

EPRI Smart Grid Demonstration Initiative & Early Results

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Who is EPRI?

Electric Power Research Institute



Accelerate Adoption of Technologies in the Electricity Sector

*Independent, non-profit, **collaborative** research institute, with full industry coverage*

- *Nuclear, Generation, Power Delivery & Utilization, Environment, & Innovation*

Major offices in: Palo Alto, CA; Charlotte, NC; and Knoxville, TN

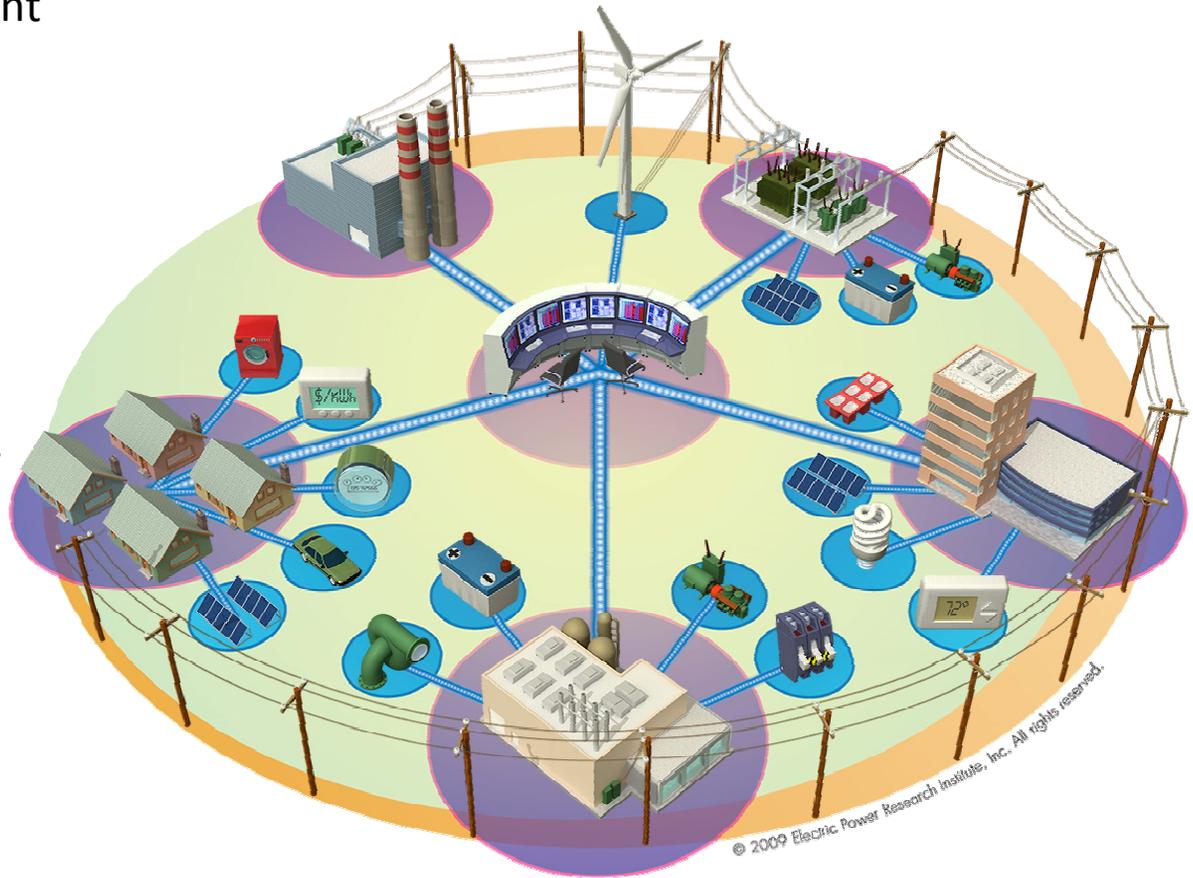
EPRI Smart Grid Demonstration Initiative

