TIMING IS EVERYTHING: UNDERSTANDING THE FUTURE OF EE CAPABILITY FOR UTILITY OPERATIONS

PRESENTED AT THE 2017 ACEEE NATIONAL CONFERENCE ON ENERGY EFFICIENCY AS A RESOURCE

OCTOBER 31, 2017

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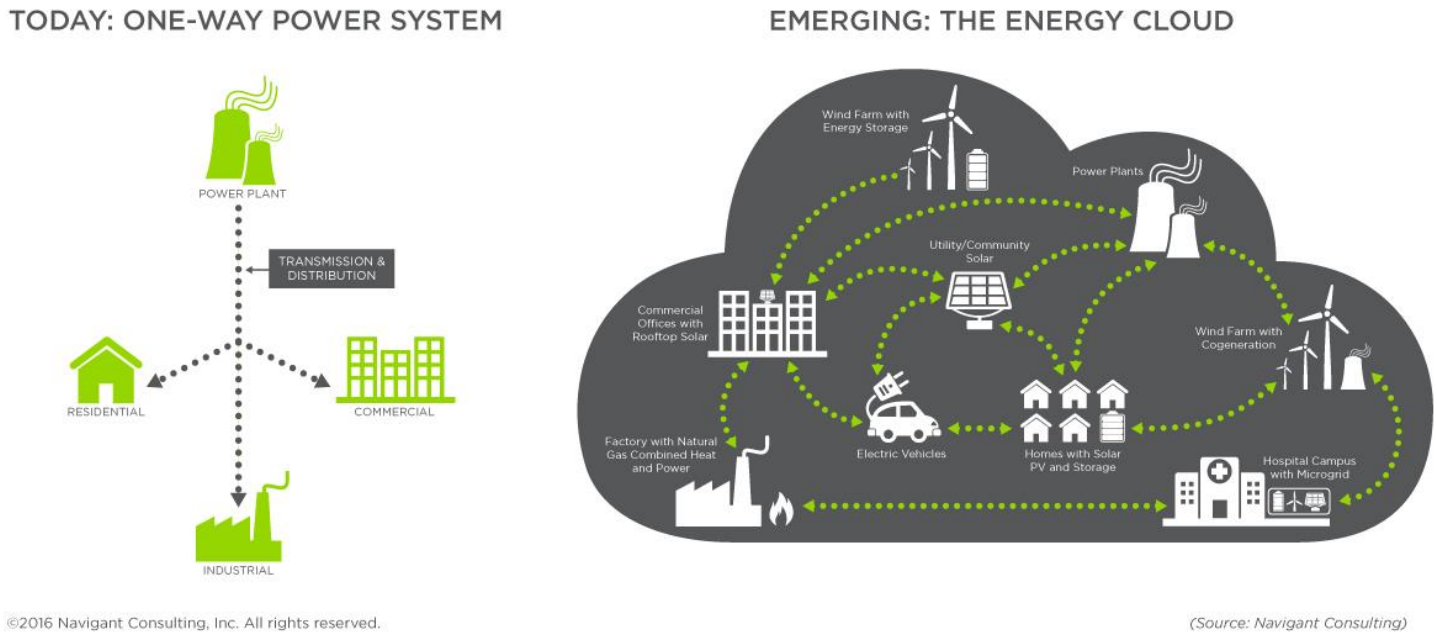
THE UTILITY TRANSFORMATION

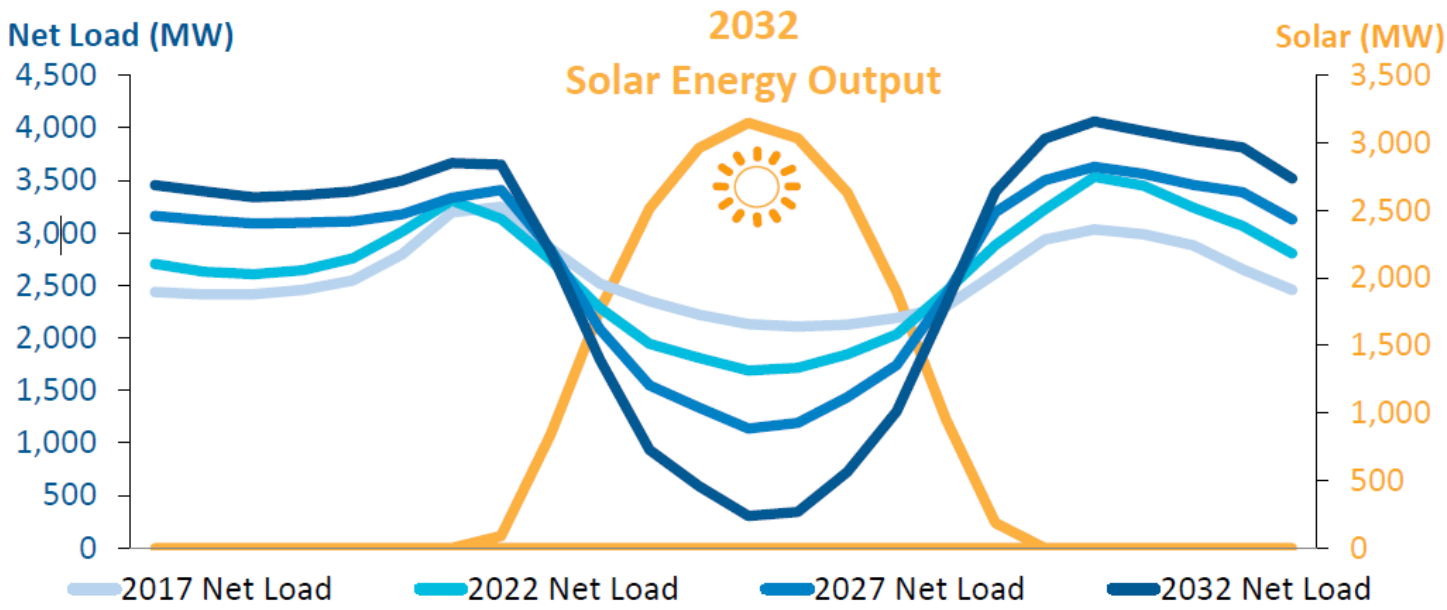


(Source: Navigant Consulting)

Utilities are preparing for and adapting to the changing way power is produced and consumed

- Rising deployment of distributed generation, mainly solar in the Southwest
- Digitalization and customer engagement
- Energy efficient technologies

WHAT DOES THIS MEAN FOR LOAD???



