



DR/DER Integration: Opportunities and Challenges

Ali Ipakchi
Vice President, Smart Grid and Green Power

Grid Interop 2011, Phoenix, Arizona
December 06-08, 2011



Trade Secret

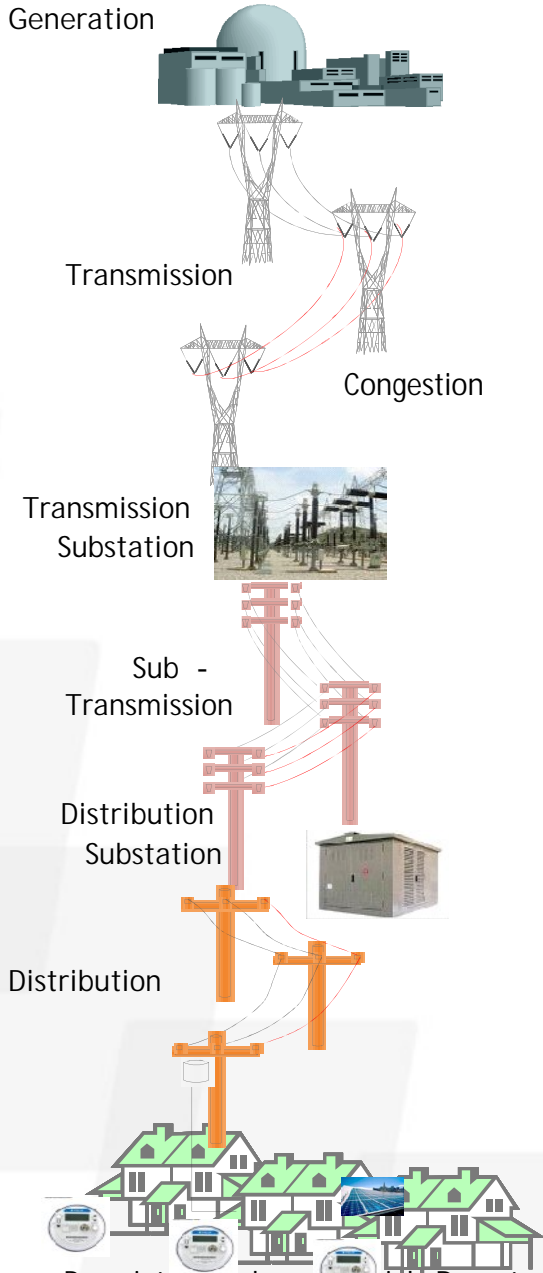
This document and attachments contain confidential and proprietary information of Open Access Technology International, Inc. This information is not to be used, disseminated, distributed, or otherwise transferred without the expressed written permission of Open Access Technology International, Inc.

Proprietary Notice

All OATI products and services listed are trademarks and service marks of Open Access Technology International, Inc. All rights reserved.

