

NERC

NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

NERC's Smart Grid Task Force

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to ensure
the reliability of the
bulk power system

- NERC
- The Changing Power System
- The Smart Grid Landscape
- Smart Grid Task Force (SGTF)

- The electric industry’s “self-regulatory organization” for reliability
 - Balances the interests of all stakeholders
 - Represents industry consensus
 - Independently acts in the best interest of reliability
- The regulator’s “electric reliability organization”
 - International “charter” lending government support and oversight to NERC activities, ensuring that the best interests of society-at-large are represented

About NERC: Mission

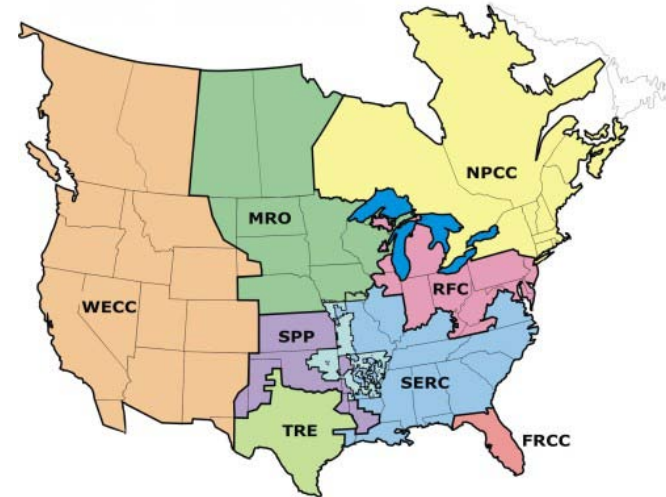
To ensure the reliability of the North American bulk power system

- Develop & enforce reliability standards
- Assess current and future reliability
- Analyze system events & recommend improved practices
- Encourage active participation by all stakeholders
- Pursue mandatory standards in all areas of the interconnection

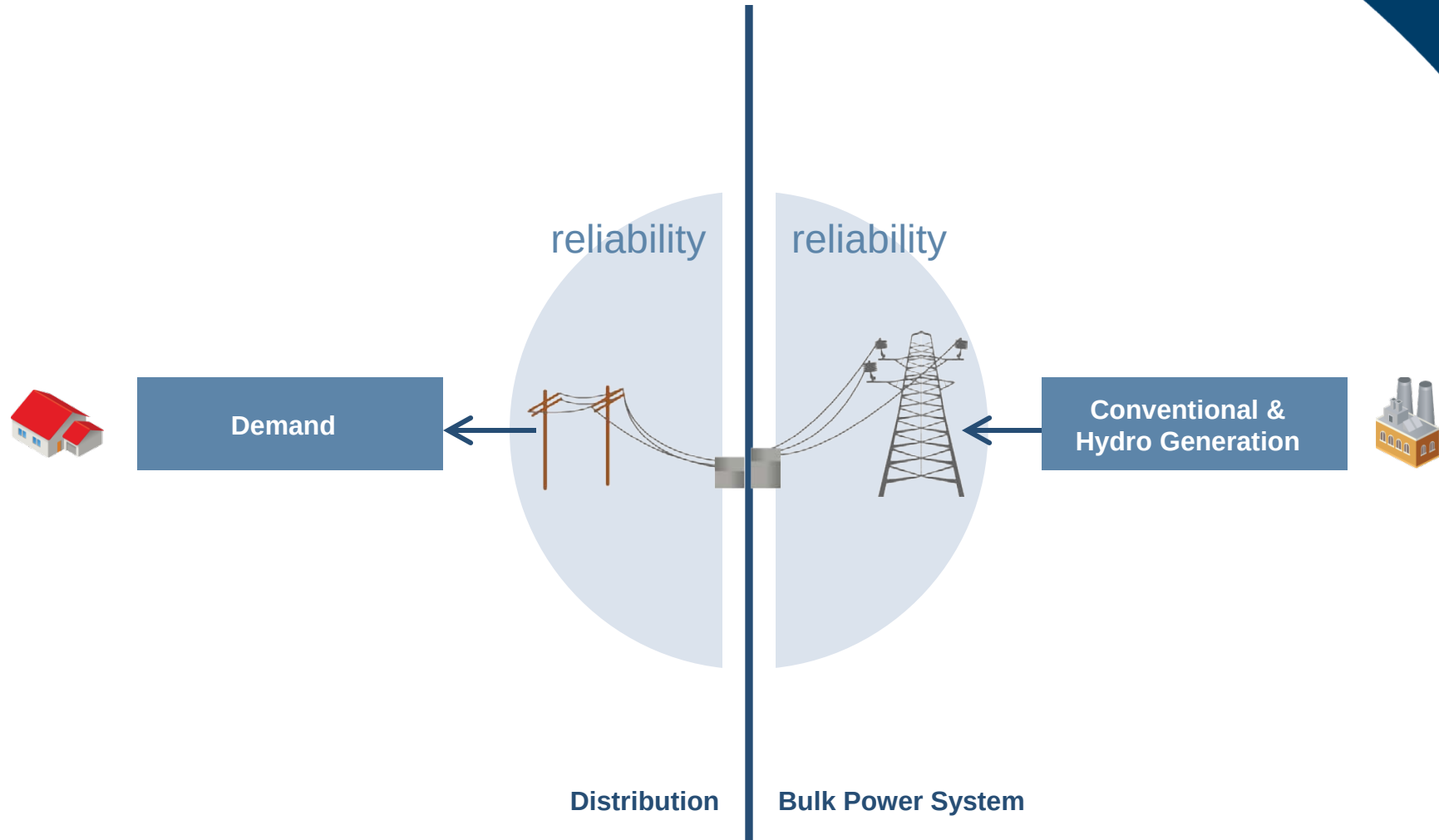


About NERC: Regional Entities

- Delegated functions
 - Compliance
 - Regional standards
 - Organization registration
 - Reliability assessment
 - Reliability readiness and improvement
- Regional consistency is key
 - Transparency
 - Predictability
 - Uniform outcomes

