2022 Integrated Resource Plan (IRP)

Public Advisory Meeting #1

1/24/2022

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Agenda and Introductions

Stewart Ramsay, Managing Executive, Vanry & Associates

Agenda

Time	Topic	Speakers
Morning **Starting at 10:00 AM**	Safety and Virtual Meeting Schedule and Protocols	Chad Rogers, Senior Manager, Regulatory Affairs, AES Indiana Brandi Davis-Handy, Chief Public Relations Officer, AES US Utilities
	Welcome and Overview of AES Indiana	Kristina Lund, President & CEO, AES US Utilities
	IRP Planning and Model Overview	Erik Miller, Manager, Resource Planning, AES Indiana Will Vance, Senior Analyst, AES Indiana
	2019 IRP Recap	Aaron Cooper, Chief Commercial Officer, AES US Utilities Erik Miller, Manager, Resource Planning, AES Indiana
	Overview of Existing Resources, Replacement Resource Options and Future IRPs	Aaron Cooper, Chief Commercial Officer, AES US Utilities Erik Miller, Manager, Resource Planning, AES Indiana
Break **11:45 AM – 12:15 PM**	Lunch	
Afternoon **Starting at 12:15 PM**	Baseline Energy and Load Forecast	Eric Fox, Director, Forecasting Solutions, Itron Mike Russo, Forecast Consultant, Itron
	Electric Vehicle (EV) and Solar PV Forecasts	Jordan Janflone, EV Modeling Forecasting, GDS Associates Patrick Burns, PV Modeling Lead and Regulatory/IRP Support, Brightline Group
	DSM Market Potential Study Introduction	Jeffrey Huber, Overall Project Manager and MPS Lead, GDS Associates Jacob Thomas, Market Research and End-Use Analysis Lead, GDS Associates Melissa Young, Demand Response Lead, GDS Associates
	Final Q&A and Next Steps	

Virtual Meeting Protocols and Safety

Brandi Davis-Handy, Chief Public Relations Officer, AES US Utilities

Chad Rogers, Senior Manager, Regulatory Affairs, AES Indiana

IRP Team Introductions

AES Indiana Leadership Team

Aaron Cooper, Chief Commercial Officer, AES US Utilities
Brandi Davis-Handy, Chief Public Relations Officer, AES US Utilities
Kristina Lund, President & CEO, AES US Utilities
Wendy Mehringer, Chief Customer Officer, AES US Utilities
Judi Sobecki, General Counsel and Chief Regulatory Officer, AES US Utilities

AES Indiana IRP Planning Team

Joe Bocanegra, Load Forecasting Analyst, AES Indiana
Erik Miller, Manager, Resource Planning, AES Indiana
Scott Perry, Manager, Regulatory Affairs, AES Indiana
Chad Rogers, Senior Manager, Regulatory Affairs, AES Indiana
Brent Selvidge, Engineer, AES Indiana
Will Vance, Senior Analyst, AES Indiana

AES Indiana IRP Partners

Patrick Burns, PV Modeling Lead and Regulatory/IRP Support, Brightline Group
Eric Fox, Director, Forecasting Solutions, Itron
Jeffrey Huber, Overall Project Manager and MPS Lead, GDS Associates
Jordan Janflone, EV Modeling Forecasting, GDS Associates
Stewart Ramsey, Managing Executive, Vanry & Associates
Mike Russo, Forecast Consultant, Itron
Jacob Thomas, Market Research and End-Use Analysis Lead, GDS Associates
Melissa Young, Demand Response Lead, GDS Associates

AES Indiana Legal Team

Nick Grimmer, Indiana Regulatory Counsel, AES Indiana
Teresa Morton Nyhart, Counsel, Barnes & Thornburg LLP

Virtual Meeting Best Practices

Questions

→ Your candid feedback and input is an integral part to the IRP process.

→ Questions or feedback will be taken at the end of each section.

→ Feel free to submit a question in the chat function at any time and we will ensure those questions are addressed.

Audio

→ All lines are muted upon entry.

→ For those using audio via Teams, you can unmute by selecting the microphone icon.

→ If you are dialed in from a phone, press *6 to unmute.

Video

→ Video is not required, however, if you have a camera on, please refrain from distractions.

Public Advisory Meeting

Public Advisory Meeting #1	Public Advisory Meeting #2	Public Advisory Meeting #3	Public Advisory Meeting #4	Public Advisory Meeting #5
January 24, 2022	**March/April**	**May/June**	**July/August**	**September/October**

→ All meetings will be available for attendance via Teams. Meetings in 2022 may also occur in-person.

→ A Technical Meeting will be held the week preceding each Public Stakeholder Meeting for stakeholders with nondisclosure agreements. Tech Meeting topics will focus on those anticipated at the next Public Stakeholder Meeting.

→ Meeting materials can be accessed at ***www.aesindiana.com/integrated-resource-plan.***

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AES Purpose & Values

Accelerating the future of energy, together.

Safety first

Highest standards

All together

Make your virtual environment safer

1.

Secure Your Accounts Use unique, complex passphrases and enable two-factor authentication wherever possible.

2.

Think before you click on a link, file, or attachment on your laptop and mobile.

3.

Know Your Network Protect your home network by changing default passwords; use a VPN when conducting sensitive transactions or on public WiFi.

4.

Protect your Device Patch your devices regularly and be mindful of connecting unauthorized hardware like USB drives.

5.

Share Data Responsibly Control your social media settings and be mindful when posting publicly.

6.

Be Safe by Being Prepared Know the cyberattack types and report anything suspicious.

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Welcome & Overview of AES Indiana

Kristina Lund, President & CEO, AES US Utilities

A Once in a Lifetime Transformation in the Energy Sector

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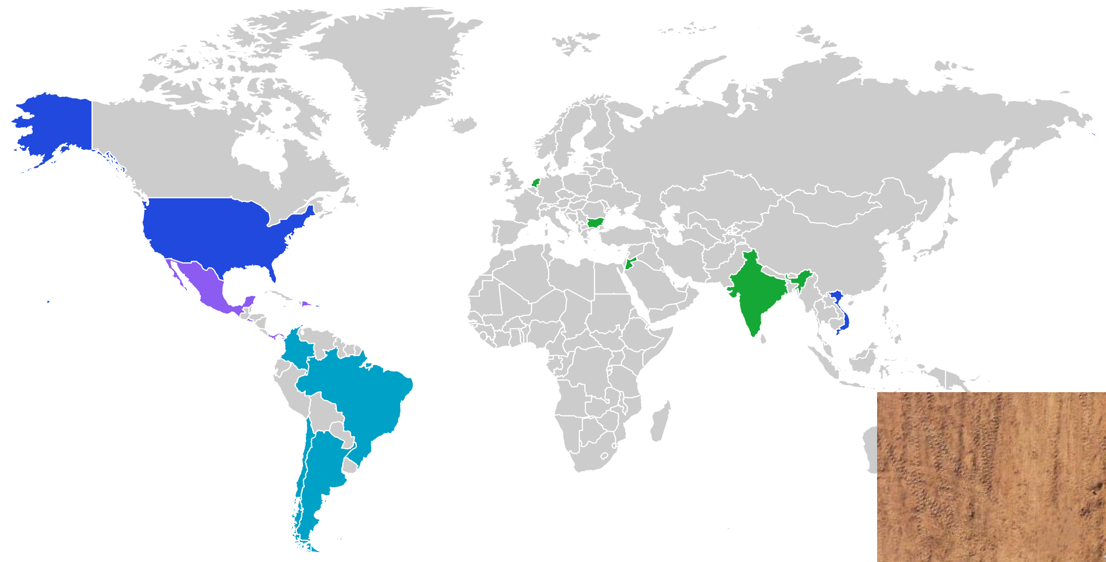
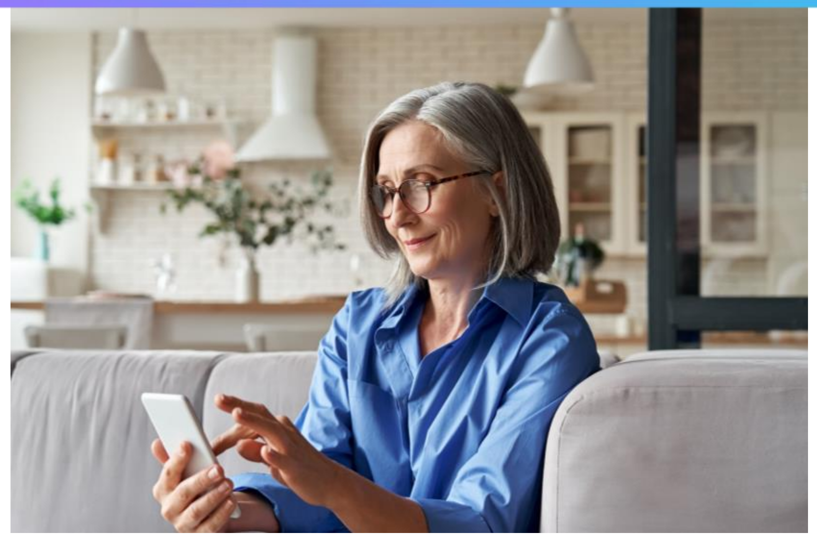


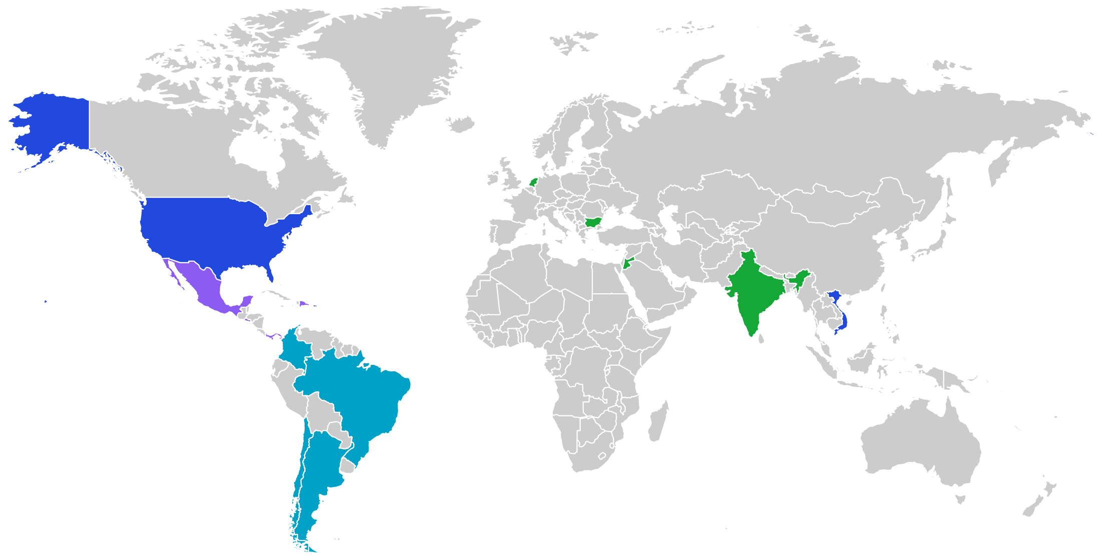
AES: a unique culture of excellence, innovation and customer-centric product development.

