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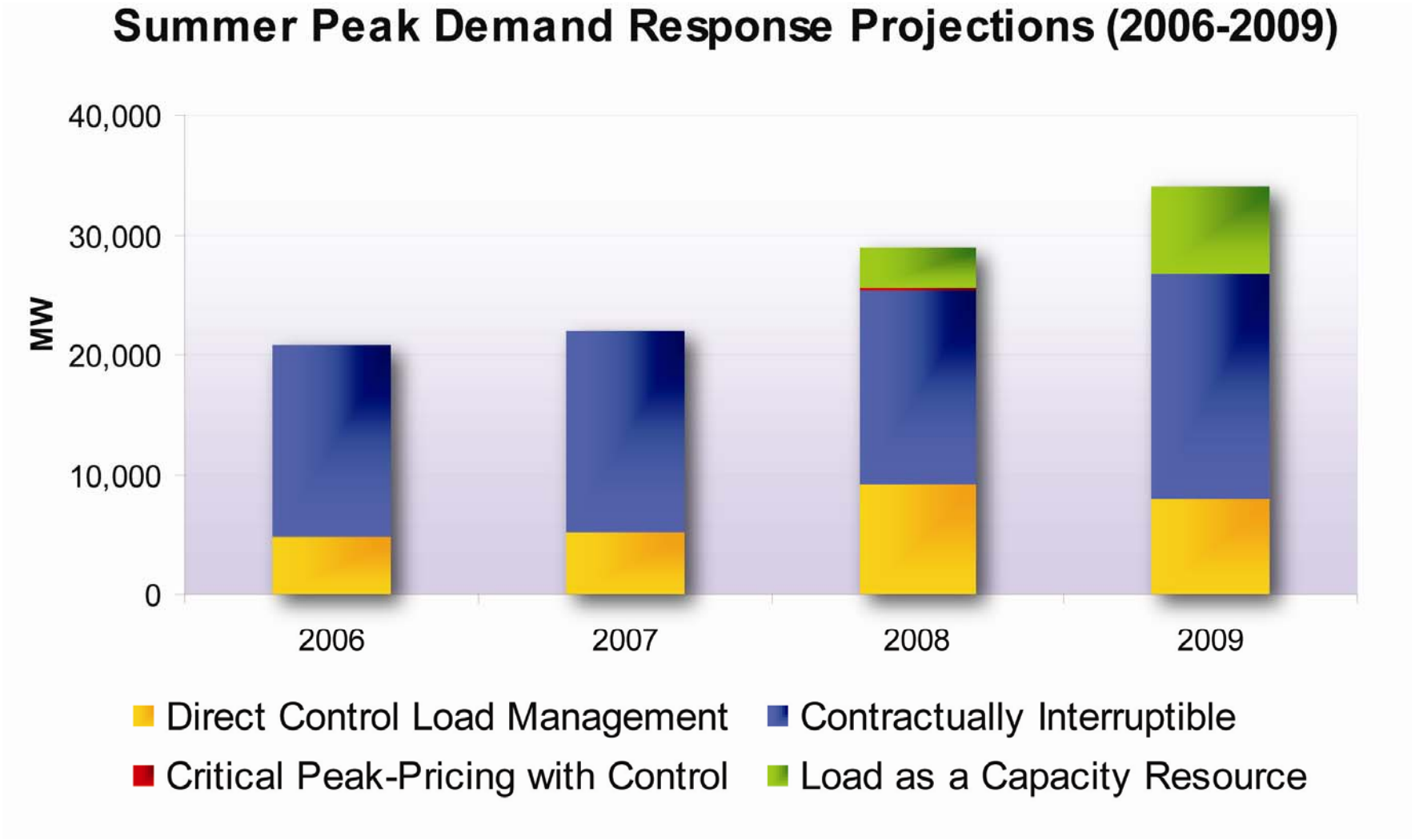
The 21st Century Grid

