Waiting Room

One moment please, while we wait for people to join

Song by artists:
Paco De Lucia, Al Di Meola and John McLaughlin - Mediterranian Sun Dance Live

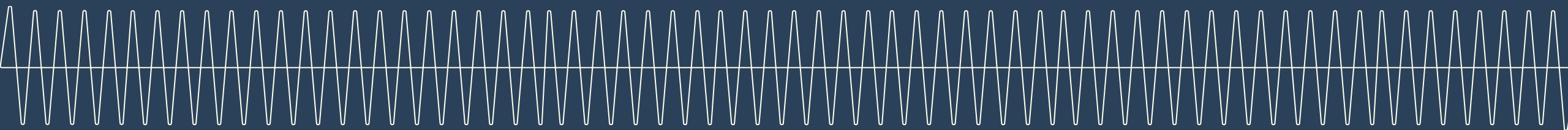
https://www.youtube.com/watch?v=ADwfyxpriAM

Please use the QR code to check-in:
Name and Organization

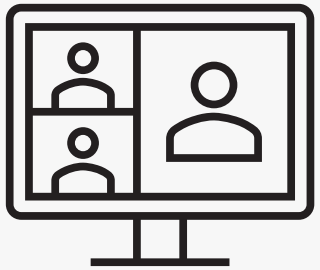
Distribution System Planning (DSP)

Angela Long, Manager, Distribution Resource Planning (DRP)

May 12, 2021 | Workshop 5



Meeting Logistics



- We are available at: DSP@pgn.com
- Teams Meeting
  - Please click the meeting link sent to your email or Click here to join the meeting
    - +1 971-277-2317 (dial this number into your phone for best results)
    - PW: 885 018 032#
  - Please use Microsoft Edge or Google Chrome with Teams as it will give you the best experience
  - During the presentation, all attendees will be muted; to unmute yourself via computer, click on the microphone that appears on the screen when you move your mouse
  - To unmute yourself over the phone, press *6
  - If you call in using your phone in addition to joining via the online link, please make sure to mute your computer audio
  - There is now a meeting chat feature rather than a Q&A feature. Pull this up on the menu bar when you move your mouse and look for the little message icon

Agenda

- Opening Remarks
- Baseline Data and System Assessment: Review Datasets
- Community Engagement Plan: Community Facilitator Scope of Work Update
- Non-Wire Alternatives (NWA): Overview
- BREAK
- Forecasting of Load Growth, DER Adoption, and EV Adoption: DER Potential & Flex Load Analysis – Phase 1
- Long Term Plan: Update
- Hosting Capacity Analysis: Technical Working Group (TWG) Update

Quick Updates!

- May is National Electrical Safety Month
  - Spring into safety by always calling 811 before you dig!
- We have a new website! Please visit us at www.portlandgeneral.com/dsp
- We have a new DSP Project Manager
  - Meet Shadia Duery
- We'd like to hear from you
  - Online Feedback Form
- Reminder about the future OPUC TWG Meetings
  - Wednesday, May 26, 2021 from 9:00 am – 12:00 pm Pacific
  - Wednesday, June 30, 2021 from 9:00 am – 12:00 pm Pacific
  - Wednesday, July 28, 2021 from 9:00 am – 12:00 pm Pacific
  - Wednesday, August 25, 2021 from 9:00 am – 12:00 pm Pacific

Proposed Partner Engagement Timeline

		2021									
		January	February	March	April	May	June	July	August	September	October
Distribution System Planning (DSP) plan - Part 1	Baseline data and system assessment	Data collection, organization, QA/QC, and visualization				Present to partners for feedback	Iterate as necessary	Final draft shared with partners		PGE review process	Filed on Oct 15th
	Hosting capacity	System evaluation map and hosting capacity option analysis					Present to partners for feedback	Iterate as necessary	Final draft shared with partners	PGE review process	Filed on Oct 15th
	Community engagement plan	Development of the Community Engagement Plan							Present to partners for feedback	PGE review process	Filed on Oct 15th
	Long term planning	Development of long-term plan						Present to partners for feedback	Final draft shared with partners	PGE review process	Filed on Oct 15th

Baseline Data & System Assessment:
Review Dataset Spreadsheet

Tony Grentz
Distributed Resource Planning Engineer
DSP Part 1





Baseline Workstream Timeline

January - April

- Collected data

May

- Present dataset spreadsheet at monthly partner meeting
- Spreadsheet will be available for download on DSP website
- Present baseline map requirement 4.1.f.iii
- Request volunteers to review map

Jun

- Show data visuals for datasets
- Incorporate partner feedback

Community Engagement Plan: Partnership Model Update

Jake Wise

Community Outreach Manager, DEI Office

DSP – Part 1

UM2005 Stated Policy Goals

- Empower all customers with authentic choices, including access to diverse providers.
- Create inclusive, nondiscriminatory, equitable access to opportunities across customer types, with particular attention to those that reduce energy burden.
- Engage customers in an approachable, fully-accessible manner.
- Provide access to detailed, real-time information on electricity use and costs to help customers manage use and costs and understand how to save.
- Create procedural inclusion for new stakeholders traditionally not represented.
- Promote collaboration between utilities and community-based organizations to broaden perspectives and representation in planning process and outcomes.

Integrated Community Approach

Objective: Apply equity lens to internal coordination and external engagement

Turn Eye Inward

Apply equity lens to various DSP requirement areas to ensure alignment with UM2005 stated policy goals

Partner with Community

Defer to community-based organizations (CBO) to lead development of energy curriculum and engagement model

CBO Partnerships

Technical Advisory

Education:

- Assess/ Translate
- Energy 101
- DSP 101

Best Practice:

- Recruit/ Convene
- Workshops/ Surveys
- Collect Feedback

Best Practice:

- Analyze
- Synthesize
- Recommend

CBO Partnerships

Milestone	Delivery Date	Adjusted Date
Energy/DSP 101 Discovery and Development (CEP) • Curriculum socialized w/ technical advisory group	30-Apr-21	7-May-21
Coordinate recruitment in southern region (PGE, ETO DAC) • Augmented reach to ensure Marion and Yamhill representation	30-Apr-21	
Recruit and Convene Workplan (Unite/CCC) • Description of planned community engagement • Registration form and Leadership Council recruitment	30-Apr-21	7-May-21
Draft Feedback Collection Tool (Unite/CCC) • Outline of community outreach and research approach	30-Apr-21	14-May-21
Educational workshops (CEP, Unite/CCC) • Foster procedural equity by providing context	**May 22/23**	
Best Practice workshops (Unite/CCC, CEP) • Foster procedural equity by ensuring representative engagement	**May 22/23**	

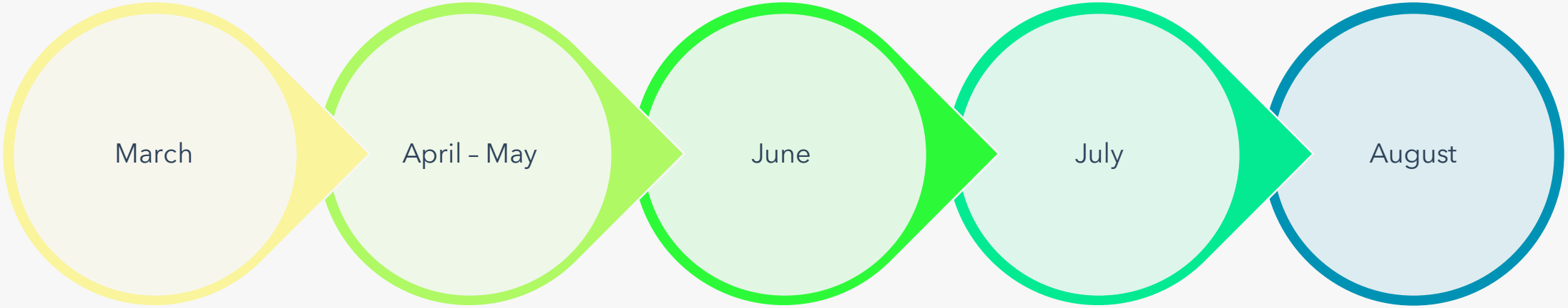
Community Engagement Plan

Describe actions the utility will implement in order to engage community members and CBOs during development of the pilot concept proposals required in Solutions Identification requirements.

Utility should implement these activities as part of the development of pilot proposals prior to filing **Part 2** of its DSP Plan:

- Proactively engage stakeholders regarding proposed pilots in impacted communities which may include in-person meetings located in the community; presentation of the project scope, timeline, rationale; and solicitation of public comment, particularly to understand community needs and opportunities.
- Document stakeholder comments and utility response, including comments that were heard but not implemented.
- Collaboratively develop and share datasets and metrics to guide community centered planning.
- Community-centered questions below should be addressed through the process above, and during development of pilot proposals described in **Part 2, Solutions Identification**.
  - ☐ Community interest in clean energy planning and projects
  - ☐ Community energy needs and desires
  - ☐ Community barriers to clean energy needs, desires, and opportunities
  - ☐ Energy burden within the community
  - ☐ Community demographics

Community Engagement Calendar



- Community Facilitator secured
- Energy/DSP Education curriculum development partnership formalized
- Recruit community members to attend PGE's community engagement workshops

- Educate community and define outreach and research plans

- Draft CE Plan
- Develop and present the CE Plan to community partners

- Compile feedback and review CE Plan

- Final **CE Plan**
- Present the finalized CE Plan at monthly DSP workshop

Updates since April Workshop:

- Education curriculum drafted and socialized with core technical advisory committee
- Feedback Collection Tool outline delivered, and workshop dates defined
- Flexible Learnings: Identified an opportunity to characterize engagement in both a COVID-virtual and physical environment in our development of best practices

Non-Wire Alternatives (NWA): Overview

Andy Eiden
Senior Strategy & Planning Analyst

DSP – Part 2

Background

UM2005 Guidelines for first utility DSP filing contain guidance on non-wire solutions (also known as non-wire alternatives or NWAs)

Guidance shows up in a couple of ways:

- Most prominently in section 6: Solution Identification
  - Utilities must file minimum of two non-wire solutions pilots with Part II of the initial filing (due date August 2022)
  - In its pilot concept proposals, a utility should discuss:
    - the grid need(s) addressed,
    - various alternative solutions considered, and
    - provide detailed accounting of the relative costs and benefits of the chosen and alternative solutions.
  - Emphasizes need for community involvement in developing solutions

Context

PGE is transitioning to human-centered planning. This is in line with UM2005 feedback from community groups and participants.

- We want to bring community partners along when we investigate non-wire solutions. This is called out in final DSP guidance, and we agree it is the right thing to do.
- As we ramp up Community Engagement efforts, we are working internally to vet different tools that help us assess advanced DER use cases for non-wire solutions.
- We expect the Community Engagement efforts (highlighted previously) will directly inform future non-wire solution proposal development, and that fresh community needs assessments will be conducted for each project.
- We intend to empower customers and communities in making their energy decisions.

These slides cover needed updates to utility modeling, ***they are a start to the conversation, not the end.***

Non-Wire Alternatives (NWA): Update on PGE Planning Practices

(Specifically, just the non-wire solutions stuff)

Planning to Meet Customer Needs

We are working on developing a streamlined process that employs a proactive approach to identifying and screening non-wire solutions across all investments

Current practice is to investigate options periodically to defer or costly upgrades

Here is an example of a non-wire solution we've engaged in with a customer:

Customer Need	Planning Challenge	Solution
Customer planned to convert 100 HDVs to electric Aimed to use 150 kW chargers with 1:1 vehicle to charger ratio	Resulting 15 MW of added load would require substation upgrade Very costly and would have impacted ability to achieve fleet conversion goals	PGE's technical outreach and engineering teams worked with customer to identify managed charging practices Resulted in 3:1 EV to charger ratio and reduced expected grid upgrade needs

Non-Wire Solution Studies

Contracted with software vendor to conduct detailed time-series power flow studies of substations facing growth-related constraints.

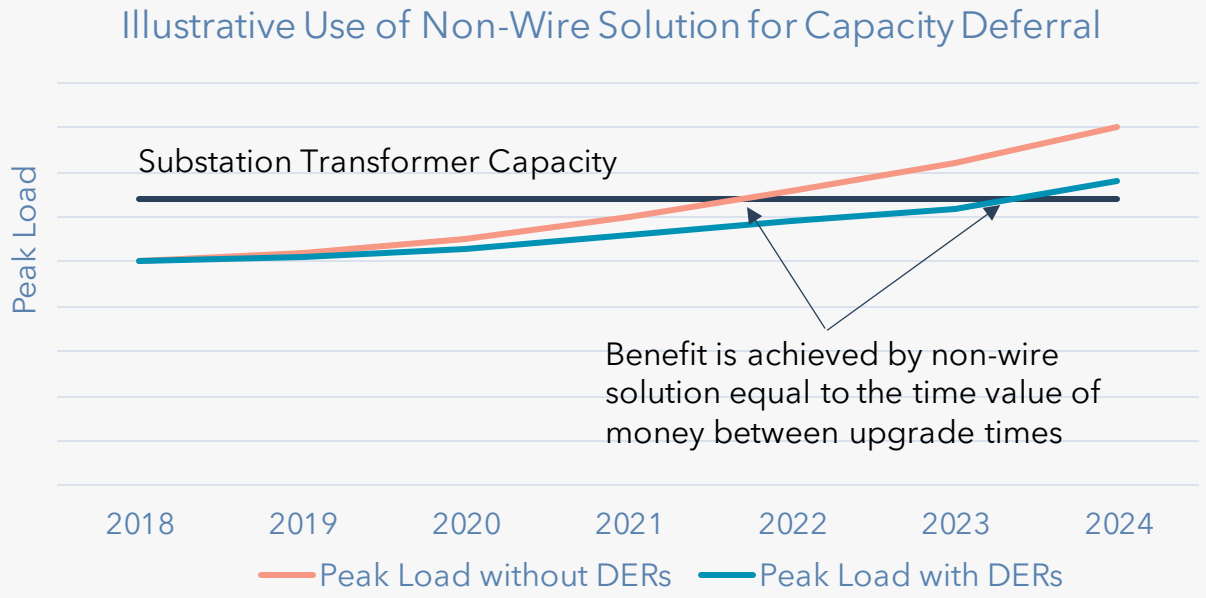
Aim is to evaluate tools and processes needed for non-wire project selection, including ability of DER adoption to influence the traditional system upgrades needed to maintain safety and reliability targets.

Results will inform short-term internal planning requirements for PGE and will also be helpful as we get further into community engagement planning and Part II solutions identification discussions.

Expected Value from Capacity Deferral

Most common use case for non-wire solution is deferring capital investment in traditional infrastructure (new substation, transmission line, etc.).

Due to the time value of money, investments deferred into the future through non-wire solutions can yield economic benefit to PGE customers.



