

21CPP – ACCELERATING THE TRANSITION TO CLEAN, EFFICIENT, RELIABLE AND COST-EFFECTIVE POWER SYSTEMS

Evolving Generation Portfolios

Electric Vehicles

Smart Grid, EE & Demand Response

Cross Cutting Issues:
Operations,
Transmission,
Distributed
Generation
Market Design

Coordinated Power System Planning, Policy, and Regulation

Select Funders and Partners



In-country Technical Assistance

- Brazil, China, India, Mexico, South Africa
- Similar PST programs with USG and foundation support with Colombia, Indonesia, Morocco, Vietnam, others

Thought Leadership

Information Exchange & Capacity Building

Power Systems of the Future
A 21st Century Power Partnership Thought Leadership Report
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National Renewable Energy Laboratory
Spain: Argonne Energy Innovation Policy and Technology LLC
France: Fraunhofer Institute for Energy Efficient Buildings

Flexibility in 21st Century Power Systems
Introduction
The power system has been transformed over the past few decades. The transition from a centralized, fossil-fueled system to a more decentralized, renewable energy system is well underway. This report explores the challenges and opportunities associated with this transition, focusing on the role of flexibility in the power system. It discusses the need for flexible generation, transmission, and distribution assets, and the importance of market design and regulation in supporting a flexible power system. The report also provides a framework for assessing the flexibility needs of a power system and offers recommendations for policy and market design.

Market Evolution: Wholesale Electricity Market Design for 21st Century Power Systems
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France: Fraunhofer Institute for Energy Efficient Buildings
Introduction
The wholesale electricity market is a key component of the power system. It provides a platform for the trading of electricity, and its design has a significant impact on the efficiency and reliability of the power system. This report explores the challenges and opportunities associated with the evolution of the wholesale electricity market, focusing on the need for market design and regulation that supports a flexible power system. The report also provides a framework for assessing the market design needs of a power system and offers recommendations for policy and market design.

Analyzing Driving Factors and Enabling Policies for Future Power Transformation Pathways

Business as Usual

- Goal: replace aging assets with same, newer assets; meet existing fed/state policies
- Impact: Trans. grid improved, but not modernized (same updated equip.), increase carbon
- Tomorrow: central gen. dominates, slightly improved T interconnectivity (one-way system communications; some DER), same wholesale/retail markets, objective = least-cost

Low-Carbon, Centralized Generation

- Goal: replace aging generation w/low-carbon, centralized gen.: 1) utility-scale RE, 2) natural gas, 3) nuclear, and/or 4) clean coal; (but what can/will utility own differs by region)
- Impact: Slower/decreased carbon output; some DER; curtailment likely; better Trans. grid
- Tomorrow: Low-carbon, centralized generation dominates in 20 years, improved T interconnectivity, updated 5-min. markets, objectives = lowest risk, lowest carbon

Rapid Growth of DER

- Goal: Growth of distributed energy resources (DER: non-dispatchable DG, distr. storage)
- Impact: Shift towards DG PV (primarily) and storage; some distribution grid improvements
- Tomorrow: Measurable energy and capacity needs met with DER in 20 years, improved D interconnectivity, updated wholesale/retail markets, objective = resilience

Interactivity: Grid and Demand

- Goal: Fully interactive T&D grid and substantial interactive demand (including DR) in 20 yrs
- Impact: Fully optimized, communicating, and modernized T&D grids (planning and ops)
- Tomorrow: Max. grid flexibility (gen., loads, storage, new T&D, power systems ops.); updated wholesale /retail markets; Consumer control; objectives=grid flexibility, consumer desires

Grid Defection

- Definition: Past a tipping point – measureable grid defection in next 20 years;
- Impact: Rising costs (same cost over fewer customers) leads to more defection;
- Tomorrow: consumers tired of escalating electricity rates, so decide to disconnect from the grid. Assumes full grid defection (not using grid as backup)

Thank you

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