Rick Sergel
President & CEO
July 16, 2009

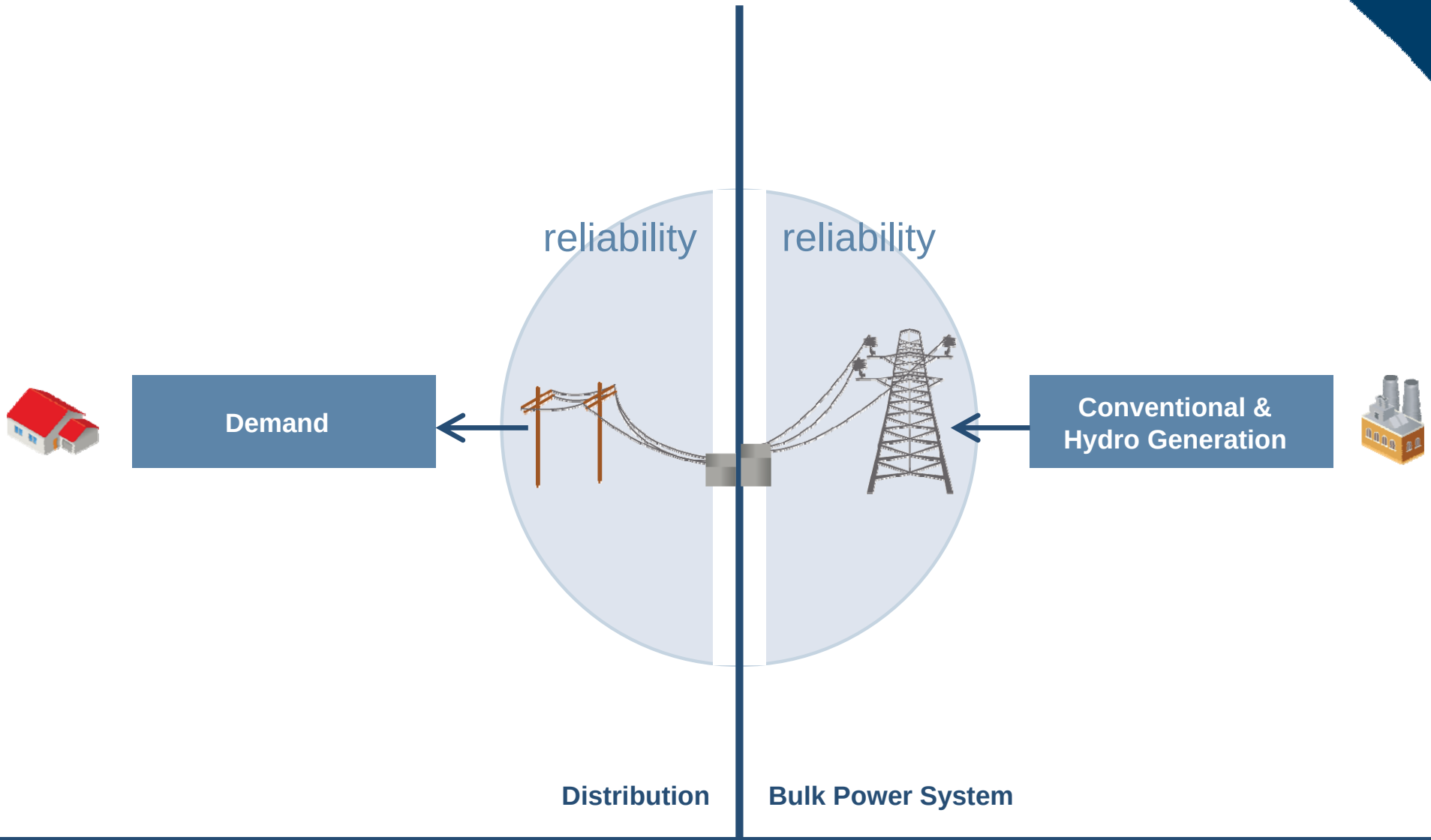
to ensure the reliability of the bulk power system

