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Turning Locational Value to Real Dollars

Presented at the 2017 ACEEE National Conference on Energy Efficiency as a Resource

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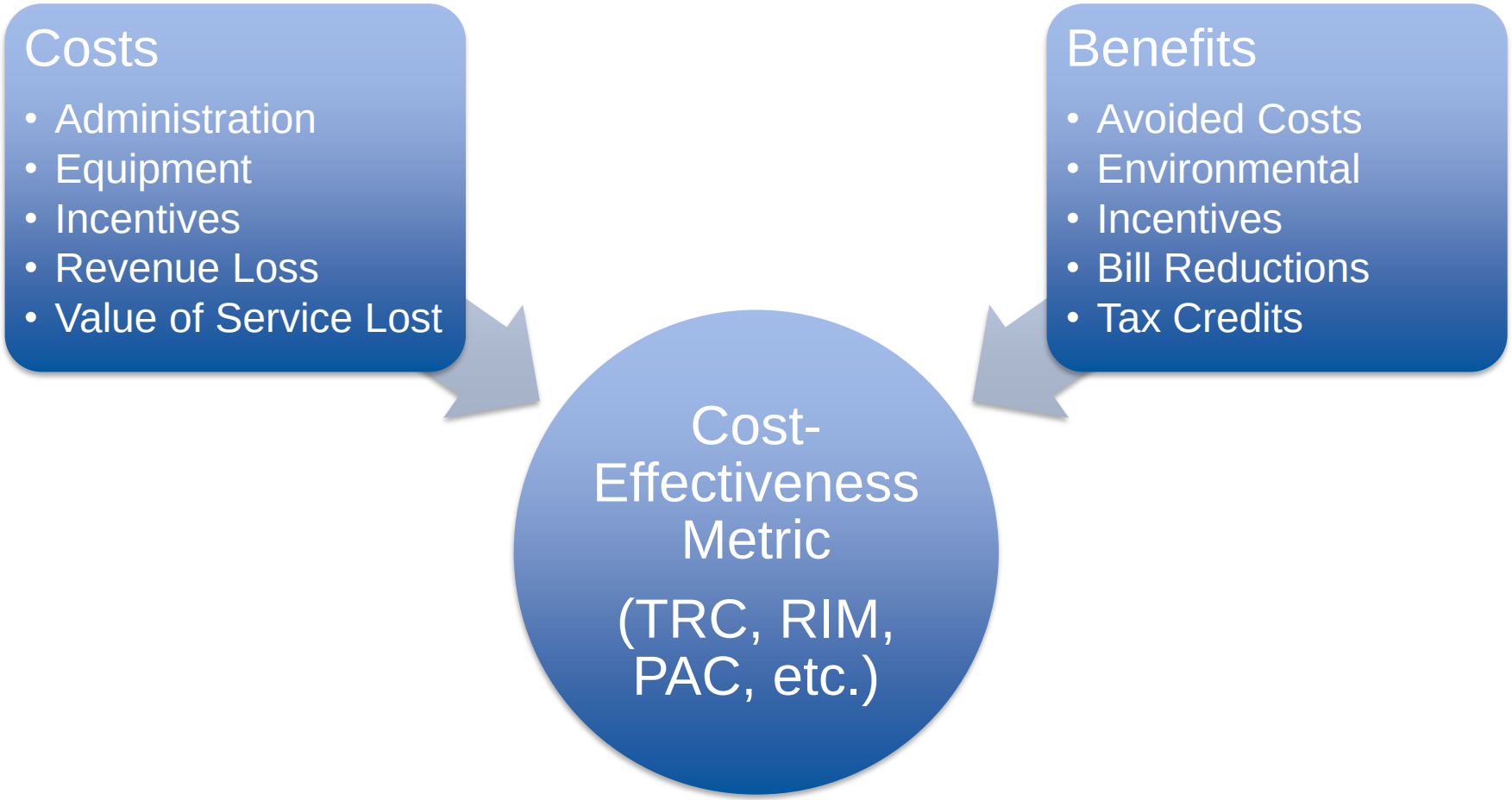
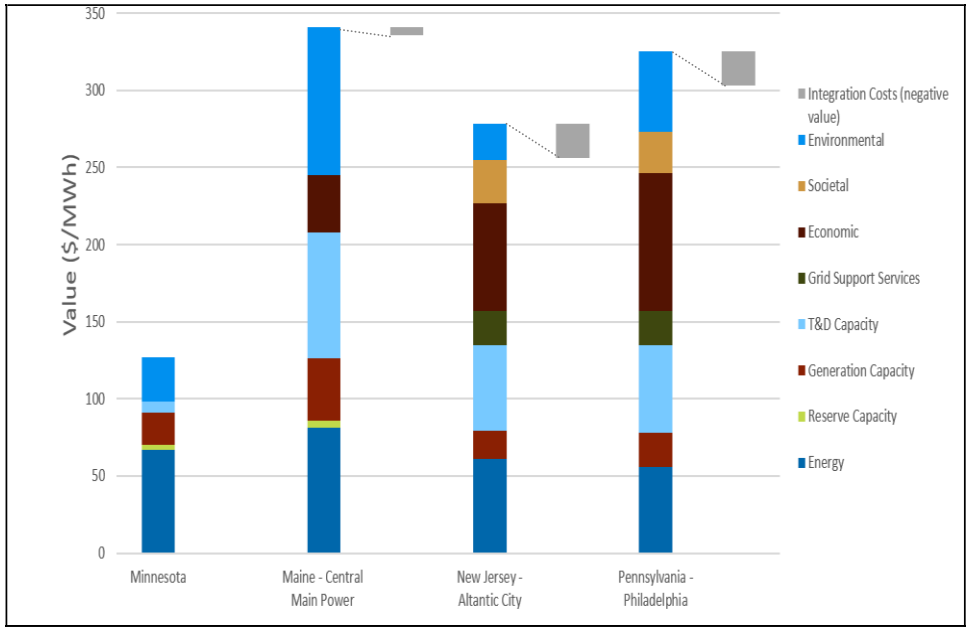
Introduction & Definitions