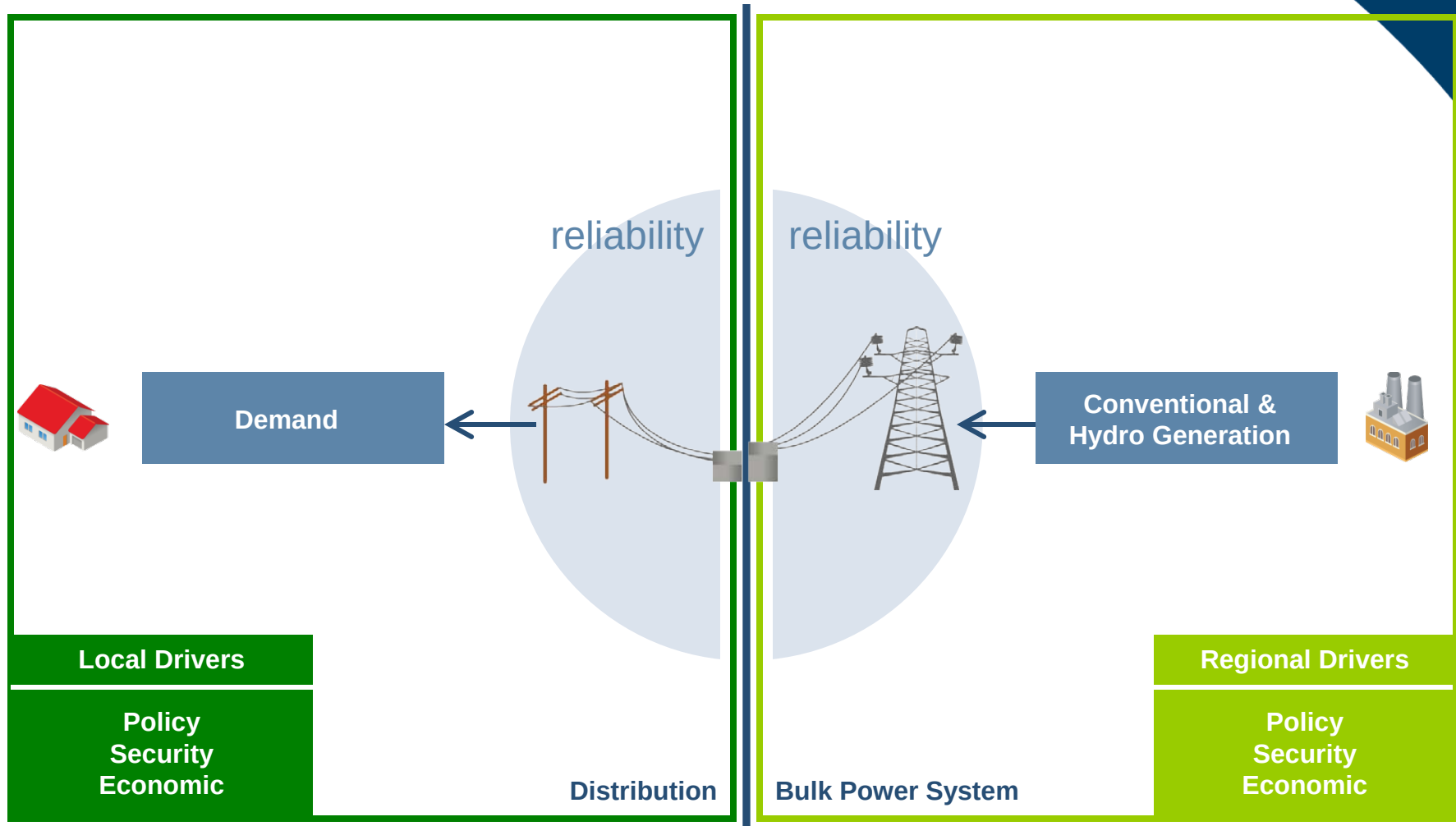


System: A Traditional View



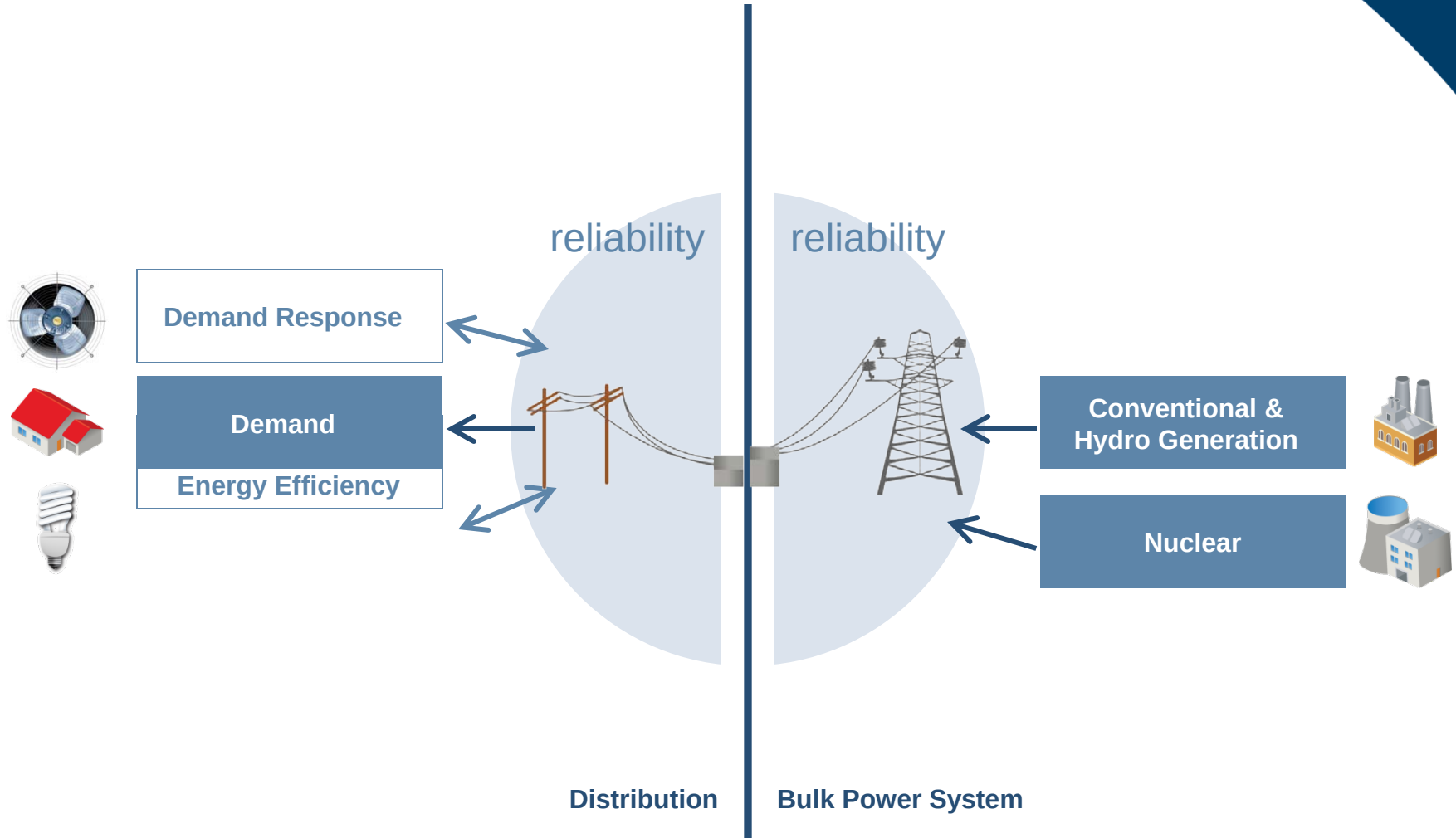
Over the past 60 years, we've divided the "grid" into two separate systems. Reliability requirements are different for each system.

