UM 2005 Technical Work Group
June 30, 2021 Notes and Discussion

August 2, 2021

Below are notes from the June 30, 2021, Technical Work Group meeting.

Attendees:

- PUC Staff
  - Nick Sayen
  - Kacia Brockman
- Oregon DOJ: Natascha Smith
- IMT: Jake Duncan
- Energy Trust:
  - Jeni Hall
  - Gina Saraswati
- PacifiCorp
  - Erik Anderson
  - Teri Ikeda
  - Wyatt Pierce
  - Jonathan Connelly
  - Heide Caswell
  - Adam Lint
  - Melissa Nottingham
  - Adam Rosenstein
  - Adam Lint
- ODOE: Jason Sierman
- PGE
  - Angela Long
  - Andy Eiden
  - Joe Boyles
  - Misty Gao
  - Shadia Duery
  - Stefan Brown
  - Jake Wise
- NWEC: Fred Heutte
- TeMix: Stephen McDonald
- Renewable NW: Micha Ramsey
- OSSIA: Angela Crowley Koch
- Idaho Power
  - Mark Patterson
  - Jim Burdick
  - Chris Cockrell

Questions/clarifications/etc. on follow up materials from the May 26, 2021, meeting

There were no questions or clarifications on the follow up materials from the May 26, 2021, meeting.

Follow up discussion from May 26 meeting

There was a question during the May 26 meeting about the value that granular data can offer hosting capacity analysis. In response to this question, Stephen MacDonald presented on potential value of utilities making publicly available dynamic HCA data through a GUI. Slides are included below.

Discussion included:

- HCA is often static, based on Daytime Minimum Load (minimum load between 9am-4pm during a year).
    - This doesn't provide much temporal data as its not updated frequently; it lacks intra-day locational information.
- In dynamic HCA, the hourly minimum load is provided for each circuit.
- This requires software that can process and reformat data possibly already available from SCADA and other existing tools, and add to a relational database.
- Granular data may assist non-solar technologies (better suited to respond to intra-day limits/needs) to smartly locate on the grid and speed the adoption rate.

New questions for discussion and consideration

<u>Demographics and Socioeconomic data</u>

Based on feedback received in a PGE DSP Partners meeting, PGE would like to engage the Technical Work Group in understanding the following: what are preferred sources of public data that include demographics and other details that adequately characterize our communities?

Discussion included:

- PGE staff provided additional context; they would like to pursue alignment with the Technical Work Group on what to present and trusted sources; ideally the Technical Work Group would agree on what data would be useful to layer over the technical DSP data, the data would be from a source that is updated routinely, is publicly available, and can be leveraged over long term. Possibly the three utilities could leverage aggregated data from one common resource.
- It was noted this is a good discussion, however the right people to answer the question were not on the call.
- PacifiCorp staff supported pursuing this topic and questions, and noted the need for consistency in how information is represented for people who know the data, and for people who will use the data. This is not just a utility issue, given recent legislation, this is a statewide issue. PacifiCorp staff support a separate workgroup to pursue this further, with potentially broader application beyond DSP.
- A priority metric is energy burden; it could identify overlap between solving grid issues and community issues (see https://www.equitymap.org).
- This topic may have overlap at the Commission with wildfire planning in AR 638 and implementation of HB 2021.
- PUC Staff suggested some potential next steps:
    - A separate working group that focuses on questions of demographic and socioeconomic data, and useful energy planning metrics
    - Some tasks for the working group might include:
        - Identifying current efforts addressing these questions

        - Identifying best practices, datasets
        - Engaging groups to provide the needed perspective
    - Staff will follow up with PGE, PacifiCorp, and other Technical Work Group members regarding participation in this effort.

Data Accessibility

Might the Technical Work Group consider coalescing around guidance on public accessibility of data? For context, in the data transparency workshop, someone shared a link to a Regulatory Assistance Project presentation on Open Data Access Standard Approaches (link below). It seems like the DSP process may be an appropriate place to consider this topic.
https://www.raponline.org/wp-content/uploads/2021/03/rap_seidman_shenot_data_access_mnpuc_2021_feb_26.pdf

Discussion included:

- PUC Staff asked Natascha Smith, Oregon DOJ, to begin by providing background on any existing rules or statutes regarding data accessibility. Ms. Smith noted the following:
    - In this context, the ask is for utilities to make DSP data public; any relevant guidelines are broad.
    - PUC will not ask utilities to share confidential data.
    - The utilities have established consumer protection guidelines that meet or exceed identity theft protections in ORS.646A.
    - In other contexts at the PUC, data that gets made public has been negotiated on a case-by-case basis; in some of these data was anonymized through randomization or aggregation.
    - Where stakeholders are able to agree on a standardized approach to sharing data, this makes data more useful, and possibly more comparable across utilities.
    - In DSP, stakeholders should strive to establish agreed-upon data requirements.
- Some anonymized data uses a "universal ID". California is an example to look at with a consumer ID protection act, though there are no federal guidelines yet.
- Data accessibility is a big issue and important to get right; tradeoffs will need to be considered; the status quo approach will need to evolve. There is already a lot of good thinking happening, such as RAP.
- A goal to consider is to have apples to apples data from all Oregon utilities with uniform methods for anonymizing.
- The current guidelines do not present privacy concerns for PGE because data can be rolled up before it's presented, but the next DSP stage may generate desire for more granular data, and hence a need to revisit privacy issues at that time.
- Utilities currently have data standards based on internal codes-of-conduct, ISO practices, etc.
- The more time and locational granularity there is, the more difficult it is to protect anonymity. There may be a need for guardrails to prevent unintended consequences from more granular data.

- Standardized data is really important for business and policy decision making, however distribution system data is different. For example, load shapes could identify private customer info. So then, what's the method to anonymize? One approach is to perform an analysis of value of different levels of granularity. Minnesota PUC has been investigating distribution level data access in Docket No. 20-800, for anyone that would like to dig in.
- PUC Staff noted there seems to be benefit in finding some uniform practices for handling this data in the future, while respecting and navigating current policies, practices, constraints; Staff suggested a separate working group that focuses on this question may be a practical next step.

<u>Resource Adequacy and DSP</u>

Could the utilities speak at a high level as to how resource adequacy planning may or may not show up in the distribution system planning process? For example, regional resource adequacy plans flow into the utilities' IRPs, but would there also be considerations within the DSP Long Term Plan?

Discussion included:

- Idaho Power staff noted that resource adequacy planning is handled by the balancing authority to balance load and generation. The transmission system is assumed to have sufficient capacity for local distribution needs. Ultimately the utility has obligation to serve load – with or without DER presence – as for example, a large DER recently disconnected after 10 years of generation.
- It may have been reasonable to assume distribution system has sufficient capacity in the past, but that may not be the case anymore, as demonstrated by rolling blackouts in Spokane due to distribution constraints.
    - The rolling blackouts in Spokane illustrate a difference between resource adequacy and capacity adequacy.
- As economy decarbonizes there will need to be large investment in renewable energy (RE), and this will influence DSP. For example, look at the high RE scenarios put forth in the 2021 NW Power Plan, and how those scenarios would get incorporated into DSP.
- PGE evaluates RE from both the demand and generation side and is looking at how flexible loads can contribute to resource adequacy. NW Power Pool asked utilities for information on this, PGE can report back after results are in.
- Resource planning and load service planning (DSP) are different types of planning approaches: supply side studies as opposed to load side studies. As noted earlier in load service planning, there is an expectation of load service. Care should be taken when considering reform to re-evaluate uni-directional power flow on the distribution circuits due to DERs. It may be legacy planning, but deterministic scenarios are still valid.

May 7 Data Transparency Workshop – Next Steps

Staff will propose potential next steps stemming from the May 7 Data Transparency Workshop. Discussion was kept brief to maintain an on-time agenda.

- PUC Staff will post Data Workshop follow up soon including notes, two spreadsheets (one from the beginning of the workshop with update on Oregon circumstances, and a second marked up version with information developed during the Workshop.
- Staff will start a data-related parking lot for topics. This will be included in notes and agendas to maintain these issues over time. The first item in the parking lot will be: *where/how data from DSP filings might be stored*? Also to be added: today's data privacy discussion.
- Staff will ask about interest in volunteering to help define different data types.
- Staff will also ask about interest in determining priority data types to focus attention on now and pursue completion of Figure 2.

PGE DER Readiness map – Sprint 3

PGE's hosting capacity analysis team will discuss:

a. Sprint 3 feedback
b. Final map product and publication

PGE noted the following:

- The question to consider today is: *Is this product worth publishing for a broader audience?* The goal is for the product to be intuitive. We don't want it to generate a lot of confusion and questions, and we want it to add value.
- PGE appreciates stakeholder input to date.
- PGE needs to focus the purpose of the map and be clear about what users can conclusively do with the data.
    - This is a DG readiness indicator by feeder. PGE needs to internally define DG-readiness, and coordinate with other utilities.
- The current map shows DG-constrained feeders. The new map would also show DG-ready feeders that already have protections needed.
- It would also still show DML, but we've learned that DML is not really important on a DG-ready feeder, since protections are in place for overgeneration.
- PGE is proposing not to include other layers that have been reviewed (such as future gen to load ratio) as the color coding of feeders is not helpful. It also doesn't apply in all cases, and it's difficult to explain when it doesn't apply.
- The target is to have a final map in September with plans to retain many of the layers developed and reviewed by the Technical Work Group.

