

ENHANCING TARGETING AND PROGRAM DESIGN WITH AMI DATA

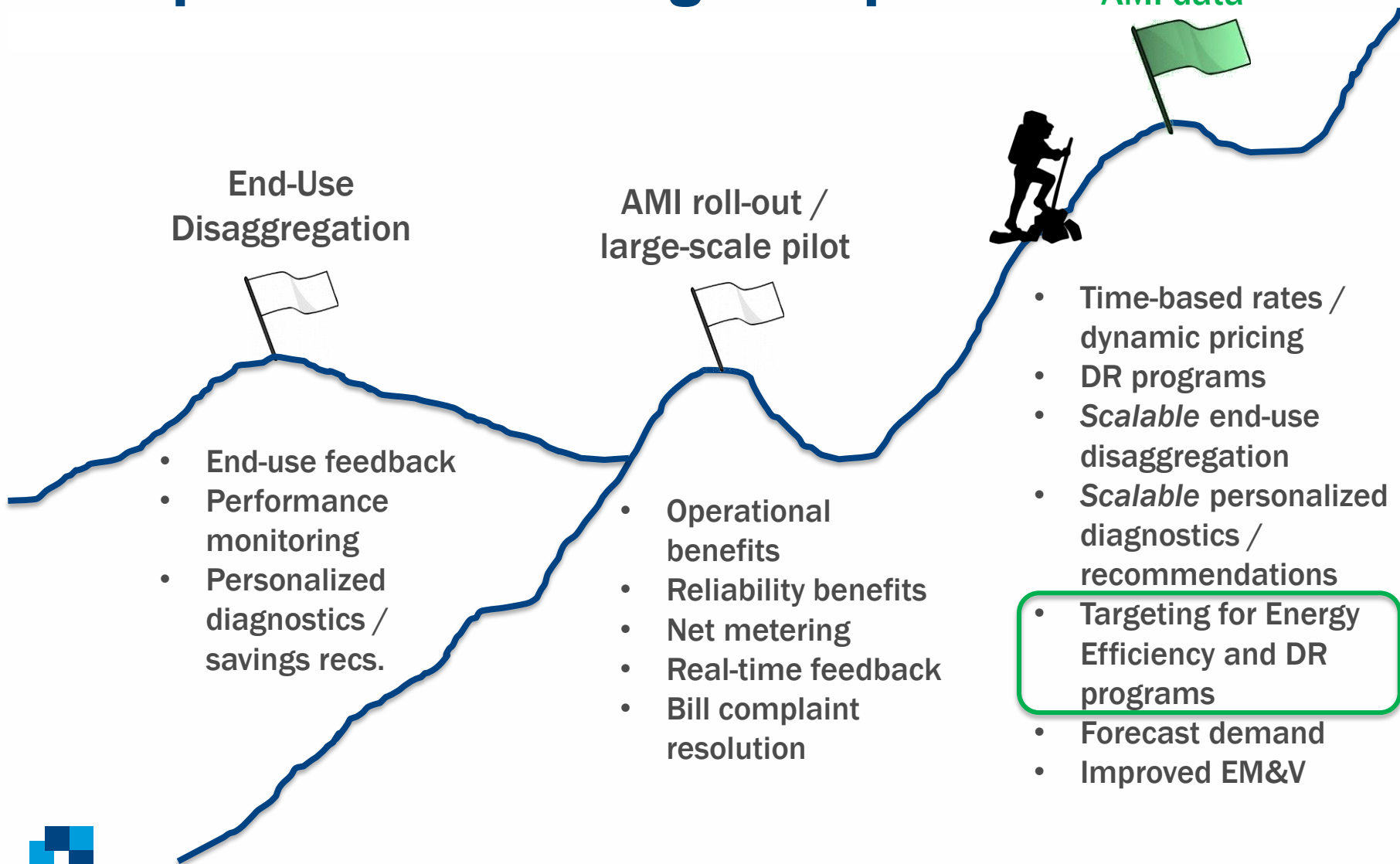
AESP Northeast Chapter
Conference

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The pieces are falling into place

