

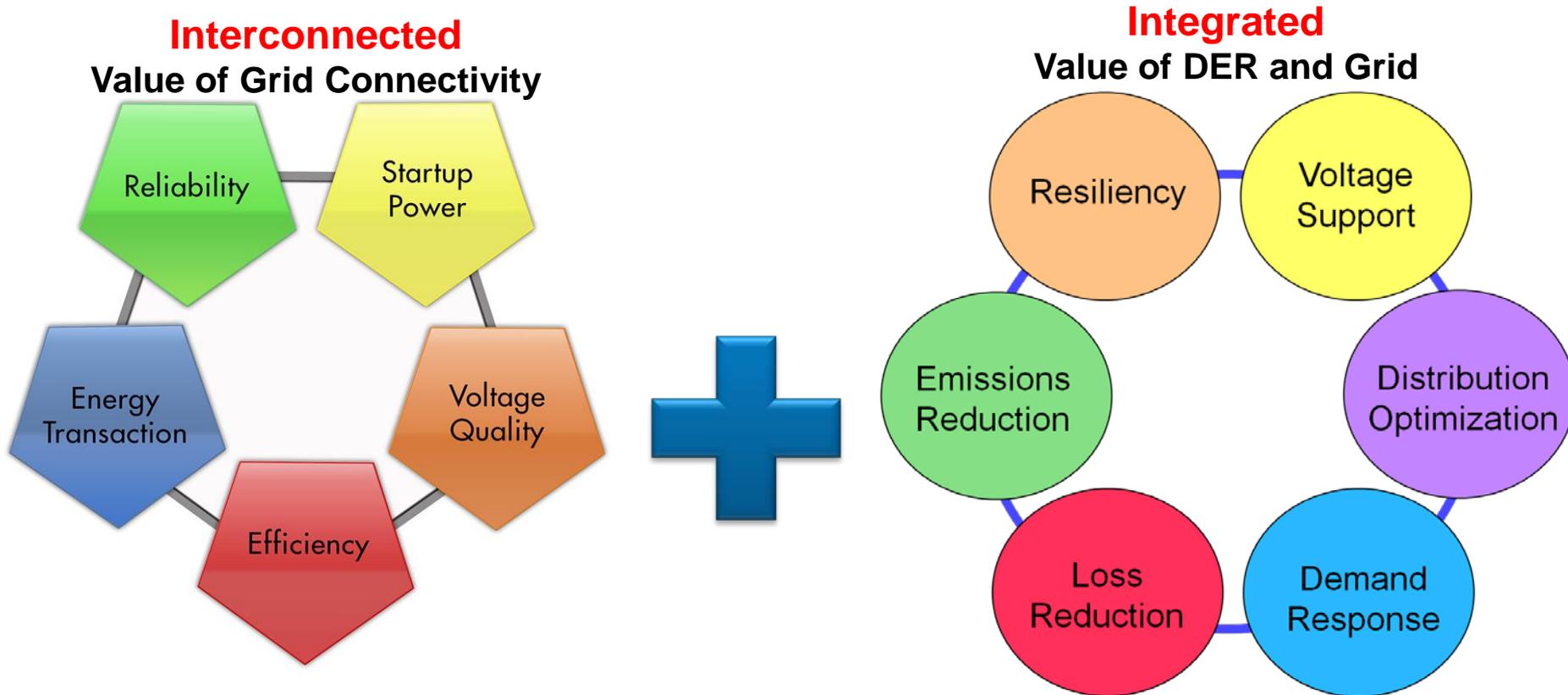
THE INTEGRATED GRID

REALIZING THE FULL VALUE OF CENTRAL
AND DISTRIBUTED ENERGY RESOURCES

***Hank Courtright, Senior Vice President, EPRI
Mid-America Regulatory Conference
Indianapolis, Indiana
June 2, 2014***



Interconnected but Not Integrated



Integration Enables Values of all Resources

Next Steps

3 Key Areas & Research Challenges In Addition to EPRI's Existing Research Portfolio



**Benefit/Cost
Framework**



**Interconnection
Technical
Guidelines**



