Lawrence Berkeley National Laboratory
Behavior Analytics
decision science, econometrics & machine learning for evidence-based & big-data-driven results

Uses for Smart Meter Data

Topic #1: Basic Customer Segmentation

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Research team also includes: C. Anna Spurlock, Ling Jin, Sam Borgeson, Dan Fredman
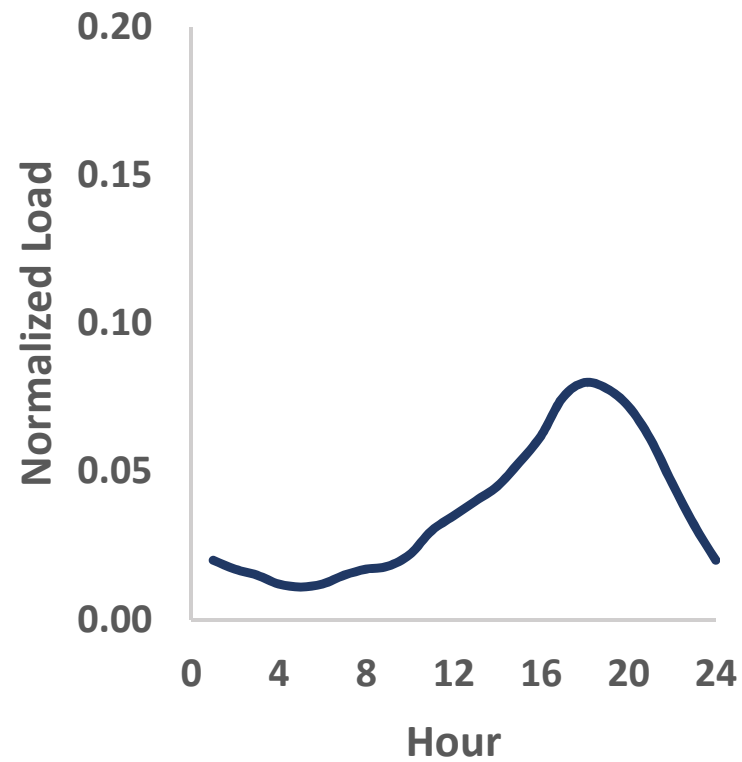
Data explosion in energy sector

- AMI, thermostats, appliances, cars
- Linked to other time and location-specific information (temperature, census, satellite)
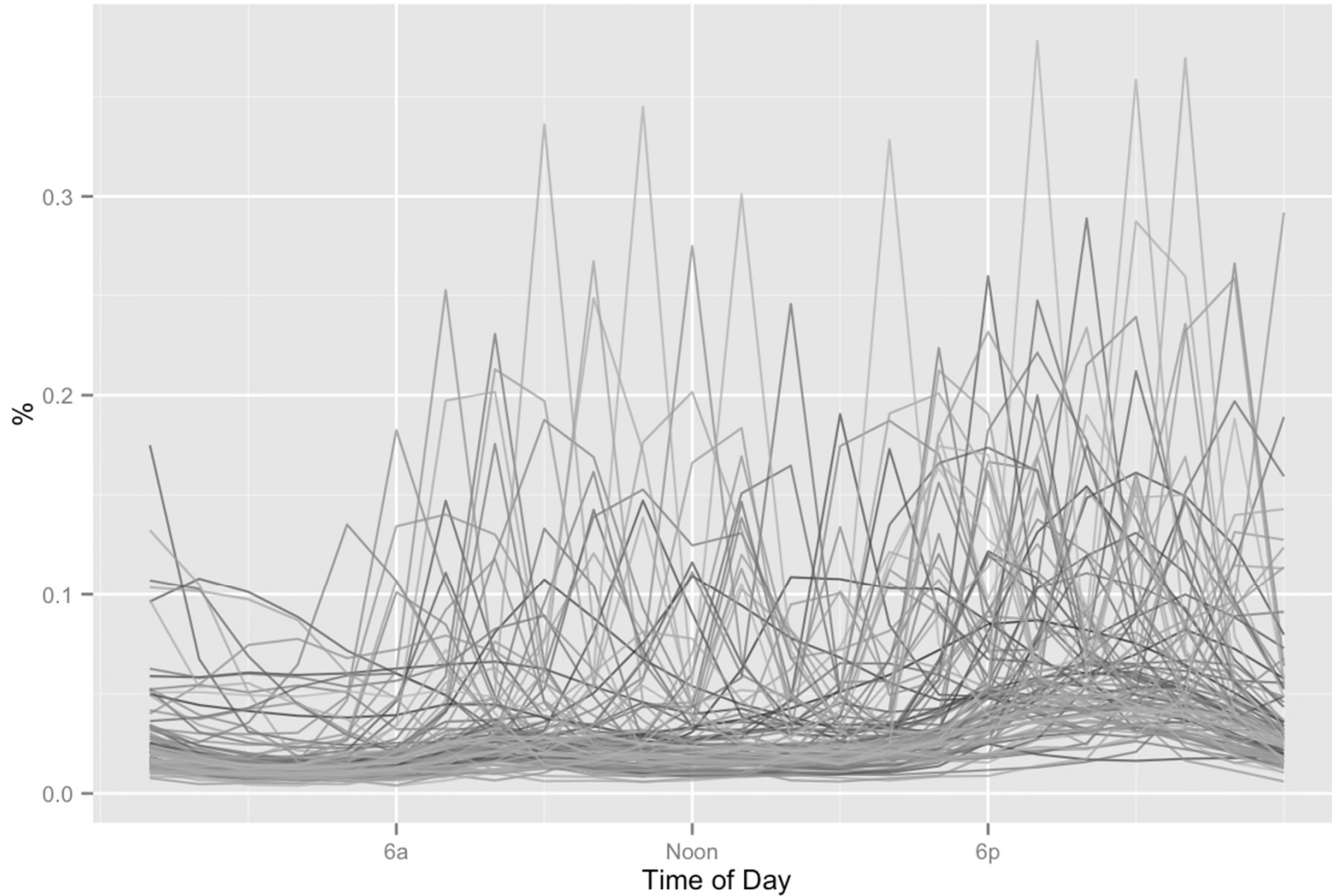- Provide vast, constantly growing streams of rich data
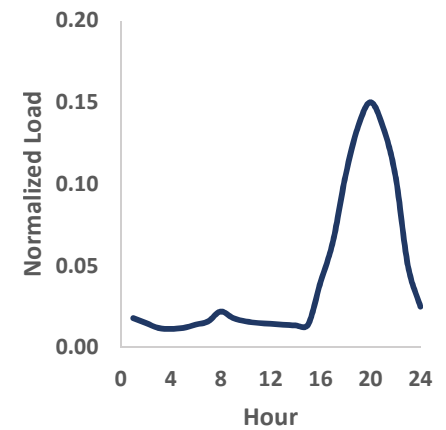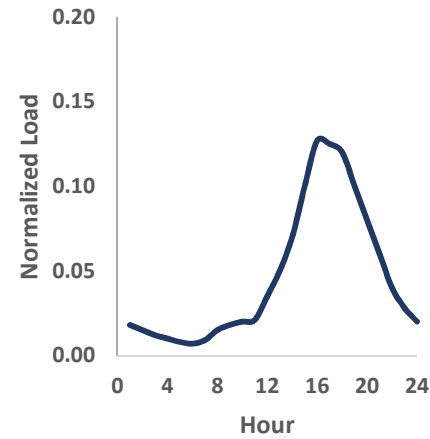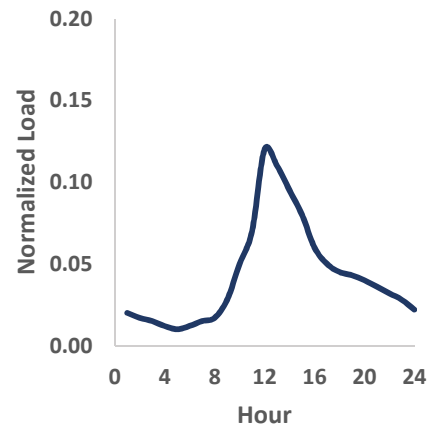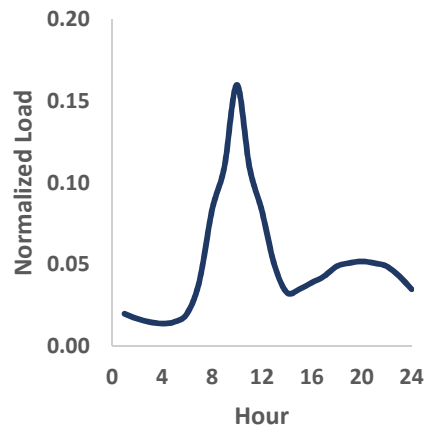
Are All Residential Customers the Same?