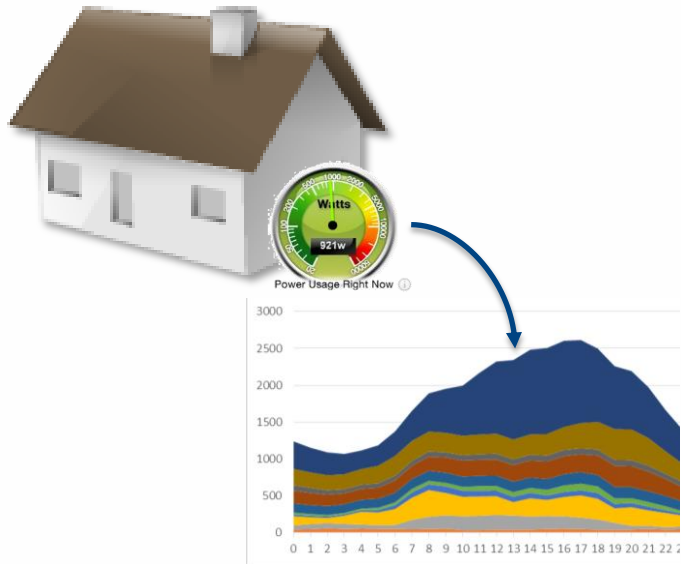
Getting value from
AMI data



Whole-house and end-use metering data can identify specific program opportunities

Valuable for a single customer...