Source: Arizona Public Service 2017 Integrated Resource Plan

Despite predictions for growing capacity needs, the changes in power production and usage are creating concerns about minimum net loads in non-summer months

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WHAT DOES THIS MEAN FOR ENERGY PRICES???

- Regional energy markets can mitigate solar curtailment by exporting excess energy to neighboring participants….but only if a demand exists

- In 2017, Arizona Public Service (APS) experienced periods of negative pricing as a member of the California ISO Energy Imbalance Market

Percent of Negatively Priced Hours for ELAP_AZPS

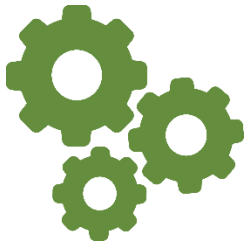
		Hour																						
Year	Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
2016	10				3%	3%				3%	13%	16%	19%	13%	10%	10%	6%								
	11			3%			3%	3%	7%	13%	20%	20%	20%	33%	20%	10%	3%								3%
	12					6%	6%				3%	10%	29%	26%	26%	10%	3%								
2017	1	3%	6%	6%	10%	10%	10%			6%	19%	13%	16%	26%	23%	13%	13%	6%							
	2		7%	7%	18%	25%	11%	4%		18%	39%	36%	43%	29%	29%	29%	29%	25%							4%
	3		3%	6%	13%	39%	13%	3%	10%	23%	45%	52%	55%	52%	65%	42%	48%	32%	10%				3%		6%
	4	7%		10%	10%	17%	13%	7%	13%	30%	23%	30%	50%	37%	33%	37%	33%	27%	13%	3%		3%			3%
	5	3%	3%	3%	3%			6%	23%	26%	16%	19%	16%	19%	19%	19%	10%								
	6				7%			17%	23%	30%	27%	17%	13%	13%	10%	10%	7%								3%
	7	3%	3%	3%			3%	3%	3%	6%	3%														

Source: California ISO via Utility Dive

The evolving paradigm of energy production, usage, and customer connectivity is changing the way utilities are designing energy efficiency portfolios to meet customer and system needs

WHAT DOES THIS MEAN FOR APS EE/DSM PROGRAMS??

How can EE be leveraged to manage a changing load profile?



Is there an optimal mix of EE technologies to facilitate temporal or locational “deployment”?

How do we **measure**, **compare** and **value** EE technologies as distributed energy resources?

Need for granular data

End-use load shapes

Direct Measurement

Simulation Modeling

Disaggregate AMI Data

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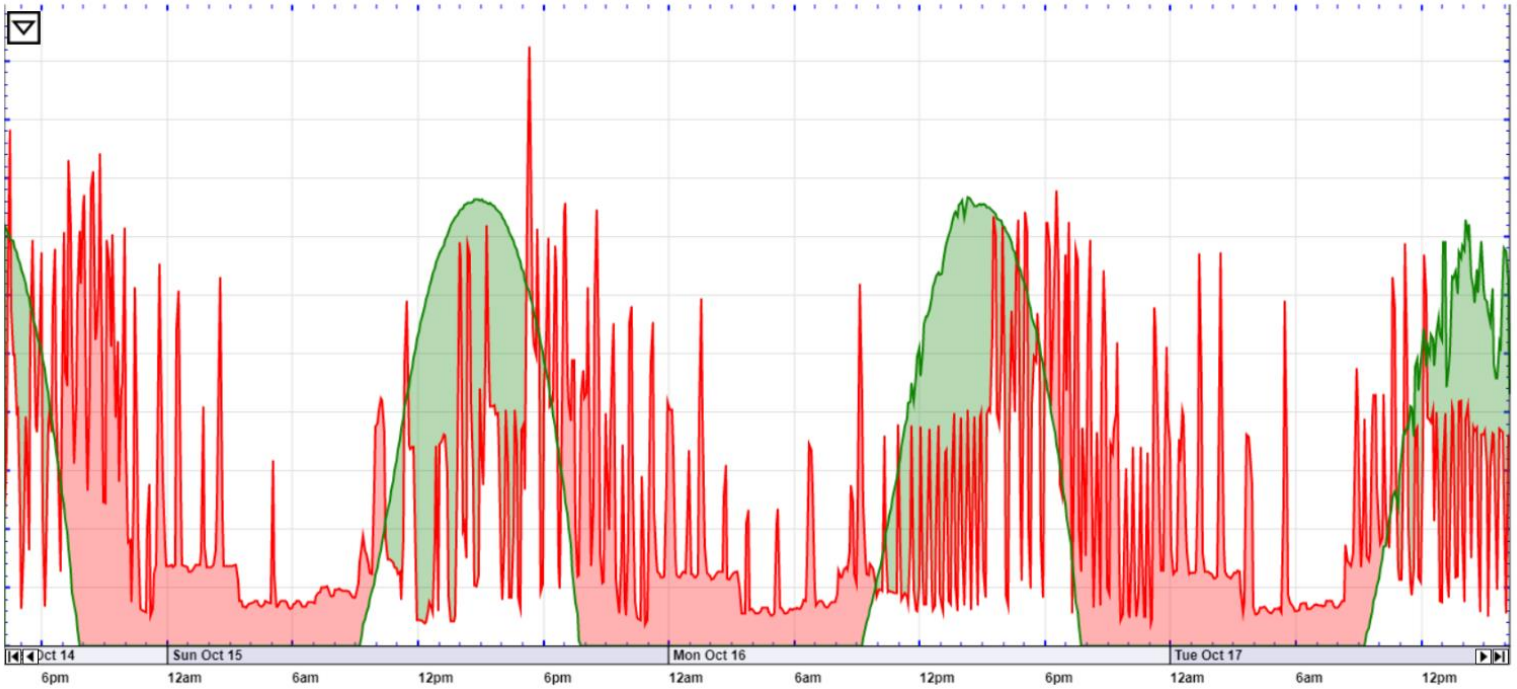
DIRECT MEASUREMENT OF EE PROFILES



