PNM 2023-2042 IRP: AEG EE Bundles, PNM EE Program & Highlights, Astrape ELCC Study Results, Review of Summer 2022 and Market Assistance included in Resource Adequacy Modeling

STEERING MEETING 10

JANUARY 17, 2023

DISCLOSURE REGARDING FORWARD LOOKING STATEMENTS

The information provided in this presentation contains scenario planning assumptions to assist in the Integrated Resource Plan public process and should not be considered statements of the company's actual plans. Any assumptions and projections contained in the presentation are subject to a variety of risks, uncertainties and other factors, most of which are beyond the company's control, and many of which could have a significant impact on the company's ultimate conclusions and plans. For further discussion of these and other important factors, please refer to reports filed with the Securities and Exchange Commission. The reports are available online at www.pnmresources.com.

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MEETING GROUND RULES

THE FOCUS OF THE MEETING IS THE DEVELOPMENT OF THE 2023 IRP

01

- Questions and comments are welcome – One Person Speaks at a Time

02

- Reminder; today's presentation is not PNM's plan or a financial forecast, it is an illustration of the IRP process

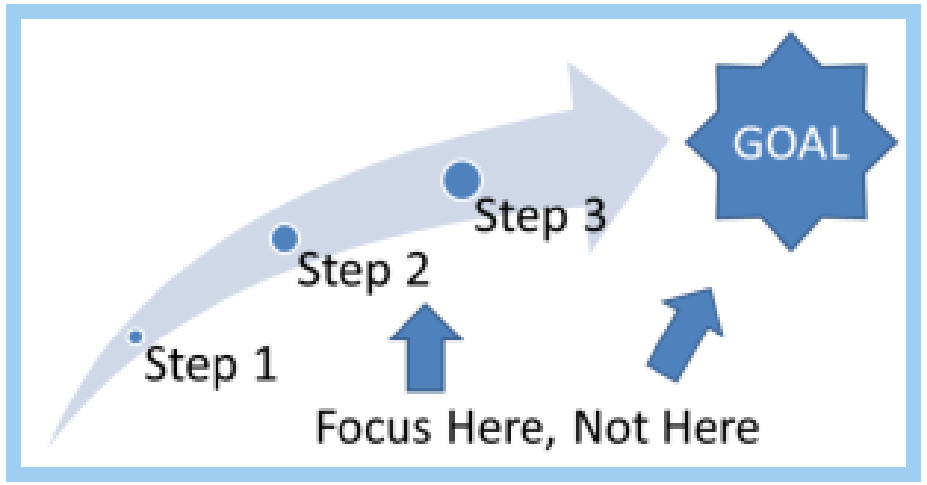
03

- When asking a question, please speak clearly and slowly as all questions will be logged and labeled with the person and organization responsible for asking the question

04

- These meetings are about the 2023 IRP, questions and comments should relate to this IRP. Any questions or comments related to other regulator proceedings should be directed towards the specific filing.

THE FOCUS OF THE MEETING IS THE DEVELOPMENT OF THE 2023 IRP



The technical sessions are about discussing the advantages and disadvantages regarding the application of different technical methodologies within the IRP modeling framework.

We are not here to focus on the results or drive towards a specific result. **We all know where we are going: 100% Carbon Free by 2040. The focus in the IRP development is how do we get there in the best way possible for PNM's customers and New Mexico.**

AEG
APPLIED ENERGY GROUP

EE Potential Study Stakeholder Meeting

January 17, 2023

Agenda

- Introductions
- Study Overview
- Energy Efficiency Potential
- IRP Inputs

Introductions

Kelly Marrin
Managing Director
Role: Project Director

Len Bergman
Manager
Role: Project Manager

Eli Morris
Managing Director
Role: IRP Input Lead

Rob Strange
Product Manager
Role: Modeling Lead

Fuong Nguyen
Lead Analyst
Role: Analysis Lead

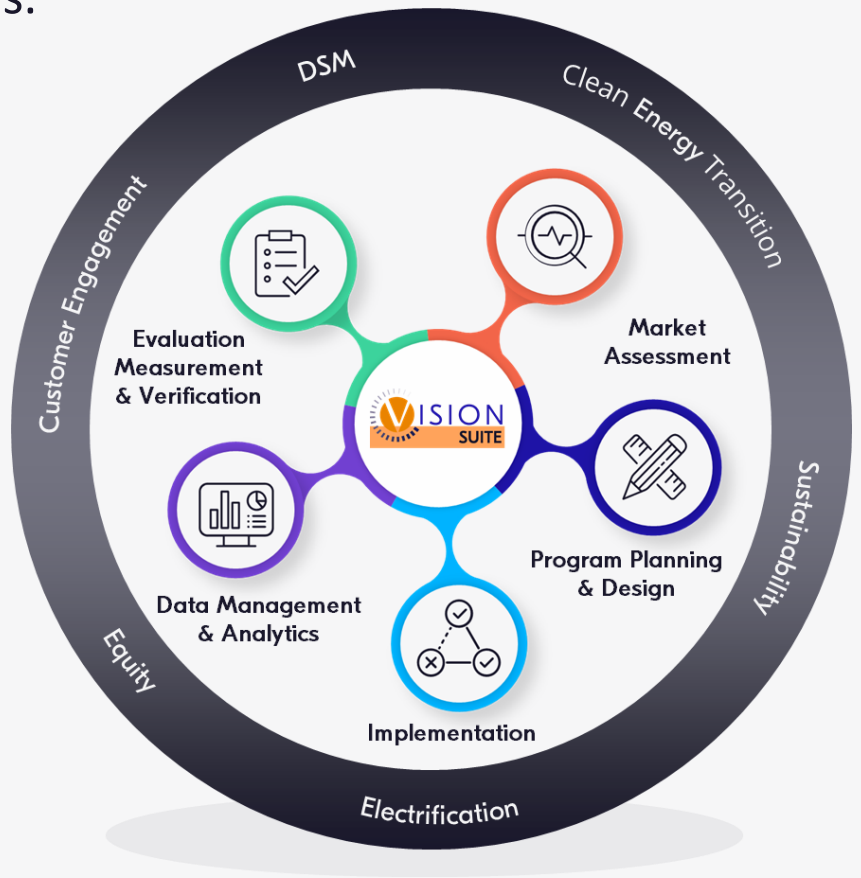
Presenter

About AEG

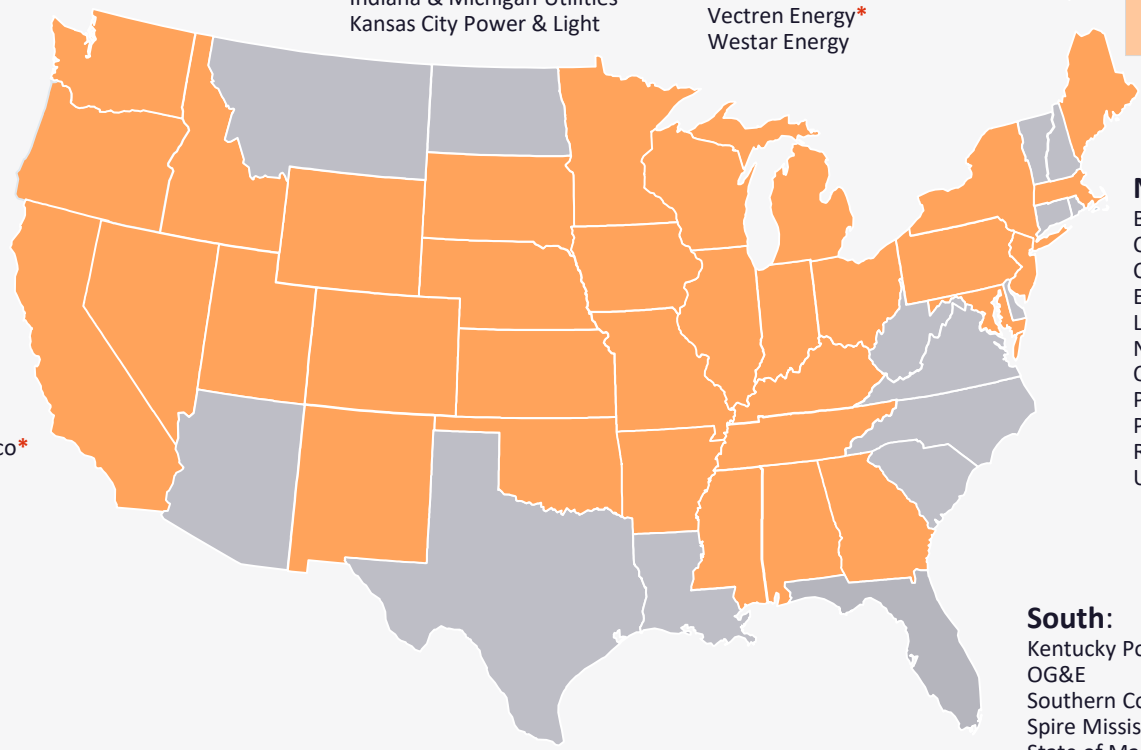
Founded in 1981 | Join Ameresco 2011

AEG provides expertise, products, and insights to utilities and other agencies to solve current and future business and sustainability needs.

115	Dedicated Professionals
49	States and provinces in which we've worked
200+	Utility and govt. clients served
1,000+	Projects completed



AEG's Market Potential Study Footprint



Midwest:
Ameren Illinois*
Ameren Missouri*
Black Hills Power *
Citizens Energy
Empire District Electric *
Indianapolis P&L*
Indiana & Michigan Utilities
Kansas City Power & Light

MERC
NIPSCO*
Omaha Public Power District*
Peoples' Gas/ North Shore Gas *
Spire Missouri
State of Michigan
Sunflower Electric
Vectren Energy*
Westar Energy

Regional & National:
Midcontinent ISO*
EEI/IEE*
EPRI
FERC

West:
Avista Energy*
BPA*
Cascade Natural Gas*
Chelan PUD
Cheyenne LFP *
Colorado Electric*
Cowlitz PUD*
HECO
Idaho Power*
Inland P&L*
LADWP
NV Energy
Oregon Trail EC
PacifiCorp*
PNGC
PG&E*
Portland General Electric
Public Service New Mexico*
Seattle City Light*
State of Hawaii*
State of New Mexico
Tacoma Power*
Xcel/SPS

Northeast:
Berkshire Gas
Central Hudson G&E *
Con Edison of NY *
Efficiency Maine *
Liberty Utilities *
New Jersey BPU
Orange & Rockland *
PECO Energy
PSEG Long Island
Rockland Electric
Unitil

South:
Kentucky Power
OG&E
Southern Company / Georgia Power
Spire Mississippi
State of Maryland – EmPOWER *
TVA

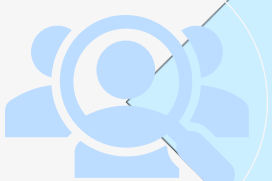
* **Two or more studies**

As of November 2022

- 60 potential studies in last 5 years
- Currently performing potential studies in New Mexico, Washington, Oregon, Idaho, Utah, Wyoming, California,, Michigan, Missouri, Maryland, and Washington DC

Study Objectives

There are 3 overarching objectives for the study

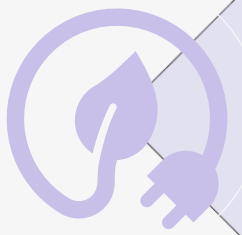


Incorporate Key Updates from the 2019 Study

- Incorporate results from the 2020 RASS that AEG completed with Itron
- Perform limited updates to the measure list

Develop New Projection of EE Potential

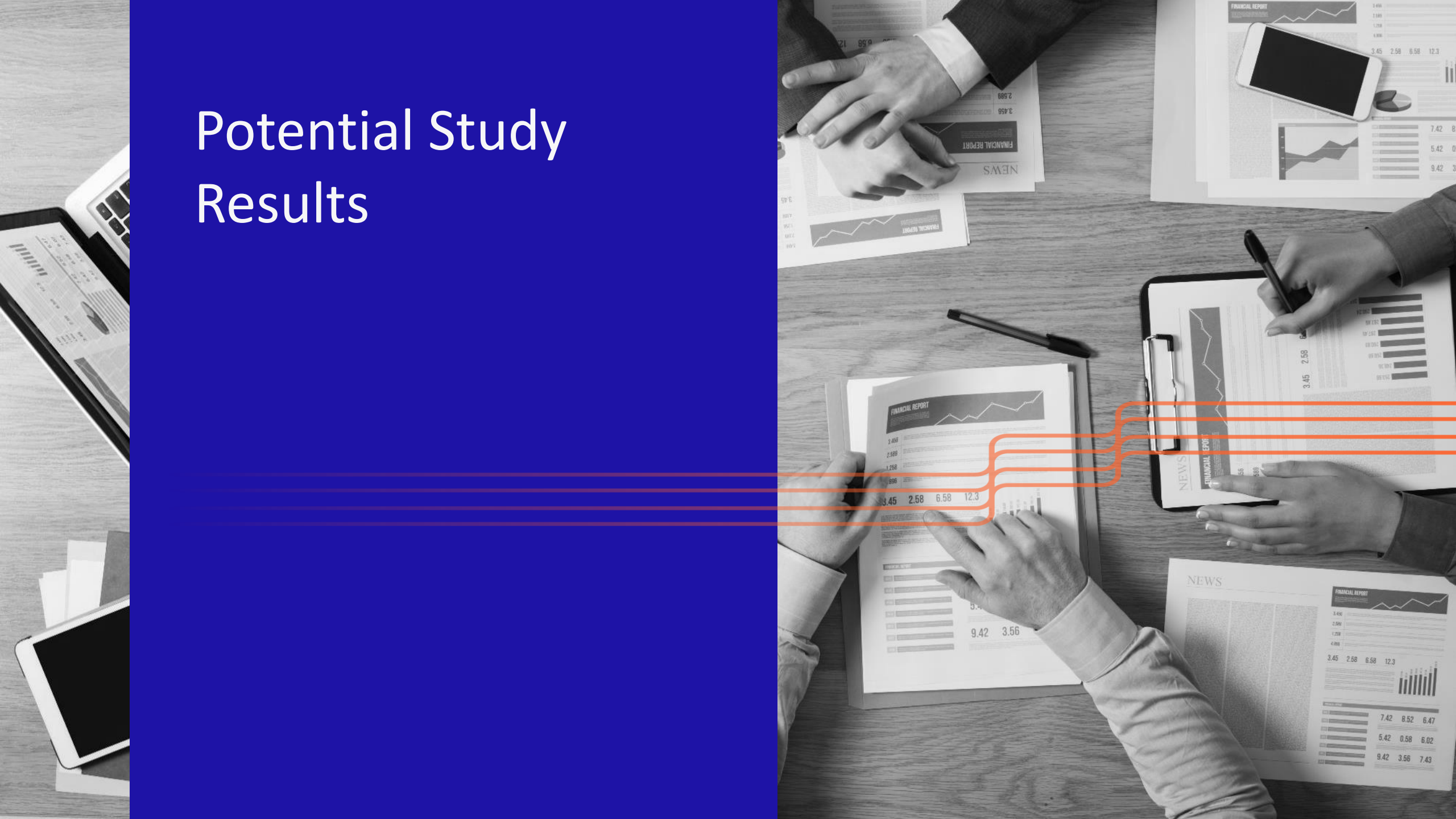
- Align with Itron's EE forecast and program scenarios
- Review long-term achievability assumptions
- Project technical, economic, and achievable EE potential through 2044



IRP Bundle Development

- Determine the "right" number of EE bundles based on the previous study
- Develop bundle cutoffs
- Supply finalized bundles in IRP format

Potential Study Results



Energy Efficiency Potential Approach

Market Characterization

- Customer segmentation
- Utility data
- Residential Surveys
- Secondary data

Identify and Characterize Measures

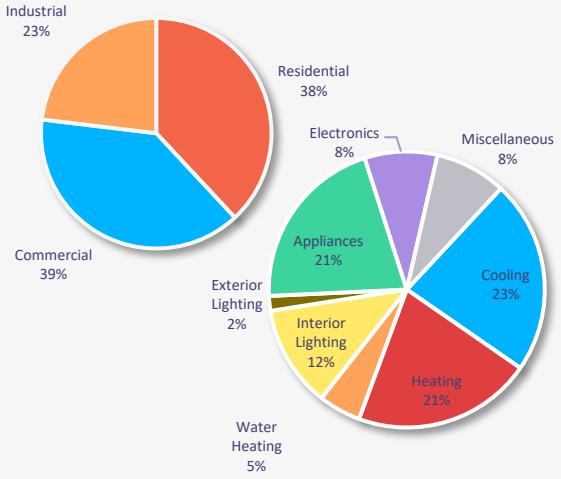
- Efficiency equipment
- Retrofit opportunities
- Emerging technologies

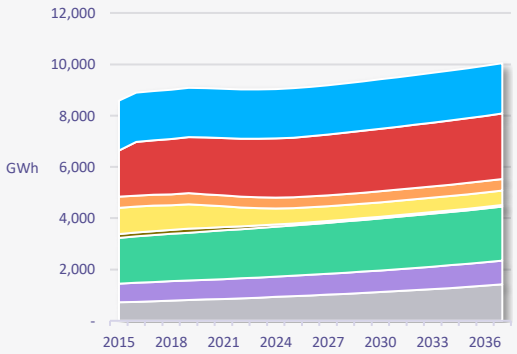
Baseline Projection

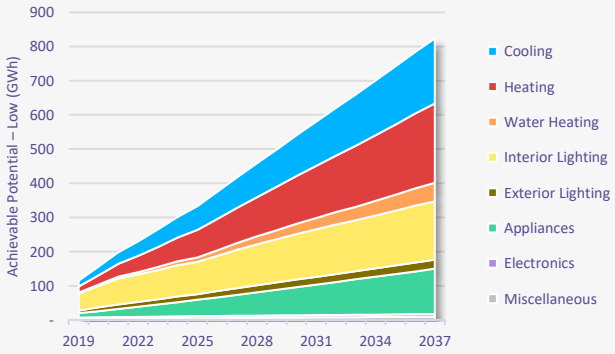
- Utility forecasts
- Stock turnover
- Codes and standards

Potential Estimation

- Technical , Economic, and Achievable
- Scenario representing current statutory goals





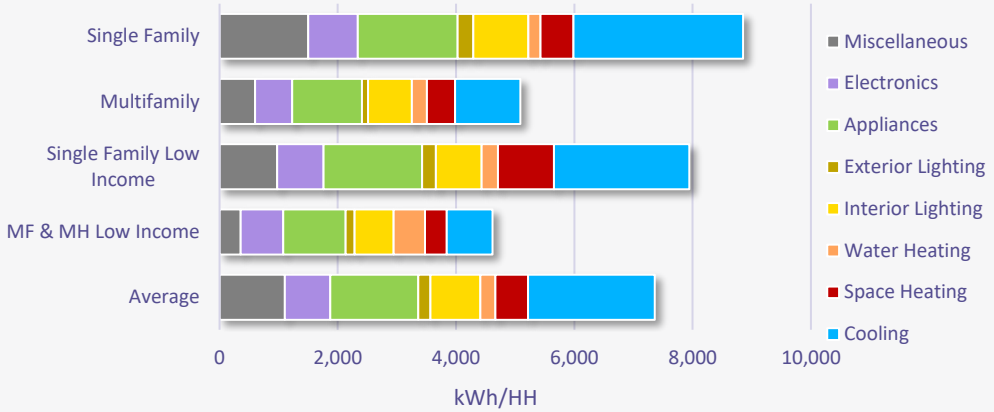


Market Characterization

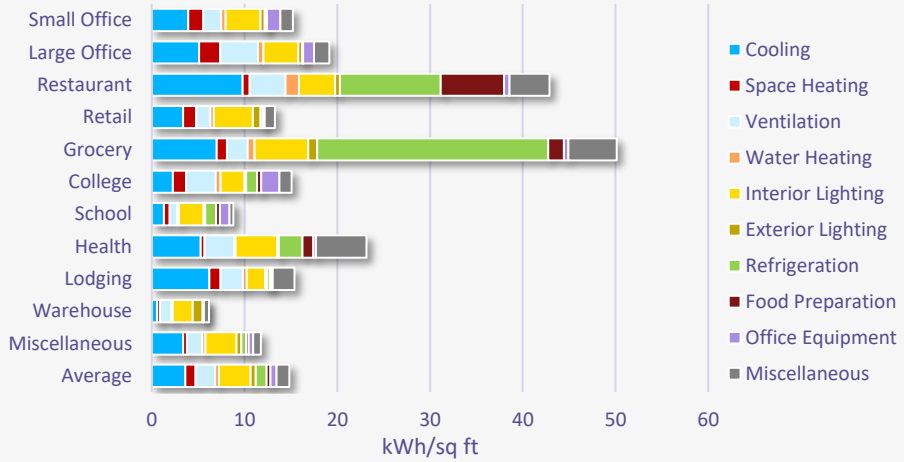
Key Elements and Drivers

- Market characterization is anchored to actual sales and customers in study base year (2021)
- Segment residential sector based on dwelling type and income
- Segment C&I sector by building type using SIC codes
- Fully characterize energy consumption by sector, segment, end-use, and technology
  - We call these “market profiles”
- **Market Profiles provide insight into baseline equipment and usage, bound technical potential, and establish eligibility to adopt EE measures**

