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EE Lighting the Way

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ICF's Energy Practice

- **Leading Edge Analytics**
 - Foundational modeling and analytical capabilities that inform strategic decisions on customer engagement, generation and grid investments and DER valuation and sourcing
- **Premier DSM Consultants in North America**
 - Delivering Programs in 40 States and Provinces
- **Award-winning Customer Engagement**
 - Leveraging combinations of marketing, technology, analytics, and program expertise to deliver end to end customer engagement solutions for over 40 utilities
- **Comprehensive Experience for Complex “Future Utility” Issues**
 - Insights from leading utility engagements in NY, CA, OR, NV, MN, AZ, MA, CO, Canada & Australia





Energy Efficiency is an Effective Alternative to Traditional Grid Investments

Energy Efficiency Lighting the Way to an Integrated Grid

1

Energy efficiency is competitive against zero marginal cost resources

2

Energy efficiency measures can be tailored to meet grid needs (both local and system)

3

Energy efficiency can improve the economics and grid performance of other DER



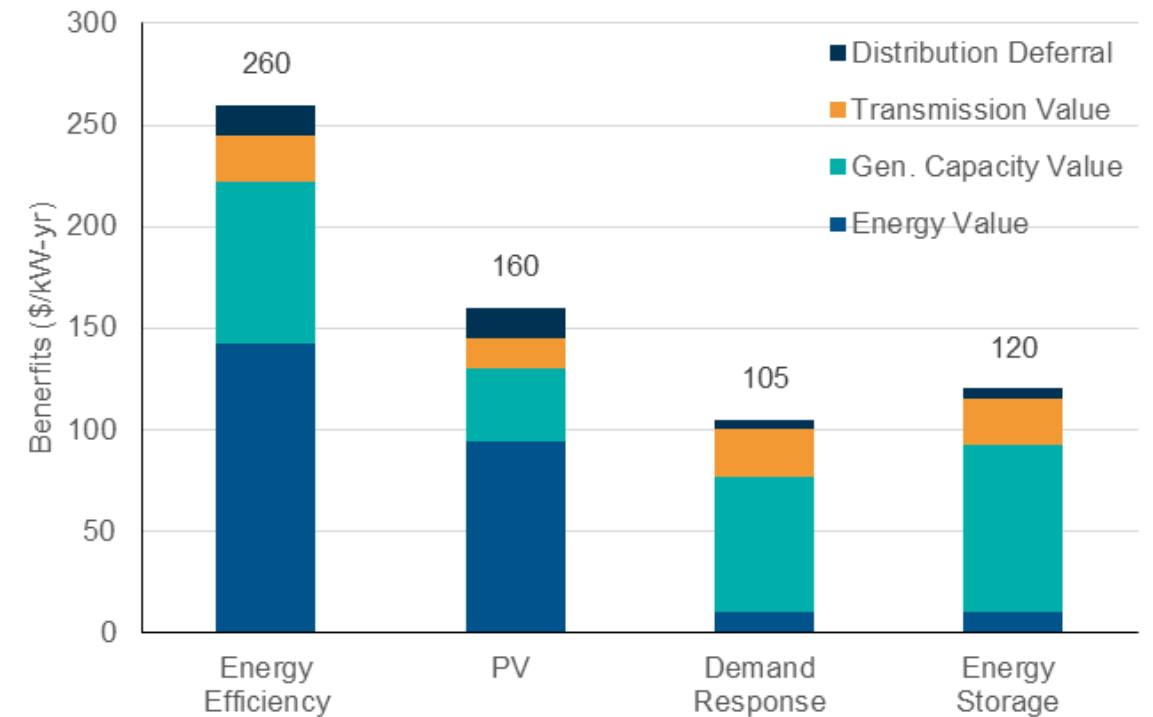
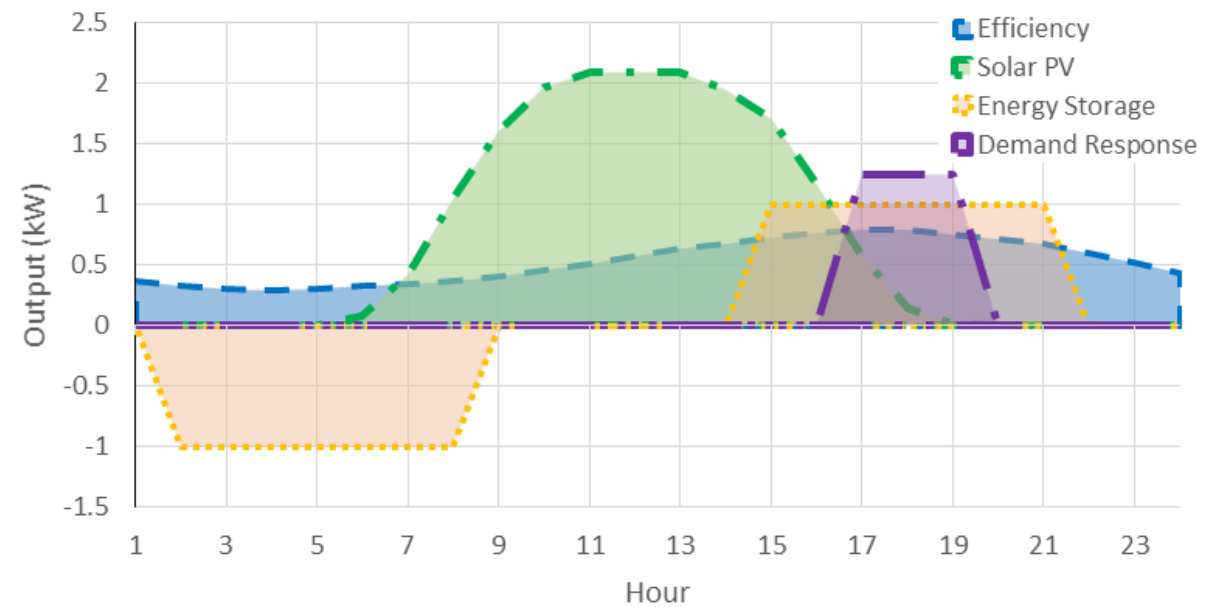
1

