

“Policy Guidance for Load Shapes” Issue Statement

The load shape is part of the electric impact profile that feeds into the cost-effectiveness calculator. Thus, the load shape is an important factor for program design. The set of *statewide* 8,760 electric load shapes is currently limited (7 commercial and 14 residential) and has gaps. Several ongoing activities by the DOE, CEC, and RTF are producing or updating end-use profiles.

The objective of this white paper is to establish guidance with respect to the development of CA savings load shapes to ensure that we achieve the appropriate level of detail to meet immediate and long-term needs for identified use cases (cost-effectiveness, GHG calcs, peak-period estimation, etc).

Target Audience

Who cares about this problem? Who are we trying to persuade? Who will be able to take action?

See NREL load shape project report:

(<https://www.nrel.gov/docs/fy20osti/75215.pdf>, pg 7-11).

Target Audience

- IOUs, POUs calculate C/E, CO2
- Resource planners
- Implementers – creating 3P programs, c/e. Example PG&E lighting to sm/med business. Load shapes do not reflect actual hours and do not get credit, therefore programs not developed.

Use Cases

- Potential and goals study - MICS (measure input characterization system) adds mapping of load shapes, potential analysis is done Analytica platform (MC/AS)
- CET requires elec impact profile, which is load shape + costs
- Carbon accounting (POUs now, IOUs later?)
- Demand reduction values
- POU CET relies on load shapes to report overall impacts (CET is also reporting platform).
- CEC end use profiles are used for demand forecasting (hourly elec load model, HELM 2.0). ADM provided guidance which shapes are good for EE use, leveraged by POUs
 - That depends on whether savings shape is well represented by end-use shape. (DH)

Potential Research / Analysis Approach

What is the analysis approach to the research that needs to be done to devise one or more potential solution(s)?

Savings shape vs. end-use shape assessment:

- Quick assessment of whether end-use load profile (EULP) is representative of measure savings load profile (MSLP). (DH)

Format/availability of data:

- Consider how results will be shared/file format availability (beyond data tables) and how they can be ‘durable’ and flexible (MC)

Potential Data Sources (Primary and Secondary)

What are the data sources that will be analyzed? Is the data accessible?

- CEC/ADM
- DOE nationwide end use profile project - done end of 2021, many utilities are providing data to refine load shapes. (Presentation at CEE w/ map of participating areas, Armen to share w/ group)
- DNV GL is trying to update load shapes from DEER for deemed measures. Updating some shapes and making improvements to system to address some of the issues raised in meeting. DNV GL is connected to DOE effort. (BR)
- Need to find any available (if any) sources of MSLPs and whether they are well represented by EULPs.
 - DH not aware of any such source
- Look at DERIM/DRPEP/ICA maps for disaggregated circuit/substation level load profiles (MC)
- Look at EnergyAtlas/CATALENA for potential data / input (MC)
- Use ADM load shapes when applicable (MC)
- Leverage new RASS data when released (MC)
- Suggest adding load profiles based on actual metered data; current profiles seem to be limited to secondary research, such as CEC, DNV GL, DOE. (ER)
- See SDG&E's SDG&E Dynamic Load Profile website: (ER) <https://www.sdge.com/more-information/doing-business-with-us/energy-service-providers/dynamic-load-profiles>
 - Load Profiles are limited to Agriculture, LrgCom/Ind, Med Com/Ind, Residential, A6, and Small Com.

Key Technical & Policy Considerations and Challenges

What are the barriers to address this problem? What are the barriers to completing this white paper? Any timeline considerations?

Need "right" load shapes to develop programs that best meet market and policy need.

In most cases, end-use load profiles are reasonably close to the end-use impact load profiles. However, there are some impact load profiles that are not well represented by the simple end-use profile. Any measure that does not generate the same % savings at all hours of the end-use's operation is not well represented by the end-use load profile. Examples include daylighting controls and HVAC economizers. (DH)

Level of Detail

- Level of detail depends on use case and the approach and methodology to develop shapes. Each application will have its "best" level of detail. (AS, BR)
- Some C/E tools use TOU buckets (grouped hours instead of 8760), which are easier to understand and target. (BR)
- CEC/ADM created a load shape generator that changes based upon selected parameters. This dynamic application might be

useful for hybrid measures; deemed measures need the best fit load shape (static application). (AS, BR)