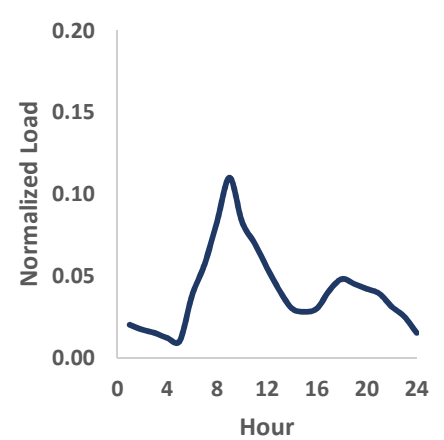# Wide Variety of Load Shapes Exist Across Customers Within the Same Class
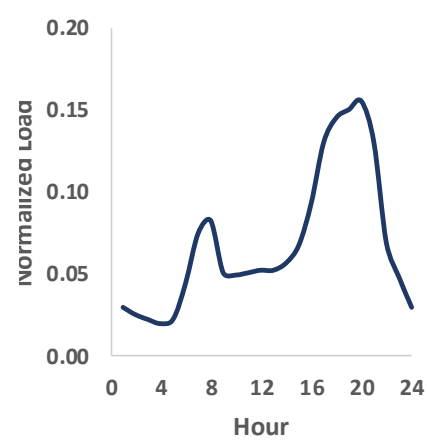
Common Customer Load Shapes

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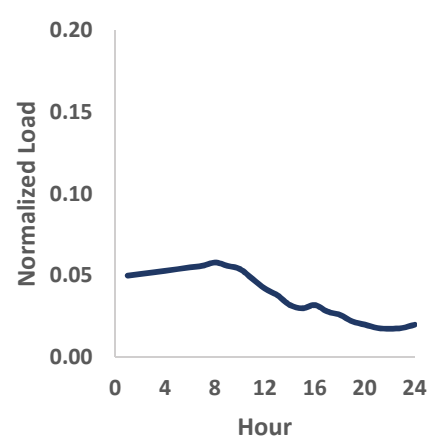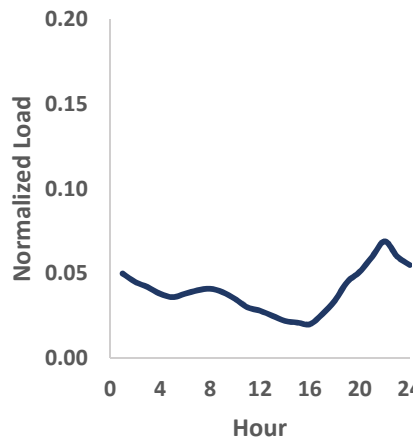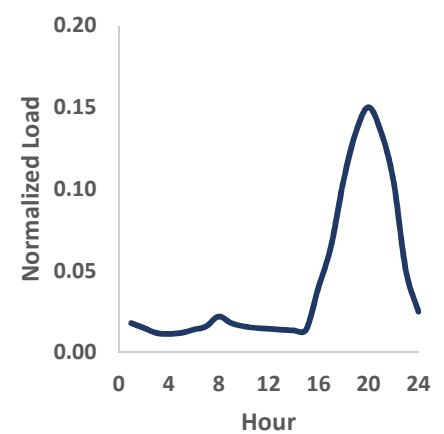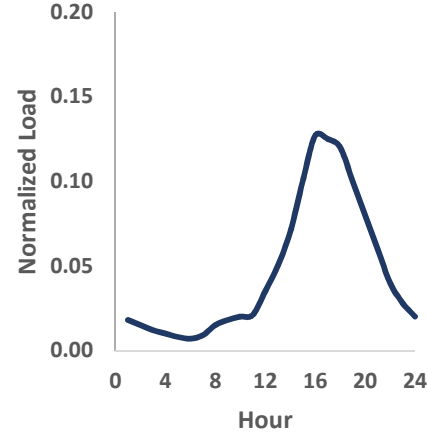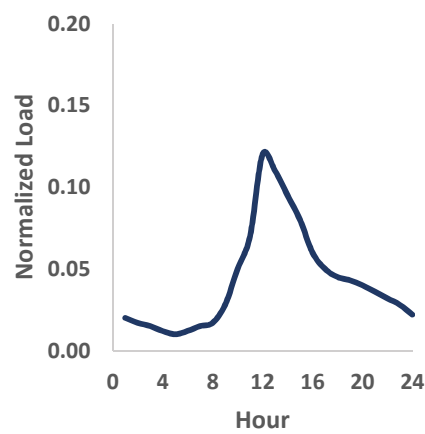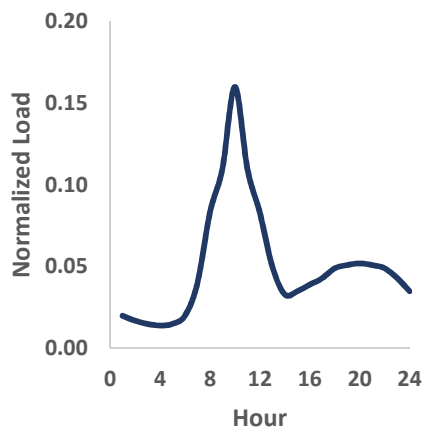
Group Load Shapes Based on When and How Many Customer Load Peaks Occur

