Evolving DSM Portfolios in the Age of DERs

A Data-Backed, Customer-Centric Approach

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E Source Forum 2018

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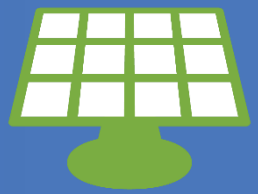
Utility DER Benchmark Edition!

Round 1

DER definitions	DER impacts	DER portfolios	DER portfolio goals
			

DER definitions

This technology is the one most commonly included in utility's definitions of distributed energy resources (DERs)

DER definitions are becoming more inclusive

Technologies included in utility definition of DERs	2017 (n = 28 utilities) (%)	2018 (n = 36 utilities) (%)
Rooftop or behind-the-meter solar	89	97
Behind-the-meter battery storage	71	89
Distribution-grid battery storage	64	89
Community solar	82	86
Electric vehicles	71	83
Electric vehicle charging infrastructure	64	83
Demand response	75	75
Microgrids	64	75
Energy efficiency	71	72
Utility-scale solar	61	67
Smart home devices or facility energy management systems	54	58
Smart inverters	NA	56
Green-pricing programs or green tariffs	NA	53
Combined heat and power	50	50
Fuel cells or microturbines	57	NA

Base: n varies by year. **Question S2_1:** How does your utility define DERs for the purpose of DER strategy work? In other words, what is included in or a consideration in your utility's current and planned DER strategy work? Select all that apply. **Note:** NA = not asked.

And including less-traditional technologies and applications

Technologies included in utility definition of DERs	2018 (n = 36) (%)
Electrification	44
Grid-interactive water heaters	42
Thermal storage	36
Customer use of third-party power purchase agreements	33
Community-choice aggregation	22

Base: n = 36 utilities. **Question S2_1:** How does your utility define DERs for the purpose of DER strategy work? In other words, what is included in or a consideration in your utility's current and planned DER strategy work? Select all that apply.

Round 1

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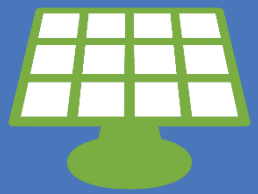
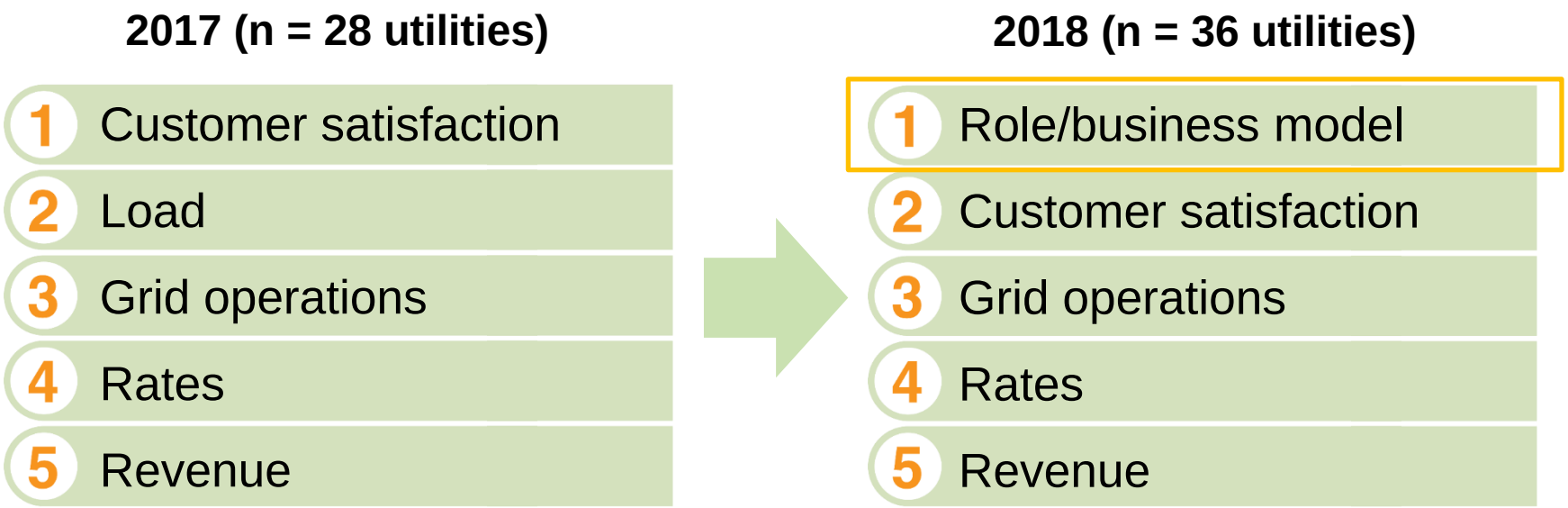
			

DER impacts

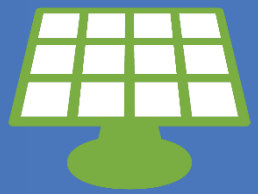
Utilities anticipate DERs will have the biggest impact on this in the next seven years

Anticipated impacts of DERs are shifting slightly



Base: n varies by year. **2017 Question S3_1:** For each of these DER technology categories, please indicate if your utility anticipates noticeable impacts related to that specific technology in the next 7 years. Select all impacts that apply for each technology category. **2018 S3_1:** For each type of possible impact, what is the anticipated overall magnitude of the impact on your utility related to all DER technologies in the next 7 years?