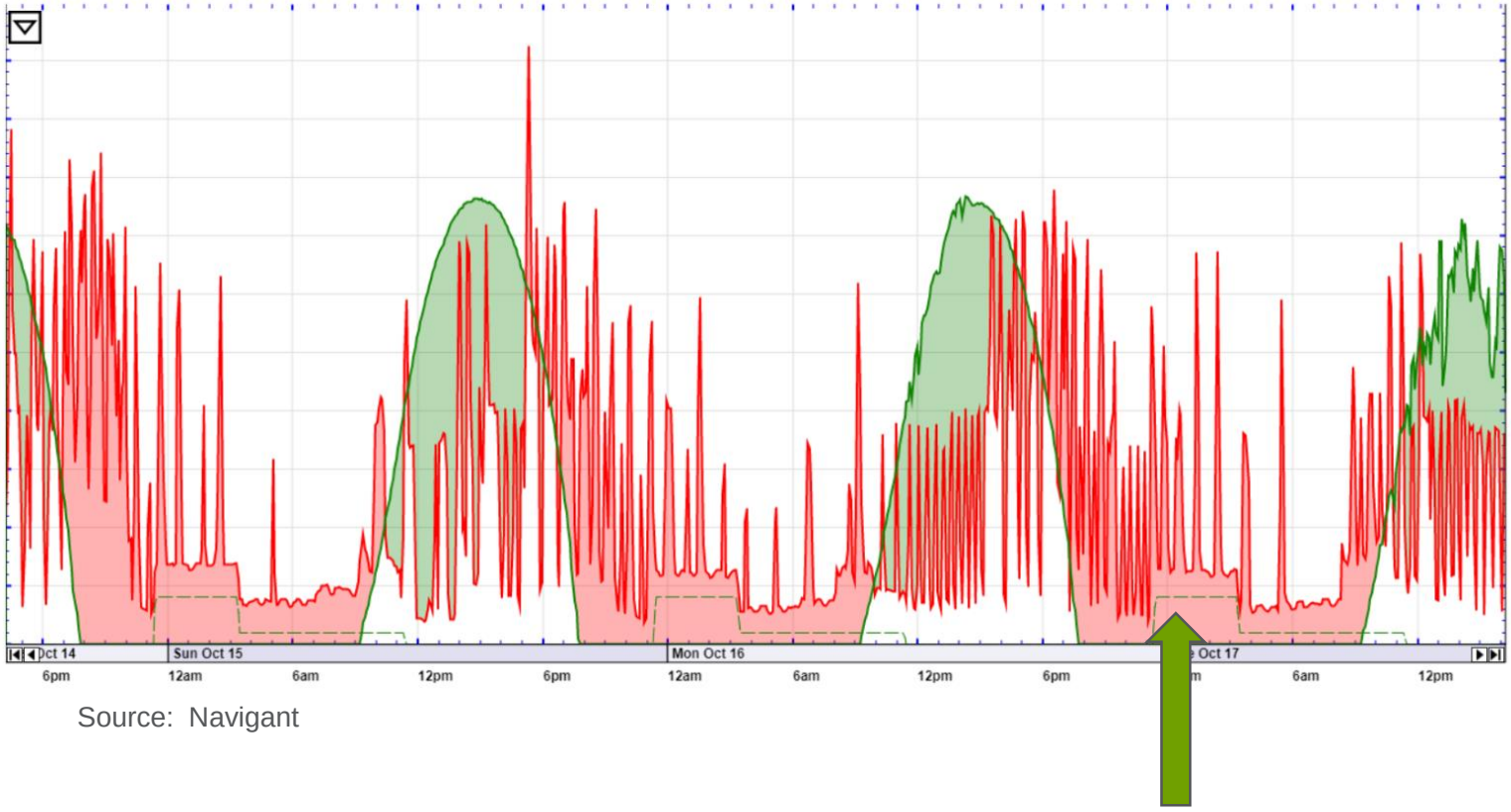
Whole Home Consumption (kW)

PV Production (kW)

Source: Navigant

High resolution data collection and modeling can be used to understand the profiles and patterns of energy use

DIRECT MEASUREMENT OF EE PROFILES



Source: Navigant

Whole Home Consumption (kW)

PV Production (kW)

Pool Pump (kW)

Disaggregated data by end use

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DIRECT MEASUREMENT OF EE PROFILES

Source: Navigant

Whole Home Consumption (kW)