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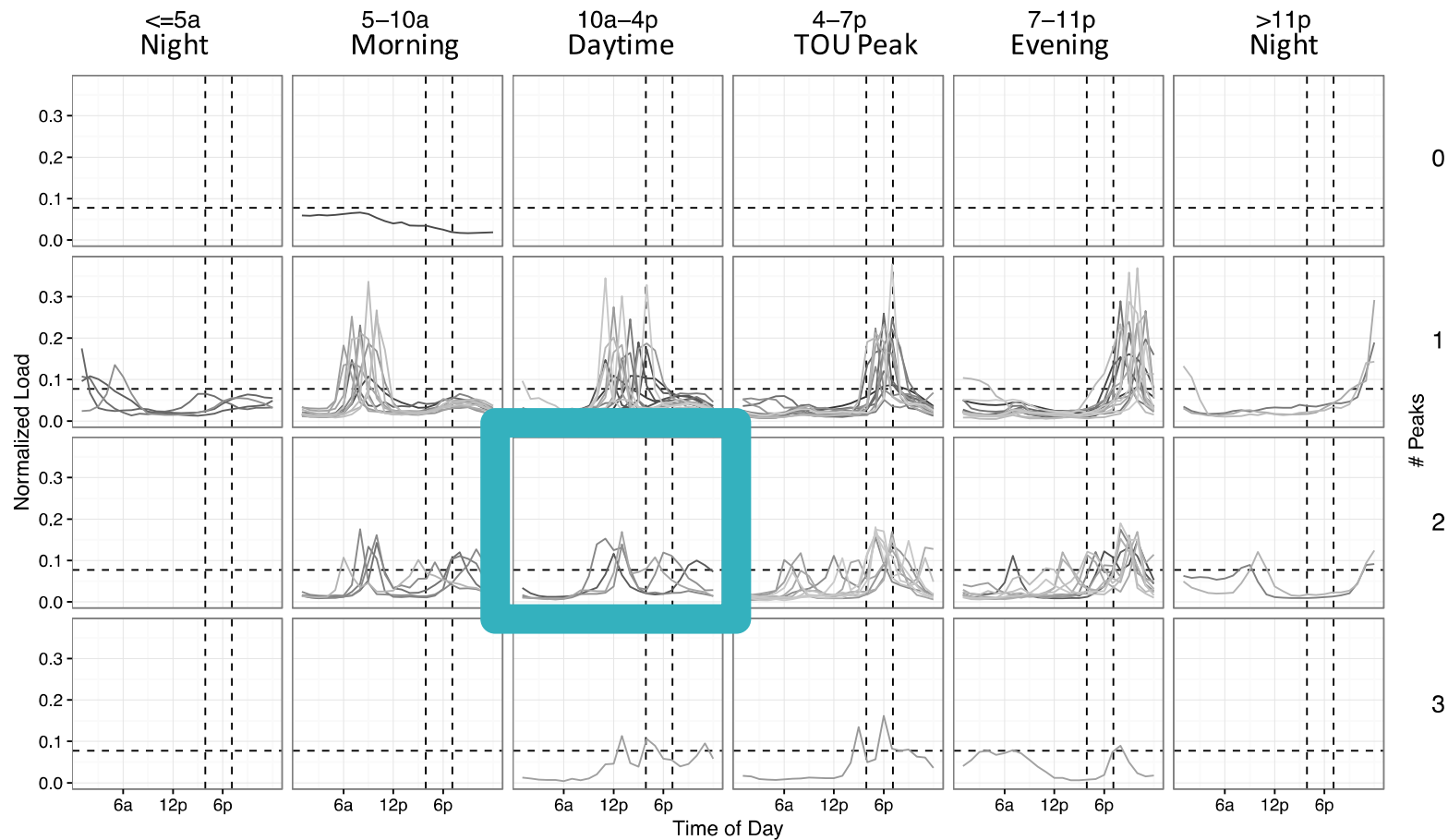
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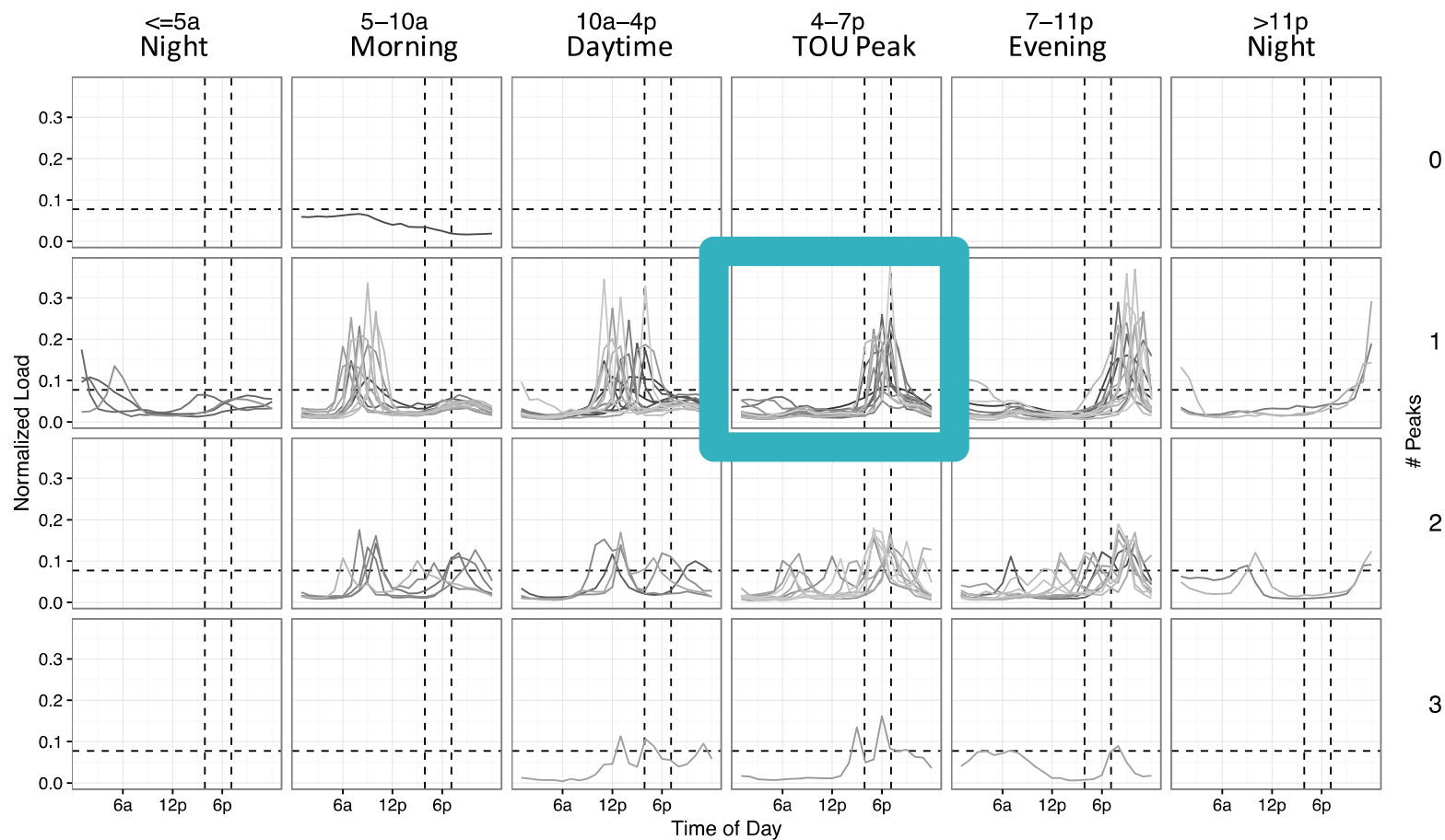