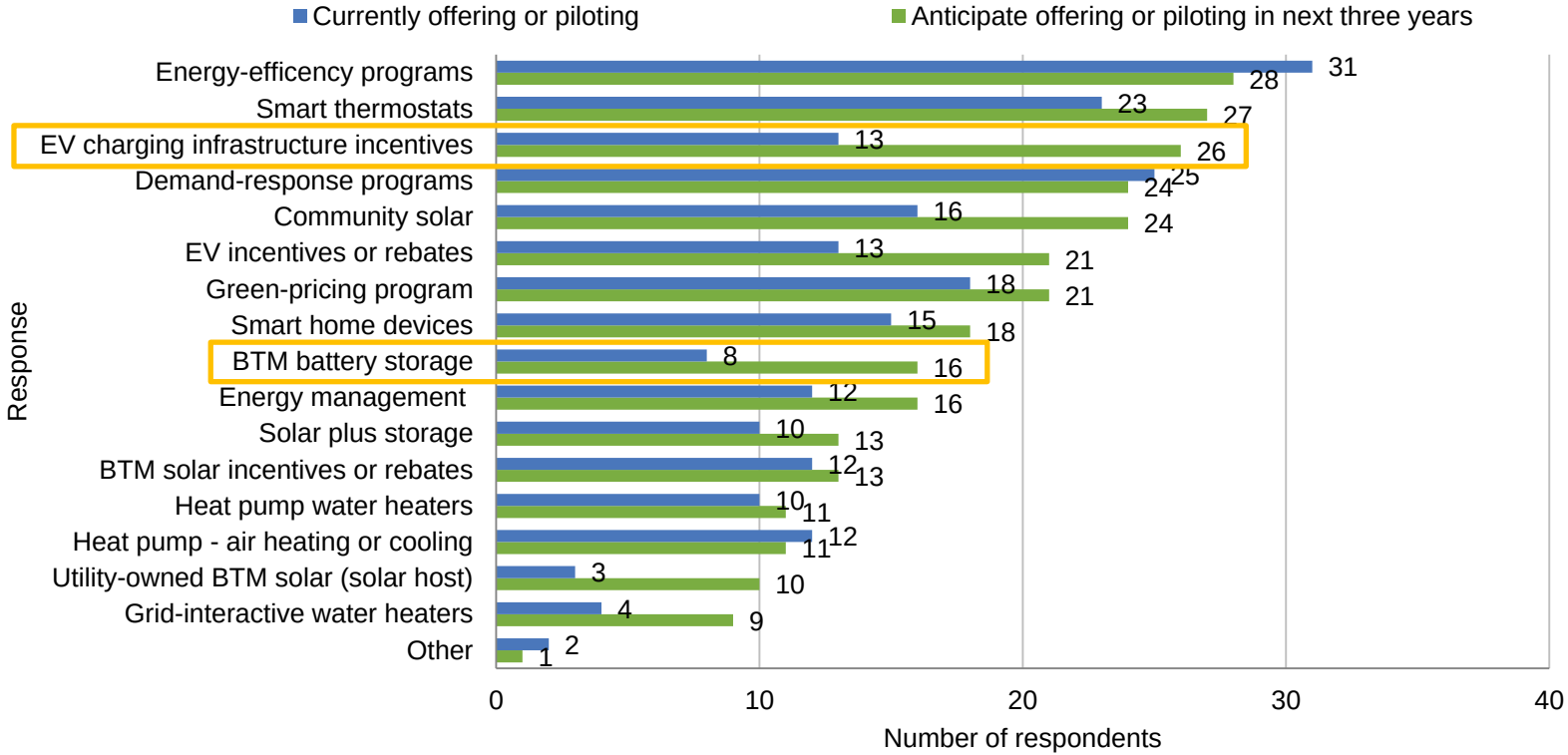
Round 1

DER definitions	DER impacts	DER portfolios	DER portfolio goals
			

DER portfolios

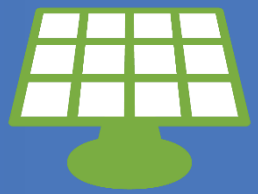
Utilities anticipate doubling the number of these types of residential pilots/programs in the next three years

Adjusting their portfolio of offerings



Base: n = 35. **Question S5_11:** Which of the following programs or services is your utility currently piloting or offering for residential customers? **S5_12:** Including continuing current pilots and offerings, which of the following does your utility anticipate piloting or offering for residential customers in the next 3 years? Select all that apply. **Notes:** BTM = behind the meter; EV = electric vehicle.

Round 1

DER definitions	DER impacts	DER portfolios	DER portfolio goals
			

DER portfolio goals

Utilities are increasingly thinking about these types of objectives for their demand-side management (DSM)/DER portfolios

DSM-DER portfolio goals are evolving

- Energy savings
- Cost-effectiveness

- Demand reduction/ load management
- Customer benefits
- Greenhouse gas (GHG) reduction
- System operational benefits
- Locational benefits

Round 2

The big question	A holistic approach
	

The big question

This pressing question is likely why you are all here today

Utility problem statement

> How can my utility proactively and more-effectively address evolving customer desires and utility needs through our DSM-DER portfolio?

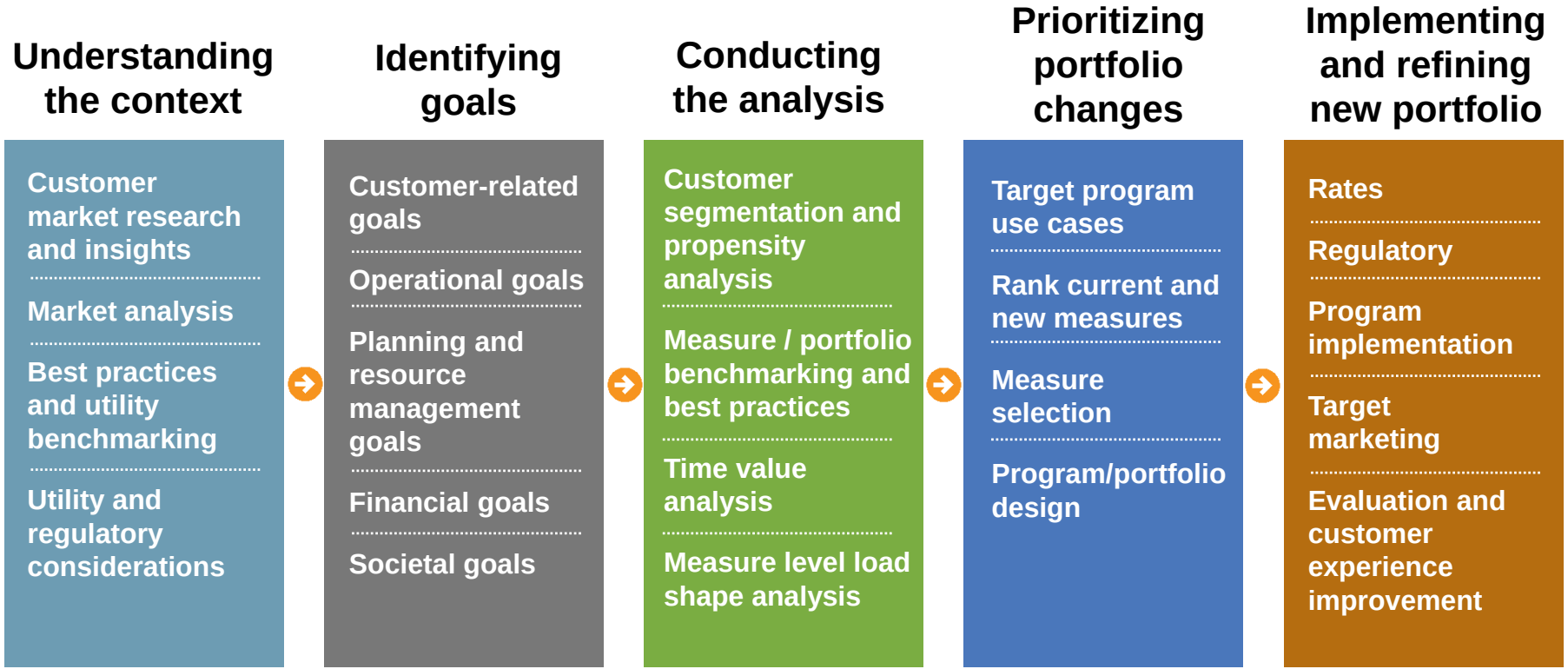
Round 2

The big question	A holistic approach
	

A holistic approach

The customer-centric approach to DSM-DER portfolio evolution that we're going to share with you today has how many phases?