...And valuable at scale

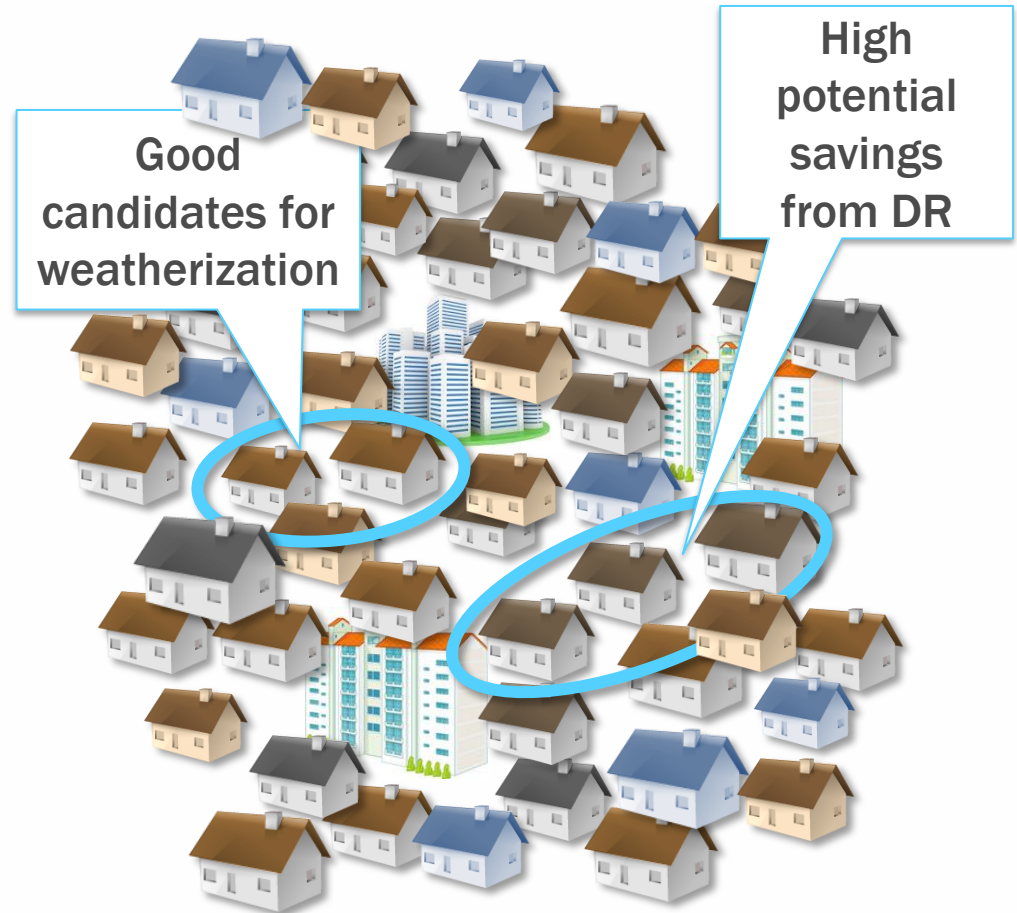


Recommendations:

- Duct sealing
- Lighting upgrades
- Direct load control



Opinion Dynamics



Whole-house load shape segmentation and opportunity analysis

1. Group/cluster customers based on daily usage patterns (using AMI data)
2. Overlay end-use profiles to illuminate what **“objective” potential may exist**
3. Overlay home & equipment characteristics, and attitudinal/behavioral characteristics illuminate **barriers and levers to change**
4. Develop segment-specific program strategy – combination of EE, DR, behavioral programs



Data gathered for this example

- Residential whole-house *and* end-use metering
- Augmented with on-site audit data (equipment characteristics) and customer surveys (operations, behavior)



B4 How old is your central air conditioner?
 Less than 6 years 10 to 14 years 20 or more years
 6 to 9 years 15 to 19 years Don't know

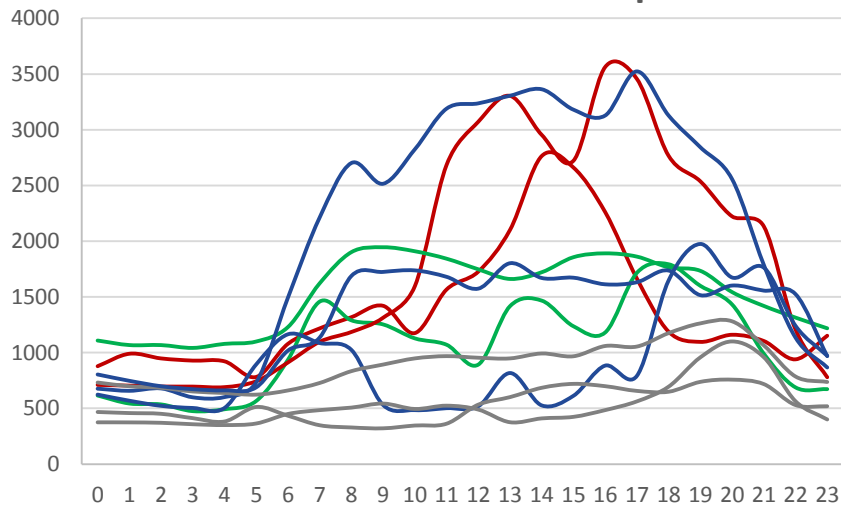
B5 Is your central air conditioner ENERGY STAR rated?
 Yes No Don't know

B6 Do you have a programmable thermostat?
 No
 Yes → **B6a Is your thermostat programmed automatically, depending on the time of day?**
 Yes No

- Data patterns and trends shown in this presentation are illustrative – i.e., the underlying data has been modified