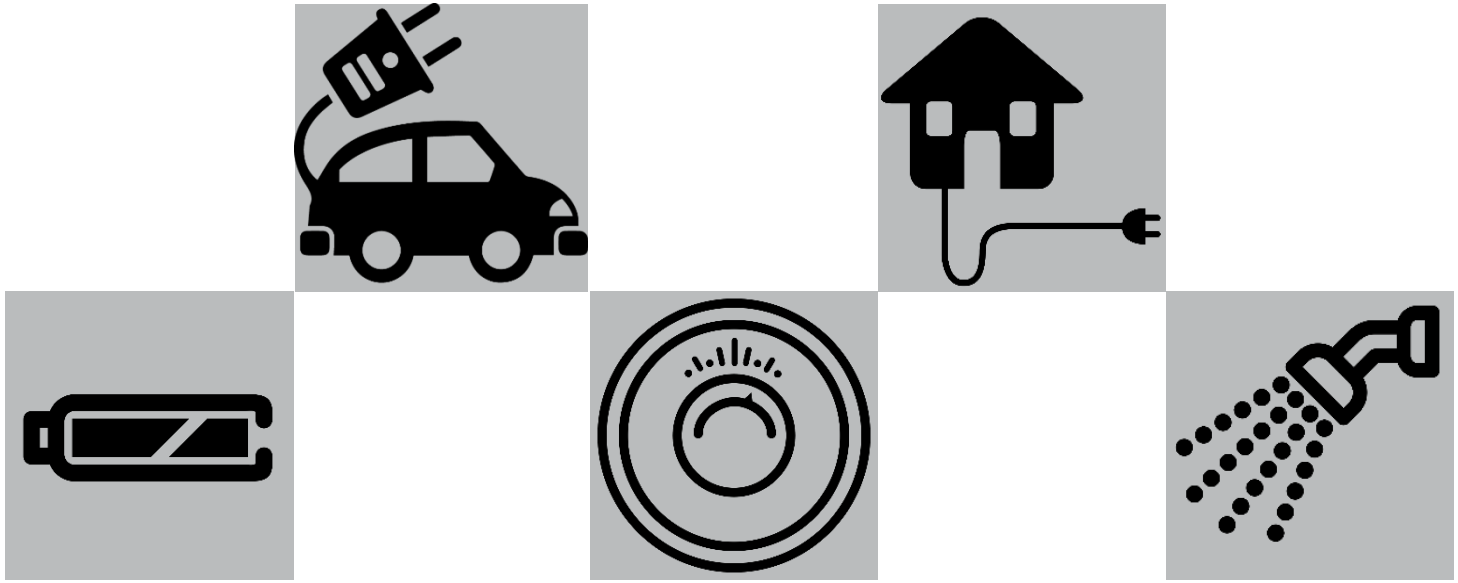
PV Production (kW)

Air Conditioner(kW)

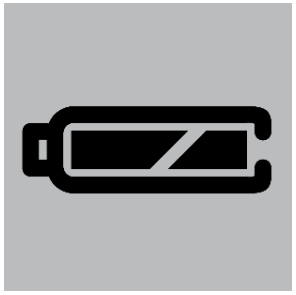
Disaggregated data by end use

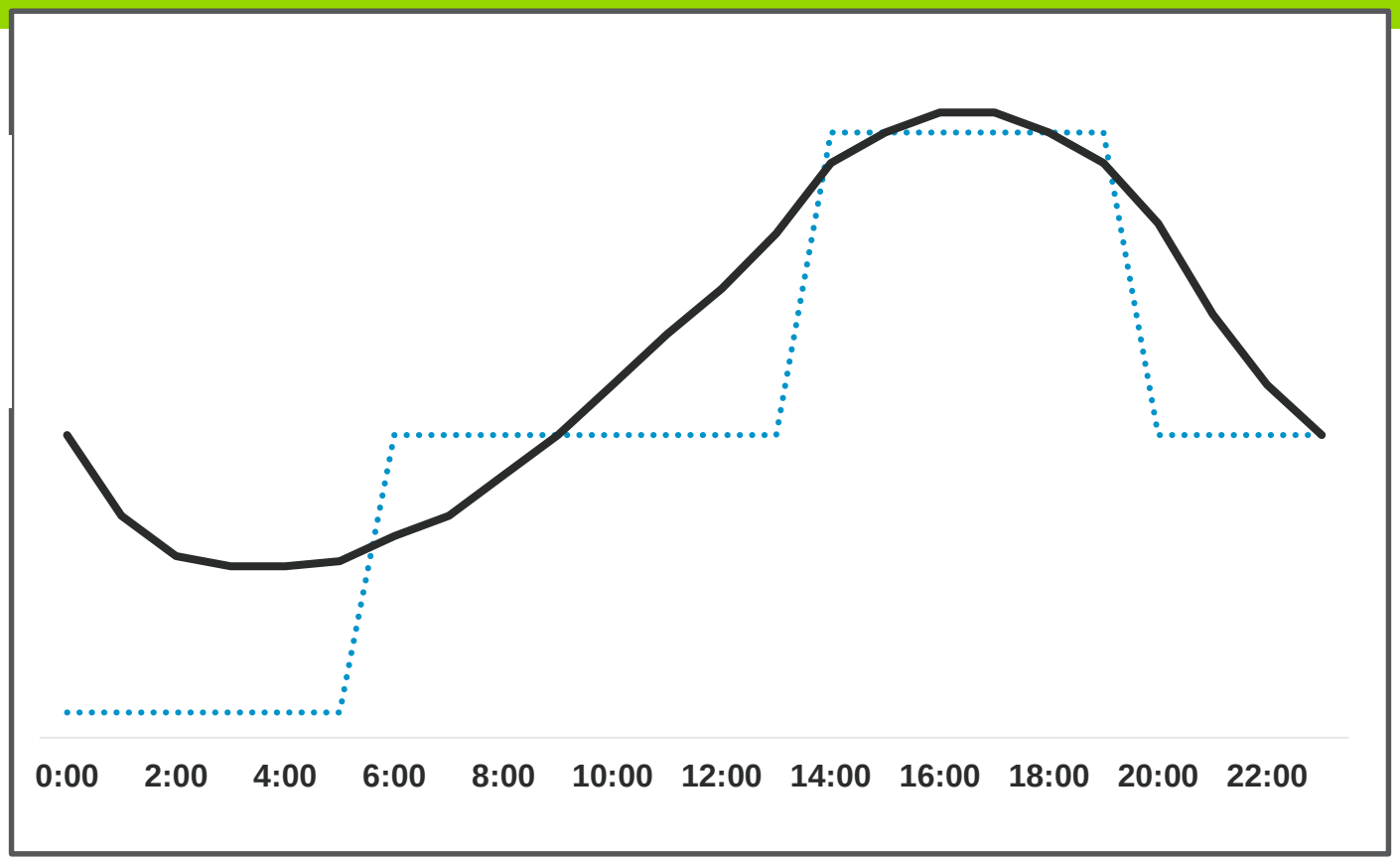
MODELING EMERGING TECHNOLOGIES

- New products and services can be modeled for planning purposes
- Simulation scenarios can be run to optimize performance in response to load or price signals



MODELING LOAD SHIFTING CAPABILITY





Source: Navigant

Simulation can be used to evaluate “peak shaving” capability with battery during times of peak load or high prices