Portfolio evolution approach



Thank you for participating in

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DSM-DER portfolio evolution approach

Approach overview

Understanding the context	Identifying goals	Conducting the analysis	Prioritizing portfolio changes	Implementing and refining new portfolio
Customer market research and insights	Customer-related goals	Customer segmentation and propensity analysis	Target program use cases	Rates
Market analysis	Operational goals	Measure / portfolio benchmarking and best practices	Rank current and new measures	Regulatory
Best practices and utility benchmarking	Planning and resource management goals	Time value analysis	Measure selection	Program implementation
Utility and regulatory considerations	Financial goals	Measure level load shape analysis	Program/portfolio design	Target marketing
	Societal goals			Evaluation and customer experience improvement

Understand the customer context

- Customer energy usage and program participation
- Existing customer market research and segmentation
- Direct customer feedback

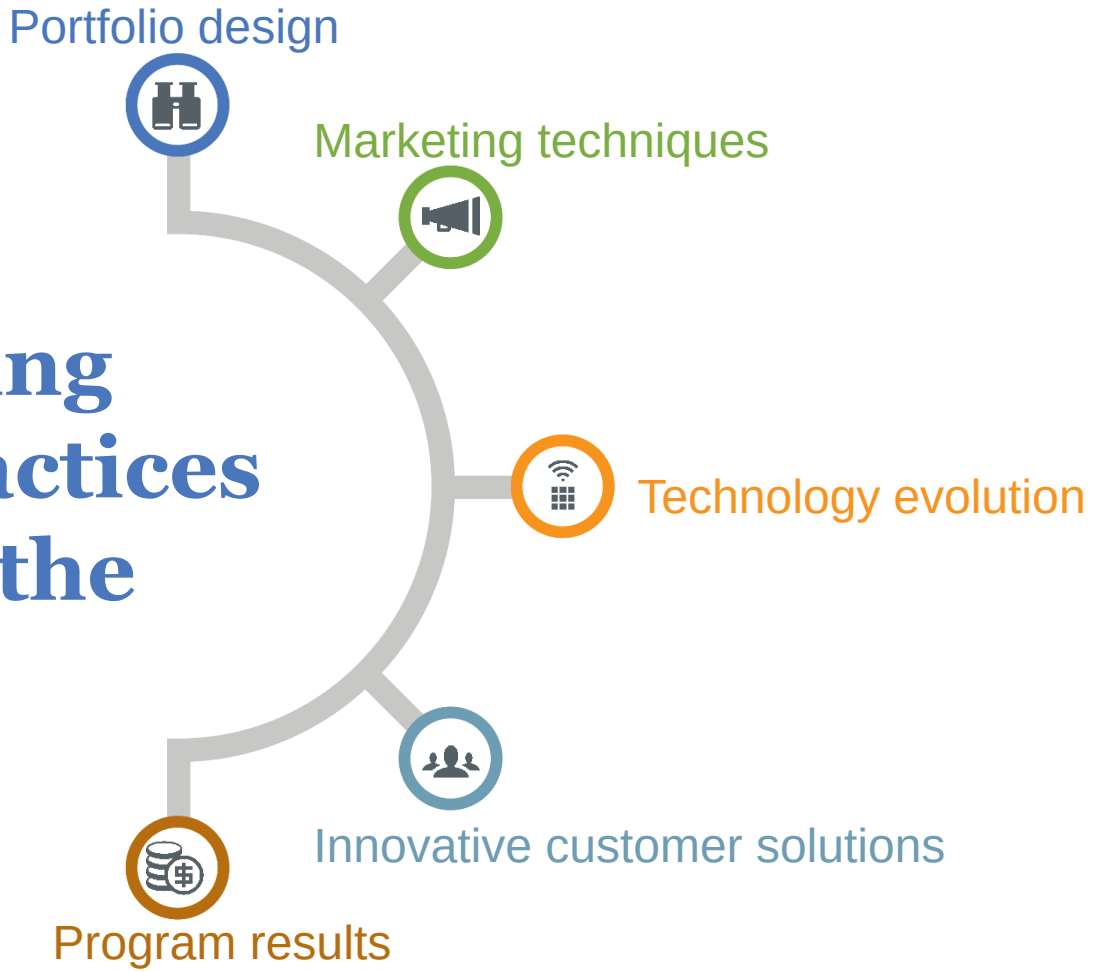
Understand the market context

- Market maturity and evolution
- Innovative energy products, services, and business models
- Market forecasts
- Best practices and competitive intelligence

Understand the utility and regulatory context

- Existing resources and capabilities
- Regulatory considerations
- Operational considerations
- Financial considerations

Utilize benchmarking and best practices throughout the process



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Approach overview

Understanding the context

- Customer market research and insights
- Market analysis
- Best practices and utility benchmarking
- Utility and regulatory considerations

Identifying goals

- Customer-related goals
- Operational goals
- Planning and resource management goals
- Financial goals
- Societal goals

Conducting the analysis

- Customer segmentation and propensity analysis
- Measure / portfolio benchmarking and best practices
- Time value analysis
- Measure level load shape analysis

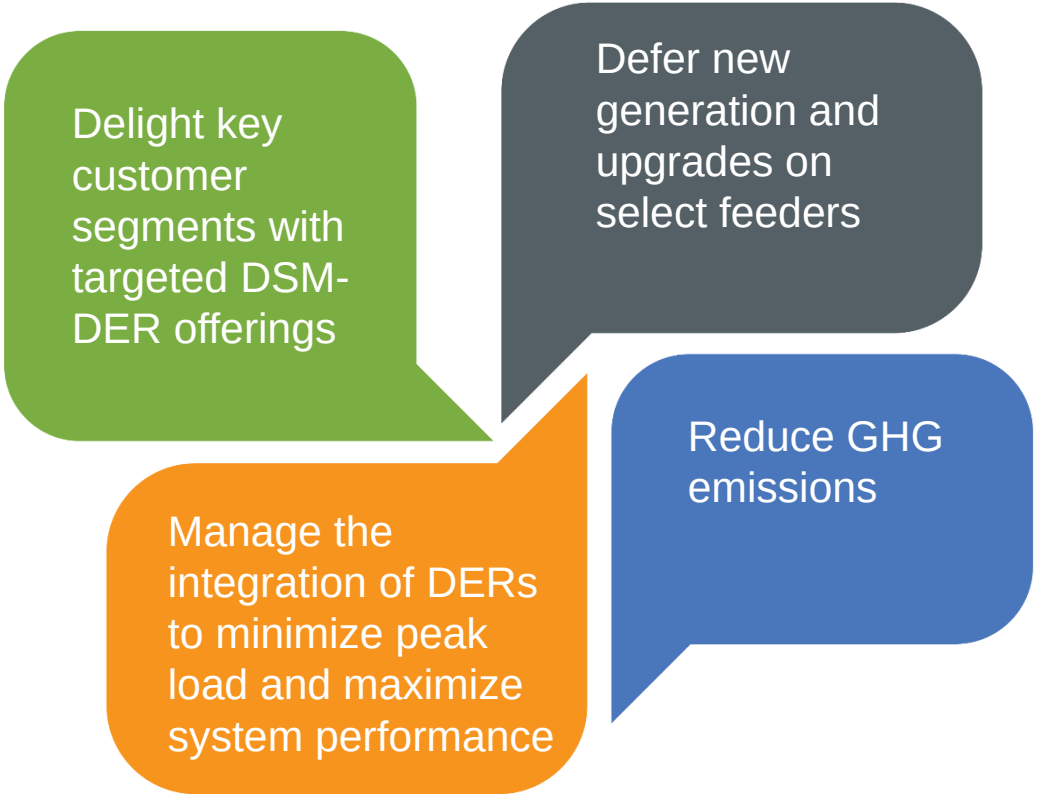
Prioritizing portfolio changes

- Target program use cases
- Rank current and new measures
- Measure selection
- Program/portfolio design