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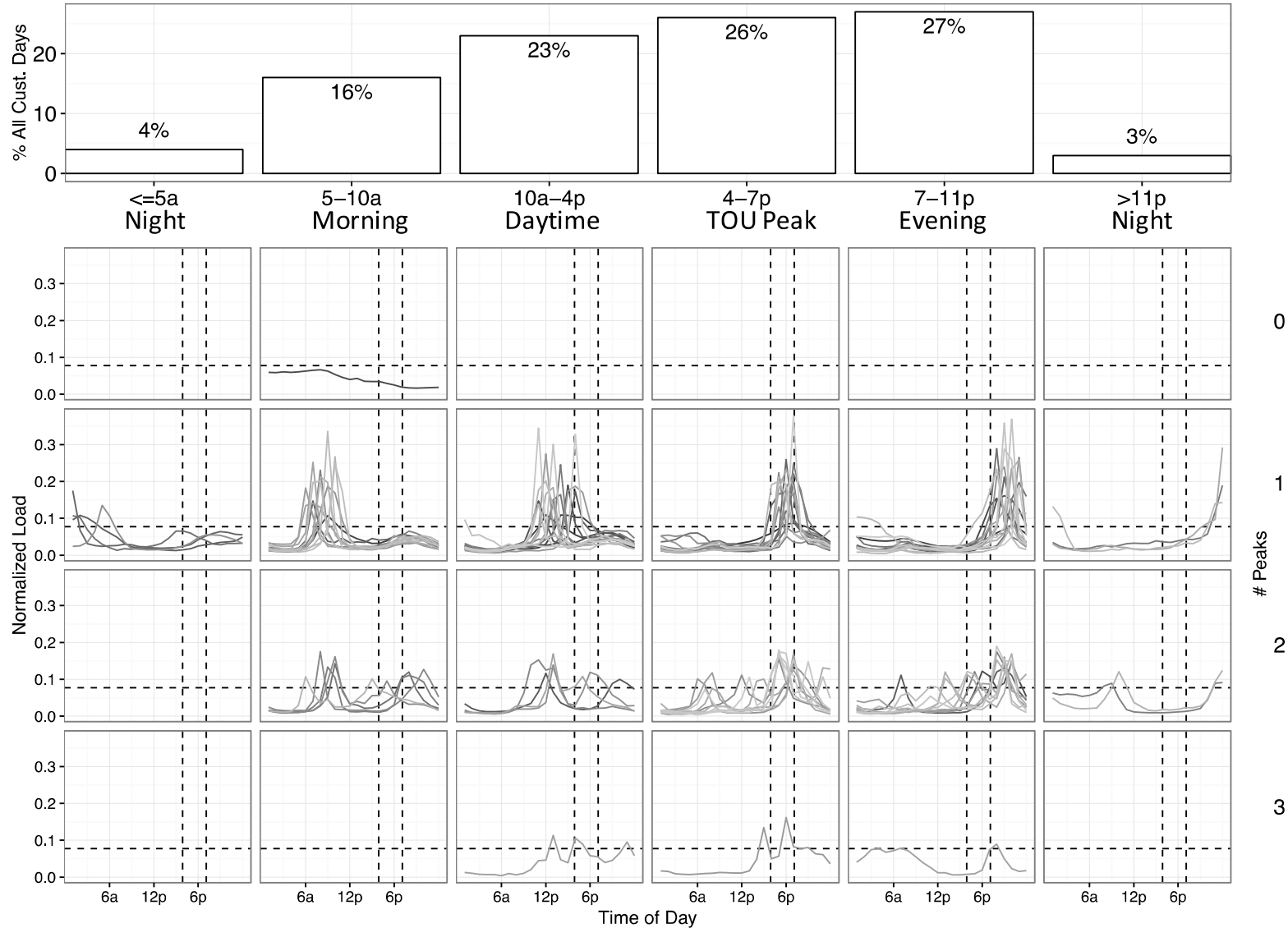
Group Load Shapes Based on When and How Many Customer Load Peaks Occur