Discussion included:

- Some of the kinds of protections installed to be DG-ready include: equipment that allows the transformer or the line to be disconnected from system; hot line blocking to prevent feeder breaker from reclosing while the line is still energized by generation – even though it's disconnected (this prevents reclosing until after feeder fully deenergized), transformers need 3V0 protection to, in case of a transmission fault, disconnect enough DER on system using transfer trip.
- WECC is working to identify areas with high or low risk for environmental and other factors, and the resulting map is designed to encourage customer contact with appropriate entities who manage impacts. Perhaps that that approach may be considered for this map?
- While the maps are not exclusively for solar, over 95% of interconnection requests are from solar projects.
- If the map does not allow connections to be drawn between the limited generation feeder polygons and opportunities for distributed storage, then there should be an explanation for why a user shouldn't use the map for siting storage.

Analytical Tools Used for DSP and Transportation Electrification Planning

Staff asked PGE to make a brief presentation about analytical tools used for DSP and Transportation Electrification planning. The intent is to *begin* a discussion about how these tools are used, and their relationship to one another, with the goal of increasing parties' overall understanding of these complex topics. PGE will go over the following elements:

a. Adoption modeling i.e. Brattle econometric modeling of electric vehicles
    i. Relationship to other tools
b. Load shape analysis i.e. NREL EVI-Pro Lite detail for electric vehicles
    ii. Relationship to other tools
c. Hosting capacity analysis
    iii. Tools used for HCA
    iv. Evolution of HCA
d. Relationship between the forecast tool and the power flow analysis tool

In the interest of time, Staff narrowed the question to: *How does HCA relate to Power Flow Analysis?* Slides are included below.

Discussion included:

- Maybe an easy way to think about the relationship between load flow (aka power flow) analysis and HCA is this: HCA represents a large set of independent load flow and protection analyses. Something like HCA = {LF1, LF2,..., LFn, Prot1, Prot2,..., Protn}. Each element represents some specific scenario/question of the system.
- Current practices are capacity-based; in the future practices will be more based around real time functionality.

- PGE analysis utilizes Oregon DEQ data (which includes ODOT registration data) but the data sharing agreement is very sensitive with limits on how PGE can use data, even internally. Each accessing of the data requires payment.
- PGE is running a pilot with FleetCarma which has around 100 drivers enrolled. The goal of the pilot is to provide a view of load charging profile.

Parking-lot for outstanding issues and questions

#1 – Where and how data will be stored is an important question to discuss early so there is a way to manage, keep safe, and access data as it comes in (from 5/7/21 Data Transparency Workshop)
#2 – Volunteers to work on establishing common definitions for distribution system planning discussions (from 5/7/21 Data Transparency Workshop)
#3 – Volunteers to work on further completing Figure 2 for priority data types (from 5/7/21 Data Transparency Workshop)
#4 – What are preferred sources of public data that include demographics and other details that adequately characterize our communities? (from 6/30/21 Technical Work Group meeting)
#5 – Working subgroup to focus on demographic and socioeconomic data, useful energy planning metrics, and quantifying measures and data sources for equity (from 6/30/21 Technical Work Group meeting)
#6 – Working subgroup to focus on practices for handling public accessibility of data (from 6/30/21 Technical Work Group meeting)

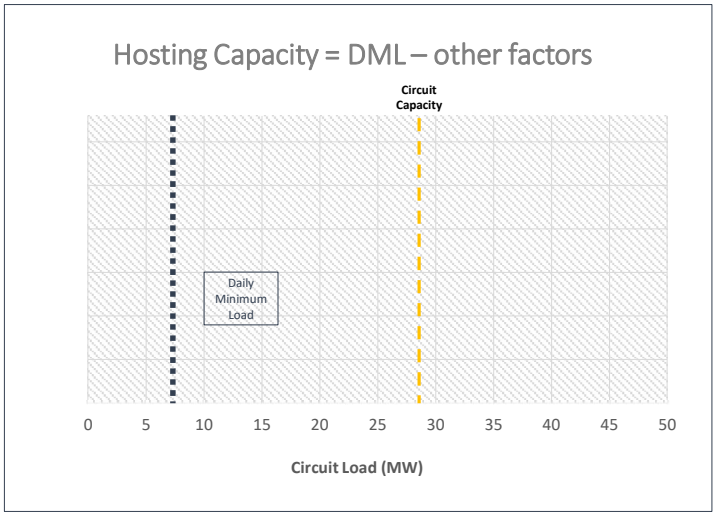
Exploring the Business and Use Cases for a Dynamic Hosting Capacity Analysis

6/30/2021

Today we explore the Business and Use Cases for a Dynamic Hosting Capacity Analysis (HCA).

Currently, Hosting Capacity Analysis utilizes granular circuit data from SCADA and other inputs to report out key insights for a given circuit. These insights can be accessed, by all stakeholders, from a graphical user interface tool – known as a GUI. Well understood, HCAs are created to assist developers and other stakeholders quickly understand key considerations for each circuit within a given service territory. The primary goal of the current HCA methodology is communicating how much Net Generation is available to be installed on a circuit and the prime output of the analysis is the circuit's Daily Minimum Load (DML) value.