Implementing and refining new portfolio

- Rates
- Regulatory
- Program implementation
- Target marketing
- Evaluation and customer experience improvement

Define goals for your portfolio



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Implementing and refining new portfolio

- Rates
- Regulatory
- Program implementation
- Target marketing
- Evaluation and customer experience improvement

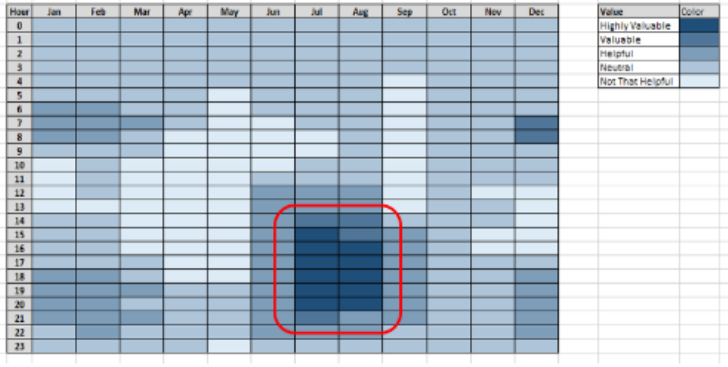
Developing the pieces

Life stage group	No percentage of respondents (weighted)	Yes percentage of respondents (weighted)	Total percentage of respondents (weighted)	Index score
F2 – Young Accumulators	9%	20%	10%	203
F1 – Accumulated Wealth	3%	7%	3%	195
M1 – Affluent Empty Nests	9%	14%	9%	156
Y1 – Midlife Success	13%	12%	12%	96
F3 – Mainstream Families	13%	12%	13%	88
M2 – Conservative Classics	9%	8%	9%	87
Y2 – Young Achievers	10%	8%	9%	83
Y3 – Striving Singles	8%	6%	8%	75
F4 – Sustaining Families	8%	6%	8%	72
M3 – Cautious Couples	9%	5%	8%	55

Base: n = 33,050. **Question C3_2:** Which statement best describes the stage you are at in the purchase process for the following green/renewable technologies? [Solar panel system/photovoltaic (PV) electricity generating system]

© E Source (2016 Claritas Energy Behavior Track)

Map time value of avoided costs



Understanding your environmentally focused customers

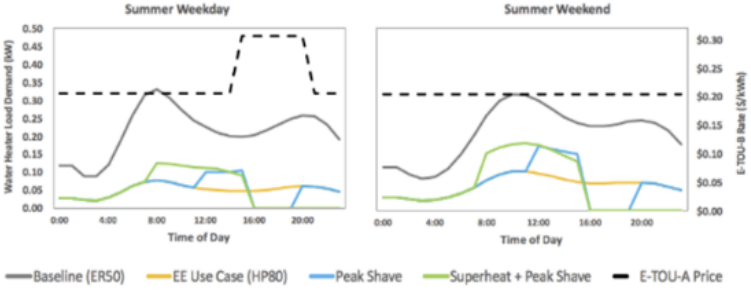
Most likely to purchase or lease the following technologies:

- Smart thermostat
- Virtual assistant with connected HEMS
- On-site solar
- Green electricity program

62.1% of this self-identified segment already have at least one DER-related technology

Base: All respondents (n = 7,201). **Question S2_4:** Which of the following technologies do you or someone in your household currently have? Select all that apply. **S7_1:** Which of the following best describes your household? (Self-identified segment)
Base: Respondents without the technology (n varies by technology). **Question S2_5:** How likely are you or someone in your household to purchase or lease any of the following technologies in the next three years? **Note:** Percentages reflect those selecting 4 or 5 on a scale of 1 to 5, where 1 means not at all likely and 5 means extremely likely.

© E Source (2018 DER Residential Customer Market Research)



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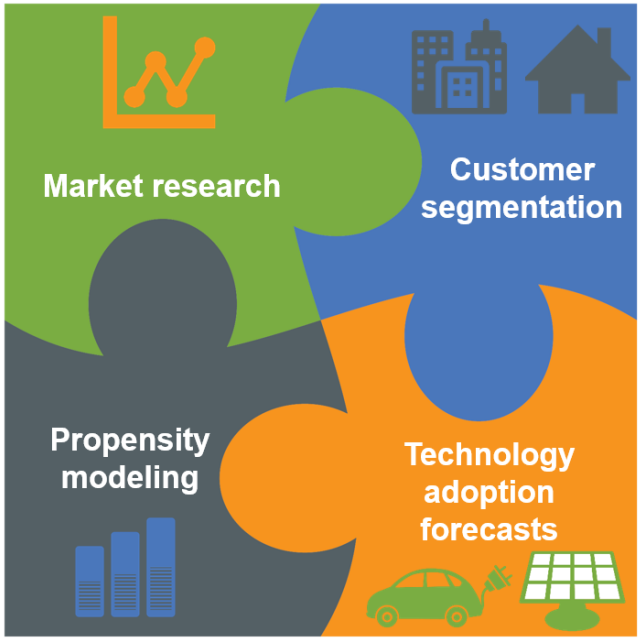
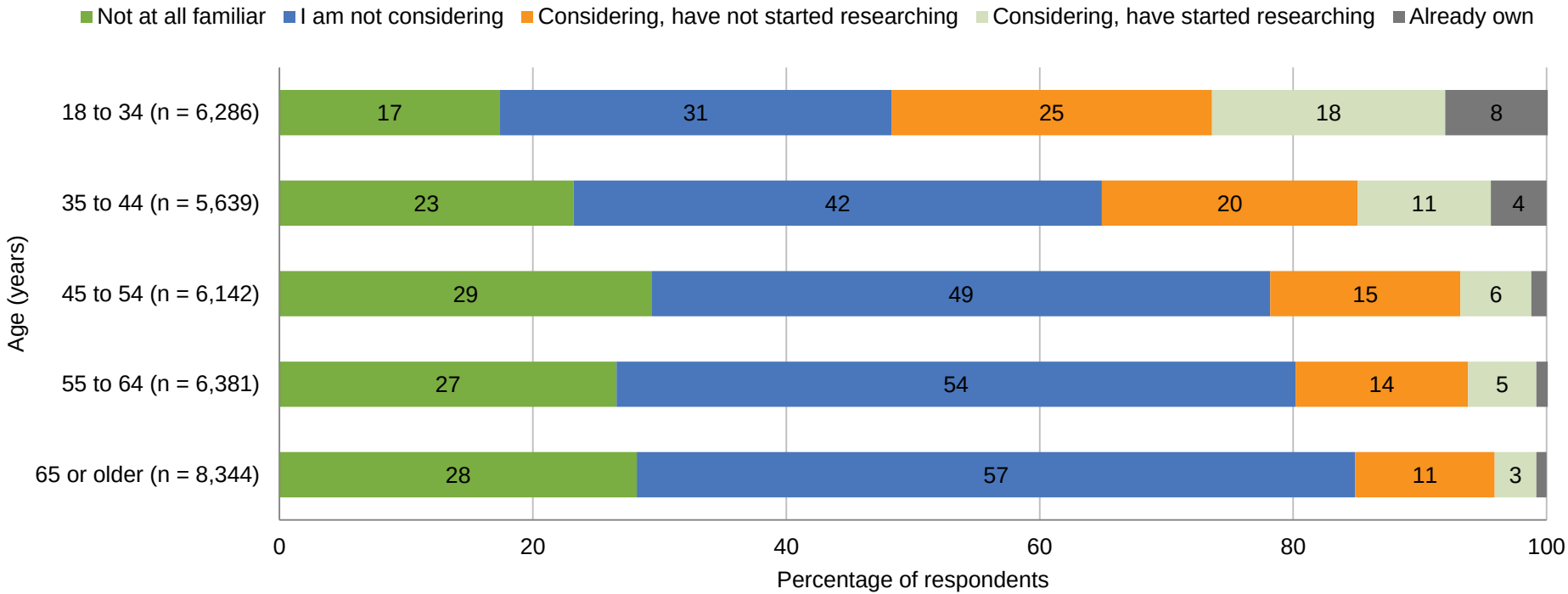
Predict customer behavior via market research, technology forecasting, segmentation, and propensity analysis