Residential Market Characterization for 2021

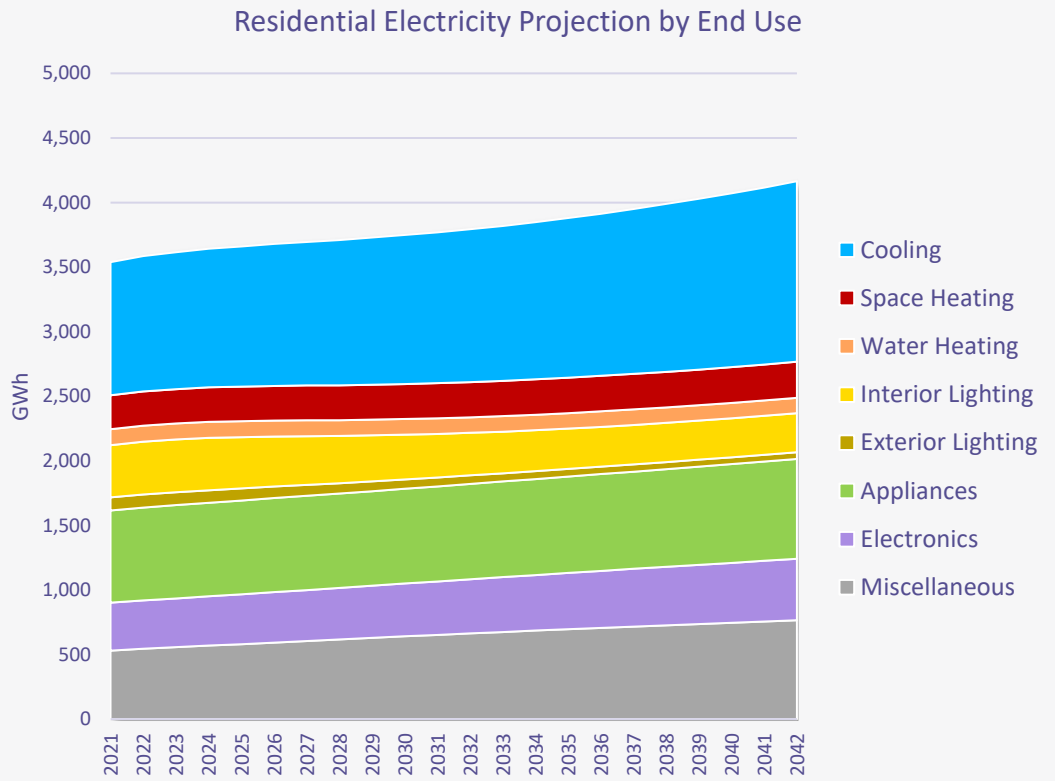


Commercial Market Characterization for 2021

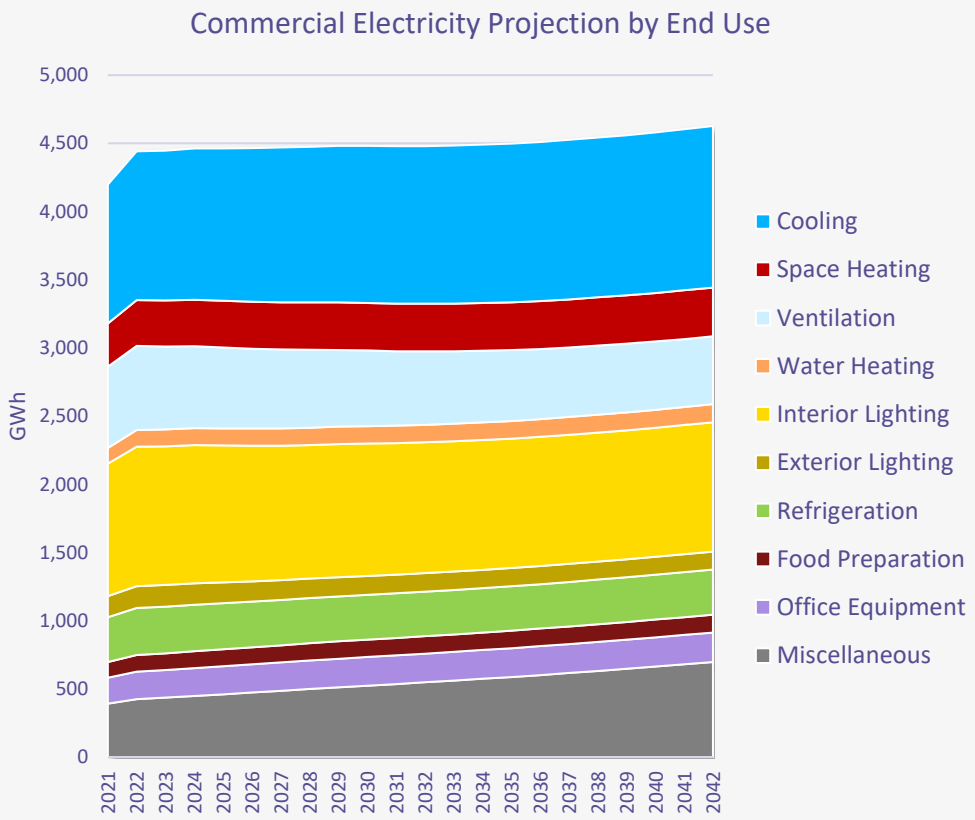


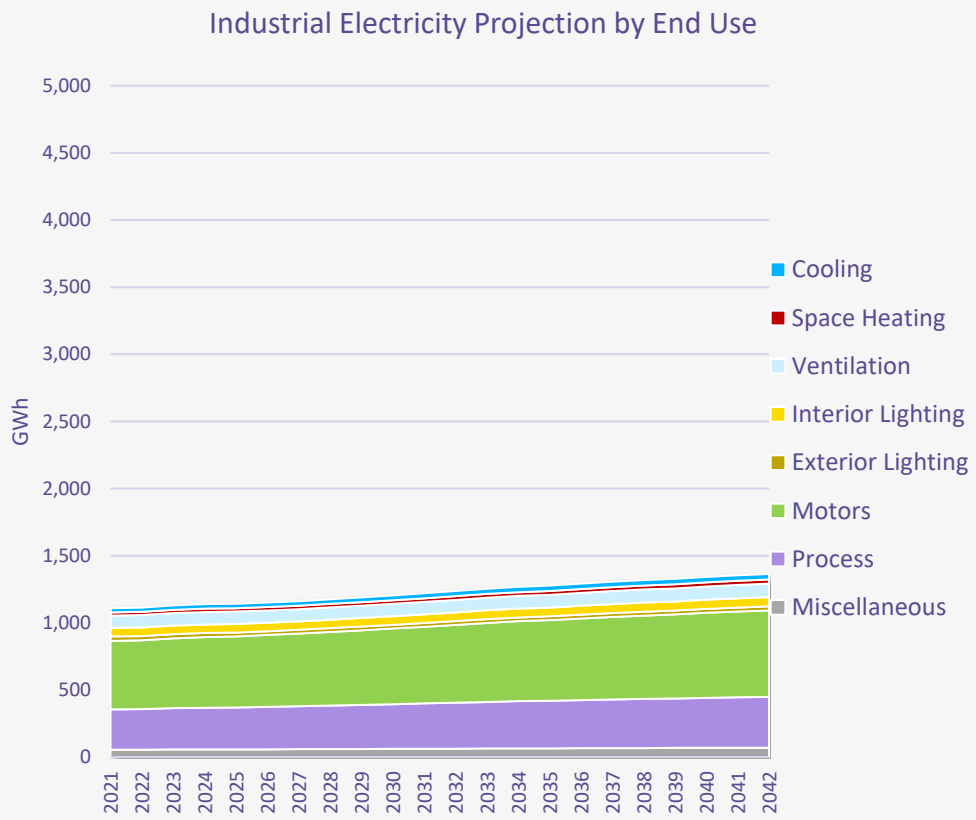
Residential Baseline Projection

- Projects end-use consumption in the absence of future program interventions
  - This is the basis from which potential is estimated
- Accounts for:
  - Differences by sector, and segment
  - Customer growth
  - Codes and standards **(including EISA lighting)**
  - Equipment turnover rates
  - Efficient measure penetration
  - Trends in equipment saturations



C&I Baseline Projection





Measure Identification and Characterization

Identify Universe of Measures

- Previous Study
- Current Programs
- Emerging Technology Literature
- AEG Databases
- Other Sources

Measure Screening

- Applicability to Sectors and Segments
- Codes and Standards
- Transformed Markets
- Unreliable Cost, Savings, or Availability

Measure Characterization

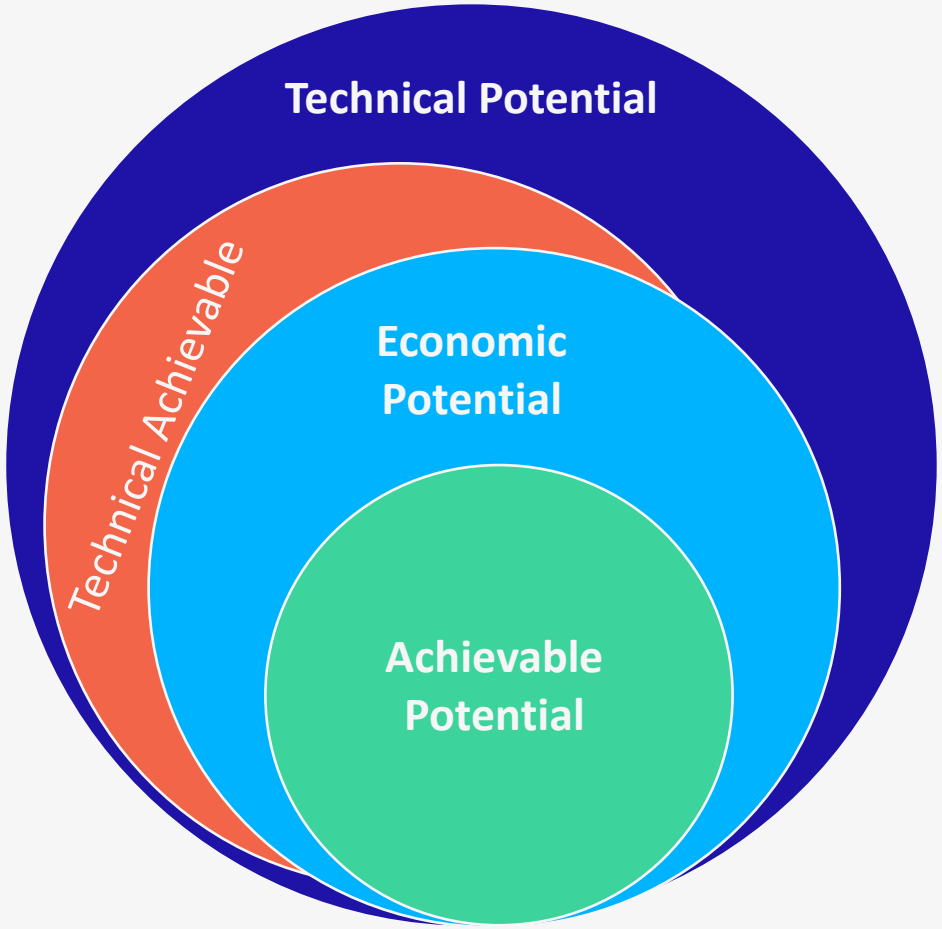
- Measure Source Hierarchy
- Fully Describe Measure Attributes
- Comparison to Previous Study Assumptions
- Documentation of Sources

Study Integration

- Energy Efficiency Potential
- Integrated Resource Planning

Estimating Energy Efficiency Potential

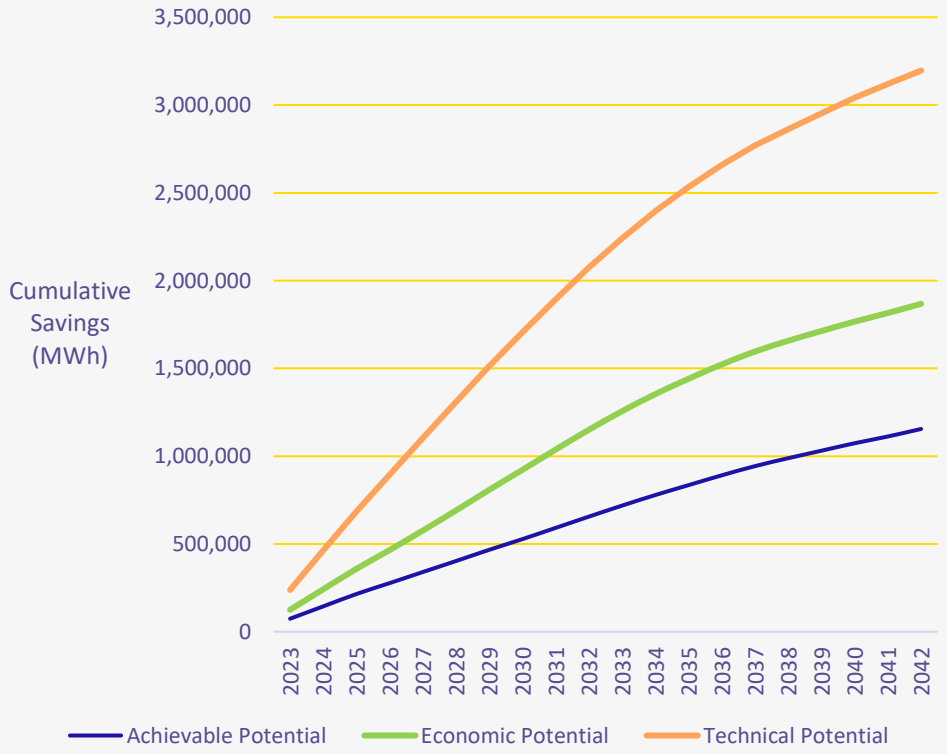
- Potential is estimated by creating an alternate sales forecast incorporating efficient measure adoption and calculating the change from the baseline
- AEG will calculate five distinct levels of potential:
  - Technical
  - Technical Achievable
  - Economic
  - Achievable
- AEG will also incorporate various scenarios that represent achievement of Statutory spending goals



Potential Summary for All Sectors

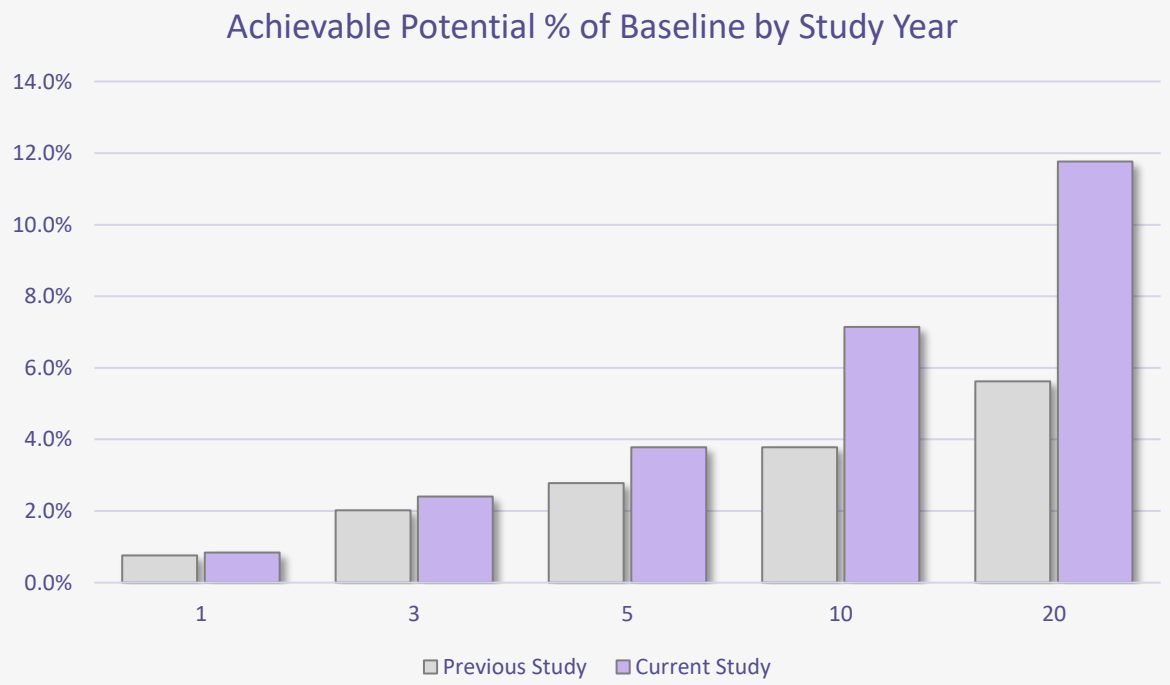
- Achievable Potential savings in the first year of 75 GWh, 0.8% of baseline usage.
- Achievable Potential savings reach 11.8% of baseline usage by 2042, an average of 0.6% annually
- 20-year Achievable Potential is 62% of Economic Potential

Summary of Energy Savings	2023	2025	2027	2032	2042
Baseline Projection (MWh)	8,917,779	8,981,490	9,026,886	9,192,373	9,819,602
Cumulative Savings (MWh)					
Achievable Potential	75,064	215,808	341,018	656,349	1,155,181
Economic Potential	126,169	359,266	577,575	1,150,697	1,867,135
Technical Potential	238,016	687,057	1,104,022	2,075,023	3,197,540
Energy Savings (% of Baseline)					
Achievable Potential	0.8%	2.4%	3.8%	7.1%	11.8%
Economic Potential	1.4%	4.0%	6.4%	12.5%	19.0%
Technical Potential	2.7%	7.6%	12.2%	22.6%	32.6%



Comparison to Previous Study

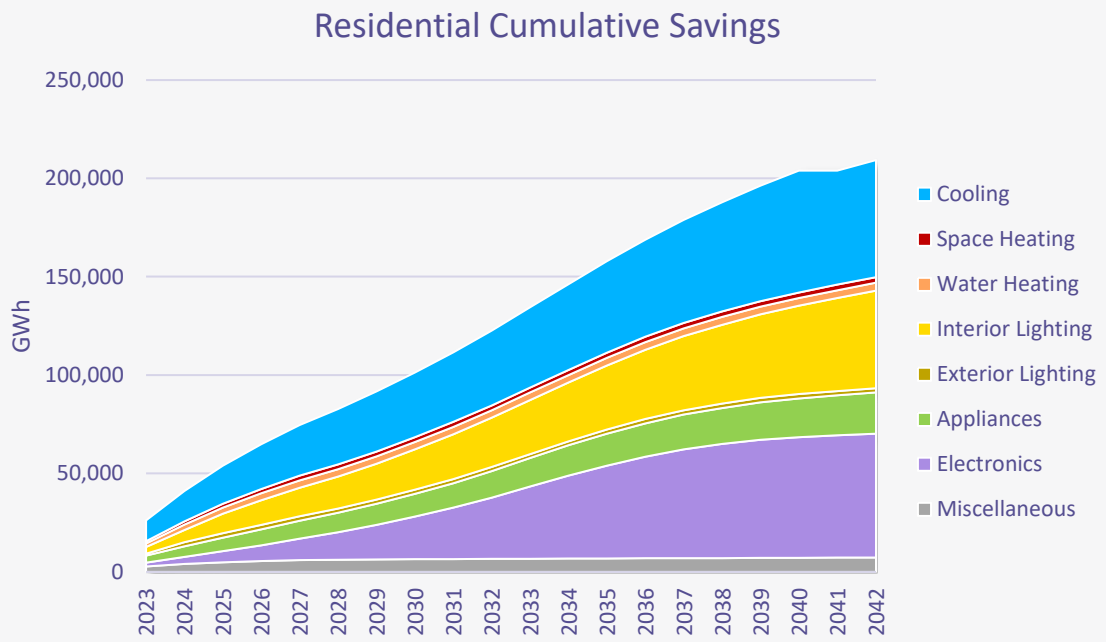
- In the short term, Achievable Potential savings are similar to the previous study
  - The previous study used a conservative growth rate for energy efficiency adoption, which was an average of 0.5% linear growth
- The current study incorporates adoption rates to diffuse savings based on an S-shaped curve
  - This reflects a measure's slow growth from early adopters, to an accelerated adoption rate once the measure reaches its technical maturity

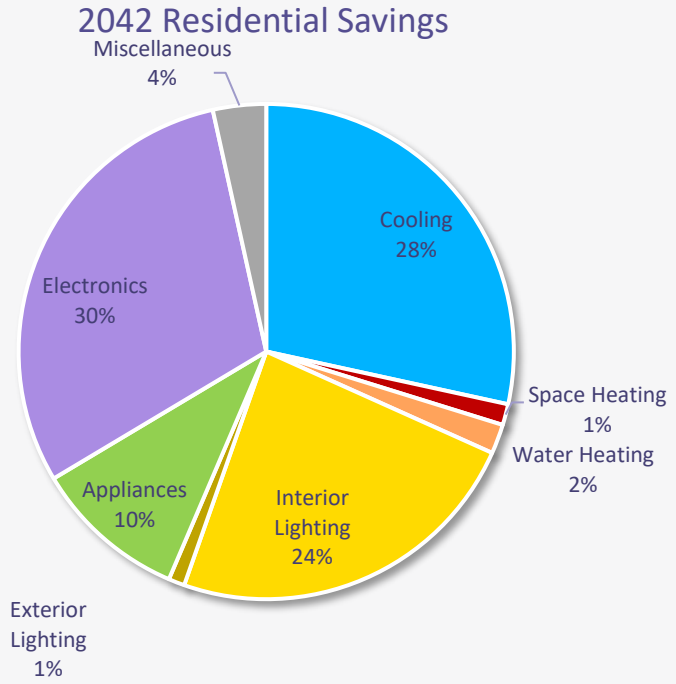


Residential Potential by End Use and Segment

Cumulative Achievable Potential in 2042

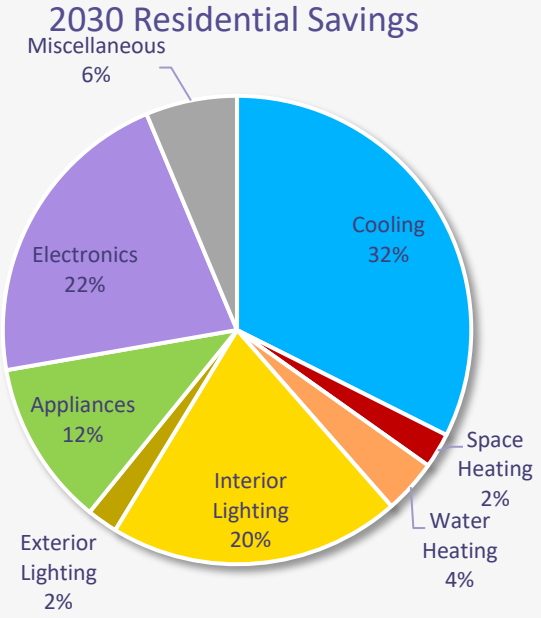
- By 2042, Electronics contribute that largest portion of savings, followed closely by Cooling and Lighting end use





Residential Top Measures – Achievable Potential

- Behavioral Programs provide the highest savings in 2030, followed by Central AC equipment replacements
- General Service Lighting potential is significantly lower than prior studies due to the implementation of the EISA backstop provision