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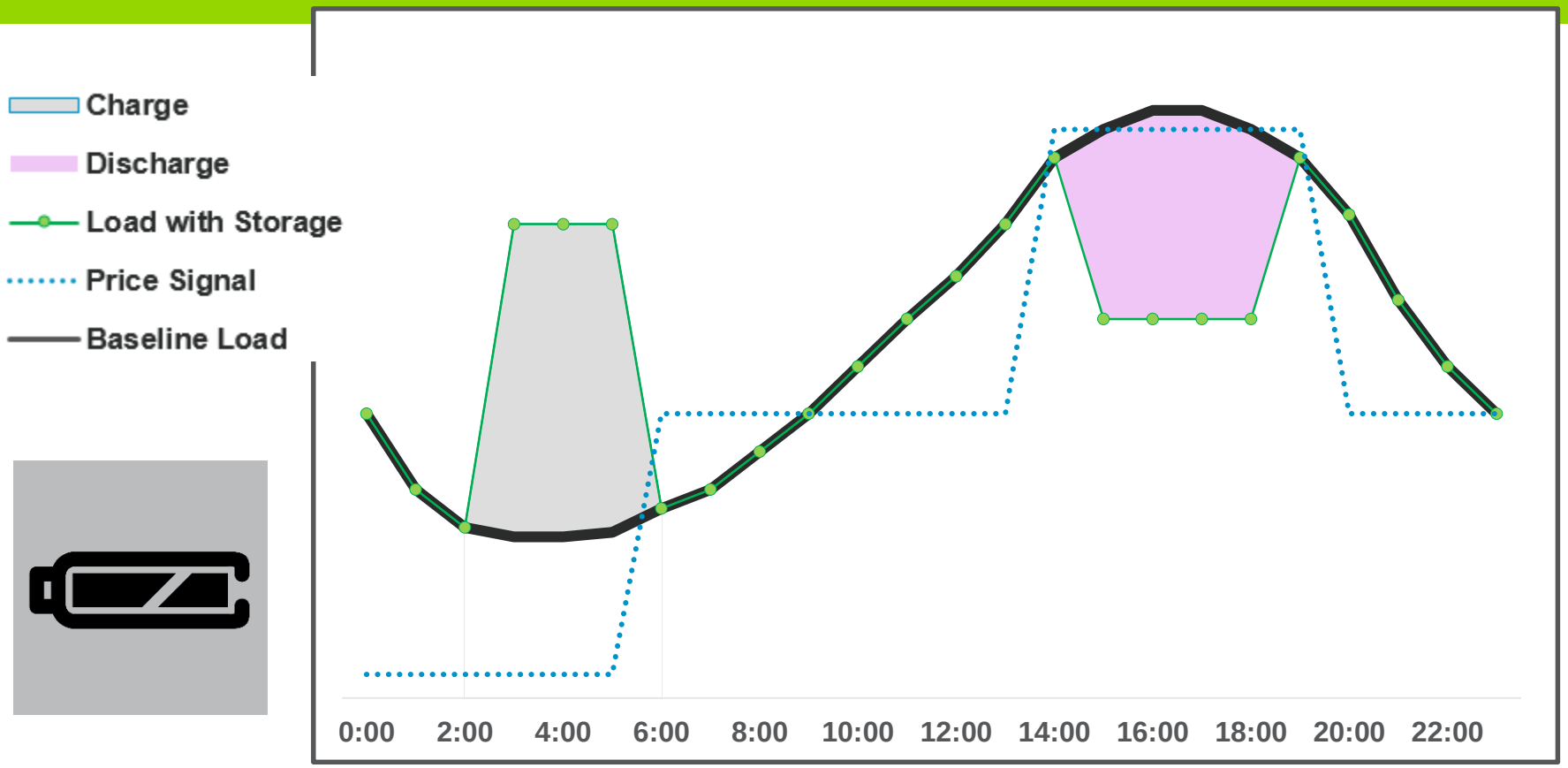
MODELING LOAD SHIFTING CAPABILITY