**Grid Planning &
Operations**

**Collaboration with All Stakeholders
Including Regulatory/Policy**

Integrated Grid Framework

Timeline for Three Components

DER Penetration Scenario

**2Q
2014**

Power System Impact

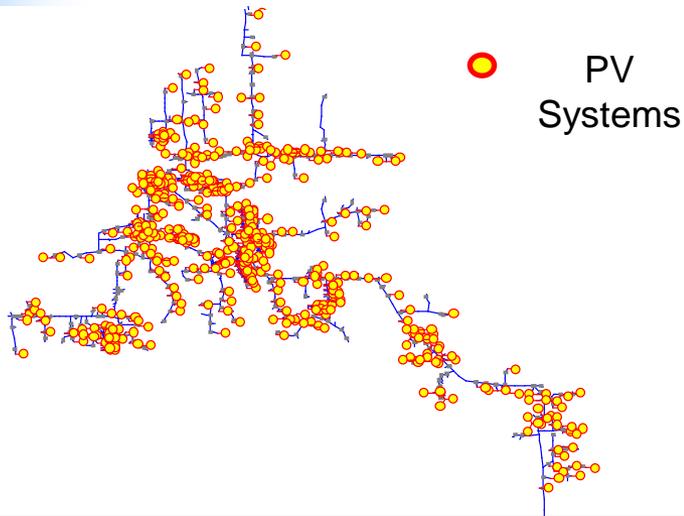
**3Q
2014**

Overall Benefit/Cost

**3Q
2014**

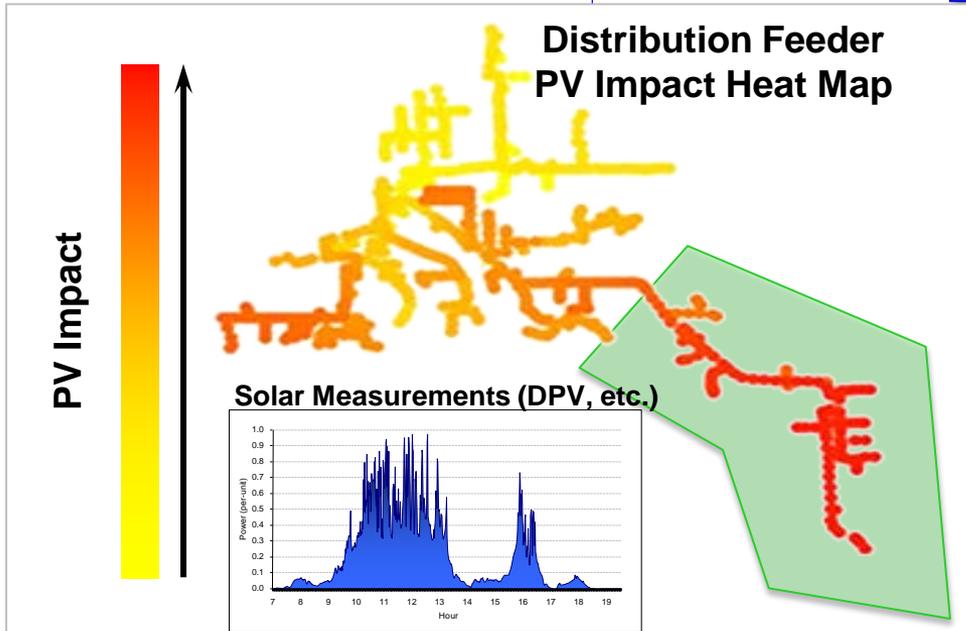
Framework Leverages Prior EPRI Research

Distribution Feeder Hosting Capacity



- Baseline – No PV
- PV Penetration 1
- PV Penetration 2
- PV Penetration 3
- Beyond...