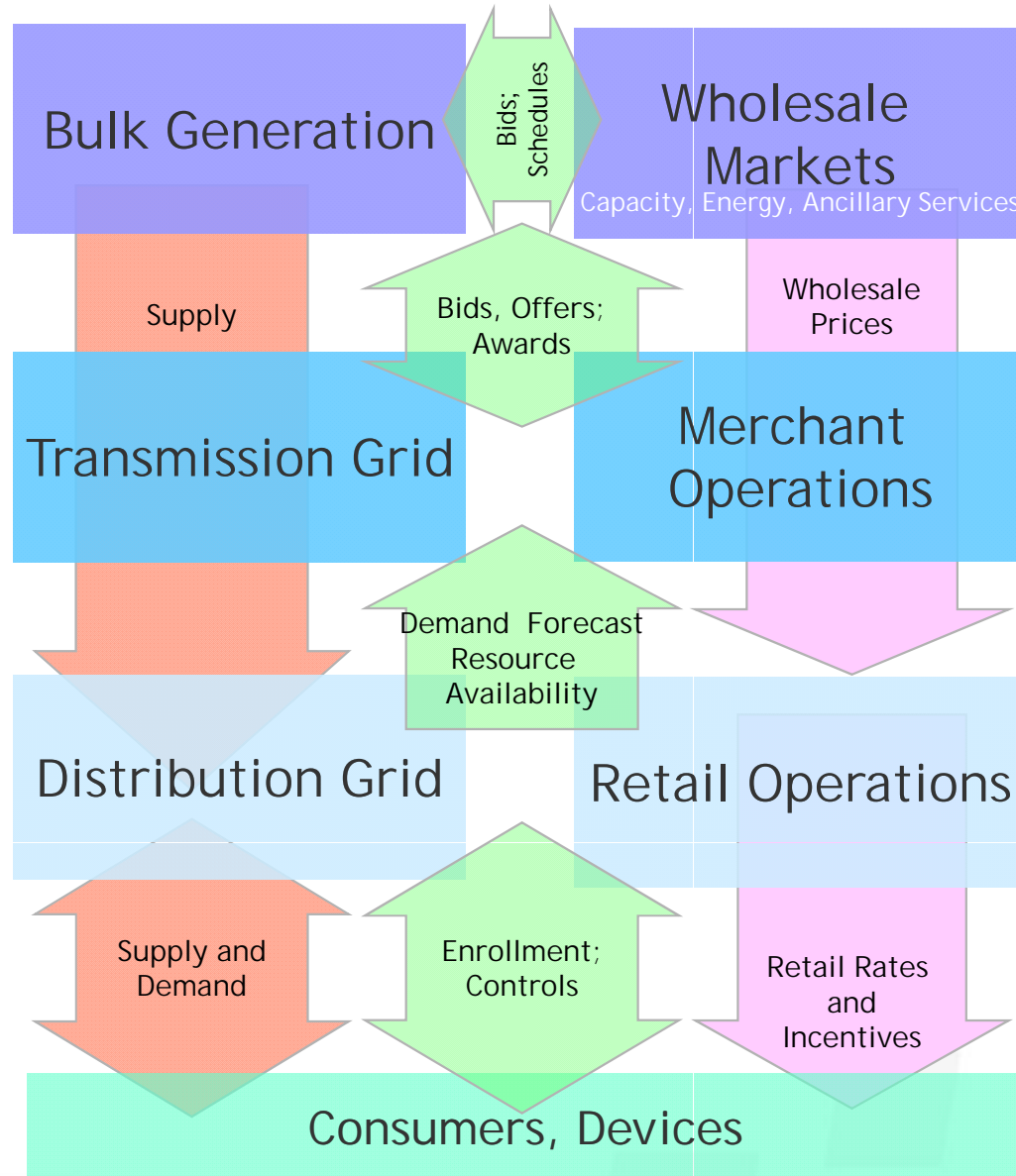


End-to-End Power System Operation



Bulk Power Operation

Retail Operation



Legend:

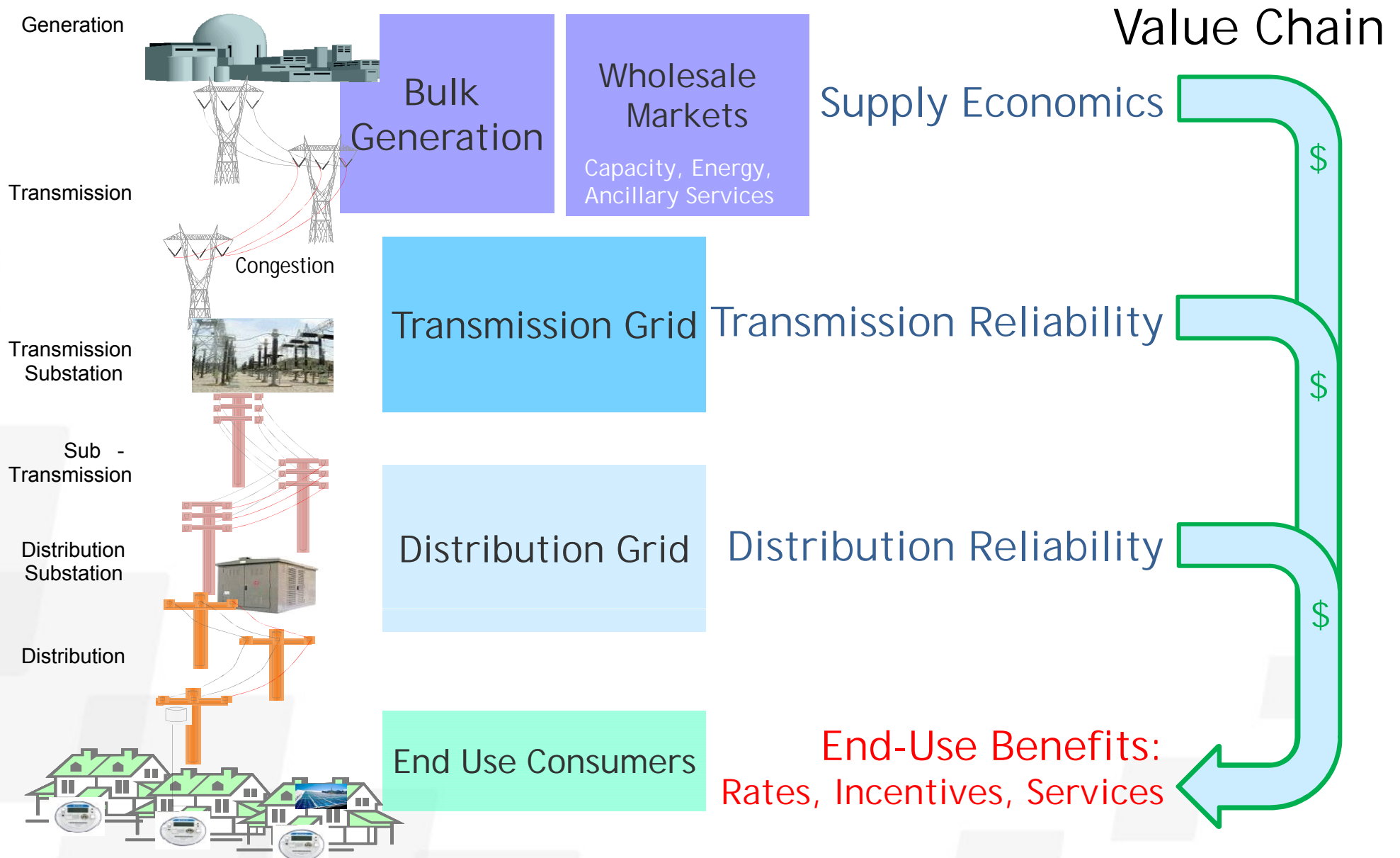
Electricity

Data

Pricing

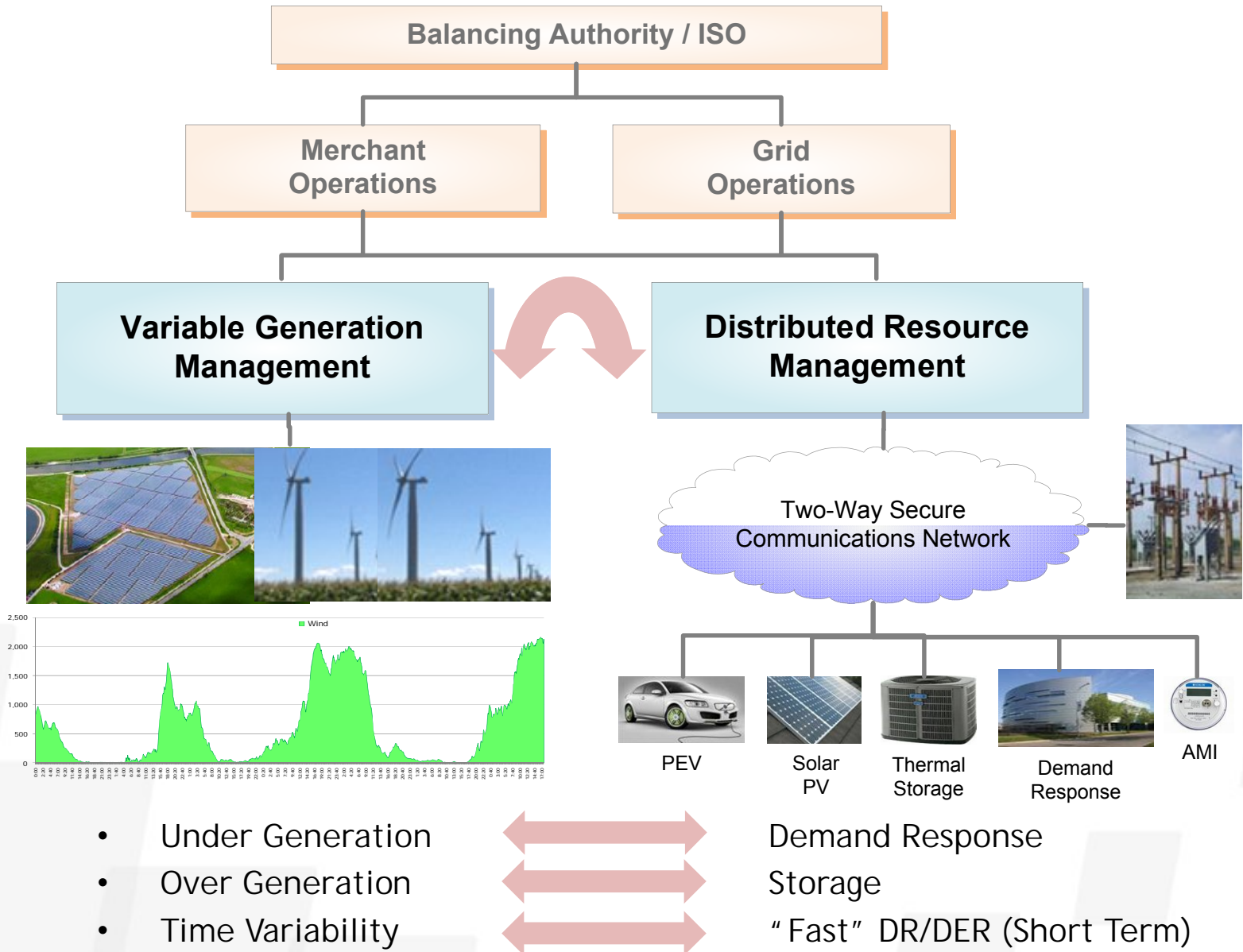


Capturing and Delivering Value



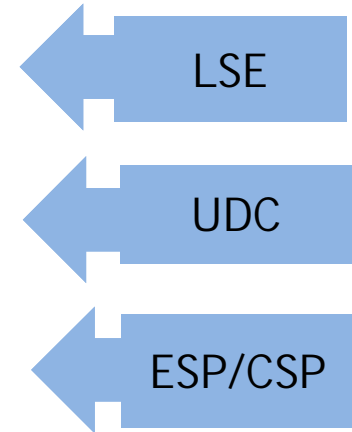
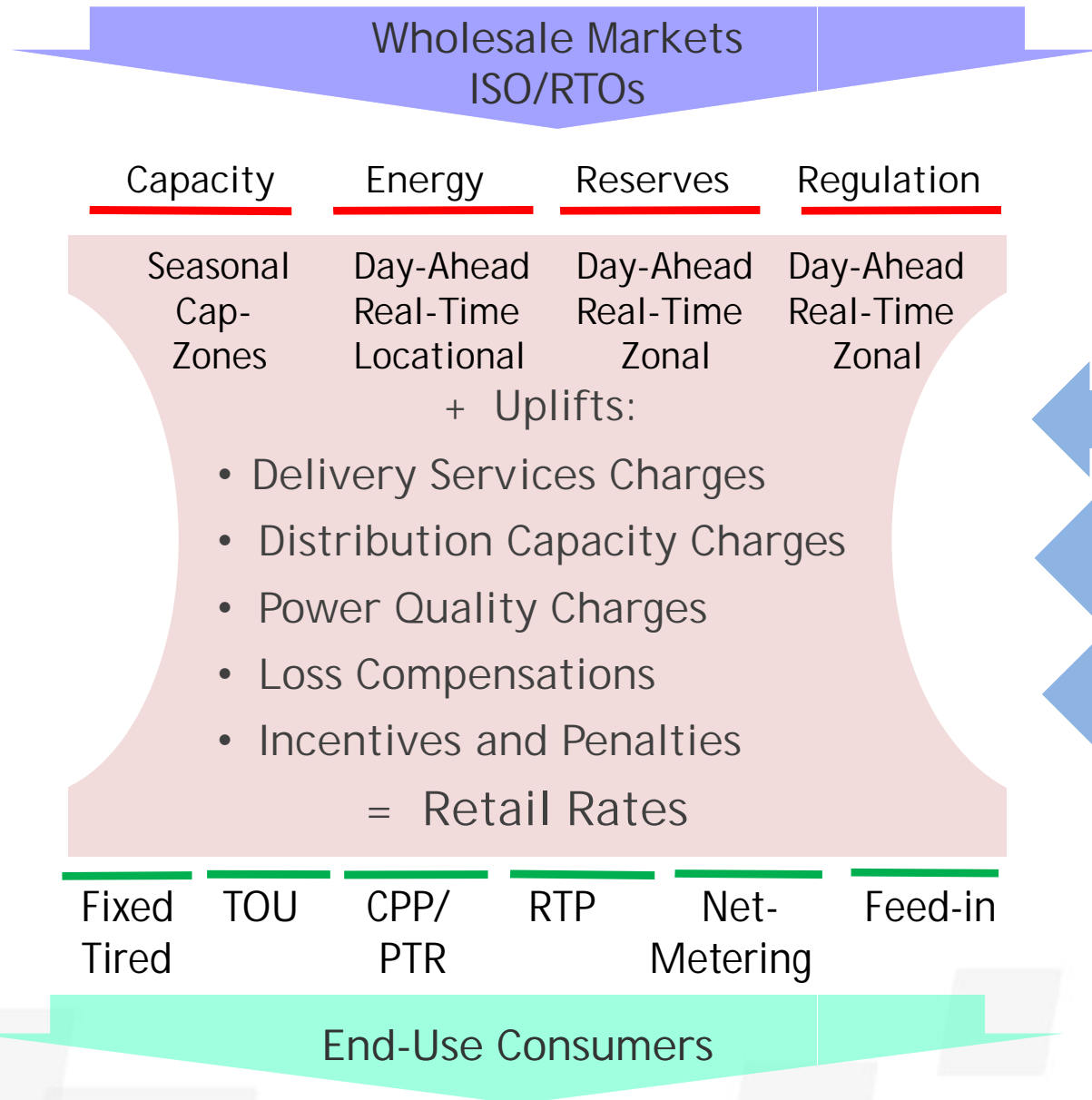
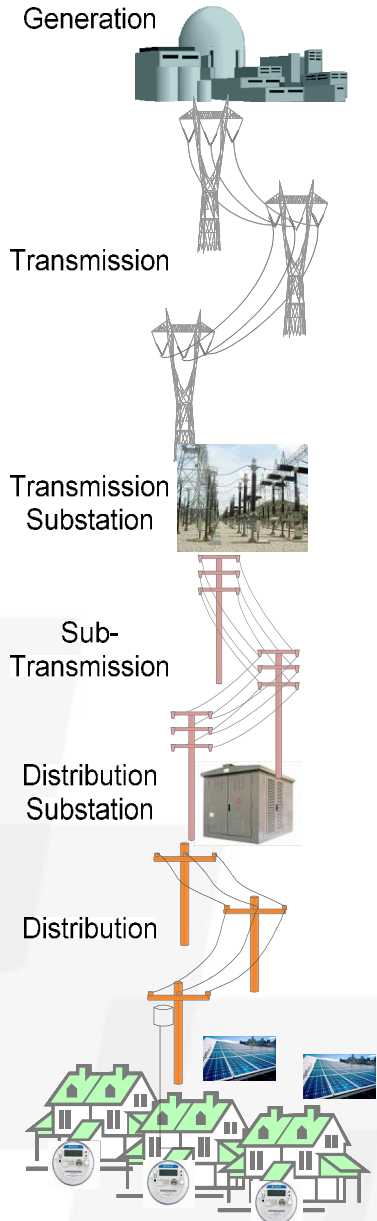


Sample Value: DR/DER the "Dancing Partner" of VER





Wholesale to Retail Pricing Predicament





Value Capture and Optimization

Wholesale Products (Values):

<u>Capacity</u>	<u>Energy</u>	<u>Reserves</u>	<u>Regulation</u>
\$3-\$4 MW/h Seasonal	\$20-\$80 MWh Hourly and Sub-hourly	\$2-\$4 MW/h 24x7	\$10-\$15 MW/h 24x7

T&D Wires Charges:

\$3-\$6 MWh
Varies

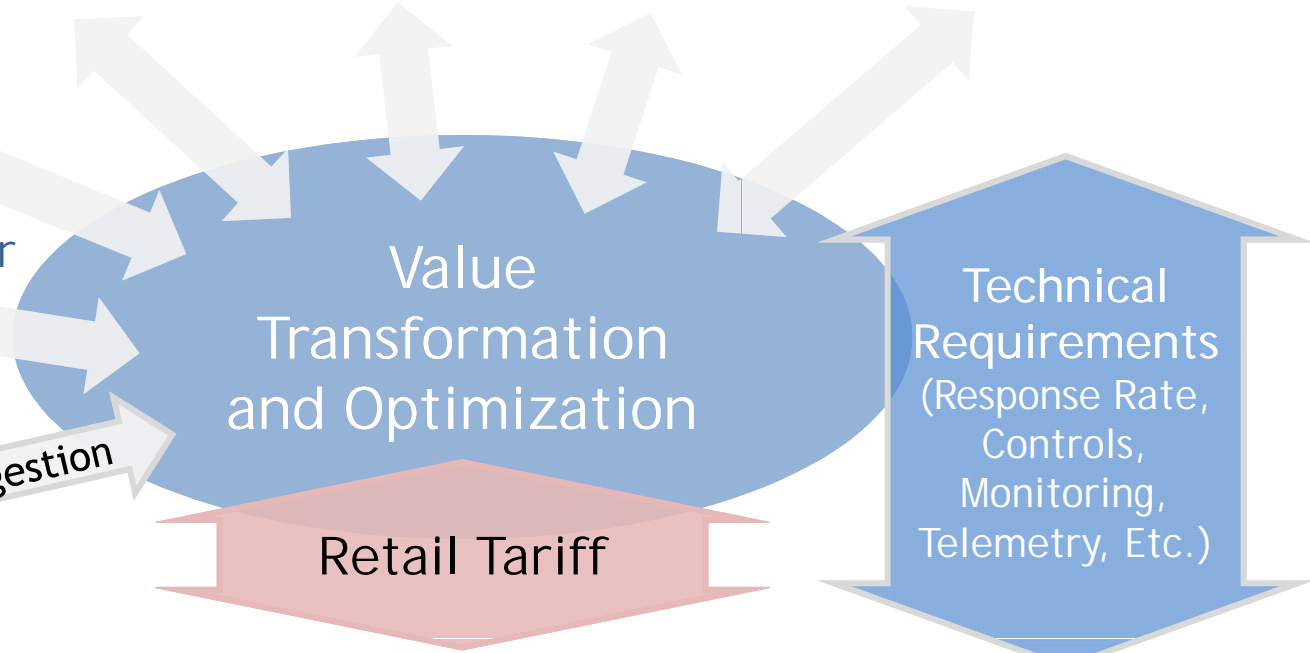
CAPEX Benefits:

- Distribution
- Transmission

\$0-\$500K MW/Yr
Varies



Distribution Congestion



Rates, Incentives, and Penalties

~ 6¢ - 24¢ / kWh + Incentives



EV



PV



Demand Response



Water Heater



Thermal Storage

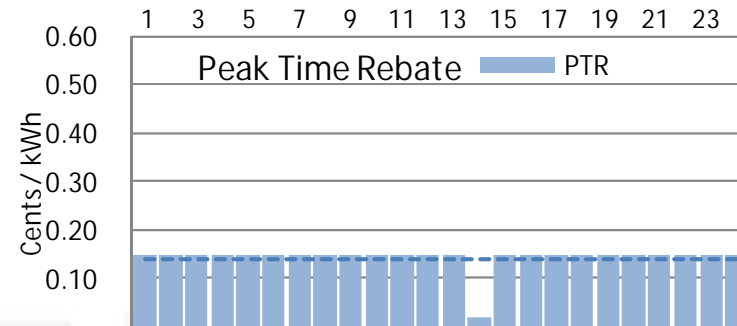
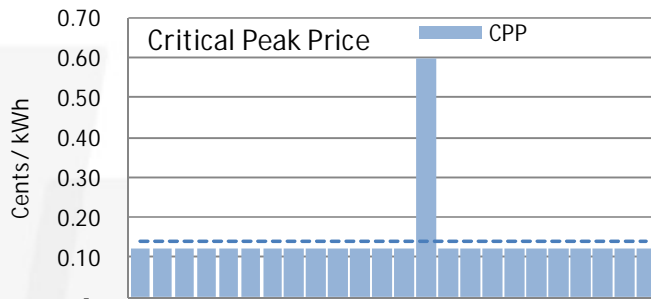
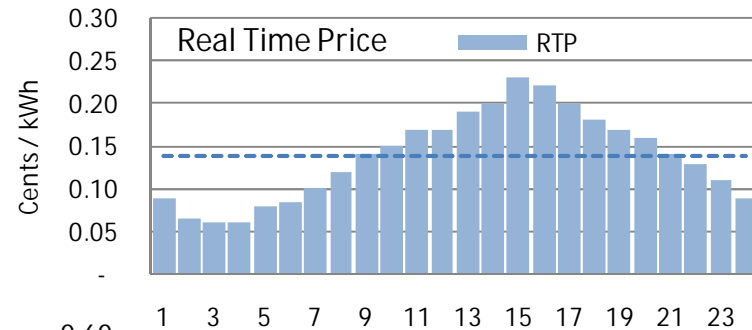
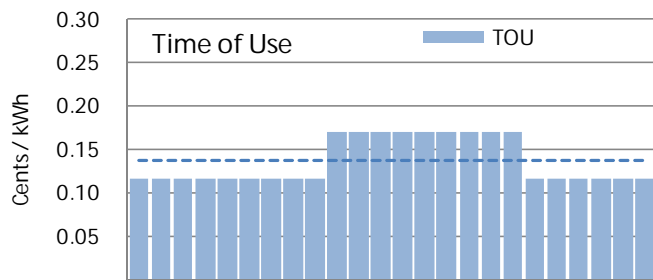
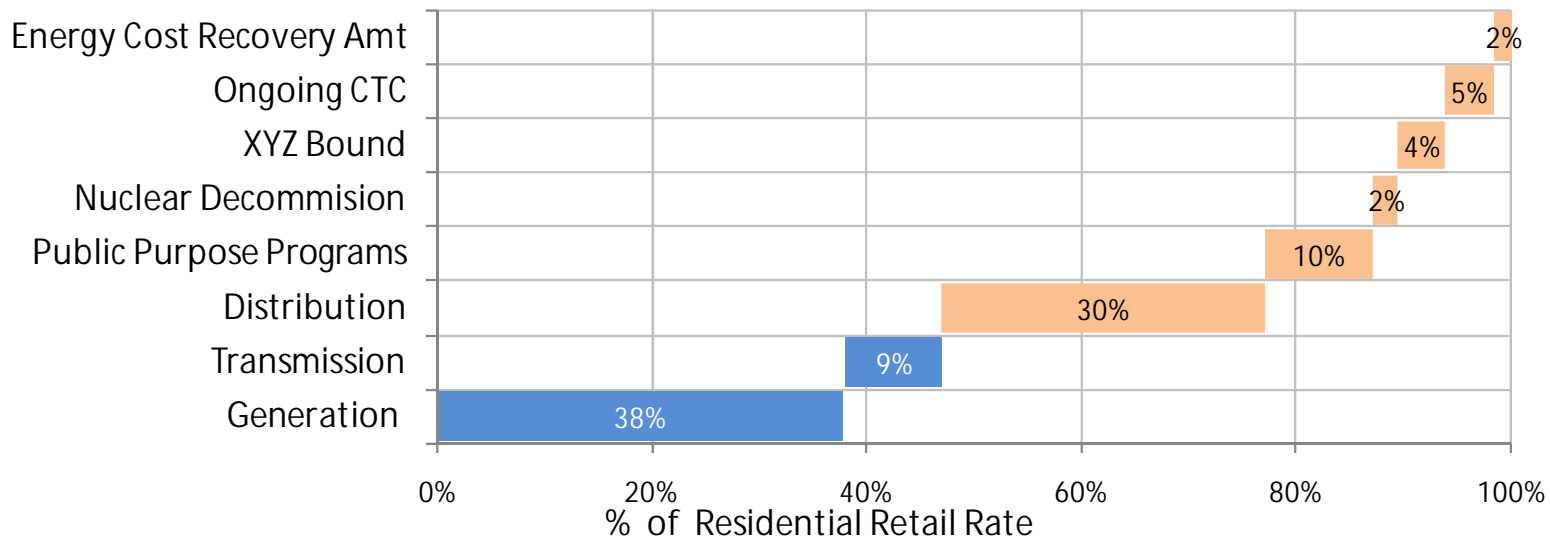