Gain a Better Understanding of Who is Peaking When
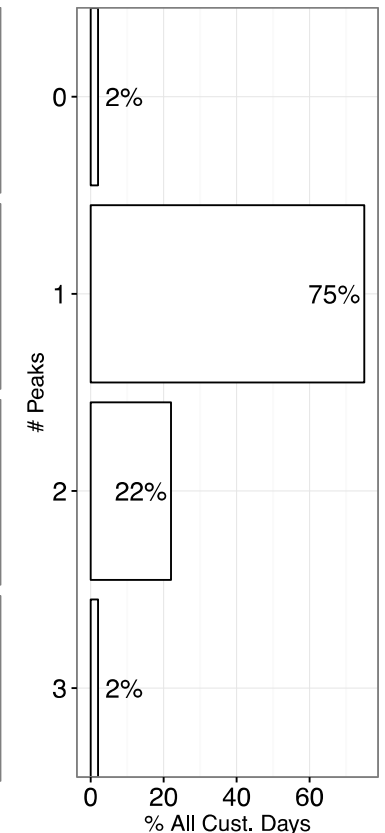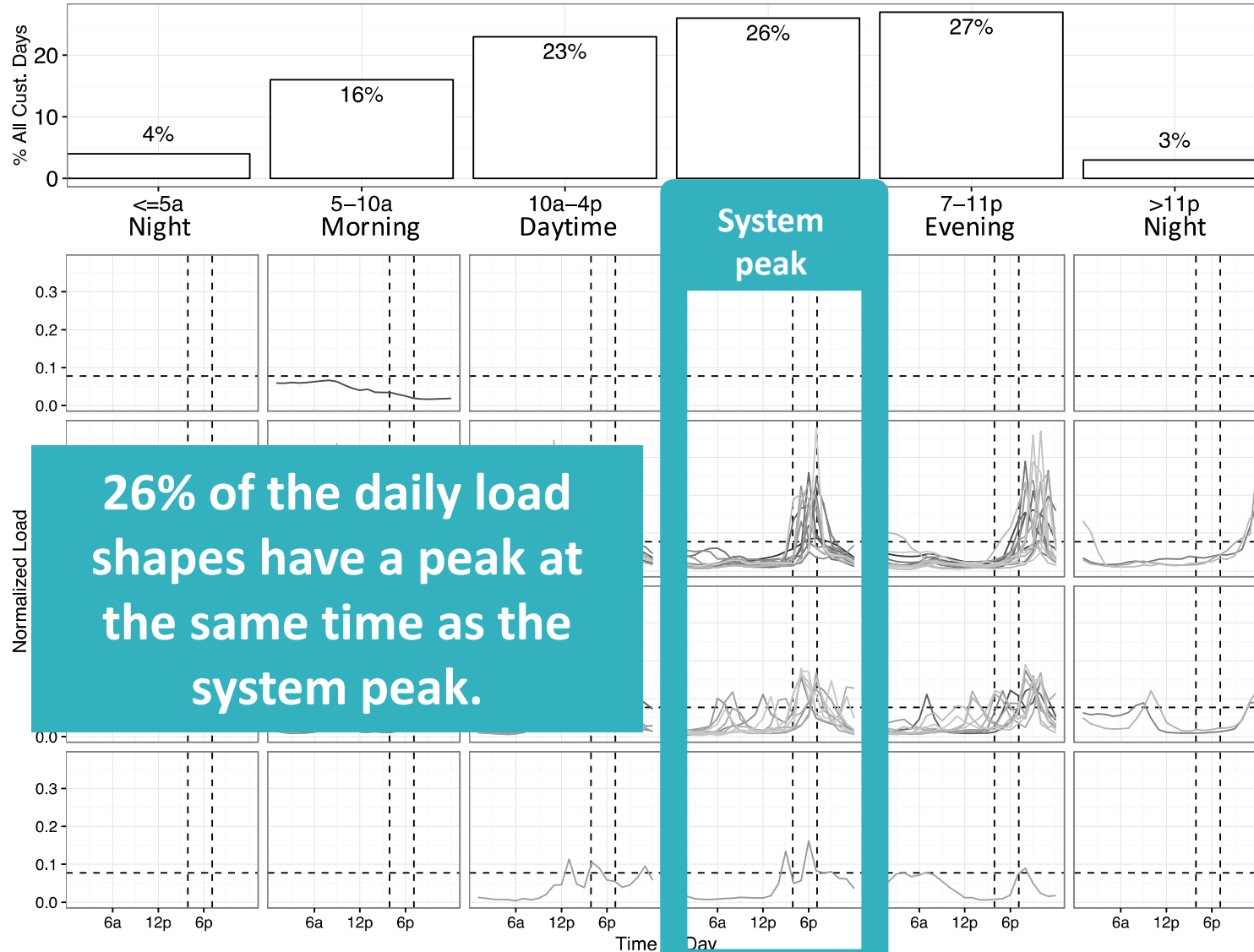
26% of the daily load shapes have a peak at the same time as the system peak.