Energy efficiency is competitive against zero marginal cost resources

- **EE is the cheapest DER (avg 2.4 cents/kwh):**
 - Unlike storage or DR there is no incremental cost to operate
- **Proven track record of success in commercial and residential markets**
- **Mature technology and measures are relatively persistent**
 - No customer opt-out unlike DR
 - Very low equipment failures unlike storage

Value of DER – Avoided Costs and Benefits

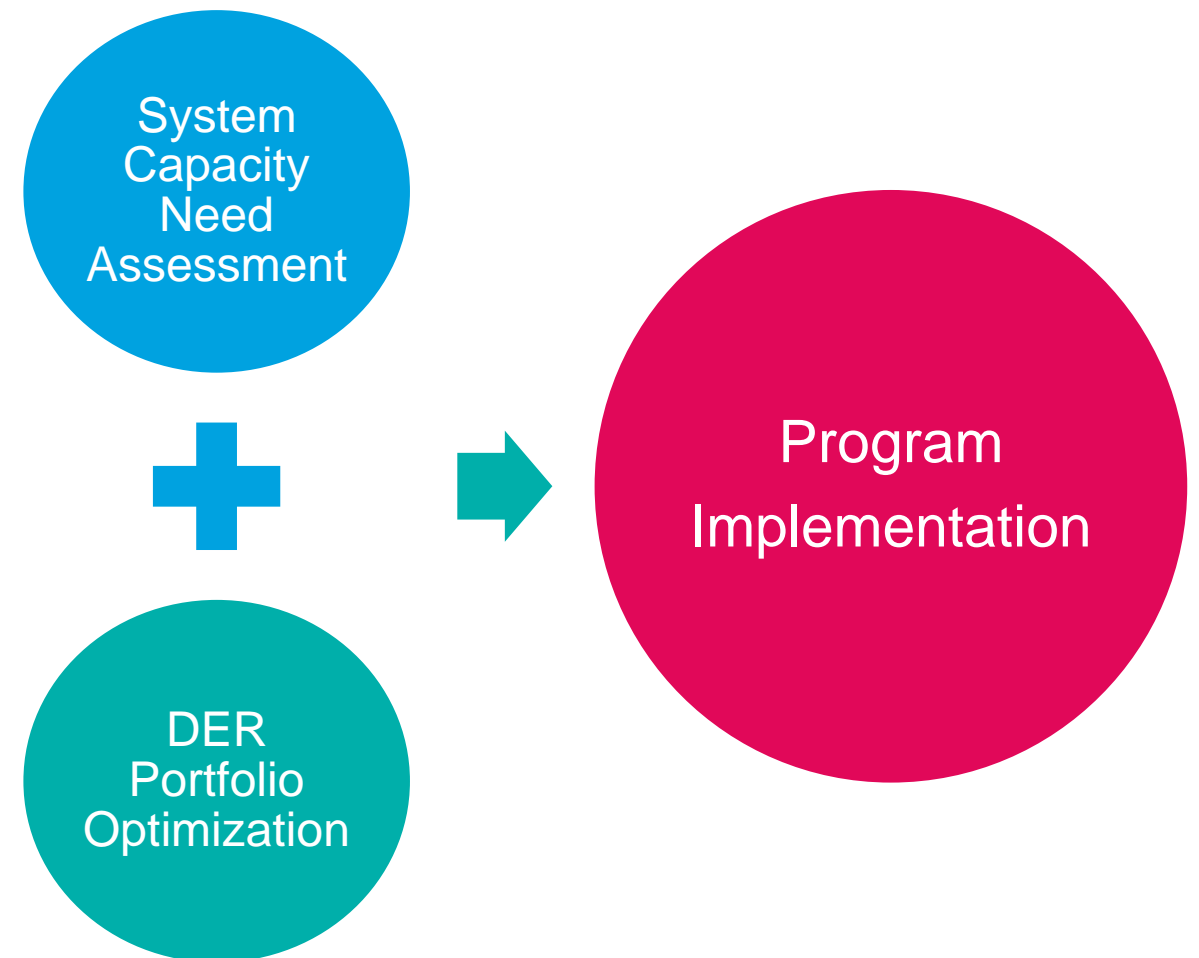
- **DER Output Characteristics play an important role in determining the Value of DERs**
- **Energy Efficiency**
 - High energy and capacity value per kW
 - Lower availability/potential
- **Solar PV**
 - Low utilization (capacity factor)
 - Lower capacity and energy value
 - High hosting capacity/availability
- **Demand Response and Energy Storage**
 - Capacity products
 - Very low energy value (only arbitrage for energy storage)