Current Hosting Capacity Analysis



6/30/2021

The DML assists stakeholders in siting projects and minimizes unnecessary planning and analysis cost for both stakeholders and utility organizations. The DML represents when the circuit would experience reverse flow conditions. ***Advance*** The equation of Hosting Capacity is DML minus other physical limitations like voltage and thermal capacities; however, for conceptual purposes we will assume Hosting Capacity equals DML. ***Advance*** In this example of a circuit, you can see the circuit's capacity is 29 MWs ***Advance*** and the DML equals 7.5 MWs, so in return the Hosting Capacity would also equal 7.5 MWs.

Using current HCA methods, the DML is found by surveying the circuits historical load data to determine the singular minimum load event, between the hours of 9a-4p, over a given timeframe, typically a year.

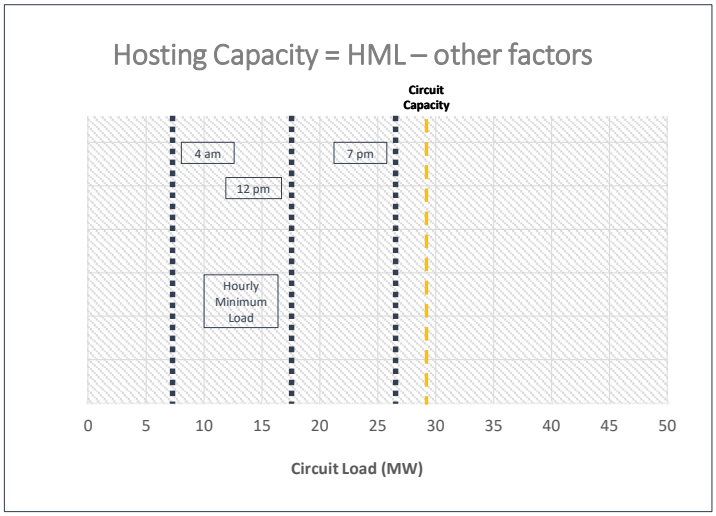
While highly-valuable to some distributed generation (DG) projects, current methods presents fundamental limitations that lead to low adoption rates of other technologies that would assist Grid Operators and Stakeholders achieve Organizational and Environmental goals such as 100% clean energy and electrification.

The principal limitations are: 1) the HCA output provides minimal temporal context of a circuit, and 2) the refresh rate is too infrequent; for instance, this update can be bi-annually.

These limitations result in the HCA providing a static snapshot of the circuit, which often leads to outdated information causing additional latency in project development cycles, increased costs to stakeholders, and establishes artificial barriers in meeting both Organizational and Environmental goals. One key barrier of this current method is the DML presents an opaque view of the circuit's intra-day, locational dependent, conditions which limits stakeholder's circuit awareness along the entire circuit and impedes projects that are looking to deploy additional technologies such as: EV charging stations and stationary storage, to name a few. Technologies that are just as vital for supporting grid reliability as generation assets.

To address this concern Grid Operators should move to a dynamic HCA.

Dynamic Hosting Capacity Analysis



6/30/2021

Conversely, a dynamic HCA provides complementary insights into a circuit, as well as establishes the foundational IT system Grid Operators can use to incorporate additional business and use-cases, outside the purview of the HCA. In return, only further accelerates the time to achieve Organizational and Environmental goals.

Advance Here, illustrated on the same circuit, we highlight this effect by leveraging the same dataset but, simply refreshing the HCA daily ***Advance*** by doing so, the HCA would provide stakeholders the circuit's entire daily condition and the output is the Hourly Minimum Load (HML).

In order to leverage this dynamic feature, Grid Operators' have minimal barriers. They already posses the low-latency data from current IT systems such as; SCADA, AMI, or Meter Data Management (MDM) so, what is needed is incorporating a software platform that can process, re-format and create a relational database of this data which would then feed as the input dataset to the Hosting Capacity Analysis.

And other than replacing the DML with the HML value in the GUI not much else is needed to complete this update. A final point on integration barriers, since this upgrade involves only software integration to existing IT systems this ensures this