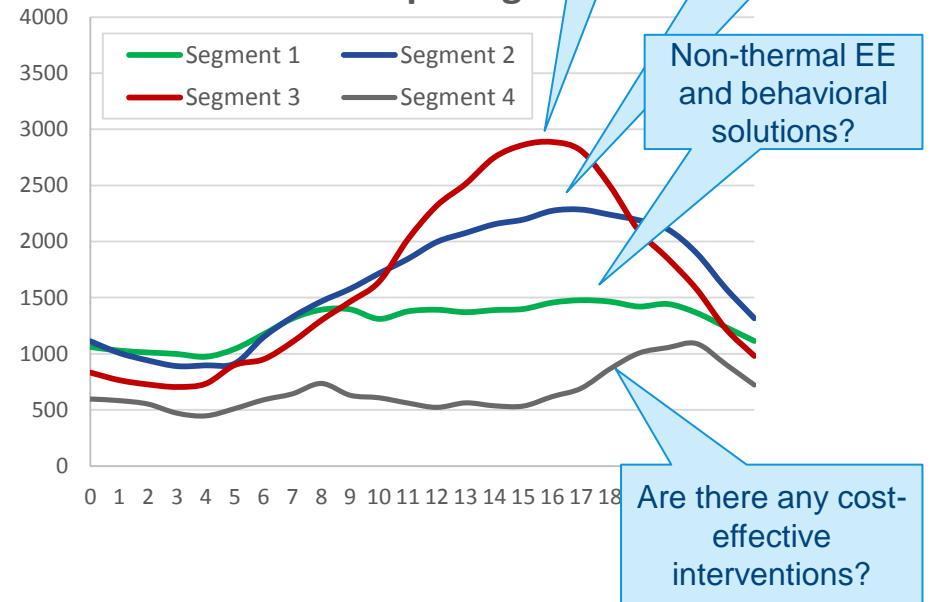
1. Cluster households by load shape patterns