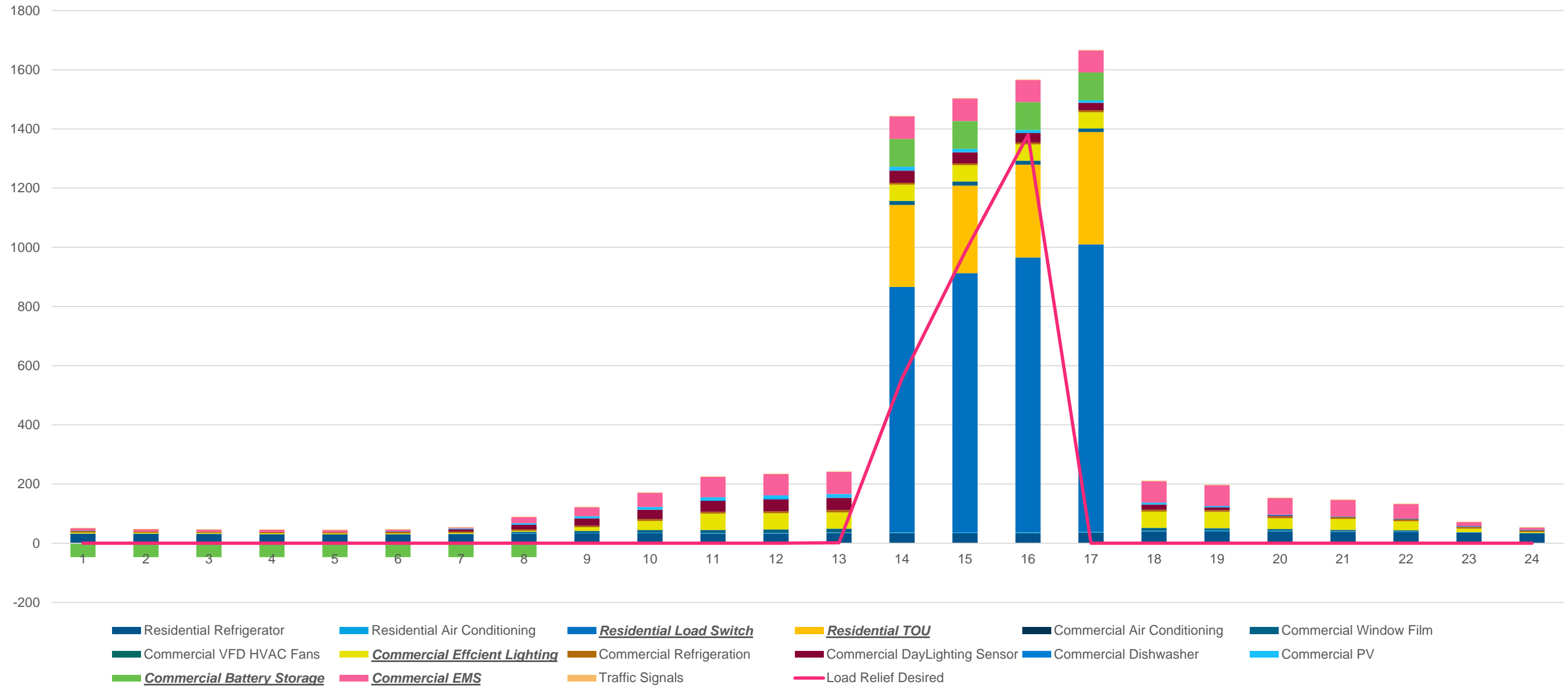
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Energy efficiency measures can be tailored to meet grid needs

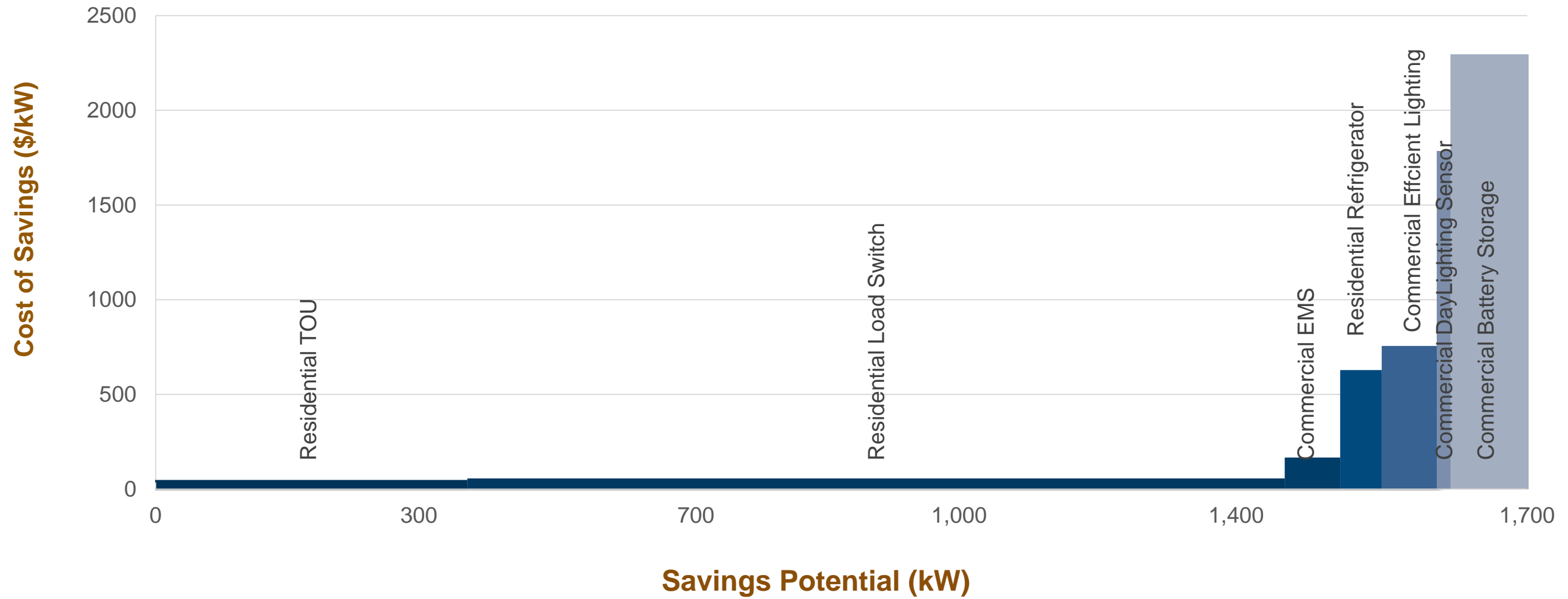
- Naturally location specific and lends itself to targeted programs
- Measures can be selected to address specific temporal grid needs during the day
- However, need to address the M&V and deemed reductions as traditional approaches are insufficient for grid purposes
 - Meter-based savings approaches/P4P