Gain a Better Understanding of Who is Peaking When

These load shapes minimally contribute to system peak
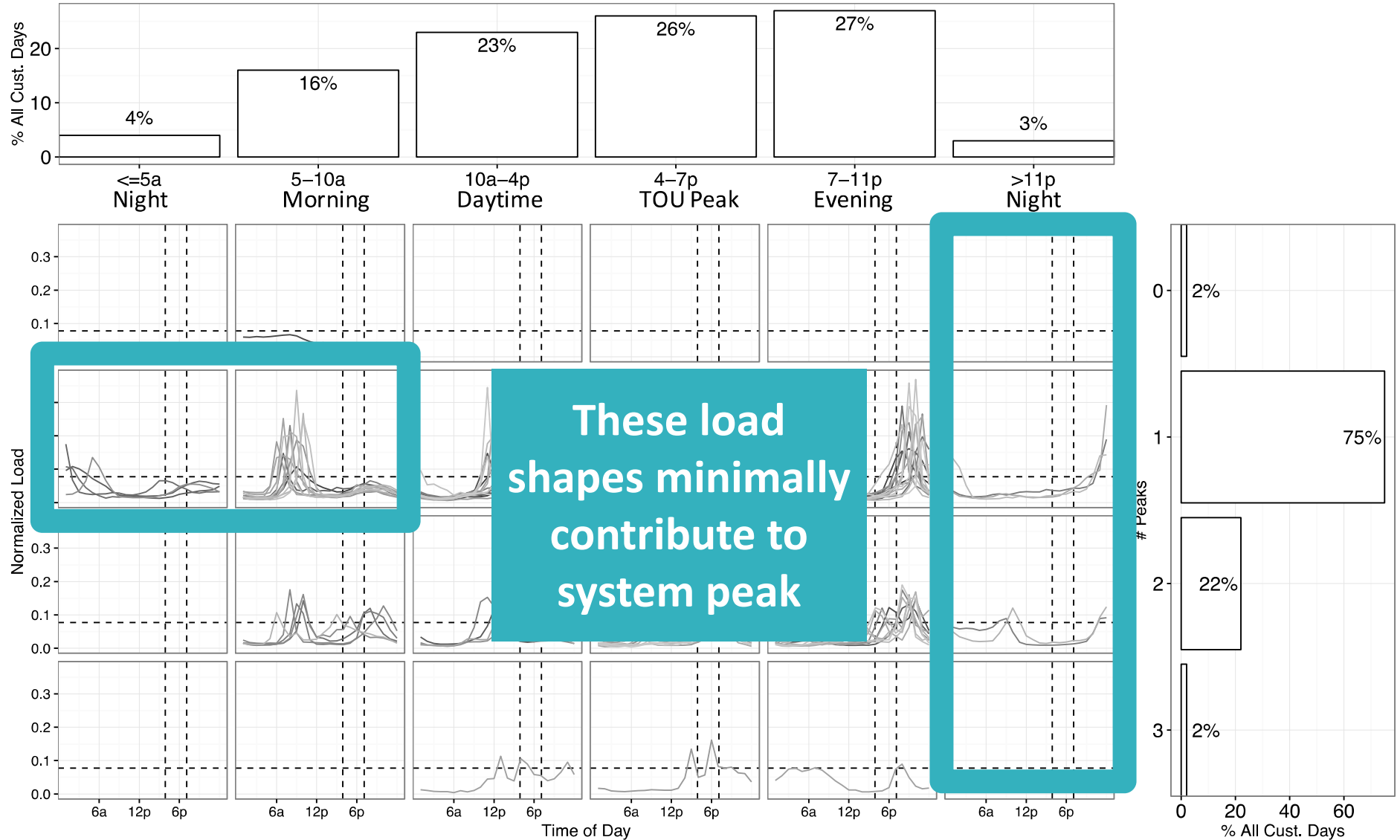
- Identify load shapes that might indicate whether a customer may:

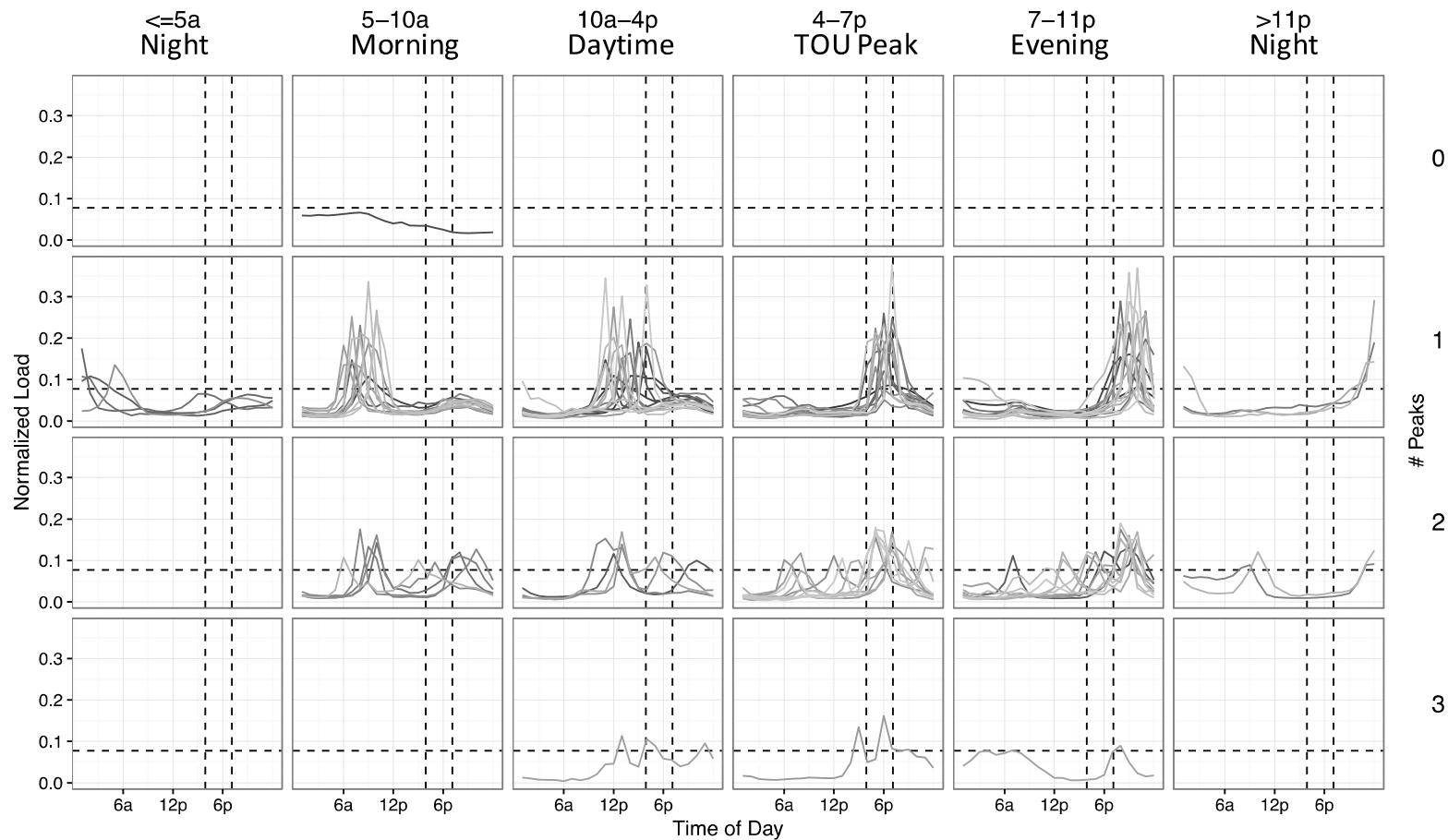 - Have challenges adapting to particular rates or offered programs