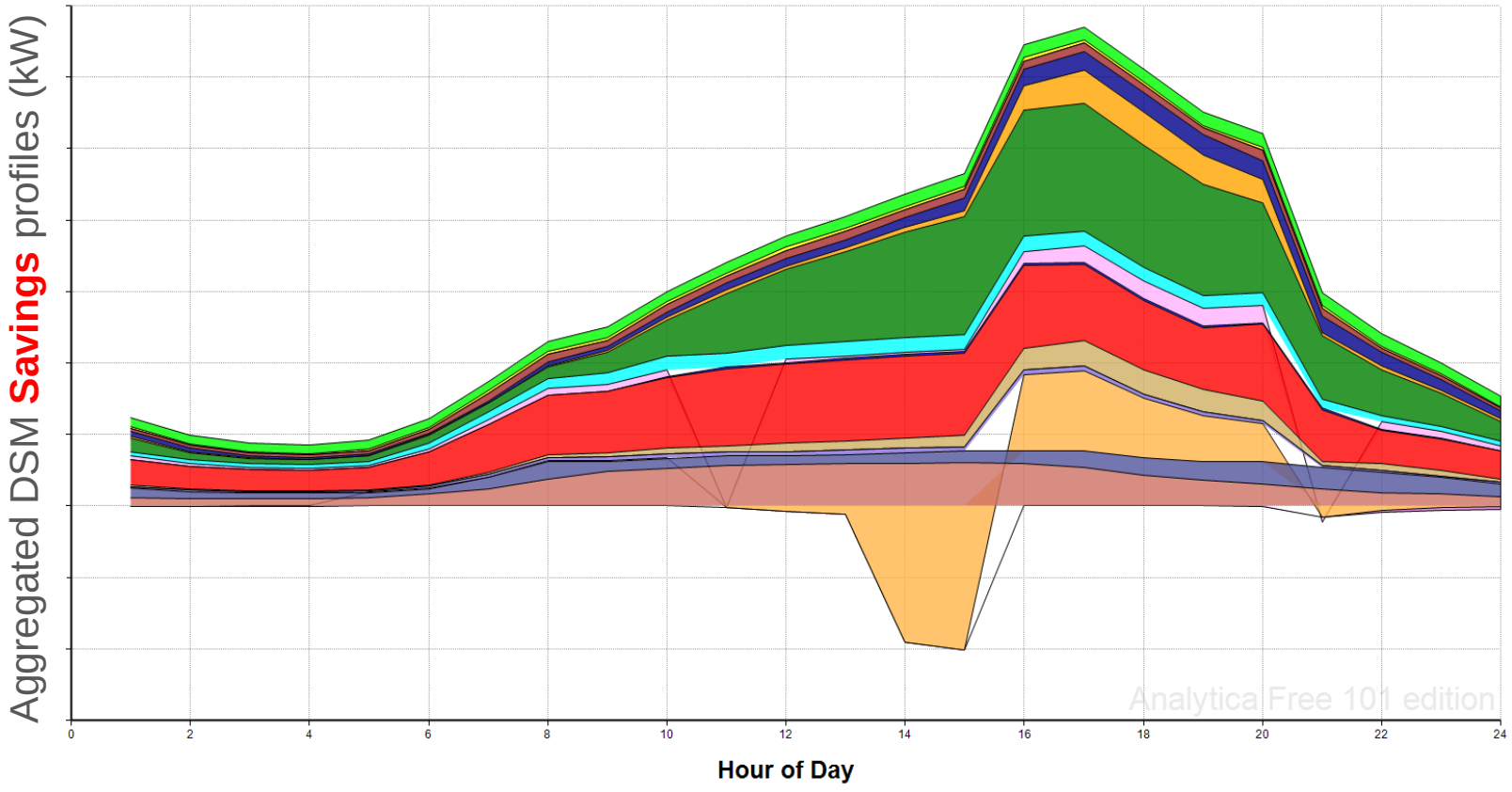


Source: Navigant

Simulation can be used to evaluate “peak shaving” capability with battery during times of peak load or high prices

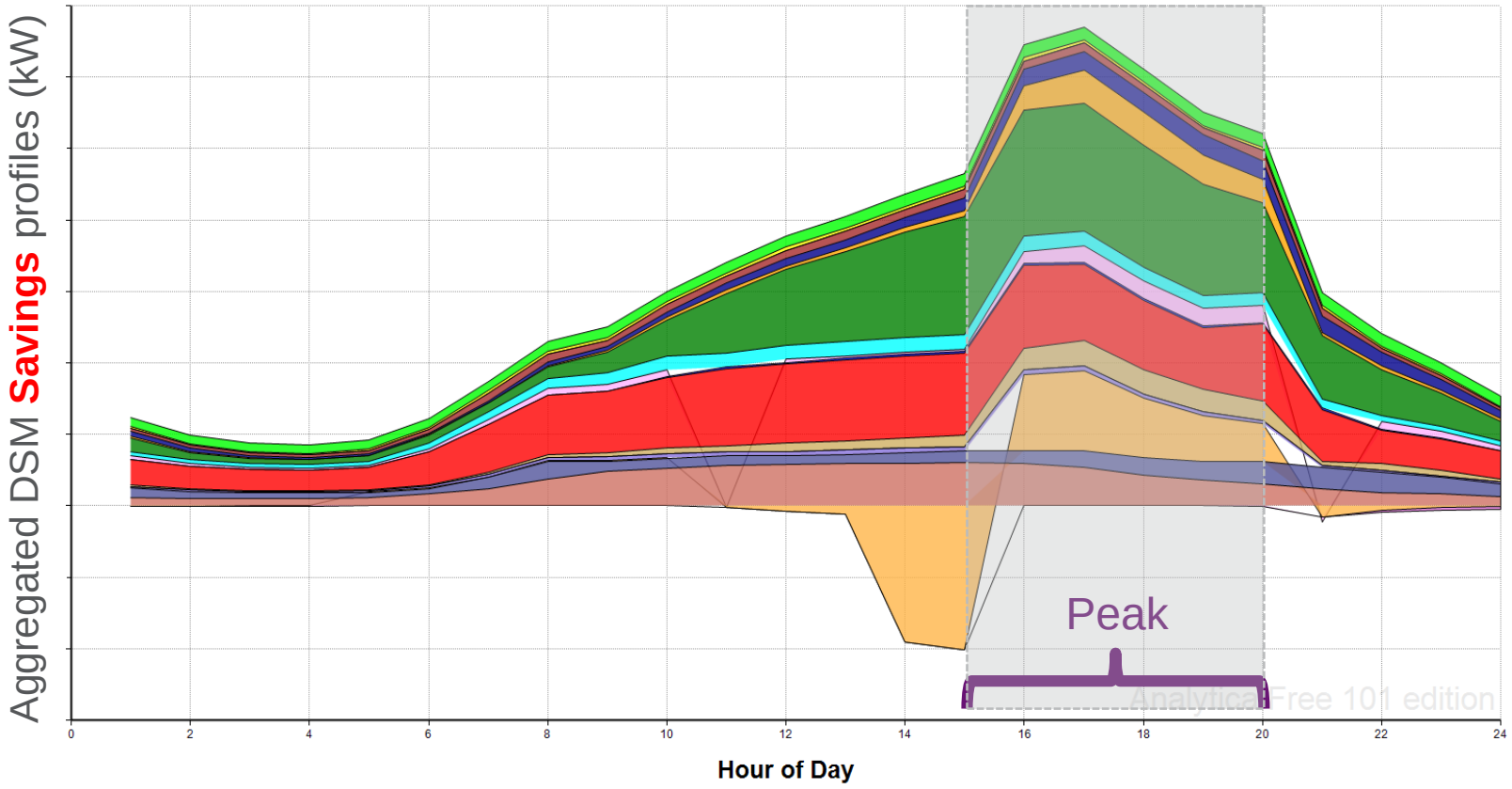
And put it all together……..