7x

Edison Award Winner



Company Overview



30,308

Gross MW in operation*

$9.78 billion

Total 2020 revenues

6,909 MW

Renewable generation under construction or with signed PPAs

$34.6 billion

Total assets owned & managed

4 Continents

14 Countries

4 Market-oriented strategic business units

6 Utility companies

2.5 million

Customers served

8,200 people

Our global workforce

Recognized for our commitment to sustainability

Great Place To Work®

2021 WORLD'S MOST ETHICAL COMPANIES® WWW.ETHISPHERE.COM 8-TIME HONOREE

FTSE4Good

FAST COMPANY

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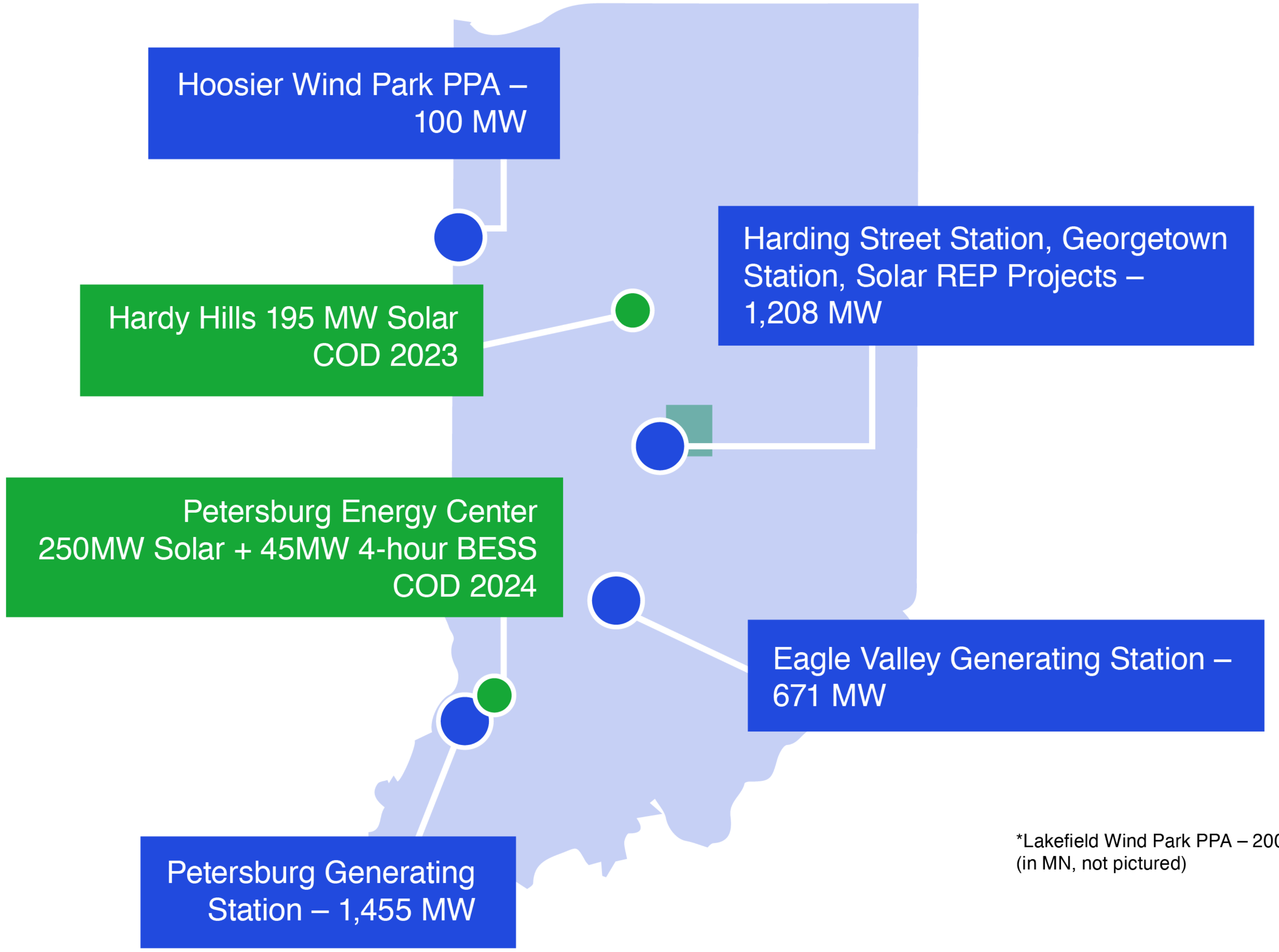
Indiana

- MISO Member
- 528 square miles
- Serves downtown Indianapolis and 8 counties in Indiana
- Serves > 500,000 regulated customers
- 3,643 MW of Generation
  - 1,464 MW Coal*
  - 38 MW Oil
  - 1,745 MW Gas
  - 300 MW Wind
  - 96 MW Solar
- Retiring Pete 1 & 2 – 630 MW of coal – and replacing with solar and storage in 2023/2024

*Includes Pete 1 retirement of 220 MW

3,634 Total MW of Generation



*Lakefield Wind Park PPA – 200 MW (in MN, not pictured)

Leading the inclusive, clean energy transition

Customer

Reliability. Affordability. Diverse needs.

Create value in how we serve customers today to become their energy partner in the future.

Smart Grid

Use new technologies across our value chain to create the resilient grid of the future.

Sustainability

Maintain reliability and affordability while driving lower carbon emissions.

Workforce of the Future

Work differently, using new technologies and skills. Strengthen our culture of safety, innovation and belonging.

Facilitate economic and community development

IRP & Planning Model Overview

Erik Miller, Manager, Resource Planning, AES Indiana
Will Vance, Senior Analyst, AES Indiana

What is an Integrated Resource Plan?

Integrated Resource Plan (IRP) in Indiana –> 170 IAC 4-7-2

→ 20-year look at how AES Indiana will serve load

→ Submitted every three years

→ Plan created with stakeholder input

→ Modeling and analysis culminates in a preferred resource portfolio and a short-term action plan

What is a preferred resource portfolio?

"'Preferred resource portfolio' means the utility's selected long term supply-side and demand-side resource mix that safely, reliably, efficiently, and cost-effectively meets the electric system demand, taking cost, risk, and uncertainty into consideration." IAC 4-7-1-1-cc

Stakeholders are critical to the process

AES Indiana is committed to providing an engaging and collaborative IRP process for its stakeholders:

→ Five Public Advisory Meetings for stakeholders to engage throughout the process

→ Five Technical Meetings available to stakeholders with nondisclosure agreements (NDA) for deeper analytics discussion

→ Planning documents and modeling materials will be shared with stakeholders with NDAs upon request

→ After full consideration of stakeholder input, the Preferred Resource Portfolio will be announced in the fall of 2022

IRP rules link: http://iac.iga.in.gov/iac/iac_title?iact=170&iaca=&submit=+Go Article 4. 170 IAC 4-7-2

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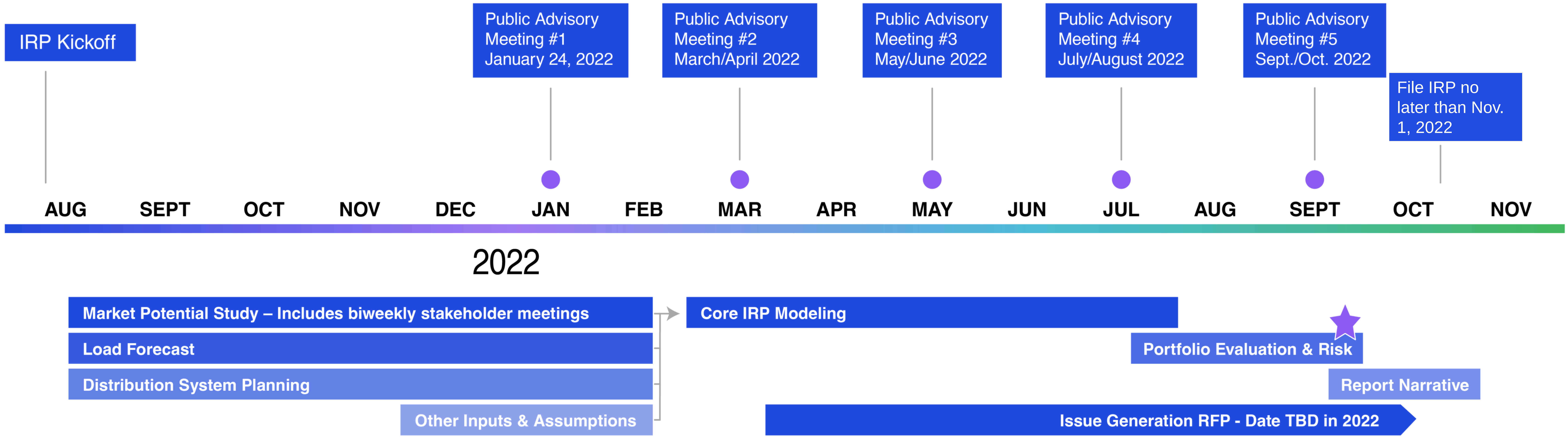
Updated 2022 IRP Timeline



● = Stakeholder Technical Meeting for stakeholders with executed NDAs held the week before each public stakeholder meeting

★ = Preferred Resource Portfolio selected

AES Indiana is available for additional touchpoints with stakeholders to discuss IRP-related topics.