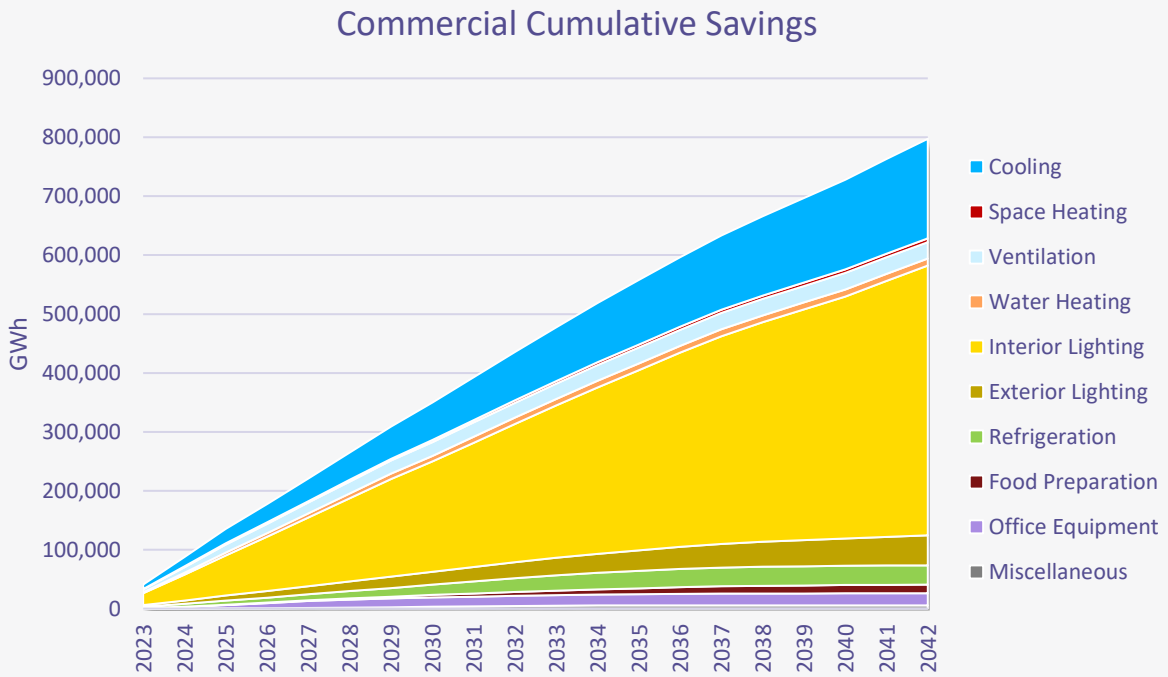


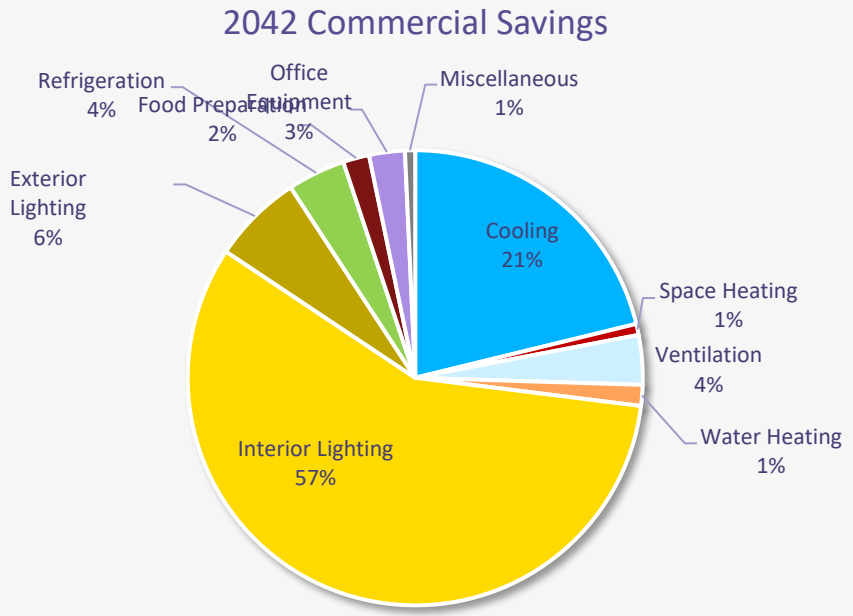
Rank	Measure	Achievable Potential in 2025	Achievable Potential in 2030	% of Total
1	Behavioral Programs	28,109	31,960	31.6%
2	Central AC	9,170	20,077	19.8%
3	Linear Lighting	2,758	12,681	12.5%
4	Set-top Boxes/DVR	836	7,571	7.5%
5	TVs	877	7,420	7.3%
6	General Service Lighting	5,547	6,367	6.3%
7	Clothes Dryer	1,170	4,520	4.5%
8	Personal Computers	718	2,625	2.6%
9	Air-Source Heat Pump	374	1,649	1.6%
10	Room AC - Recycling	1,303	1,356	1.3%
11	Water Heater - Pipe Insulation	1,069	1,276	1.3%
12	Water Heater - Tank Blanket/Insulation	1,025	1,161	1.1%
13	Laptops	183	401	0.4%
14	Pool Pump - Timer	120	384	0.4%
15	Second Refrigerator	52	331	0.3%
16	Exempted Lighting	266	309	0.3%
17	Printer/Fax/Copier	96	307	0.3%
18	Water Heater - Faucet Aerators	245	293	0.3%
19	Freezer	48	176	0.2%
20	Water Heater (> 55 Gal)	25	161	0.2%
	Total Top 20 Measures	**53,988**	**101,027**	**99.8%**
	Total Measures	**53,998**	**101,214**	**100.0%**

Commercial Potential by End Use and Segment

Cumulative Achievable Potential in 2042

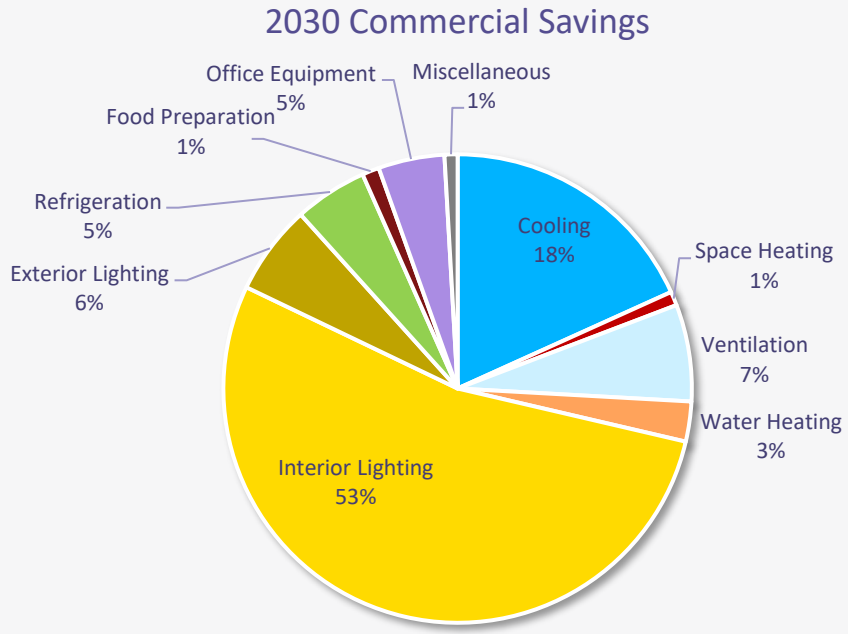
- Lighting represents the majority of savings in the Commercial sector, followed by the Cooling end use





Commercial Top Measures – Achievable Potential

- Linear and High-Bay Lighting continue to provide the most savings, including both lamps/fixtures and control technologies
- Significant additional cost-effective opportunities exist for retrocommissioning, ventilation, and efficient office equipment.



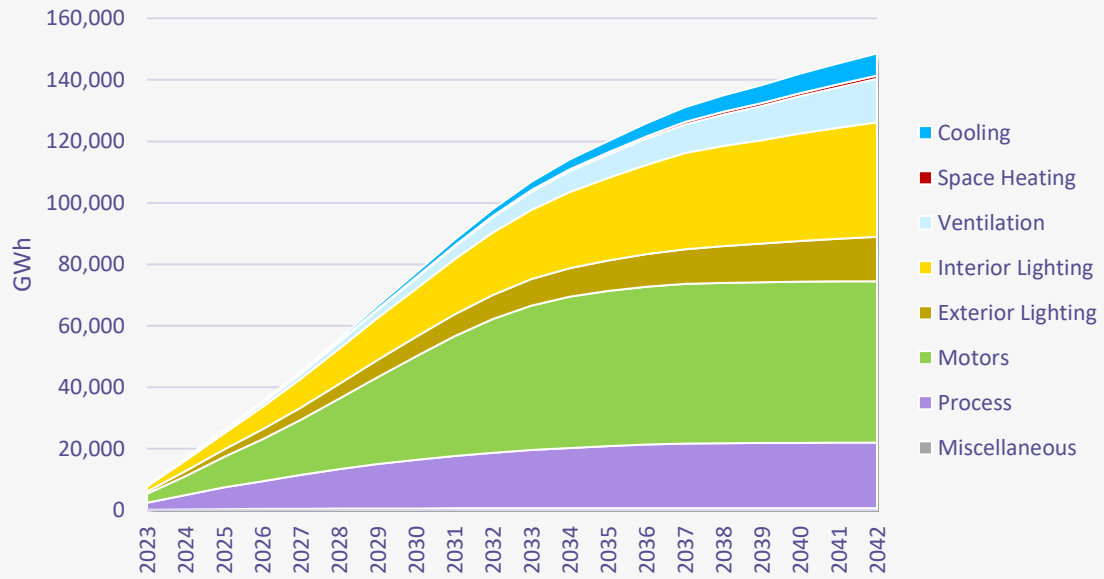
Rank	Measure	Achievable Potential in 2025	Achievable Potential in 2030	% of Total
1	Linear Lighting	53,296	159,134	45.5%
2	High-Bay Lighting	10,436	30,509	8.7%
3	Retrocommissioning	31,491	28,841	8.2%
4	Ventilation - Variable Speed Control	7,052	15,632	4.5%
5	Desktop Computer	4,621	12,785	3.7%
6	Water-Cooled Chiller - Condenser Temp Reset	3,633	9,395	2.7%
7	Water-Cooled Chiller	1,285	7,988	2.3%
8	RTU	876	7,269	2.1%
9	Ventilation - Nighttime Air Purge	1,591	6,304	1.8%
10	Water Heater - Pipe Insulation	2,059	4,977	1.4%
11	Water-Cooled Chiller - Var Flow Condenser Pump	1,823	4,643	1.3%
12	Area Lighting	1,405	4,089	1.2%
13	Refrigeration - Variable Speed Compressor	355	3,902	1.1%
14	Chiller - Variable Speed Fans	1,394	3,219	0.9%
15	Chiller - Variable Flow Chilled Water Pump	1,357	3,122	0.9%
16	Interior Lighting - Retrofit - Networked Lighting Controls	534	2,750	0.8%
17	Engine Block Heater Controls	428	2,672	0.8%
18	General Service Lighting	1,305	2,601	0.7%
19	Air-Source Heat Pump	316	2,575	0.7%
20	Ducting - Repair and Sealing	243	2,547	0.7%
	Total Top 20 Measures	**125,500**	**314,953**	**90.0%**
	Total Measures	**135,503**	**349,987**	**100.0%**

Industrial Potential by End Use and Segment

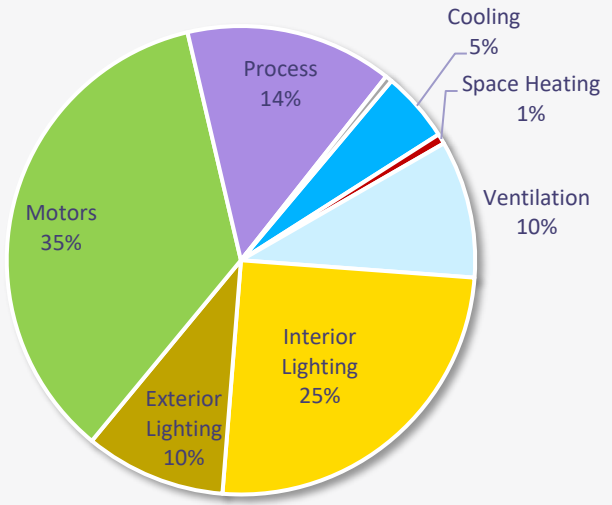
Cumulative Achievable Potential in 2042

- Savings in the motors end use are made up of pump and fan controls, as well as Compressed Air measures
- Process end use savings come from Refrigeration optimization measures such as High Efficiency Compressors and Floating Head Pressure
- Lighting savings in this sector come from conversion of High-Bay Lighting to LEDs

Industrial Cumulative Savings



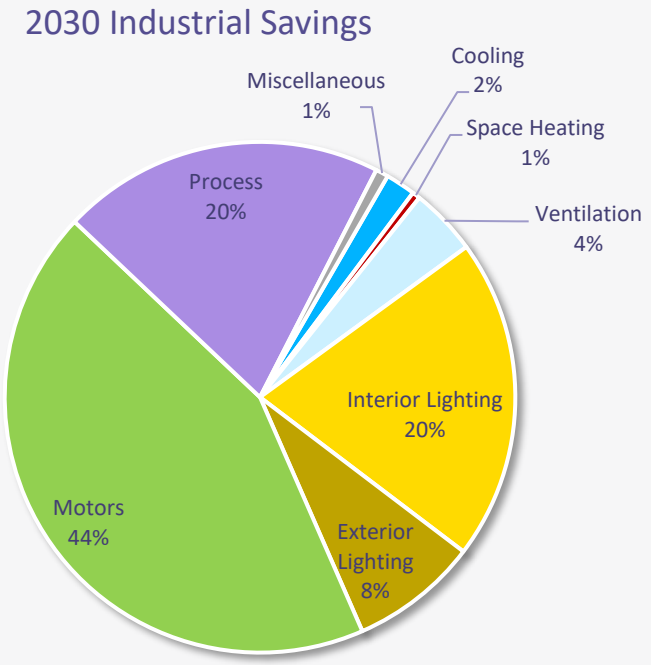
2042 Industrial Savings



Industrial Top Measures – Achievable Potential

Industrial Sector

- Linear and High-Bay includes savings incorporate lighting control technologies



Rank	Measure	Achievable Potential in 2025	Achievable Potential in 2030	% of Total
1	Linear Lighting	3,522	11,241	14.6%
2	High-Bay Lighting	2,738	8,482	11.0%
3	Strategic Energy Management	3,302	7,725	10.0%
4	Pumping System - Controls	1,765	7,188	9.3%
5	Refrigeration - Floating Head Pressure	2,081	5,083	6.6%
6	Fan System - Controls	1,167	4,802	6.2%
7	Refrigeration - High Efficiency Compressor	1,483	3,643	4.7%
8	Retrocommissioning	3,747	3,567	4.6%
9	Switch from Belt Drive to Direct Drive	844	3,380	4.4%
10	Refrigeration - System Optimization	1,242	3,004	3.9%
11	Compressed Air - End Use Optimization	703	2,875	3.7%
12	Fan System - Equipment Upgrade	629	2,610	3.4%
13	Material Handling - Variable Speed Drive	609	2,452	3.2%
14	Ventilation	276	2,385	3.1%
15	Compressed Air - Variable Speed Drive	100	1,181	1.5%
16	Exterior Lighting - Retrofit - Enhanced Controls	507	966	1.3%
17	Pumping System - Variable Speed Drive	234	941	1.2%
18	Fan System - Variable Speed Drive	206	848	1.1%
19	Process - Tank Insulation	53	595	0.8%
20	Pumping System - Equipment Upgrade	140	561	0.7%
	Total Top 20 Measures	**25,348**	**73,527**	**95.3%**
	Total Measures	**26,306**	**77,135**	**100.0%**

IRP Inputs


FINANCIAL REPORT
NEWS
3.45 2.58 6.58 12.3
9.42 3.56
7.42 8.52 6.47
5.42 0.58 6.02
9.42 3.56 7.43

Modeling Energy Efficiency Potential within the IRP

The EE Potential Assessment identifies the EE opportunities in PNM's service territory through 2042

Energy efficiency measures can be considered on par with supply-side resources based on their availability, hourly impacts, cost, and life.

- Program potential is the best representation of energy efficiency's likely effect on loads and resource needs, however:
  - HB 291 savings targets only run through 2025 with guidance to establish targets through 2029
  - The 2023-2025 EE Program Potential is already screened for cost-effectiveness, so does not allow the IRP to consider higher-cost energy efficiency measures based on changing resource needs

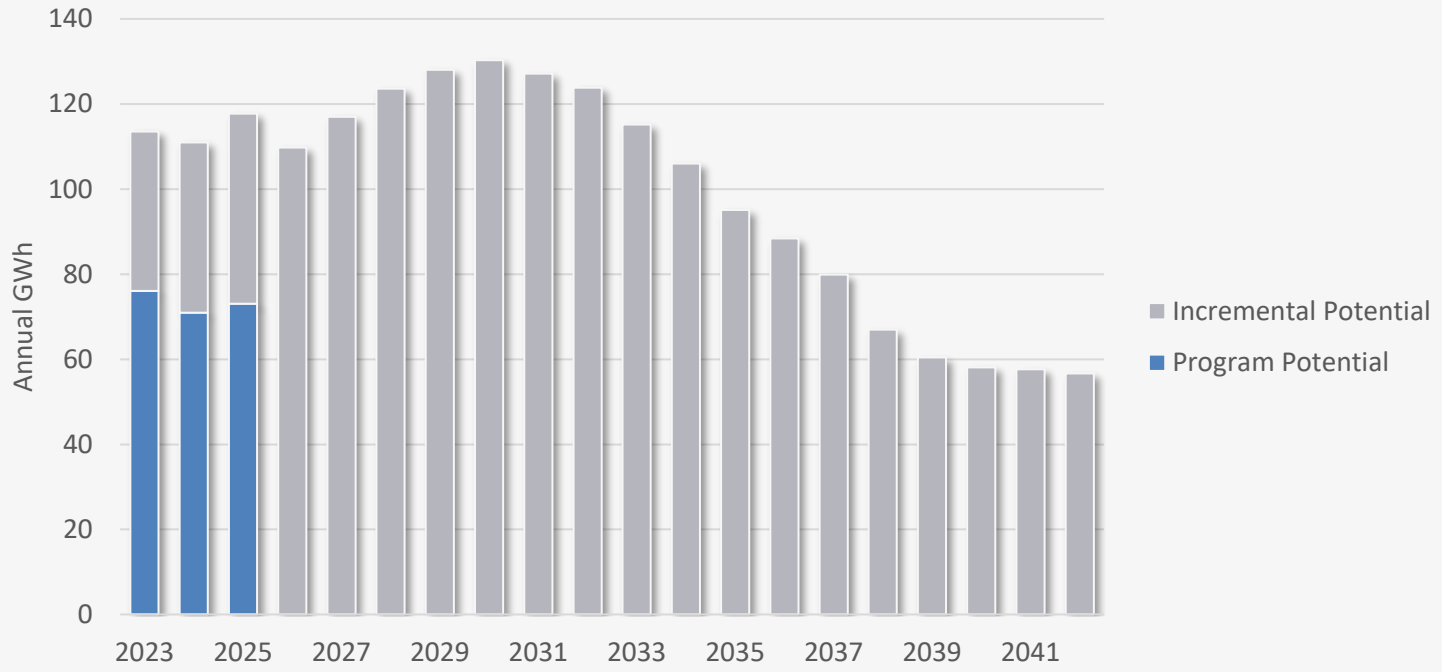
To enable modeling energy efficiency as a resource within the IRP, AEG developed hourly supply curves representing program potential and additional opportunities not deemed cost-effective within the potential study

AEG Supply Curve Bundling Methodology

Step 1: Calculate "achievable technical" potential, incorporating achievability rates, but not cost-effectiveness screening.

Step 2. Identify measure-level incremental potential beyond statutory goals

- **2023 – 2025:** Incremental Potential = Achievable Technical − Program Potenital
- **2026 – 2040:** Incremental Potential = Achievable Technical



AEG Supply Curve Bundling Methodology (Continued)

Step 3. Define bundles based on levelized cost of conserved energy. Levelized costs are in 2021$

Step 4. Match energy efficiency measures to resource bundles and calibrated load shapes.

- AEG assigned each measure in the potential study to a bundle in each year based on
  - a) whether it was included in the program potential, and
  - b) its levelized cost.
- Each measure was similarly matched to a calibrated load shape by building type and end use.

Step 5. Calculate annual incremental energy savings and weighted average cost and measure life for each bundle based on included measures.