Electric Storage



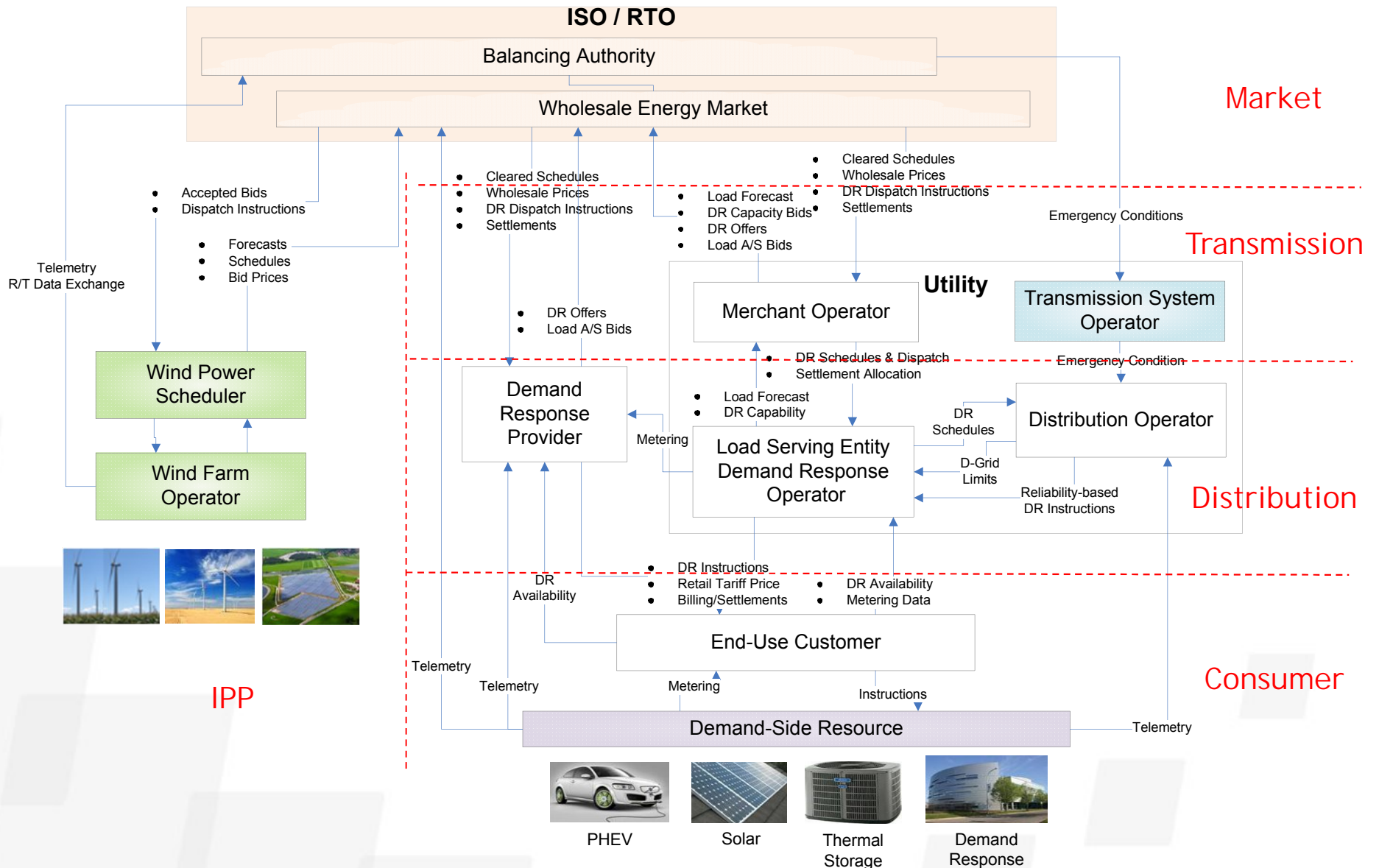
Examples of Retail Rates - Tariff

Breakdown of a Residential Rate Structure



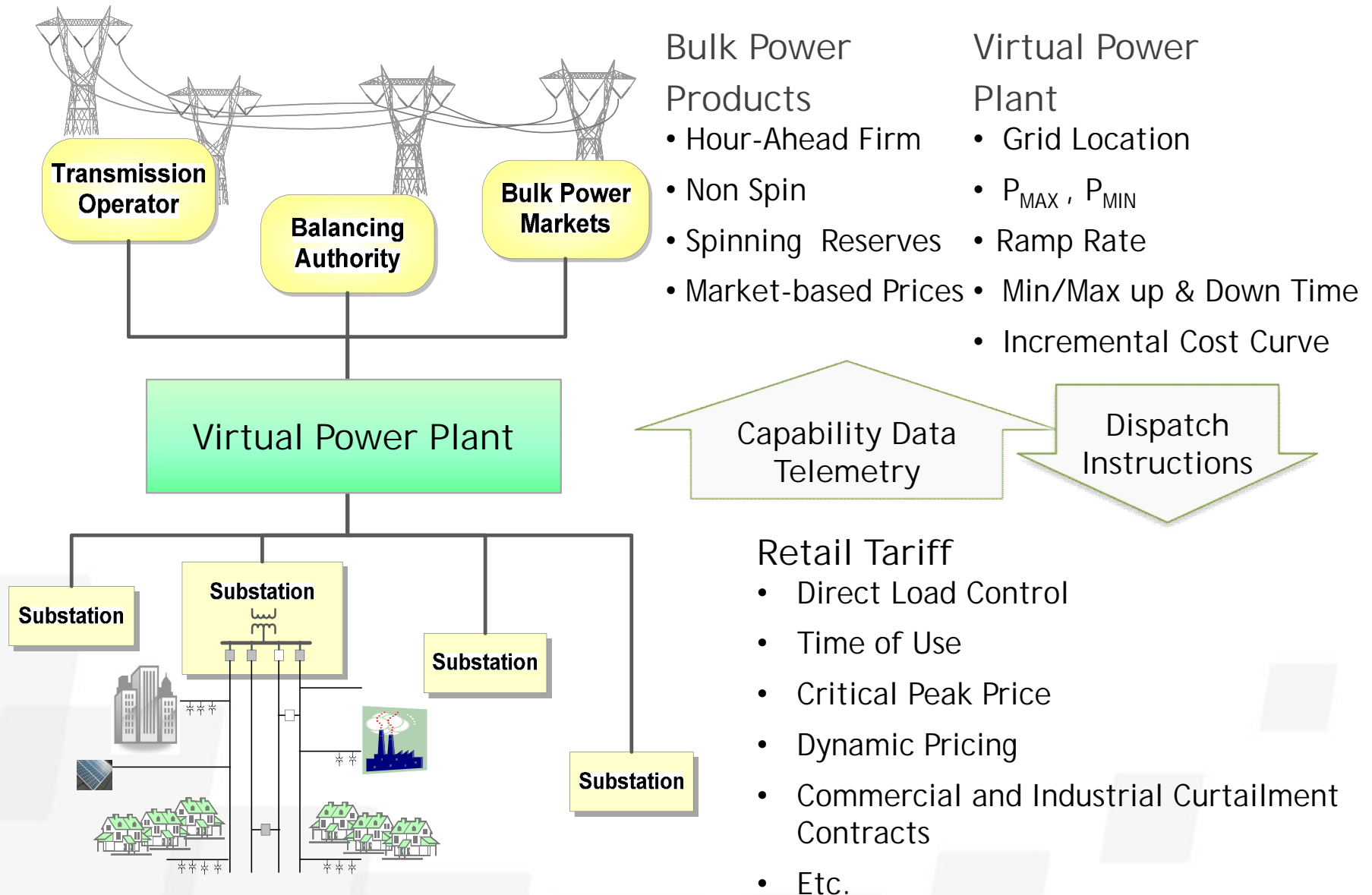


Intra and Inter Domain Transactions



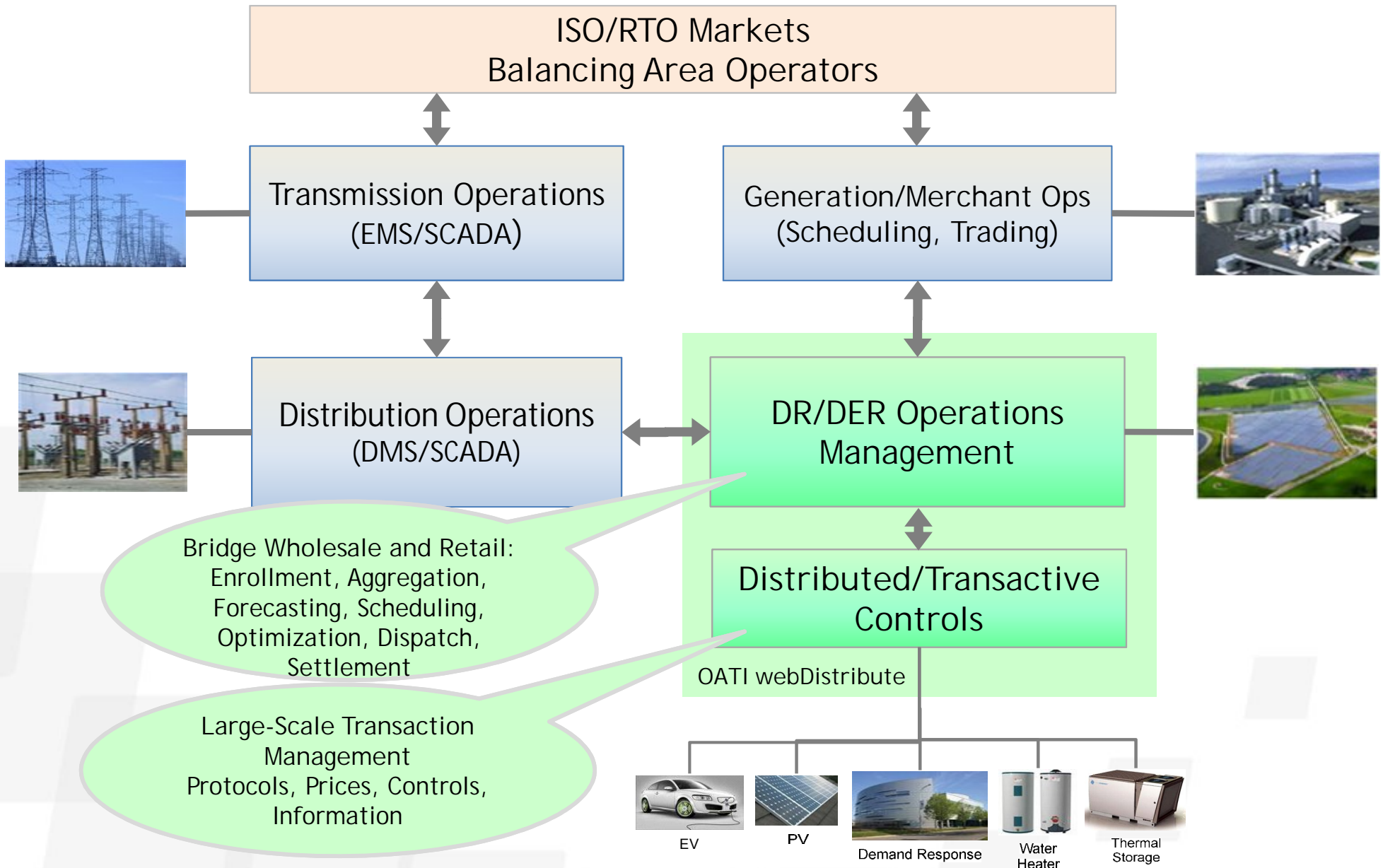


Virtual Power Plant: Linking Demand-Side Capabilities to Wholesale Operations





Way Forward





Concluding Comments

- DR/DER can deliver significant value
- An end-to-end integration is needed to gain the full benefits of DR/DER
 - System Level Economic
 - Grid Reliability
- This requires a two-way bridge between wholesale and retail operations
 - Prices and Rates
 - Scheduling and Dispatch
 - Operations and Business Practices
- The industry is moving forward with solutions, but the road forward may present obstacles
 - Consumer Acceptance and Integration
 - People and Processes
- Potential for innovative techniques and Paradigm Shifts
- Lessons learned from the wholesale operations provide valuable guidance



Thank You

Ali Ipakchi
sales@oati.net
763-201-2000