Public Advisory Schedule

Public Advisory Meeting #1 - January 24, 2022

- 2022 IRP Schedule & Progress
- 2019 IRP Recap
- Load, EV, DG Forecasts
- MPS Overview

Public Advisory Meeting #2 - March/April

- DSM Modeling & Inputs
- Replacement Resource Inputs
- Commodity Inputs

Public Advisory Meeting #3- May/June

- Portfolio Matrix Framework
- Portfolio Metrics & Scorecard Framework
- Reliability Analysis

Public Advisory Meeting #4 - July/August

- Preliminary Modeling
- Risk Analysis
- Portfolio Metrics & Scorecard Review

Public Advisory Meeting #5 - September/October

- 2022 Modeling Insights
- Preferred Resource Portfolio & Short-Term Action Plan

Topics for meetings 2-5 are subject to change depending on modeling progress.

IRP Process Overview

DSM Market Potential Study (MPS)
- → End Use Analysis
- → Comprehensive measure list
- → Measure uptake & potentials: MAP & RAP
- → Develop IRP model inputs (bundles)

Replacement Resource Costs
- → Cost assumptions from 2020 RFP and Consultants, e.g. Wood Mackenzie, NREL
- → New RFP issued date TBD in 2022

Distribution System Planning (DSP)
- → Bottom-up forecast on sample of constrained circuits
- → Assess EV and DG impacts
- → Load shapes inform IRP analysis

Load Forecast
- → Itron SAE Methodology
- → Base, High & Low Scenarios
- → IRP model peak and energy inputs

Core IRP Modeling & Evaluation

Capacity Expansion Modeling
- → Retirement and replacement analysis
- → Portfolio optimization

Production Cost Modeling & PVRR
- → Prod Cost - Portfolio dispatch analysis serve as PVRR inputs
- → Portfolio PVRR analysis
- → Stochastic risk analysis

Portfolio Evaluation & Short-Term Action Plan
- → Screen against Evaluation Criteria
- → Selection of Preferred Resource Portfolio & Short-Term Action Plan

Other Inputs & Assumptions
- → Portfolio and scenario framework
- → Power & Commodity Price Forecasts
- → Model Parameters & Constraints
- → Existing Resources

IRP Submitted Nov. 1, 2022

IRP-driven Filings
- → DSM Filing
- → Certificate of Public Convenience and Necessity (CPCN) Filing

Contributors:

DSM MPS – GDS Associates
RFP – Sargent and Lundy
DSP – Internal & Conrad Technical Services
Load Forecast – Itron
PVRR Calculations – Concentric
IRP Modeling & Evaluation – Internal with ACES & Anchor Power support

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Portfolio Metrics & Scorecard

Scorecard Framework in the 2019 IRP

- → Portfolio Metrics in the 2019 IRP included three key overarching categories: Cost, Environmental and Risk
- → In 2022, AES Indiana will consider additions to the scorecard, such as reliability metrics

Planning Model Overview

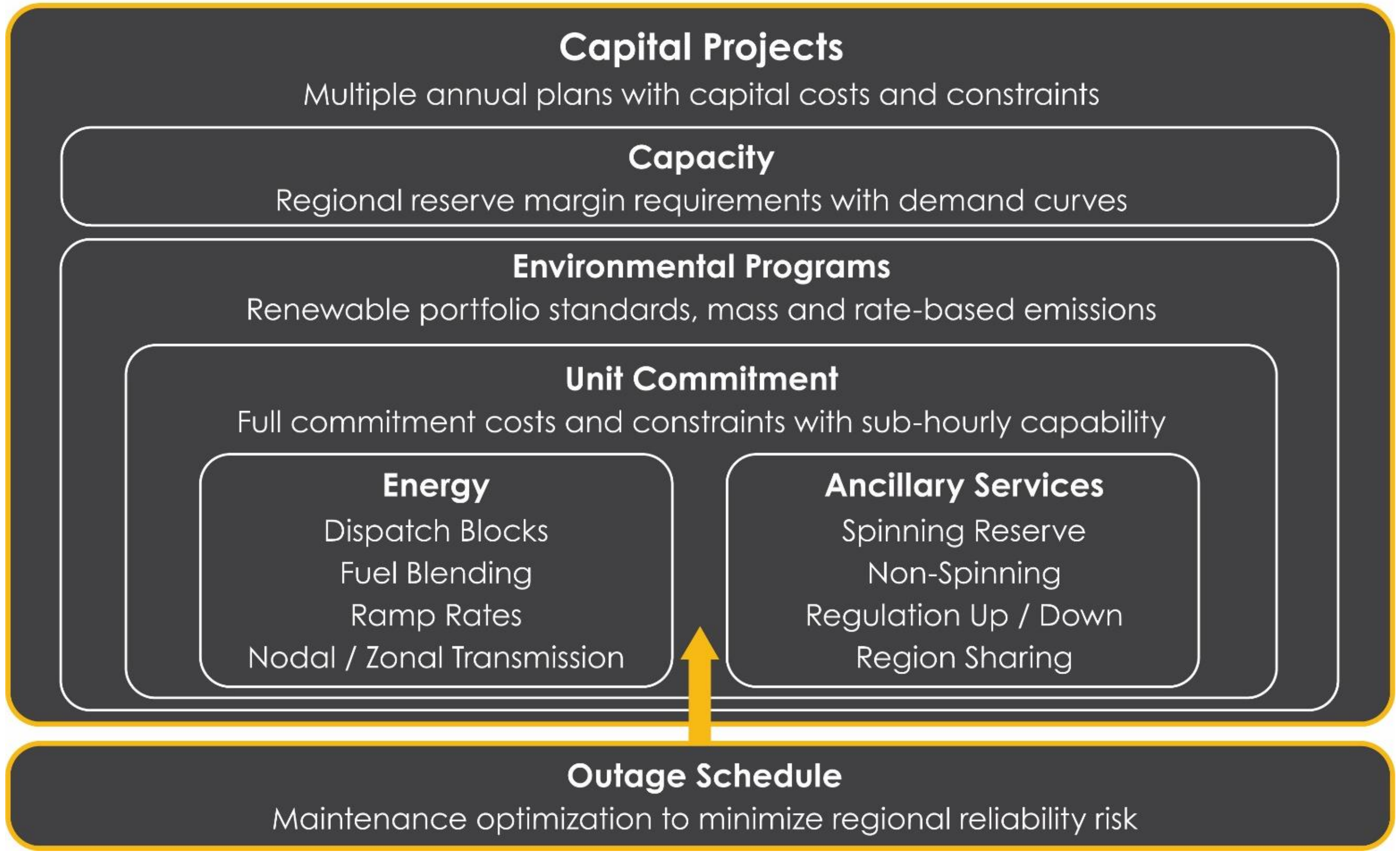
EnCompass

- Long-term Production Cost and Capacity Expansion model created by Anchor Power Solutions.
- EnCompass is used by utilities, co-ops, municipalities, and consultants. It has been used to support regulatory filings in 17 states.

EnCompass

- →EnCompass models thermal, renewable, storage, and load resources with hourly granularity.
- →It will be used for capacity expansion analysis to make long-term resource decisions based on scenario input assumptions.
- →Based on resource selections, EnCompass will calculate the present value revenue requirement of each portfolio.
- →Through the use of stochastic analysis, EnCompass will be used to understand the risk associated with portfolios.

ENCOMPASS POWER PLANNING SOFTWARE



EnCompass

Key Advantages of Utilizing EnCompass

→Quick run times

- → Allows for additional scenario analysis
- → Provides expedient model feedback

→Straightforward capacity expansion

- → Deterministic capacity expansion allows for more intuitive cause and effect results

→User control of modeling parameters

- → MIP Stop Basis is a user input for capacity expansion
- → Stochastic draws can be specified by user

→Model Transparency

- → Transparent hourly renewable and load profiles

2019 IRP Recap

Aaron Cooper, Chief Commercial Officer, AES US Utilities
Erik Miller, Manager, Resource Planning, AES Indiana

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2019 IRP – Short-Term Action Plan

Retire	Replace	Save	Monitor
Retire 630 MW of coal generation by 2023: → Pete 1: 2021 → Pete 2: 2023	Competitively bid for approximately 200 MW of firm capacity with all-source RFP.	Target – 130,000 MWh per year of new DSM as part of the 2021-2023 DSM Plan.	Maintain cost-effective units at Petersburg to retain flexibility and continue to monitor market conditions leading to our 2022 IRP.

Source: IPL's 2019 Integrated Resource Plan Non-Technical Summary, page 6.

Short-Term Action Plan Progress

- **December 2019 - July 2021** – AES Indiana issues & evaluates all-source RFP for approximately 200 MW of firm capacity in 2023 that will result from the anticipated retirements of Pete Units 1 & 2.
- **November 2020** – AES Indiana receives IURC Order for the implementation of DSM programs in 2021-2023. DSM portfolio will target approximately 130,000 MWh per year.
- **May 2021** – AES Indiana retires Petersburg Unit 1 (220 MW).
- **June 2021** – AES Indiana receives IURC Order approving the CPCN for Hardy Hills Solar (195 MW) identified through the RFP process. Project estimated COD May 2023.
- **November 2021** – AES Indiana receives IURC Order approving the CPCN for the Petersburg Energy Center Solar + Storage project (250 MW solar; 45 MW 4-hr battery) identified through the RFP process. Project estimated COD June 2024.
- **May 31, 2023** – Plans for retirement of Petersburg Unit 2 (410 MW).