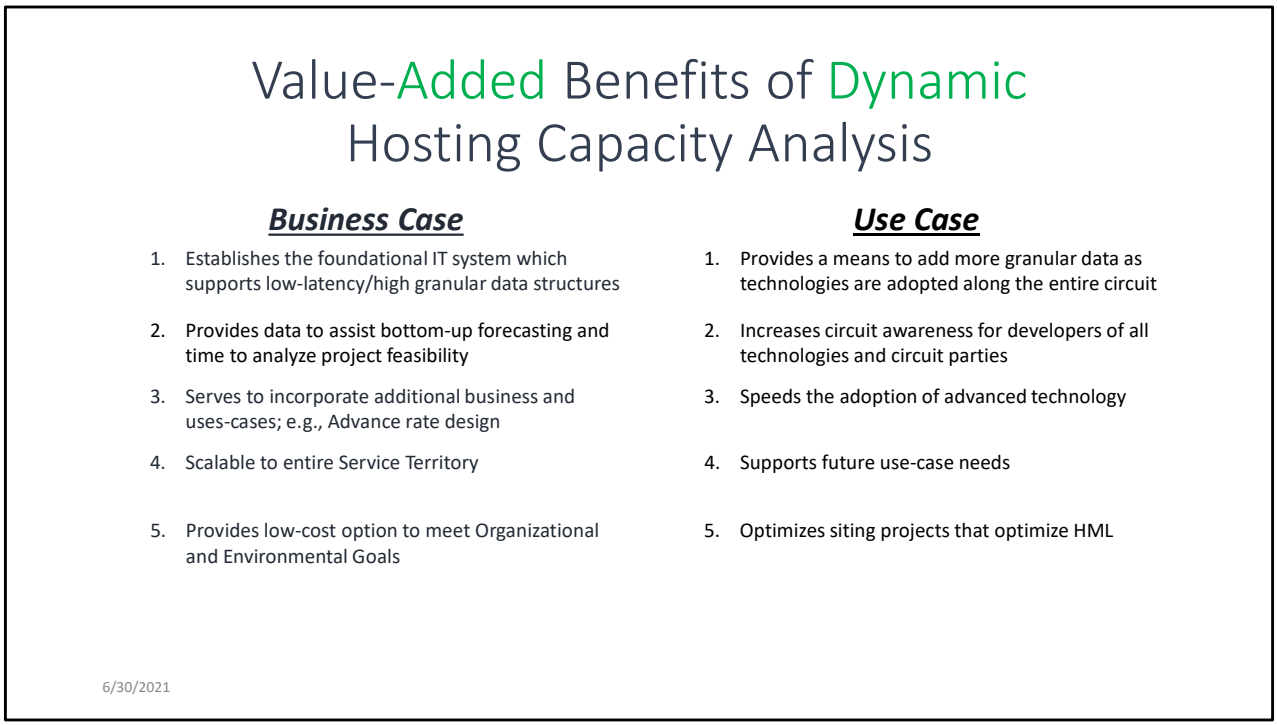
highly valuable business-case is a least cost option.

Once achieving this dynamic capability, as noted, Grid operators and Stakeholders now have the circuit awareness to meet additional business and use cases along the entire circuit.

This dynamic HCA would still assist the Solar DG siting use-case, so no loss there, but now has the means to provide valuable time-dependent information which supports stakeholders looking to deploy projects that utilize technologies that are better suited to meet this intra-day conditions. Additionally, having this data structure and platform serves additional Organizational business needs such as: short-term bottom-up forecasting and assists when analyzing projects that utilize these other technologies. Conversely, developers and circuit parties now would have the proper insight to increase their adoption of technologies while maximizing investment requirements.

An important note to highlight is in order to achieve both Organizational and Environmental goals, in today's electrical industry, Grid Operators are already planning, exploring or in some cases procuring these real-time platforms. However, the key to deploying this technology is how Grid Operators scope the requirements for a platform. Grid Operators need to assemble a cross-functional team to ensure the correct platform is procured to avoid limitations when scaling. A properly acquired platform should easily scale and be able to incorporate the additional datasets these newer and ever evolving technologies produce; which in return provides more locational dependent awareness to the circuit and HCA.

More on the benefit of this increased data granularity in the following slide but, I would like to pause for a moment and take questions on any initial thoughts…



To recap the Value-Added Benefits a Dynamic Hosting Capacity Analysis provides we start with the Business Case:

1. Establishes the foundational IT system which supports low-latency/high granular data structures
2. Provides data to assist bottom-up forecasting and time to analyze project feasibility
3. Serves to incorporate additional business and uses-cases; e.g., Advance rate design
4. Provides data to assist and increase time to analyze projects
5. Ensures a low-cost option to meet Organizational and Environmental goals

Moving on to the Use Cases:

1. Provides a means to add more granular data as technologies are adopted along the entire circuit
2. Increases circuit awareness for developers of all technologies and circuit parties
3. Speeds the adoption of advanced technology
4. Supports future use-case needs
5. Optimizes siting projects that optimize HML

Thank you for your attention!