Whole-House Load Shapes



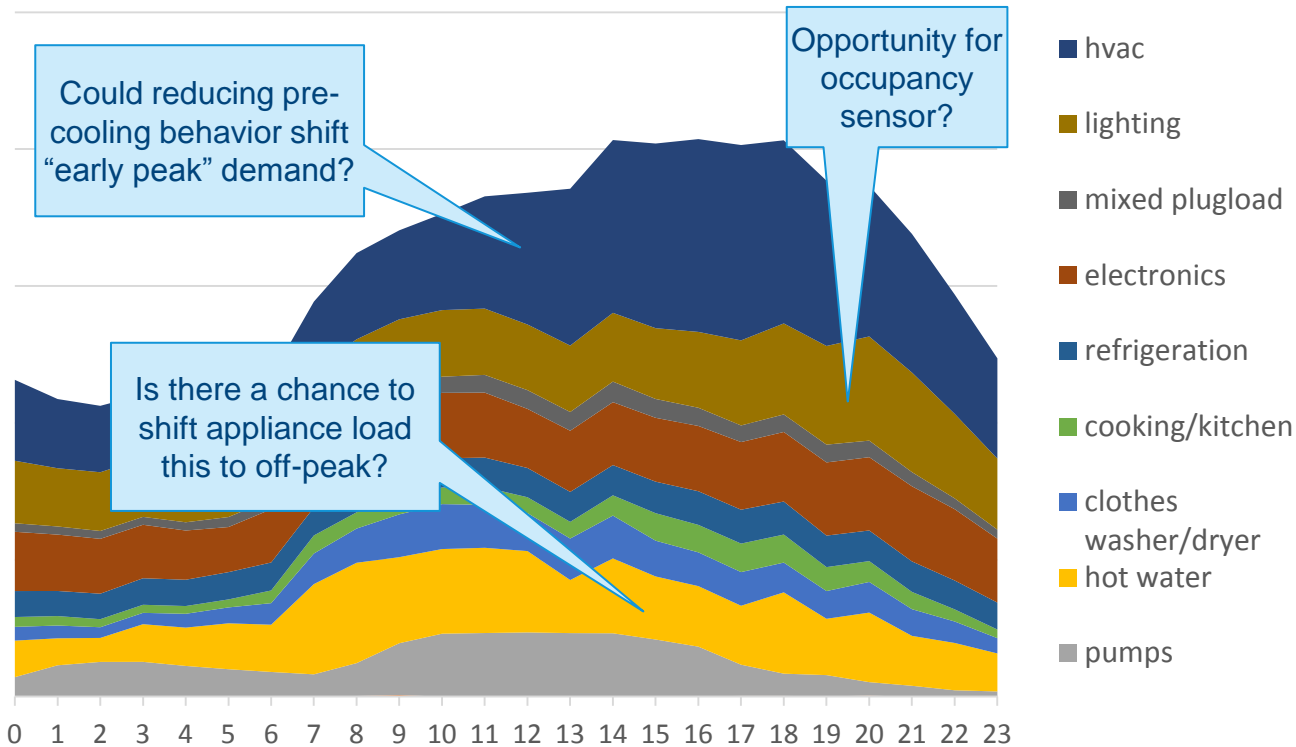
cluster similar patterns

Load Shape Segments



2. Examine end-use load shapes by segment

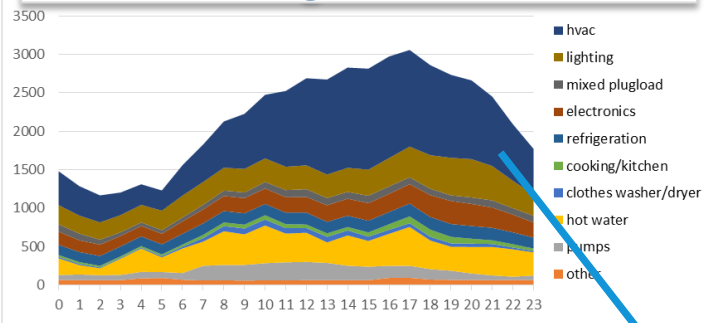
Segment 2 Hourly Usage by End-Use:
Average Summer Day



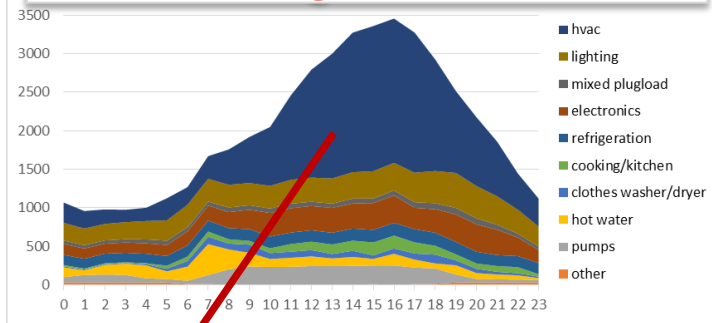
Pct Total Load	Pct Peak Period Load
27%	33%
17%	15%
3%	3%
14%	12%
7%	6%
4%	5%
6%	6%
14%	12%
8%	7%
0%	0%

3. Overlay equipment, household, behavioral and attitudinal factors by segment

Average End-Use Profile, Segment 2



Average End-Use Profile, Segment 3



Building / Equip. Characteristics

	Segment 2	Segment 3
% CAC	83%	87%
Energy intensity of home	XX btu/sqft	YY btu/sq ft
Home Vintage		
% Built before 1970	40%	30%
% Built after 2000	12%	14%
Envelope efficiency index	45	65
Cooling system efficiency (SEER)	12.1	11.3
Weather sensitivity index	50	54

Behaviors

	Segment 2	Segment 3
Thermostat behavior		
"Set it & forget it" – constant temp	45%	35%
Programmed; variable temp	17%	35%
Manual; variable temp	38%	30%
Avg. interior temp (cooling)	77 deg	75 deg
Avg. setpoint difference, morning vs. peak	2 deg	1 deg