System: A Traditional View



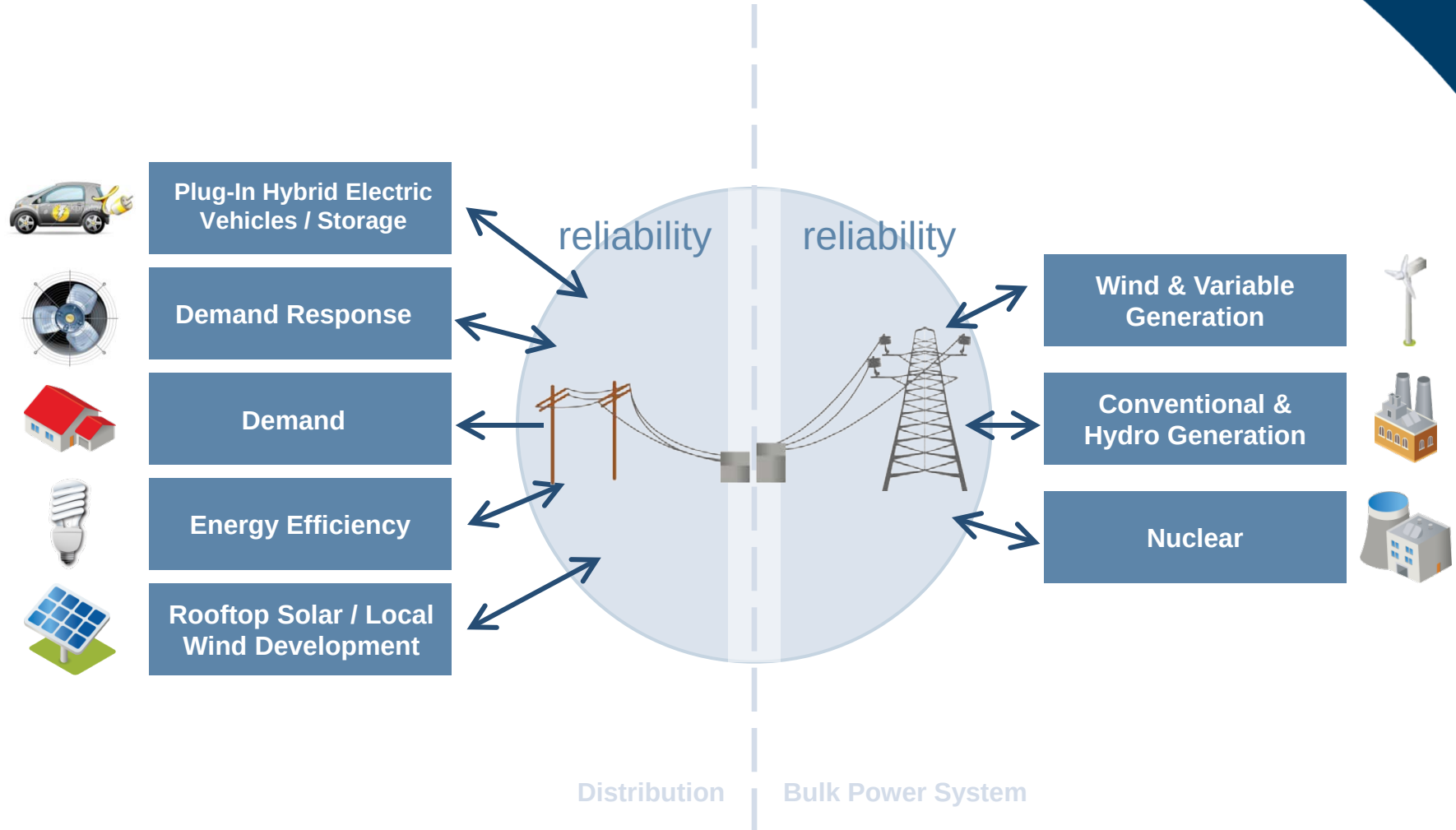
Policy and other drivers of development developed along the same line – factors that affected one system did not necessarily affect the other.