Leveraging Today's Technology to Advance the Industry

- Deploying the Virtual Power Plant
- Demonstrate Integration and Interoperability
- Cost Benefit Analysis
- Leverage information & Communication Technologies
- Integration of Multiple Types of **Distributed Energy Resources (DER)**:

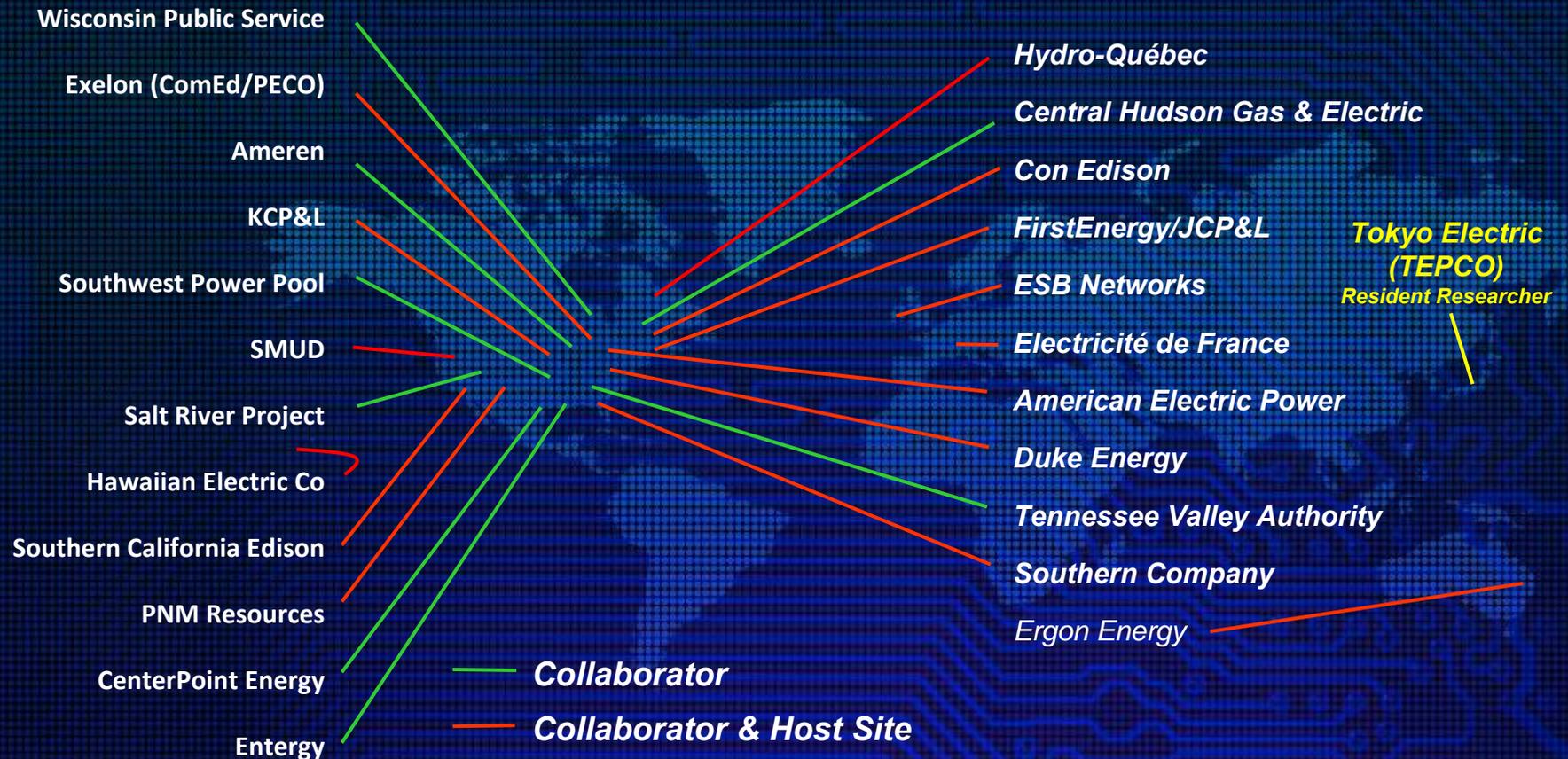
-  *Distributed Generation*
-  *Renewable Generation*
-  *Storage*
-  *Demand Response*