- Conduct market research and analyze technology adoption forecasts
- Segment customers and model aggregate adoption and savings potential/load growth
- Identify individual customer's propensity to adopt specific technologies

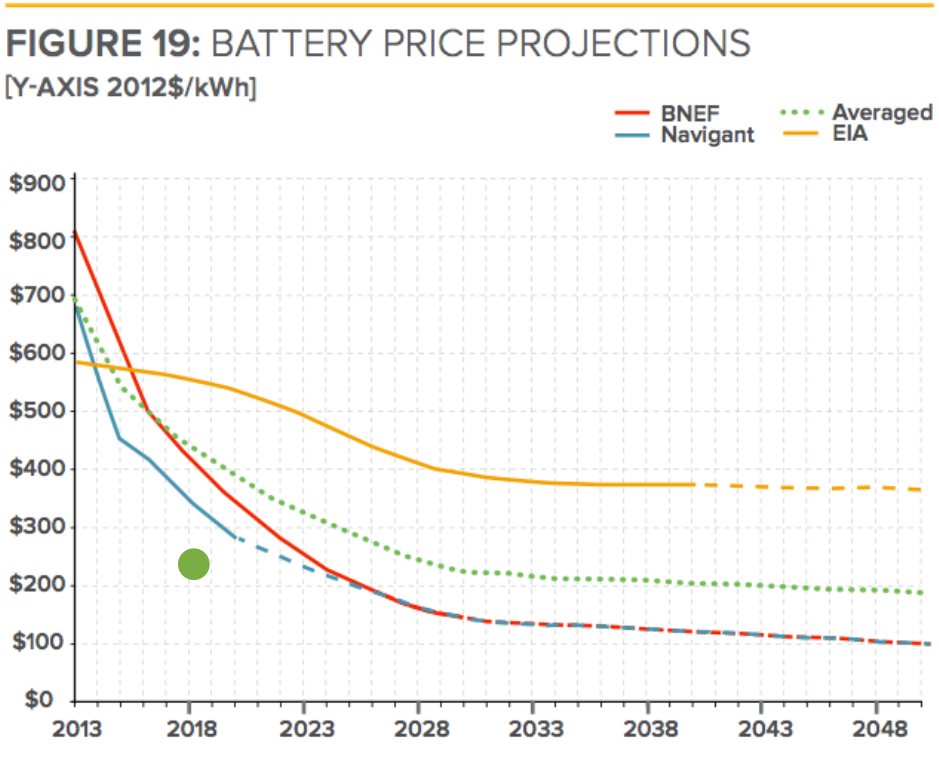
Conduct customer market research



Base: All respondents (n varies). **Question C3_5:** Which statement best describes the stage you are at in the purchase process for the following green/renewable technologies? [All electric vehicle that plugs in to charge.] **Note:** Data may not add to 100% due to rounding. Percentages shown in chart reflect weighted data; sample sizes (n) are based on unweighted data.

Analyze market forecasts

Green dot =
Actual Nissan Leaf battery pack retail price ($5,500 + install)



Source: CleanTechnica

Segment customers and identify which technologies or measures they're most likely to adopt

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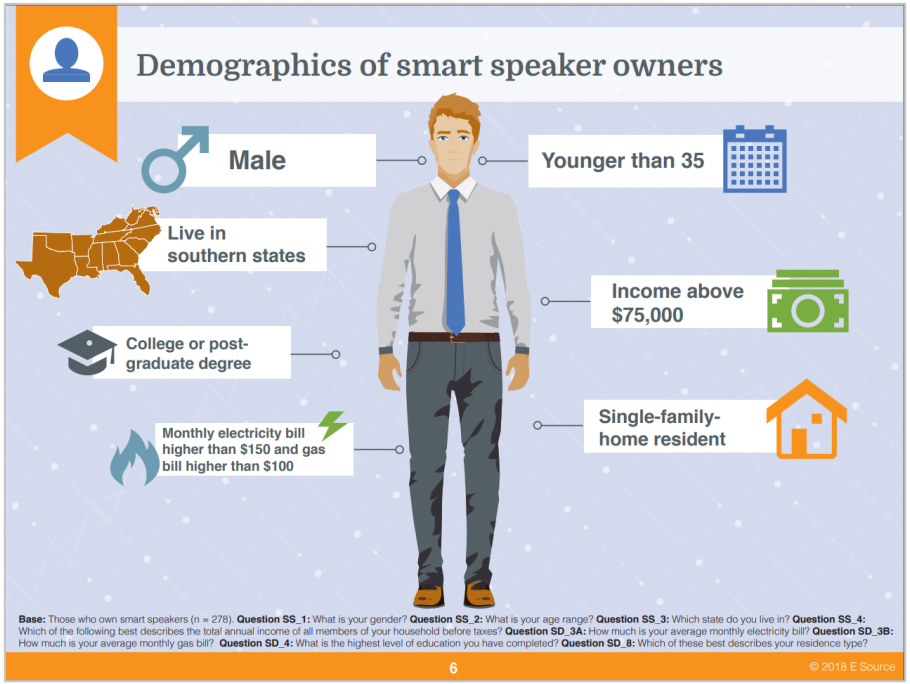
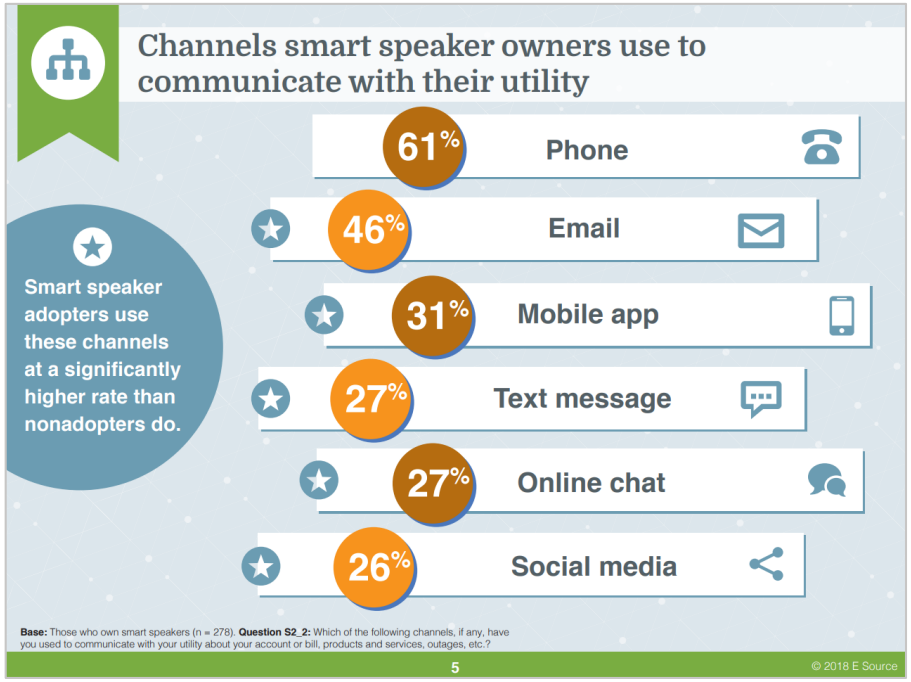
Segment customers