PLANNING BY OPTIMIZATION



DSM load shapes can be aggregated by measure, end use, program, etc. to assess magnitude and timing of savings contribution

PLANNING BY OPTIMIZATION



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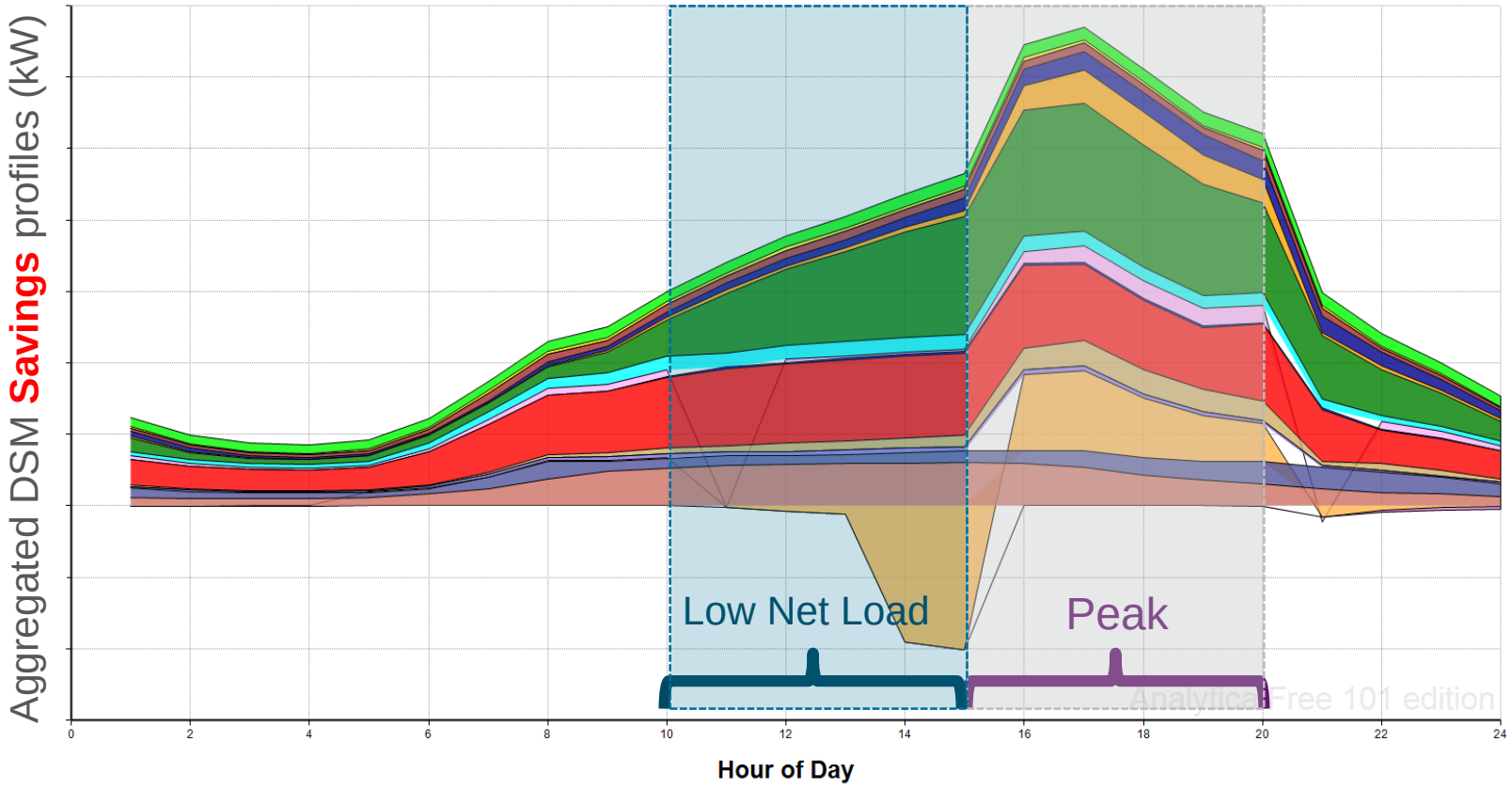

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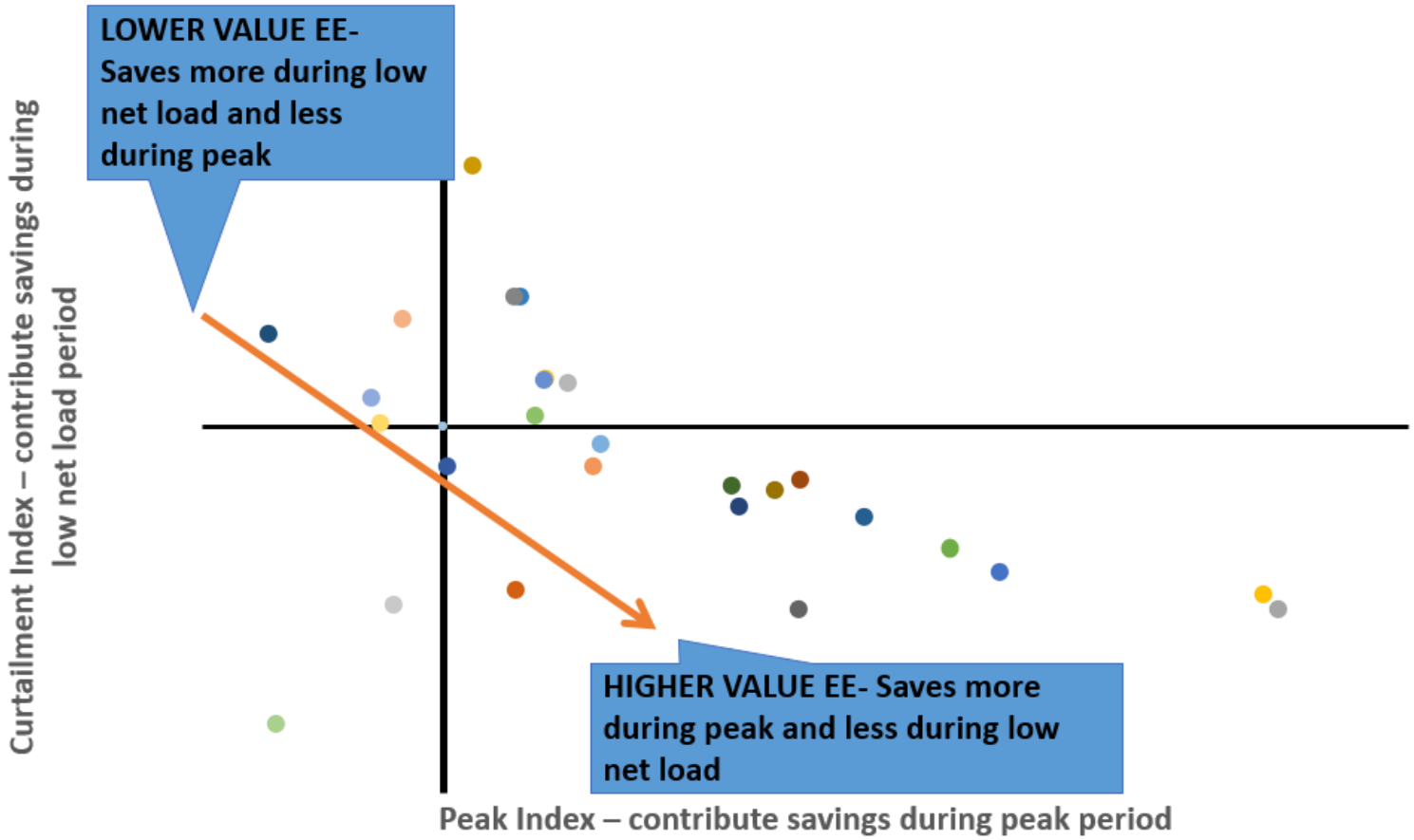
COMPARING EE TECHNOLOGIES