Step 6. Develop hourly impacts for each bundle by spreading measure-level impacts over calibrated end use load shapes

Updated Bundle Breakpoints

Updated bundling scheme groups more low-cost measures together and provides additional granularity in the cost range that is likely to be more marginal within the IRP model

Previous Study

Statutory Period 2021-2025	Post-Statutory Period 2026-2040
Program Potential	n/a
Up to $50/MWh[1]	Up to $5/MWh
	$5/MWh to $15/MWh
	$15/MWh to $25/MWh
	$25/MWh to $35/MWh
	$35/MWh to $50/MWh
Over $50/MWh	Over $50/MWh

Initial Current Study

Statutory Period 2023-2025	Post-Statutory Period 2026-2042
Program Potential	Program Potential
Up to $50	Up to $50
$50 and Up	$50 to $75
	$75 to $100
	$100 to $125
	$125 to $150
	$150 and Up

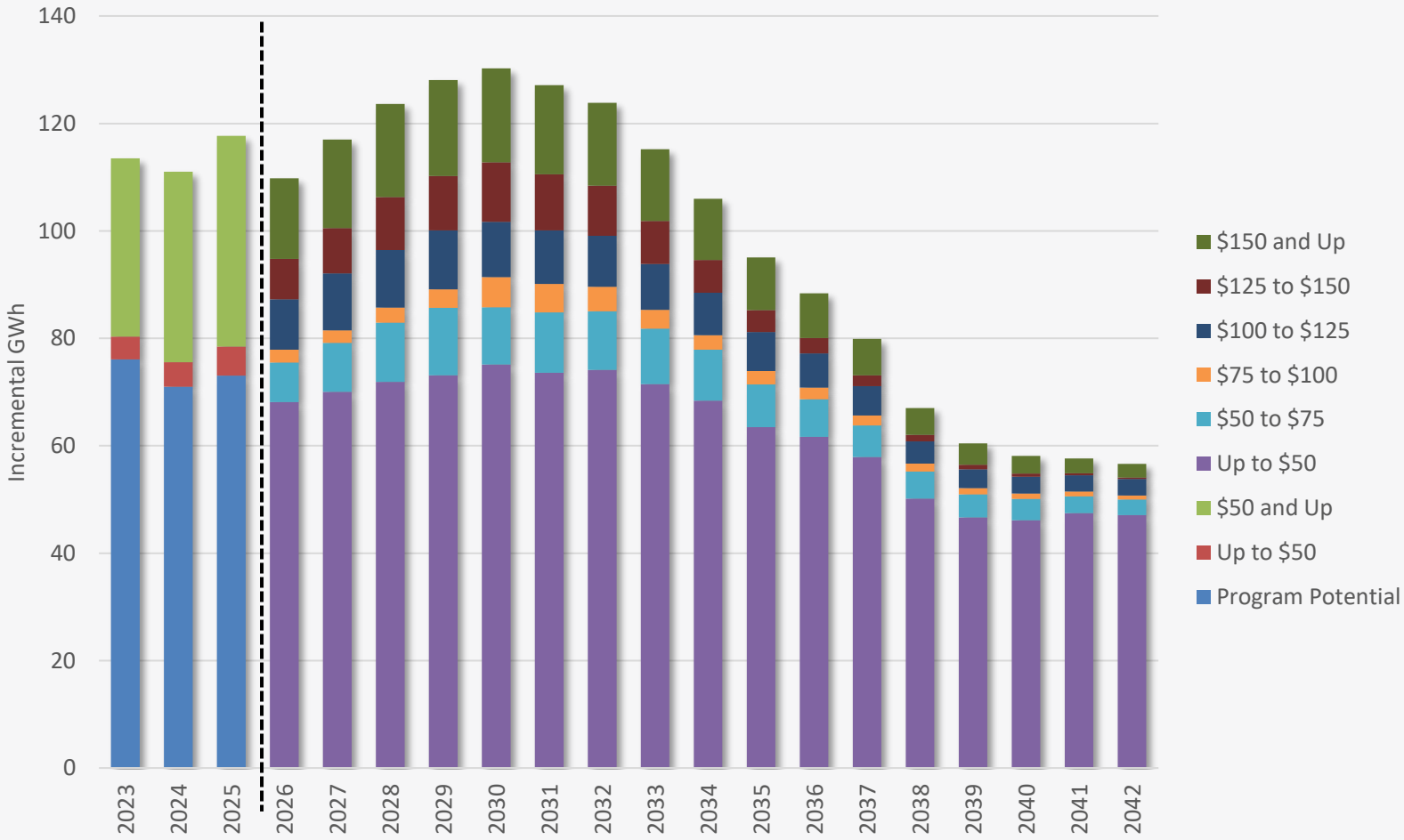
Annual Incremental Energy Savings per Bundle

2023-2025

- In 2023 – 2025 the average cost of the program bundle is $17/MWh.
- Capturing almost all the potential up to $50

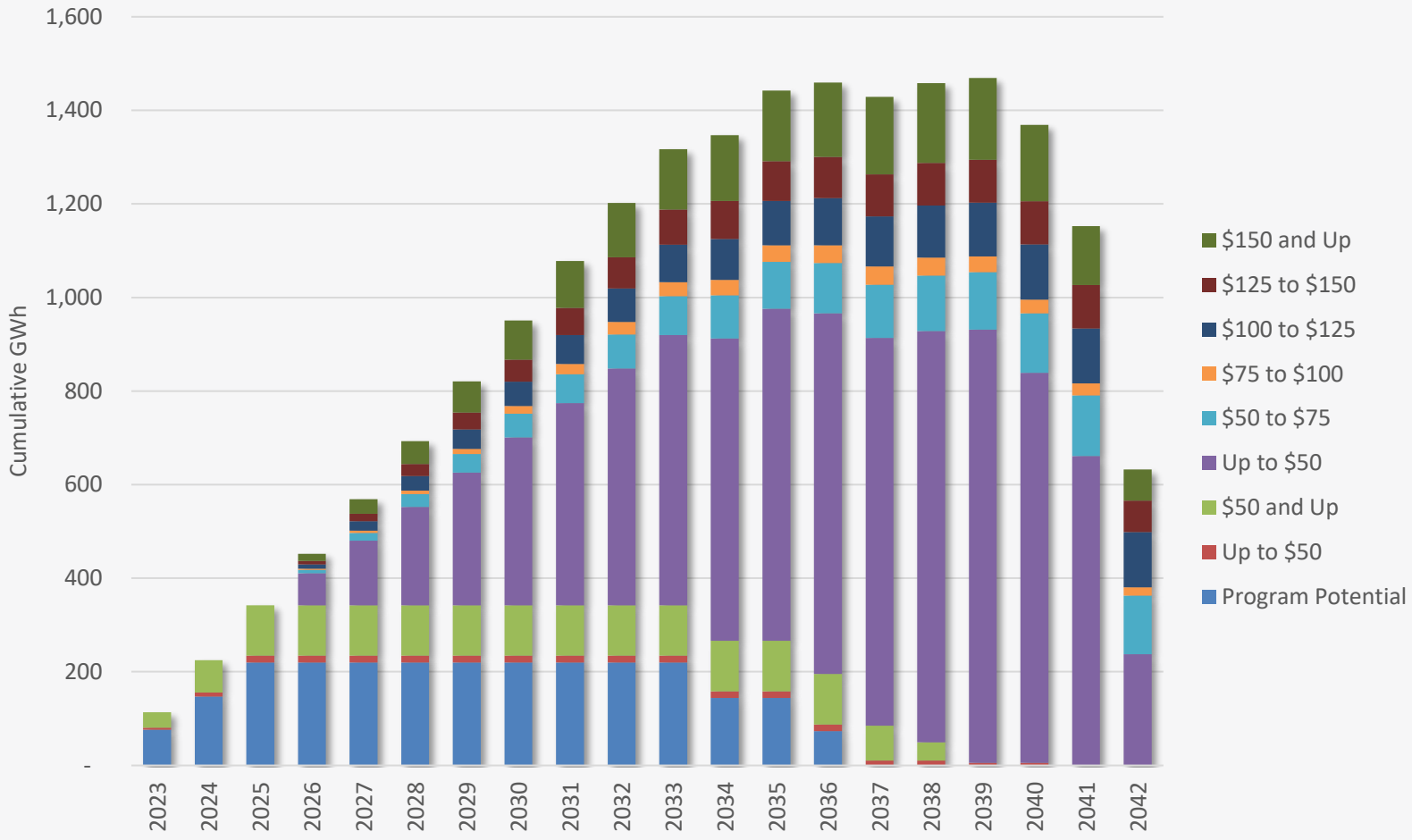
2026-2042

- Most of the potential still falls in the “up to $50” bundle, especially in the out years
- The more expensive buckets are primarily made up of HVAC & more expensive lighting measures
- After 2036, as we approach market saturation, incremental installations and savings begin to level off or decrease relative to previous years



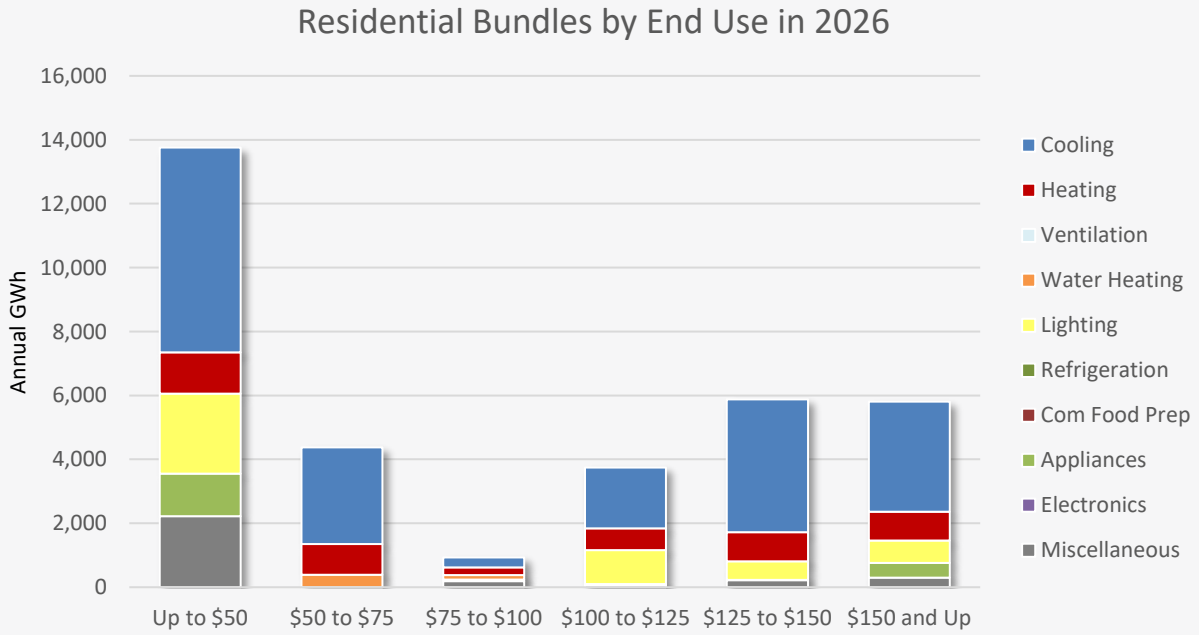
Cumulative GWh by Bundle

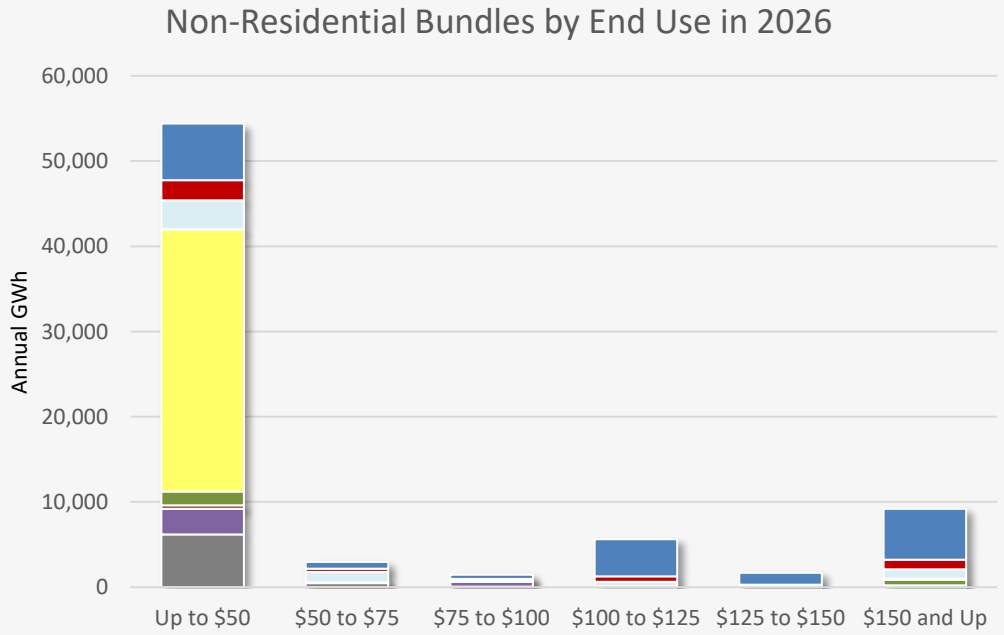
Cumulative Savings by average measure life in each bundle.



Bundles by End Use

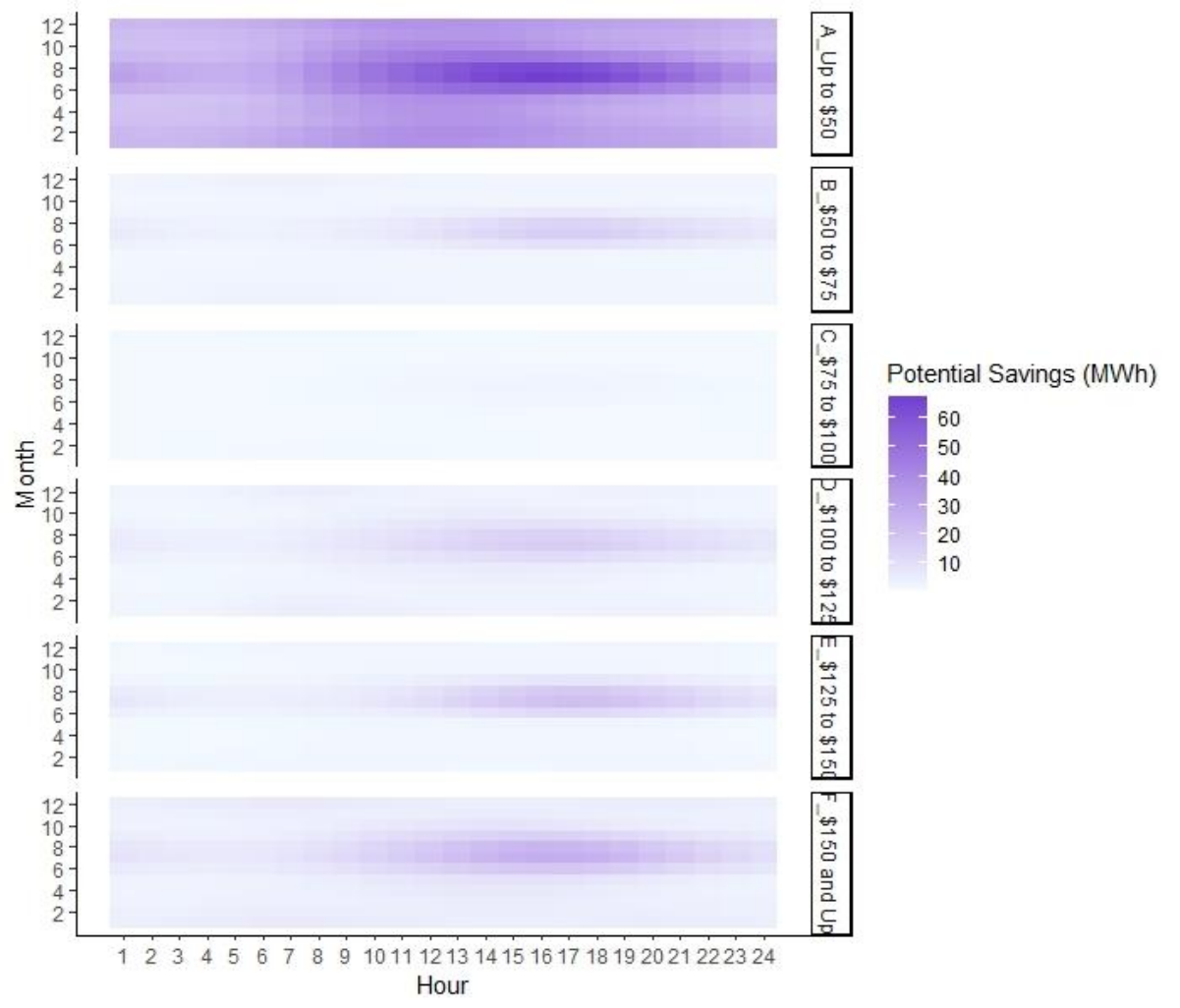
- Majority of savings fall into the “Up to $50” bundle
  - Correlates to the Program bundle from the 2023-2025 Statutory period
- Residential lighting savings are a smaller portion of savings than in previous study due to new EISA backstop provision
  - Non-Residential lighting savings come LED replacements for Linear Lighting and High-Bay Lighting