Household Com

- Daytime ccupancy
- Presence of children
- Mean # Occupants
- Age of Head-of-Household
- Income
- College educ. or higher

specific to each load shape segment



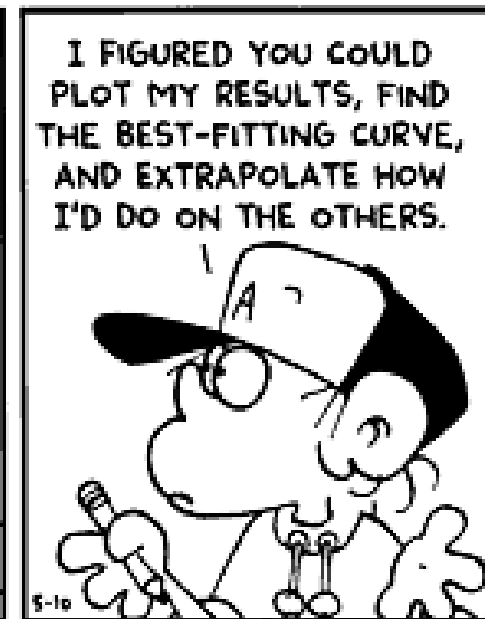
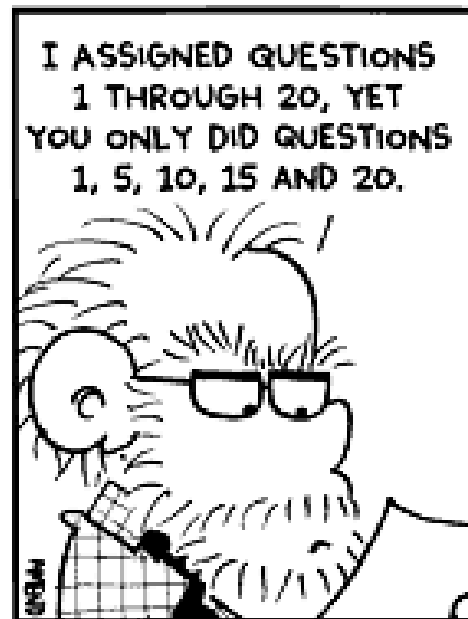
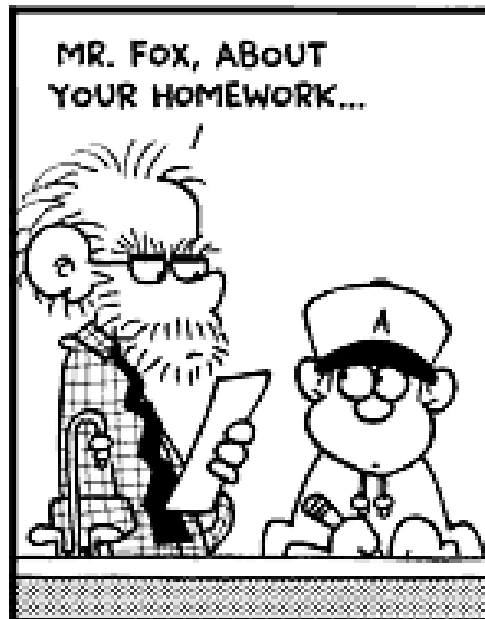
Segment	Key Characteristics	End-Use Notes	Weatherization	AC Rebate	Conservation Behaviors	Demand Response	Dynamic Pricing
1	Consistently high baseload but limited peak	Steady HVAC use. Off-peak appliance use.	✓	✓			
2	High baseload and high, extended peak	On-peak HVAC, lighting; variable appliance use	✓	✓	✓	✓	✓
3	Lower baseload and high, compressed peak	On-peak HVAC, lighting, and appliance use			✓	✓	✓
4	Generally low load	Limited/no AC use	✓		✓		