The System Begins to Change



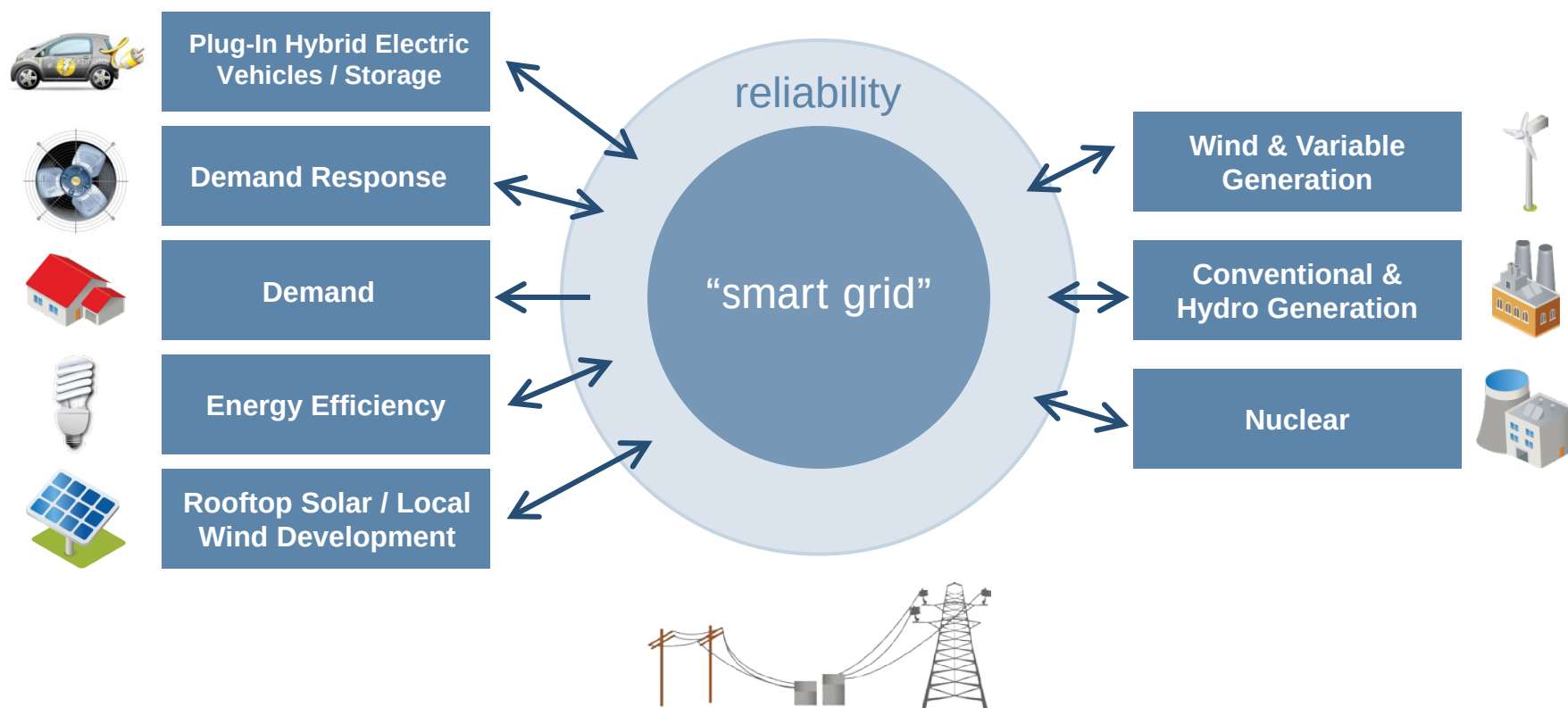
As new resources were added in the 1970's and 80's, bulk system reliability became more dependent on distribution-level assets like demand response and energy efficiency. This began to blur the line between the bulk power system and the distribution system.

The 21st Century Grid Emerges



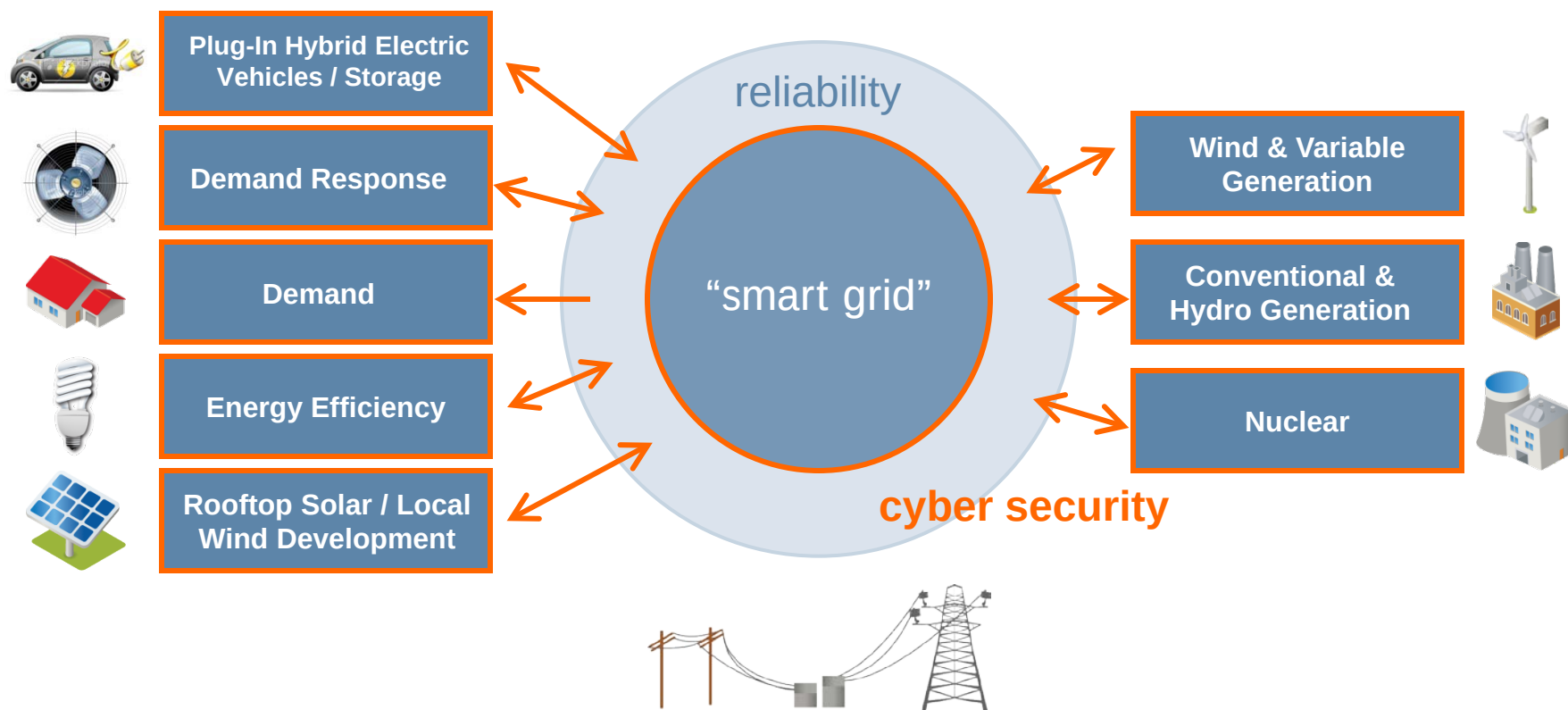
The development and successful integration of these resources will require the industry to break down traditional boundaries and take a holistic view of the system with reliability at its core.