Demand Response Grows

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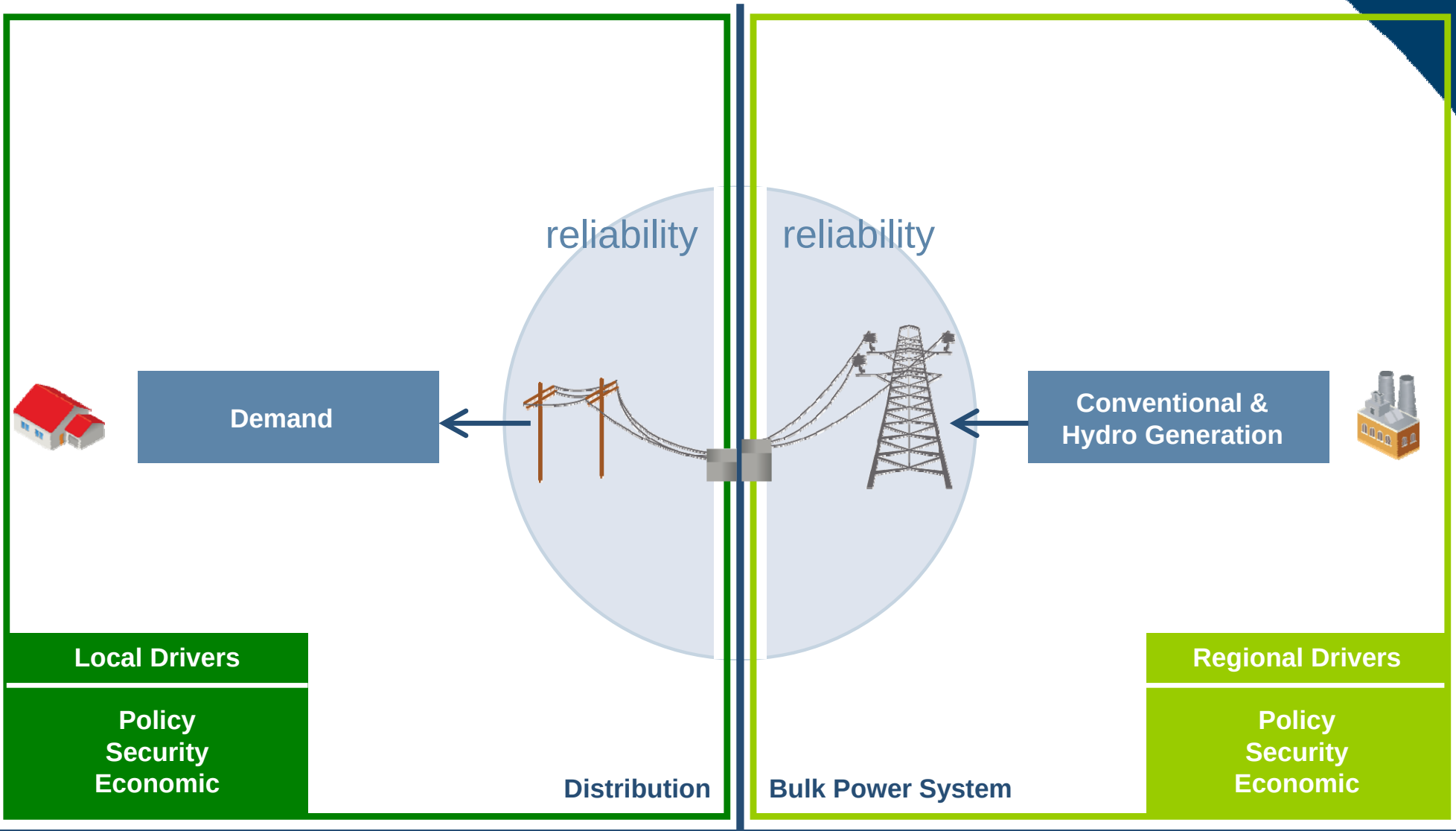


