

Michael Pesin

Deputy Assistant Secretary

Grid Systems & Components

Office of Electricity

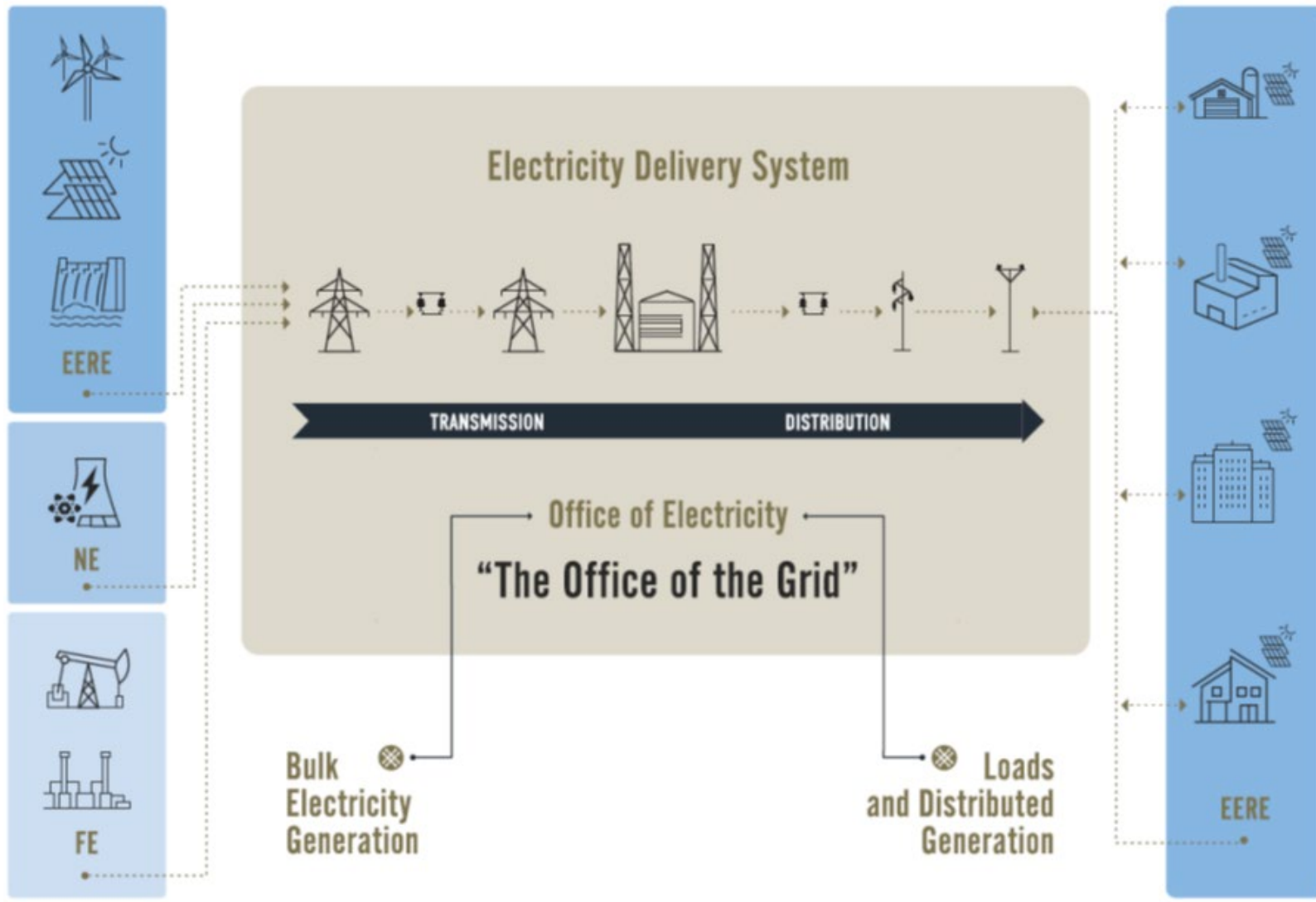


Office of Electricity

Working closely with private and public partners, our organization leads the Department of Energy's efforts to strengthen, transform, and improve energy infrastructure so consumers have access to resilient, secure, and clean sources of electricity.

The Grid Systems and Components Division – formerly the *Advanced Grid R&D Division* - at OE leads national efforts to develop next-generation technologies, tools, and techniques for the electricity delivery system.





Drivers of Change

- ✓ Efforts to decarbonize the grid and the US economy
- ✓ Rise of non-dispatchable and inverter-based generation
- ✓ Changing grid edge – bi-directional power flow
- ✓ Evolving demand for electricity - electrification
- ✓ Growing physical and cyber threats
- ✓ Efforts to reduce social inequalities
- ✓ Impact of energy transition on employment
- ✓ Globalization of supply chains



Grid Systems and Components

- Advanced, Modular, Flexible Transformers
- Cables and Conductors
- Solid State Power Substations
- HVDC/MVDC Systems
- Power Flow Controllers (PFC)
- Solid-State Components
- Advanced Materials
- Robotics/Autonomous Vehicles
- Microgrids
- Applied Grid Transformation Solutions

Communications and Controls

- Advanced Grid Modeling
- Sensors and Data Analytics
- Transmission Reliability – Planning/Operations
- Observability/Controllability
- Advanced Distribution Management Systems
- Transactive Energy
- Buildings/EV- Grid Integration
- T-D integration
- North American Energy Resilience Model
- SecureNet

OE R&D Portfolio

Energy Storage

- Energy Storage R&D
- Energy Storage Safety and Reliability
- Energy Storage Policy, Valuation,
- Environmental Justice



Grid Trajectory Considerations



**High RE Penetration,
High-Voltage AC+DC
Grids, and Storage**

Loose Coupling
Agile/Flexible

**Dynamic
and
Coordinated
Grid across
TD&C**

Next-Generation Electricity Network

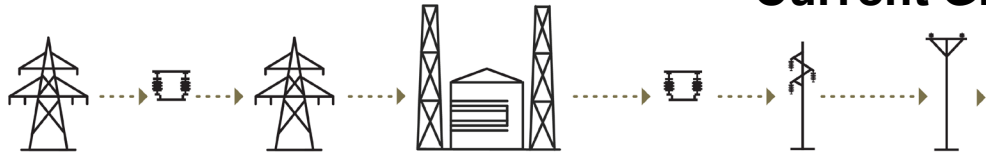
- Control of flexible generation and load
- Energy storage
- Synthetic inertia
- Multi-directional power flow
- Varied/dynamic grid configuration
- Evolving business and market structures

Capital Intensive
Economies of scale

Capital Diffuse
Network economies

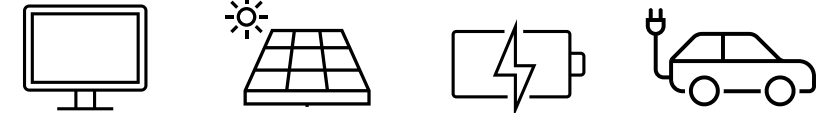
Current Grid

**High DER + Complex
Industry Structure**



TRANSMISSION

DISTRIBUTION



INTEGRATED DISTRIBUTION AND CUSTOMER ASSETS

Tight Coupling
Rigid/Brittle



Thank You

Michael Pesin - Deputy Assistant Secretary
U.S. Department of Energy, Office of Electricity,
Grid Systems and Components