© E Source (Which Customers Are Interested in Smart Speakers, and How Do You Reach Them?)

Conduct propensity analysis

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Propensity score


10


8


7

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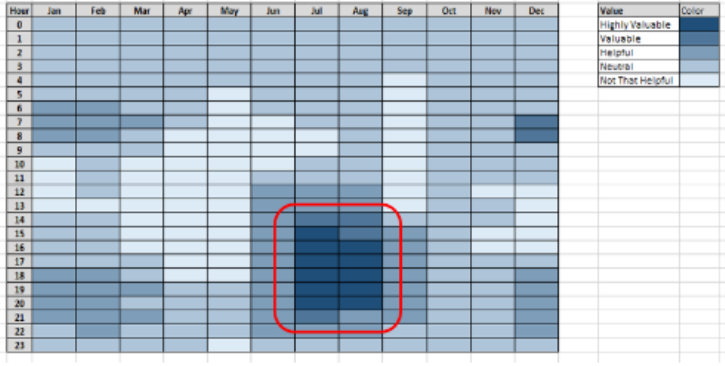
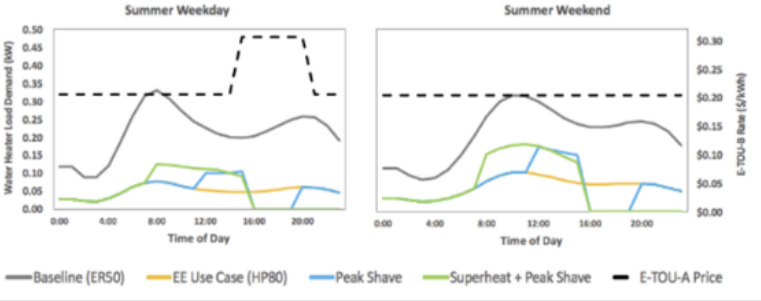




Conduct a value assessment

Objective: Assess DERs using data to value load shapes according to their alignment with objectives