Selecting Substations

Developed screening list based on internal discussions and brief literature review

Used a combination of engineering criteria and community criteria

First attempt at this – and meant to inform knowledge sharing, not be final precedent

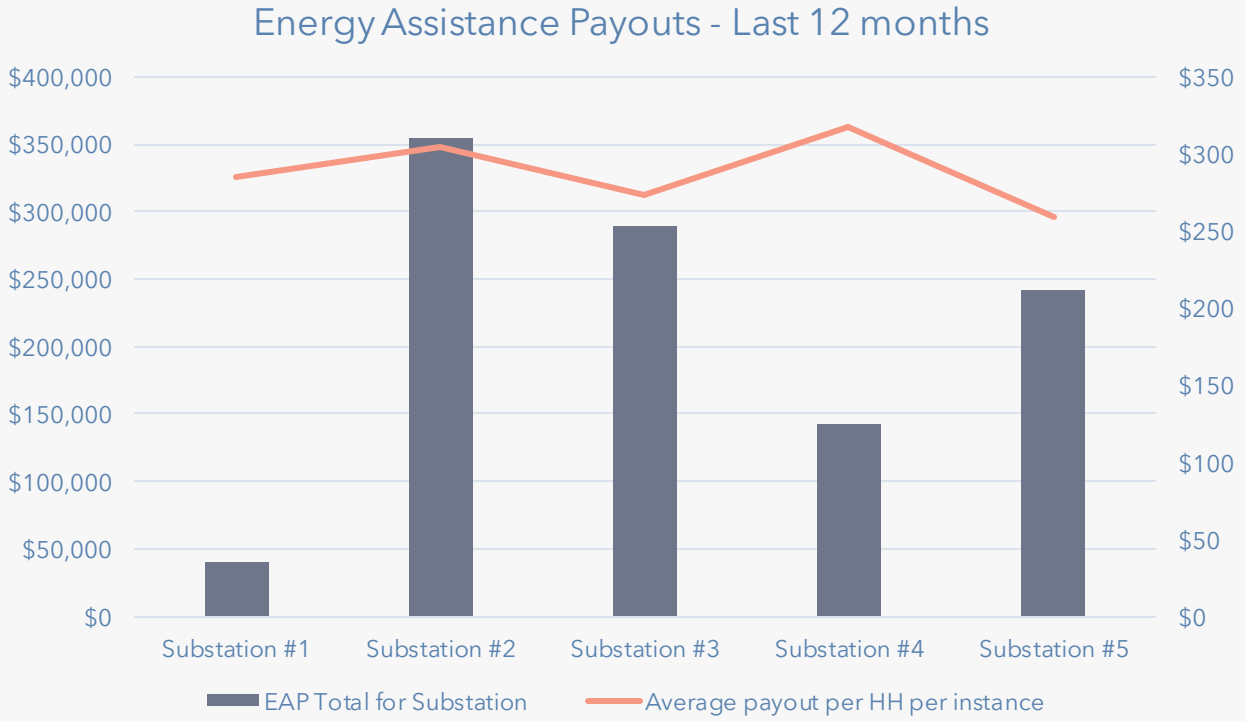
Initial lessons learned:

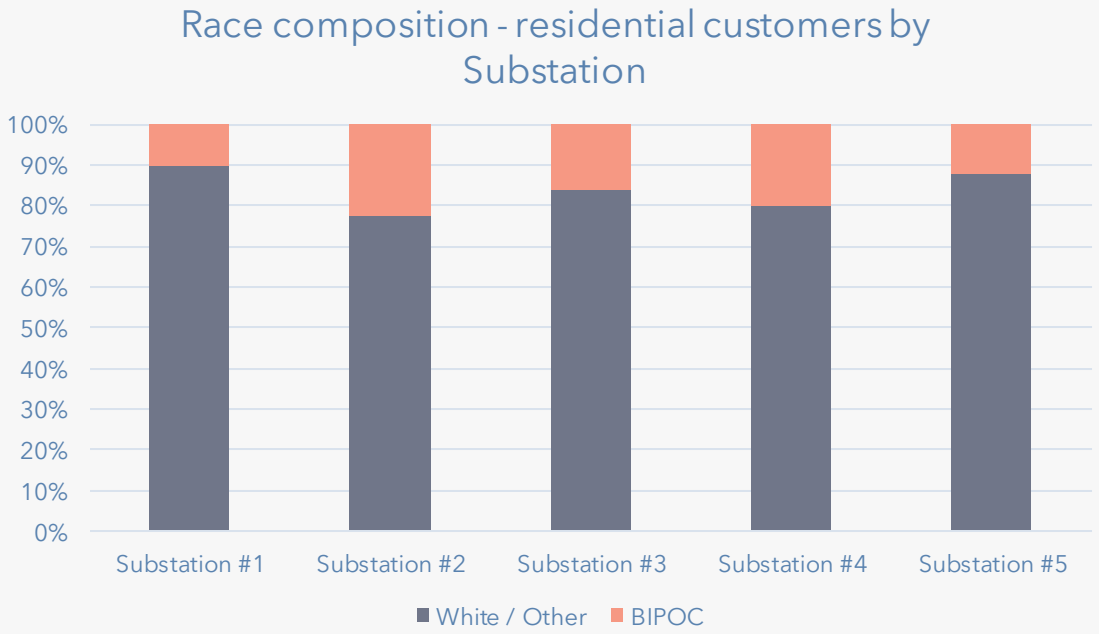
- Hard to pull together a comprehensive criteria! These are disparate datasets
- Scoring and weighting needs more conversation, particularly around the appropriate DEI and community metrics
- Importance is to investigate the various perspectives, rather than get it right first time

Example Screening Criteria For Substations

Metric	Category	Detailed Description	Weight
1	Capacity constraint	Distribution system equipment (transformers, feeders, etc.) are nearing their seasonal loading capacity thresholds (80% and 67% of nameplate, respectively). May be due to either existing load growth or anticipated lumped load additions (new subdivision, EV growth, etc.)	30%
2	Risk / cost mitigation	Equipment fails and needs to be replaced, or equipment is viewed as high risk and needs replacing	20%
3	Operational / performance issue	Difficulty in keeping feeder voltage balanced, or performance of feeders is limited by excess renewable generation back-feeding	20%
4	Data availability	Sufficient historical data exists to evaluate granular time needs of non-wire solution, and/or baseline periods do not have extended periods of abnormal system conditions to mask underlying load/generation drivers.	10%
5	Community metric (draft)	Community needs reflected through a combination of utility analysis and community engagement, including 1) Diversity of customer mix (% of residential, commercial, and industrial), 2) Proportion of residential customers that are low-income or renters, 3) % of customers that identify as BIPOC, 4) Calculated energy burden compared to rest of customer mix, 5) scoring on a vetted third-party social vulnerability index.	20%

Preliminary Demographic Data Used

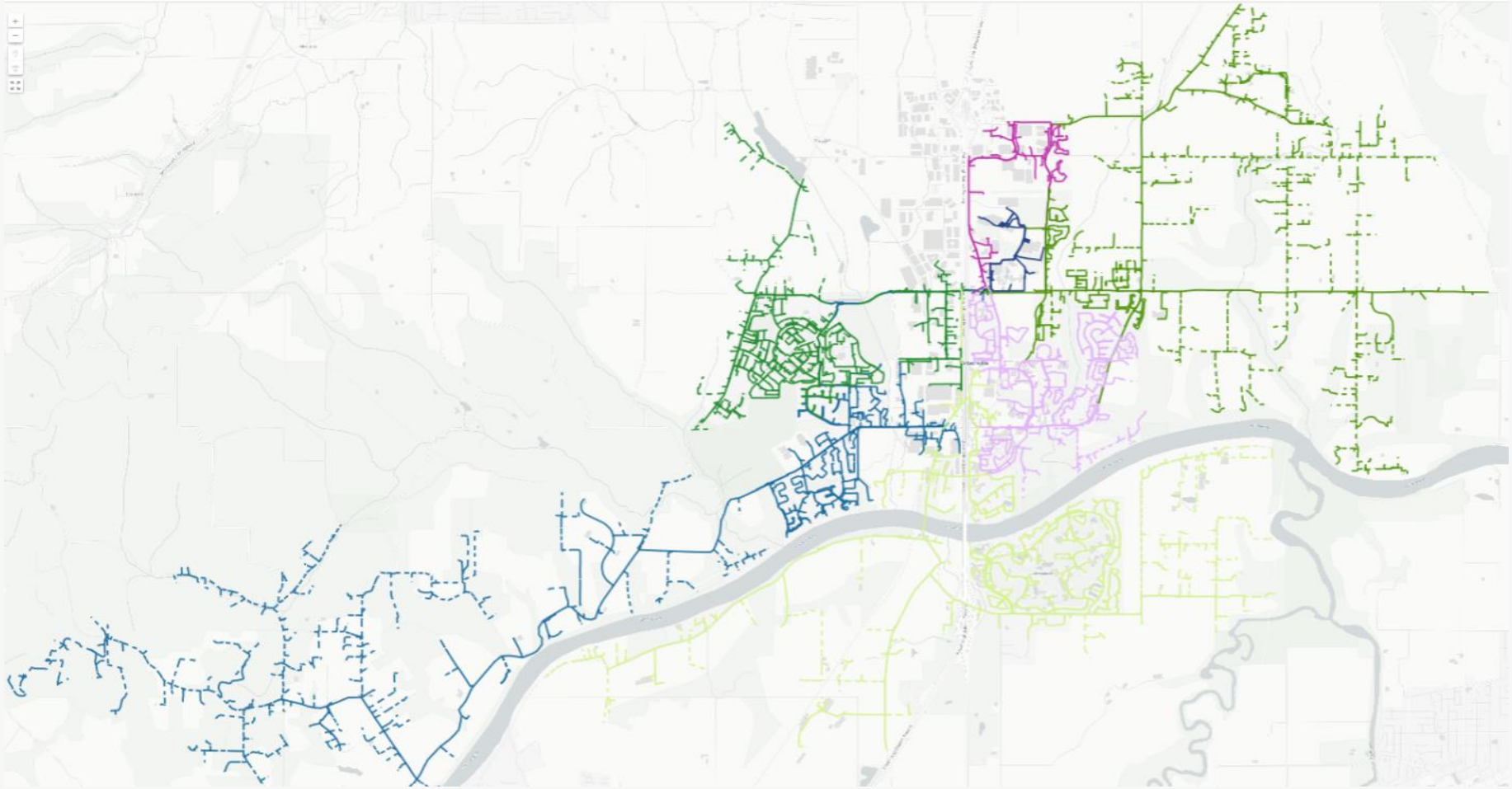




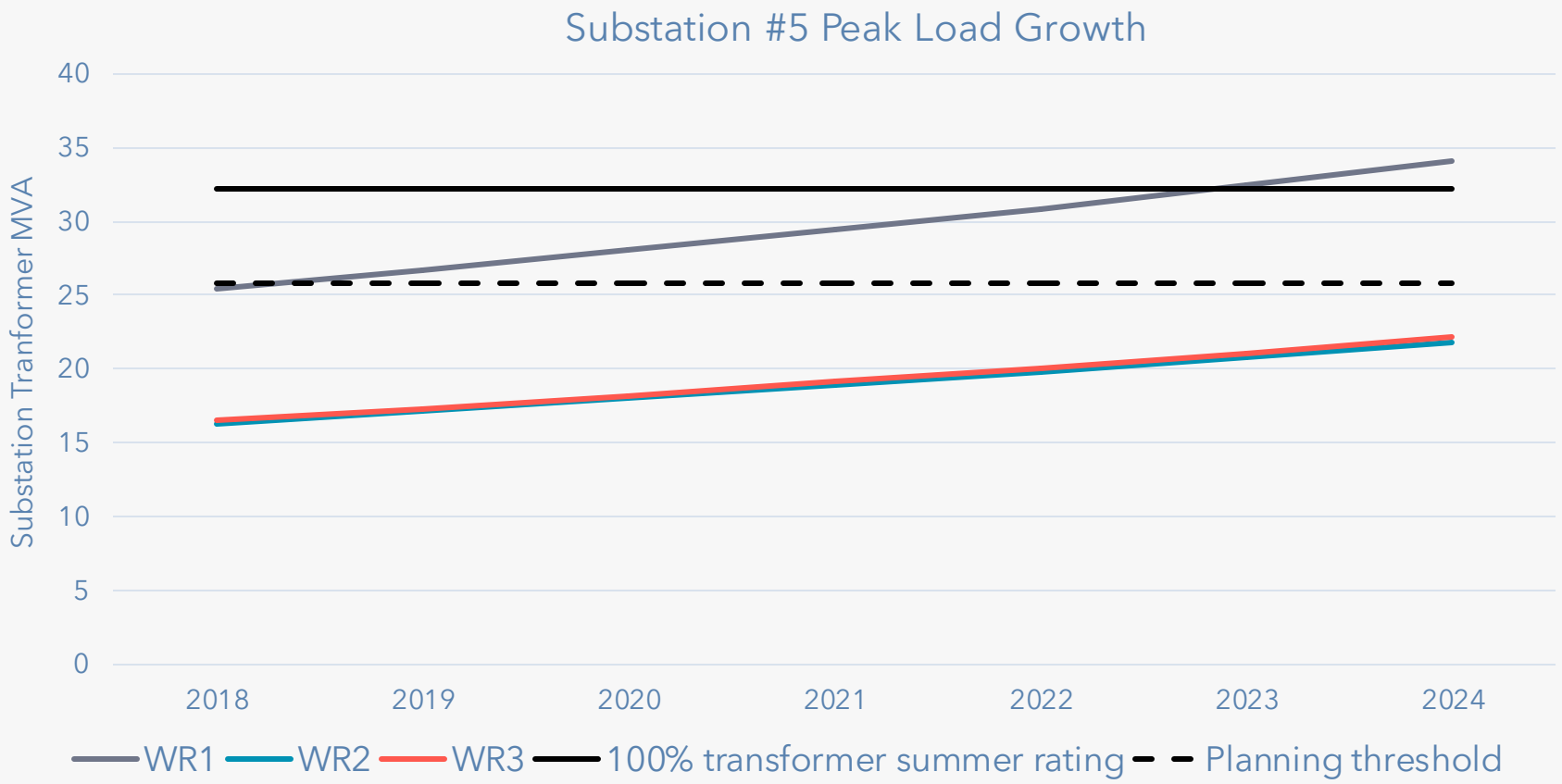
Non-Wire Solutions Analysis (Opus One IDP)

Data Gathering Steps	**Step 1** **Model Feeder in IDP**	Import feeder models to GridOS
	Step 2 **Collect Asset and Cost Data**	Collect asset age, reliability and cost of ownership data.
	Step 3 **Forecast Feeder Load**	Create 5 year load growth forecast for modeled feeder. Create scenarios to reflect different growth possibilities.
	Step 4 **Assess DER Availability**	Use 3D visualization to identify utility owned and customer owned DER potential for the modeled feeder.
IDP Modeling Steps	**Step 5** **Evaluate the System Need**	Simulate the system operation for the forecast duration, IDP will identify constraints
	Step 6 **Design Wires Solution**	Design wires solution(s) that clears constraints, technical feasibility and project cost is handled by IDP.
	Step 7 **Design non-wire Solution**	Design non-wire solution to clear constraints in a new network version, technical feasibility and project cost is handled by IDP.
Reporting Step	**Step 8** **Create Business Case**	IDP will visualize the technical and economic feasibility of each solution

Substation #5 Feeder Topology Mapped



Case Study Load Growth – Substation #5



Non-Wire Solutions Studied

Collected DER performance and cost data from PGE existing pilots and energy efficiency offerings

Developed scenarios to test the incremental changes to the solutions with each tier of DER addition

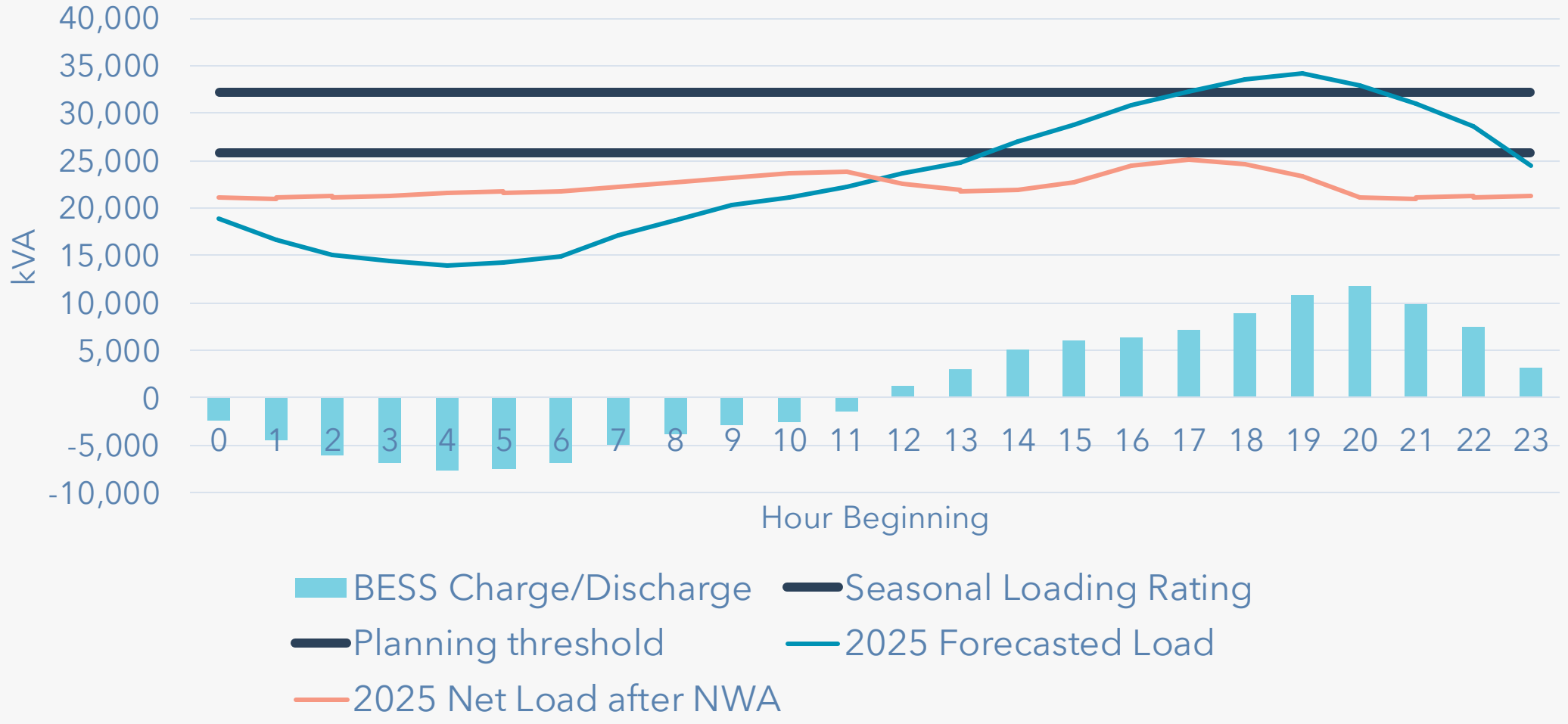
Overview of DERs included in study:

- Distribution-scale battery
- Aggregated customer storage devices
- Demand response / flexible load
- Energy efficiency

Scenarios modeled were:

- Distribution-scale battery only
- Distribution-scale battery + base case DER
- Distribution-scale battery + aggressive DER