System: A Traditional View



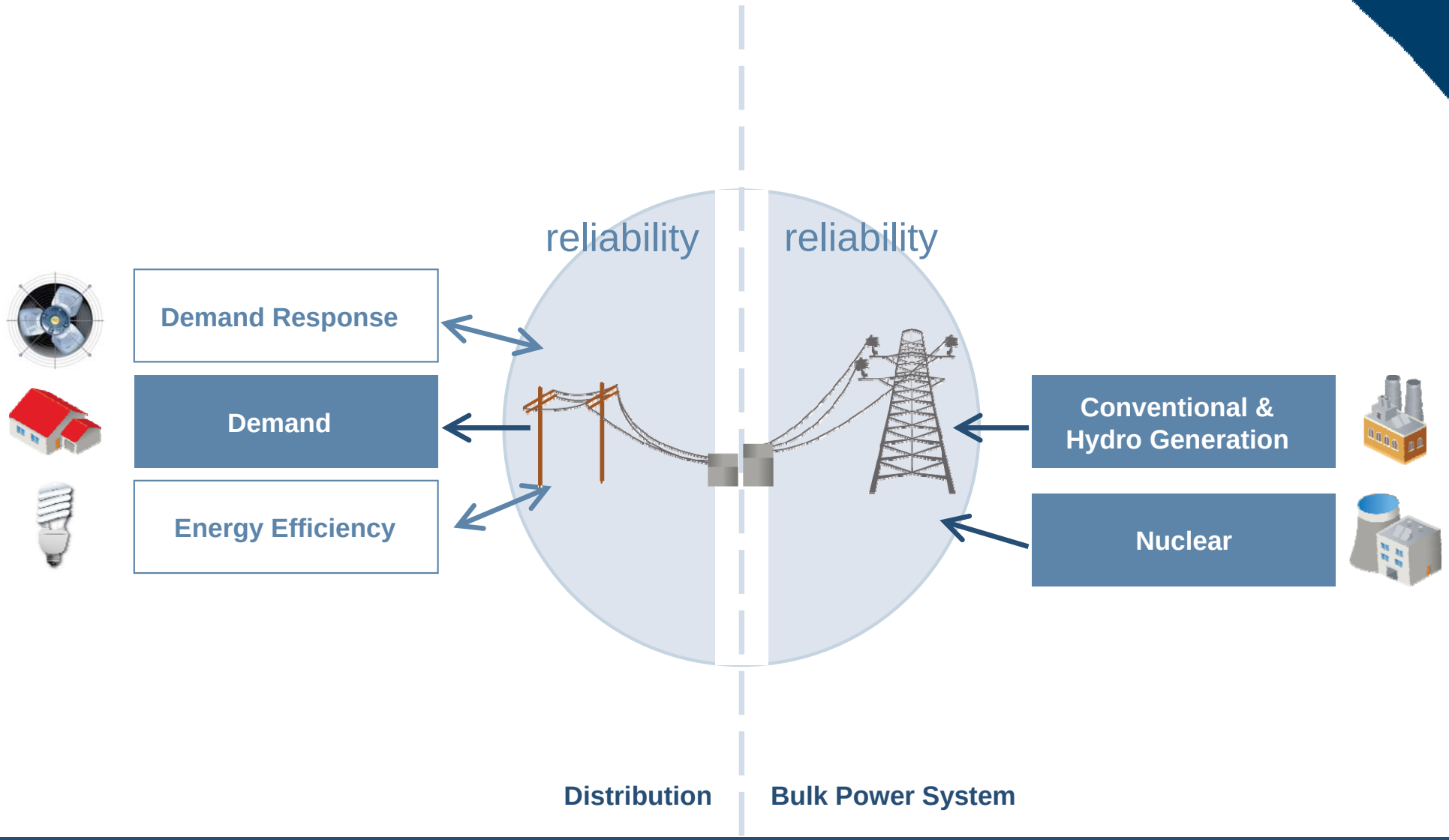
Over the past 60 years, we've divided the "grid" into two separate systems. Though coordination exists, the "demand side" and "supply side" are planned and operated separately. Reliability requirements are different for each system.

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.