Resource planning

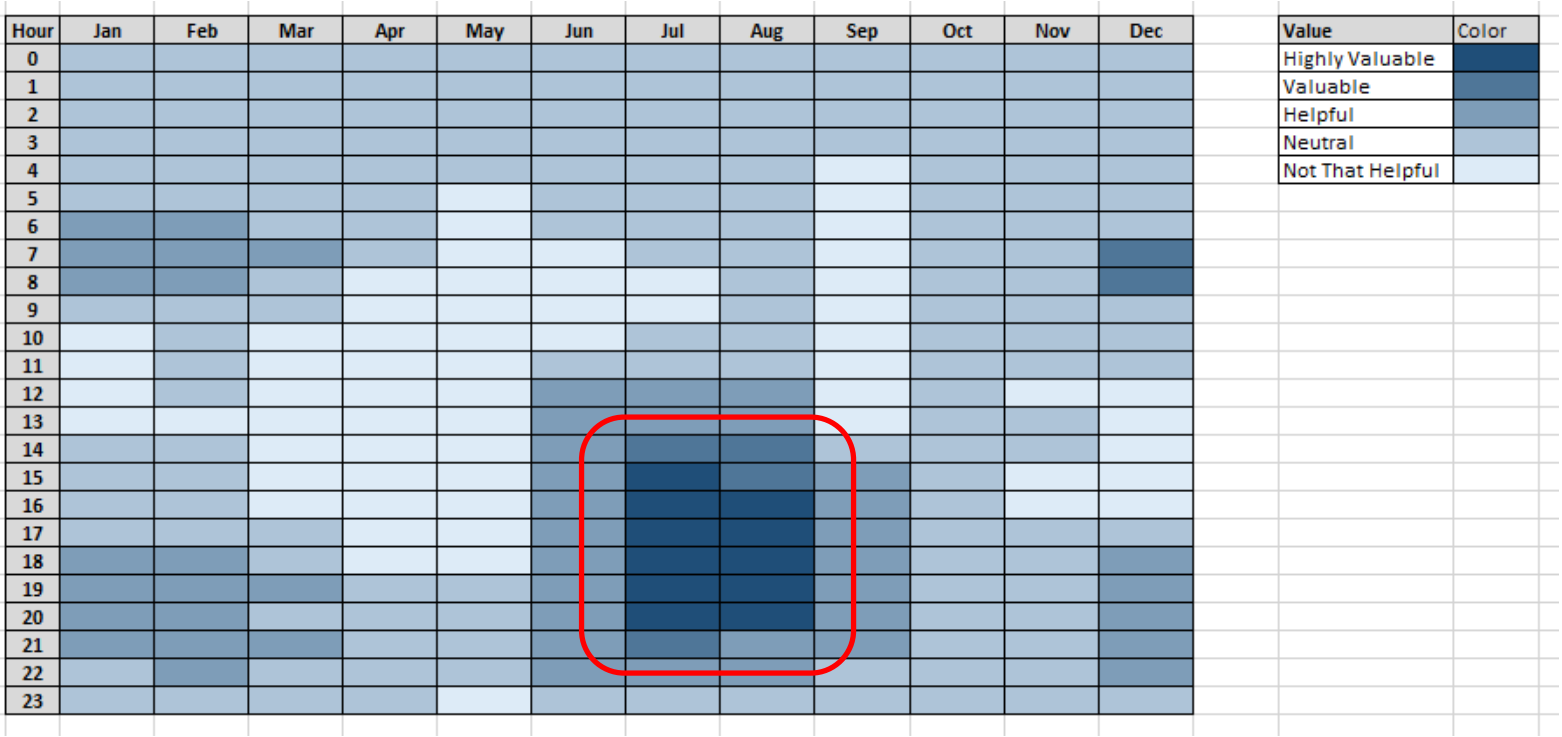
Grid needs

Transmission and distribution (T&D) feeder loads

GHG emissions

Bill savings by rate

Map time value of avoided costs



Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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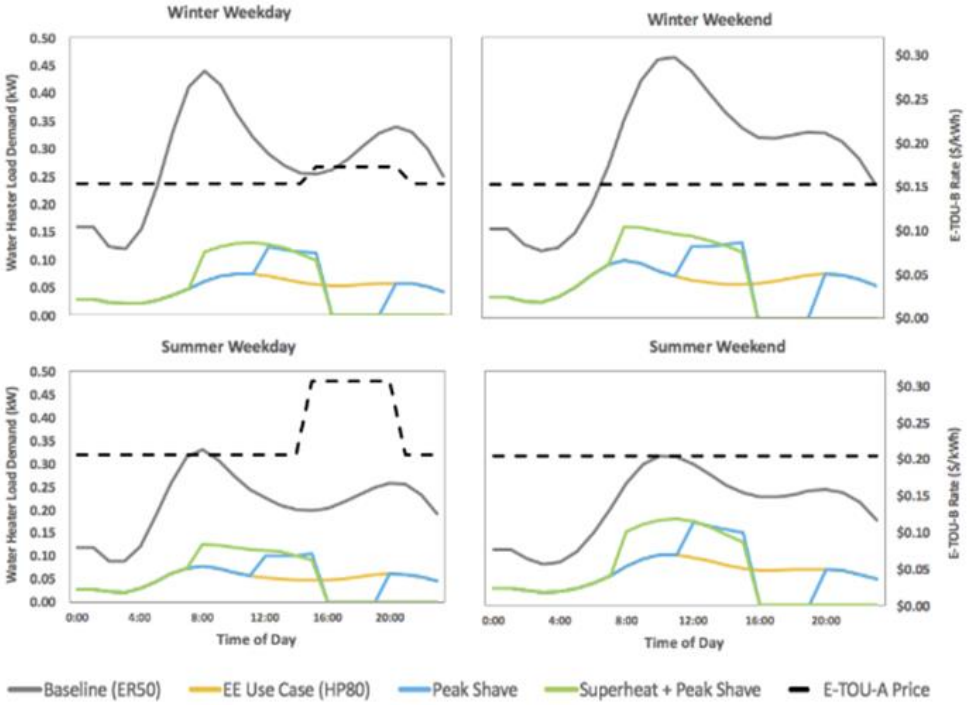
22												
23												

Value	Color
Highly Valuable	
Valuable	
Helpful	
Neutral	
Not That Helpful	

Build DER savings load shapes

- Does your utility have 8,760 hourly load shape data?
- If not, use EPRI's publicly available regional data
- Map shapes to current portfolio measures
- Modify into program-specific savings load shapes



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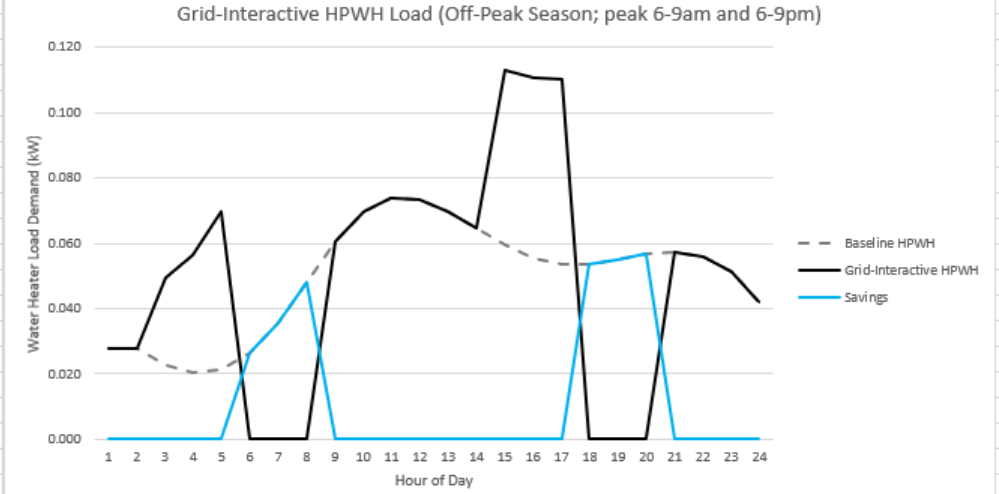
Analyze savings load shapes

Total Savings by Bin						
	Highly Valuable	Valuable	Helpful	Neutral	Not That Helpful	Sanity Check
Total	0.332141139	0.22721	1.0884099	1.1000987	0	
Percent of Total	12%	8%	40%	40%	0%	100%



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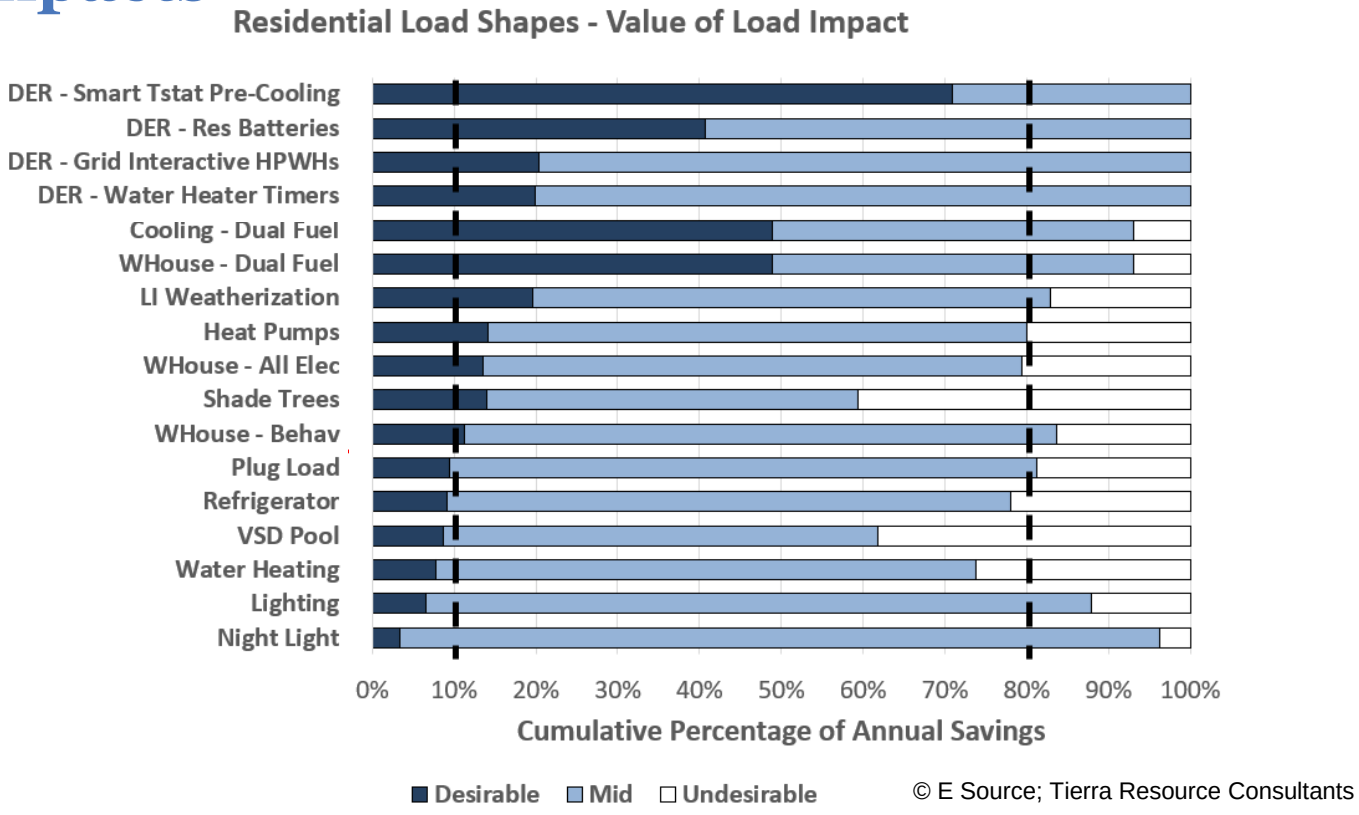
Identify measures with the most beneficial load shape impacts