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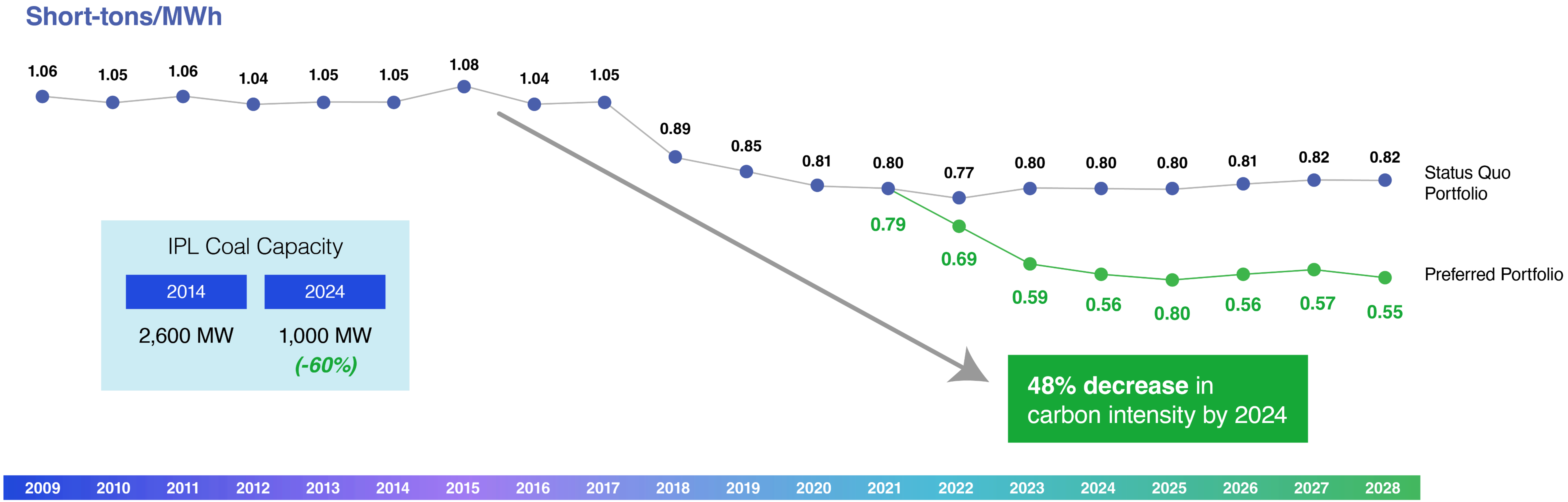
Portfolio changes have reduced carbon intensity by 48% since 2015

Petersburg Unit 1 retired May 31, 2021
Petersburg Unit 2 anticipated retirement May 31, 2023



Hardy Hills Solar

Project Information

→ **Type:** Solar facility

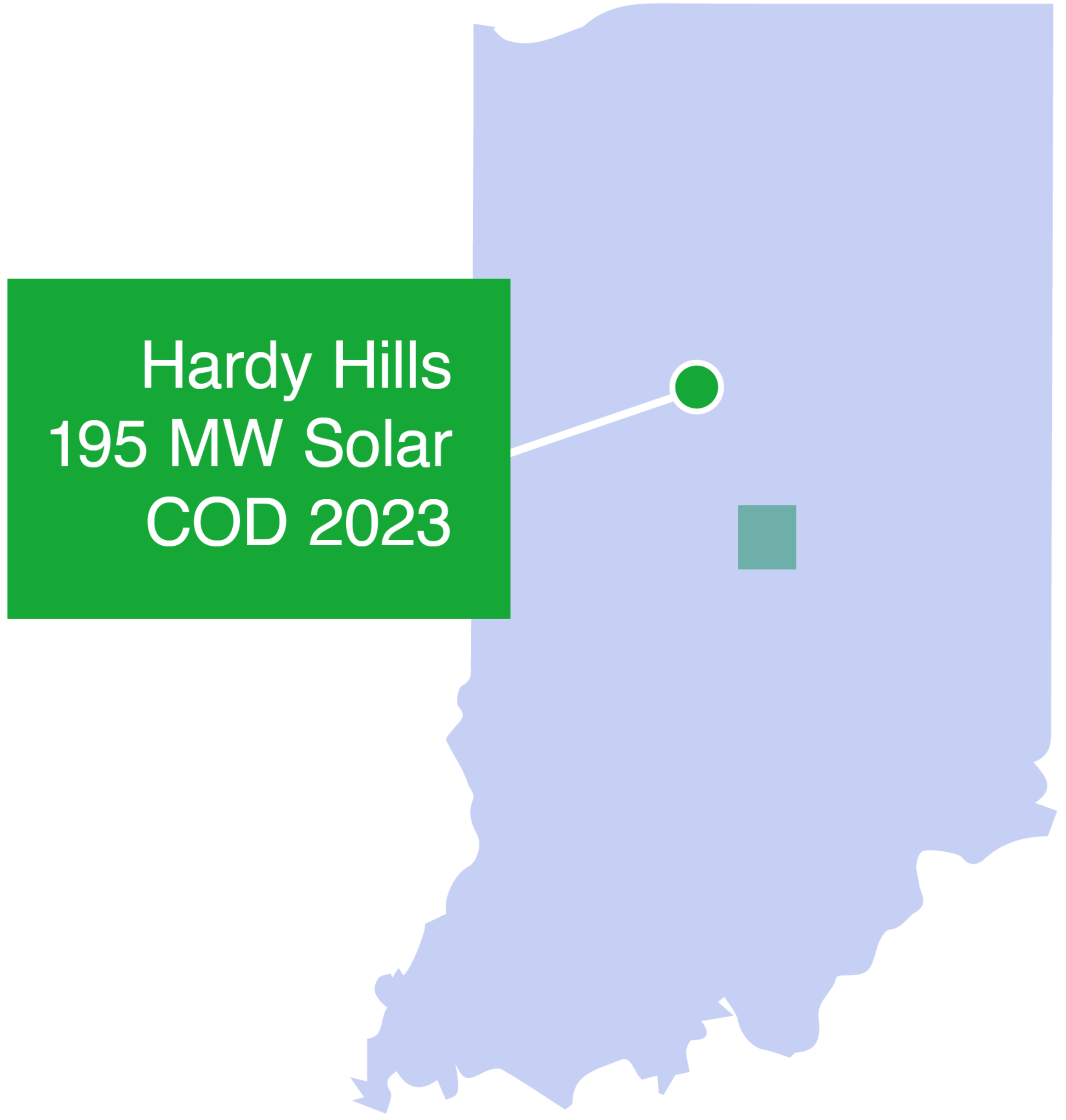
→ **Size:** 195 MWac ICAP

→ **COD:** 2023

→ **Location:** Clinton County, IN

→ **Developer:** Invenergy Solar Development North America, LLC

Hardy Hills will contribute 98 MW to AES Indiana's 2023 UCAP need resulting from the retirement of Petersburg Units 1 & 2.

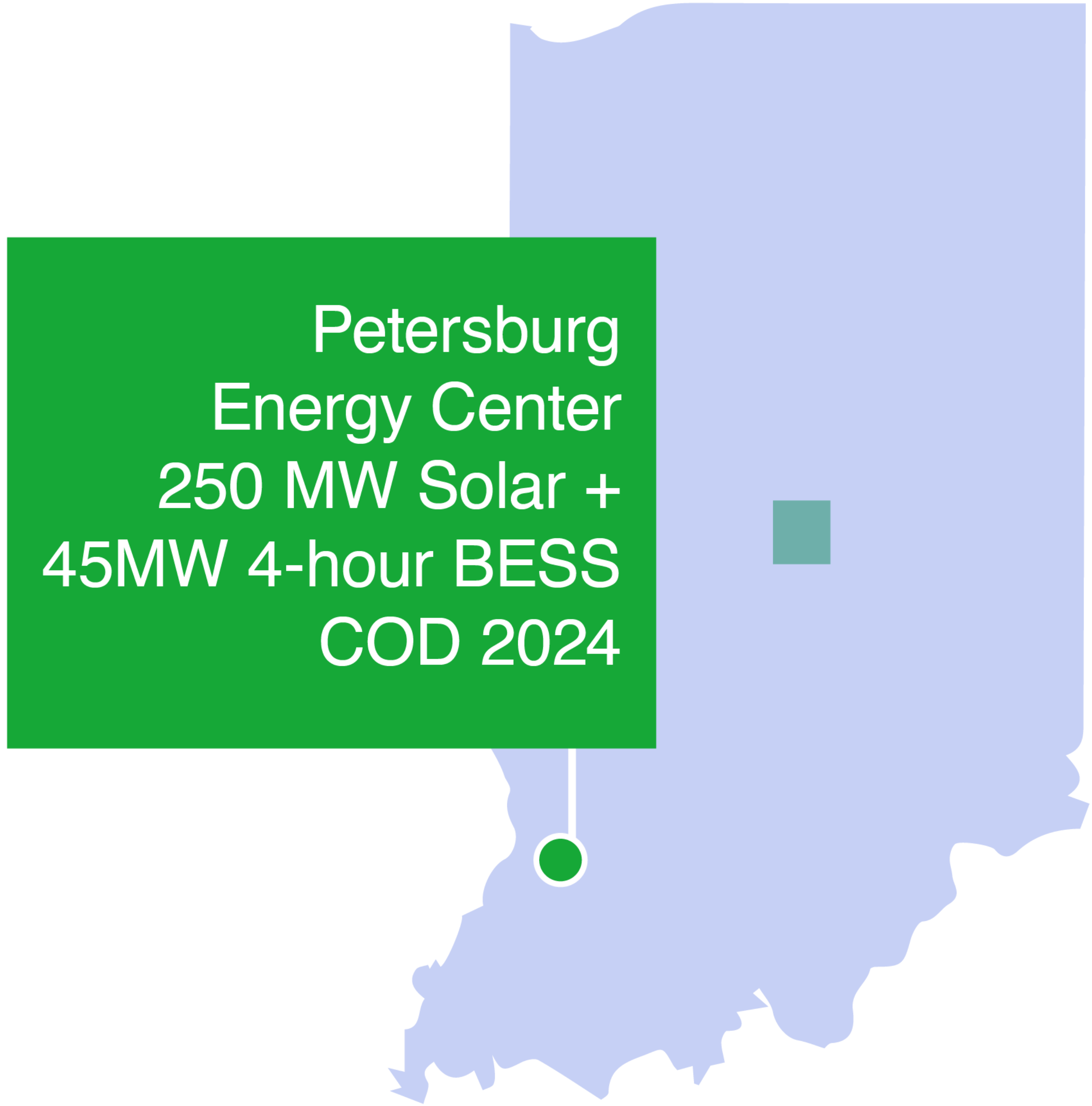


Petersburg Energy Center

Project Information

- **Type:** Solar and battery energy storage facility
- **Size:** 250 MWac ICAP coupled with a 180 MWh DC battery energy storage system (45 MW, 4-hour discharge power capacity)
- **COD:** 2024
- **Location:** Pike County, IN
- **Developer:** NextEra Energy Resources, LLC

Petersburg Energy Center will contribute 168 MW to AES Indiana's 2023 UCAP need resulting from the retirement of Petersburg Units 1 & 2.