Cost Effectiveness Primer



Avoided Costs

- Generation Capacity
- Energy
- Transmission & Distribution Capacity (T&D)
- Ancillary Services
- Renewable Portfolio Standard
- Greenhouse Gas (GHG)
- ~~Locational Adder~~
- ~~Temporal Adder~~



Distributed Energy Resources

ICF's DER Definition

Distributed Energy Resources (DERs) include:

- distributed generation systems (CHP and solar photovoltaic systems)
- distributed storage (including plug-in electric vehicles)
- demand response and energy efficiency

- DER systems typically produce less than 10 megawatts (MW) of power
- Isolated or connected to the electric distribution power grid
- Behind-the-meter and in-front-of-the-meter

EE/ DR

Distributed Photovoltaic

Distributed Storage

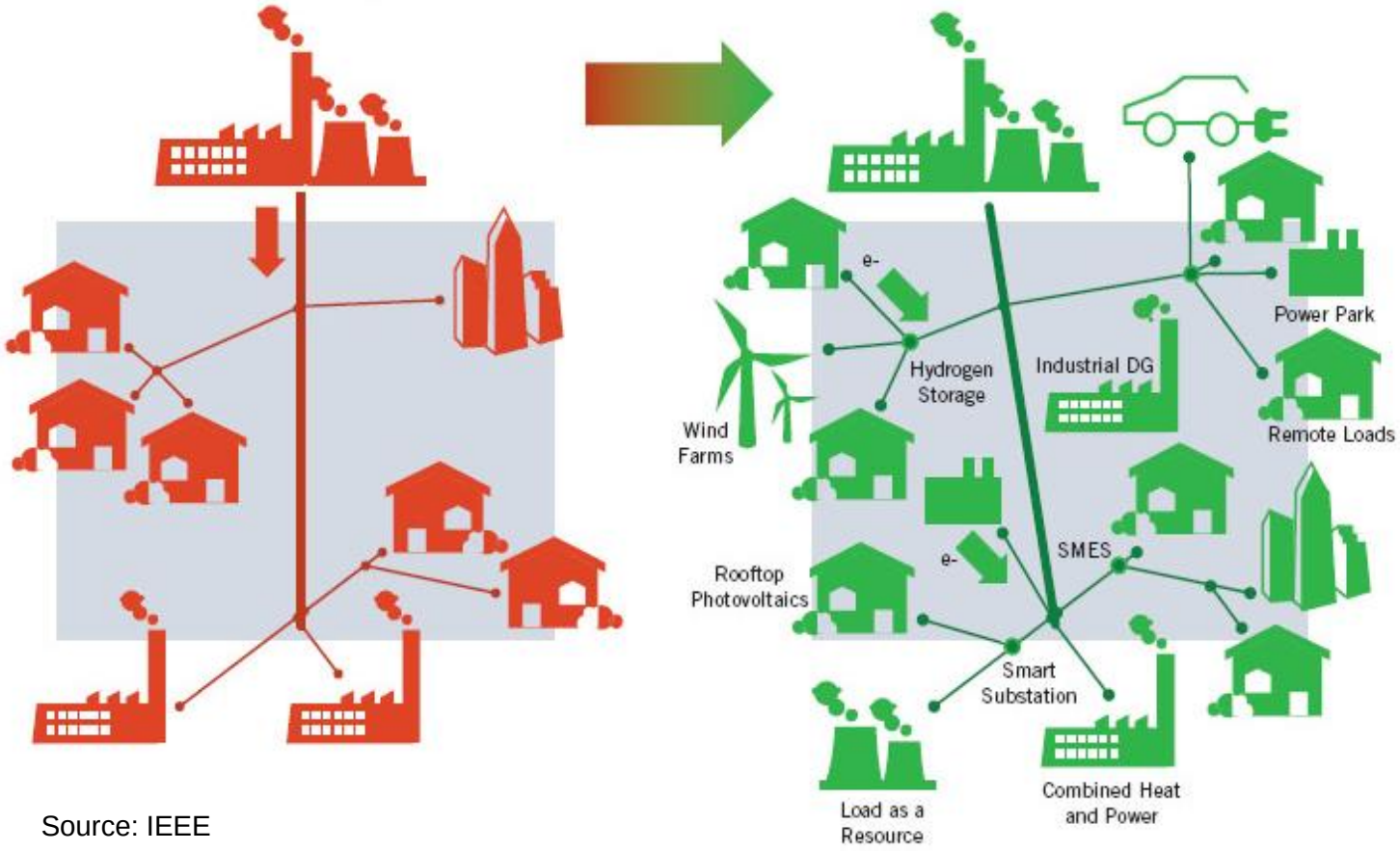
Electric Vehicles

Combined Heat and Power

The Issue

The Motivation!

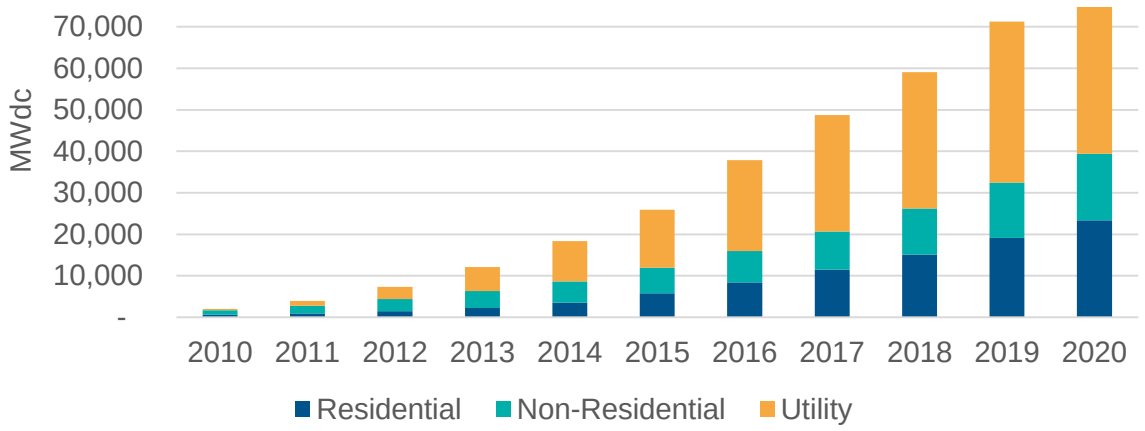
ONE-WAY ROAD TO MULTI-DIRECTIONAL NETWORK



