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Change of risk landscape by Smart Grids

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SCOR

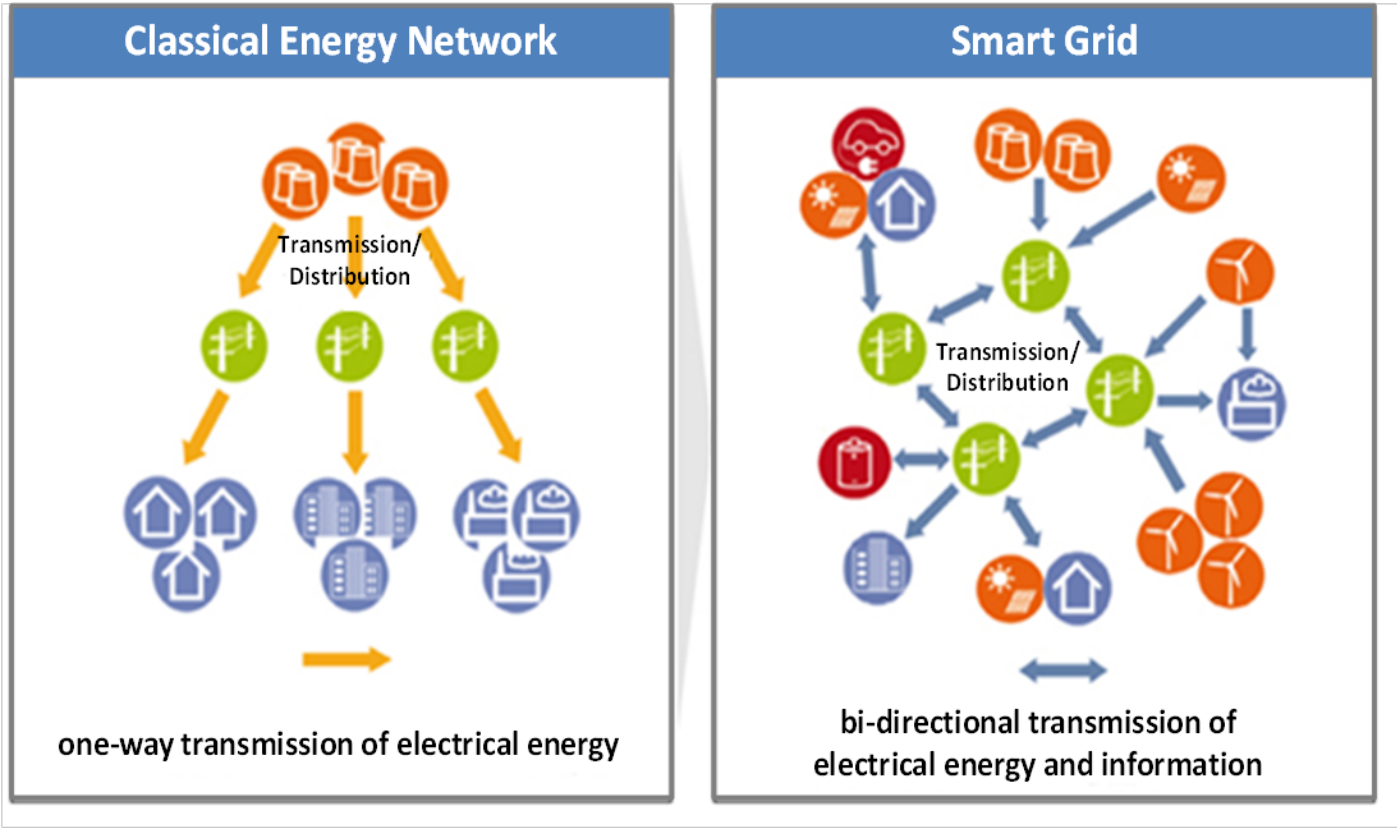
Why we need Smart Grid

Drivers for the future Electrical Systems

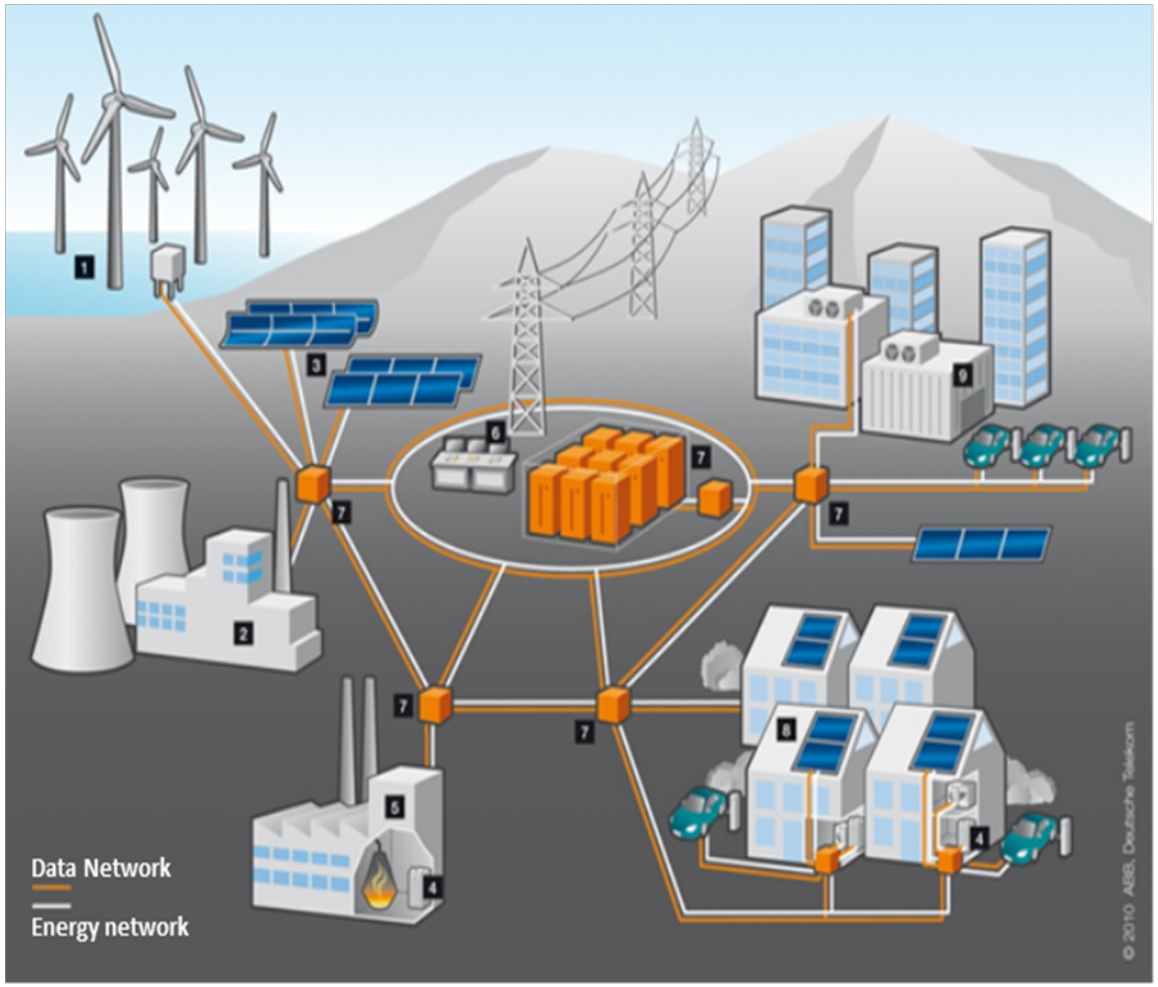
- Capacity – Fulfilling the growing global demand of electrical energy
- Reliability - Providing high quality electrical energy whenever it is needed
- Efficiency - Increasing the efficiency of Power Generation and reducing loses in transmission, distribution and consumption of electrical energy
- Sustainability - Ensuring the effective integration of renewable energy

What is Smart Grids – Producers vs Customers

Smart grid is an upgraded electricity network with two-way digital communications between the supplier and the consumer. Intelligent measuring and monitoring systems have been added