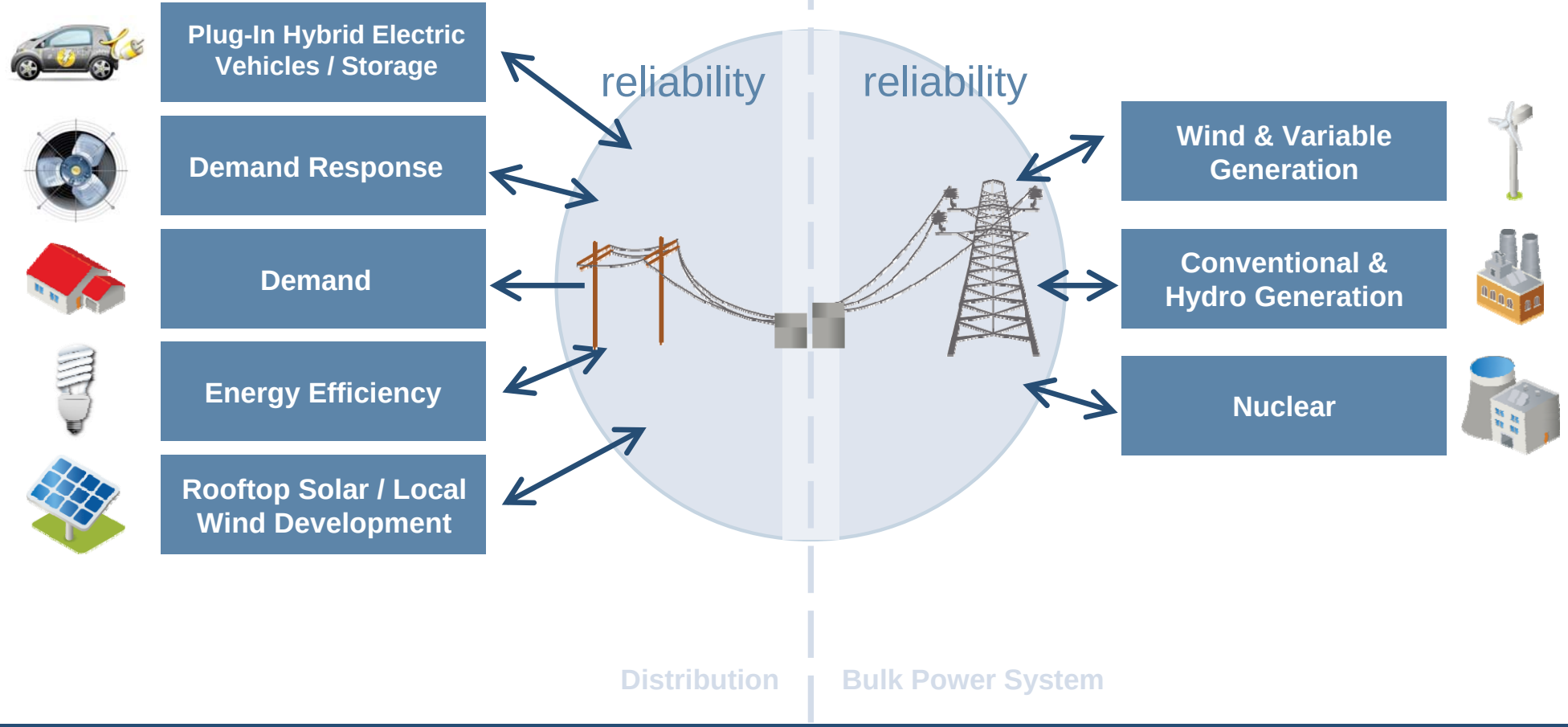
The System Begins to Change



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

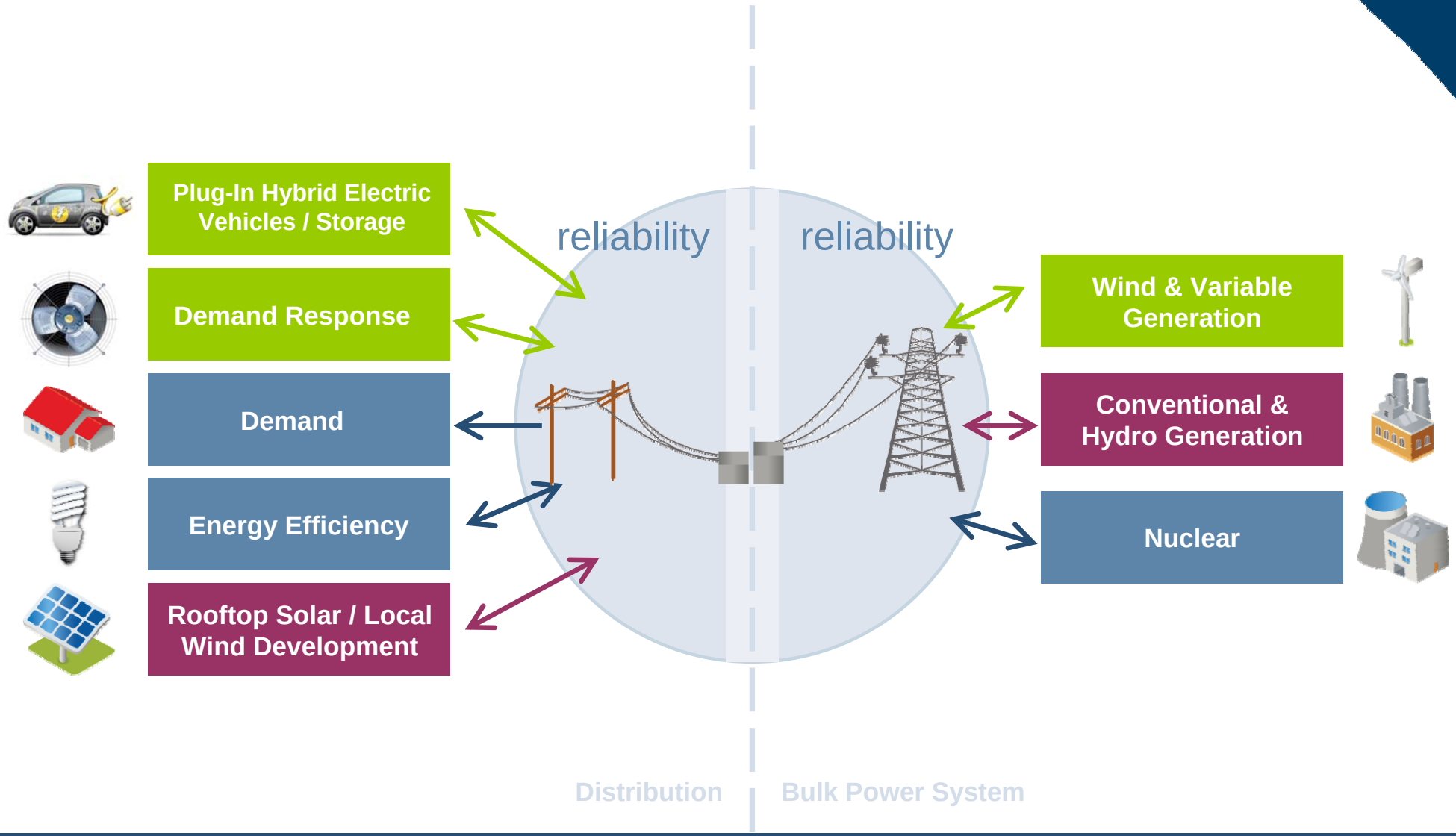
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As we look to the future, new resources like rooftop solar panels, large-scale wind generation, PHEV's, and storage will bring unique characteristics to the grid that must be understood and effectively managed to ensure reliable and cost-effective deployment.

The 21st Century Grid Emerges

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These new resources will be highly interdependent. Operational variability of large-scale wind generation can be effectively balanced by flexible resources like demand response, plug-in hybrids, and energy storage. Distributed variable generation will rely on conventional generation to ensure ancillary services and voltage and reactive support are available to maintain power quality.