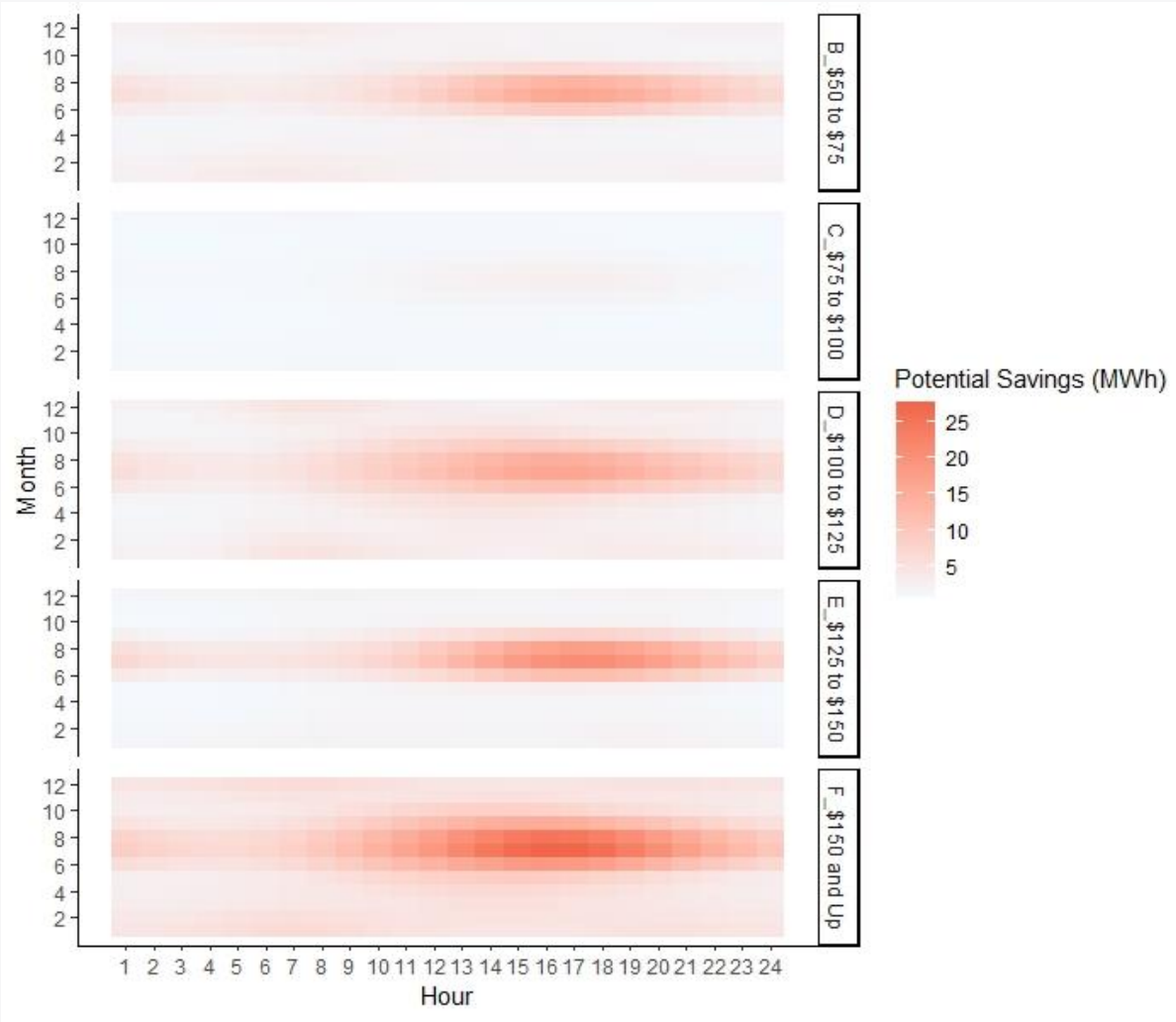


2026 Hourly Savings by Bundle

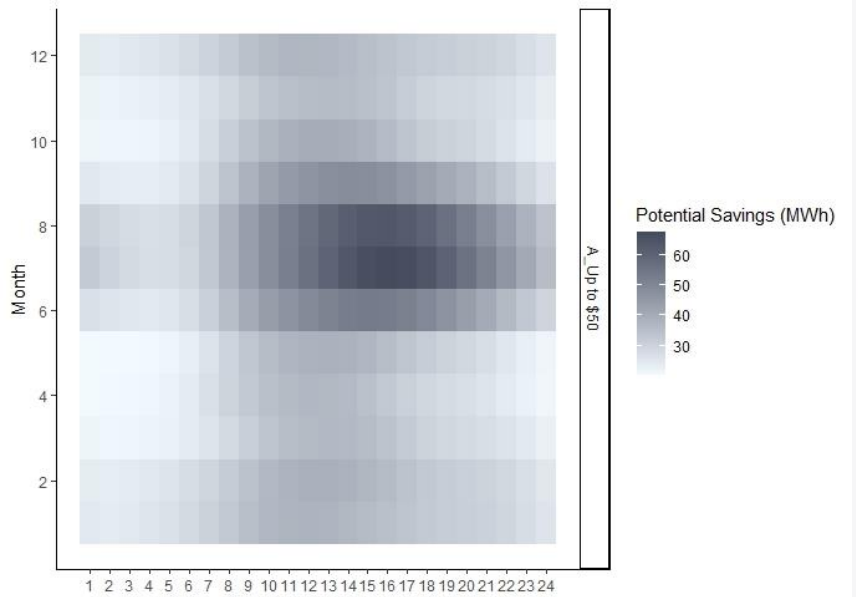
All Bundles

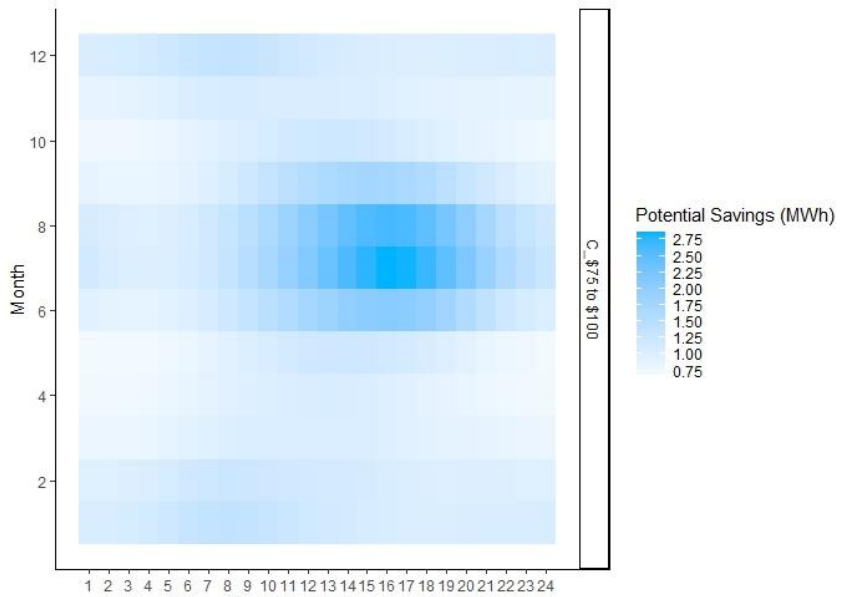


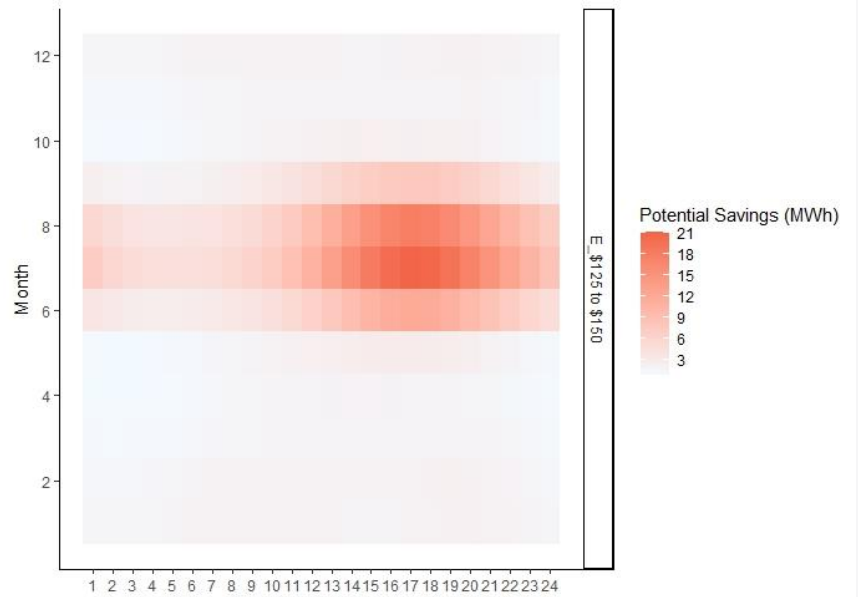
Excluding "$Up to 50" Bundle

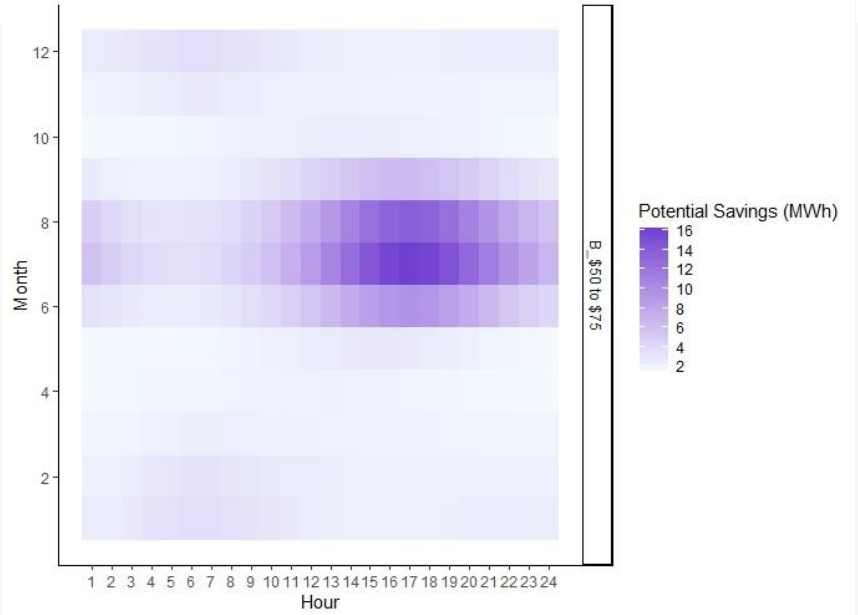


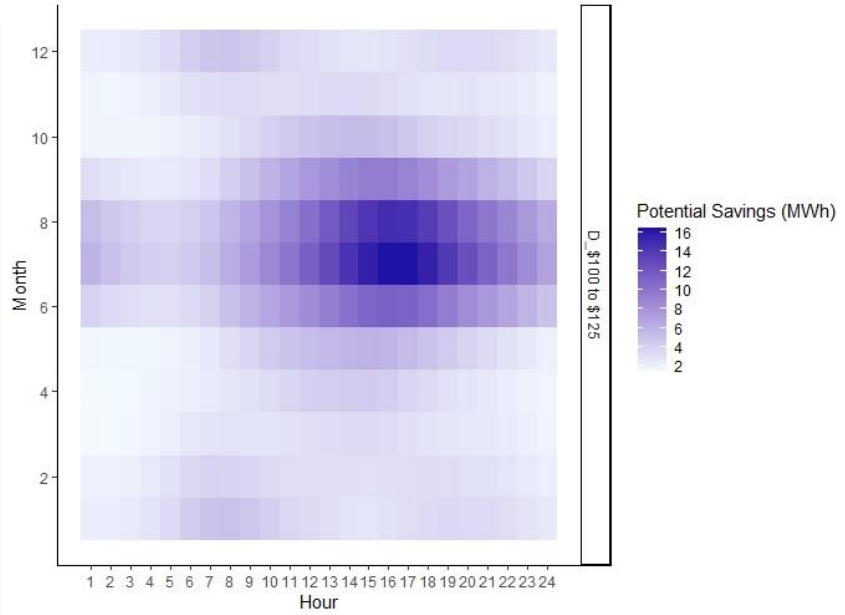
2026 Hourly Savings by Bundle

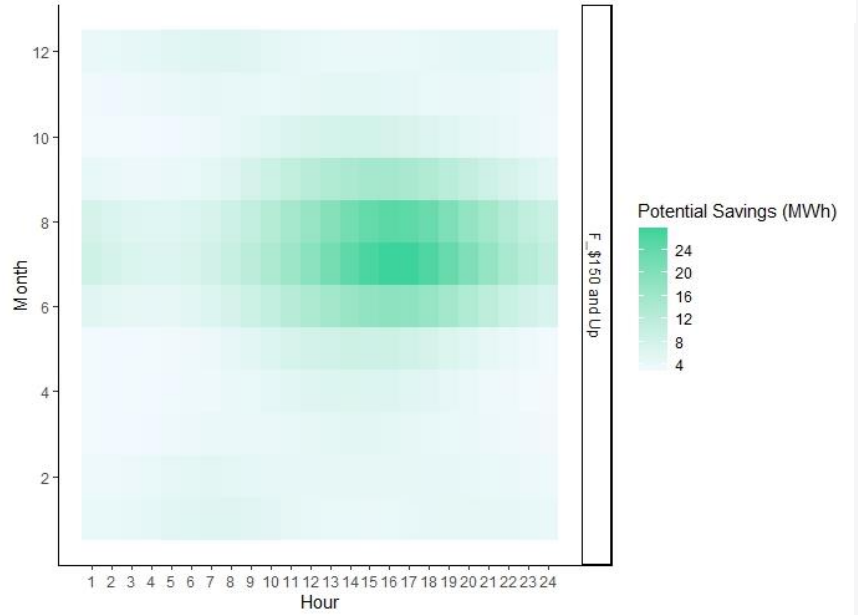




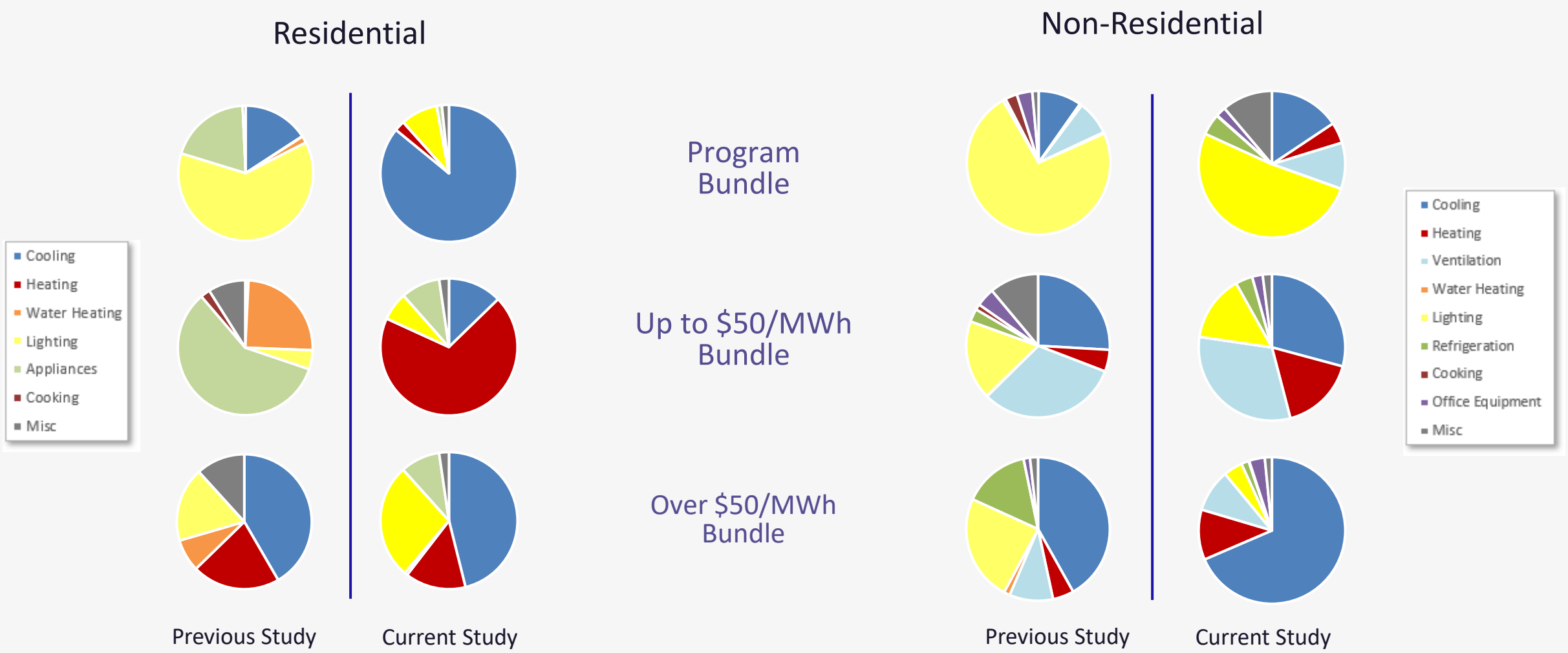








Comparison to Previous Study



Comments or Questions?

Thank You.

Phone: 631-434-1414

AEG
APPLIED ENERGY GROUP

PNM Energy Efficiency – Program Highlights

RESIDENTIAL PROGRAMS

- Cooling:
  - A/C tune-up
  - “Midstream” (distributor and HVAC contractor incentives)
- Home Energy Checkups (Assessment, DI measure Installation and rebates)
- Refrigerator Recycling
- Residential Retail Products (non-lighting and lighting measures)
- New Home Construction (builder incentives)
- Home Energy Reports behavioral program
- School Education Kit programs (targeting 5th grade and high school students)
- Income Qualified programs:
  - IQ Home Energy Checkup (Assessment, DI measure installation, free refrigerator replacement if eligible)
  - NM Mortgage Finance Authority (weatherization and retrofit)
  - Easy Savings mailed “kit” (self-install lighting, weatherization measures, etc.)

COMMERCIAL PROGRAMS

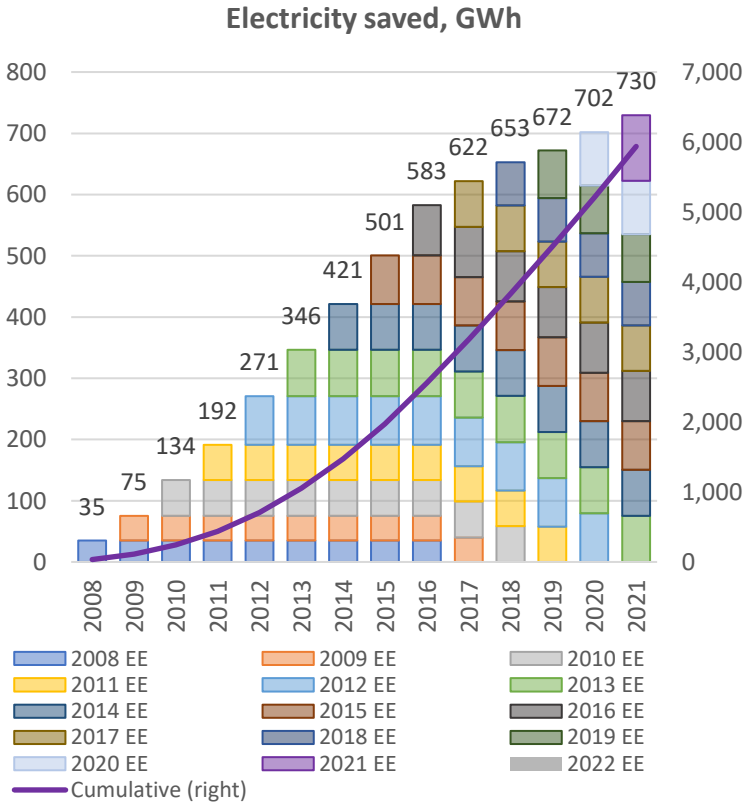
- Small Commercial Direct Install
- New Construction (offering incentives for installing/designing more efficient construction) than code standards
- Building retrofits
    - Rebates for specific measures
        - Lighting
        - Cooling
        - Custom measures
- “Midstream” offering equipment distributors incentives for measures such as cooling, cooking, lighting, etc.
- Strategic Energy Management Behavioral Program

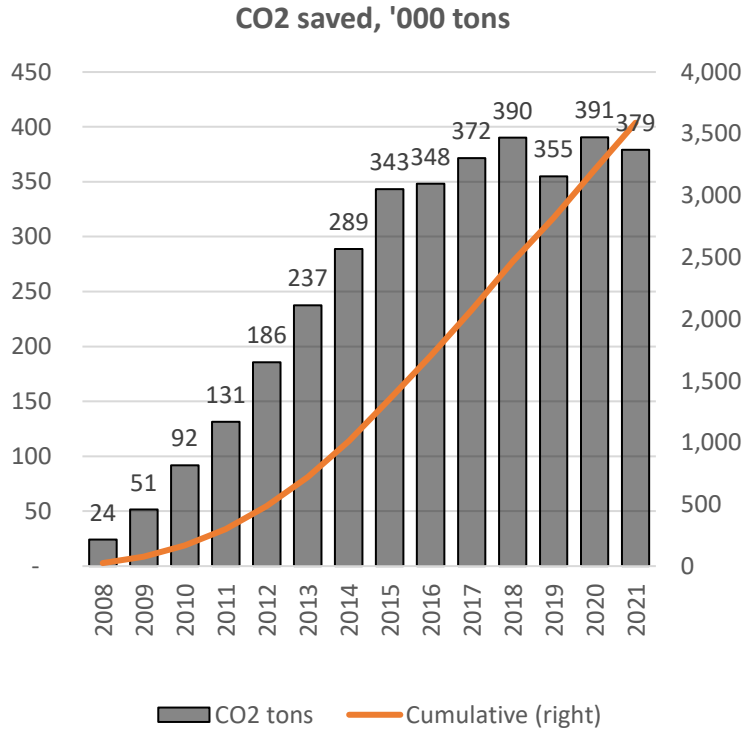
DEMAND RESPONSE

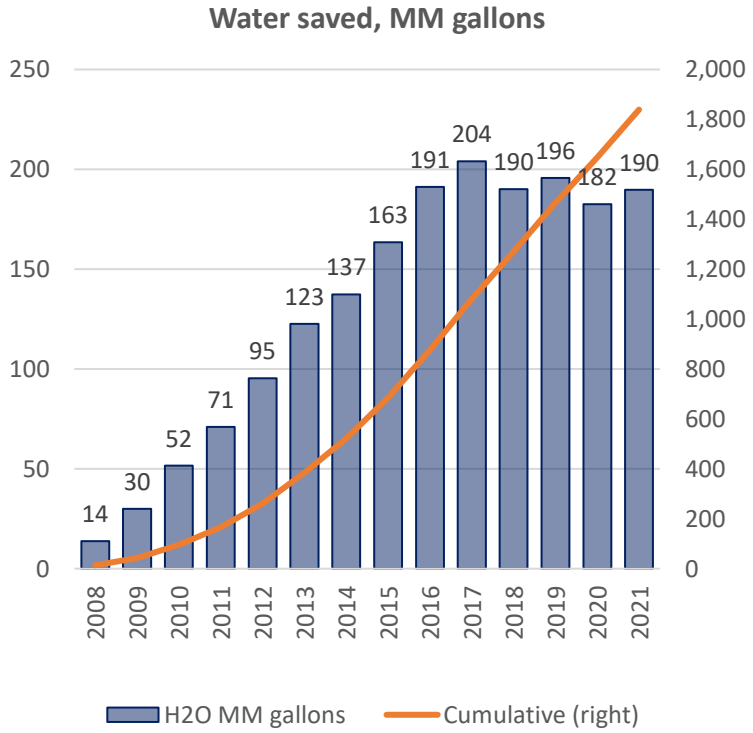
- PNM's demand response (DR) programs were first offered to customers in 2007
- Over the last 12 years, Power Saver and Peak Saver have developed into a reliable and cost effective alternative peaking resource
- The programs deliver about 55 MW of non-spinning reserve capacity during the four summer months of June – September

EE SAVINGS AND ACHIEVEMENTS

- PNM began offering Energy Efficiency programs in late 2007
- Currently on track to achieve 2025 EUEA savings goal







PNM Resource Adequacy Near Final Results Stakeholder Meeting

Astrapé Consulting

January 17, 2023

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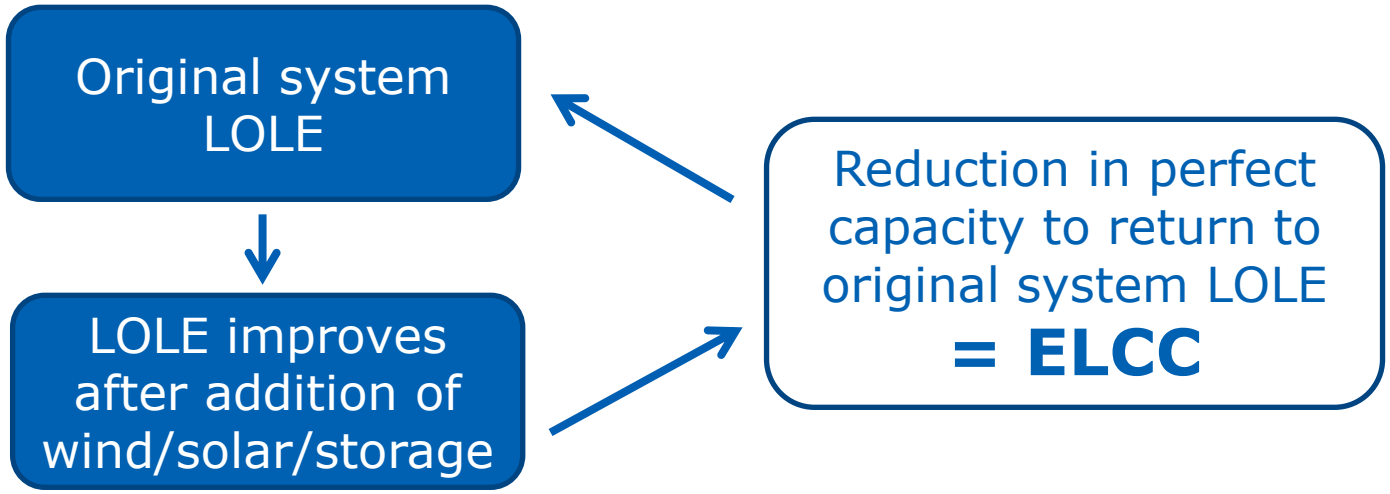
Future Resource ELCC Analysis Update

Defining ELCC

- Effective load carrying capability (ELCC) is the quantity of 'perfect capacity' that could be replaced or avoided with wind, solar, storage, etc. while providing equivalent system reliability



- ELCC is the most rigorous method for calculating qualifying capacity of energy-limited resources (solar, wind, storage, etc.)