Results – Time-Series Dispatch



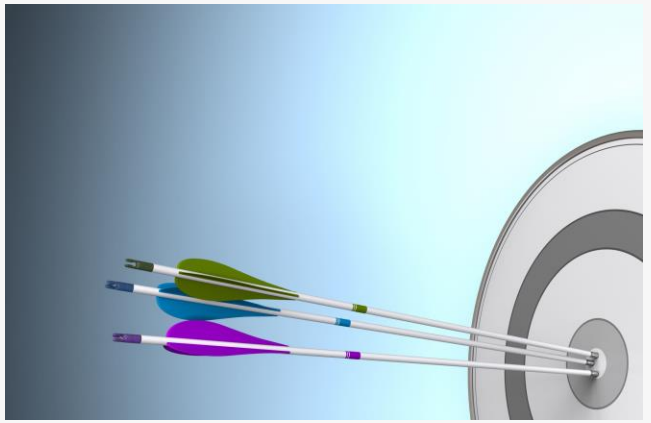
Results – Scenario Findings

Across the three scenarios, thermal and voltage violations at substation transformer resolved via:

- Scenario 1: Distribution-scale battery only
  - Two (2) 5 MW / 55 MWh batteries

- Scenario 2: Distribution-scale battery + base case DER
  - Two (2) 2 MW / 16 MWh batteries
  - 50 residential batteries
  - ~2,500 DR / Flex Load enrollments
  - ~1,231 EE projects

- Scenario 3: Distribution-scale battery + aggressive case DER
  - Eliminated need for distribution-connected battery
  - 250 residential batteries
  - ~7,800 DR / Flex Load enrollments
  - ~6,500 EE projects



NOTE: This analysis only focuses on the physics and not the economics of each scenario

Next Steps

- Continue refining screening criteria with community input
- Expand use case definition from growth-driven constraints to include reliability/resiliency
- Continue partner engagement to inform development of pilot proposals for Part II of DSP filing in August 2022
- Begin discussions about cost and risk analysis for non-wire solutions under varying deferral scenarios

Break

Distributed Resource Planning (DRP)

DER Forecast:

Final Draft Results

Andy Eiden
Senior Strategy & Planning Analyst

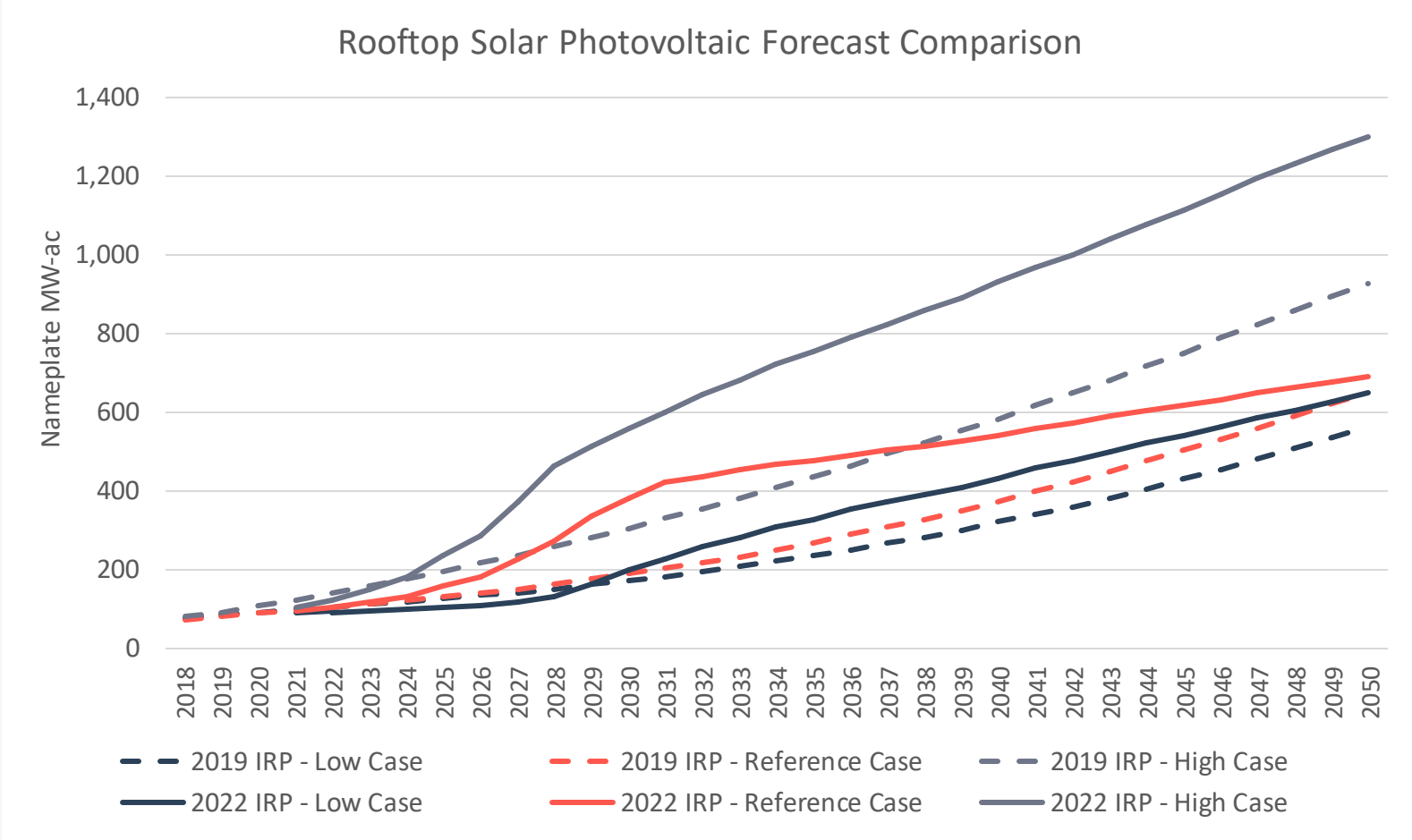
DSP – Part 2

Distributed Energy Resources in Forecast

- Rooftop Solar Photovoltaic (PV)
- Behind-the-meter storage
- Electric vehicles
- Flex Loads (aka Demand Response)
- Building electrification

Distributed Rooftop Solar

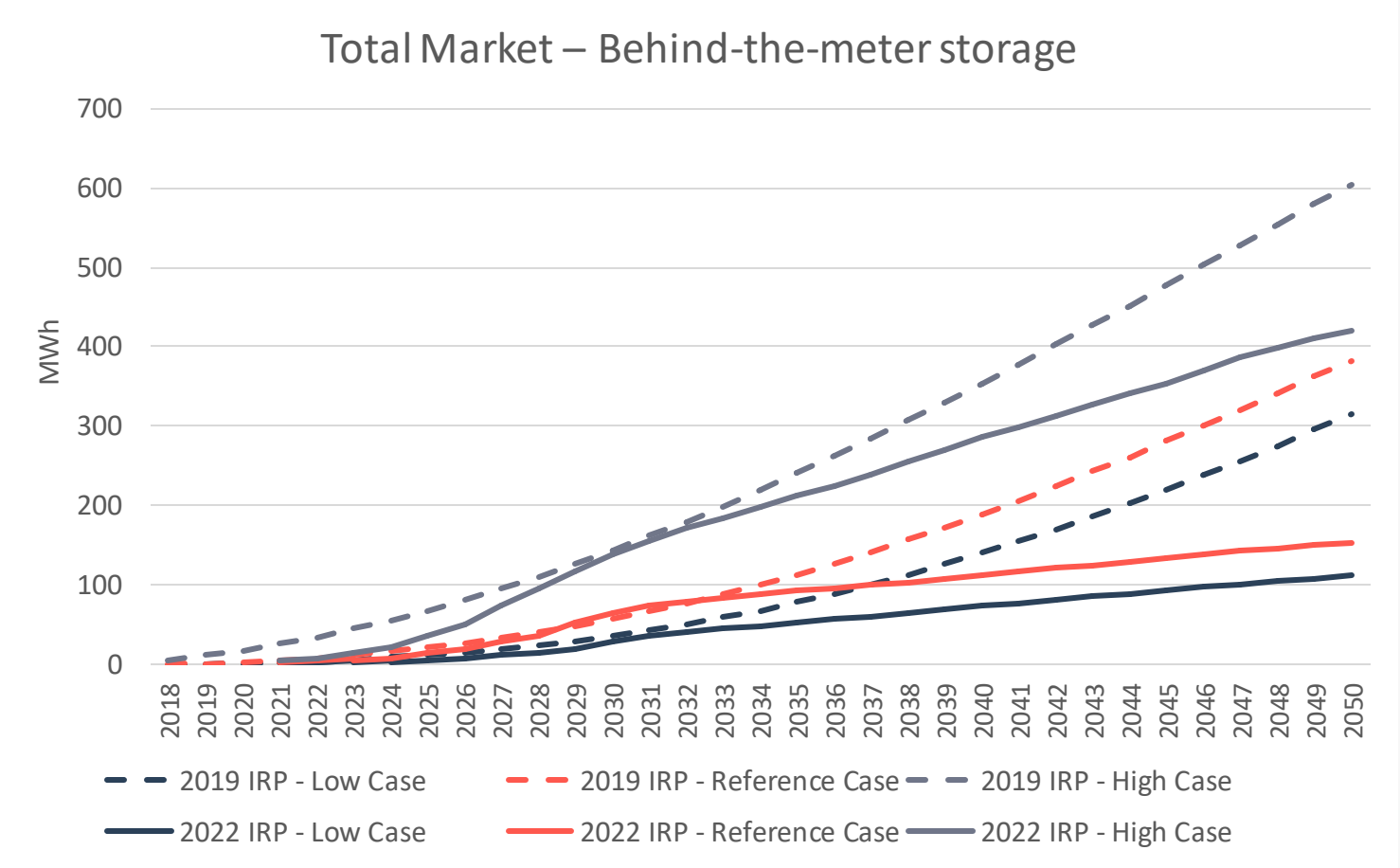
- **Solar reference case forecast similar long-term market share**
- **Increasing growth rate in mid-term (s-curve shape)**
- **Employed bottom-up forecast versus top-down in 2019 IRP**
- Used NREL's dGen tool for final market share and adoption rate
- Calibrated to existing PGE customer installations from interconnection data
- Modeled site-level suitability



*Draft – subject to change

Distributed Behind-the-meter storage

- **Results track well to 2030 from previous study, not as high in out years**
- **Uncertainty is high for storage (4-6x from low to high case over last two IRP forecasts)**
- Includes residential and C&I standalone storage plus microgrids for critical customers
- Multifamily is not included except for common-area
- dGen is felt to understate storage adoption, will undergo update e.g., to better capture FERC 2222 market impacts
- Cadeo modeled "attachment rate" for percent of new solar adoption paired with storage based on benchmark states



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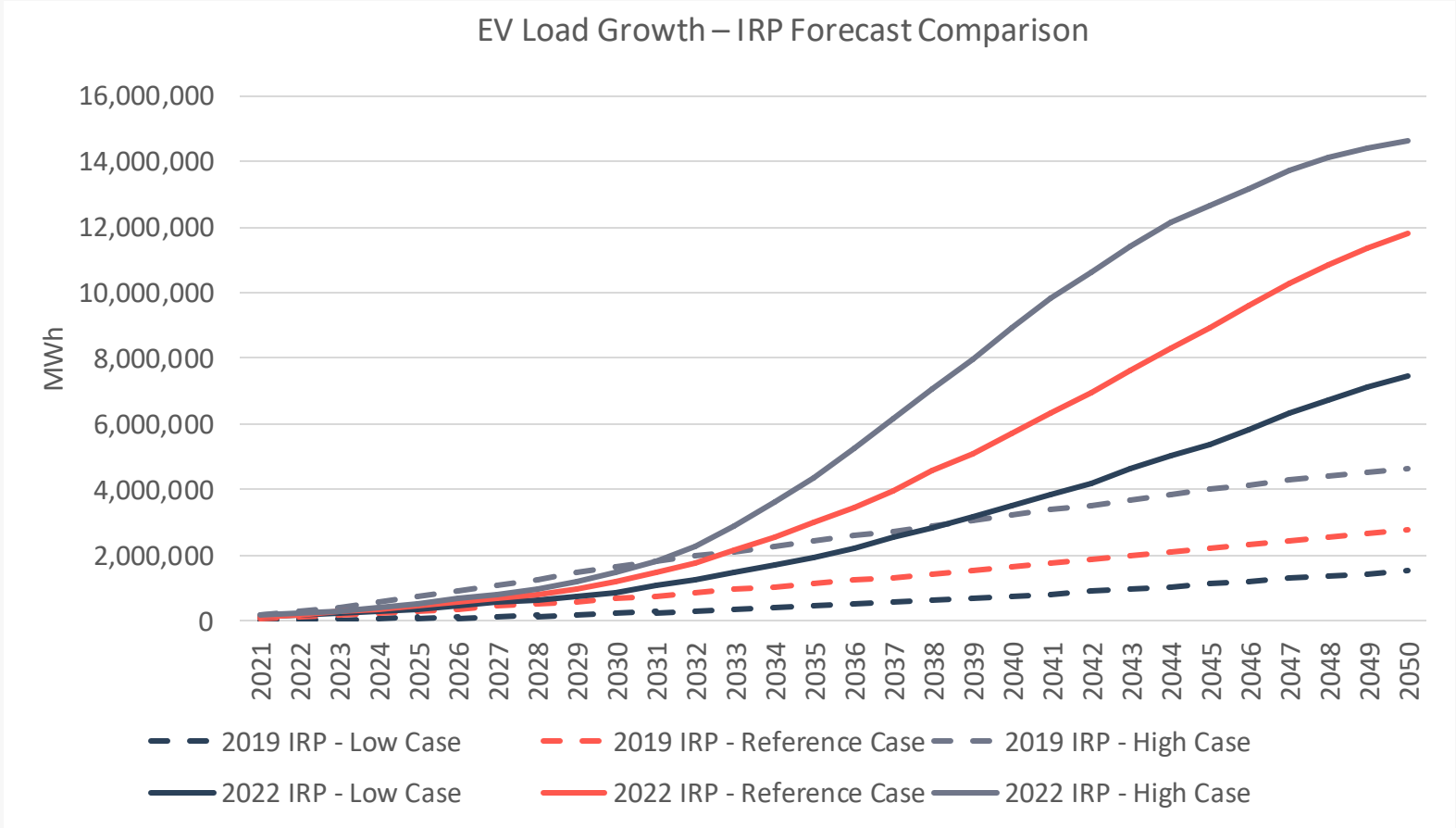
Electric Vehicles Load Forecast

- **Long-run forecast for EV load growth increased substantially**
- **2019 IRP analysis only included LDV market segment, 2022 IRP analysis will cover all segments, including medium and heavy duty**
- Modeled plug-in hybrids as well as short/long range battery electric vehicles
- Market landscape has changed significantly since previous study
    - California ICE vehicle ban in 2035
    - Manufacturer commitments
    - Federal policy change and infrastructure bill



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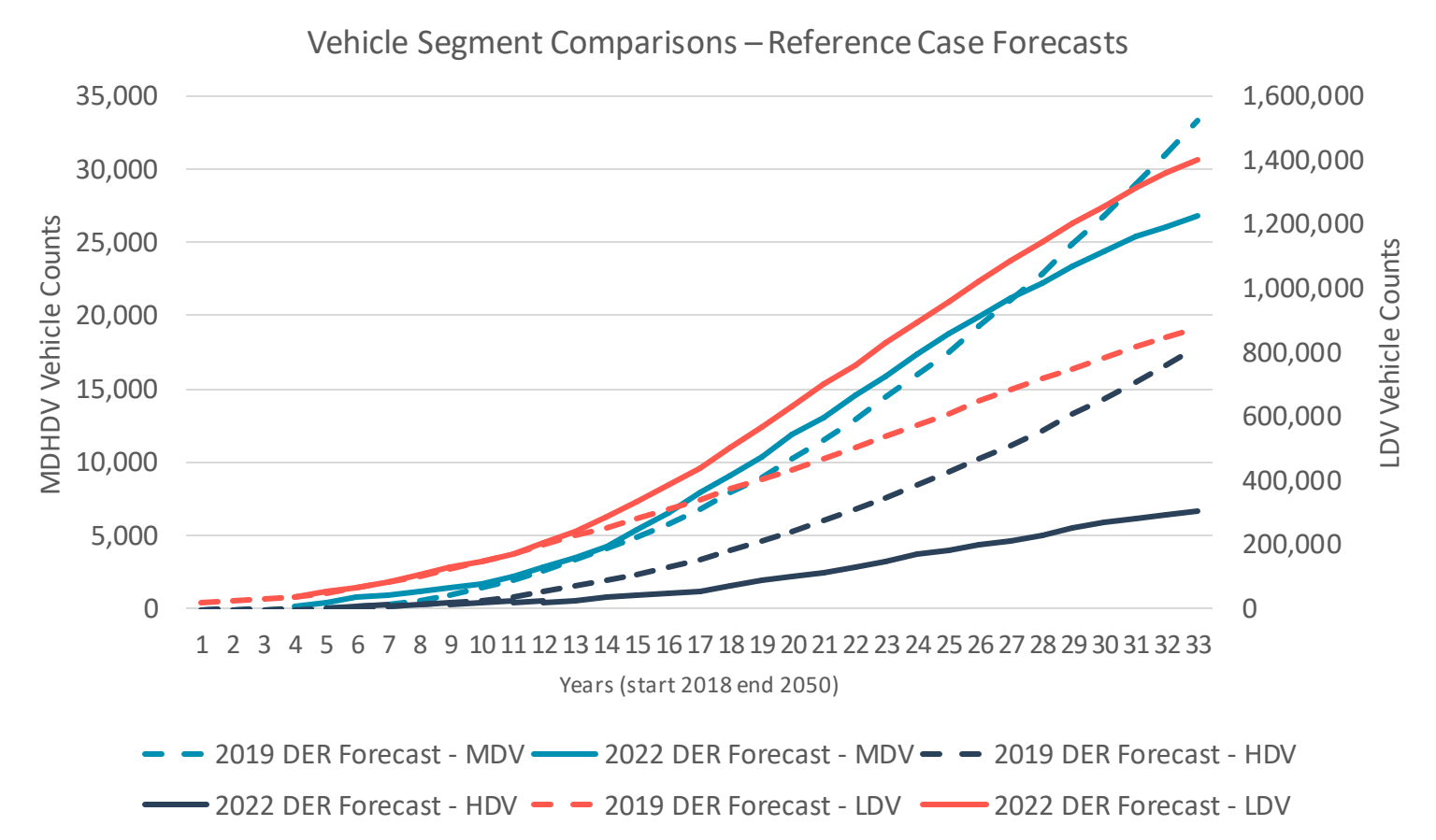
Electric Vehicles by Vehicle Weight Class