Stephen MacDonald

Managing Director of Business Development

E: Stephen.MacDonald@temix.com

P: 360.773.2781

Distribution Planning: EV Analysis and HCA

JUNE 30, 2021

Background and context

Staff shared with PGE a Utility Dive article on HCA,[1] which summarizes the report by the Interstate Renewable Energy Council (IREC).[2]

Three use cases for HCA highlighted in the paper:

1. Interconnection
2. Distribution System Planning
3. Locational Net Benefits Analysis

Utility Dive article states that,

> *"the [IREC] paper's first recommendation to regulators is that they work with a full range of stakeholders, including utilities and customers, to identify what HCA will be used for…A meaningful stakeholder process can help regulators identify the HCA that will achieve state policy."*

1. Trabish, H.K. (2018). "Why are the newest distribution system buzzwords 'hosting capacity analysis'?", *Utility Dive*, available at: https://www.utilitydive.com/news/why-are-the-newest-distribution-system-buzzwords-hosting-capacity-analysis/514219/
2. IREC (2017) "Optimizing the Grid: A Regulator's Guide to Hosting Capacity Analyses for Distributed Energy Resources". Available for download at: https://irecusa.org/2017/12/tools-to-build-the-modern-grid/

DSP Part 1 HCA: Clarification

- For the purpose of hosting capacity analysis as considered under the current DSP Guidelines, "DER" is being used interchangeably with distributed generation "DG"
- PGE's HCA plan and approach for Part 1 is focused on DG and the Interconnection Use Case
- Full HCA would include an evaluation of both the ability to integrate new loads (EVs) and new generation (solar PV)

EPRI work on DERs and HCA

IREC Paper cites previous EPRI work[3] on considerations for integrating DERs into existing planning tools. According to EPRI, there are three main factors affecting the amount of DER that can be hosted on a given feeder:

1. **DER Location** (centralized and distributed DER; phasing of feeder at the location)
2. **Feeder design and operation** (feeder topology, load location, voltage control schemes, etc.)
3. **DER Technology** (availability or shape of DER output/load, controllability)

EPRI also notes that selected HCA methodology should be scalable, repeatable, and conducted with a transparent and proven method.

3. EPRI (2016). "Integration of Hosting Capacity Analysis into Distribution Planning Tools". Available for download at: https://www.epri.com/research/products/000000003002005793

Purpose of this Presentation

There is a lot of great information out there. Today, we just want to:

- Discuss EV forecasting and how that flows into DSP analysis and HCA
- Share some details on PGE's DSP tools and processes
- Open floor to discussion – level set where more info would be helpful

DER Forecasting and DSP, with focus on EVs

Forecasting EV load growth

- PGE regularly conducts DER forecasting for purposes of informing IRP, and now will add locational forecasting of DERs to inform DSP Part II.
- EV load growth added to corporate load forecast
  - EVs not well represented in baseline period (i.e., extrapolation of current trends does not account for large scale transportation electrification)
- Outputs for IRP include energy (MWa), capacity (MW), and resource shape (8760 load profile)
- Includes both un-managed load impacts and demand response / smart charging potential

Elements of PGE's AdopDER Model

Within the AdopDER model, we are leveraging multiple tools to characterize the amount and timing of EV load that is expected under a range of plausible future scenarios:

- Brattle conducted multivariate regression model based on historical LDV sales at national level, calibrated to specific variables present in Oregon (e.g., ZEV policy).
- Cadeo then adjusted the results from regression to fit PGE customer base
  - Utilized DMV registration data for vehicle weight class, make/model, and fuel type
  - Accounted for site-level characteristics for EV charging feasibility (existing panel ampacity and on-site parking)
- Used NREL's EVI-Pro Lite tool to determine total charging energy for all vehicles across segments, supplemented with additional PGE data on specific vehicle use cases

Adding locational factors

In our 2019 TE Plan,[4] PGE provided a summary of a locational EV study led by Guidehouse.

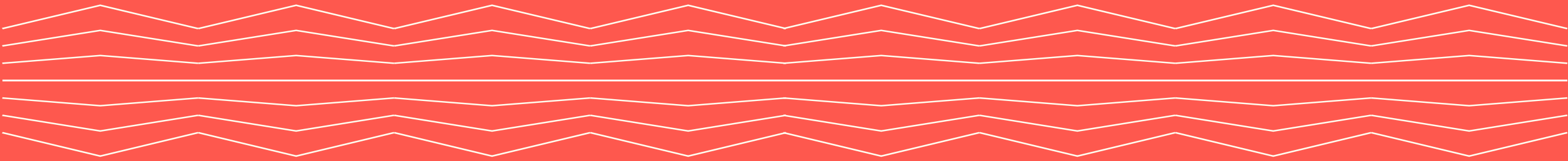
- Provided MWh and hourly MW impacts by feeder
- Limitations to the study:
  - Covered LDV only
  - Only went out to 2027
  - Did not include impacts of managed charging

We just kicked off Phase II of our work with Cadeo to build the locational DER forecast for Part II of the DSP.