The Smart Grid



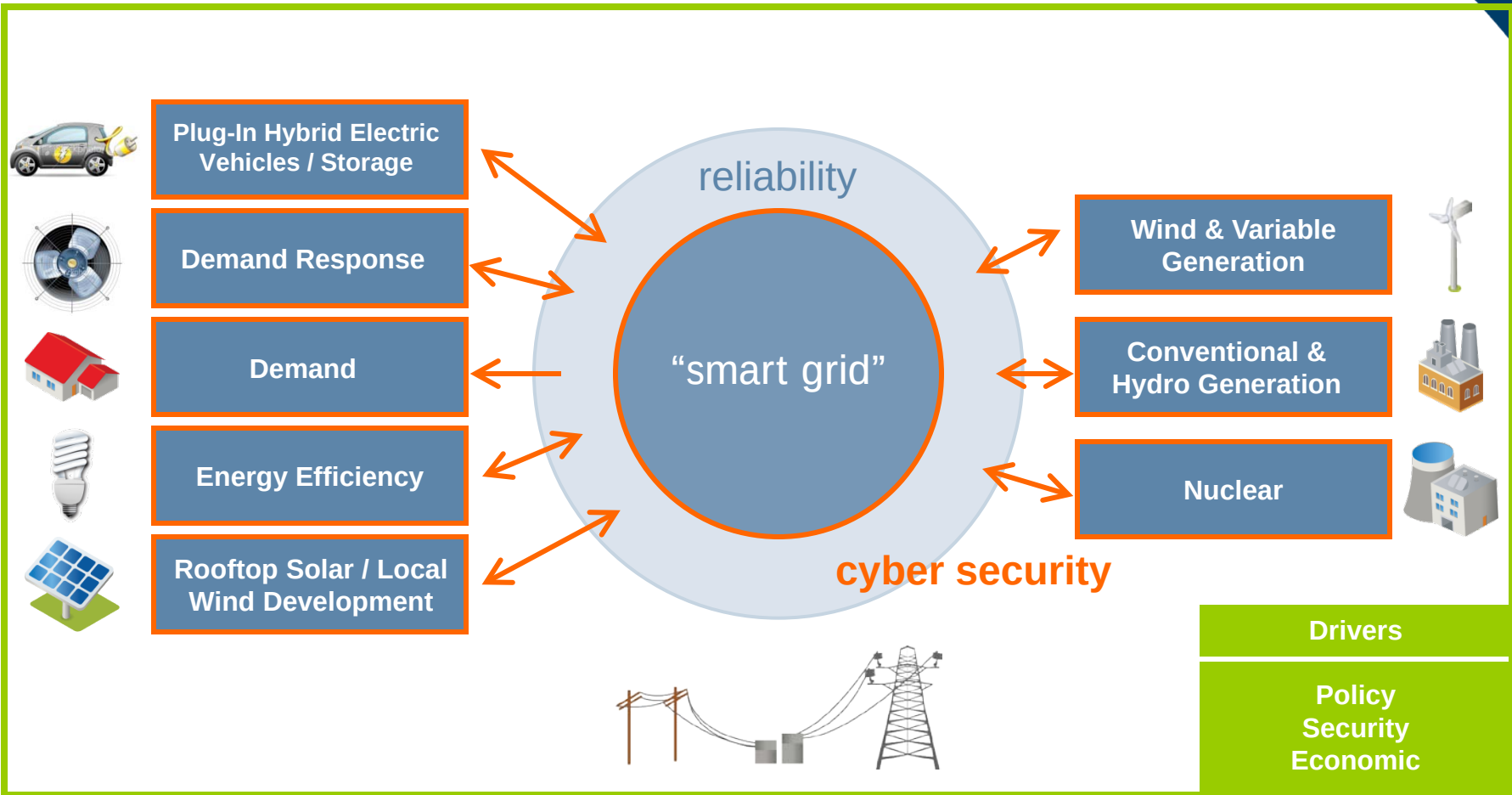
The "Smart Grid" completes the picture of a fully integrated system without boundaries. Stretching from synchro-phasors on the transmission system to smart appliances in the home, these systems will enable the visualization and control needed to maintain operational reliability.

Common Challenges



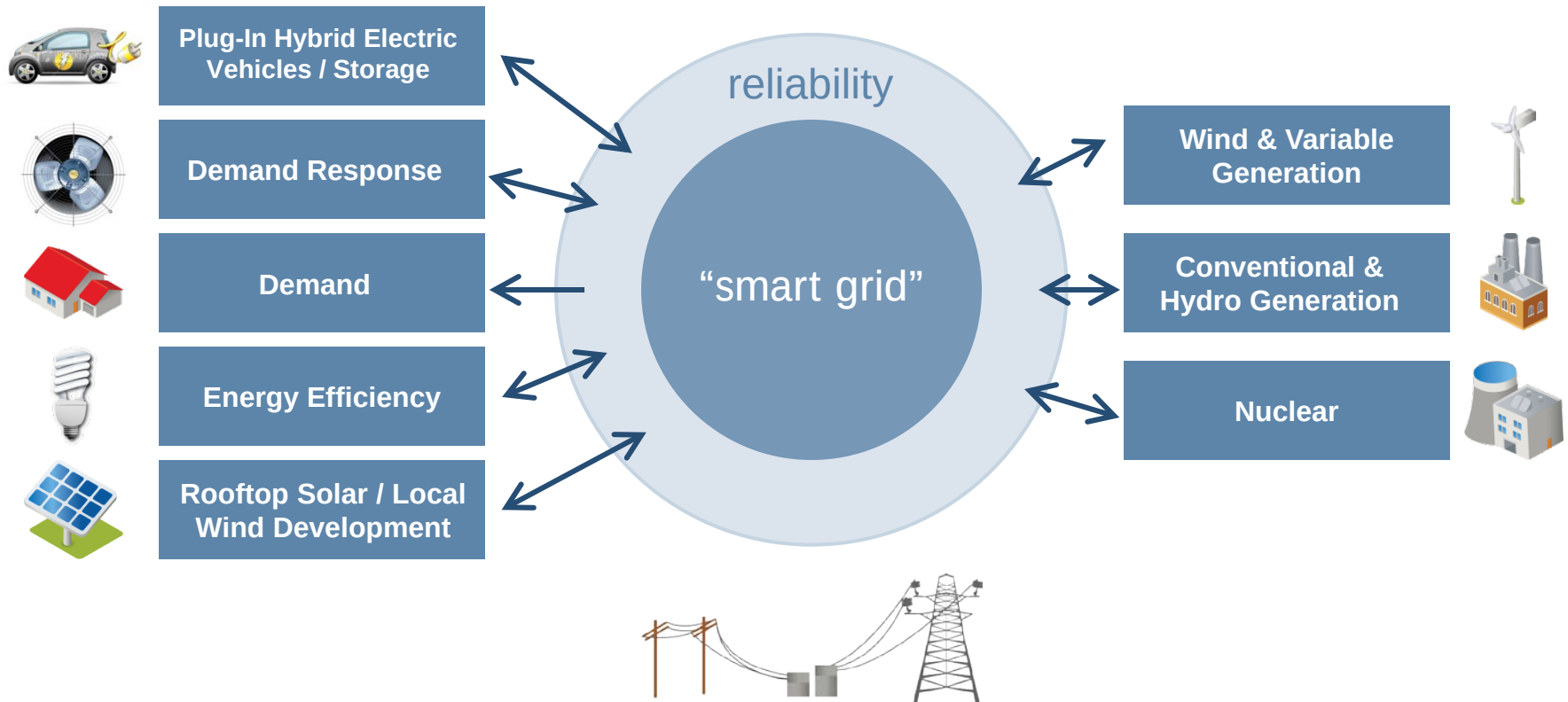
Cyber security is one of the most important concerns for the 21st century grid and must be central to policy and strategy. The potential for an attacker to access the system extends from meter to generator.