Key Assumptions

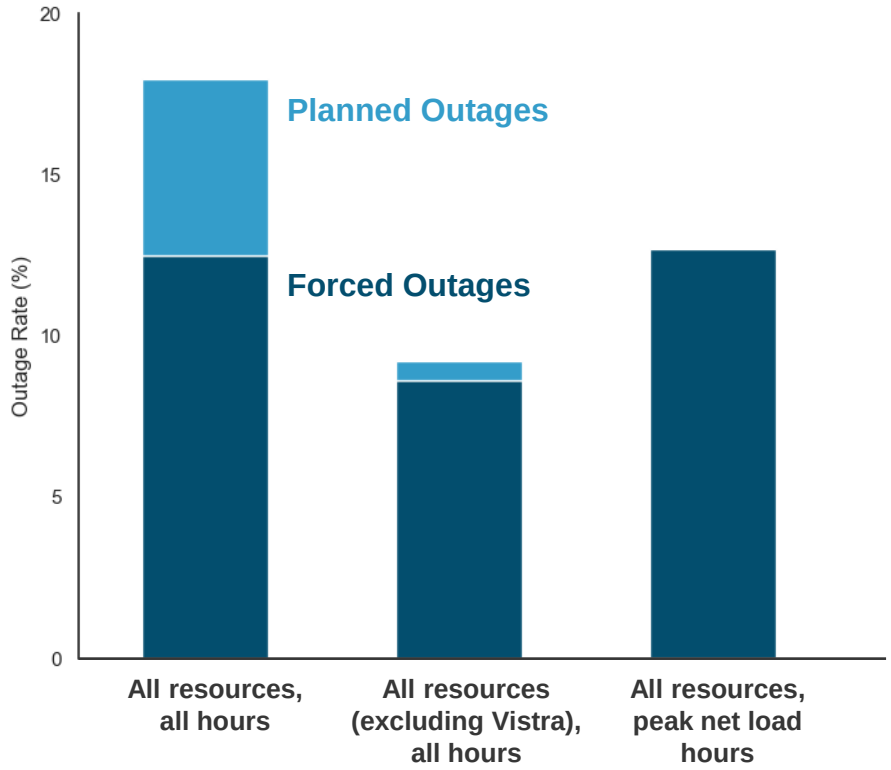
- **Neighbor Assumptions**
  - Based on recent SW E3 study data
  - Public ERP and IRP data for PSCO and SPS
  - 50 MW import limit during peak periods
  - Impacts PNM existing solar accreditation
- **2025 storage, wind, and solar assumptions**
  - 650 MW of battery
  - 607 MW of Wind
  - 1,531 MW of Solar
- **Battery Outage Rates – modeled at 92% availability**
  - Based on E3 study of California battery operation

Utility-Scale Battery Outage Rates in California

+ **Over the past year, installed capacity of energy storage on CAISO system has increased from approximately 2 to 4 GW**
  - Daily outage reports published by CAISO provide insight into how often those resources have been available to serve loads
+ **Outage data from Oct 1, 2021 - Sept 30, 2022 analyzed under three filters:**
  - **All resources, all hours:** how has the entire CAISO storage fleet performed over the past year?
  - **All resources (excluding Vistra), all hours:** to what extent does the large extended outage at the Vistra facility affect the numbers?
  - **All resources, peak net load hours:** how well have storage resources performed during the most critical periods for reliability?
+ **Preliminary takeaways from the data:**
  - Operational data set is still small enough that outliers can significantly skew results
  - Roughly 10% of storage capacity has consistently been offline due to forced outages (excluding Vistra from sample)
  - During the tightest periods on the grid, planned outages are limited, but forced outage rates for storage facilities have approached 15%

Planned and Forced Outage Rates Observed Among CAISO Energy Storage Resources

Oct 1, 2021 – Sept 30, 2022



Notes:
Data analyzed based on one-year period from October 1, 2021 to September 30, 2022
"Peak net load hours" defined as the highest four hours of net load on the five days with highest net loads (all occurred in early Sept 2022)

Resource Adequacy Risk by Hour of Day

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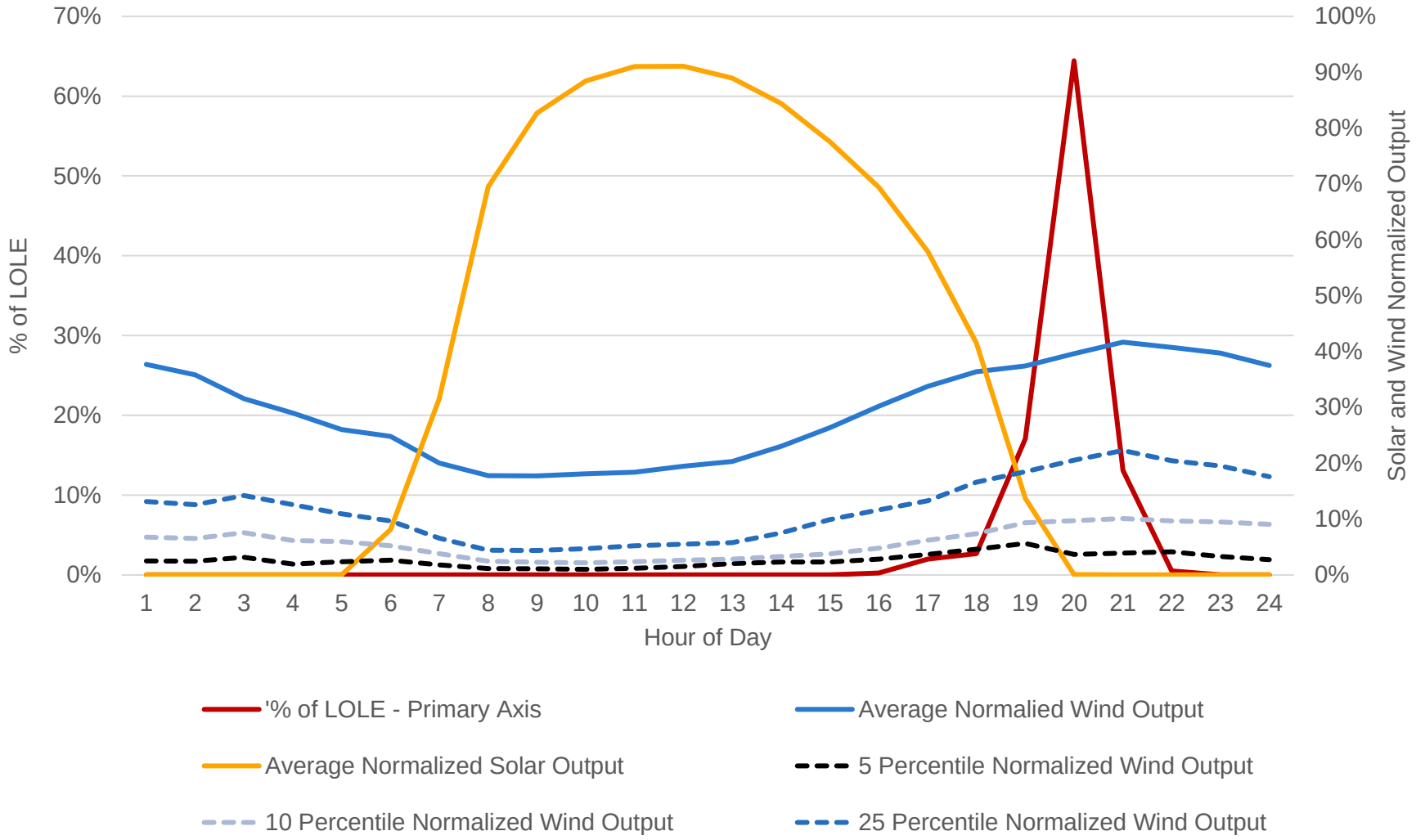
Resource Adequacy Risk With 2025 Renewable Shapes



Renewables Shapes are represented with July Data

Surface Creation

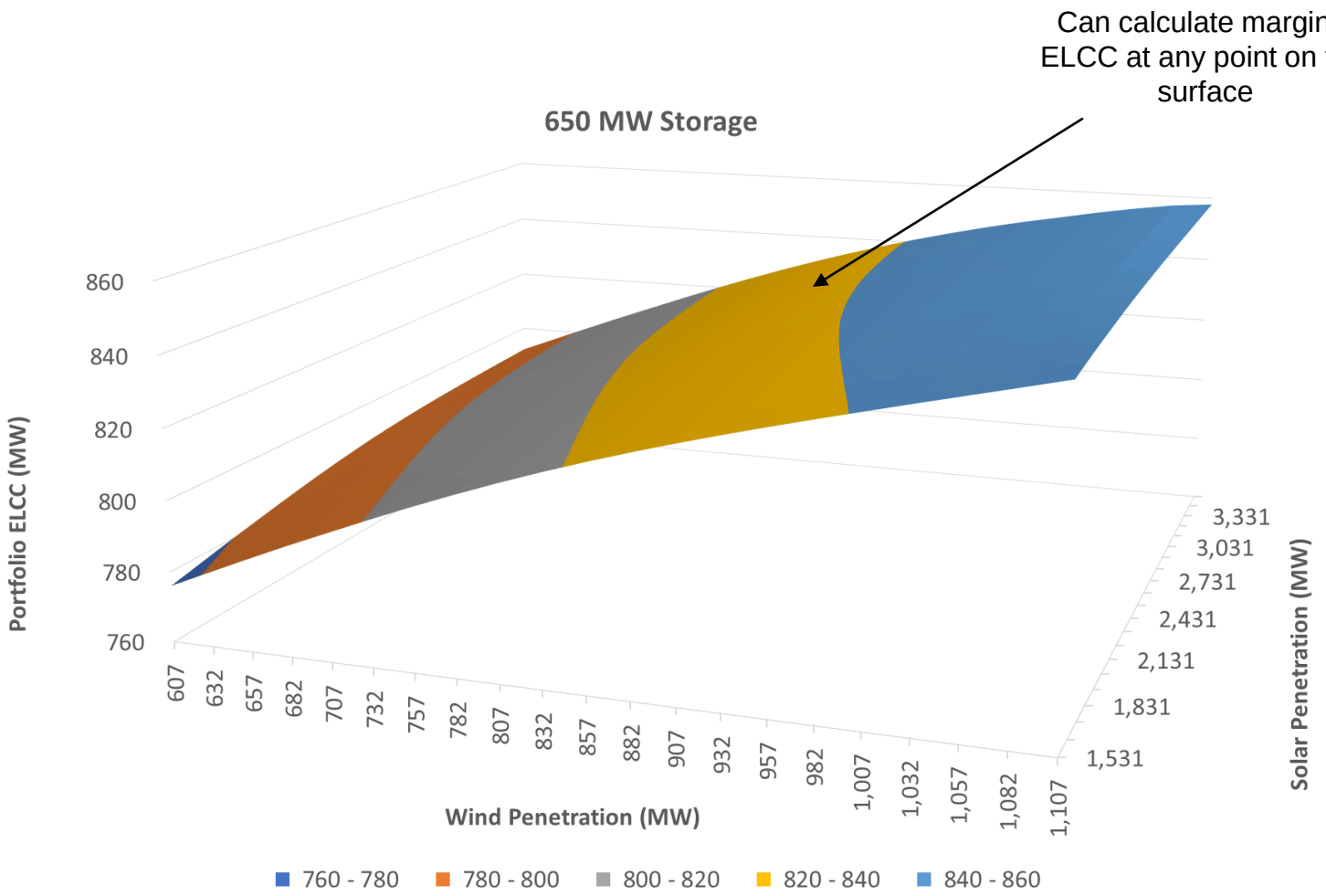
- **To capture the ELCC values of incremental storage, solar, and wind resources we created surfaces of results for combinations of the three variables.**
- **The table below highlights what combinations were run in SERVM for total storage values of 650 MW, 850 MW, 1,250 MW, and 1,650 MW.**

Solar and Wind ELCC at xxx MW Storage						
	Wind (MW)					
Solar (MW)	607	707	807	907	1007	1107
1531	x		x		x	
1931		x		x		x
2331	x		x		x	
2731		x		x		x
3131	x		x		x	
3531		x		x		x

Surface Creation

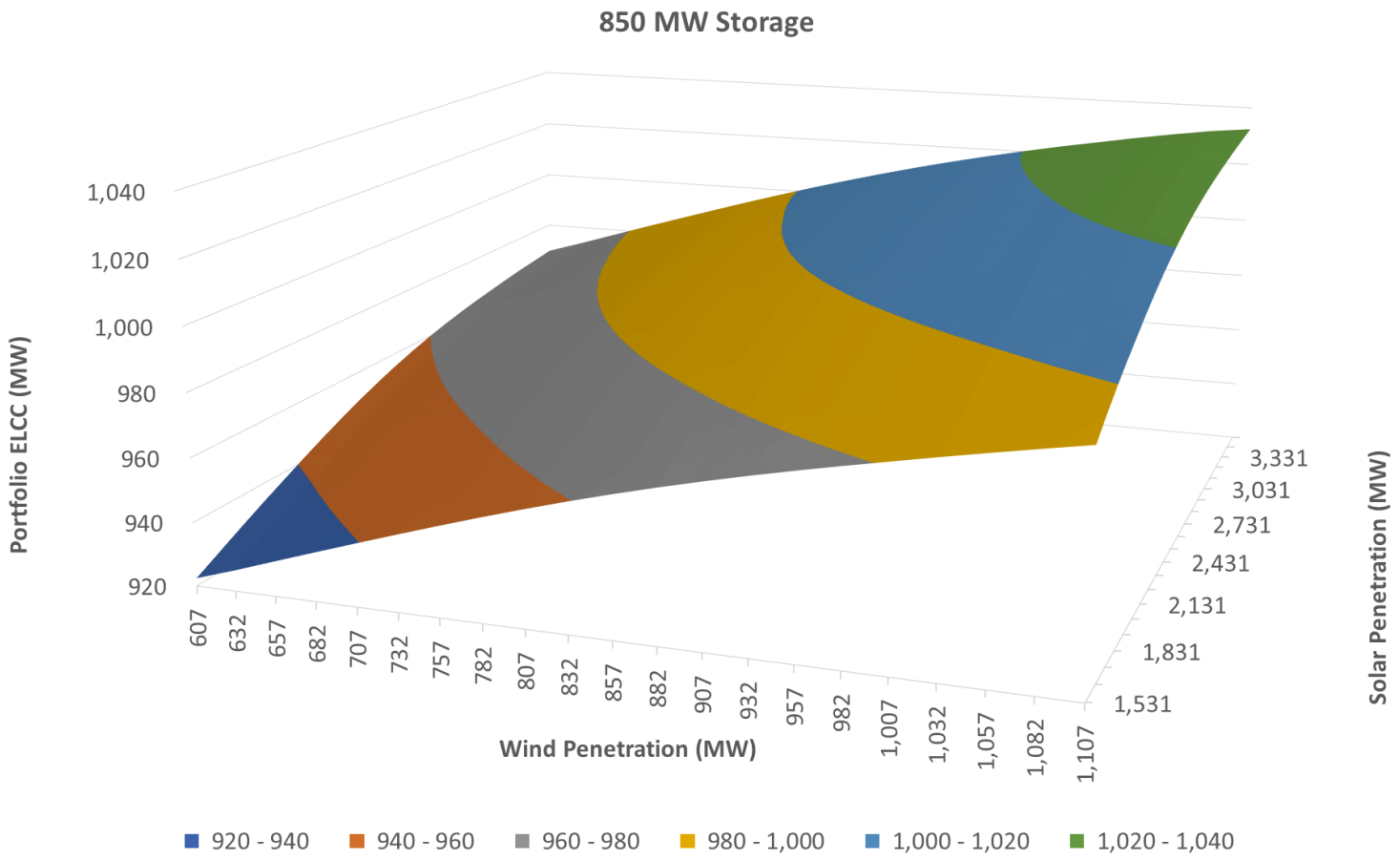
- **Created Surfaces using SERVM results and smoothing algorithms.**
- **The surfaces provide the ability to calculate marginal ELCC for any of the three technologies at any combination within the ranges simulated**
  - Storage 650 MW – 1,650 MW
  - Solar 1,531 MW –3,531 MW
  - Wind 607 MW – 1,107 MW