  - Be successful on particular rates or offered programs

  - Be a good candidate to receive education and outreach material to improve realization of savings potential

Group load shapes based on when peaks occur

Different # of peaks at different times of the day

% All Cust. Days

<=5a Night	5–10a Morning	10a–4p Daytime	4–7p TOU Peak	7–11p Evening	>11p Night
4%	16%	23%	26%	27%	3%
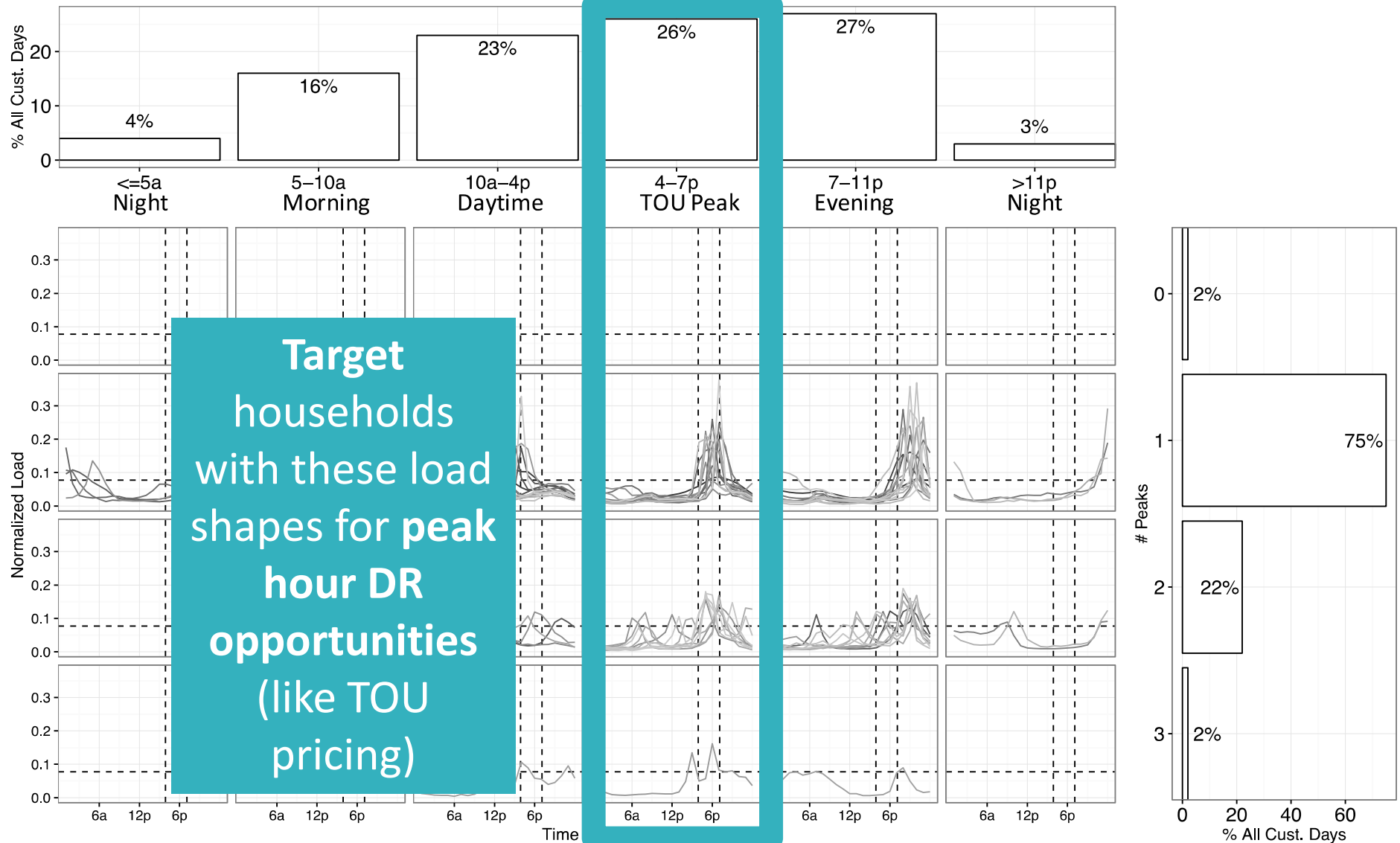
Target households with these load shapes for **peak hour DR opportunities** (like TOU pricing)

Peaks

0	2%
1	75%
2	22%
3	2%

% All Cust. Days

Group load shapes based on when peaks occur

Different # of peaks at different times of the day

% All Cust. Days

4%	16%	23%	26%	27%	3%
<=5a Night	5–10a Morning	10a–4p Daytime	4–7p TOU Peak	7–11p Evening	>11p Night

Normalized Load

Time of Day

Avoid targeting households with these load shapes for **peak hour DR opportunities**

Peaks

# Peaks	% All Cust. Days
0	2%
1	75%
2	22%
3	2%

% All Cust. Days

Group load shapes based on when peaks occur
Different # of peaks at different times of the day