- Higher LDV counts, including light-duty SUVs
- In general, near-term adoption of MHDEV is expected to be limited
- Adoption of electric city and school buses are expected to be higher
- Medium- and heavy-duty vehicle forecasts differ primarily based on vehicle stock composition and data source



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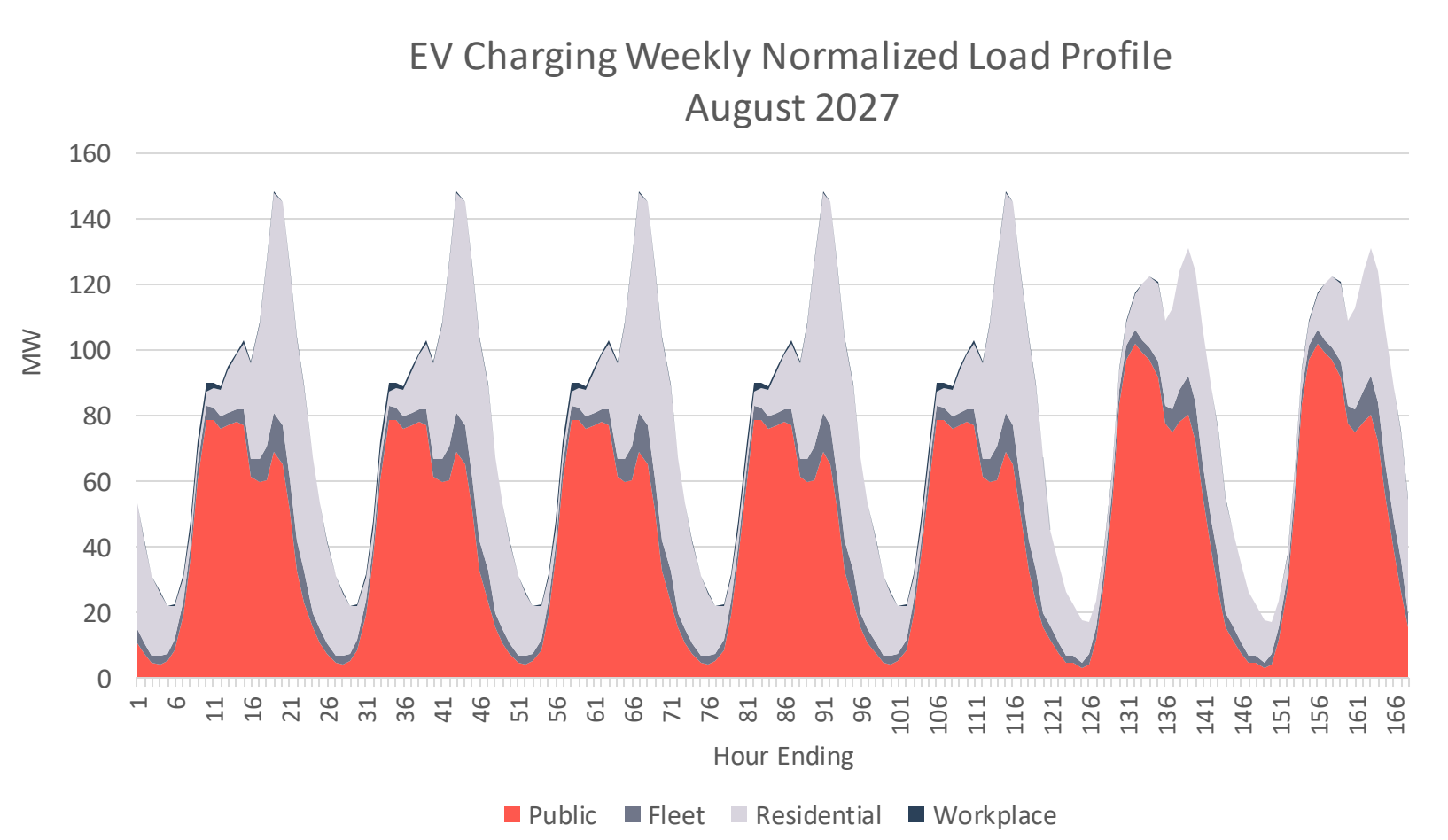
Passive Resource Weekly Load Profiles

- Non-dispatchable (passive) shapes include:
  - Solar PV
  - EV (unmanaged)
- Relied on trusted third-party sources (NREL PV Watts for solar, EVI-Pro Lite for EVs)
- Will undergo further modeling within IRP analysis



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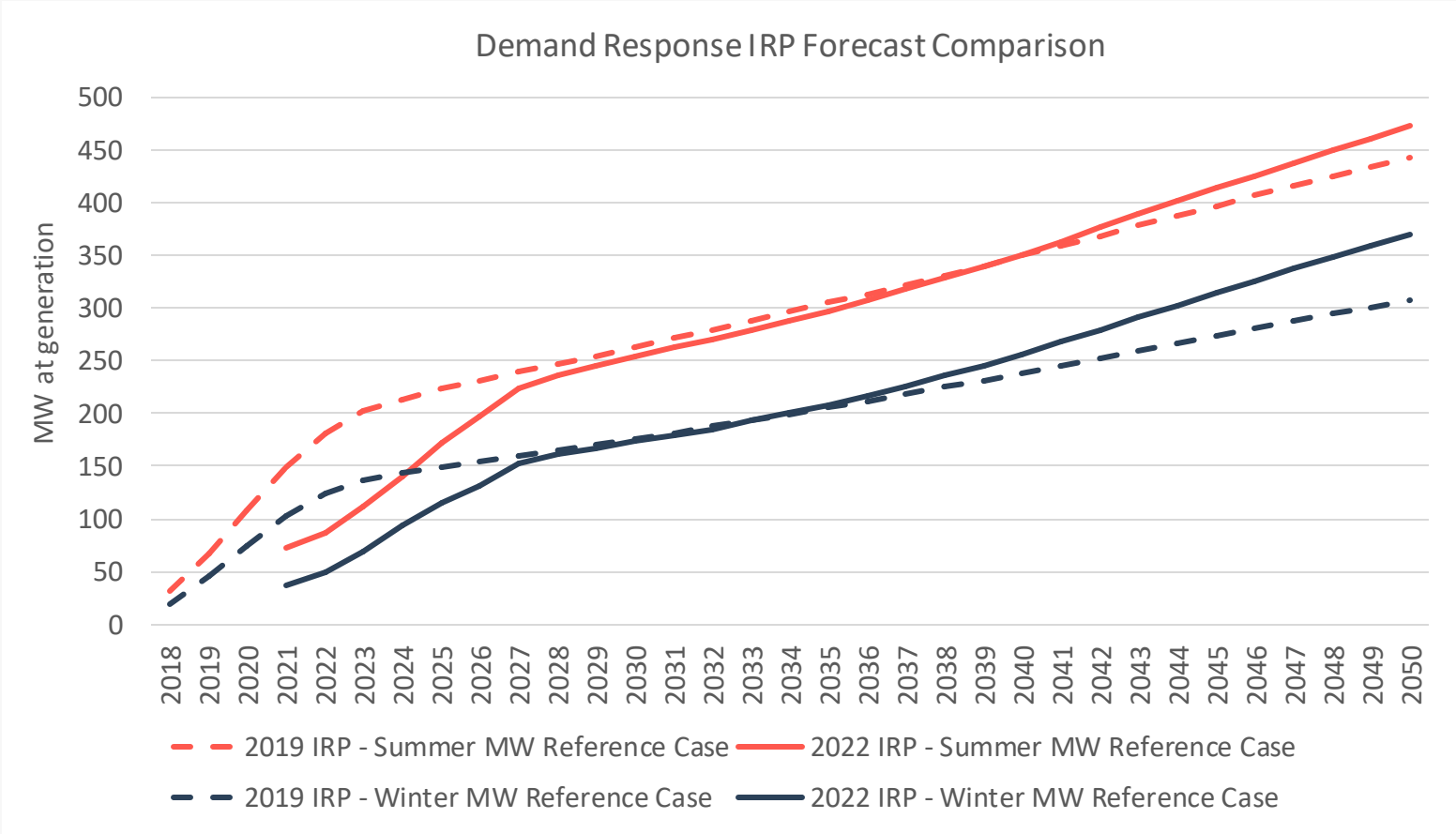
Flex Load Forecast

- **Overall, very similar Flex Load forecast with some changes early and late in the forecast horizon**
- Larger growth in late years due in part to added technologies
  - Better characterization of small commercial thermostats
  - Cold storage and line voltage thermostats



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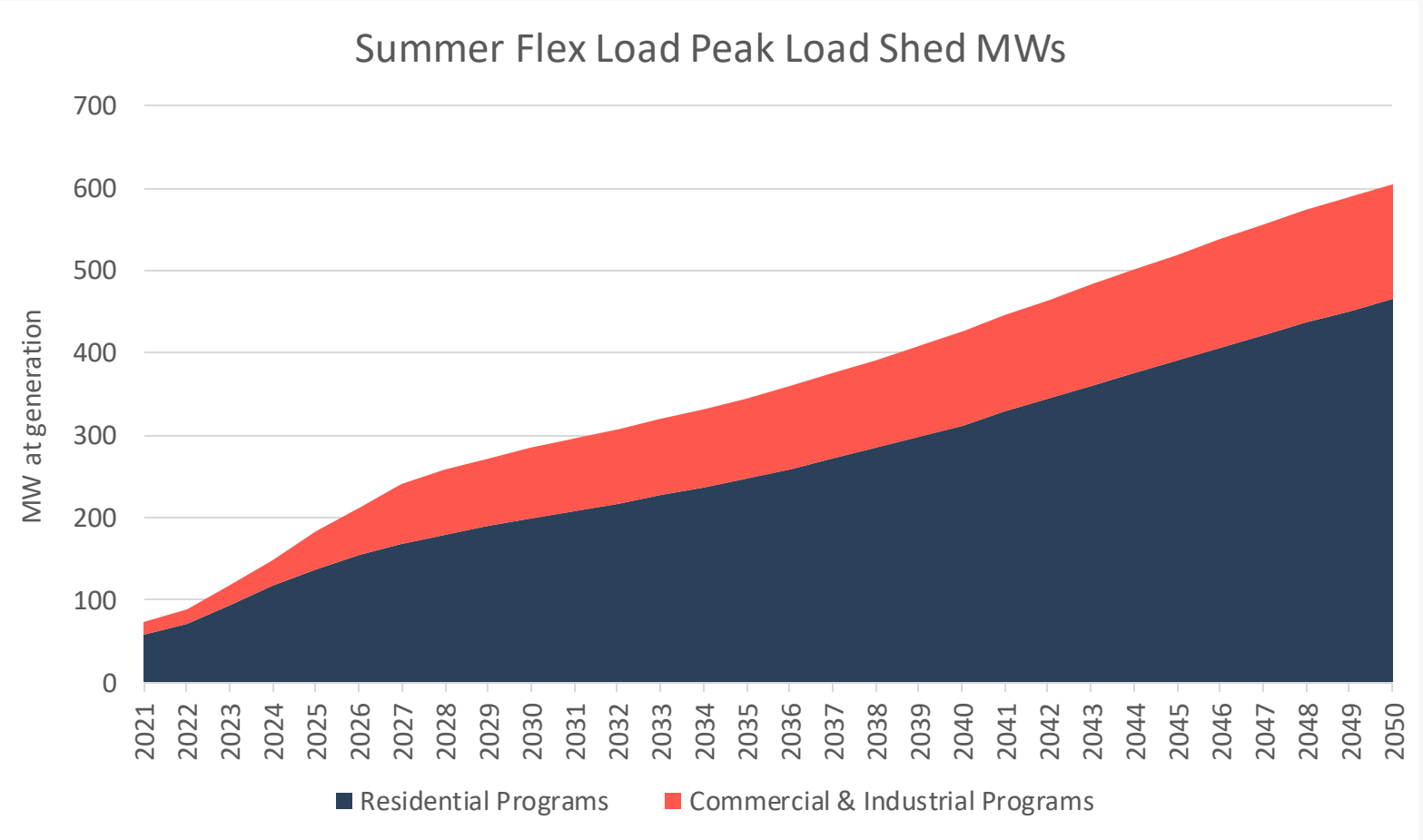
Flex Loads – Summer, Cost-effective

- Top residential **summer** resources include:
  - Pricing (PTR, TOU)
  - Thermostats (Central A/C and heat pumps)
  - Water heaters
- Top commercial & industrial **summer** resources include:
  - Energy Partner ADR (sch 25 and sch 26)
  - Cold storage



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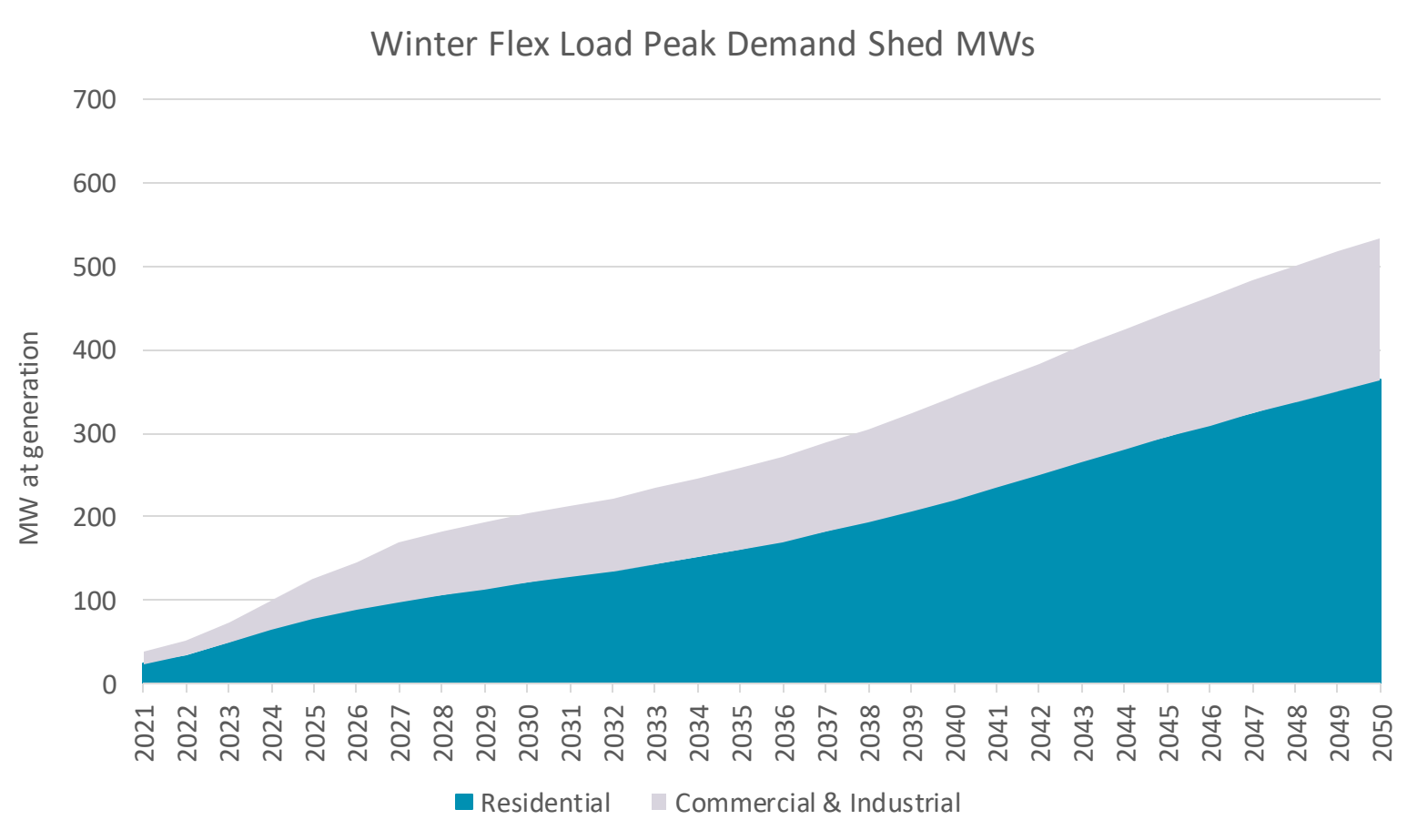
Flexible Loads – Winter Results