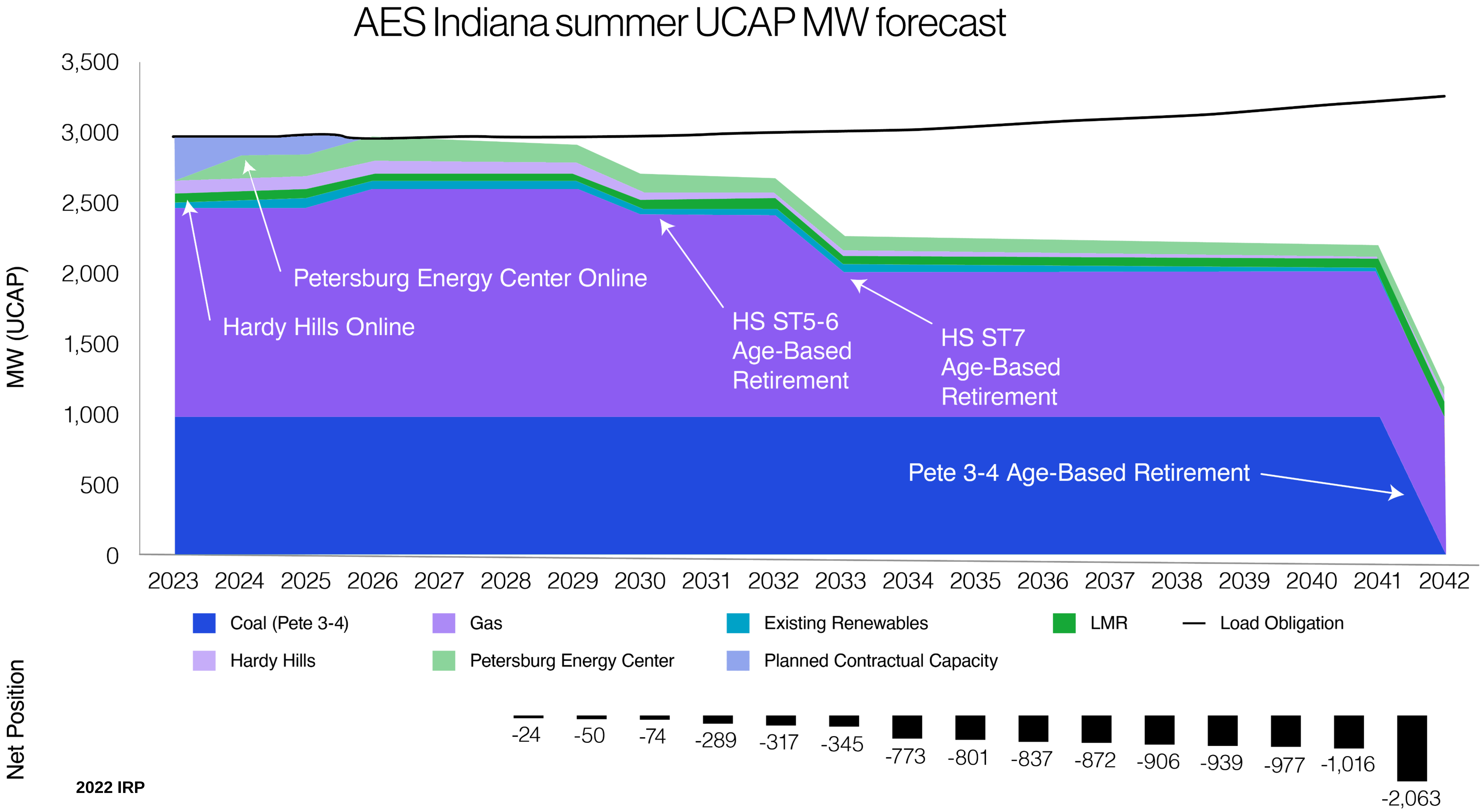
IURC Director's Comments to 2019 IRP

Topic	Comments Summary *(not exhaustive)*	2022 IRP Improvements
Resource Optimization & Risk	→ General **lack of clarity** around the model and methodology → PowerSimm's **stochastic capacity expansion methodology caused confusion** and lacked explanation → "Future IRPs would **benefit from industry experts' judgments** to evaluate whether there is a rationale for hardwiring certain resource." – *p.26, Director's Report for Indianapolis Power and Light's 2019 IRP*	→ AES IN will provide **better explanation of the model and methodology** used at stakeholder meetings and in the report. → AES IN is transitioning to **deterministic capacity expansion using Encompass** which should provide a more straightforward methodology**.** → An outside third-party consultant will provide **industry expert guidance** regarding resource options and modeling approaches.
DSM Modeling	→ DSM **bundles span the entire planning period** which is too long → Combining unrelated measures across residential and C&I measures makes a **questionable load shape** → Important that **hourly impact of DSM measures** be given particular attention	→ Encompass will allow for optimization using **shorter duration bundles**; AES IN will collaborate with stakeholders to determine more appropriate bundle durations. → AES IN will collaborate with our consultants and stakeholders to **consider alternative approaches** for measure bundling → AES IN will work with LBNL and NREL to **capture the hourly shapes** associated with DSM measures for inclusion in the portfolio modeling
Load Forecasting	→ IRP excluded **detailed Itron report** in the appendix → IRP excluded analysis on the **appropriateness of base temperature** for weather normalization → IRP excluded discussion of **street lighting usage** and how it is modeled in the load forecast → IRP excluded discussion of risk and uncertainty associated with the **load forecasting scenarios**	→ AES IN has contracted Itron to **perform the load forecast and provide a detailed report** that describes the methodology including all items noted to by the Director

Overview of Existing Resources

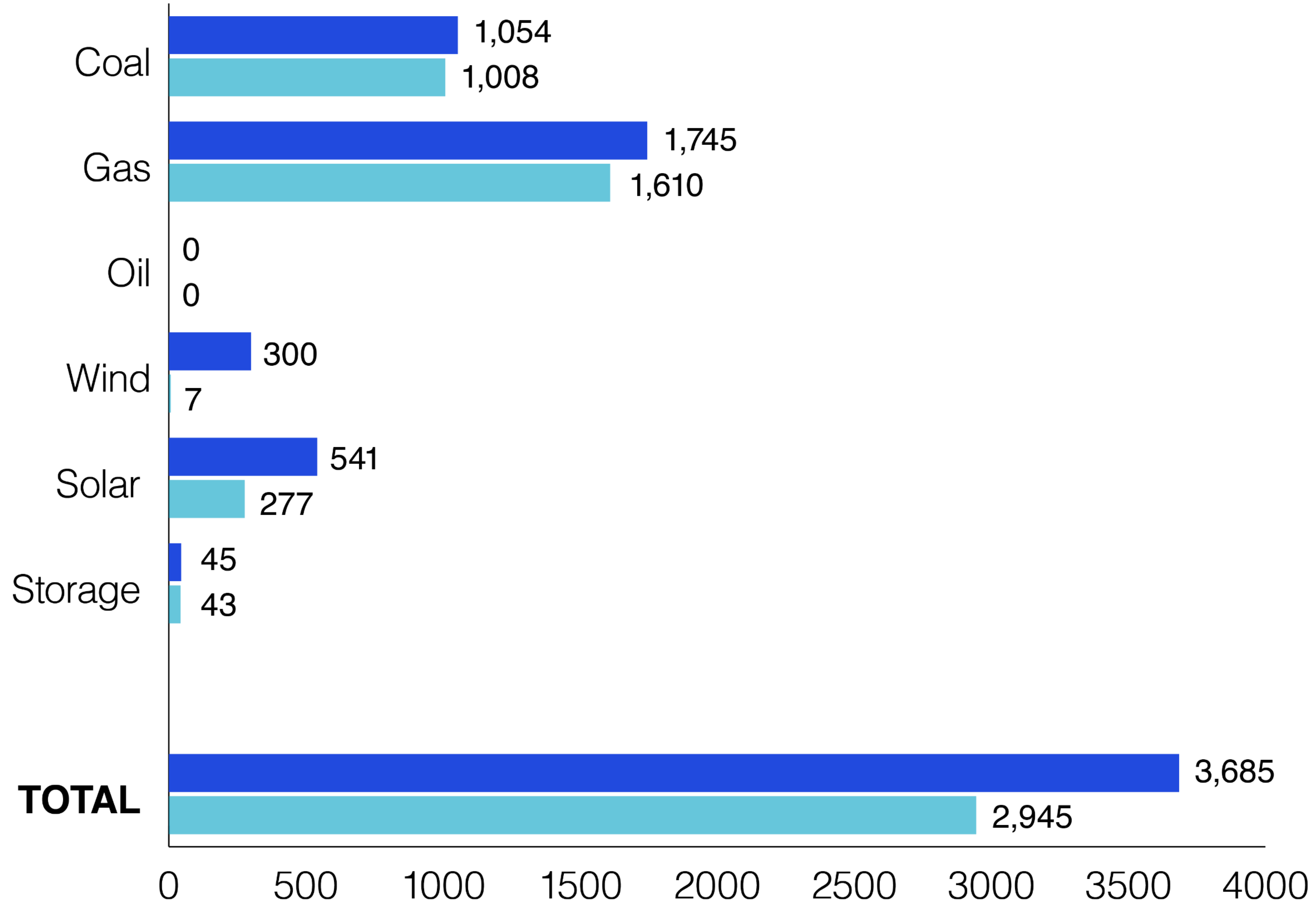
Aaron Cooper, Chief Commercial Officer, AES US Utilities
Erik Miller, Manager, Resource Planning, AES Indiana