The 21st Century Grid Emerges

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Plug-In Hybrid Electric Vehicles / Storage



Demand Response



Demand



Energy Efficiency



Rooftop Solar / Local Wind Development

reliability

Wind & Variable Generation



Conventional & Hydro Generation



Nuclear

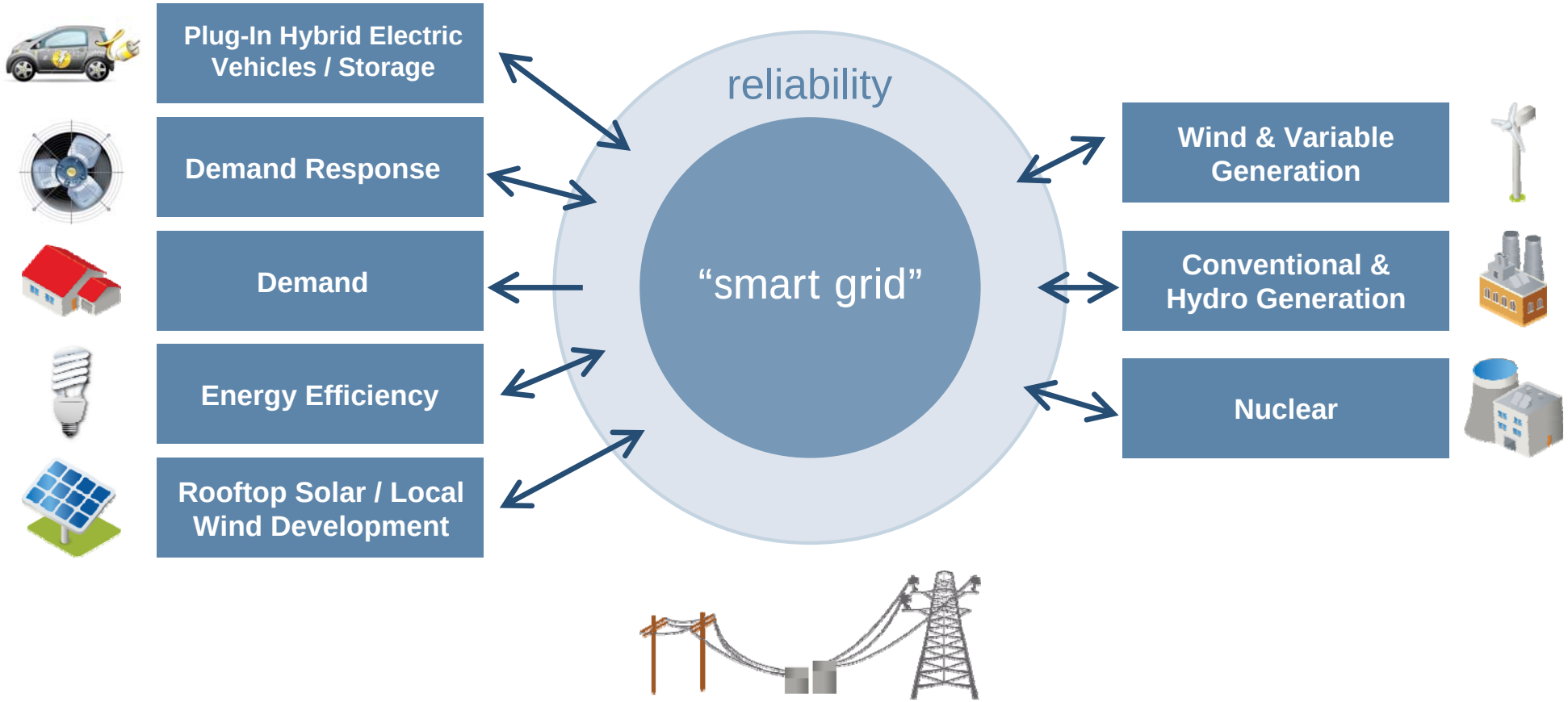




The development and successful integration of these resources will require the industry to break down traditional boundaries and take a holistic view of the system with reliability at its core.