- Top residential **winter** resources include:
  - Pricing (PTR, TOU)
  - Thermostats (Heat Pumps and electric furnaces)
  - Water heaters
- Top commercial & industrial **winter** resources include:
  - Energy Partner ADR (sch 25 and sch 26)



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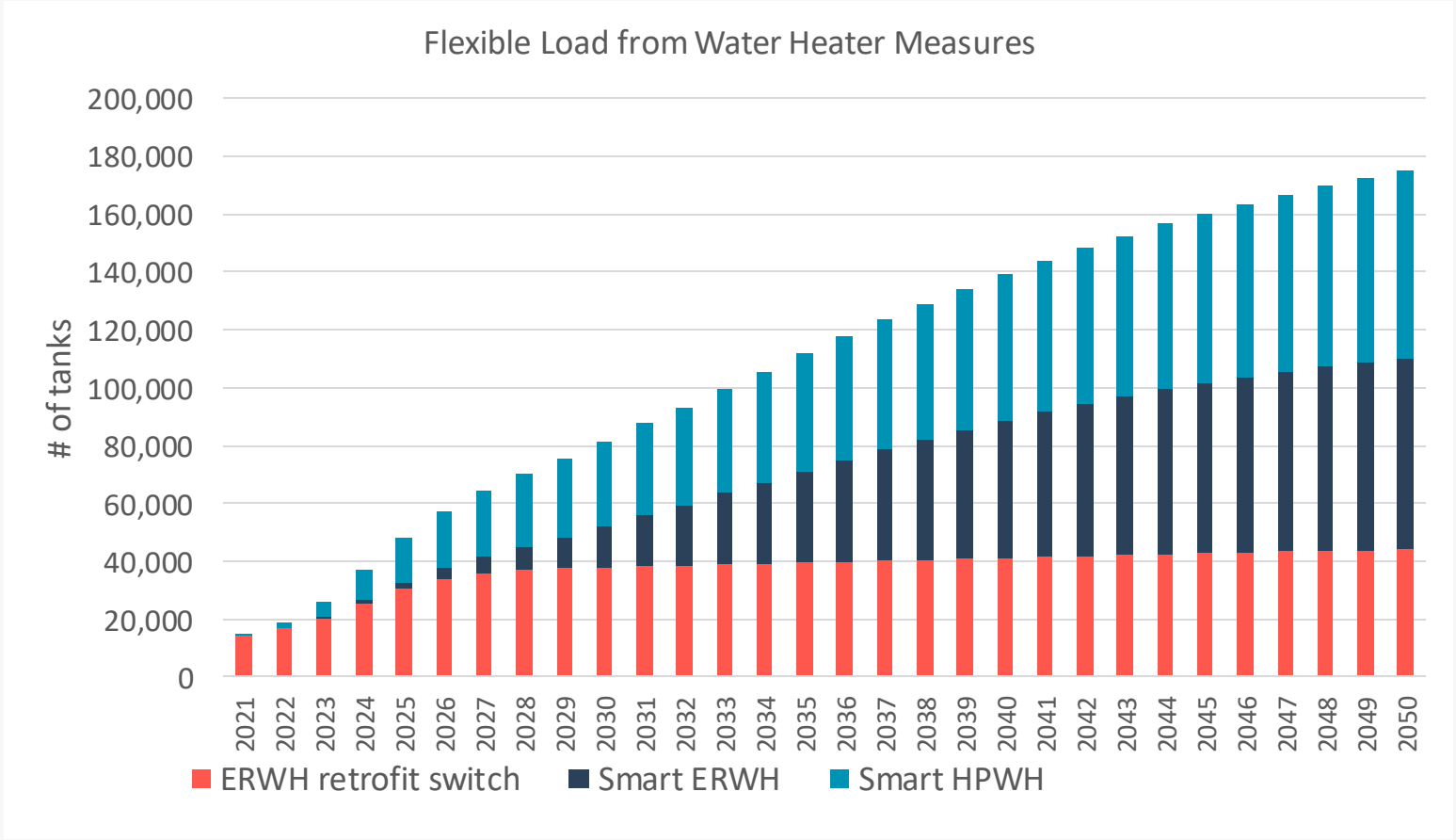
Flex Load Spotlight – Water Heaters

- Early years retrofit switches predominate
- Smart appliance standards (e.g., CTA-2045) provide more resources at lower cost in future years
- 13 MW summer / 16 MW winter by 2027;
- 42 MW summer / 50 MW winter by 2050
- Capable of daily load shifting



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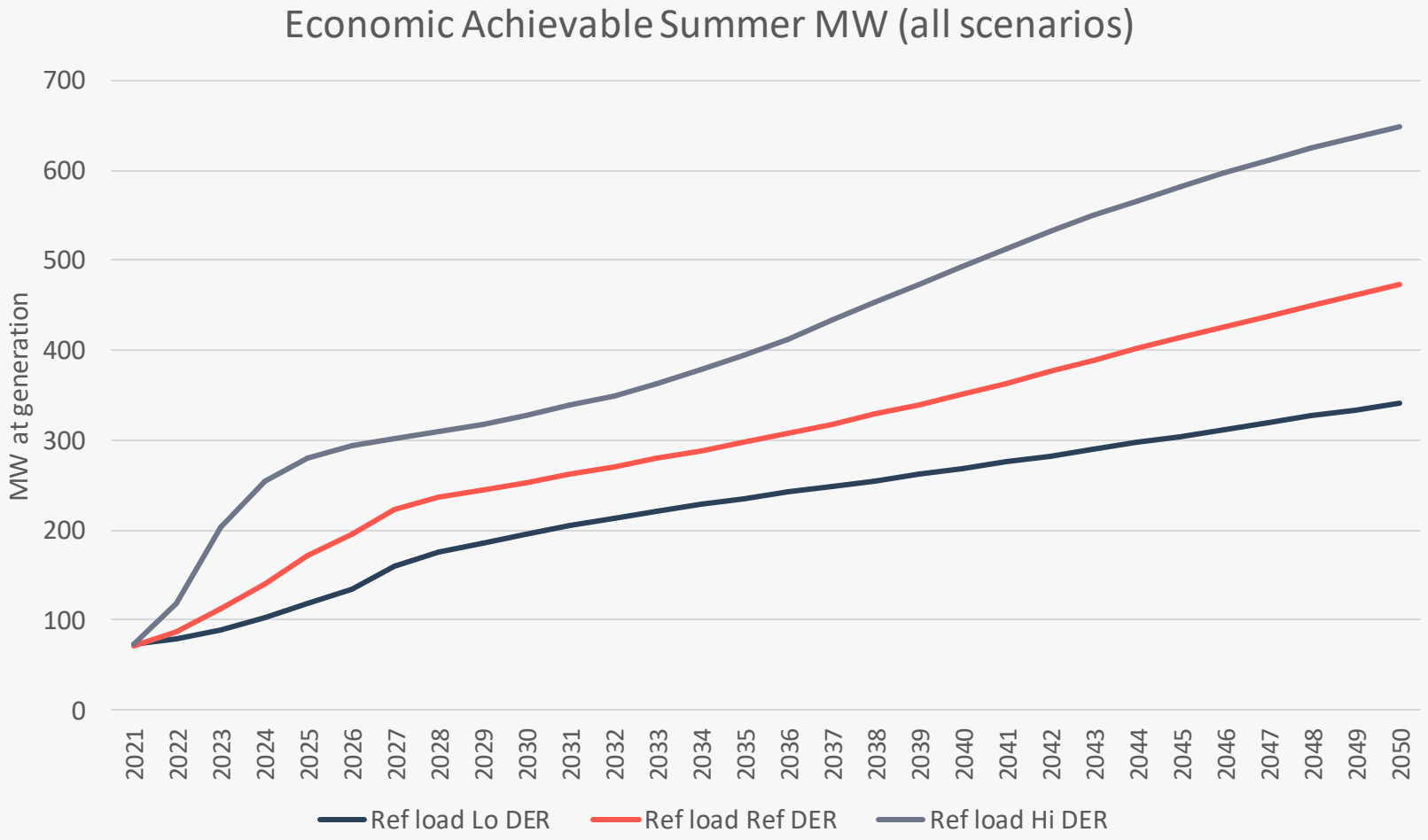
Uncertainty Range for Flex Load Adoption

- Modeled low, reference, and high scenarios for Flex Load adoption
- Primary drivers are:
  - Time to maturity (aka "ramp rates")
  - Avoided costs (high case included distribution deferral value)
  - Customer price elasticity of demand (from BPA study)
  - Removed value of lost service from high scenario



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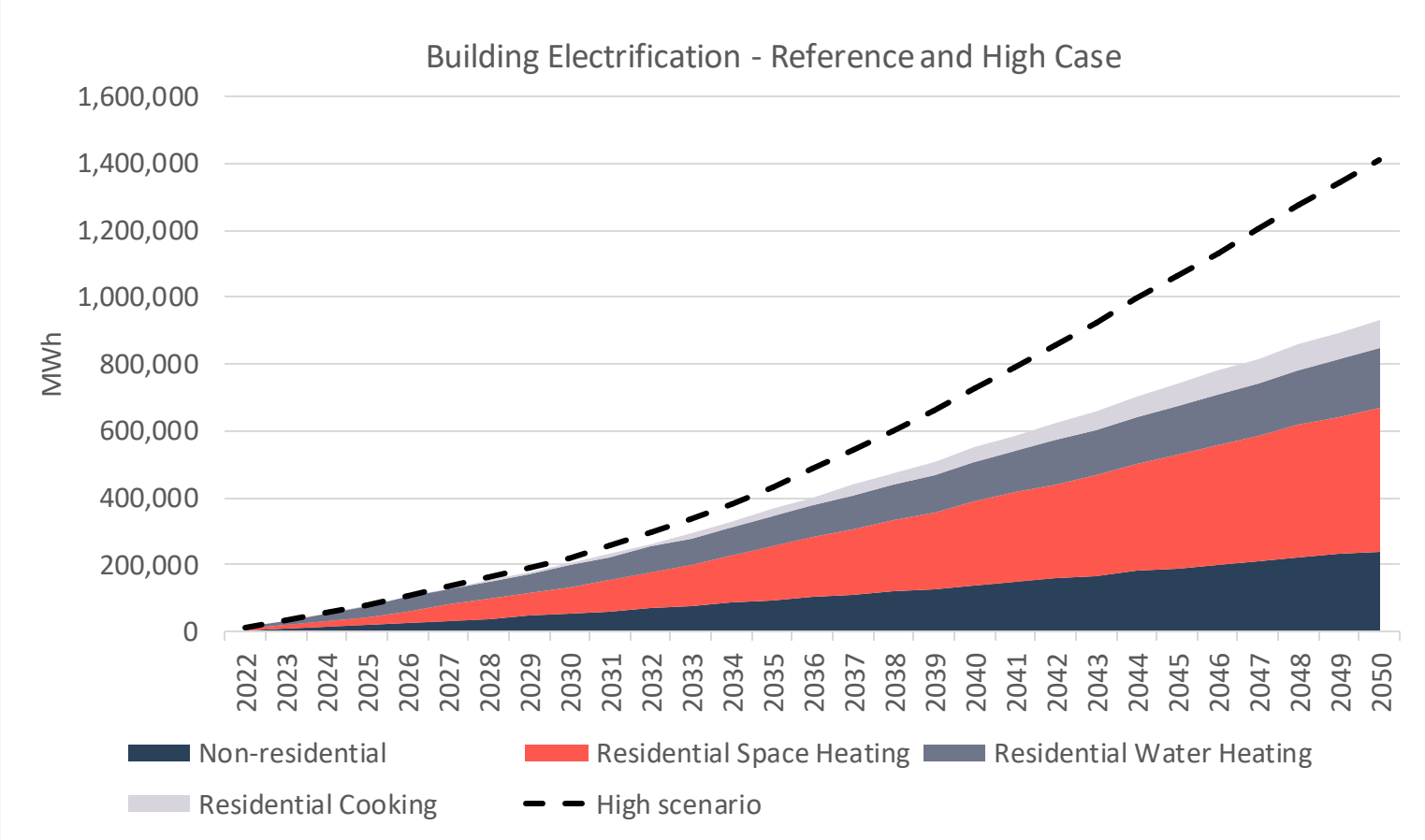
Building Electrification

- For 2022 IRP, modeled naturally occurring building electrification
- Used NREL electrification futures study* for scenarios
- Follows-up PGE's 2019 Deep Decarbonization study
- Interactive in the model with Flex Load and DER adoption
    - Service panel impacts and consumer economics



*NREL Electrification Futures Study information available at: https://www.nrel.gov/analysis/electrification-futures.html

*Draft – subject to change

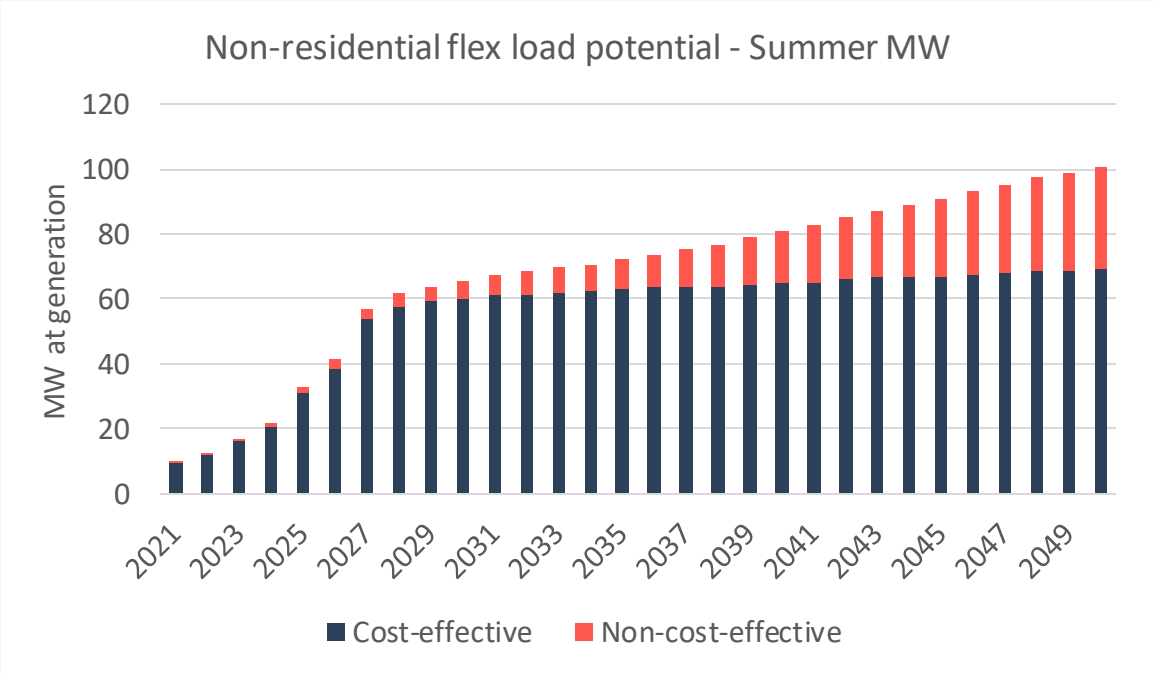
DER Forecast :
Flex Load Supply Curves

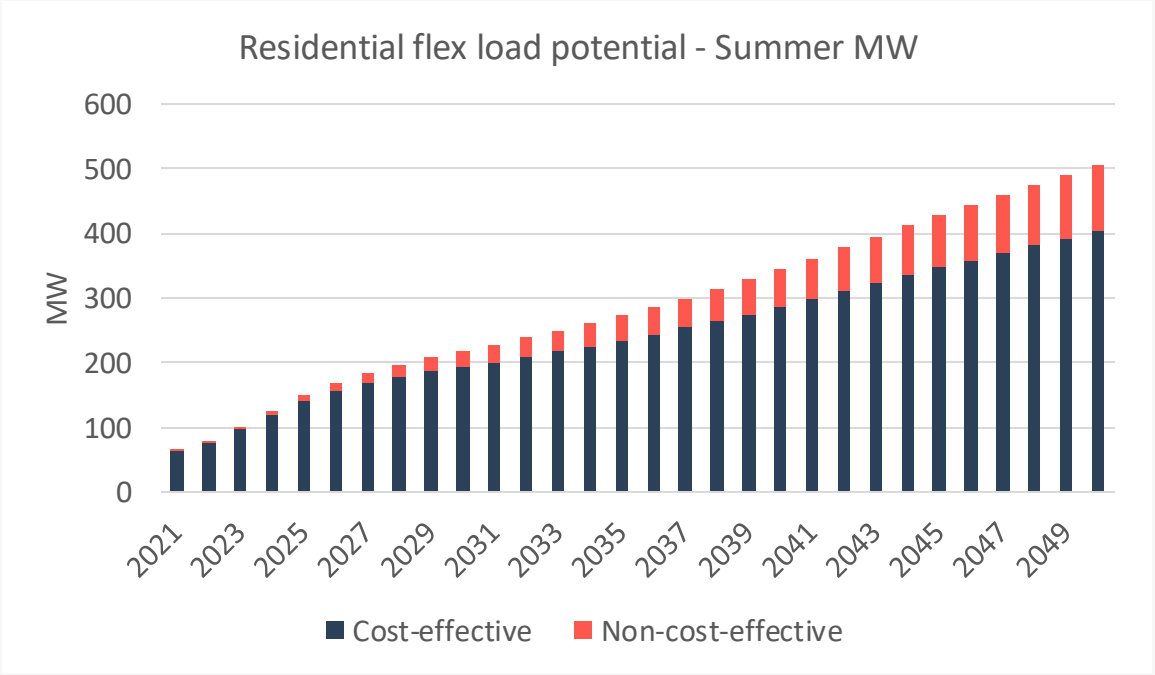
Supply Curves for Additional DER

- A supply curve is a function relating the cost of a resource for a given quantity
- For Flex Loads, this is expressed in MW and levelized cost from a TRC perspective (expressed in kW-yr)
- For the 2022 IRP, PGE plans to incorporate supply curves for some non-cost-effective Flex Load resources in IRP analysis
- Portfolio analysis will determine where incremental DER is a more optimal choice than other resource options