Starting Point Portfolio

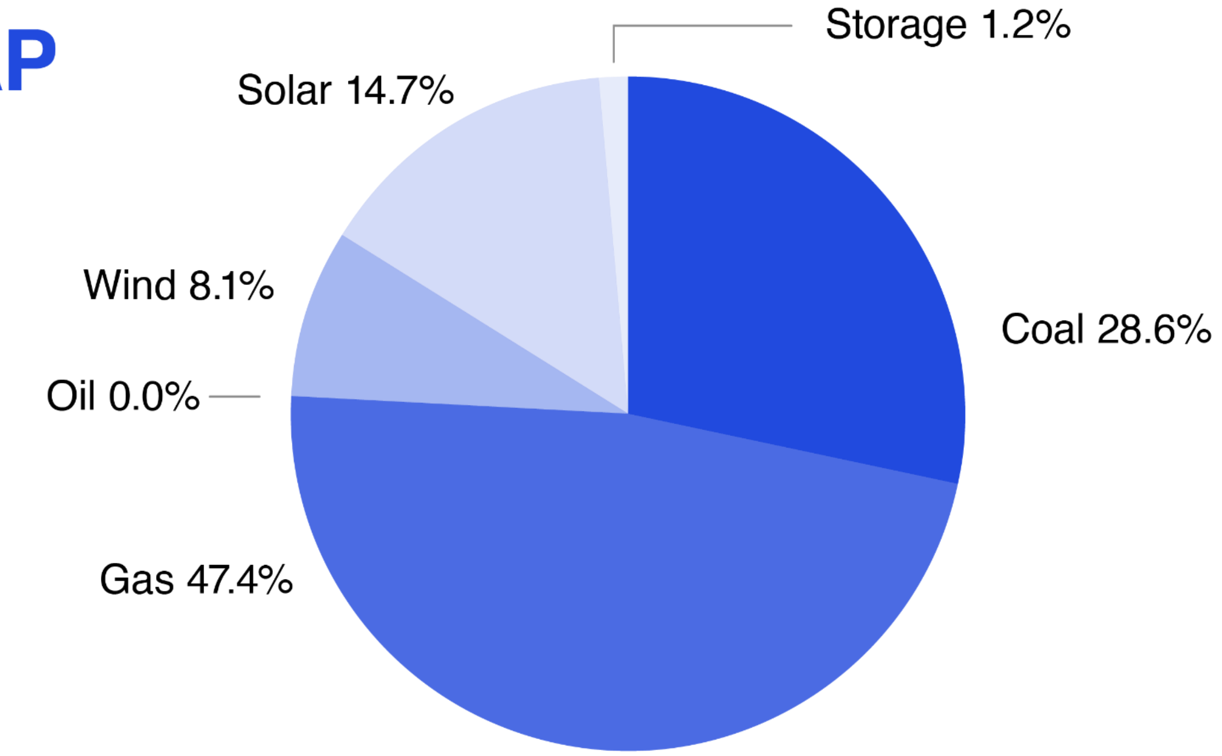


AES Indiana: Current Generation Mix

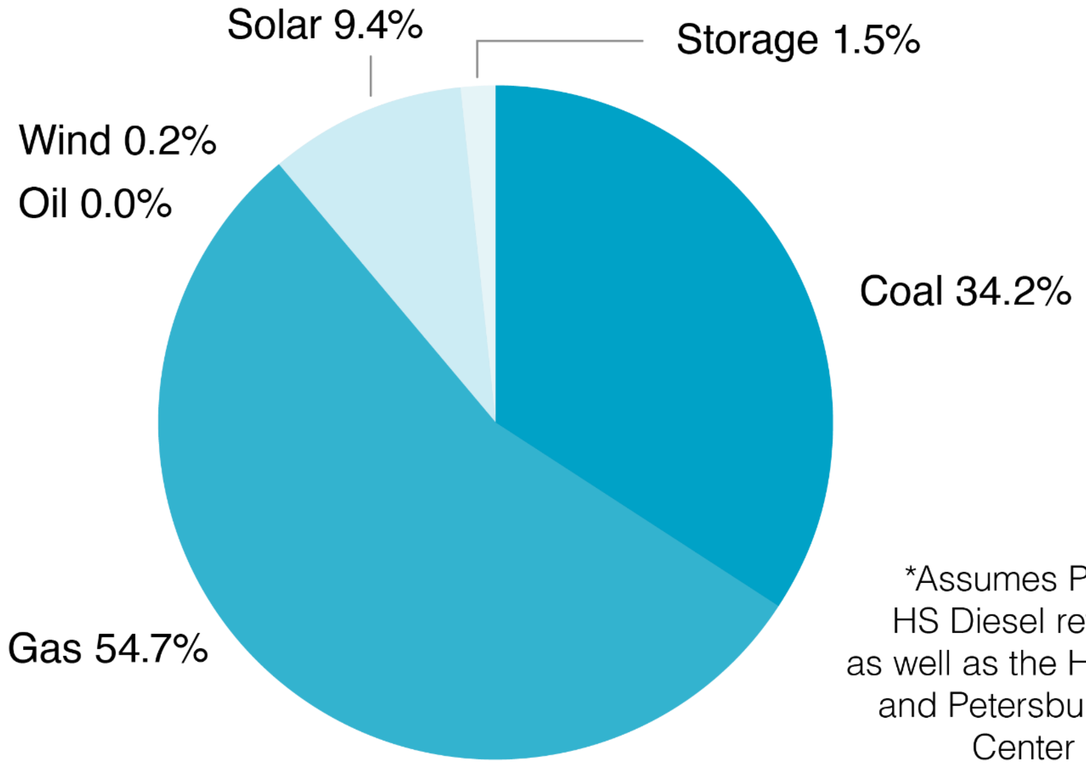
TECHNOLOGY – ICAP MW / UCAP MW



ICAP



UCAP



*Assumes Pete 2 and HS Diesel retirements, as well as the Hardy Hills and Petersburg Energy Center additions.

Existing Coal Resources

Coal Units	Reference Name	Technology	ICAP (MW)	UCAP (MW)	In-Service Year	Estimated Last Year In-Service
Petersburg						
PETE ST 2	Pete 2	Coal ST	410	368	1969	2023
PETE ST 3	Pete 3	Coal ST	518	488	1977	2042
PETE ST 4	Pete 4	Coal ST	536	520	1986	2042
		Total Coal:	1,464	1,376		

Notes on units:

- → Petersburg Unit 1 retired on May 31, 2021 consistent with the 2019 IRP Short Term Action Plan
- → Petersburg Unit 2 scheduled to retire on May 31, 2023 is consistent with the 2019 IRP Short Term Action Plan

Existing Gas Resources

Gas Units	Reference Name	Technology	ICAP (MW)	UCAP (MW)	In-Service Year	Estimated Last Year In-Service
Eagle Valley						
EV CCGT	Eagle Valley	CCGT	671	601	2018	2055
Harding Street						
HS 5G	Harding Street 5	Gas ST	100	93	1958	2030
HS 6G	Harding Street 6	Gas ST	99	94	1961	2030
HS 7G	Harding Street 7	Gas ST	415	399	1973	2033
HS GT4	Harding Street GT4	Gas CT	74	67	1994	2044
HS GT5	Harding Street GT5	Gas CT	74	69	1995	2045
HS GT6	Harding Street GT6	Gas CT	154	140	2002	2052
HS GT1 & GT2	Harding Street GT1 & 2	Oil	38	36	1973	2023/2024
Georgetown						
GTOWN GT1	Georgetown 1	Gas CT	79	72	2000	2050
GTOWN GT4	Georgetown 4	Gas CT	79	75	2001	2052
		Total Gas:	1,745	1,610		
		Total Oil:	38	36		

	ICAP (MW)	UCAP (MW)
CCGT	**671**	**601**
CT	**460**	**423**
ST	**614**	**586**

Existing Renewable Resources

Renewables	Technology	ICAP (MW)	UCAP (MW)	In-Service Year/ PPA Start	Estimated Last Year In-Service/PPA End
Hardy Hills					
Hardy Hills	Solar Only	195	98	2023	TBD
Petersburg Energy Center					
PEC Solar	Solar + BESS	250	125	2024	TBD
PEC BESS	Solar + BESS	180 MWh	45 MW, 4-hour	2024	TBD
PPAs					
Hoosier Wind Park (IN)	PPA	100	7	2009	2029
Lakefield Wind (MN)	PPA	200	0	2011	2031
Solar (Rate REP)	PPA	96	54	varies	varies
	Total Renewable:	841	328		

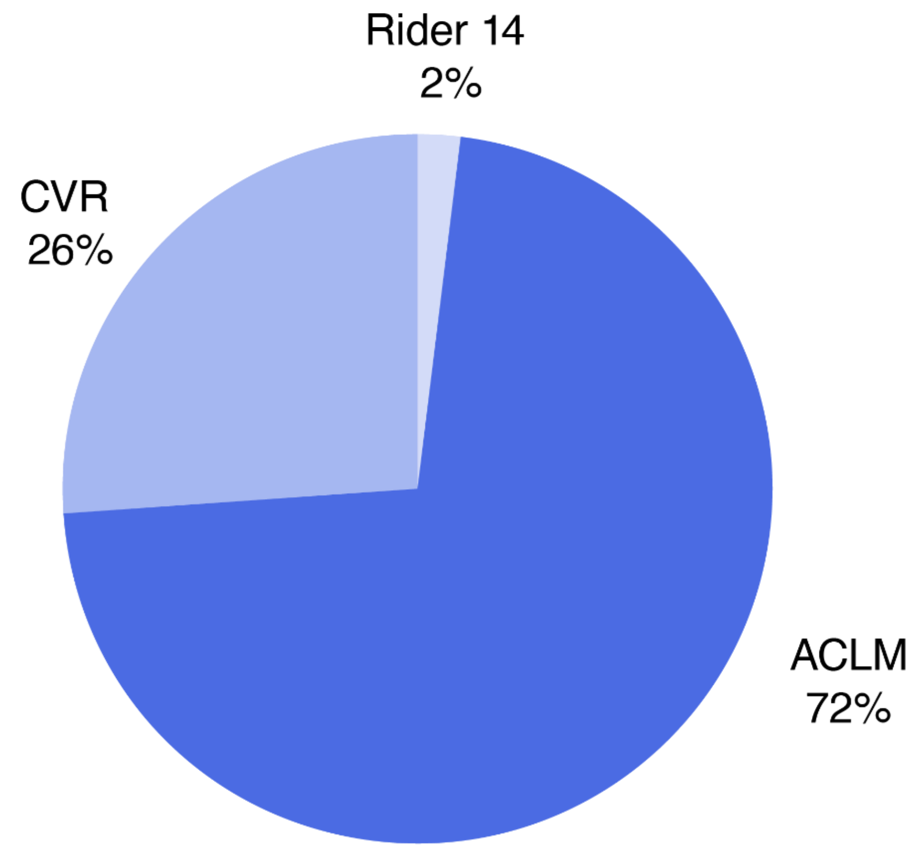
- → Lakefield Wind has no firm transmission and therefore receives no capacity credit from MISO to AES
- → Rate REP solar receives no capacity credit from MISO; rather it serves as a reduction to load in the PRA
- → UCAP values are based on current MISO capacity credit levels for renewable resources. These values will likely fall over time as renewable penetration increases within MISO.