- Will include LDV, MDV, HDV out to 2050
- Will include EV demand response and TOU impacts

4. PGE 2019 TE Plan. Available at: https://edocs.puc.state.or.us/efdocs/HAA/haa165721.pdf

PGE DSP Tools and Practices



PGE's Current Planning Drivers and Requirements

Load Growth

- Top-Down Approach Via Corporate Forecasts
- EVs treated simply as any other load
- 10-year View

Reliability

- Use Basic Metrics (SAIDI, SAIFI, CAIDI, MAIFI)

Resiliency

- Transmission and Distribution Resiliency Initiative (T&DRI)

Safety

Tools Used in the Distribution Planning Process

- CYME - Powerflow Modeling Software
- GIS / Spatial Information
- AMI Meter Information
  - Provides Usage Data
- Asset Models and Databases
- PI Data Historian (aka SCADA data)
- Reliability Data and Reports

Inputs to Power flow modeling

CYME Models

Circuit Connectivity

- Locational data of equipment

Equipment and Settings

- Sources
- Voltage regulators
- Transformers
- Capacitor banks
- Circuit Breakers (CB)
- Remote Automatic Reclosers (RAR)
- Switches
- Cables and conductors
- Generation

Circuit Profiles

- Historical Circuit Profiles
  - Load
  - Voltage

Spot Load

- AMI (Advanced Metering Infrastructure)
  - Aggregated customer data at the distribution transformer level
- Generation Profiles (Project Level)

Example Power flow Studies

Steady State Voltage Studies

- Identify the maximum amount of generation/load that can be installed without violating voltage thresholds

Voltage Fluctuation Studies

- Identify the maximum amount of generation/load that can be installed without causing a voltage variation of 3% or more

Thermal Limit Studies

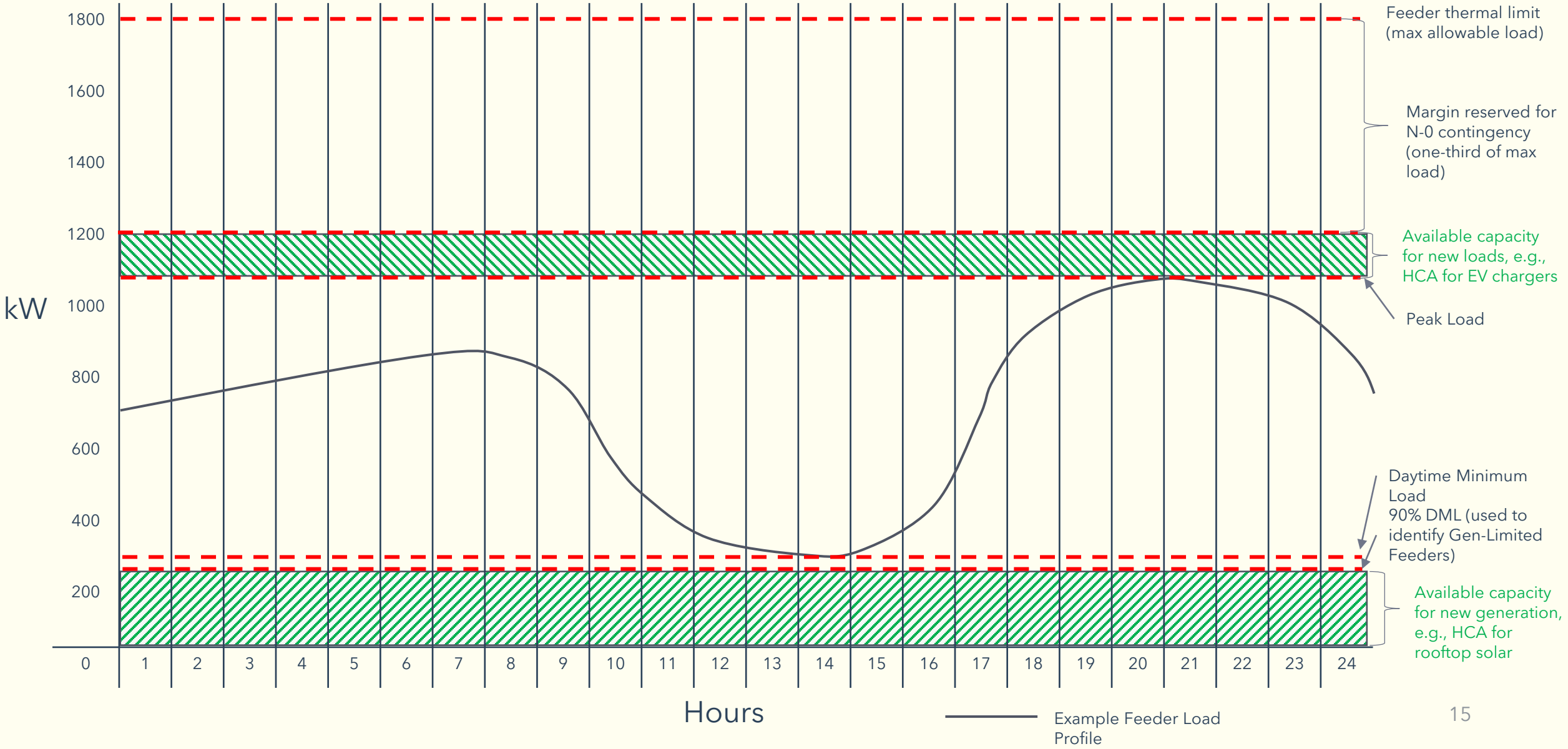
- Identify the maximum amount of generation/load that can be installed without causing thermal overloads