The Smart Grid

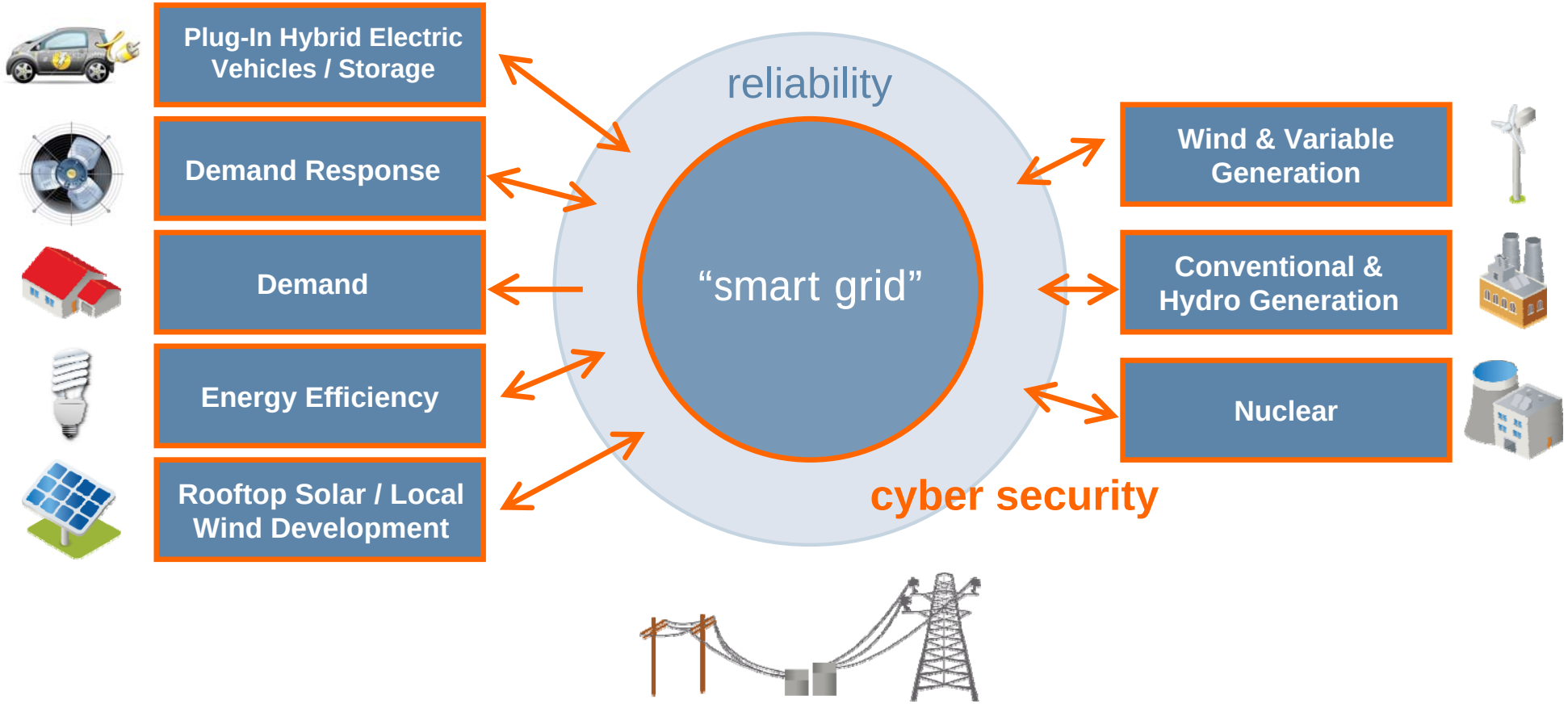
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The "Smart Grid" completes the picture of a fully integrated system without boundaries. Stretching from synchro-phasors on the transmission system to smart appliances in the home, these systems will enable the visualization and control needed to maintain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

Common Challenges

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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

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Plug-In Hybrid Electric Vehicles / Storage

Demand Response

Demand

Energy Efficiency

Rooftop Solar / Local Wind Development

reliability

"smart grid"

cyber security

Wind & Variable Generation

Conventional & Hydro Generation

Nuclear







Drivers

Policy
Security
Economic

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.

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Question & Answer