Source: IEEE

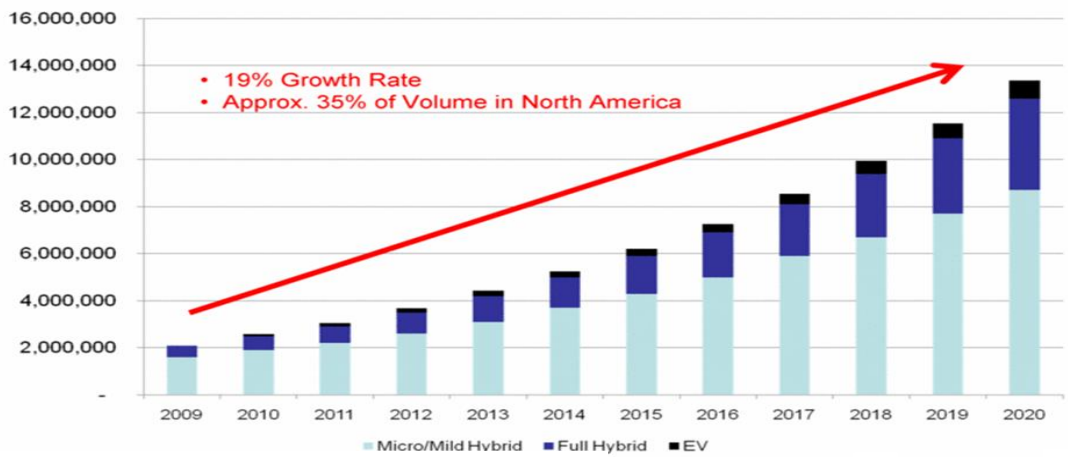
DER Penetration

Solar PV Growth



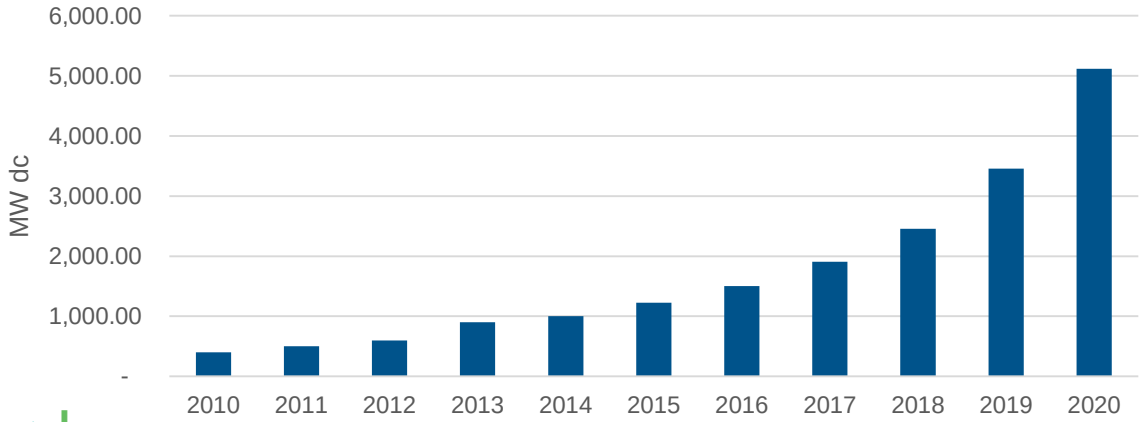
SOURCE: ICF, BNEF, GTM Data

Electric Vehicles Growth



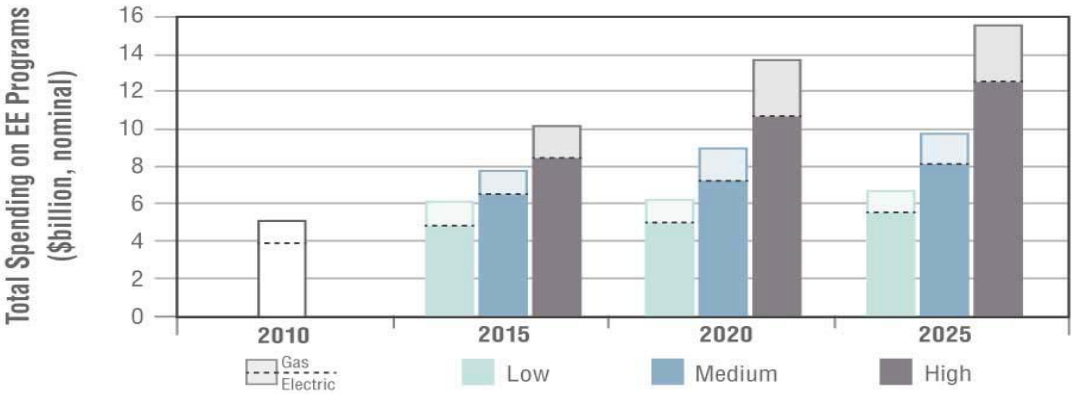
SOURCE: *Source: Prismark, October 2009*