 *Multiple Levels of Integration - Interoperability*

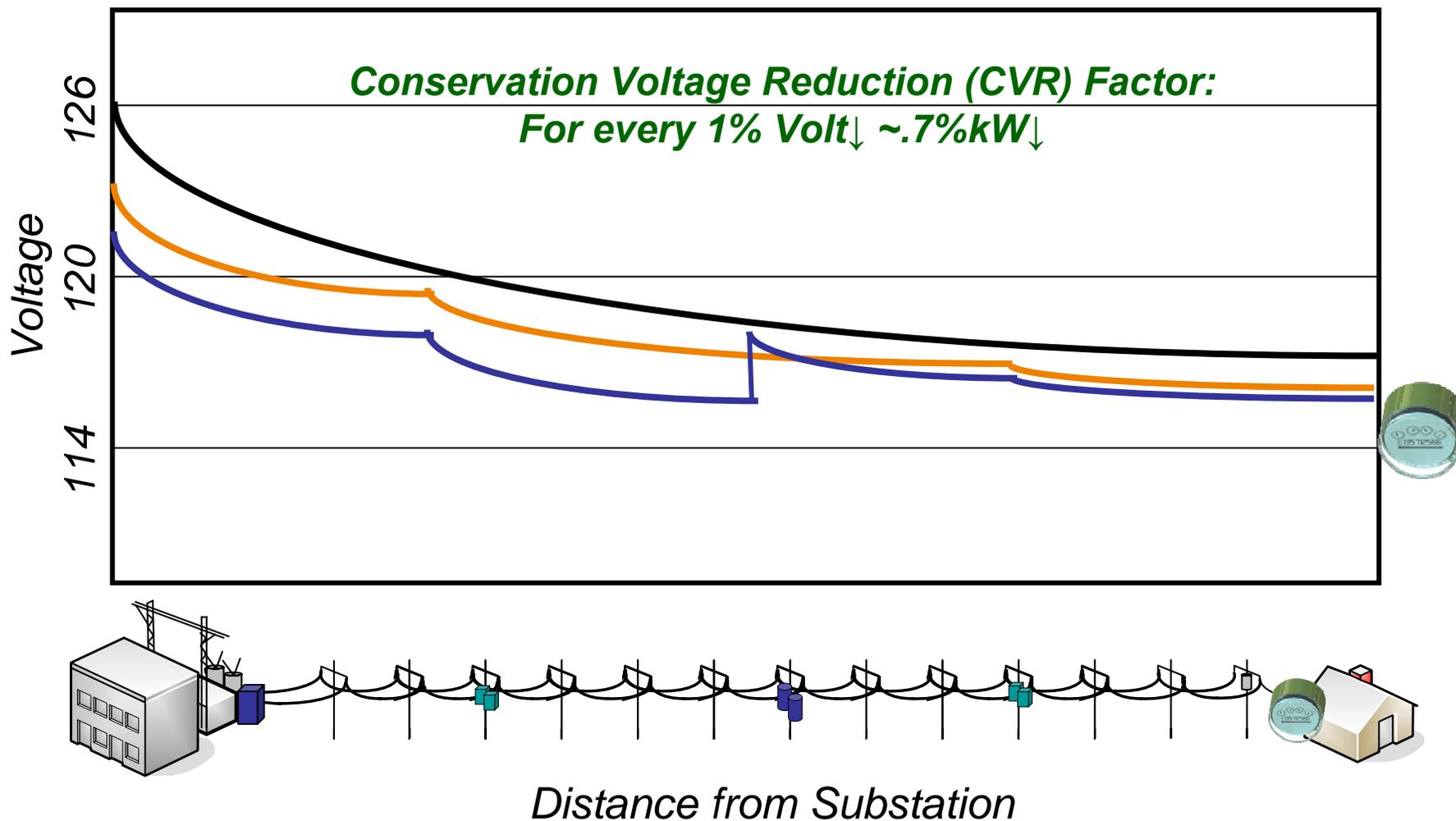


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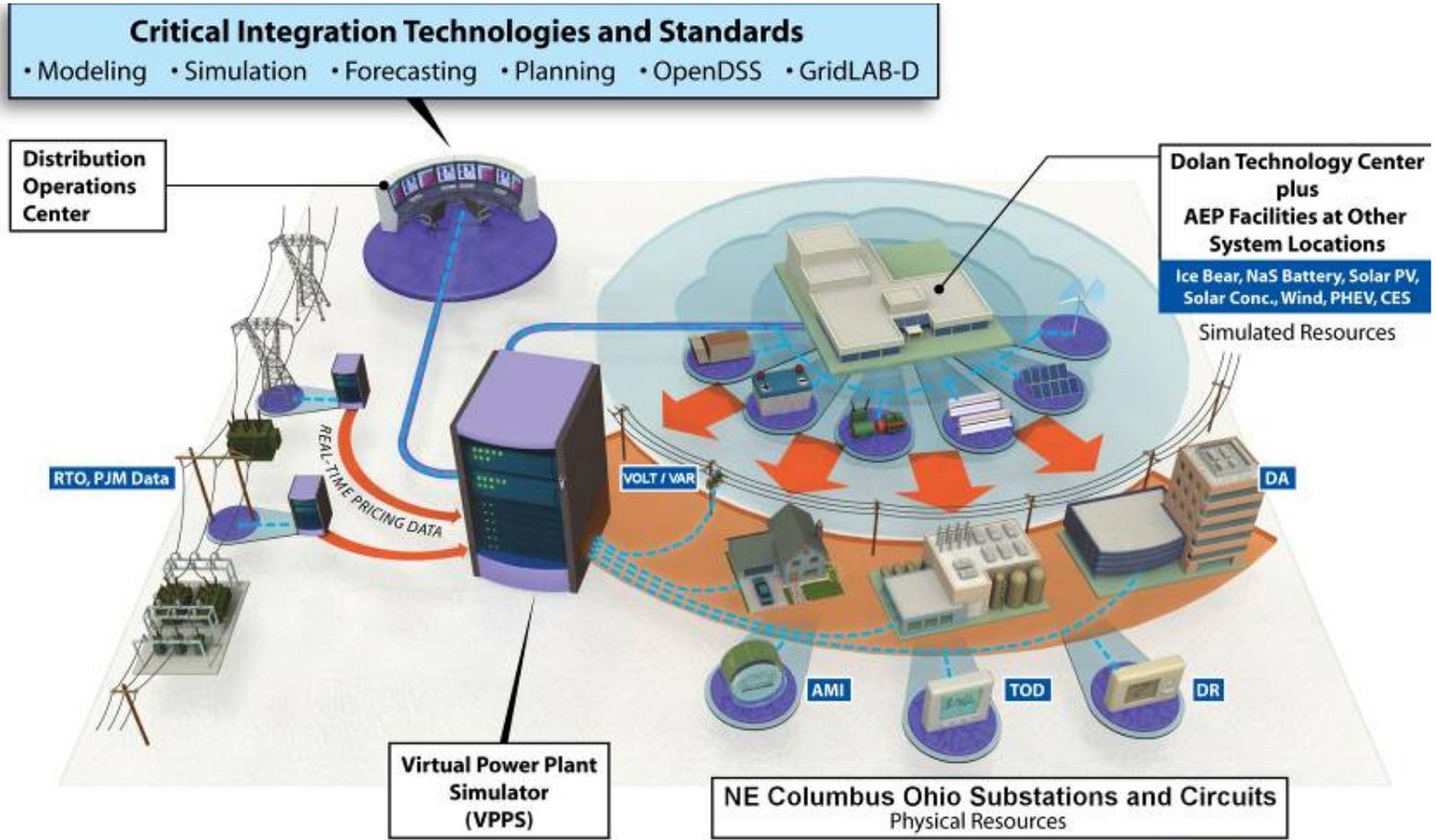
23 Electric Utility Collaborators



Conservation Voltage Reduction for **greengov**[™] Efficiency & Demand Response (Matt's Cartoon)



Example Project – American Electric Power



AEP – Integrated Volt Var Control (IVVC)

Modeling & Simulation Assessed Potential Benefit

Technology and infrastructure upgrades integrated into the electric distribution system to optimize voltage levels.