Common Drivers



Building the 21st century grid requires a comprehensive and coordinated approach to policy and resource development – looking at the grid as a whole, not as component parts.

The 21st Century Grid



Reliability Considerations

- Coordination of controls and protection systems
- Cyber security in planning, design, and operations
- Increased reliance on distribution-level assets to meet bulk system reliability requirements
- Important to consider these affects on:
 - Ability to maintain voltage and frequency control
 - Disturbance ride-through (& intelligent reconnection)
 - System inertia – maintaining system stability
 - Modeling harmonics, frequency response, controls
 - Device interconnection standards

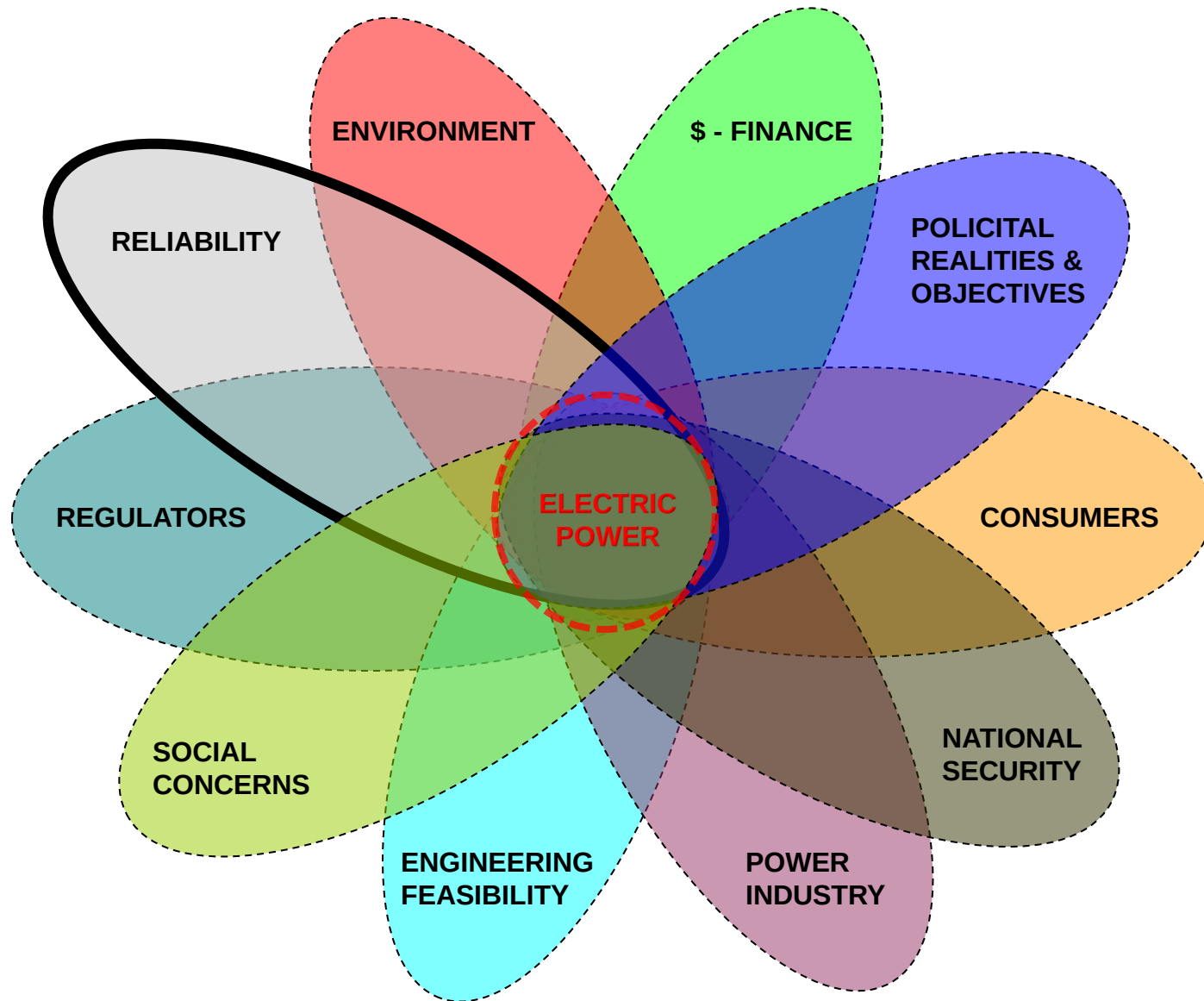
System Benefits

- Enhanced flexibility and control
- Balancing variable demand & resources (storage, PHEV, etc.)
- Integration of new technologies: i.e. Demand response
- Large deployment of sensor & automation technologies (wide-area situational awareness)
- Voltage stability (transient & post-transient stability)
- Frequency regulation, oscillation damping
- Disturbance data monitoring/recording
- Integrating increased amounts of distribution-level assets (residential solar panels, PHEV, etc.)

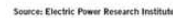
The Smart Grid - DOE's "stakeholder groups"



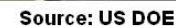
Electric Power: Players, Drivers, Etc.