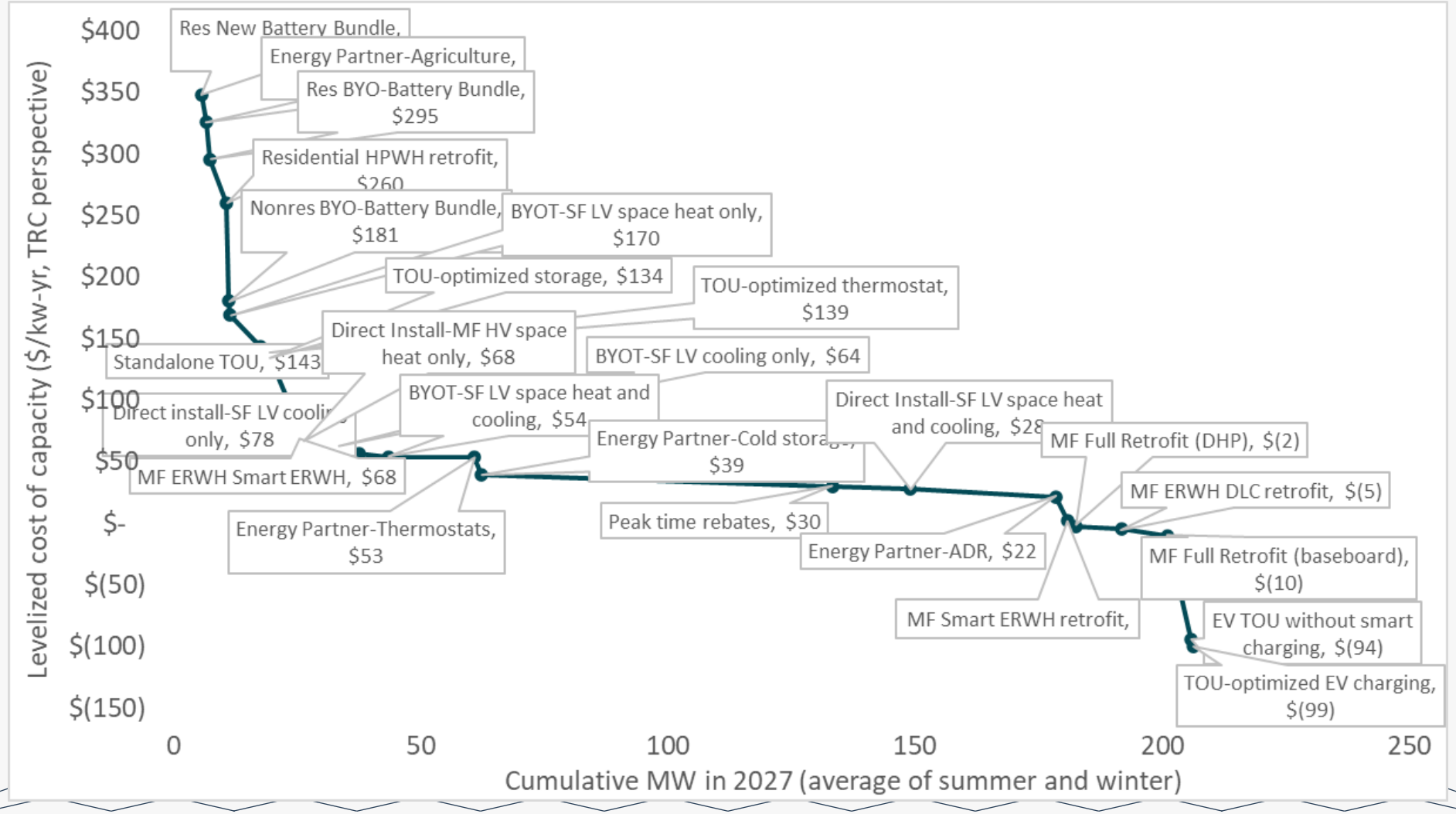
Flex Load Non-Cost-Effective Contribution

Charts below show summer MW of flex loads that are cost-effective and how many MW are still "achievable" but not cost effective under current costs and benefits



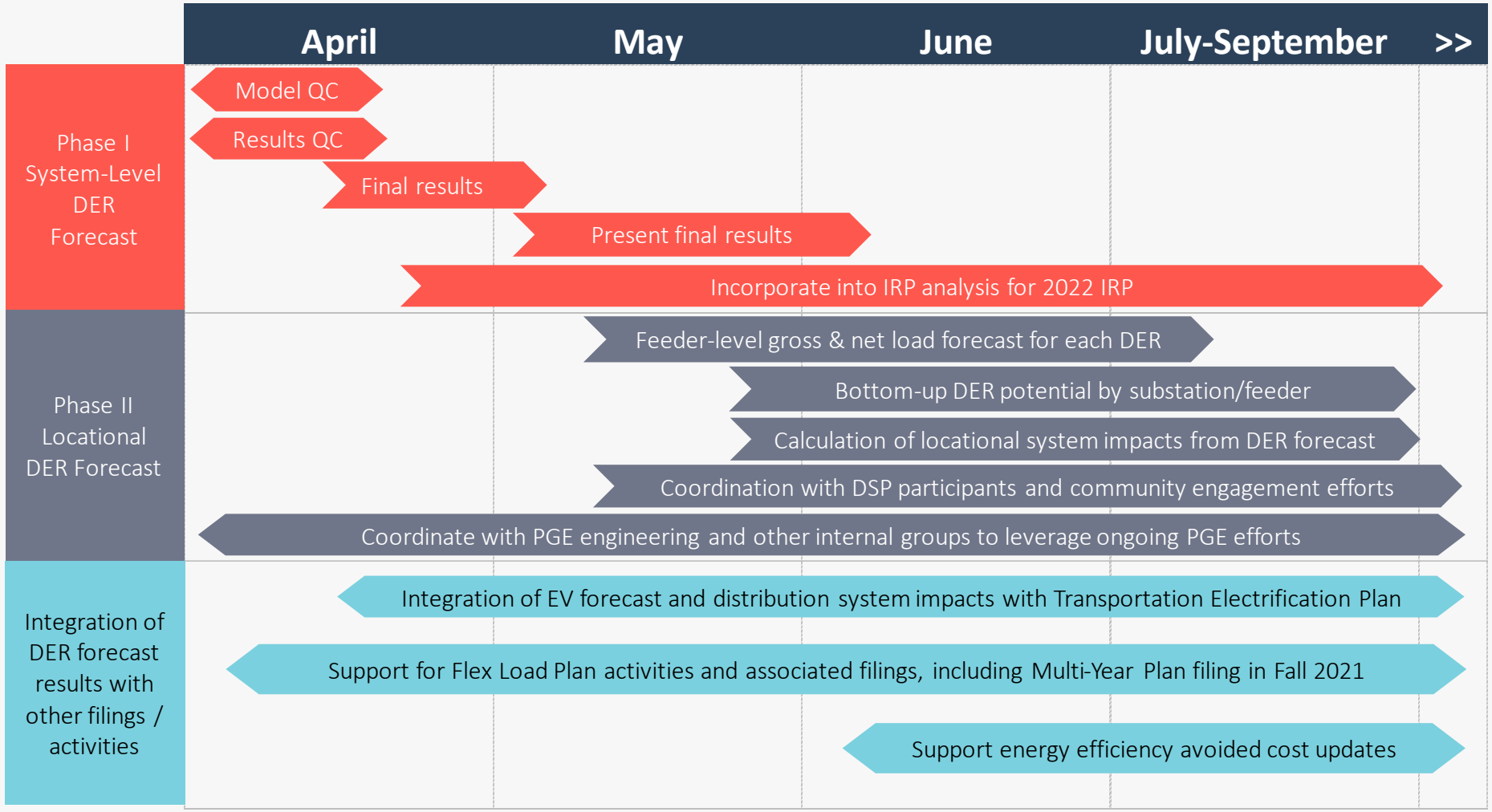


Levelized Costs of Flex Loads: $/kW-yr., TRC Perspective



DER Forecast :
Conclusions and Next Steps

Timeline for DER Forecast through Q3



Preliminary Takeaways

- Flex Load potential has remained relatively stable from previous study, though composition has shifted
- Pricing based resources, especially coupled with technology show large promise but need field data to validate
- Shift toward nonresidential charging in later years
- Economics for storage and microgrid unlikely to be carried by demand response value alone (i.e., without locational, ancillary, and/or resilience value)

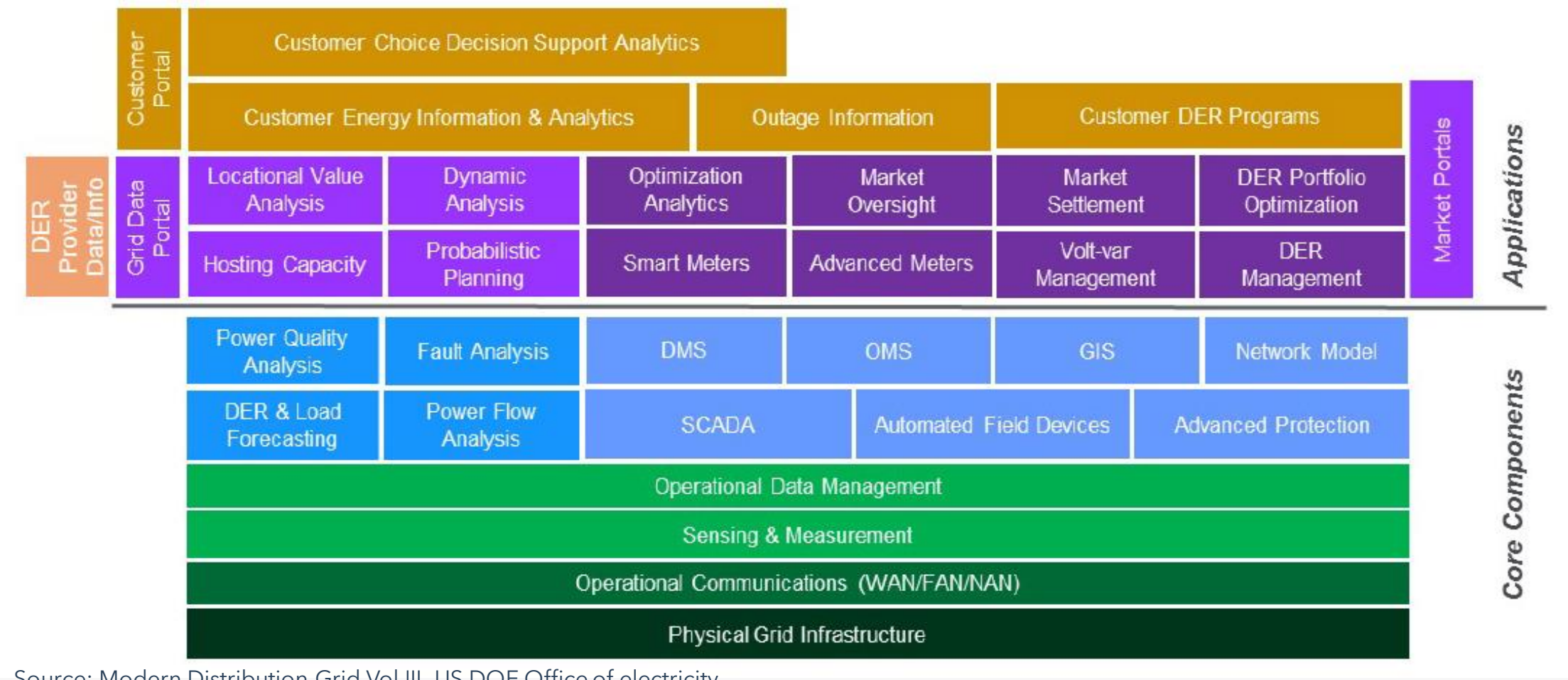
Next Steps: Areas for Exploration

- Continue work to characterize the locational, ancillary, and resiliency values associated with DERs
    - More refined dispatch shapes to provide different grid values (e.g., primary frequency response, spinning reserves, voltage optimization)
    - Standardized, technology-neutral valuation framework
- Weighting of capacity benefits between summer and winter (currently equal for cost effectiveness purposes)
- Coordination with Energy Trust on Multifamily Low- and Moderate Income for forecasting Solar adoption for this market segment
- Better characterization of medium- and heavy-duty EV charging load shapes as more customers adopt these vehicles
- DER Forecast incorporation into IRP portfolio analysis – how should the IRP preferred portfolio translate to annual targets?

Long Term Plan: Update

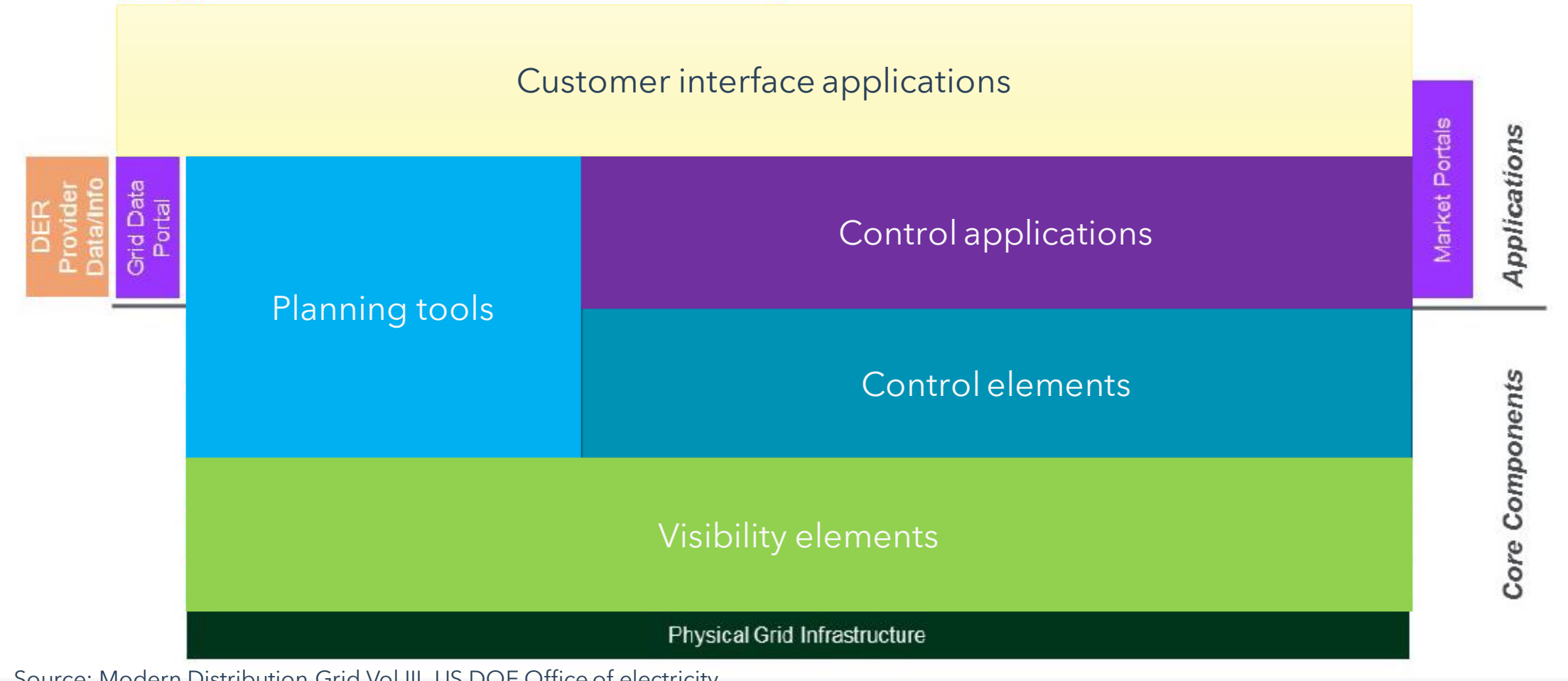
Nihit Shah
Senior Strategy & Planning Analyst
DSP – Part 1

DSPx - Distribution System Platform & Applications



Source: Modern Distribution Grid Vol III, US DOE Office of electricity

PGE's Initial Categorization
March workshop recap (03/10/2021)



Source: Modern Distribution Grid Vol III, US DOE Office of electricity

PGE Grid Modernization Framework (DRAFT)

Cybersecurity

Workforce Strategy

Compliance

Customer Choice Decision Support Analytics

Please see slide 89 for acronym definition

Customer Energy Information & Analytics		Outage Information		Customer DER Programs	
Locational Value Analysis	**Dynamic Analysis**	**Optimization Analytics**	**Market Oversight**	**Market Settlement**	**DER Portfolio Management**
Locational Net Benefit Analysis NWS locational value	Dynamic Line Rating	DER optimization	TBD	TBD	Non-wire Solutions Flexible loads
Hosting Capacity	**Probalistic Planning**	**Smart Meters**	**Advanced Meters**	**Volt-var Management**	**DER Management**
Hosting Capacity Analysis Interconnection	Long-term planning	AMI 2.0		Conservation voltage reduction	DERMS 1.0 + DRMS DERMS 2.0 VPP
Power Quality Analysis	**Fault Analysis**	**DMS**	**OMS**	**GIS**	**Network Model**
Planning support analysis Analytics		ADMS	OMS	As-planned, as-built, as-operated models	Consolidated System Modeling
DER & Load Forecasting	**Power Flow Analysis**	**SCADA**	**Automated Field Devices**	**Advanced Protection**	
Long-term Forecasting	Time series power flow	DMS and EMS	Interrupters, Breakers, Switches, Synchrophasers	Adaptive Protection	

Operational Data Management	Mobile Grid Platform	Coordinated Work Packages Asset LiDAR
Sensing and Measurement	Substation Automation	Distribution Field Automation
Operational Communications	WAN FAN/NAN	4G/5G, Private LTE, Low Orbital Satellites
Physical Grid Infrastructure	Conductor Upgrades	D/T Substation Construction

Coordinated Work Packages

Integrated Operations Center

Grid Mod. Focus Areas

Foundational	Planning & Engineering	Operational Systems	Sensing & Measurement	Telecommunications	Grid Analytics	Physical Infrastructure	Facilities
Advanced	Work Management Systems	Operational Systems	Virtual power plant	Telecommunications	Grid Analytics	Workforce Strategy	

Planning and Engineering

What is planning and engineering?