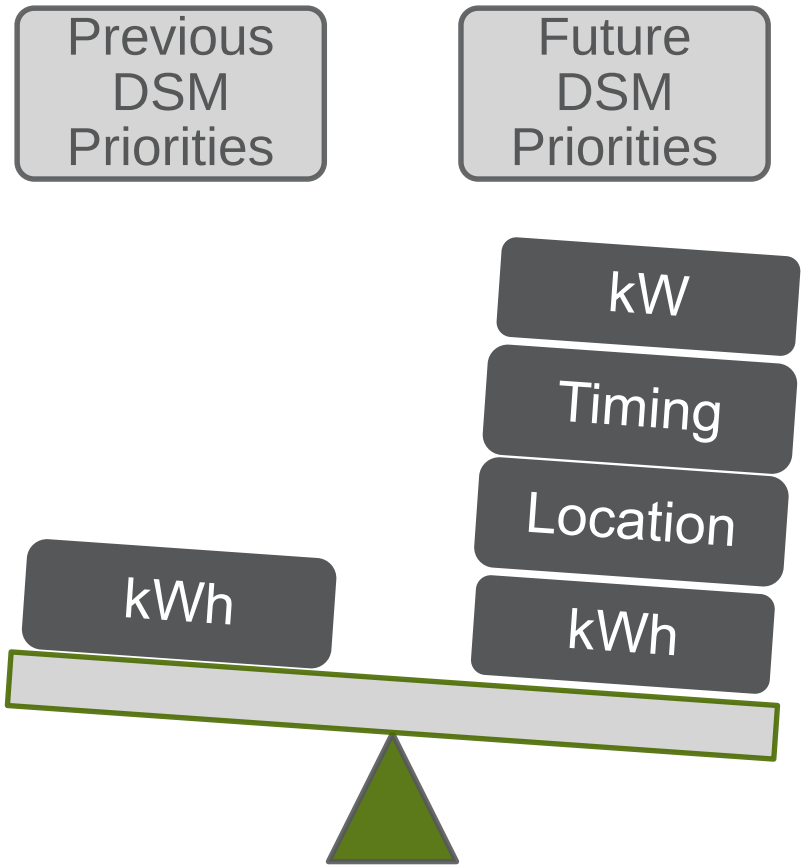


Source: Navigant

DSM PROGRAMS OF THE FUTURE

Broad range of traditional EE measures

Emphasis on energy (kWh) impacts



Prioritized selection of high-value EE measures

Emphasis on demand (kW) impacts

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PROPOSED PORTFOLIO MODIFICATIONS

Eliminating Incentives

- All Lighting (Res and Non-Res)
  - Incentives remain for Limited Income and Schools
- Pool Pumps (Res)
- Refrigeration (Non-Res)
- CO Sensors (Non-Res)
- Hotel Controls (Non-Res)
- Other Motors (Non-Res)

Redesigning Programs

- Multifamily and Home Performance
  - ⓾ Replacing lightbulbs and showerheads with smart t-stats and water heater timers
- Custom Measures, Whole Building and Retro-commissioning
  - ⓾ Only paying incentives for on peak savings in summer months

New Prescriptive Measures

- Smart t-stats optimized for APS advanced rates
- Direct Install water heater timers
- EV Prewiring (Res New Construction)
- Connected electric water heaters (Res New Construction)

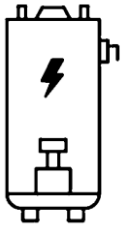
New DER Pilots

- Managed EV Charging
- EV School Buses
- Reverse DR
- DRESLM = DR, energy storage and load management

DRESLM PROGRAM SCOPE

~6000

Smart Thermostats



~400

80-gallon Water Heaters

+

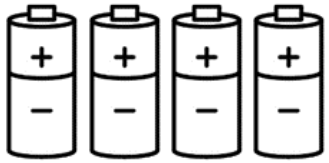
On Targeted feeders

~90

5 kW Residential Batteries

+

On Targeted feeders



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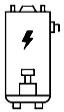
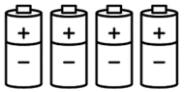
100-200 kW Intermediate Batteries

+

On Targeted feeders

DRESLM USE CASES

Use Cases	 T-Stat DR	 GIWH	 RESS	 FESS
Reduce system peak via demand response events	✓			
Reduce system peak via daily scheduled load shift / Provide feeder congestion relief	✓	✓	✓	
Solar sponging / duck curve management		✓	✓	
Customer peak demand charge management	✓		✓	
Voltage support				✓

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