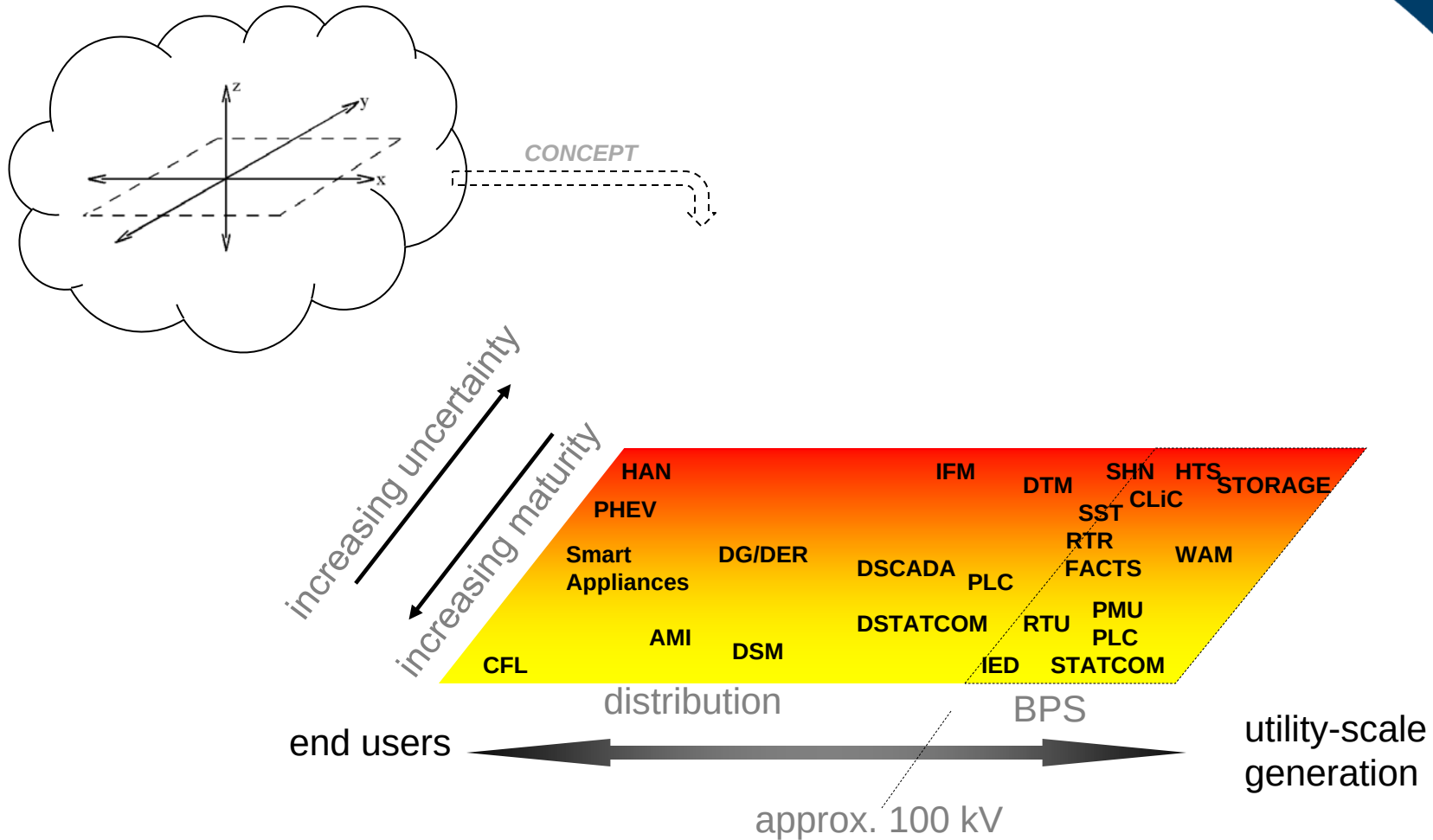
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Source: Oncor



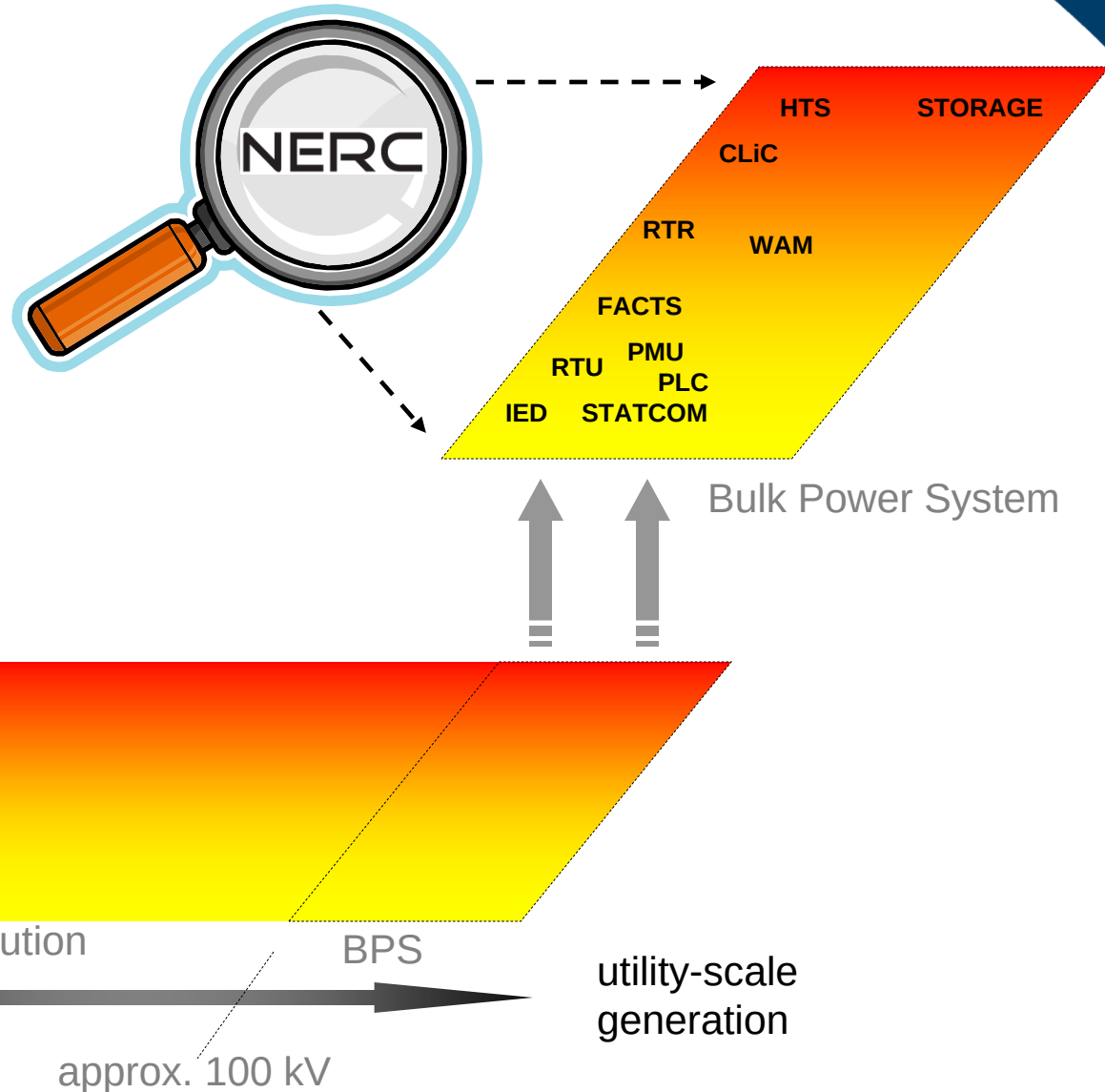
The Smart Grid Landscape



NOTE: Placement of items in the plane above is for concept discussion purposes.