- *Typically a 0.7% reduction in demand and energy for a 1% voltage reduction*
- *Models showed a 3% voltage reduction should achieve a 2.1% demand and energy reduction*
- *Power factors near unity minimize losses and relieve transmission congestion*

Hypothesis - Benefits

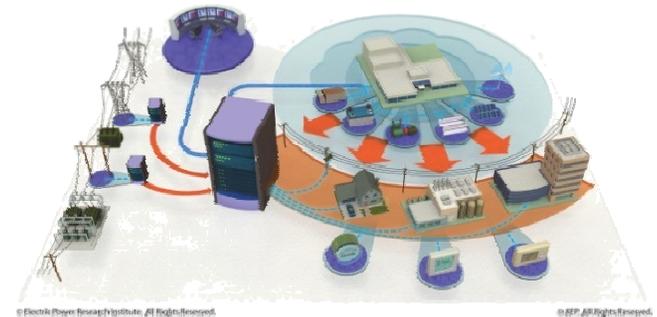
- *Immediate, highly predictable impacts.*
- *2-4% reduction in demand and energy requirements.*
- *Lessens need for incremental infrastructure spending.*
- *Helps to lower emissions (SO₂, NO_x, Hg, CO₂).*
- *Avoids traditional EE/DR challenges such as cross-subsidization.*

Initial Results – AEP 60 Day Test

Experimental Design - Compared Day-on/Day-off consumption with temperature correction

Energy Reduction was 2.9%

- 73,382,274 kWh supplied
- 2,120,091 kWh reduced
- Peak Demand Reduction averages 2 – 3%



AEP Ohio Results vary across circuits

- *Best* – “Gahanna” Circuit: Reduction @ 6 +%
- *Worst* – “Blacklick” Circuit: Reduction @ 1%

Operational results correlate strongly with projected results.

Next Steps

- *AEP - Evaluate & Compare Low-Tech Solutions*
- *Challenges - Rate Recovery Mechanisms*

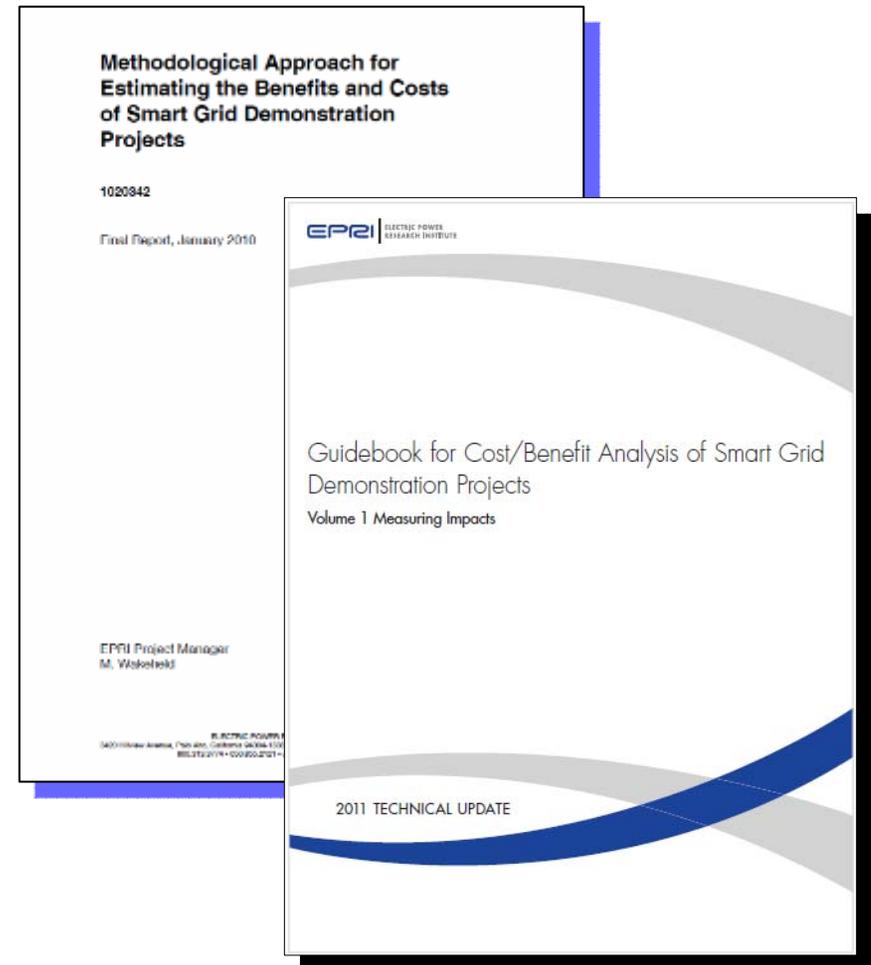
Cost Benefit Analysis – Guiding Documents