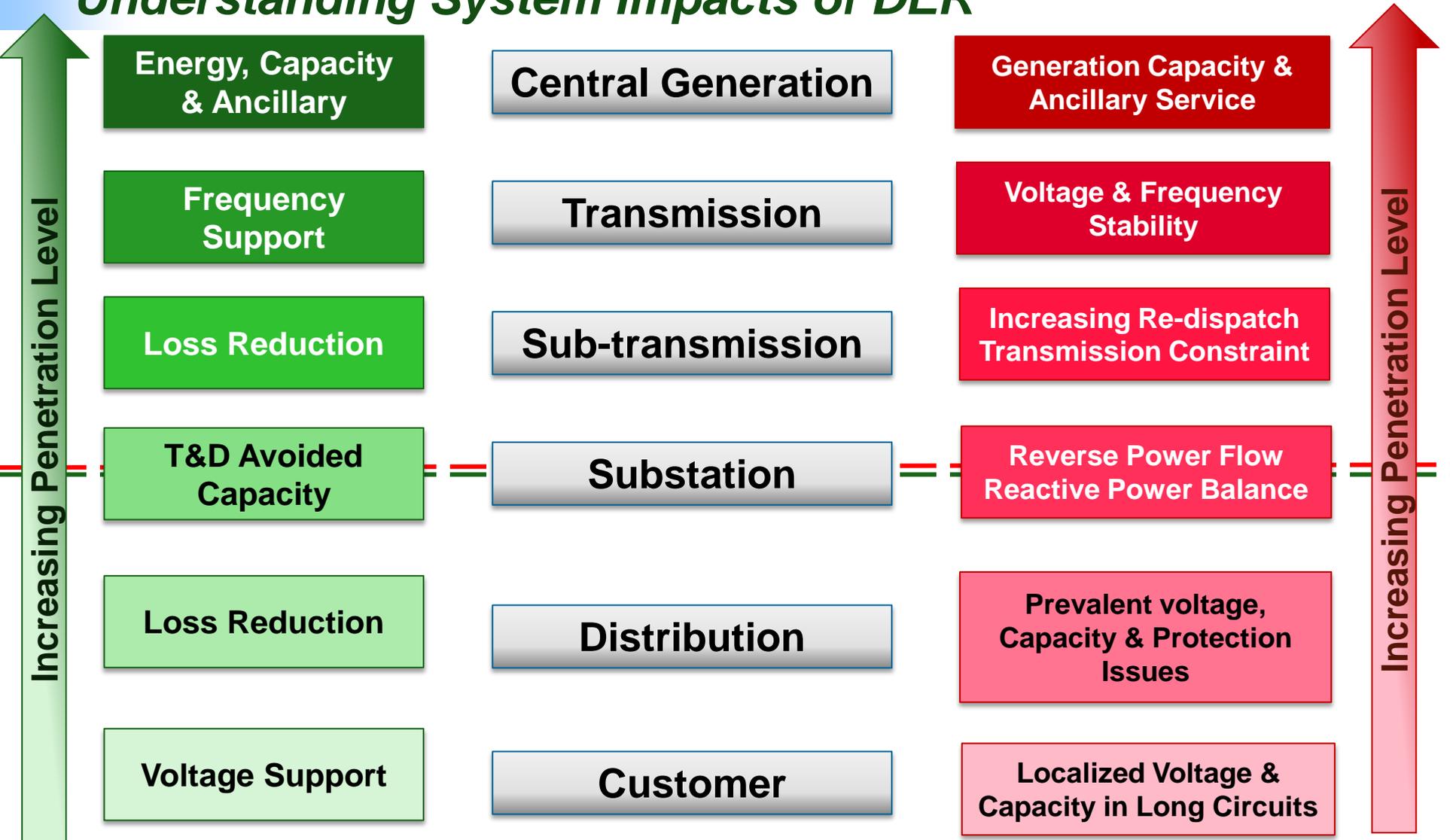
Process is repeated 100's of times to capture many possible scenarios



Increase Penetration Levels Until Violations Occur

DER Integration – Cost & Benefit

Understanding System Impacts of DER



Overall Benefit/Cost Framework

- **Utility Operations**

(people and how they do their jobs:
non-fuel O&M, non-production assets, safety)

- **System Operations**

(the power system and its efficiency: losses,
combustion, dispatch optimization, emissions)

- **Utility Assets**

(production assets required: GT&D)

- **Reliability & Power Quality**

(frequency and duration of customer interruptions,
harmonics, sags/swells, voltage violations)

- **Customer**

(equipment & other direct customer costs)

- **Society**

(environmental and other economic costs and benefits)

Utility-
Cost
Function

Customer
Perspective



Together...Shaping the Future of Electricity

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www.EPRI.com/integratedgrid

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