Updated Surfaces



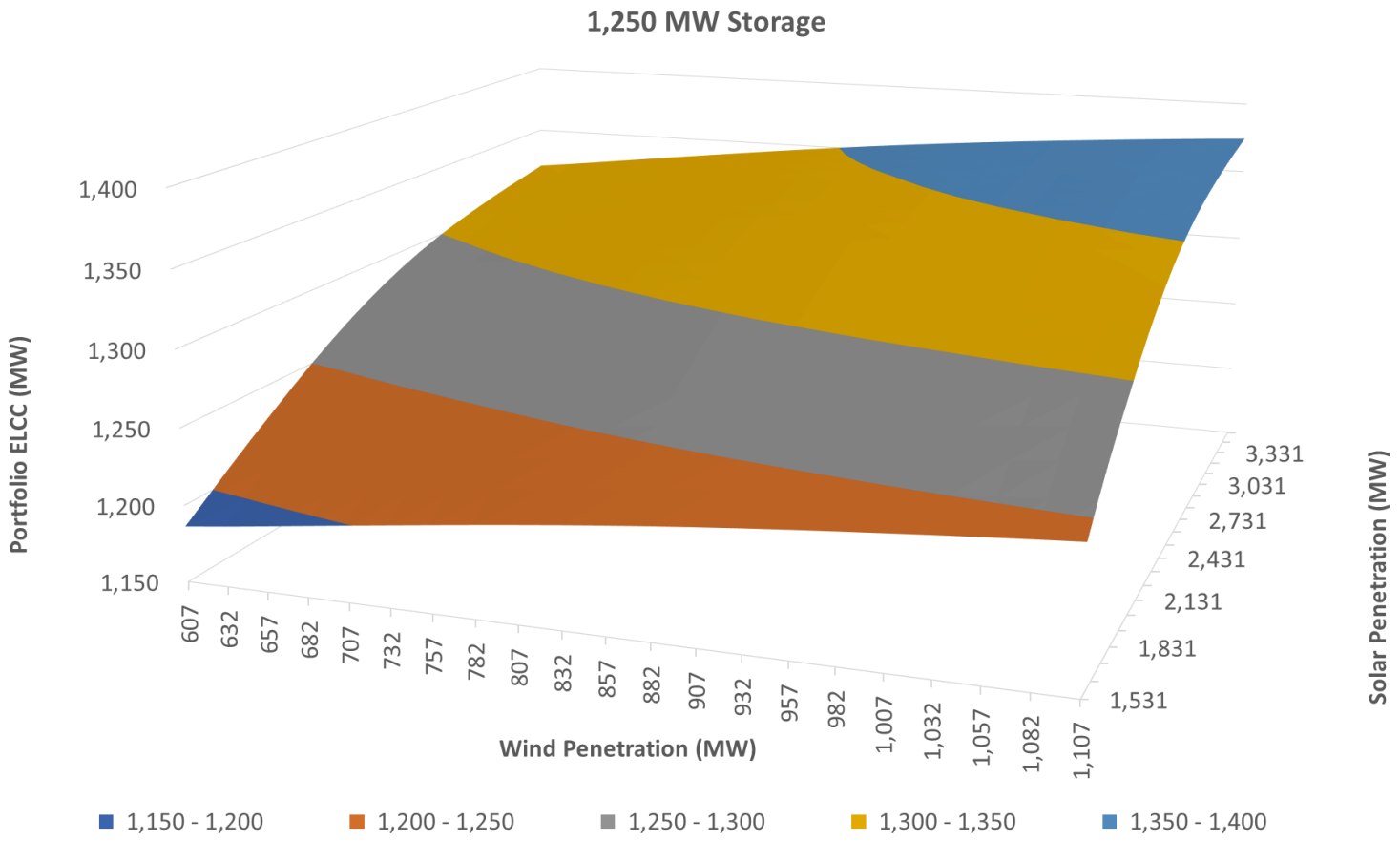
Near-final results

Updated Surfaces



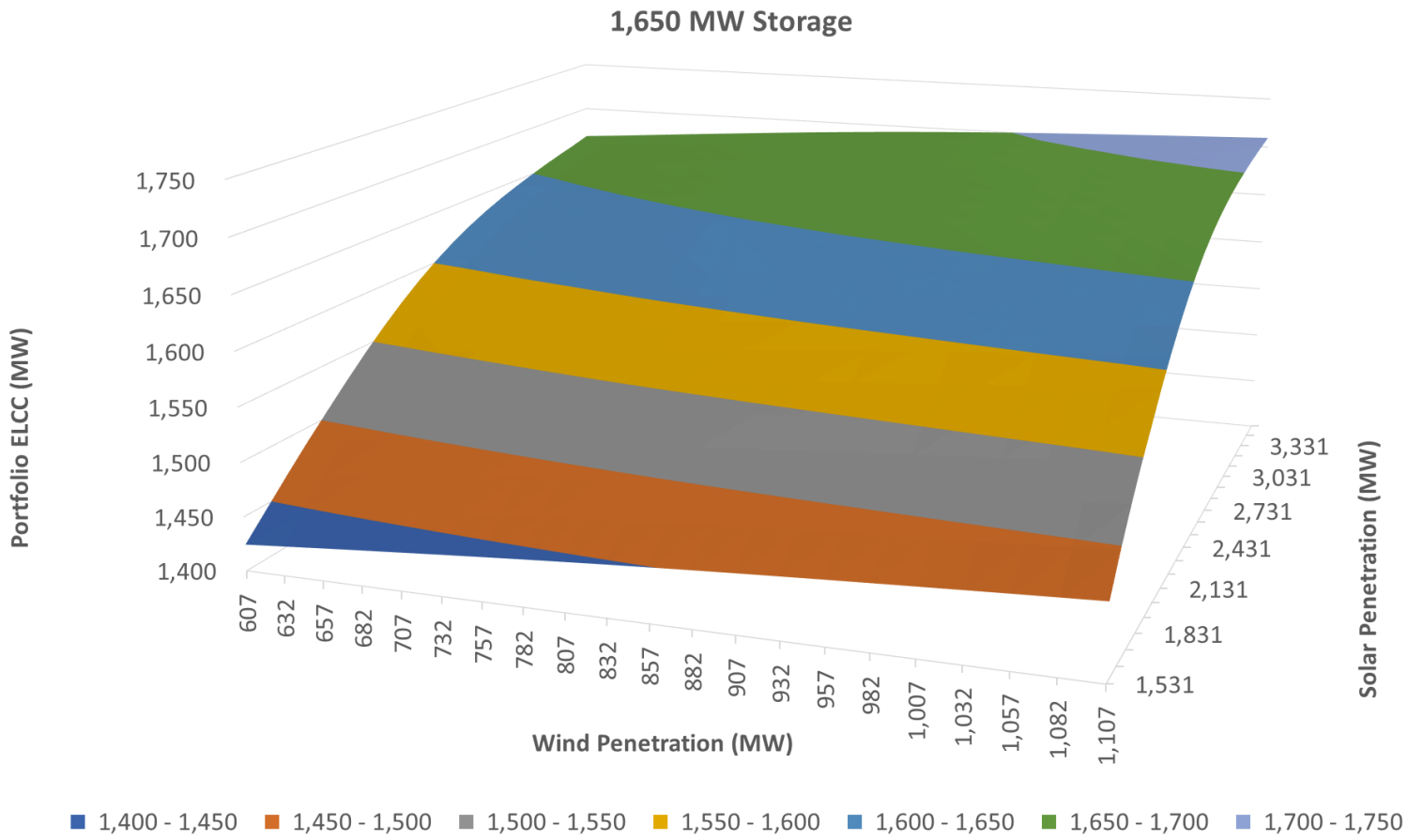
Near-final results

Updated Surfaces



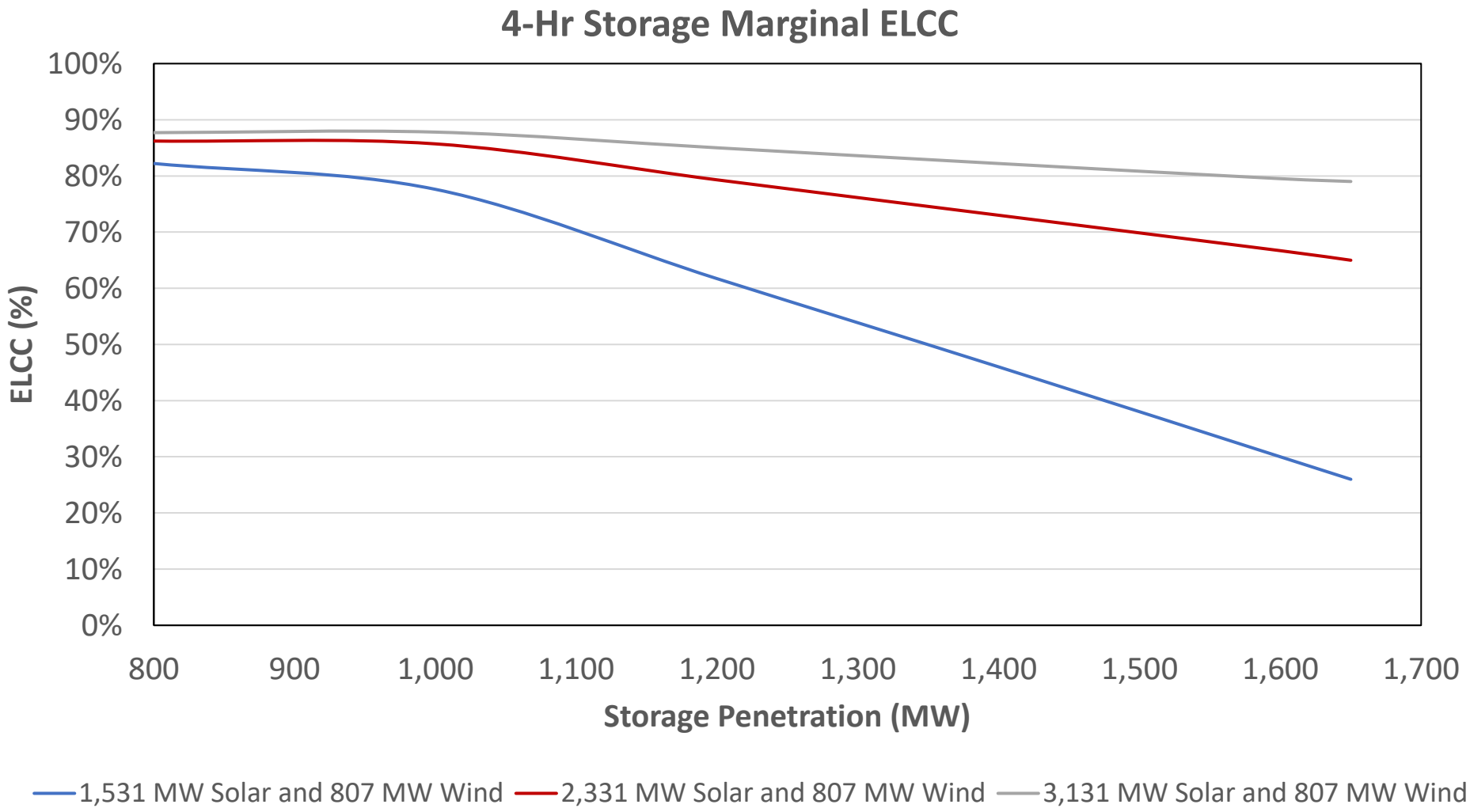
Near-final results

Updated Surfaces



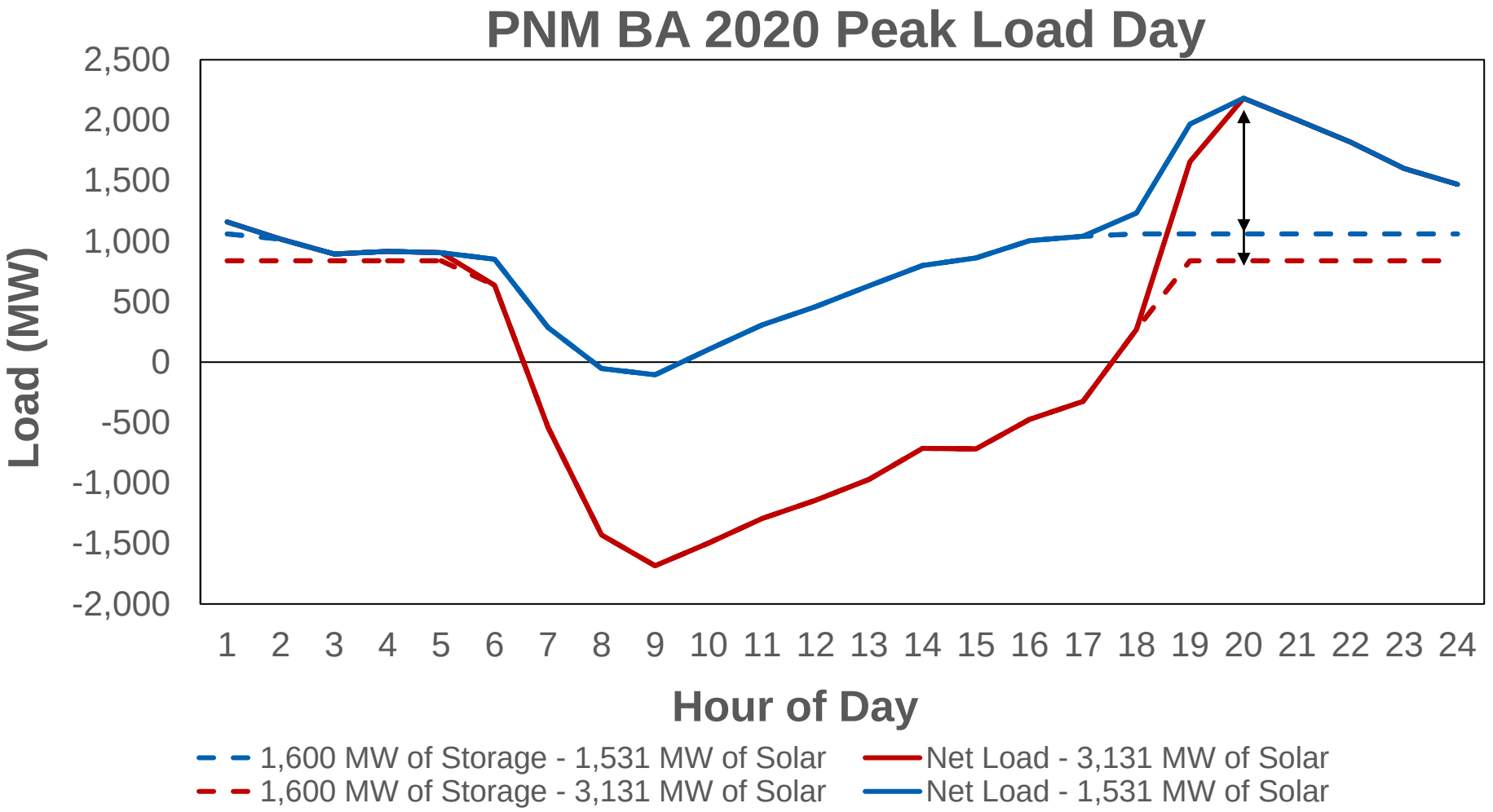
Near-final results

Marginal ELCCs: 4-Hr Storage



Near-final results

Net Load Shape Analysis – 1,600 MW of Storage under 2 Solar Scenarios



Near-final results

Charging not shown on chart but 1,600 MW of storage sees charging constraints in the baseline solar case

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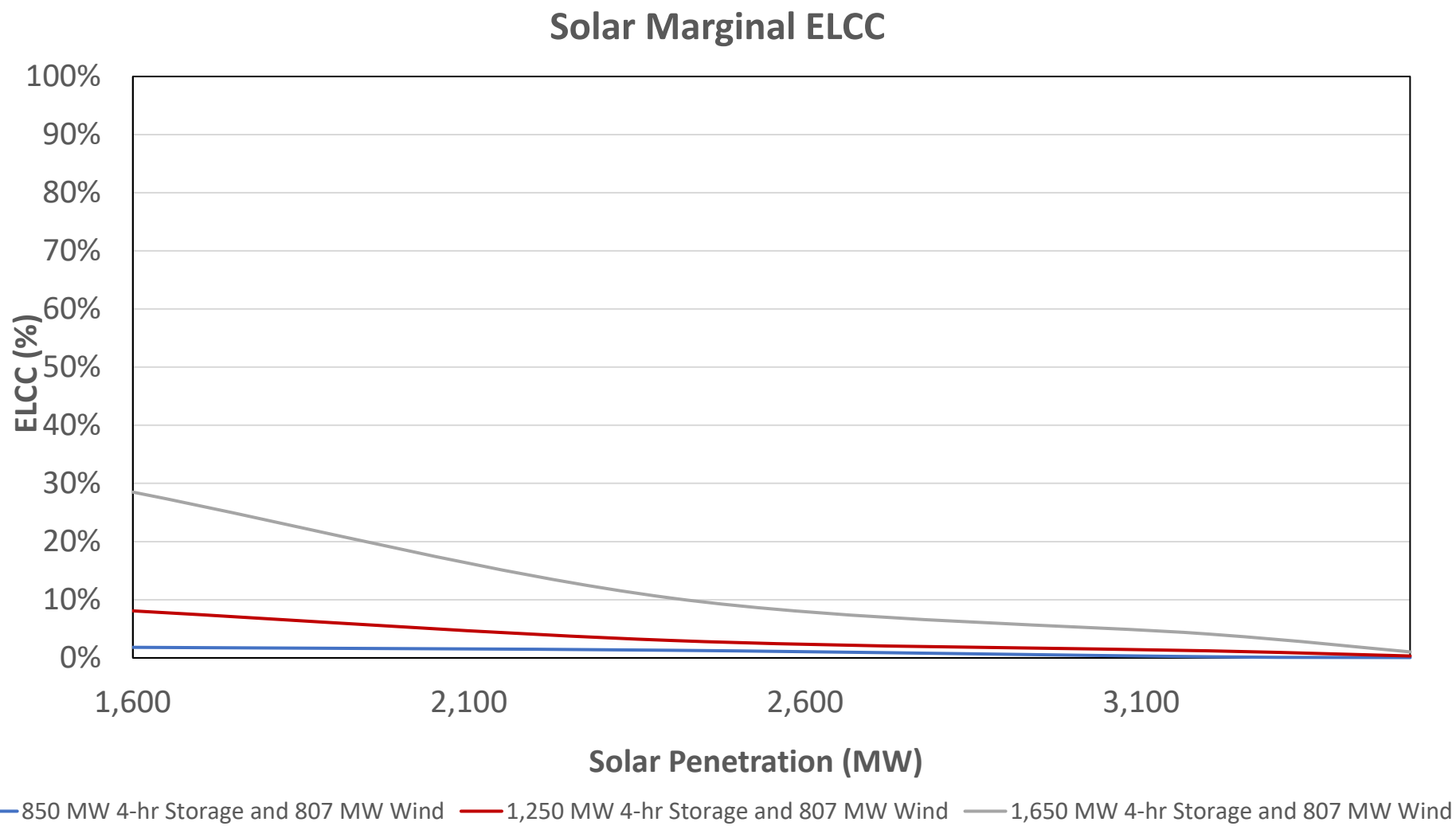
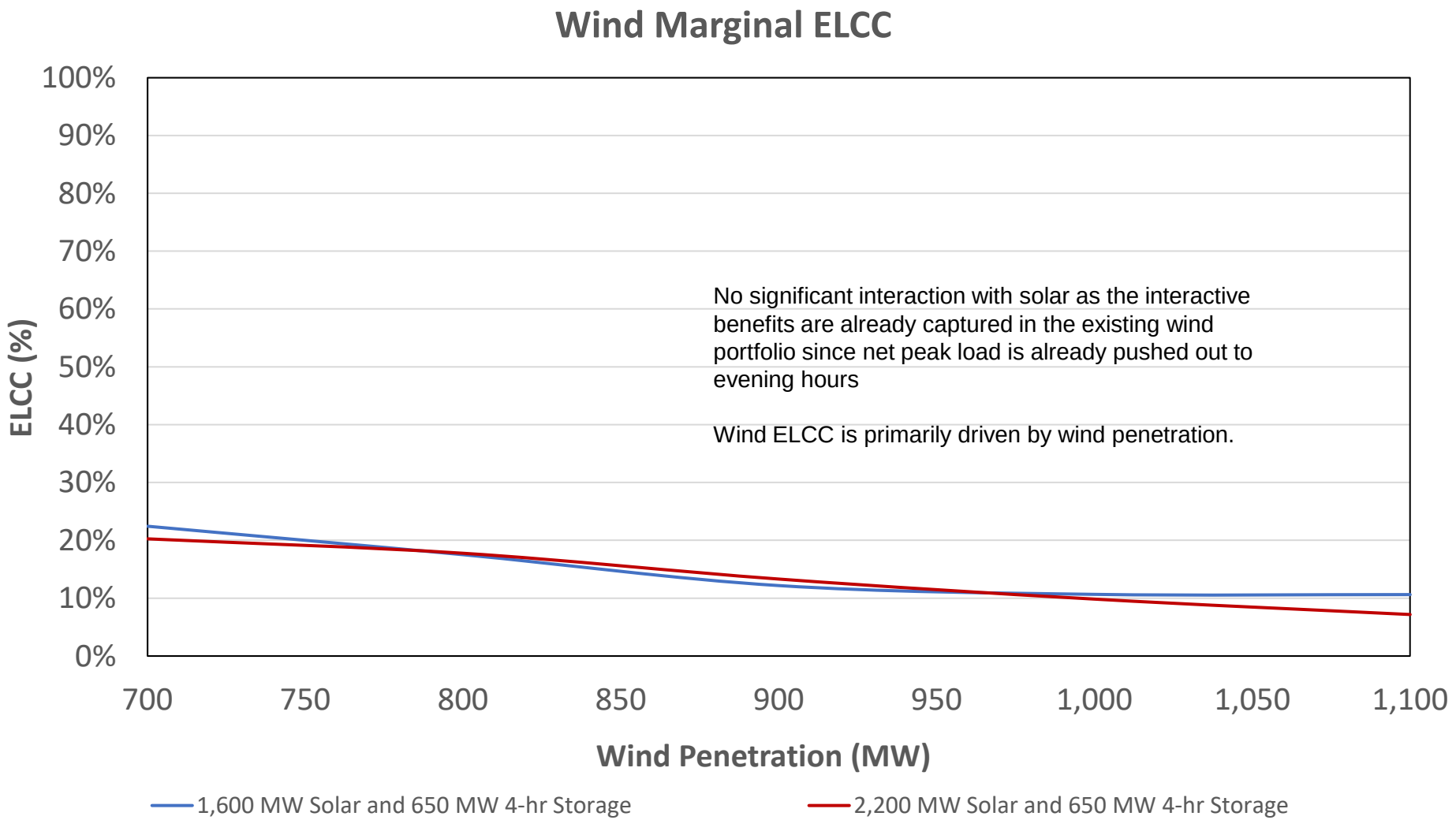
Marginal ELCCs: Solar



Near-final results

Marginal ELCCs: Wind



Near-final results

8-HR Sensitivity Results

4-hr and 8-hr Battery ELCC Comparison		
Initial 4-hr Storage Capacity (MW)	200 MW Incremental 4-hr ELCC (%)	200 MW Incremental 8-hr ELCC (%)
650	86%	88%
850	85%	87%
1,050	82%	85%
1,250	81%	82%
1,450	65%	79%
1,650	Not simulated	69%

Results include 2,331 MW of solar
ELCC values represent the incremental 200 MW block in addition to the initial 4-hour storage level.

Near-final results

2035 ELCC Sensitivity

- **Direct comparisons to 2025**
- **Slightly less value in 2035 due to higher renewable and storage values in neighboring regions**

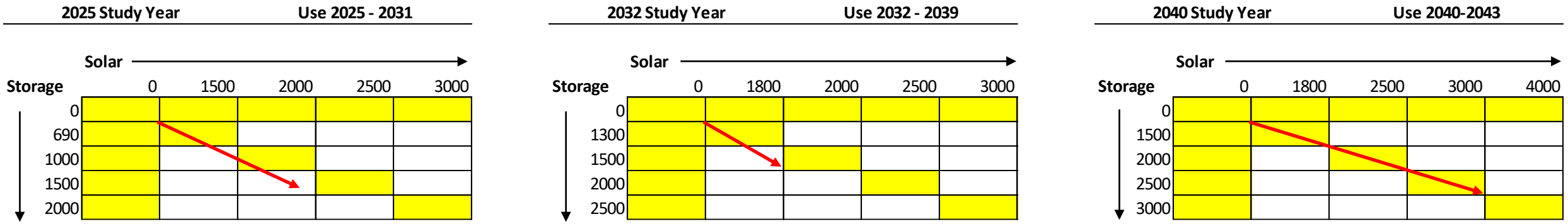
Incremental Storage (MW)	Incremental Solar (MW)	Incremental Wind (MW)	2025 Incremental ELCC (MW)	2035 Incremental ELCC (MW)	Delta (MW)
650	-	-	469	452	(17)
650	-	300	509	495	(14)
650	-	500	517	504	(13)
650	1,200	-	540	519	(21)
650	1,200	300	593	572	(21)
650	1,200	500	607	580	(27)

Near-final results

Initializing the ELCC Trajectory

Installed Capacity – PVNGS NNC

Sum of Capacity (MW)	Column Labels																			
Row Labels	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Coal:Conventional	697	697	200	200																
Demand:Distributed Generation	33	48	48	15	15	15	15	15	15	15		15	15	15	15	15	15	15	15	15
Demand:Energy Efficiency	20	39	60	83	107	114	121	128	134	141	148	155	142	130	117	124	107	90	92	95
Gas/Oil:Combined Cycle	425	425	425	425	425	425	425	425	425	425	425	425	425	425	425	425	425	425	425	
Gas/Oil:Combustion Turbine	416	416	416	416	416	416	416	416	267	267	267	267	267	267	267	267	267	267	267	126
Gas/Oil:Steam Turbine	146	146	146	146	146	146	146	146	146	146										
Nuclear:Nuclear	402	402	298	288	288	288	288	288	288	288	288	288	288	288	288	288	288	288	288	288
Renewable:Geothermal	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Renewable:Solar PV	378	1025	1521	1687	1771	1755	1743	1732	1720	1709	1698	1686	1675	1664	1663	1723	1713	1701	1770	3080
Renewable:Wind	658	658	658	658	658	658	658	658	658	658	658	658	658	658	556	556	556	556	556	956
Storage:Battery		300	590	690	846	937	959	1129	1136	1136	1304	1304	1320	1341	1382	1395	1421	1449	1569	2390



- **Evaluate resources individually**
- **Evaluate resources as a portfolio**
- **Appropriately allocate synergistic benefit**

Note this is a two-dimensional illustrative example

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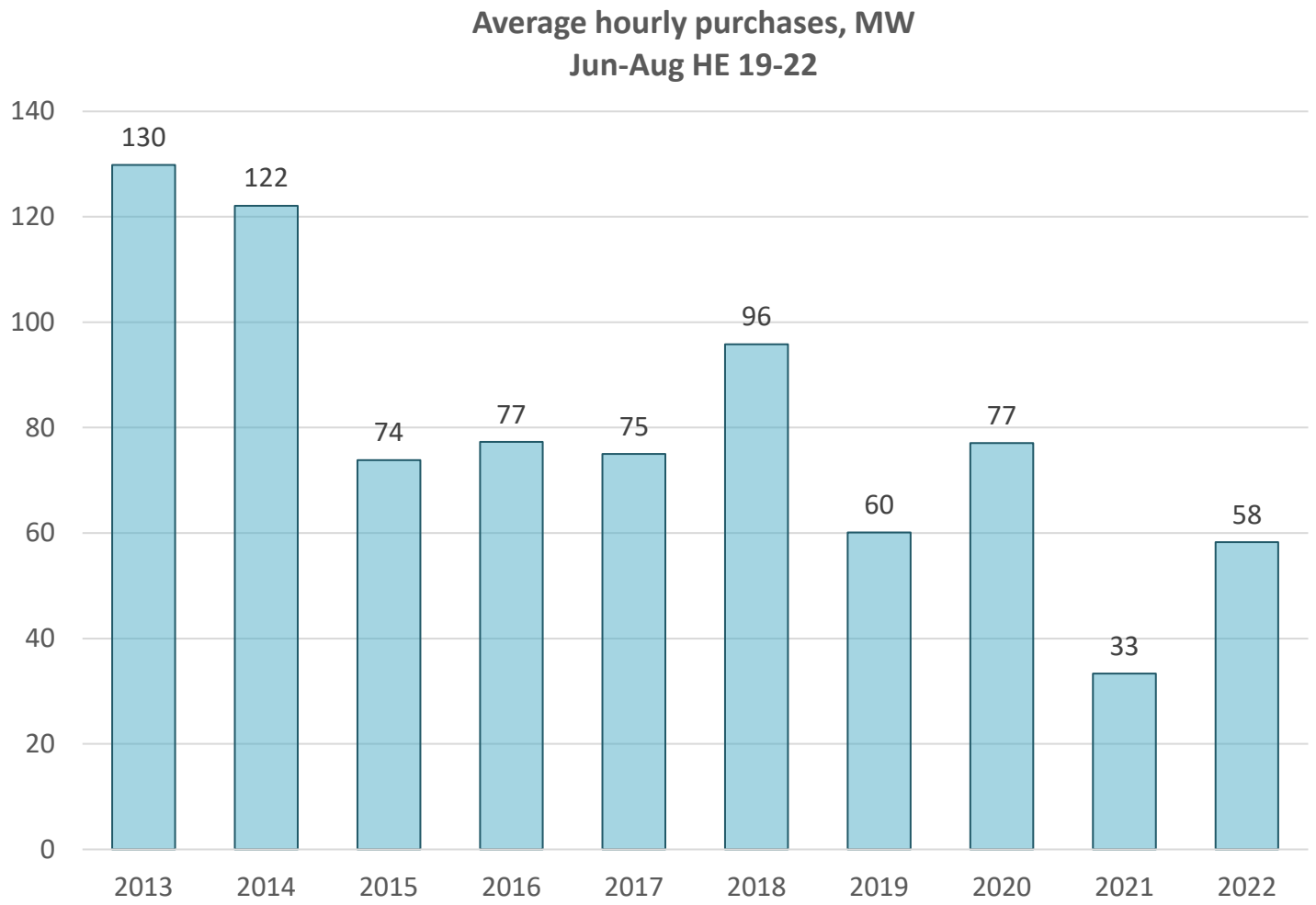
Questions

PNM Summer 2022 Review and Modeled Market Assistance for Resource Adequacy

INTRODUCTION TO SUMMER 2022 DISCUSSION

- In our previous discussion of market dynamics and system resiliency, PNM mentioned meeting after summer 2022 to review new data and modeled market assistance included for resource adequacy
- Modeled Market Assistance included for Resource Adequacy are currently same as in PV Replacement Case and 2020 IRP; SERVM allows for sharing based on economics and transmission constraints in all hours except for the following constraints:
    - Limited to 200-300 MW in all hours when load is greater than 85% of the gross peak load
    - Summer (June – August) evening net peak load hours:
        - Limit to 100-150 MW for hours 16-18 when load is greater than 85% of gross peak load
        - Limit to 50 MW for hours 19-22 from June to August when hourly gross load is greater than 80% of the gross peak load
            - 80% of gross load during hours 19-22 ensures this limit occurs on peak load days
- In the 2020 IRP, these limitations reduced internal planning reserve margin by 5% in a no-imports case (island)

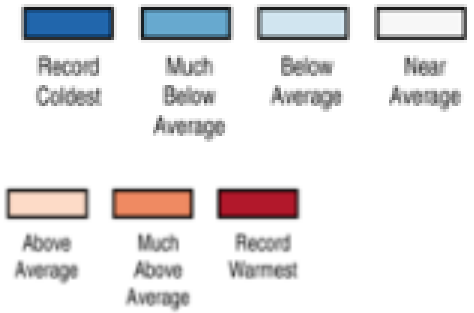
MARKET PURCHASES DURING HIGH-RISK WINDOW