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Identifying goals

- Customer-related goals
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- Financial goals
- Societal goals

Conducting the analysis

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Prioritizing portfolio changes

- Target program use cases
- Rank current and new measures
- Measure selection
- Program/portfolio design

Implementing and refining new portfolio

- Rates
- Regulatory
- Program implementation
- Target marketing
- Evaluation and customer experience improvement

Target program use cases

- Bundled solution for tech-savvy enviro customers
- Peak shaving
- Integration of intermittent resources
- Mandates for renewables and behind-the-meter storage
- T&D upgrade deferral
- GHG reductions

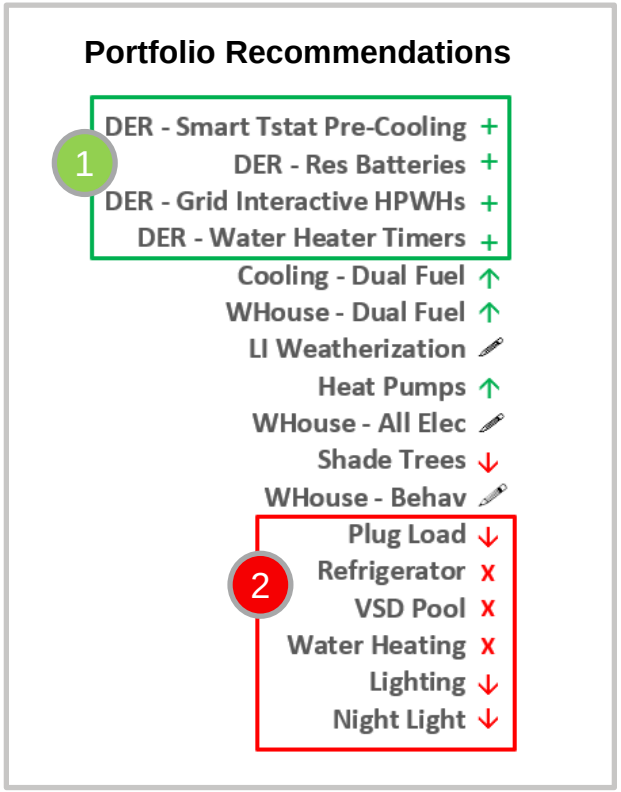
Rank and select measures

- What weighting should you apply to each goal?
- How should you rate each measure on each goal?
- What is the weighted total for each measure?

Measures	Customer goals	Operational goals	Planning and resource management goals	Financial goals	Societal goals	
Percentage weighting	20%	30%	20%	20%	10%	Total
DER – Smart Tstat Pre-Cooling	1	5	5	3	4	3.7
DER – Res Batteries	3	5	3	4	2	3.7
DER – Grid Interactive HPWHs	2	4	4	3	3	3.3
DER – Water Heater Timers	3	3	3	1	4	2.7
Cooling – Dual Fuel	3	4	2	2	3	2.9
WHouse – Dual Fuel	3	4	2	2	3	2.9
Heat Pumps	3	3	2	5	4	3.3
WHouse – All Elec	2	2	2	5	4	2.8
Shade Trees	4	1	1	1	5	2
WHouse – Behav	2	2	1	1	3	1.7
Plug Load	3	2	1	1	1	1.7
Refrigerator	3	3	2	2	2	2.5
VSD Pool	3	3	2	3	2	2.7
Water Heating	3	3	1	2	1	2.2
Lighting	4	1	1	4	2	2.3
Night Light	3	1	1	2	1	1.6

Rating	Color
5 - High	
4	
3	
2	
1 - Low	

Agree upon changes to DSM-DER portfolio



- Which measures should you add or increase?
- Which measures should you cut or decrease?
- Which measures should remain the same?

Design new programs and improve existing ones

Program design	DSM options	Load shapes and percentages

2018 budget	Budget (%)	Megawatt-hour (MWh) savings	MW savings	$/MWh	$ per kilowatt	Year 1 cost	Lifetime cost

- Previous year participation
- Key stakeholders

Design new programs and improve existing ones

Program design	DSM options	Load shapes and percentages
Provides incentives of 50% of incremental cost for heat-pump water heating, high-efficiency HVAC equipment and tune-ups, duct sealing and installing smart thermostats	Dual fuel - early retirement and replacement HVAC with quality install, advanced tune-up, coil cleaning, refrigerant charge and repair, smart thermostats	Residential cooling dual fuel Desirable: 49% Undesirable 7%
	All electric - early retirement and replacement HVAC with quality install, smart thermostats	Residential cooling heat pump Desirable: 14% Undesirable 20%
	Energy Star heat-pump water heater	Residential water heating Desirable: 8% Undesirable 26%

2018 budget	Budget (%)	Megawatt-hour (MWh) savings	MW savings	$/MWh	$ per kilowatt	Year 1 cost	Lifetime cost
$3,889,972	17%	9,262	5.8	$348	$557	$0.31	$0.018

- **Previous year participation**
- **Key stakeholders**

Approach overview

Understanding the context

- Customer market research and insights
- Market analysis
- Best practices and utility benchmarking
- Utility and regulatory considerations

Identifying goals

- Customer-related goals
- Operational goals
- Planning and resource management goals
- Financial goals
- Societal goals

Conducting the analysis

- Customer segmentation and propensity analysis
- Measure / portfolio benchmarking and best practices
- Time value analysis
- Measure level load shape analysis

Prioritizing portfolio changes

- Target program use cases
- Rank current and new measures
- Measure selection
- Program/portfolio design

Implementing and refining new portfolio

- Rates
- Regulatory
- Program implementation
- Target marketing
- Evaluation and customer experience improvement

Develop a roadmap for portfolio evolution

- Regulatory strategy
- Program design
- Rate design
- Target marketing
- Customer experience
- And a lot more …

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Continue to evolve your portfolio as the context changes


Daily double!

- Gain deeper insights into residential customers' interest in DER technologies – focus on electric vehicles and low- and moderate-income solar
- Expand your understanding of other utilities' efforts to create innovative DER programs, services, and portfolios
- Develop a data-backed tactical plan for making changes to your utility's DER programs and portfolio

E Source Distributed Energy Resource Strategy Service members only!

Information and registration

To contact today's E Source E-pardy hosts …

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