Energy Storage Growth



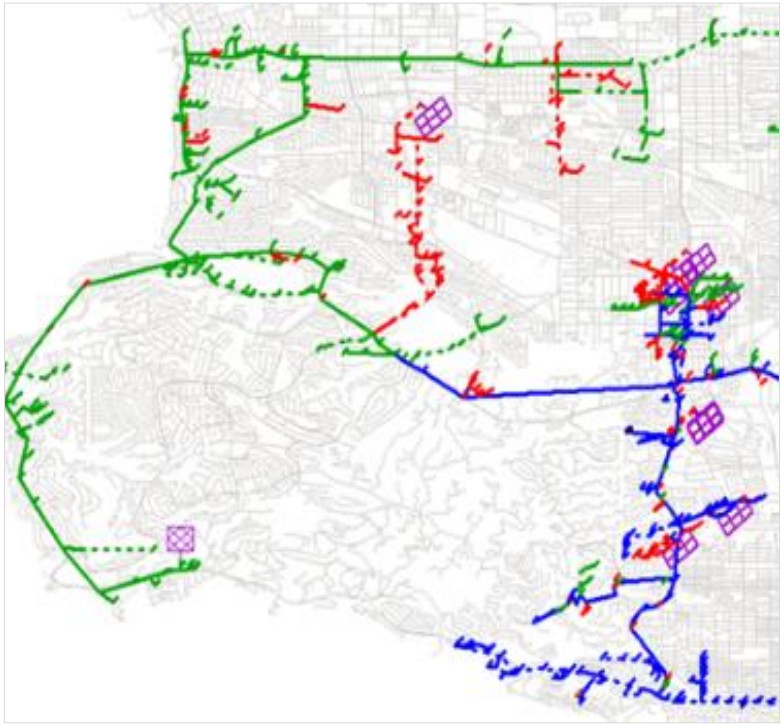
SOURCE: ICF

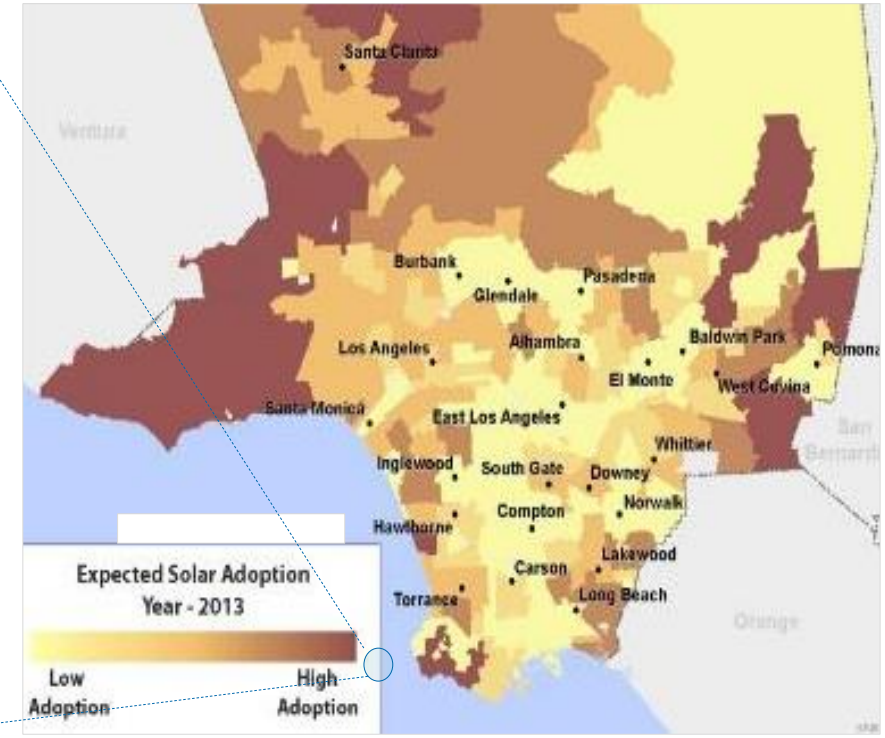
Energy Efficiency Growth



SOURCE: *Source: 2010 spending based on CEE (2012)*

Impact on Grid





Number of low and high voltage violations are observed at 1:00 pm

Legend

- Low Voltage Violation (<95%)
- Normal Voltage (95% - 105%)
- High Voltage Violation (>105%)
- Source or Substation
- Rooftop Solar PV Arrays

[1]30% measured at 5pm.
Source: ICF DEEP Analysis.