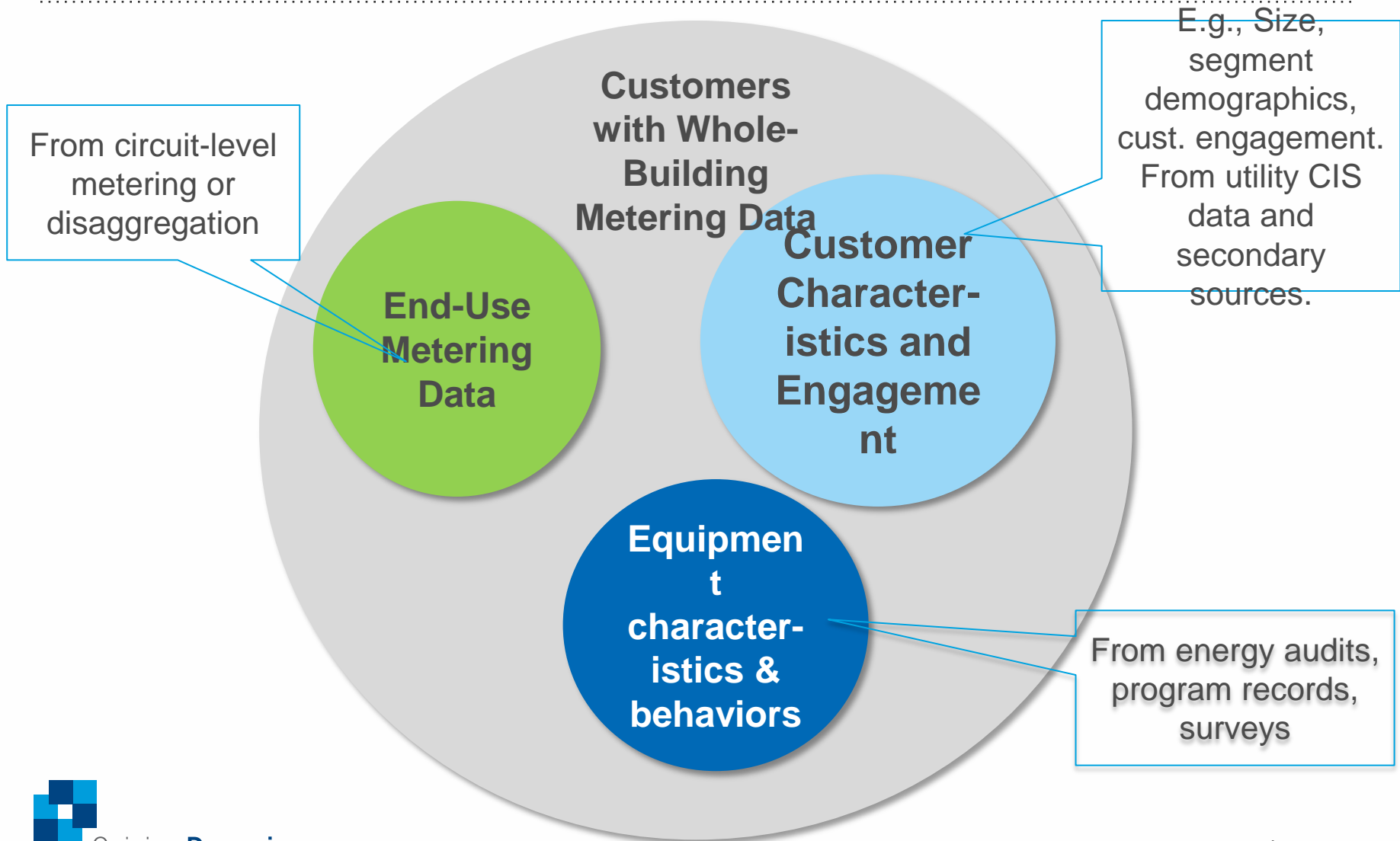
What if we only have AMI data for a sample, or pilot?

One option: Develop predictive models for each load-shape segment based on readily-available data:

- Customer data:
 - Seasonal usage levels
 - Summer vs. shoulder usage
 - Single-family vs. multifamily
- Secondary data:
 - Demographics (age, presence of children, income)
 - Home vintage
 - Home value



achieving savings potential (with interval data)



Other approaches for improving targeting through the use of interval data

- Whole-building load shape segmentation and opportunity analysis (*this presentation*)
- HVAC and energy management segmentation
- Track in segment load shapes over time
- “Change Point” analysis to understand customer behavior / actions outside of programs

Thank you!



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