- Umbrella term for capabilities such as **forecasting, hosting capacity, interconnection, grid and DER planning, risk management, locational value etc.**

How does it work and relate to other systems?

- A **suite of integrated analytical tools** work cohesively to enable the capabilities
- Planning and engineering receive data from operational systems, and sensing and measurement

Why are we pursuing this?

- To accurately assess, analyze, report and plan for system conditions with increasing DERs
- To **ensure optimal grid investment** through non-wire solutions, utility programs, system upgrades etc.

Operational Systems

What are operational systems?

- Umbrella term for capabilities that facilitate distribution system operations such as **predict, model, analyze and operate the distribution grid, power flow optimization, voltage regulation, etc.**

How does it work and relate to other systems?

- **Software and algorithms** leverage real time data to support decision making. Ex. ADMS, IVVO, DERMS, OMS, DRMS, etc.
- Operational systems receive data from sensing and measurement through telecommunications

Why are we pursuing this?

- Optimal system operation to **reduce costs and maximize safety, reliability, and resiliency**.

Sensing & Measurement

What is sensing and measurement?	How does it work and relate to other systems?	Why are we pursuing this?
• Umbrella term for grid asset monitoring capabilities such as: **sensors, meters, switches, interrupters, breakers etc.**	• Meter data, grid conditions, and environmental data **monitored and operated** through these devices.	• **Accurate, safe, and reliable information** for decision-making processes

Telecommunications

What is operational telecommunication?

- Umbrella term for communication capabilities such as: **wide area, field area, and neighborhood area networks, mesh networks, etc.**

How does it work and relate to other systems?

- Leverages networks to **communicate with field assets and transport information** to various operational systems

Why are we pursuing this?

- Accurate, safe, and reliable **information transfer** for decision-making processes

Hosting Capacity Analysis: Technical Working Group (TWG) Update

Misty Gao | Strategy & Planning Analyst

Joe Boyles | Distributed Resource Planner

DSP – Part 1

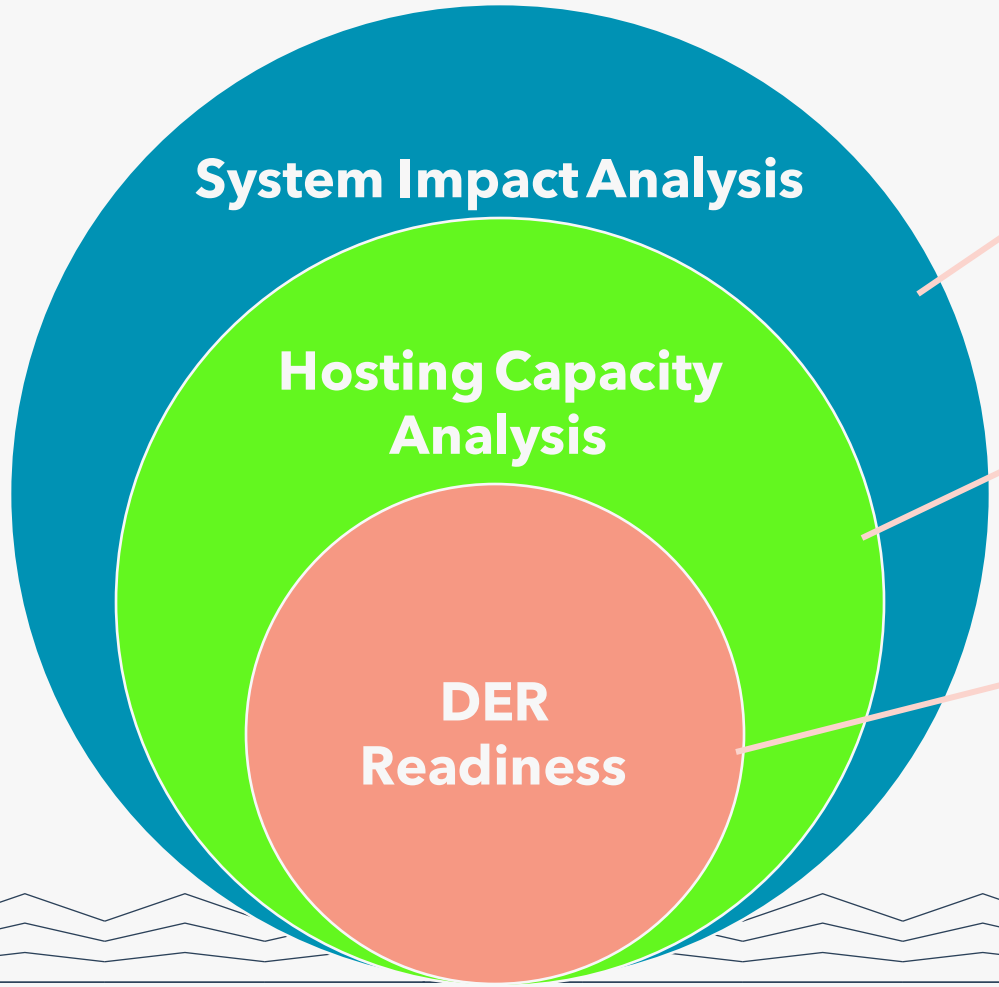
PGE

Technical Working Group (TWG) Updates and Discussion

- Q&A with OPUC and DSP Technical Working Group in April
- Shared DER* Readiness Map and supporting materials with TWG volunteers and received first round of feedback
- Can accept additional volunteers – email DSP@pgn.com if interested; include “volunteer” in subject line

*DER refers only to Distributed Generation, primarily solar pv, in this context

Relationship Among Screening Activities

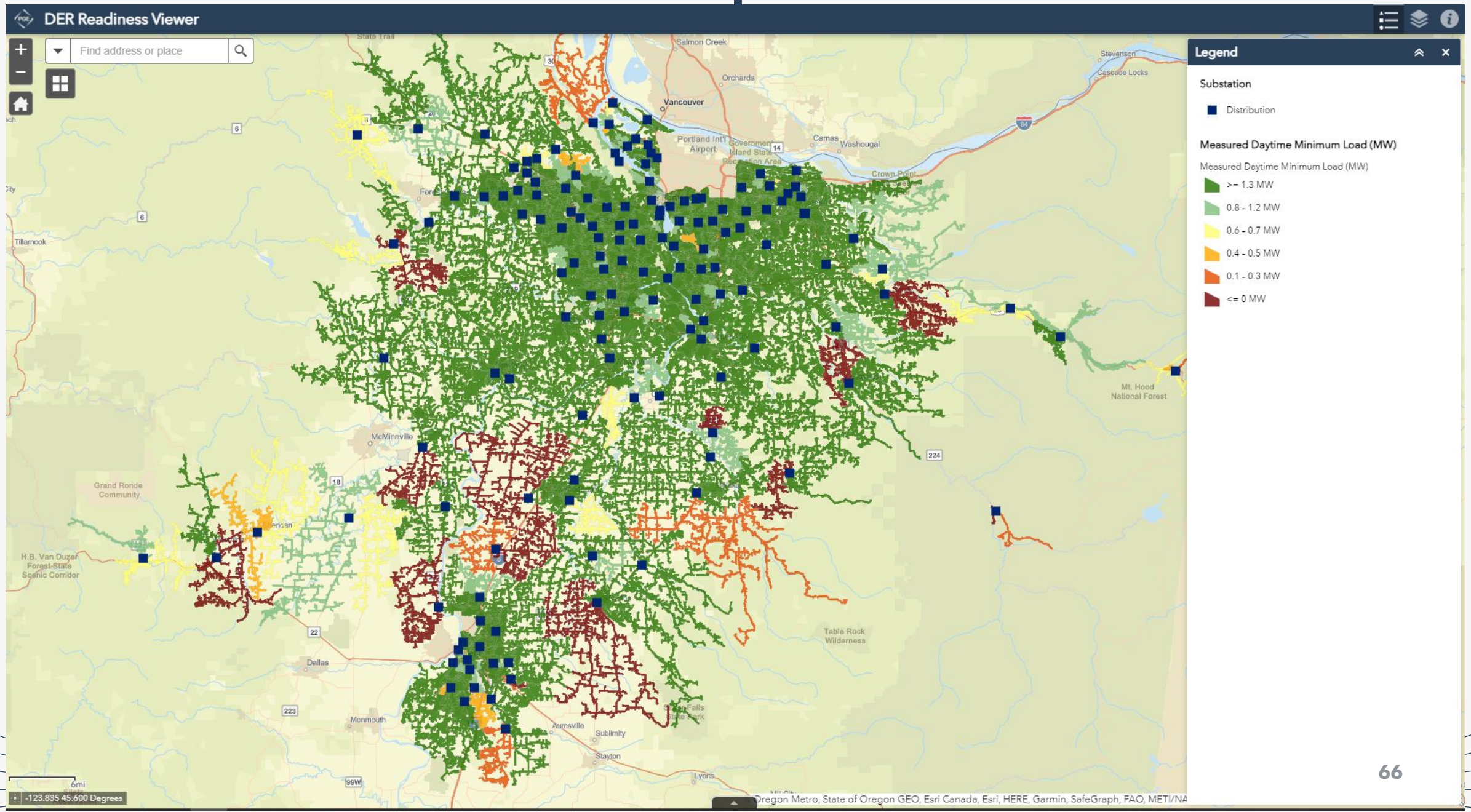


- HCA +
- Adjacent feeder/sub impact

- Readiness +
- Voltage control
- Power quality
- Thermal rating

- Substation Protection
- Daytime Minimum Load as a representation of available capacity

DER Readiness Map



Questions/Next Steps

Future Agenda Topics

Please use the QR code to submit your feedback about the DSP Partner's Meetings

June Meeting – 3.0 hrs.

Quick updates on guideline requirements: 30 mins

- Baseline Data & System Assessment
- Long-term Plan
- Community Engagement

Report Template: 30 mins

Hosting Capacity: 60 mins

July Meeting – 3.0 hrs.

Quick updates on guideline requirements: 30 mins

- Baseline Data & System Assessment
- Hosting Capacity

Report Template: 30 mins

Community Engagement: 30 mins

Long-term Plan: 60 mins

August Meeting – 3.0 hrs.

Quick updates on guideline requirements: 30 mins

- Baseline Data & System Assessment
- Hosting Capacity
- Long-term Plan

Community Engagement: 60 mins

Next Steps

Propose Meeting Topics

- Email us at **DSP@pgn.com** with suggested topics

		2021									
		January	February	March	April	May	June	July	August	September	October
Distribution System Planning (DSP) plan - Part 1	Baseline data and system assessment	Data collection, organization, QA/QC, and visualization				Present to partners for feedback	Iterate as necessary	Final draft shared with partners		PGE review process	Filed on Oct 15th
	Hosting capacity	System evaluation map and hosting capacity option analysis					Present to partners for feedback	Iterate as necessary	Final draft shared with partners	PGE review process	Filed on Oct 15th
	Community engagement plan	Development of the Community Engagement Plan							Present to partners for feedback	PGE review process	Filed on Oct 15th
	Long term planning	Development of long-term plan						Present to partners for feedback	Final draft shared with partners	PGE review process	Filed on Oct 15th

An

Oregon

Oregon

Oregon

Oregon

Oregon

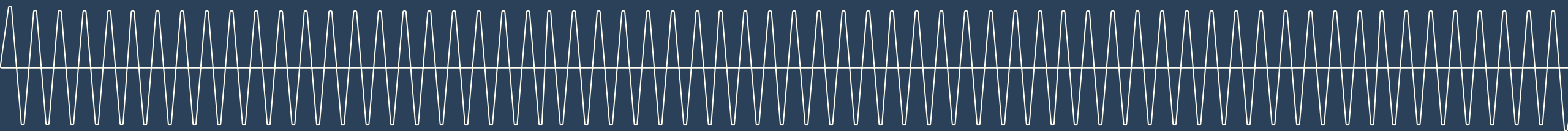
kind of energy

Additional Resources & Materials

DER Potential & Flex Load Study

Andy Eiden, Sr. Strategy & Planning Analyst

DSP Part 2



Technical Overview

The scope of the study includes the development of an open code base built upon open tools that can be iteratively refined

This reflects the reality of distribution resource planning: it's an evolutionary process that requires transparency and collaboration

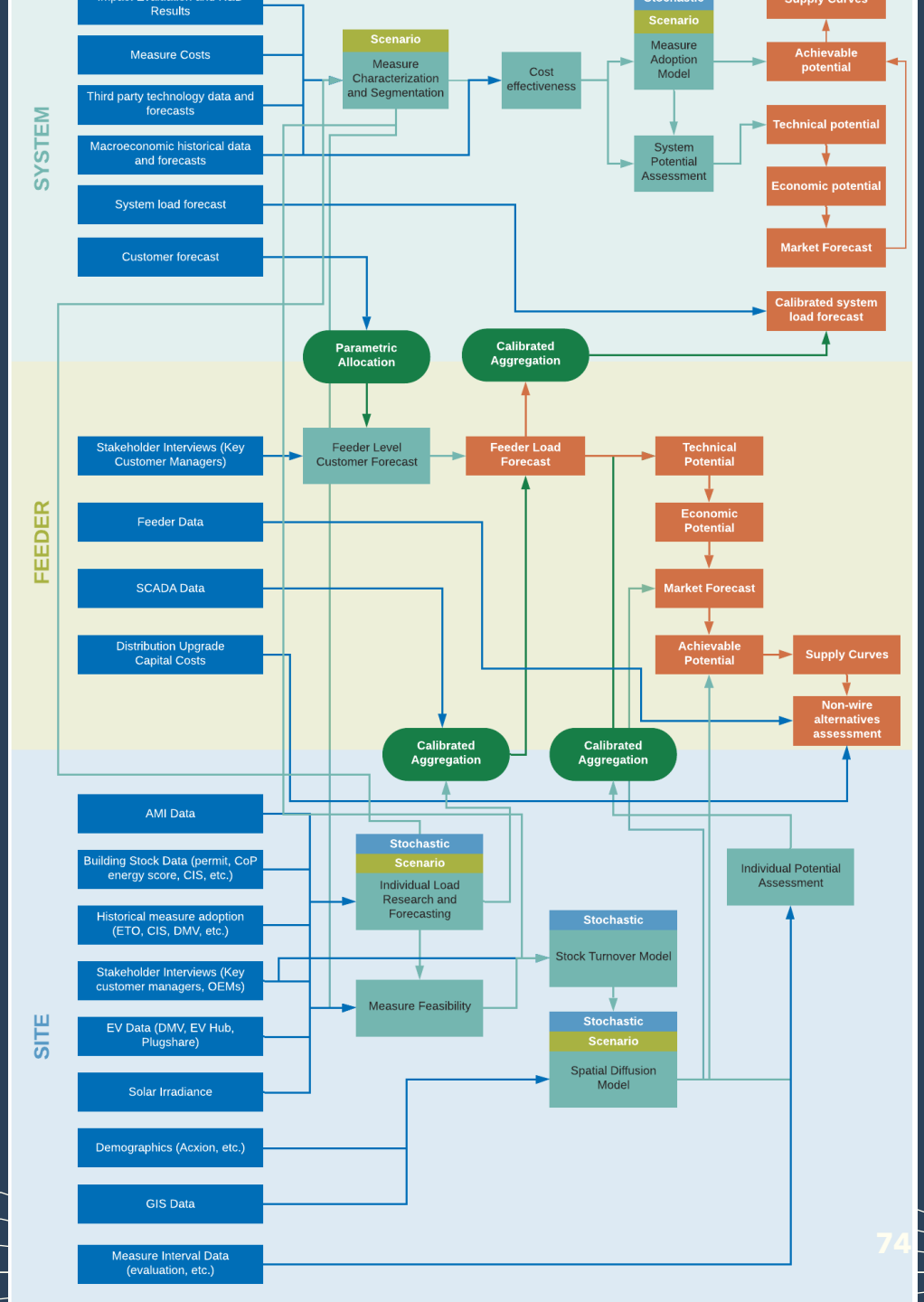
Project requires that all third-party data comes from open sources that can be shared publicly and updated easily