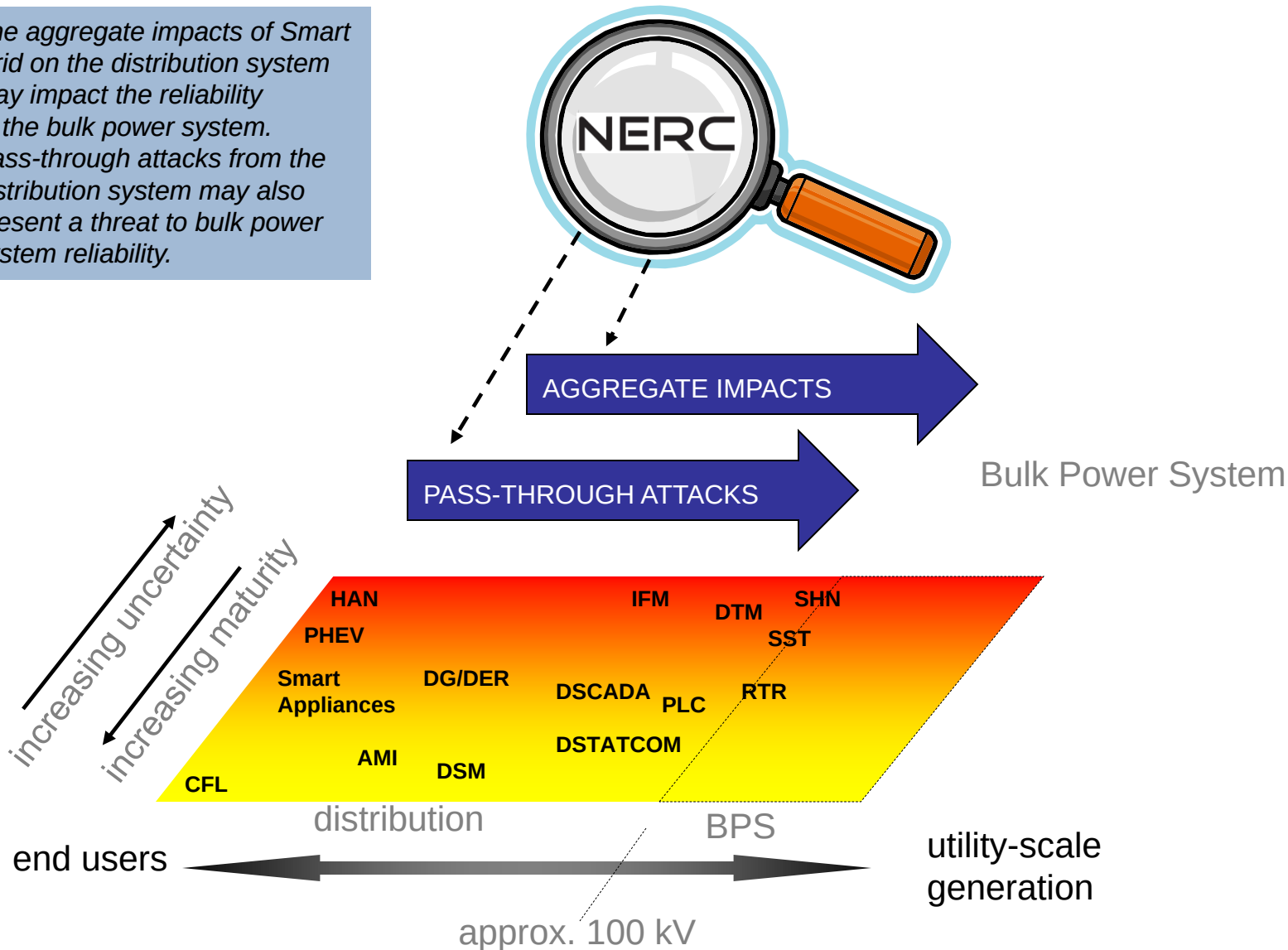
The Smart Grid Landscape

NERC's Reliability Standards apply to all users, owners, and operators of the bulk power system and typically apply to facilities at the transmission and generation level.



The Smart Grid Landscape

The aggregate impacts of Smart Grid on the distribution system may impact the reliability of the bulk power system. Pass-through attacks from the distribution system may also present a threat to bulk power system reliability.



NERC Smart Grid Task Force

Smart Grid Task Force Scope

- Identify and explain any BPS reliability issues and/or concerns of the Smart Grid
- Assess Smart Grid reliability characteristics
- Determine the cyber security and critical infrastructure protection implications
- Identify how the integration of Smart Grid technologies affects BPS planning, design and operational processes and the tools needed to maintain reliability
- Determine which existing NERC Reliability Standards may apply
- Provide recommendations for areas where Reliability Standards development work may be needed

- **Leadership**

Paul McCurley (NRECA) – Chair

Ginger Whitaker (E.ON) – Characteristics Vice Chair

Paul Myrda (EPRI) – Planning/Ops Vice Chair

Trever Seigfried (PPL) – Planning/Ops Vice Chair

Sandy Bacik (EnerNex) – Cyber Security Vice Chair

Chris Kotting (NARUC) – Cyber Security Vice Chair

Dr. Marija Ilic (CMU) – R&D Team Lead

- 80+ members and participants (DOE, FERC, NRECA, EEI, EPRI, APPA, NARUC, NAESB...utilities, vendors,...)



Questions?

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Background Slide #1

Abbreviations:

- AMI – Advanced Metering Infrastructure
- CFL – Compact Fluorescent Light bulb
- CLiC – Current Limiting Conductors
- DG / DER – Distributed Generation / Distributed Energy Resources
- DSCADA – Distribution Supervisory Control and Data Acquisition
- DSTATCOM – Distributed Static Synchronous Compensator
- DSM – Demand-Side Management
- DTM – Distribution Transformer Monitoring
- FACTS – Flexible Alternating Current Transmission Systems
- HAN – Home Area Networks
- IED – Intelligent Electronic Devices
- IFM – Intelligent Fault Management
- HTS – High-temperature Superconducting cables/devices
- PHEV – Plug-In Hybrid Electric Vehicle
- PLC - Power line carrier/communication
- PMU – Phasor Measurement Units
- RTR – Real Time (transmission line) Ratings
- RTU – Remote Terminal Units
- SHN – “Self-Healing” Networks
- SST – Solid State Transfer Switches
- STATCOM - Static Synchronous Compensator
- WAM – Wide-Area Management