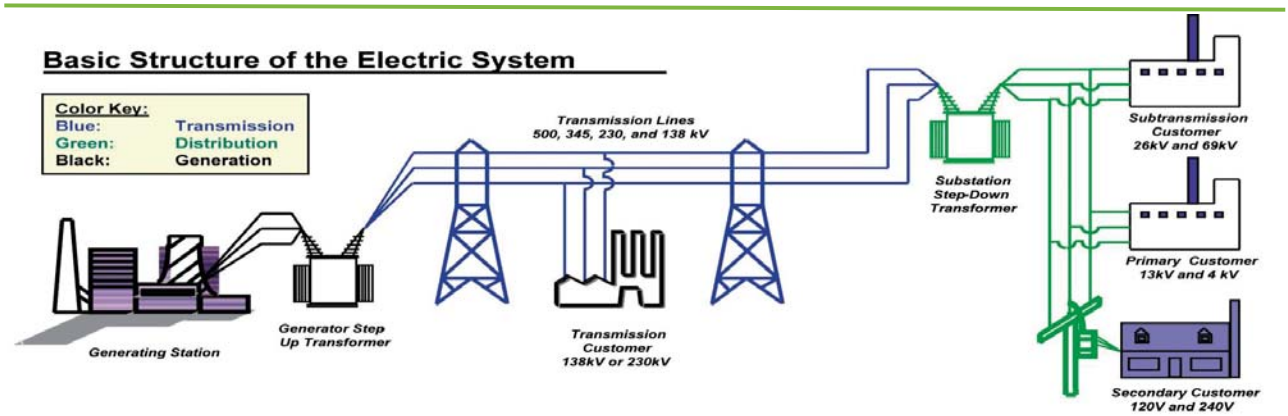
LT - End user Power security



Fuel supply Generation Adequacy	Transmission adequacy N-x redundancy	Overhead/underground network Mean time to repair

Free market ⟷ Regulated Monopoly

Example: ENTSO-E deliverables

- **ENTSO-E Statistical Yearbook and the System Adequacy Retrospect:**
  This report provides a wide range of yearly figures on member transmission system operators' power systems – including production, consumption, cross-border exchanges and network components. **https://www.entsoe.eu/Documents/Publications/Statistics/140318_YS_AR_2012_final.pdf**
- **Scenario Outlook & Adequacy Forecasts 2014-2030:**
  Analyses the adequacy of the pan-European power system by providing an overview of generation adequacy for all ENTSO-E members, for regions and for individual countries at a mid- and long-term time horizon.
  https://www.entsoe.eu/Documents/SDC%20documents/SOAF/140602_SOAF%202014-2030.pdf
- **ENTSO-E Ten Year Network Development Plan (TYNDP)**
  The TYNDP is designed to increase information and transparency regarding the investments in electricity transmission systems which are required on a pan-European basis and to support decision-making processes at regional and European level.
  https://www.entsoe.eu/fileadmin/user_upload/_library/SDC/TYNDP/2012/TYNDP_2012_report.pdf

ST - End user Power security

Short term reliability of the power system affected by:

- Failures in the distribution grids (non redundant design)
- "Excursions" from planning criteria: events that for economical reasons are not taken into account in grid planning
- Asset "health"
- Human failures
- Forecast errors for Renewable energy resources
- Combination of above mentioned risks

Emerging treats:

- Severe weather events
- Cyber attacks
- Terrorist attacks on grid infrastructure

Cascading events and Blackouts

- Simultaneous occurrence of multiple treats can destabilize power system
- Power system operators trigger “DEFENCE PLAN” to return to stable state
- Main measures are shedding of load.
- After stabilization (could be in blackout): activation of “RESTRORATION PLAN”
- Systematic approach for repowering lost load
- In case of severe infrastructure damage:
  - Restoration can take days to weeks
  - Deployment of disaster recovery plan, coordination of operational teams, external contractors, consultation with public authorities, priority setting, communication.

Resilience Definition

Reliability indexes

Several indexes enable benchmarking:

- AIT: average interruption time
- SAIDI: System average interruption duration index
- ….

Analysis to root causes can highlight improvement opportunities

Benchmarking to be done with care and taking into account the boundary conditions of different systems

How can GO15 contribute

- **Cost vs security dilemma:**
  - a generic model was developed to enable experience exchange and benchmarking
  - No common standards, due to great differences in boundary conditions of the different power systems

- **Emergency response:**
  - Database with case studies on severe power system failures
  - Crisis communication protocol
  - Framework for mutual assistance

Collaboration Framework for Mutual Assistance

Objective:	**Faster power grid restoration time following a major disturbance**
Protocole of Mutual Assistance:	**Pre-agreed contractual framework for members to provide services and equipment to a member experiencing a major disruption**
Mapping Guide:	**Provides member looking for assistance with a quick access to specialized resources around the world**
Reference Library:	**Shared documents on past events including root cause analyses and recommended actions**
Crisis Communication Network:	**Regroups members crisis communication teams to exchange best practices and promote efficient communication among members in case of a major event**

Conclusions

- **Resilience is on the agenda of GO15-members**
- **Preventive measures are benchmarked, including costs assessments**
- **Experience exchange is extremely important for low probability/high impact events.**
- **Members agreed on a framework for mutual assistance.**

Thank you