Operational Flexibility Study

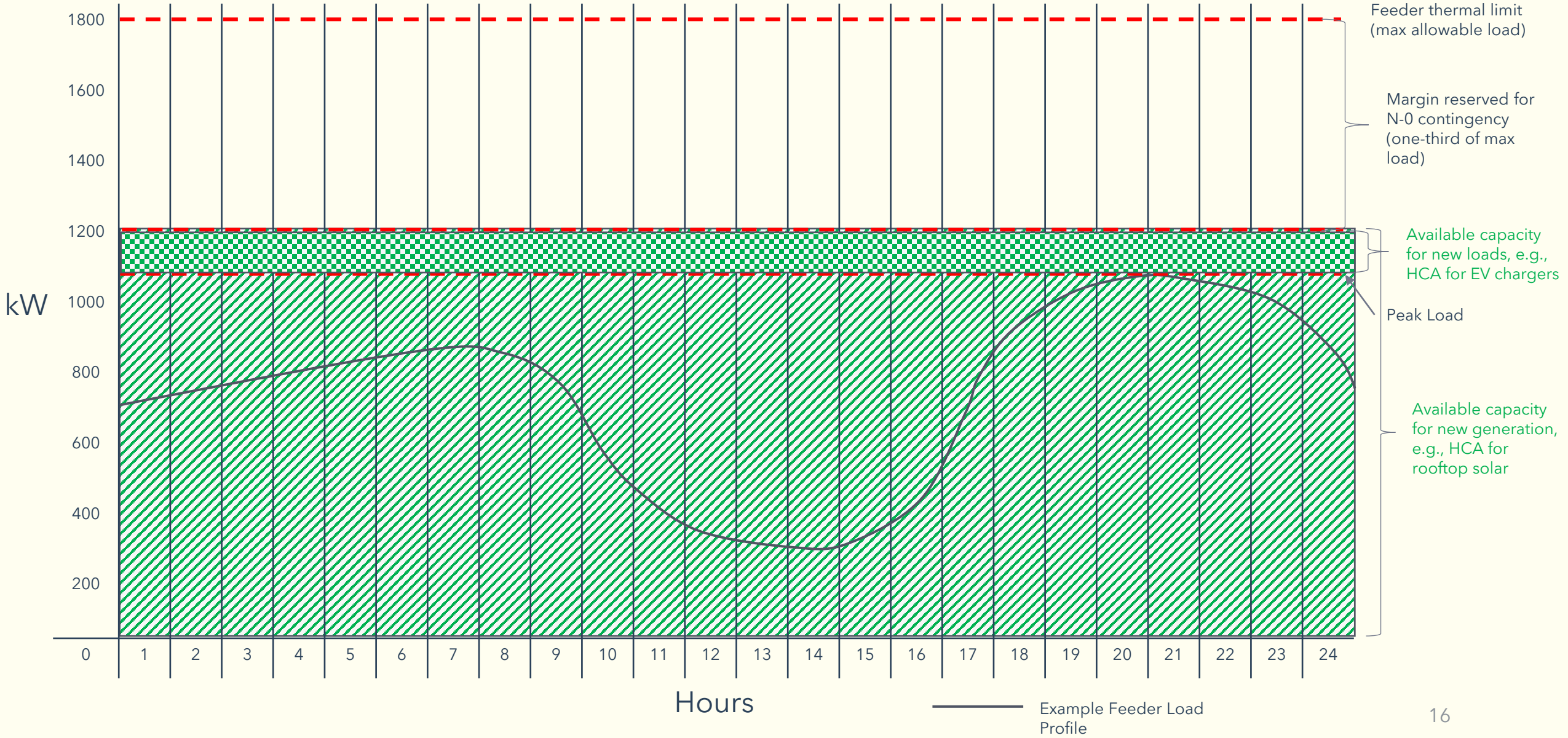
- Identify the maximum amount of generation that can be installed without causing reverse power flow

Generation Studies	Load Studies
Steady State Voltage	Steady State Voltage
Voltage Fluctuation	Voltage Fluctuation
Thermal Limit	Thermal Limit
Operational Flexibility	

HCA for All DERs: Constrained Feeder



HCA for All DER: Unconstrained Feeder



Discussion

Let's meet the future together.