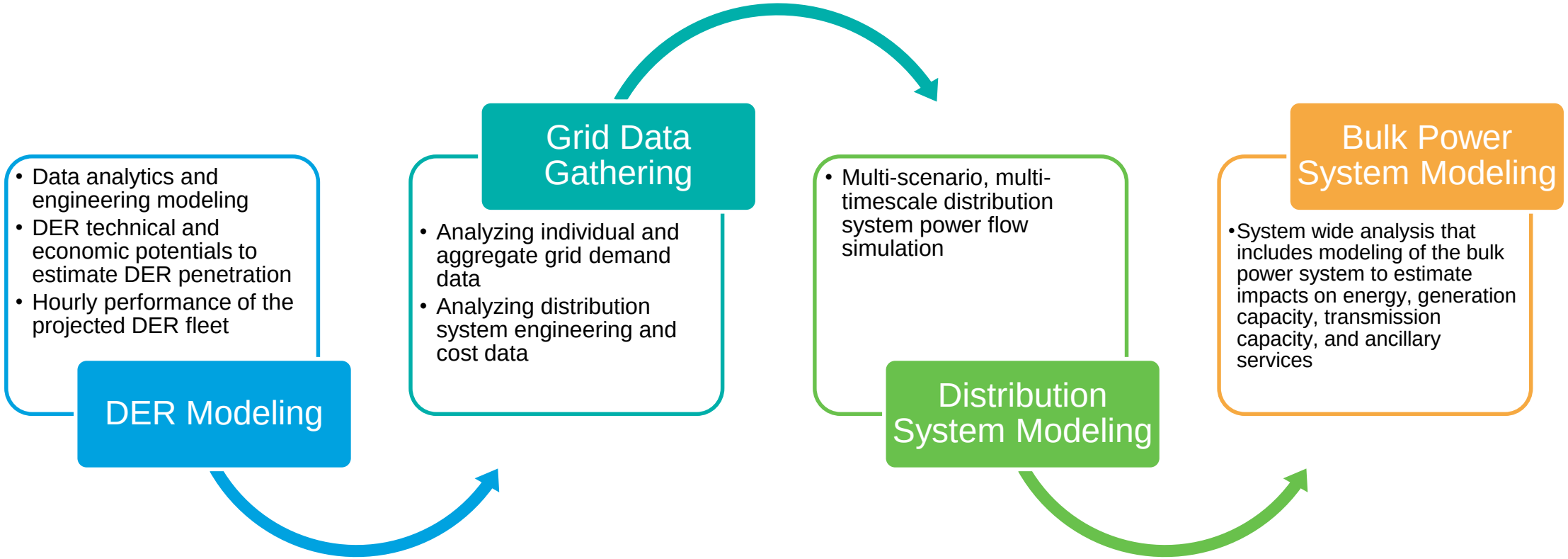
Locational Value?

- Growing understanding that there is some locational value to be captured that can help with these challenges, but:

  - **How much is it?**
  - **How big is the difference from one location to another?**
  - **How do you measure it?**
  - **How hard it is it to measure?**
  - **And, if you find it, how do you capture it?**