Smart Grids and its possible elements



1. Smart Grid line
2. Conventional Power Plant
3. Renewable energy installation
4. Decentralized Block Power to supply Industrial customers
5. Automated Industrial production Processes
6. Distribution, transmission including Transformer
7. Centralized and Decentralized computer control of energy supply
8. Smart Meter equipped homes producing renewable energy
9. Customers with automated building operation process

Smart Grids Development in the world – Europe

- Smart Grid helps EU to achieve two energy goals

  20/20/20 Power Directive is the driver

  - A 20% reduction in EU greenhouse gas emissions from 1990 levels;
  - EU energy consumption produced from renewable resources to 20%;
  - A 20% improvement in the EU's energy efficiency.

  As a tool to foster competition among Utilities by increasing transparency and encouraging switching between operators

- UK , Germany, France and Italy are the leading investors in Smart Grid development

- Key barriers – Not technical but more social / regulatory

- Lack of interoperability and standards
- Regulatory barriers
- Consumers resistance to participating in trials
- The numerous regulations in Europe

Smart Grids Development in the world – Americas

- Passage of Federal policy " Energy Independence and Security Act of 2007"
- Passage of the America Recovery and Reinvestment Act 2009

- 2030 Power performance target in US
  - 20% reduction in peak energy demand
  - 100% availability to cope with all critical loads at all times
  - 40% improvement in system efficiency/ Max load factor 70%
  - 20% of electricity capacity from renewable energy

- Key Barriers
  - the aging distribution system vs reliability data to be smart
  - Customer Product upgrade
  - legal, privacy, and security risks to share the customer information
  - US stimulus-funded projects wound down.

Smart Grids Development in the world – Asia Pacific

- Diverse Nature : sophisticated nature in Japan / Korea vs first deployment of grids and massive grid upgrade in India and China
- Key Greenhouse gas emission countries drive the renewable energy utilisation
- Japan/ Korea has active 2020 renewable energy target.
- Massive Smart Grid investment in China’s utilization of ultra-high-voltage (UHV) transmission and meter installation
- Resolve interoperability issues, defining the minimum technical requirements for the system and establishing the appropriate technical standards

Technical changes of Smart Grids System

- Energy Efficiency

  Smart meter installation provide the power consumption information

  Decentralized energy supply

  - The increase the transmission capacity on power lines
  - The use of reactive power compensation and
  - The integration of transformers with large outputs and more extensive control ranges

- Changing Production
  - New instruments e.g. demand response or energy storage systems
  - Both electricity producers and electricity consumers need to be able to act more intelligently than before

- Communication
  - Electricity generation, transmission, distribution, storage and electricity consumption are closely coordinated in real time
  - Smart meter and different Area Network (HAN, NAN and WAN) to be formed

Consequence of Smart Grid concepts

- Decentralized electricity supply / demand – Reverse feed in to the existing grid by private and industrial electricity suppliers may cause grid to expose to different scenario
  - Electricity supply may exceeds the electricity consumed and affect progressively to supply level via transformer, to the next higher grid level and cause damage any connect devices if voltage stability measures are not implemented
  - In the event of a short circuit, decentralized power supply are also fed to the faulty location, adversely increasing the power of the short circuit

- Communication – Smart grid requests high degree of developments, standardization and regulatory measures.
  - More vulnerable for cyber threats
  - Privacy on the net
  - Interdependency in a smart grid creates a snowball effect to make damage in an unexpected dimension

Risk Exposure of overall Smart Grid system

General Considerations

- Natural Disasters
- PD / BI to structure and equipment
  - Limits will vary for manufacturers vs service providers
- Contingent Business Interruption
  - What limit is appropriate / how many tiers (multiple supplier)
- Are GL / Products limit adequate to consider the emerging technology (Bodily injury and Property damage)
- loss of or damage to IT systems caused by Cyber risks
- Physical attacks (Terrorism, vandalism, sabotage, unauthorized access, theft)
- Fraud, dishonesty, information leakage
- Failure / malfunctioning of individual or groups of devices, small to large scale power outages

Risk Exposure of overall Smart Grid system

- There is no or minimum coverage for typical Transmission & Distribution Line (T&D) from the traditional insurance market
- Basic risk aspects of the Power System should be similar between Traditional Grid & Smart Grid
- Anticipate the system will continue to be covered by different insurance policies for different interests of individual insured parties.
- However, Smart components, highly decentralized and closely cross-linked characteristic will be difficult to allow the risk assessment of the frequency and severity of the potential interruption
- Increase risk also from not only increased diversity of equipment involved but also due to hugely increased quantity of data handling.