	ICAP (MW)	UCAP (MW)
Solar	**541**	**277**
Wind	**300**	**7**
Storage	**45**	**43**

Existing DSM Resources

DEMAND RESPONSE

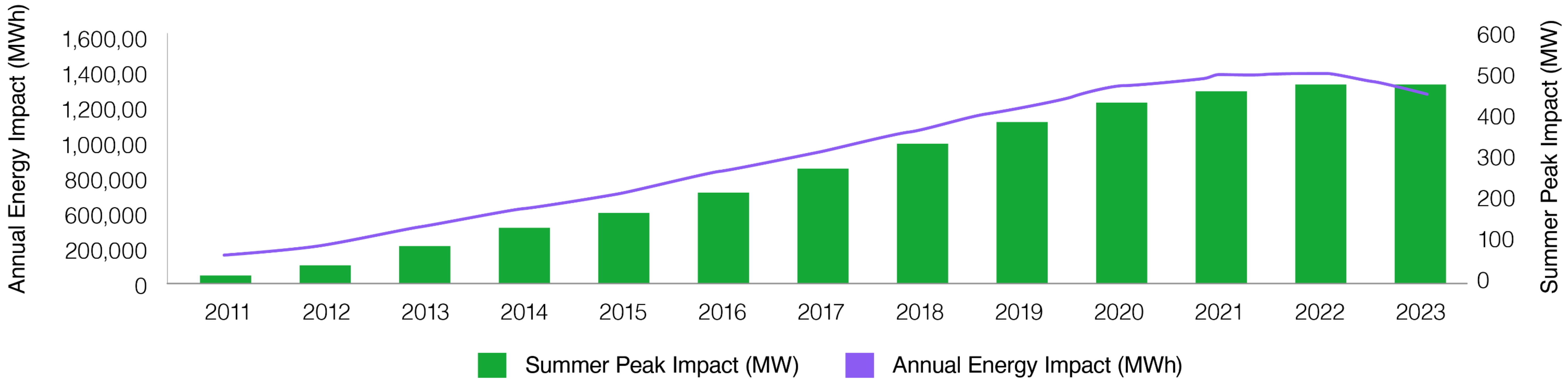
Load Modifying Resources	Summer Capacity Value (MW)
Air Conditioner Load Management	46.3
Conservation Voltage Reduction	16.8
Rider 14	1.1



ENERGY EFFICIENCY

→ Avg annual incremental program savings of 1% per year of 2021 sales

→ Savings of approximately 10% of 2021 sales from measures installed to date



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Replacement Resource Options

Erik Miller, Manager, Resource Planning, AES Indiana

Commercially Available Replacement Resources

DSM/EE

→ EE & DR Measures bundled into traunches for planning model selection

Wind

→ Land-Based Wind

Solar

→ Utility-Scale
→ C&I
→ Residential

Storage

→ Standalone Front-of-meter
→ Solar + Storage
→ Wind + Storage

Natural Gas

→ CCGT
→ CT
→ Reciprocating Engine/ICE

Optionality for Emerging Technologies

The energy sector is transforming, and many new generation technologies are under development that can be utilized to support AES Indiana's commitment to achieve our customers' goals of reliability, affordability and sustainability.

These technologies include but may not be limited to:

- →Green Hydrogen
- →Small Modular Reactors (SMRs)
- →Gravity Energy Storage
- →Pumped-hydro Storage
- →Carbon Capture and Sequestration (CCS)

As a company, we see these technologies as providing optionality in a path towards reducing carbon and we plan to consider them in future IRPs as they become commercially available.

AES Indiana welcomes stakeholder input regarding new & emerging technologies.

2022 Integrated Resource Plan (IRP)

Baseline Energy & Load Forecast

Presented by Itron

Itron

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Introduction to the Itron Team

- Itron has over 30 years of experience developing forecast models for customers worldwide. Itron's energy forecasting group is nationally recognized for its expertise in short-term forecasting (hour-ahead and day-ahead), financial forecasting (1-3 years-ahead), and long-term forecasting (10-20 years-ahead).
  We are a leading provider of forecasting solutions to independent system operators (ISO), regional transmission organizations, energy retailers, public utilities, municipalities, and cooperatives.
- Itron specializes in long-term load modeling, regulatory support, statistical analysis, and forecasting system implementation. The forecasting staff includes economists, statisticians, programmers, and consultants that have extensive experience in these areas, as well as database design and software development.