Approach

Overview of Approach



Process to Get to Locational Value

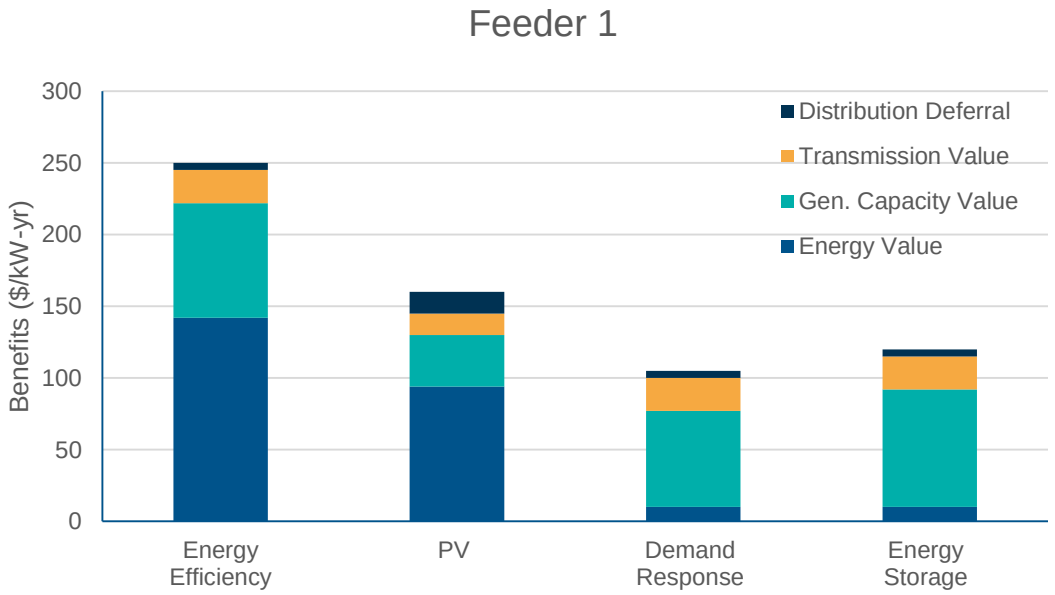
DER Characteristics

DER Potential

Cost of Traditional Grid Upgrades

Bulk Power System Impacts

Distribution Deferral Benefit

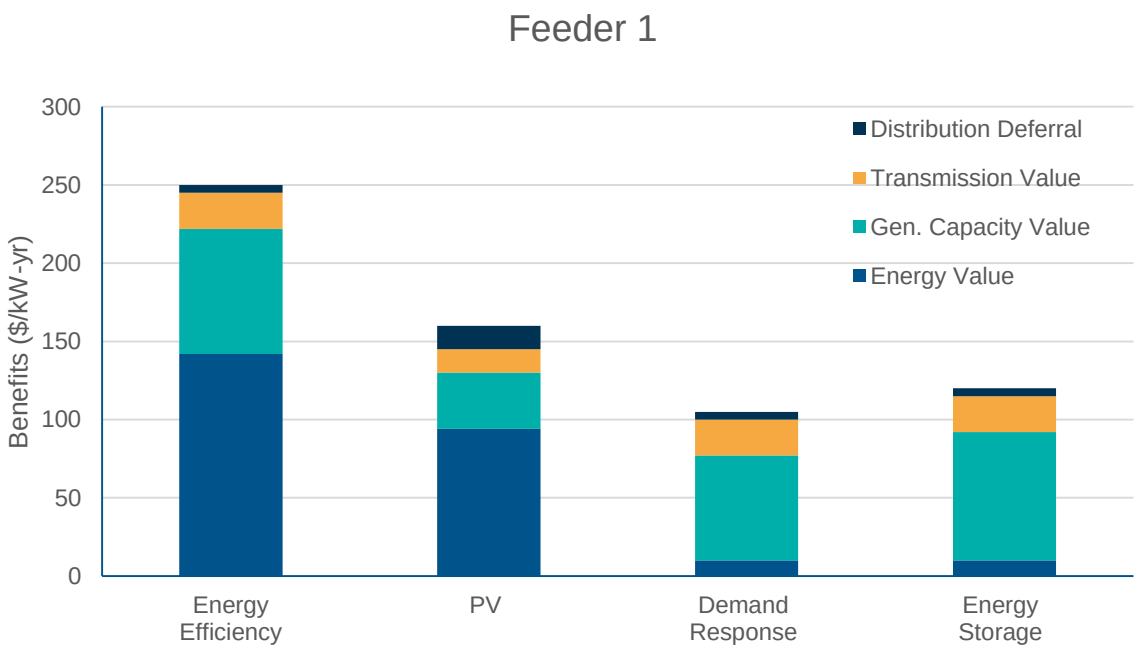


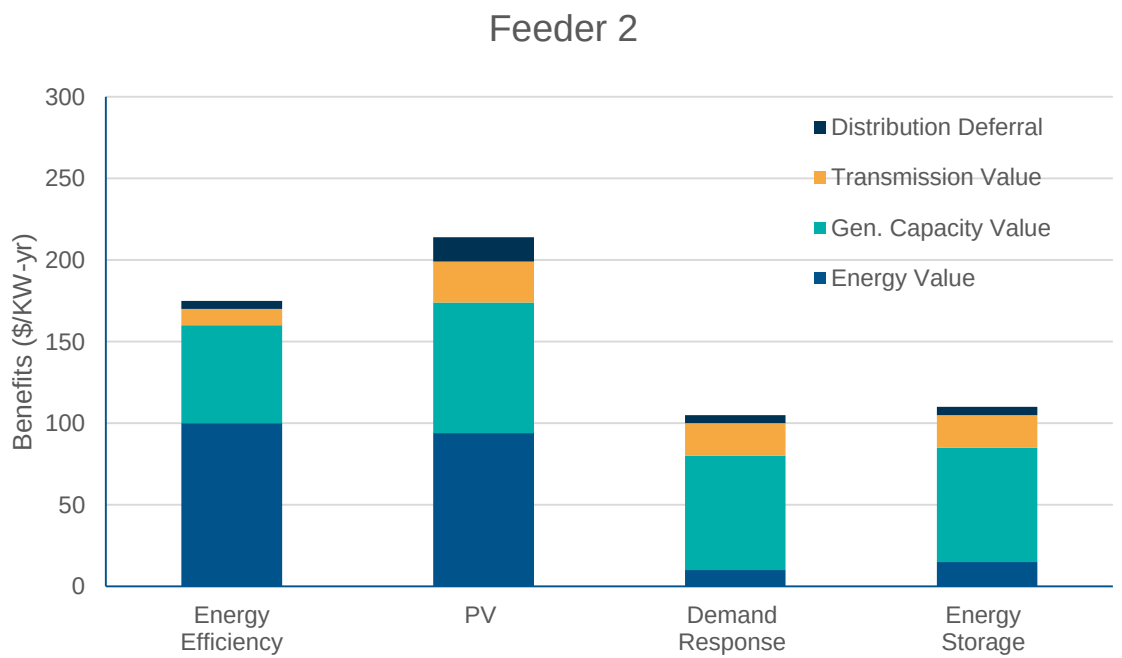
DER Benefits

Source: ICF

SOURCE: ICF

Illustrative Results of Locational Value

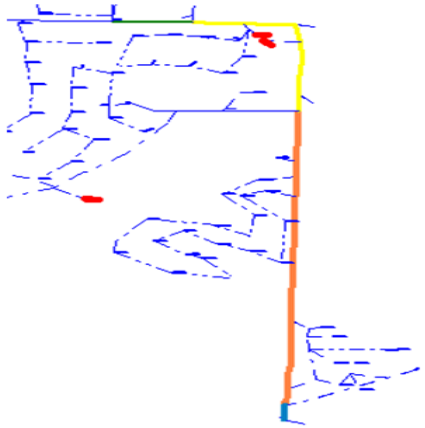




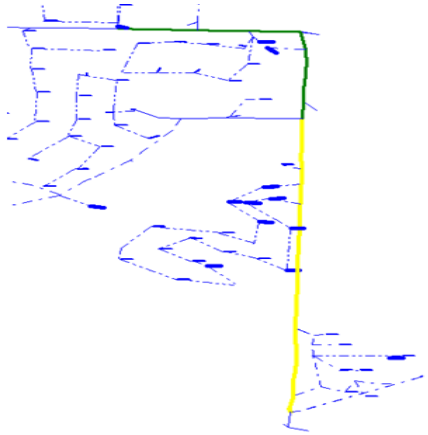
Case Study: Implications of Considering Locational Value

Uses of Locational Value Application1: Non-Wire Alternatives

Loading Level %	
0 - 80	
80 - 90	
90 - 95	
95 - 100	



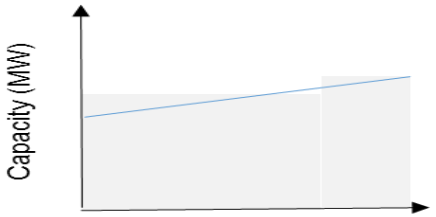
Overloading in a section of the distribution grid



A conventional DER portfolio does not eliminate the issue completely

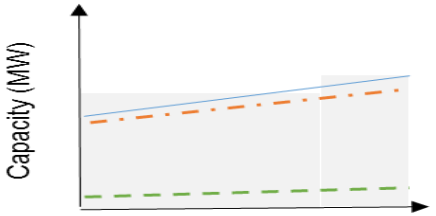
An optimal DER portfolio can provide a more effective solution

Feeder Capacity
Demand on Feeder
Output of DER Portfolio during peak hours
Net Demand on Feeder