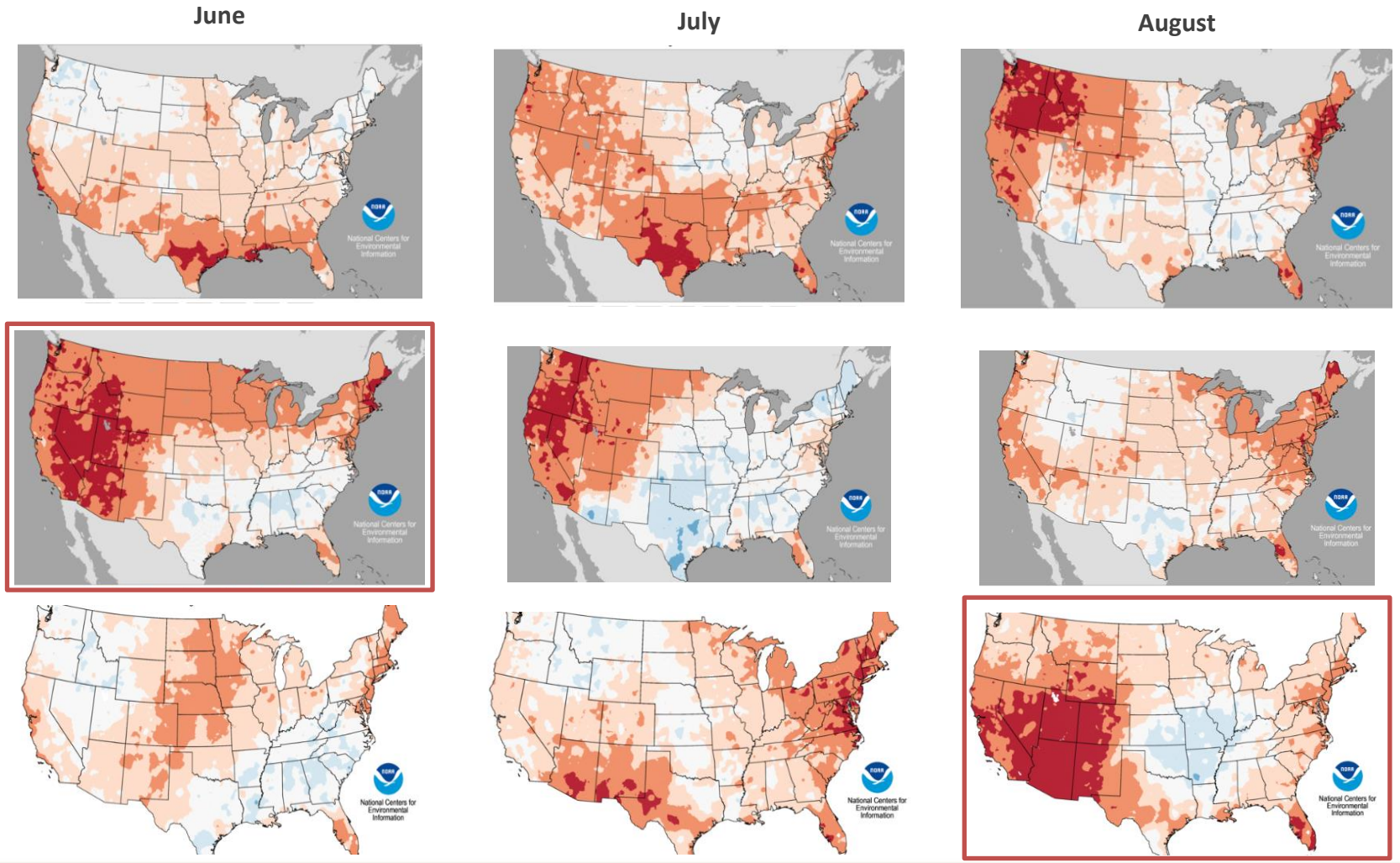
- Summer 2022 did not see a regional heat wave comparable to prior summers, in addition, thermal units had solid availability
- As the Southwest region sees more solar and storage additions, LOLE risk is increasingly concentrated in the non-solar hours 19-22
- Over time, ability to purchase from market during risk hour window has decreased over time
- Going forward, online capacity in risk hours will increasingly be made up of energy-limited resources
- PNM expects market liquidity to worsen in the most constrained hours as risk hours and resource mixes align across the Southwest region (E3 SWRA Study, presented in the May 25 IRP PAG meeting)
- While ability to purchase during high net load hours was greater in 2022 than in prior years, planning should take these growing risks into consideration

REGIONAL WEATHER DYNAMICS WERE NOT AS EXTREME IN 2022 AS IN PRIOR YEARS

Mean Temperature Percentiles

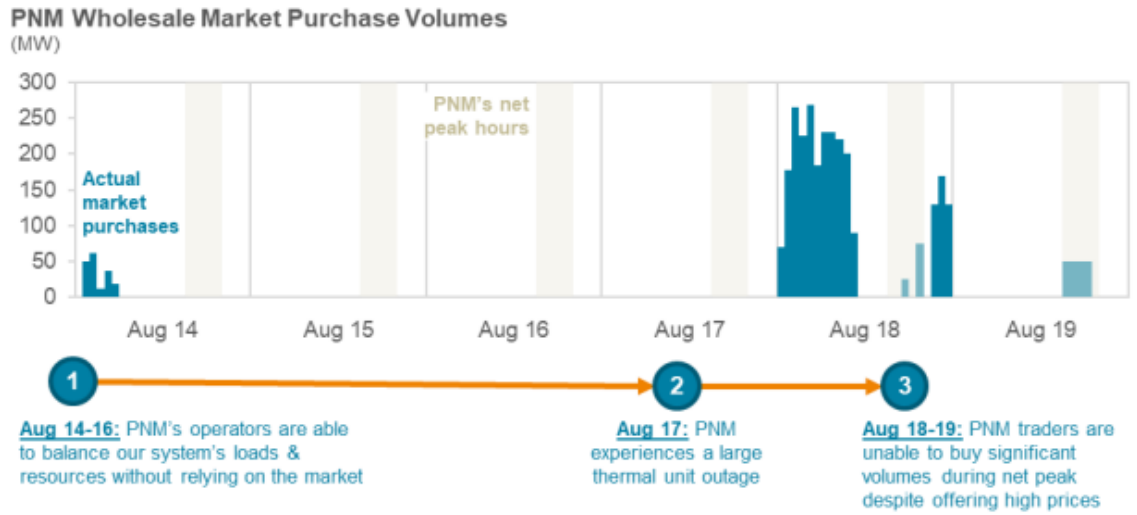


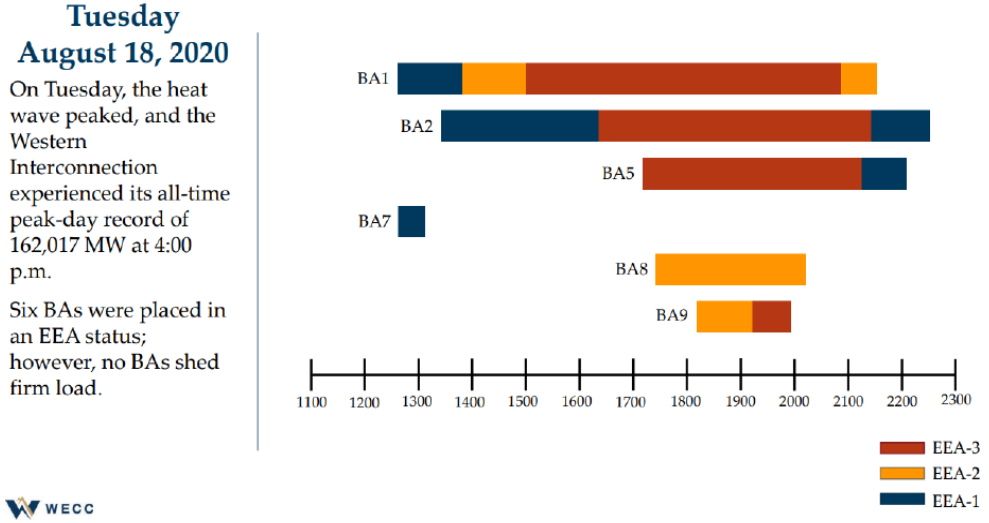
Source: NOAA National Centers for Environmental Information
Ranking period: 1895-2022



REGIONAL DYNAMICS IMPACT MARKET LIQUIDITY

Figure 19. PNM's hourly wholesale market purchases during the August 2020 heatwave





https://www.wecc.org/Administrative/Heatwave%20EEA%20Slides.pdf

- Tuesday August 18, 2020 was the peak of the heat wave and most challenging day for PNM operators and traders
- Purchases in hour 18 and 20 exhausted all PNM was able to buy in these hours of critical need despite offering high prices

- Five different Balancing Authorities were in EEA-2 or EEA-3 status on August 18, 2020.
- **PNM will continue to plan to be able to reliably serve customers under stressful system conditions such as these without an over reliance on the market.**

TAKEAWAYS

- Modeling and limits should focus on net peak periods since these are the most constrained hours
- Regional dynamics play a major role in market liquidity
- Planning should incorporate likelihood of regional constraints and weather events
- PNM has no plans to change its current modeled import limitations based on continued resource adequacy concerns in WECC and the need for conservatism in planning
- PNM is an active participant in the Energy Imbalance Market (EIM) – PNM must prove resource sufficiency in each interval in order to participate
- Market purchases and import limits refer to day-ahead and real-time purchases, and not long-term contracts for firm capacity

NEXT MEETING

We encourage you to send in your thoughts ahead of time to IRP@pnm.com so that we can summarize them and distribute them for the next meeting. Please have your submissions in by February 10, 2022.

NEAR TERM SCHEDULE

FUTURE MEETING TIME & LOCATION

When: February 15, 2023

Topics: Existing system (regulatory and planning requirements), modeling framework

Start Time: 9:00 AM

Location: Virtual

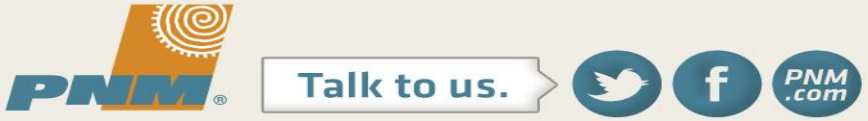
MAKE SURE WE HAVE UP TO DATE CONTACT INFORMATION FOR YOU

www.pnm.com/irp for documents

IRP@pnm.com for e-mails

Register your email on sign-in sheets to receive alerts of upcoming meetings and notices that we have posted to the website.

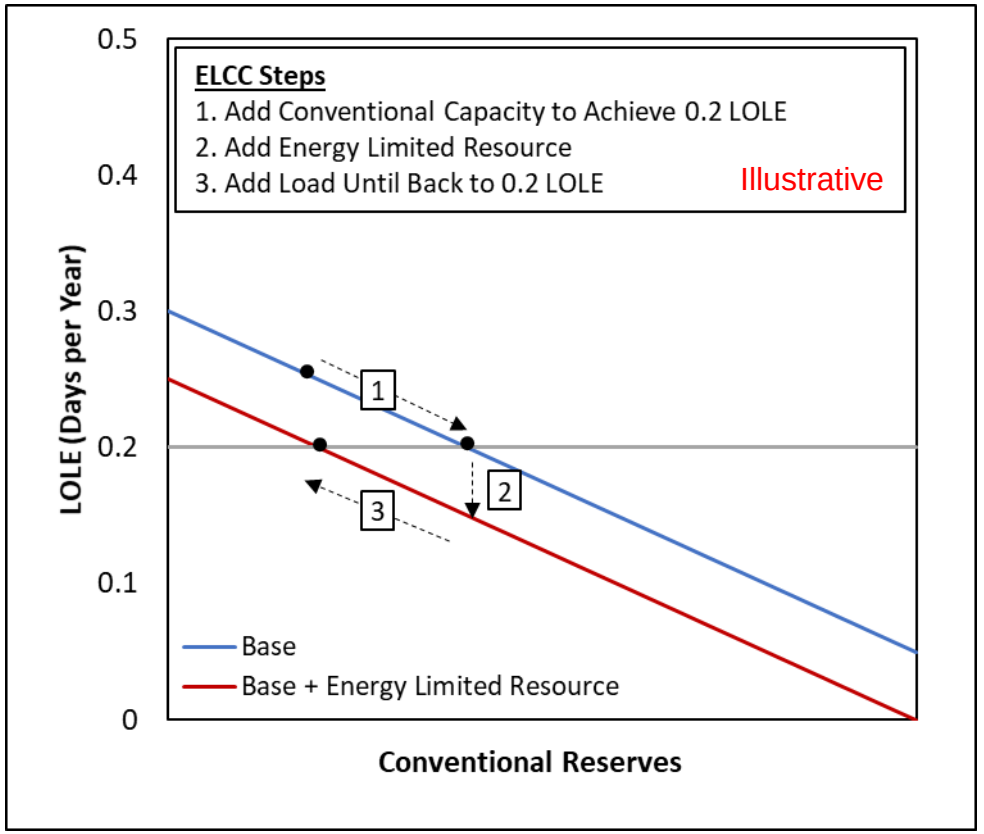
Thank you



APPENDIX

Effective Load Carrying Capability

Effective Load Carrying Capability (ELCC) describes the reliability contribution of an energy limited or non-dispatchable resource

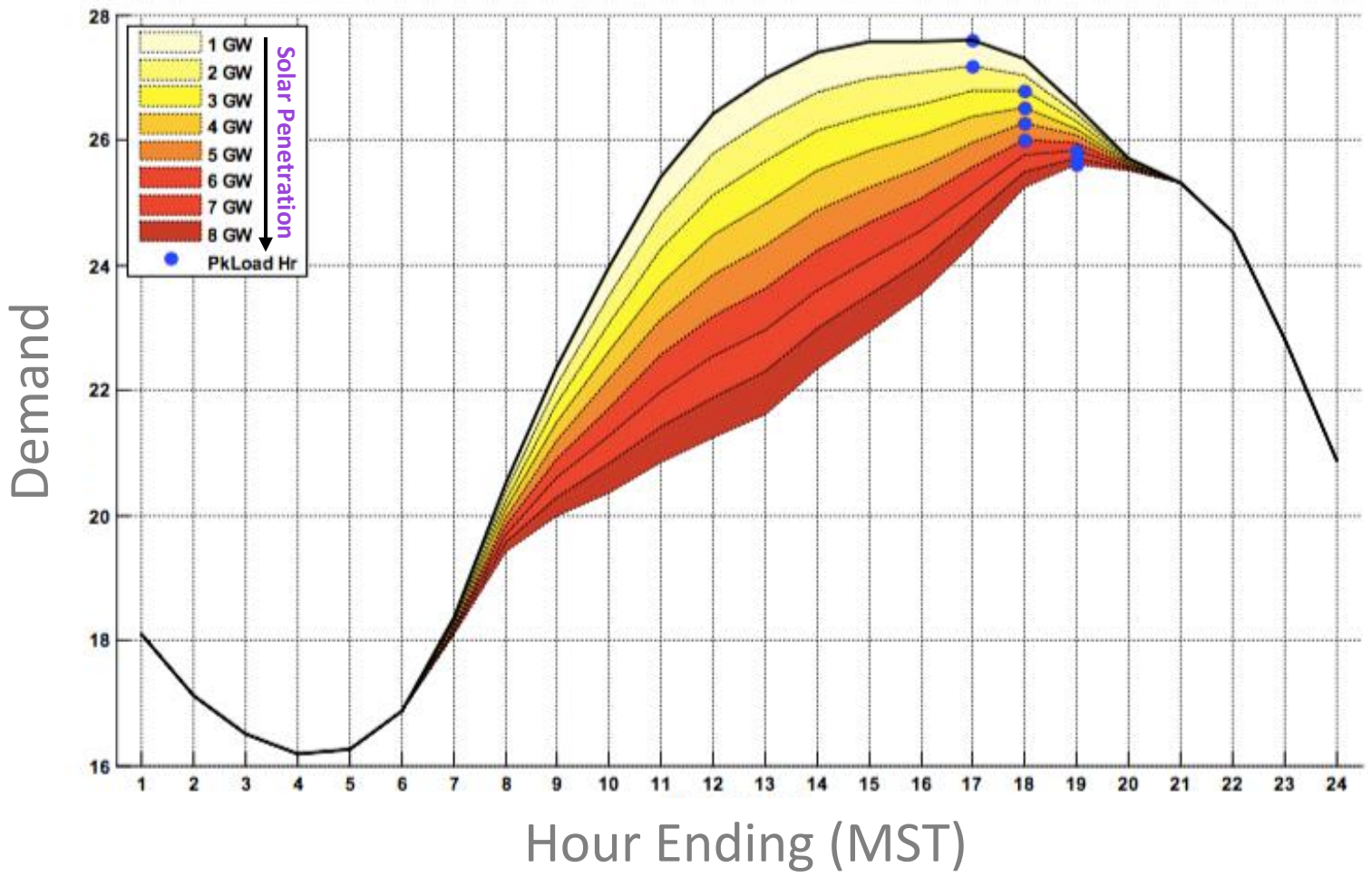


Effective Load Carrying Capability (ELCC) analysis adds load to offset the reliability contribution of the resource type under study. For example, an energy limited resource may be added to the system to improve reliability. This may be offset with load until the reliability target is achieved to quantify the reliability benefit.

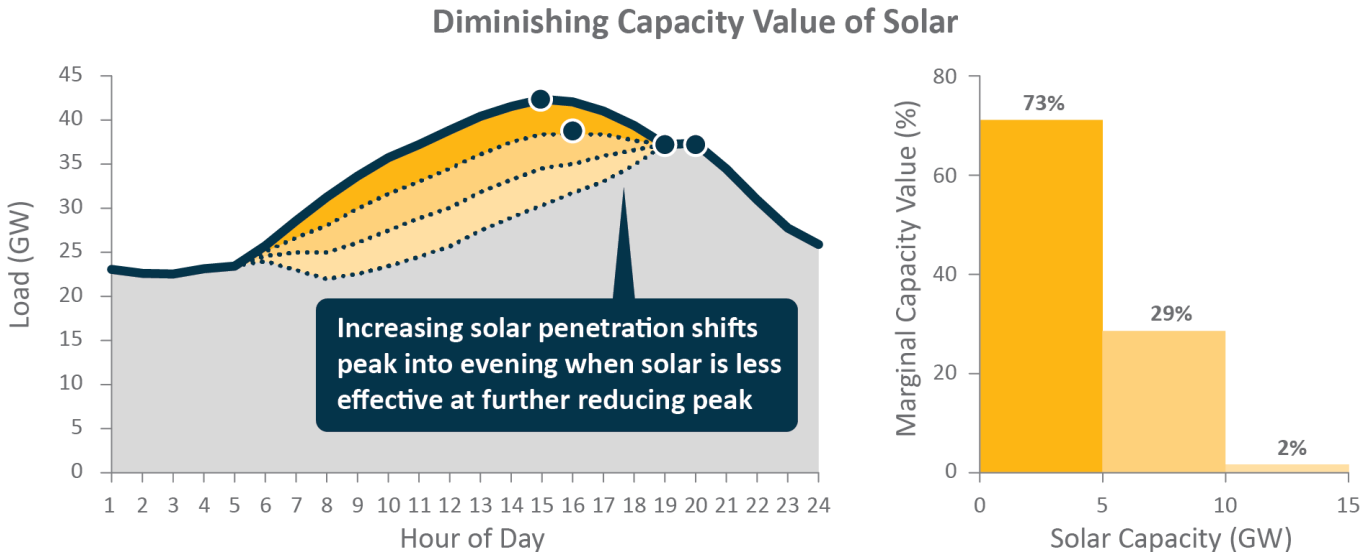
The same process may be performed on a non-dispatchable resource.

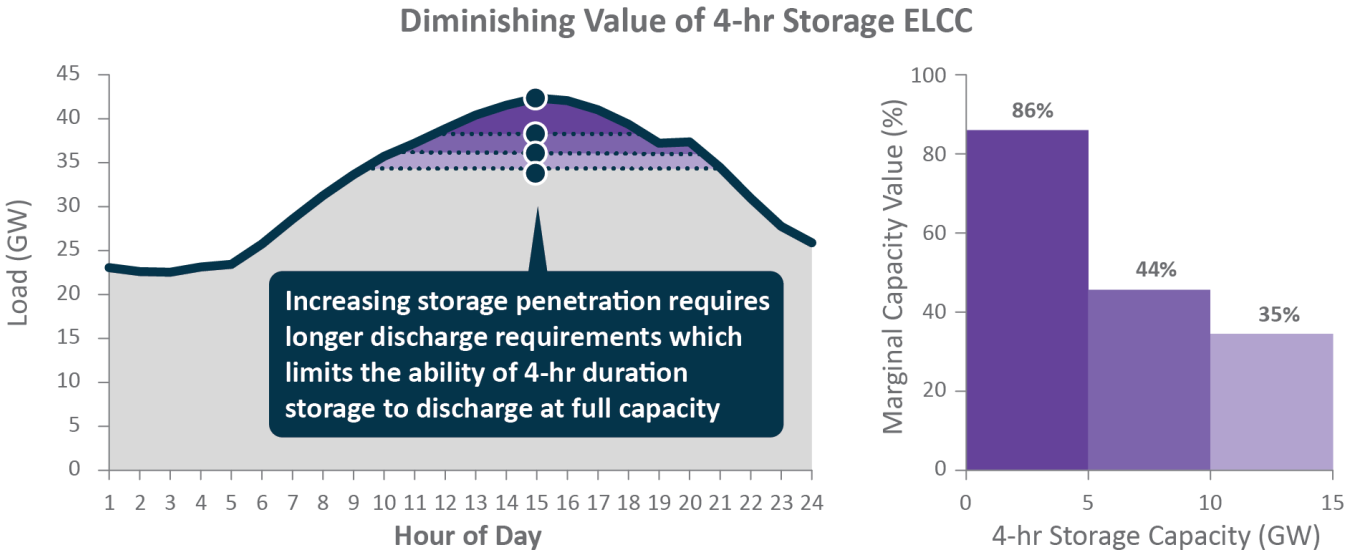
0.2 Loss of Load Expectation (LOLE) is utilized as the reliability target and equates to 2 days with generation shortage every 10 years.

Increased PV pushes net peak into evening (eventually after sunset)



ELCC captures saturation effects with increasing resource penetration





ELCC Captures Synergistic Interactive Effects Between Resources

+ **Resources with complementary characteristics produce a combined ELCC that exceeds the sum of individual resources' ELCCs, producing a "synergistic interaction"**
  - This effect has been described as a "diversity benefit" between resources