% All Cust. Days

4%   16%   23%   26%   27%   3%

<=5a Night | 5–10a Morning | 10a–4p Daytime | 4–7p TOU Peak | 7–11p Evening | >11p Night

Normalized Load

But **do target** these households for **off peak load expansion DR opportunities**

6a 12p 6p

Time of Day

Peaks

0   2%
1   75%
2   22%
3   2%

% All Cust. Days

Group Load Shapes Based on Degree of Discretionary Usage
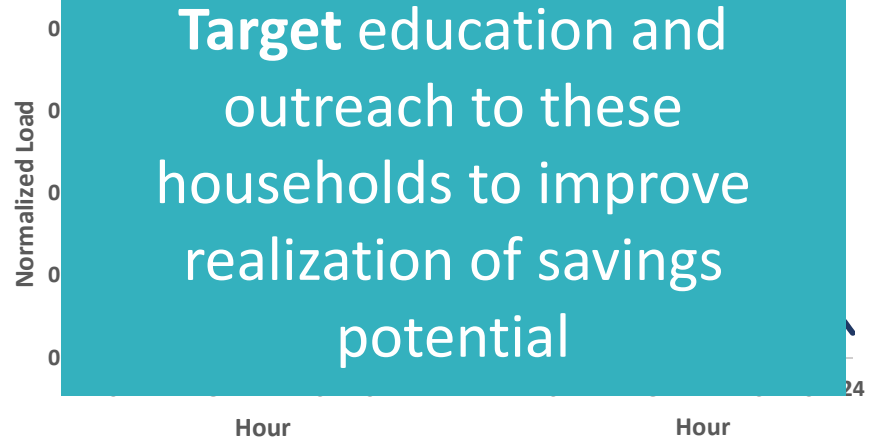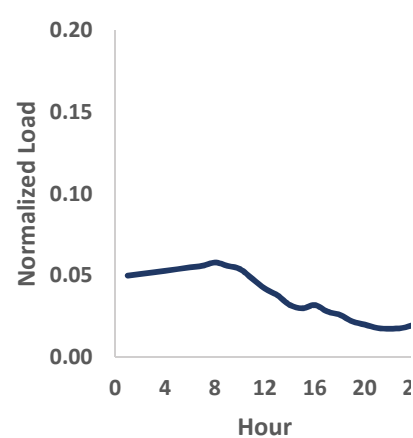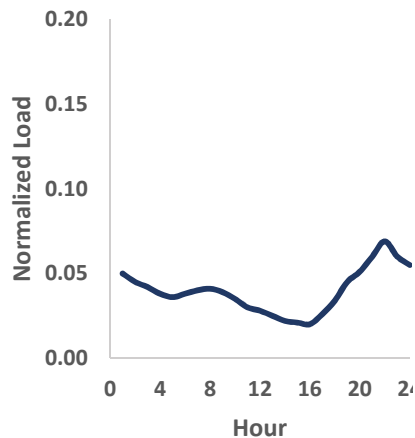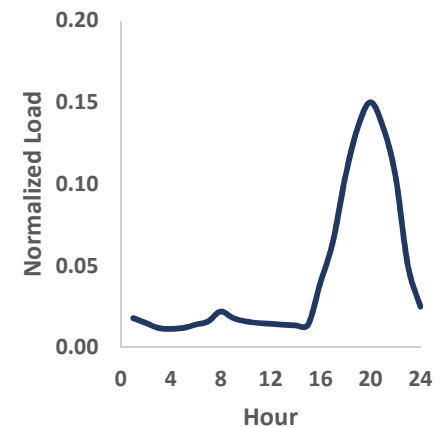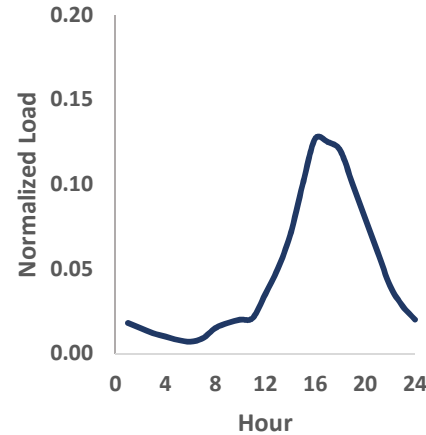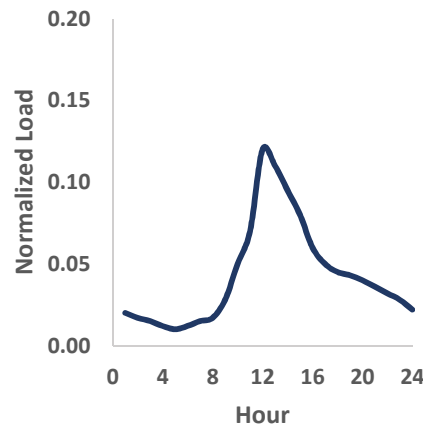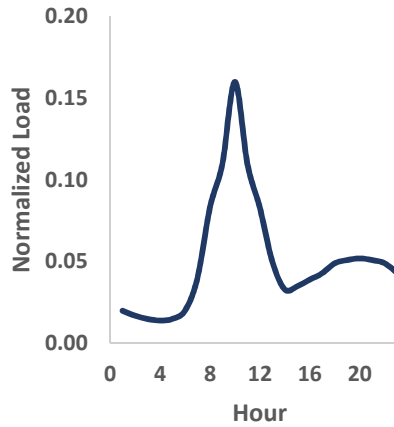
Target education and outreach to these households to improve realization of savings potential

- By analyzing existing smart meter data, a utility can:
  - Better understand the diversity of customers in its service territory
  - Identify load shapes that may be more conducive than others for **participation** in some rate or program
  - Identify load shapes that may be more conducive than others for **providing** peak reductions (or more generally, energy demand smoothing)
  - Target customers with those load shapes for rate or program offerings, as well as education and outreach material specific to them
  - Identify load shapes that should be avoided when seeking participation in some rate or program
  - Be able to easily change program offerings as the grid expands and requires load reductions at different times (e.g., solar and wind power, EV charging, batteries, etc. might change what time the peak system load occurs)

Berkeley Lab - *Behavior Analytics*

Providing insights that enable evidence-based, data-driven decisions

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