Schwartz Creek: DER Demand Reduction



Top Peak Reduction Measures: Residential & Commercial



3

Energy efficiency can improve the economics and grid performance of other DER

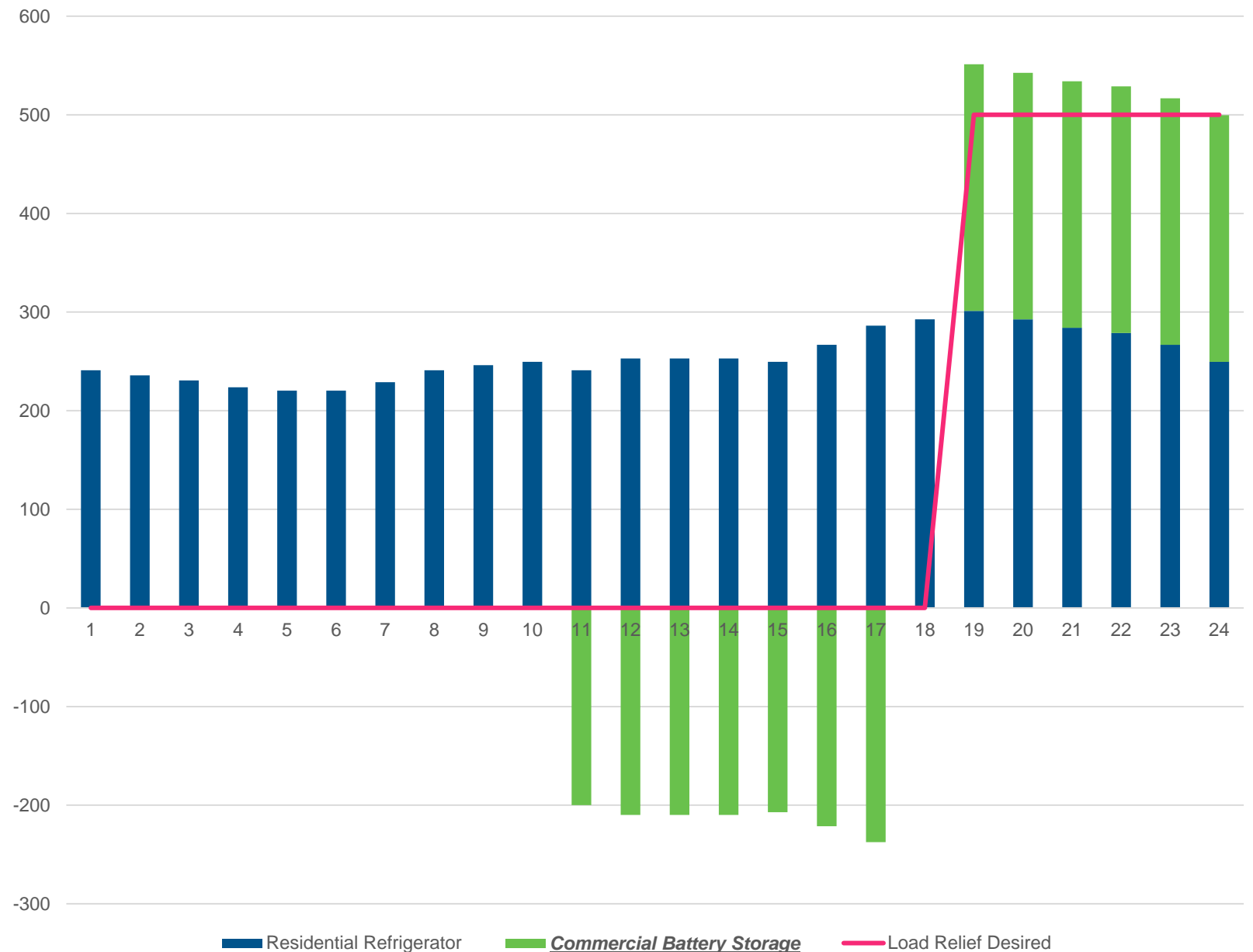
- **Energy efficiency combined with energy storage can improve the overall cost performance of storage alone**
- **Energy efficiency combined with PV results in greater annual energy and peak demand savings**