To the extent possible, analytic tools come from the public sphere:

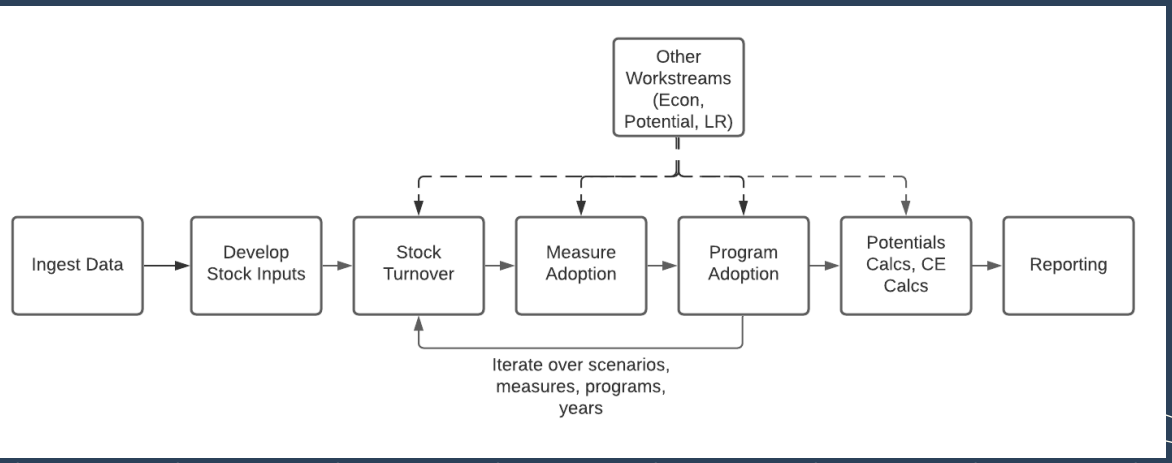
- DGEN, REOpt Lite, EVI-Pro Lite, EnergyPlus, Electrification Futures Study, PVWatts, Project Sunroof

Methodology

Scary version



Simple version



Quick Glance at Method:
EVs

Electric Vehicle Market Sizing

Four steps in vehicle market sizing approach

1. Map anonymized DMV vehicle registration data to PGE service points (80% match)
2. Run VINs through NHTSA API to determine vehicle weight class
3. Infer weight class for vehicles with missing weight class from NHTSA
    - Used decision tree and manual QC of dataset relying on vehicle make and model
4. Apply an adjustment factor to the vehicles mapped to PGE service point to get total estimate for service area (about 1.8 million vehicles)

EV Forecast Methodology – Light Duty

Brattle conducted vehicle forecasts to feed into final site-level model

- LDV econometric model uses data from 50 states, from 2011 through 2018 to explain drivers of US EV sales
- Model is robust in that the addition or removal of a variable or subsets of data (i.e., certain states) does not have a significant impact on estimates

End-result is a forecast through 2030 of light duty vehicles (both residential and fleet), which is extrapolated through 2050 based on national projections

Vehicles determine the charging requirements in the model

- Chargers are the source of load for the electric system, not the vehicle
- Site-level adoption eligibility screen (has driveway, panel size, etc.)
- Some residential customers that will adopt EVs cannot charge at home

Range of Variables in Brattle's LDV Model

Variable Name	Type	Description
Dependent Variable: *EV sales per capita*	*Continuous*	*Defined as the total incremental sales of EV (BEV or PHEV) per million residents*
State incentives	Continuous	The maximum incentive (rebate, tax credit or tax exemption) offered by a state upon purchase of a BEV or PHEV, in $/vehicle
Federal Tax Credit (FTC)	Continuous	A tax credit offered by the federal government upon purchase of a BEV or PHEV, in $/vehicle
Total Incentive	Continuous	Sum of the state incentives and FTC
Battery price	Continuous	Lithium ion battery cost index in $/kWh, as a proxy of electric vehicle cost (BNEF)
Vehicle miles travelled (VMT)	Continuous	Average vehicles miles travelled annually, per capita
Tesla Cap dummy	Binary	A dummy variable to indicate a period of spike in EV sales after Tesla hit the cap for the FTC – Q3'18 and Jan'19
Model availability	Continuous	Number of EV models available across a state by year
Green views score	Continuous (0-100)	Average environmental voting score of state House and Senate reps (League of Conservation Voters Annual Environmental Scorecard)
High Occupancy Vehicle (HOV) lane exemption	Binary	Indicates the presence of an HOV lane exemption for EVs
Traffic density	Continuous	Weighted average daily traffic per lane for all principal arterials
Zero Emission Vehicle (ZEV) mandate	Binary	Indicates the presence of a ZEV mandate enacted by the government
EV charging rate	Binary	Indicates whether or not at least one utility offers an EV rate for charging in a given state

Source: Brattle

EV Forecast Methodology – MDHDV

- LDV market has significant historical data to develop mathematical models
- Nascent MDHDV market does not have comparable data
- Brattle employed a Delphi Method, which is well established forecasting method the relies on panel of experts over two rounds
- Used for final market share and ramp rate, and tied to S-curve pattern and DMV vehicle counts

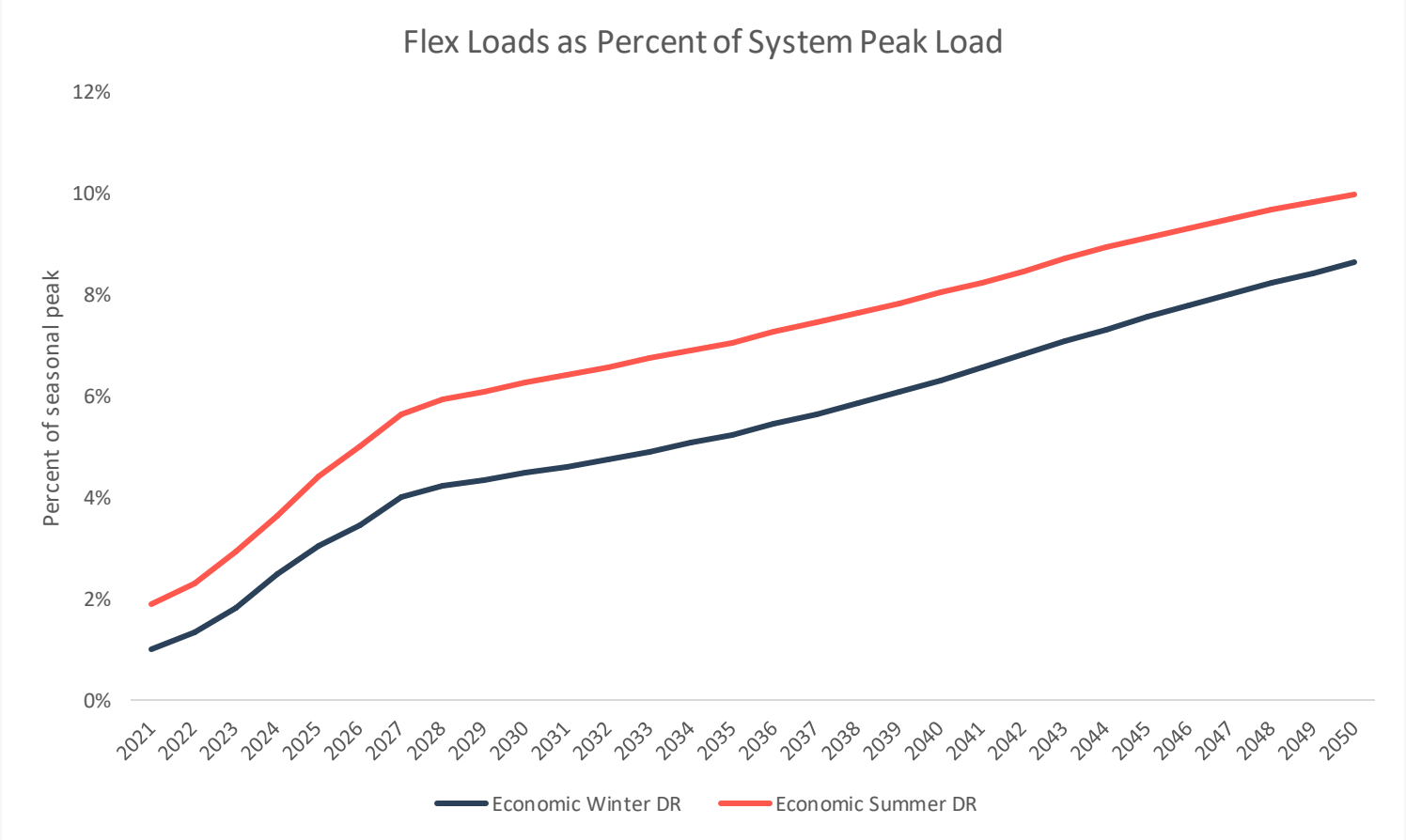
Participating Experts and Affiliations

Research/Non-Profit
Atlas Public Policy
CTE
CTE
Electrification Coalition
NREL
Rocky Mountain Institute
Union of Concerned Scientists
Government
DOT
Utility
Duke Energy
Seattle City Light
Industry
ACT Research
American Trucking Associations
NA Council for Freight Efficiency
VEIC
VEIC

*Source: Brattle

Impact of Flex Loads on System Peak

- By 2050, Flex Loads estimated to account for around 8-10% of system peak load
- Dependent on future market scenarios and regulatory landscape
- Uncertain cost curves as Flex Load resource scales beyond pilot deployments



*Draft – subject to change

Residential Flex Load TRC Costs

Resource Type	Measure	Customer acquisition cost	Ongoing customer costs	Upfront incentive	Ongoing incentive
Direct Load Control	Level 2 EV Charging	$0	$125	$413	$0
Direct Load Control	Level 2 EV Smart Charging (with DR)	$0	$125	$425	$50
Direct Load Control	Line Voltage Thermostat - Direct Install - space heat only	$0	$30	$298	$0
Direct Load Control	Multifamily bundle (add water and space heat controls)	$248	$0	$140	$42
Direct Load Control	Multifamily Replacement/New Smart Water Heater	$50	$0	$110	$25
Direct Load Control	Multifamily Water Heater Retrofit Controls	$291	$0	$0	$25
Direct Load Control	Multifamily Water Heater Retrofit Smart Water Heater	$50	$0	$0	$25
Direct Load Control	Residential HPWH direct install	$248	$30	$25	$50
Direct Load Control	Residential HPWH retrofit	$50	$21	$25	$25
Direct Load Control	Storage - Bring Your Own Device	$0	$592	$0	$411
Direct Load Control	Storage - New	$0	$592	$3,222	$0
Direct Load Control	Thermostat - BYOT - space heat / cooling only	$0	$21	$25	$25
Direct Load Control	Thermostat - BYOT - space heat and cooling	$0	$21	$25	$50
Direct Load Control	Thermostat - Direct Install - cooling only	$0	$30	$223	$0
Direct Load Control	Thermostat - Direct Install - space heat and cooling	$0	$30	$157	$0
Direct Load Control	Thermostat - Direct Install - space heat only	$0	$30	$173	$0
Pricing / Behavioral	Peak time rebates	$0	$5	$0	$8
Pricing / Behavioral	Standalone Time Of Use (TOU) rate	$0	$11	$0	$0
Pricing / Behavioral	TOU-optimized with tech (tstat, storage, water heater, EV)	$0	$11	$0	$0

* Shaded cells simply to denote groupings of similar measures

Non-Residential Flex Load TRC Costs

Measure Type	Measure	Customer acquisition cost	Ongoing customer costs	Upfront incentive	Ongoing incentive
Curtailment	Energy Partner-Schedule 26 (curtailment)	$0	$2,680	$0	$5,294
Direct Load Control	Energy Partner-Cold Thermal Storage	$0	$2,680	$0	$1,765
Direct Load Control	Energy Partner-Irrigation Direct Load Control	$0	$2,680	$0	$2,941
Direct Load Control	Energy Partner-Schedule 25 (thermostats)	$0	$798	$0	$570
Direct Load Control	Workplace Level 2 EV charging - No DR	$0	$0	$3,920	$0
Direct Load Control	Workplace Level 2 EV charging - with DR	$0	$0	$3,920	$672
Direct Load Control	Nonresidential Fleet L2 Smart Charging	$87,418	$3,100	$0	$0
Direct Load Control	Public DC fast charging		$460	$45,668	$0
Direct Load Control	Public L2 EV charging		$460	$45,668	$0
Direct Load Control	Fleet DC fast charging	$87,418	$3,250	$0	$0
Direct Load Control	Microgrid - Campus	$75,643	$250	$0	$0
Direct Load Control	Microgrid - Single site	$75,643	$250	$0	$0
Direct Load Control	Storage - Bring Your Own Device	$2,000	$360	$0	$1,152
Direct Load Control	Storage - New	$2,000	$360	$6,600	$0

* Shaded cells simply to denote groupings of similar measures

Runway

Overview of May Meeting

Topics included:

Presentation:

Forecasting of Load Growth, DER Adoption, EV Adoption:
DER Potential & Flex Load Analysis – Phase 1

DSP Details:

- Workstream Updates
  - Community Engagement Plan: Community Facilitator Scope of Work Update
  - Hosting Capacity Analysis: Options Analysis
  - Baseline Data and System Assessment: Example Datasets Update
  - Long Term Plan: Grid Modernization

Topics of Interest

- Work is in progress
- Completed
- Initial stages/under discussion

Transparency

- Monthly Partner Meetings
- DSP Timeline
- Workstream Updates
- DSP Abbreviations & Definitions
- DSP Website

Active involvement in the community engagement process

- Community Facilitator (discussed later in the presentation)
- More time for Community Engagement discussion

Stronger partnerships between customers and utilities

- Community Facilitator
- Community and Non-Technical Workshops
- OPUC Technical Work Groups (TWGs)

Education because there is a steep learning curve for those without a utility background

- Distribution Planning 101
- DER Assessment
- NWA Update
- DER Forecast & Flex Load Update
- DSP for Non-Technical People

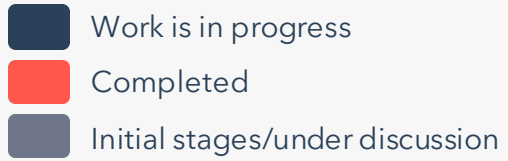
Usable, understandable mapping and website design

- Host Capacity Analysis
- DSP Website

Flexibility and innovation

- Evolving Agendas
- Community Facilitator
- Non-wire Alternative

Topics of Interest cont.



Diversity, equity and inclusion throughout the process

- Community Engagement Plan

Keeping disadvantaged communities at the forefront of the project planning

- Community Facilitator
- Non-wire Alternatives
- Data & Analytics

Geographic equity

- Hosting Capacity Analysis
- DER Potential and Flex Load Study
- Non-wire Alternatives

Role of building decarbonization

- DER Forecasting

Data gathering and reporting

- DER Forecasting
- Hosting Capacity Analysis
- Baseline Data and System Assessment

Keep costs down for rate payers when implementing climate change initiatives

- DER Forecasting
- UM 2099
- UM 2111

Parking Lot

Question/Comment	Partner	Name	Response
Will you be implementing a green button/utility API type solution for the interval data from customers?	Community Energy Labs	Tanya Barham	To be considered during DSP Part II in 2022

Appendix

DSP acronyms

ADMS = Advanced Distribution Management System

AMI = Automated Metering infrastructure

BIPOC = Black, Indigenous, and People of Color

C&I = Commercial and Industrial

CBO = Community-Based Organization

CE = Community Engagement

CEP = Community Engagement Plan

CTA = Consumer Technology Association

DCQC = Direct Current Quick Charge

DEI = Diversity, Equity, and Inclusion

DER = Distributed Energy Resource

DERMS = DER management system

DHP = Ductless Heat Pump

DR = Demand Response

DRMS = DR management system

DSP = Distribution System Plan

EJ = Environmental Justice

EMS = Energy Management System

ERWH = Electric Resistance Water Heater

EV = Electric Vehicle

EVSE = Electric Vehicle Supply Equipment

FAN = Field Area Network

HPWH = Heat Pump Water Heater

HVAC = Heating, Ventilation, and Air Conditioning

IRP = Integrated Resource Plan

kW = kilowatt

L2 = Level 2 EV Charging

LDV = Light-duty Vehicle

LIDAR = Light Detection and Ranging

MDHDV = Medium- and Heavy-duty Vehicles

MW = Megawatt

MWh = Megawatt-hour

NAN = Neighborhood Area Network

NWA = Non-Wire Alternatives

NWS = Non-Wire Solutions

NREL = National Renewable Energy Lab

OMS = Outage management system

PTR = Peak Time Rebates

PV = Photovoltaic

SGTB = Smart Grid Test Bed

T&D = Transmission & Distribution

Tstat = Thermostat

TOU = Time of Use

VPP = Virtual Power Plant

WAN = Wide Area Network