Specific Risk Exposures – BI / CBI

- With smart grid, its distribution automation allow them to indemnify the damage location and shorten the valuable restoration time after the outage

- However, the increasing level of interconnectivity and growing prevalence of digital steering and feedback systems also give rise to new vulnerabilities. It could involve cascading effect with multiple damages and long interruptions if the problem is complex and difficult to repair.

- Very difficult for insurers to estimate and monitor the BI / CBI accumulation

- Design, testing and upgrading of Emergency response plans will drive the reliability of this system

- Complex claim investigation as so many parties involved.

Specific Risk Exposure - Cyber risk

More and more Utility client have concerns as smart gird will change their risk landscape

Exponential growth of threats

Risk for Utility Client:

- Data is at Risk : Potentially large amounts of customer and employee data
- Too many opportunities for Harm (Too much to Protect) : Integral parts of network hooked up to the internet to be easily managed remotely, which increases their susceptibility to malicious attack
- Sophisticated industrial control and data acquisition systems (SCADA) targeted by hackers
- Dynamic regulatory environment
- Business/service interruption or lost income due to cyber incident
- Bodily injury or property damage resulting from cyber incident.

Risk Exposure - Cyber risk

- Globally, installed significantly more smart meters / grid system
  - fraud through manipulated meter readings
  - misuse of private customer data
  - a threat of power outages through a large cyber attack

- Power companies in general have no insurance against major cyber attacks. Most insurance products currently available will cover minor things such as data losses or downtime caused by IT issues, but not major events like explosions at multiple facilities triggered remotely by hackers

- Cyber risk is a standard exclusion from general property policy, explicitly excluding loss or damage caused by software, viruses or other malicious computer code.

- Cyber risk stand alone coverage is available from limited players but at very beginning stage (inadequate artuarial data / expertise to assess /price the risk).

Open Questions

Few loss and technical experience available in the market creates lot of open questions for insurance market :

- How to assess change of the frequency and severity of power outage based on the new smart system
- How to assess Accumulation for MPL
- Who are the insured who may be impacted by smart grid system damage / Will they be insured under the same policy
- How to split local event
  - Could there be unpredictable knock on effects as a result of one or a combination of several failure.

Open Questions

- While more renewable energy to be used and more conventional power under maintenance mode,
  - Will the future electricity storage systems be good enough to cope with this networks
  - What happens if more than one conventional power plant down at the same time
  - Can a failure of grid control center lead to a critical power outage
- Could a cyber attack block inter-operator communication to a critical point
- Cyber attack exposure assess
- How to assess the power outage exposure when there are more and different peak demand situations.

Claims Review

- No similar major claims related to Smart Grid has been reported

- Evaluate past top 10 historic power outages losses to conventional T&D and anticipate the occurrence from Smart Grid environment
  - Smart Grid implementation shall lower the frequency of power outage as it gives flexibility in response to small local failure (quicker identification of the problem, routing around problem areas, and expedited resolution)
  - The regional failure the ultimate severity will depend on the circumstances of an occurrence
  - However volatile renewable source such as Wind Power may cause outage

- Interconnectivity and growing digital system may involve cascading effects with multiple damages and long interruption in the worst scenario. CBI Claim settlement will be complex due to multiple parties involved.

Conclusion

- Smart Grid still in the preliminary stage now but it is clearly the future
- Technical and regulatory will be standardized
- More and more comprehensive systems will be put into use in the coming 5 to 10 years
- BI /CBI assessment and accumulation and Cyber risk exposure are critical
- Various study in insurance market to provide solutions