Transformation of the Power Grid and Changes in its Use

Keynote Speech, 26 April 2019
International Istanbul Smart Grids & Smart Cities Congress

Professor Saifur Rahman
Director, Virginia Tech Advanced Research Inst., USA
President, IEEE Power & Energy Society

Grid Reliability and Digitalization – Players in the digital grid

The assets

Solar power
Wind power
Hydro power
Thermal power
Prosumers
Industry

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Internet of energy ecosystem

Key applications

Monitors
Aggregates
Analyzes
Understands
Controls

Planning & building
Operations
Service
Market

Key elements

Cloud & storage
Analytics
Artificial intelligence
Cybersecurity

Integrates all players
Enables new services
Enables new business models

Generators
Aggregators
Grid operations
Market operators
Retailers

Source: ABB
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Multiple sources of cooling, heating and electricity, wide access to DG, and 2-way interaction between EVs and grids is increasing.

Multi-energy interconnection and open sharing on the user side, energy consumers are also energy producers, energy consumption patterns are more diversified.

China’s electric energy accounts for the proportion of terminal energy consumption (from SGCC).

Electric Vehicle Penetration

Data from the “China Automobile Association”

1/3 Estimated daily consumption (24 billion kWh) in 2030

100 kWh/per car × 80 million = 8 billion kWh.

Total vehicle EV

<table>
<thead>
<tr>
<th>Year</th>
<th>2016</th>
<th>2020</th>
<th>2030</th>
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<tbody>
<tr>
<td>194 million</td>
<td>270 million</td>
<td>400 million</td>
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<tr>
<td>1.09 million</td>
<td>5 million</td>
<td>? million</td>
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Novel power system integrated with modern information technology

Source: SGCC

The Novel Power System Ensures Energy Transition

Extensive & interconnected

Open & sharing

New generation power system

Smart & interactive

Flexible & resilient

Secure & controllable

Source: SGCC
Energy: Efficient, Reliable, Compatible and Open

Customer: Flexible, Intelligent, Credible and Interactive

Energy production

Energy flow

Data flow

Business flow

Environmental information

Source: SGCC

Global Energy Interconnection: Vision

Source: www.GEIDCO.org
Cross-border Power Exchange in Europe

Europe, Middle East and North Africa

EU DeserTech Project
Evolution of the Grid

Before Smart Grid:
One-way power flow, simple interactions

After Smart Grid:
Two-way power flow, multi-stakeholder interactions

Distribution domain:
• Distribution automation/Fault isolation and restoration of electric power grid

Customer domain:
• Building energy management
• Demand response
Structural Change in the Distribution System

Distribution System Operator (DSO)
Microgrid Level Deployment in Chicago

Buildings consume over 40% of the total energy consumption in the U.S.
Building Automation Platform

Utility/DR Aggregator
- DR Event
- Pricing
- Billing

Encrypted Data Link
Router

Internet

Customers/Operators

Buildings

HVAC
Lighting loads
Plug loads
Sensors/power meters
Water meters
PV & storage
Security camera

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Thank You

Prof. Saifur Rahman, PhD
srahman@vt.edu

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