- Whole-building level is different story than end-use level.
- NMEC – Need to develop guidance. NMEC involves many other considerations. Multiple measures, difficult. The effects on individual whole buildings will all be different. Population level profile? Program/aggregated level profile?
- Climate zone/building type/vintage level are factors that change load shapes. All load shapes looking at building type, CZ; whether they are used depends if they are impactful on measure (JA)
- CEC load shapes have building type and CZ; however, CEC shapes are organized by forecast zones. Is this an obstacle? Who should fund cost of translating to 16 CZs? CEC/ADM has data.
- Is the need different for CO2 calcs? Need to understand supply-side hourly CO2 emissions (CAISO?) Difficult getting from POUs. (AS)
- The comments above are based on the assumption that EULPs represent all MSLPs. This is not true! Cal TF would be well advised to get ahead of this and stop referring to LPs as EULPs and think in terms of MSLPs. (DH)

End Use vs Savings Profiles

- It is not Cal TF's charge to find good EULPs and all their associated use cases. Cal TF should be focused on MSLPs almost exclusively. For example, why should Cal TF focus on LPs for rate design? The IOUs have load research groups who's function it is to do that. (DH)
- Underlying data and methodology of end-use and savings profiles are different. End use profile shows consumption. Savings profile shows savings on hourly basis.
 - End use profiles frequently refer to hourly LPs. Matter of fact, the term "profiles" is commonly accepted to be hourly and not TOU periods
- CEC load shapes and ADM's load profiles are end-use profiles not EE profiles.
- Some savings shapes might follow its end use profile or will be distinctly different. HVAC hourly savings might be different than hourly usage. An economizer good example of savings that does not follow usage shape, also shows seasonal differences. (See related Potential Research suggestion)
- We seek savings load profiles (generally). However, certain types of measures, such as fuel substitution, are more complicated ... consider methodology and approach.

Baseline & Measure Case Usage Documentation for a Savings Profile

- We only need the savings profile, but for transparency we want to know how savings profile is derived. (BR)
 - Base and measure case usage would be useful for transparency but need controls so don't use wrong shape. Want to use
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difference between baseline and measure usage for savings profile.

- Some EM&V studies estimate net savings directly without estimating base (pre) and post installation profiles. DR and behavioral EE are examples. (DH)
- If something radically changes (non-routine event, NRE) it would be valuable if it can be easily updated; a dynamic application but with mapping in place (MC)
 - This is more of concern if the NRE is global and not site specific (DH)

Documentation & Transparency

- PG&E tried to look at documentation how load shapes created and how to support effort (prior to ADM effort). Experienced roadblocks with policy team – shapes were created so long ago, uncertain of the information to develop shapes and what would be accepted for CET. What is range of information? What are assumptions? (HL) For NMEC have metered data, expect people will start asking.
 - What did ADM do that was different from other potential study? It looks like they modeled most of their profiles using build-sim. No detailed explanation of how models were calibrated using EULPs that I could find. (DH)
- CEC load profile methods and data are fairly transparent (report). Older load shapes we rely on are less transparent, despite history and wide usage. Need documentation and data. (AS)
- There could be value in leveraging/coordinating with CATALENA (formerly the Energy Atlas project) if project gets contracted. (MC)
- ADM conducted a significant amount of measurement and also working on CEUS, data collection could be informing both load shapes and CEUS. (AS)
 - This was not well-documented if it was done (DH)

Availability of Resources to Complete Whitepaper

Are enough people able and willing to contribute to the development of this white paper? List subcommittee members here.

- Champion: Armen Saiyan
 - Subcommittee members and attendees of April 9th subcommittee meeting:
 Jessica Alison (CPUC ED), Ed Reynoso (SDG&E), Henry Liu (PG&E), Jeremiah Valera (LADWP), Bob Ramirez (DNV GL), Armen Saiyan (LADWP), Collin Smith (SDG&E), Marc Costa (Energy Coalition), Jennifer McWilliams (DNV GL), Jessie W (SDG&E), Vrushali Mendon (Resource Refocus), Luke Sun (LADWP), Dave Hanna (consultant), Johnathon Pera (Willdan), Greg Barker (Energy Solutions)
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Value/Potential Impact

Rate the impact on the CA EE/IDSM industry (high, med, low) and describe. Is the impact commensurate with level of effort/costs required?

- Transparency, traceability
 - Timing for updates
 - Case Study: LADWP lessons learned (perspective of vertically integrated utility) The transition impacted c/e dramatically. Got feedback on hourly avoided costs that was eye opening, it focused attention for EE to look at avoidance of high peak and optimizing value of EE. In a future with high renewable, EE has negative value. LADWP struggled to refocus. Targeting efficiency properly can defer future battery storage, bump up avoided cost. It's an iterative process. The load shapes are the basis to figure that out.
 - Potential & goals study (MC)
 - IRP impacts for optimizable analysis (MC)
 - Decarbonization and market transformation initiatives (MC)
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