Case Study:

Dispatch Block	Hosting Capacity
1	10:00 am to 1:00 pm
2	1:00 pm to 4:00 pm
3	10:00 am to 4:00 pm
Dispatch Block	Load Relief
1	6:00 pm to 9:00 pm
2	9:00 pm to 12:00 am
3	6:00 pm to 12:00 am

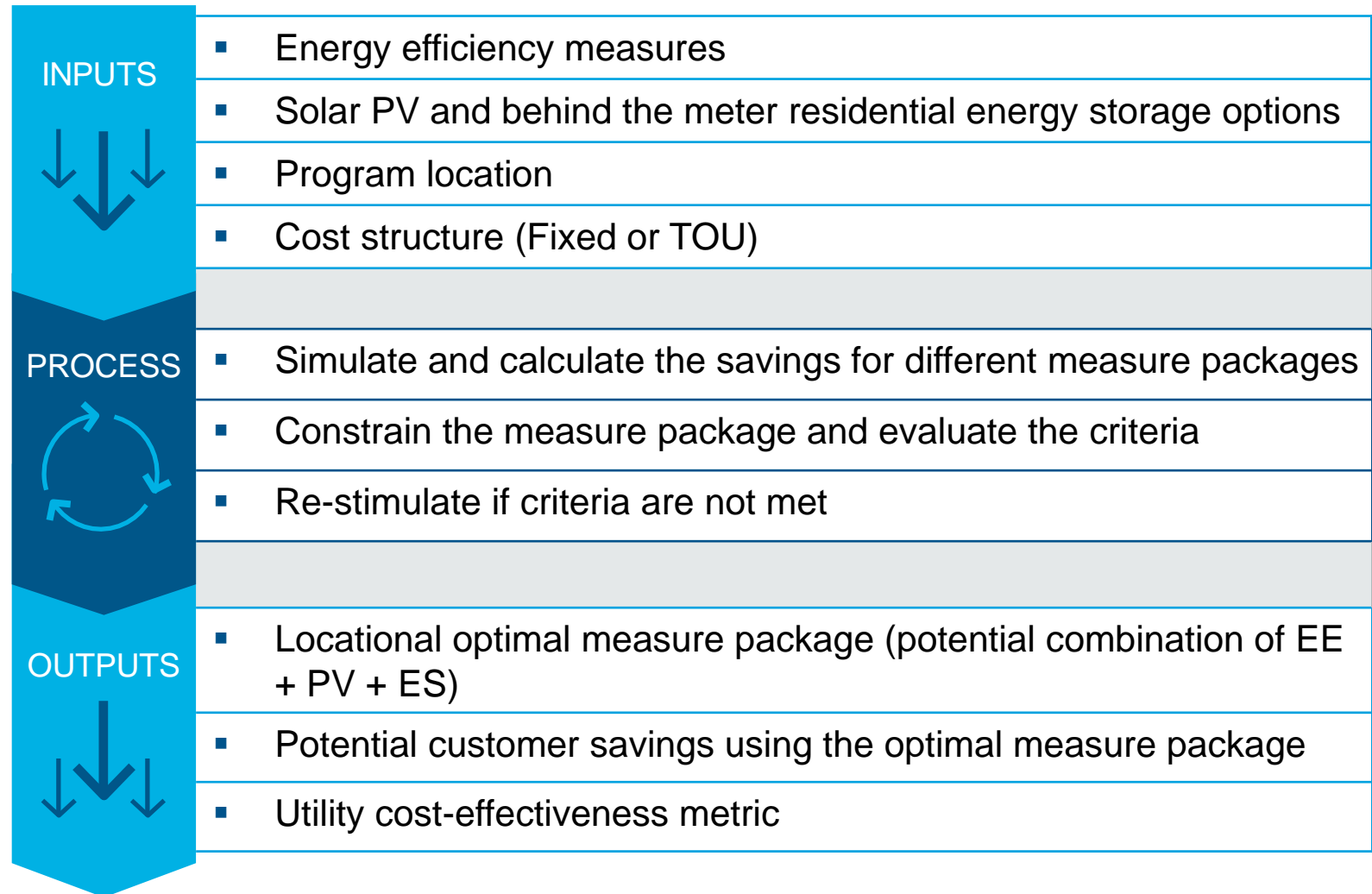
EE plus Storage: Evening Load Relief

- Product designed to avoid hosting capacity impacts from excess solar and provide evening load relief between 6:00 pm and 12:00 am
- Battery charged “for free” from efficiency savings and discharged at evening peak



DER Optimization: Example

Optimization Framework



Optimized DER (EE + PV) Program Design Savings

Customer Savings (NPV – 25Years – 3% discount)

\$7,535 (TX)

\$4,995 (MD)

Cost to Benefit Ratio (PAC)

1:5 (TX)

1:5 (MD)

Annual Energy Savings (kWh)

6,671 (TX)

4,332 (MD)

Peak Demand Savings (kW)

1.14 (TX)

0.77 (MD)

ICF's Thermostat Optimization Program Thermostat Level Data Sources

Premise Level Data Sources

- Housing Characteristics
- AMI
- Smart Home
 - Sensors
 - Connected Devices
 - DHW
 - Pool Pump, etc.
- Solar Panels
- Batteries

Customer Level Data Sources

- Past Program Participation
- Demographic
- Socioeconomic
- Number of Occupants
- Education Level
- Mosaic Segments

SIGHTLINE™
POWERED BY **ICF**

ICF Analytics

- DSM Program Design
- What the House Needs
 - Customer Propensity
 - Locational and Temporal Grid Optimization

Customer Engagement thru Next Best Offer:
EE / DR / DER Programs

Marketing and Program
M&V / EM&V

Forecasting and Future
DSM Program Planning



Energy Efficiency is a Key Firm Resource in a More Distributed Future

- A portfolio of diverse resources – including EE – is the most economical way to achieve reliability
- For benefits and grid services to be realized, DER deployment must be structured – both temporally and locationally
- AMI data, connected devices and the IoT will allow greater actionable information about consumption/management
- DSM programs of the future can be designed to address both energy efficiency and peak load management goals – total load management will be key (Manage the ducklings!)
- Aligning pricing, programs, and procurement to hosting capacity and locational value is essential

References

- Electricity 2030 – Trends and Tasks for the Coming Years, October 2017, CAISO; <http://www.caiso.com/Documents/Electricity2030-TrendsandTasksfortheComingYears.pdf>
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- Quantifying the Locational Value of DERs; <https://www.icf.com/resources/webinars/2017/quantifying-the-locational-value-of-ders>
- DER Optimization: Cost-effectiveness Utility Solutions with Energy Efficiency, PV and Storage; <https://www.icf.com/resources/white-papers/2016/der-optimization-cost-effective-utility-solutions>

Thank you