“Methodological Approach” (EPRI ID 1020342)

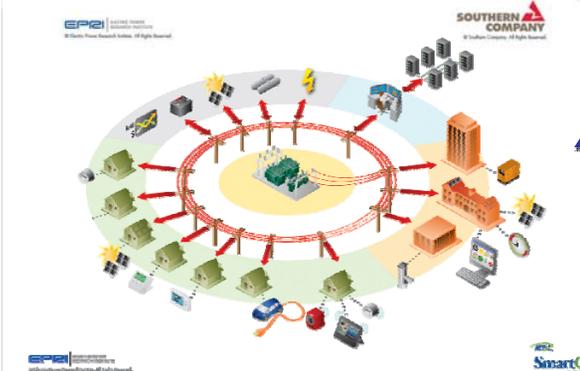
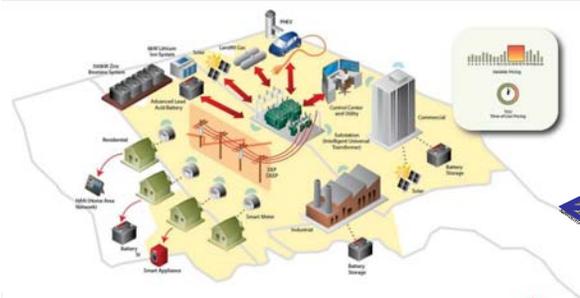
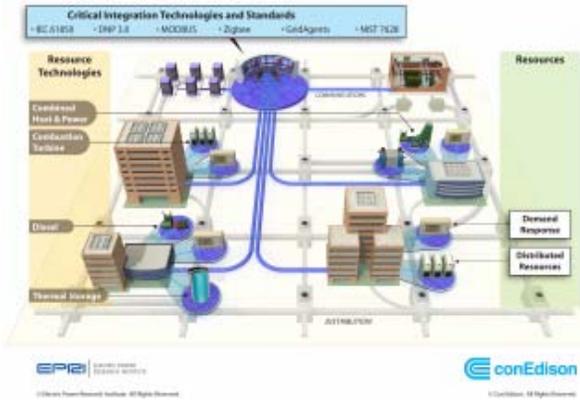
- *Jointly funded by DOE and EPRI*
- *Provides framework for estimating benefits & costs*

CBA Guidebook Vol. 1, Measuring Impacts (EPRI ID 1021423)

- *Manual for practical application with step by step instruction*
- *Guidance for documenting the project & approach to perform a CBA*



Project Overviews & Results



- More Information at www.smartgrid.epri.com
- Project Animations on YouTube (search “EPRI YouTube Channel”)
 - Consolidated Edison
 - Southern Company
 - Kansas City Power & Light
- <http://www.youtube.com/user/EPRIvideos>

Together...Shaping the Future of Electricity

Thank You

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