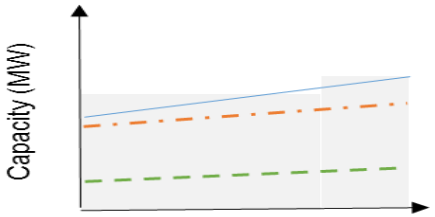
Demand on the feeder is expected to exceed installed capacity in the future thereby causing thermal overloads in the system

(a)



A conventional portfolio of DER can reduce the peak demand on the feeder, but the reduction is not significant. Grid upgrades would be needed in the future

(b)



An optimized portfolio of DER can reduce the peak demand on the feeder more effectively, and provide a more robust DER solution.

(c)

Source: ICF

Uses of Locational Value Application 2: EE Program Cost Effectiveness

Case	Avoided Cost Without Locational Distribution Savings $/kW	Avoided Cost With Locational Distribution Savings $/kW	Program Cost Effectiveness without Locational Avoided Costs (TRC)	Program Cost Effectiveness with Locational Avoided Costs (TRC)
Feeder 1	82	87.5	1	1.04
Feeder 2	82	94	1	1.1
Feeder 3	82	127	1	1.27

Implications

- Including locational value increases avoided cost benefits from 7% to 50%
- As a result, benefit-cost ratios of EE programs could increase between 4% and 27%
- Previously non cost-effective programs may become cost-effective
- Could help lead the way for planned DER deployment
- Updates to program designs (e.g., incentive levels) may be supported
- Utility shareholder incentives could increase significantly

Implementation in Programs

Locational Implementation

- **Existing incentive levels are not increased**
  - Connects customers to existing programs and incentives
- **Community-based Energy Ambassador Program**
  - Energy Ambassador
  - Energy Task Force
  - Community Challenge
  - Aggressive Marketing
  - Unique theme and website

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Conclusions

- Locational net value is key
  - Must also factor in temporal value
- Aligning pricing, programs, and procurement to hosting capacity and locational value is essential
- Analysis needs to improve
  - This is hard, but achievable
- Methodologies must be scalable
- Regulatory structures must keep pace

References

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