Eric Fox

Director, Forecasting Solutions

Michael Russo

Forecast Consultant

Agenda

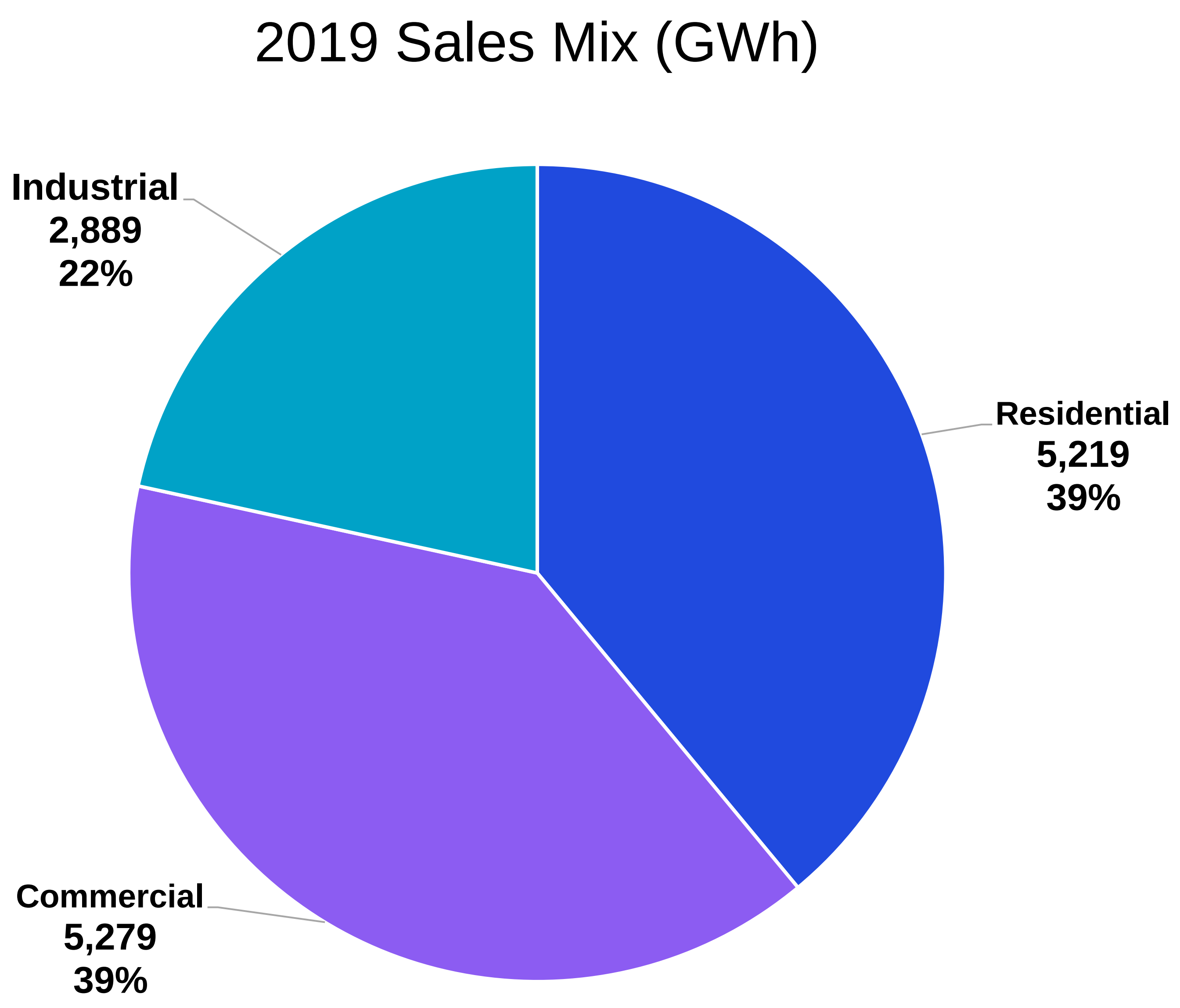
→ Sales, Energy, and Demand Trends

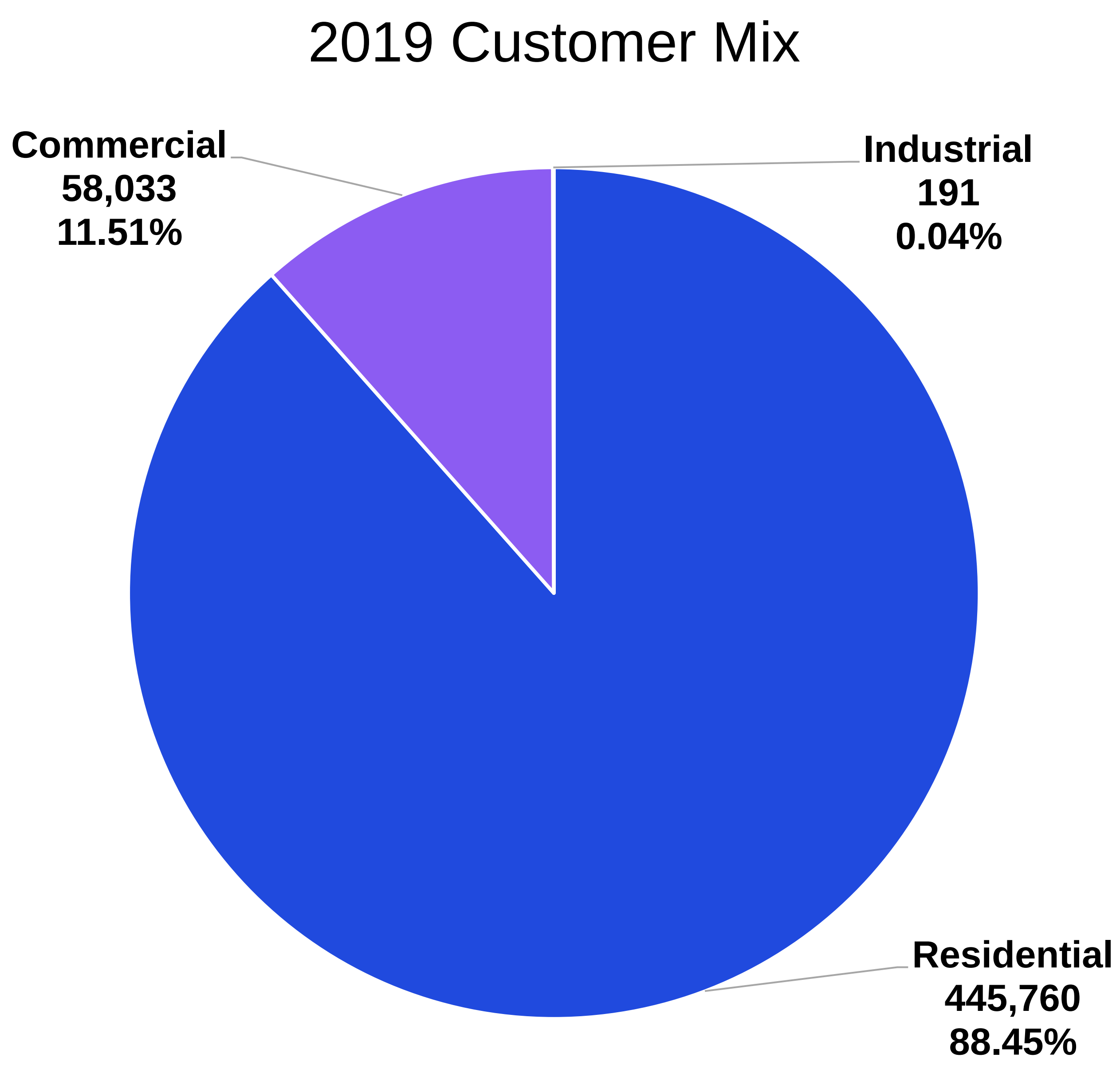
→ Modeling Approach

→ Baseline Forecast

Sales, Energy and Demand Trends

AES Indiana Customer Class Mix

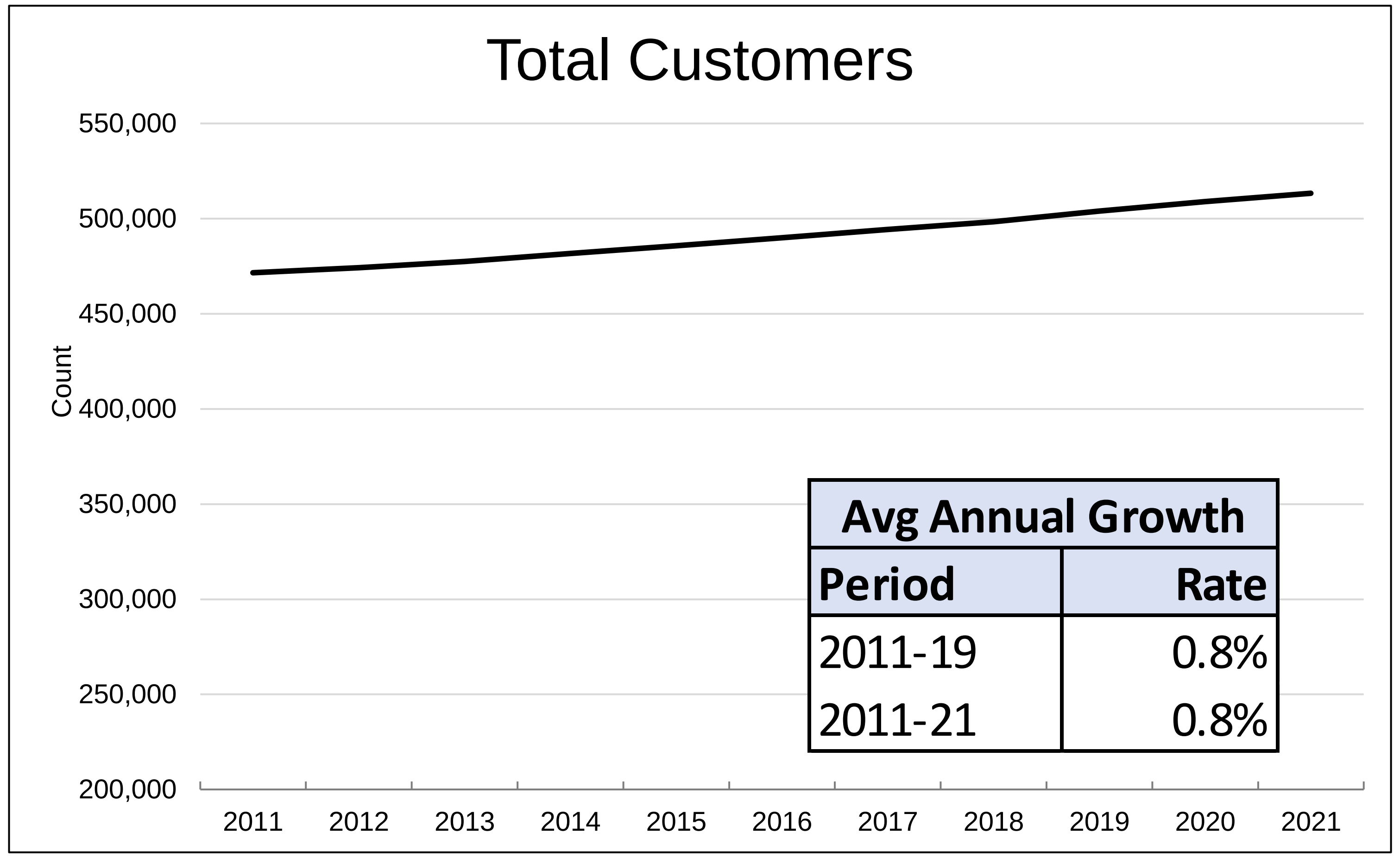




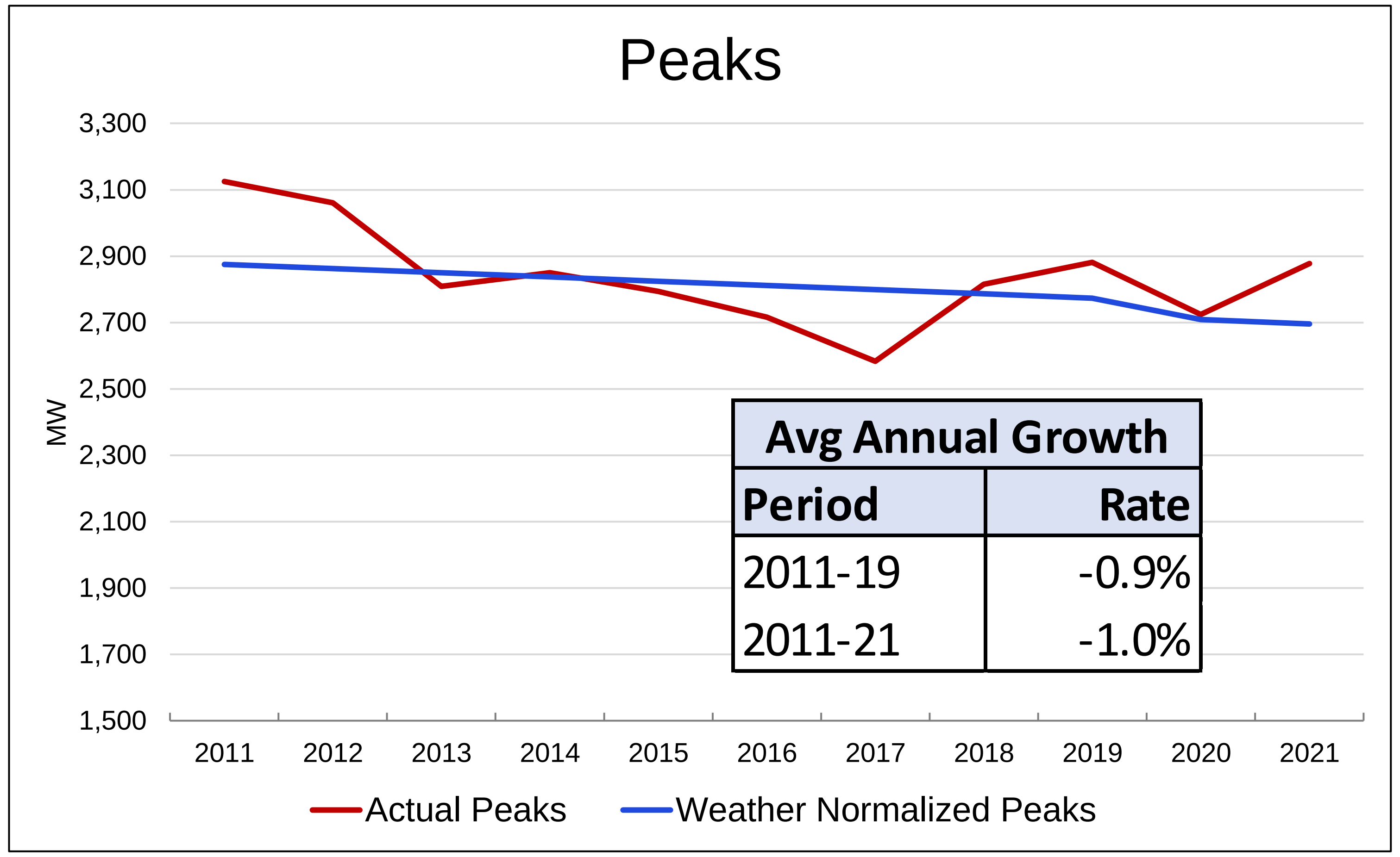
AES Indiana serves over 500,000 customers across residential, commercial, and industrial customer class. The residential class accounts for nearly 90% of the customers and 40% of system sales. Commercial sales 40%. Industrial sales 20%.

Itron aes Indiana

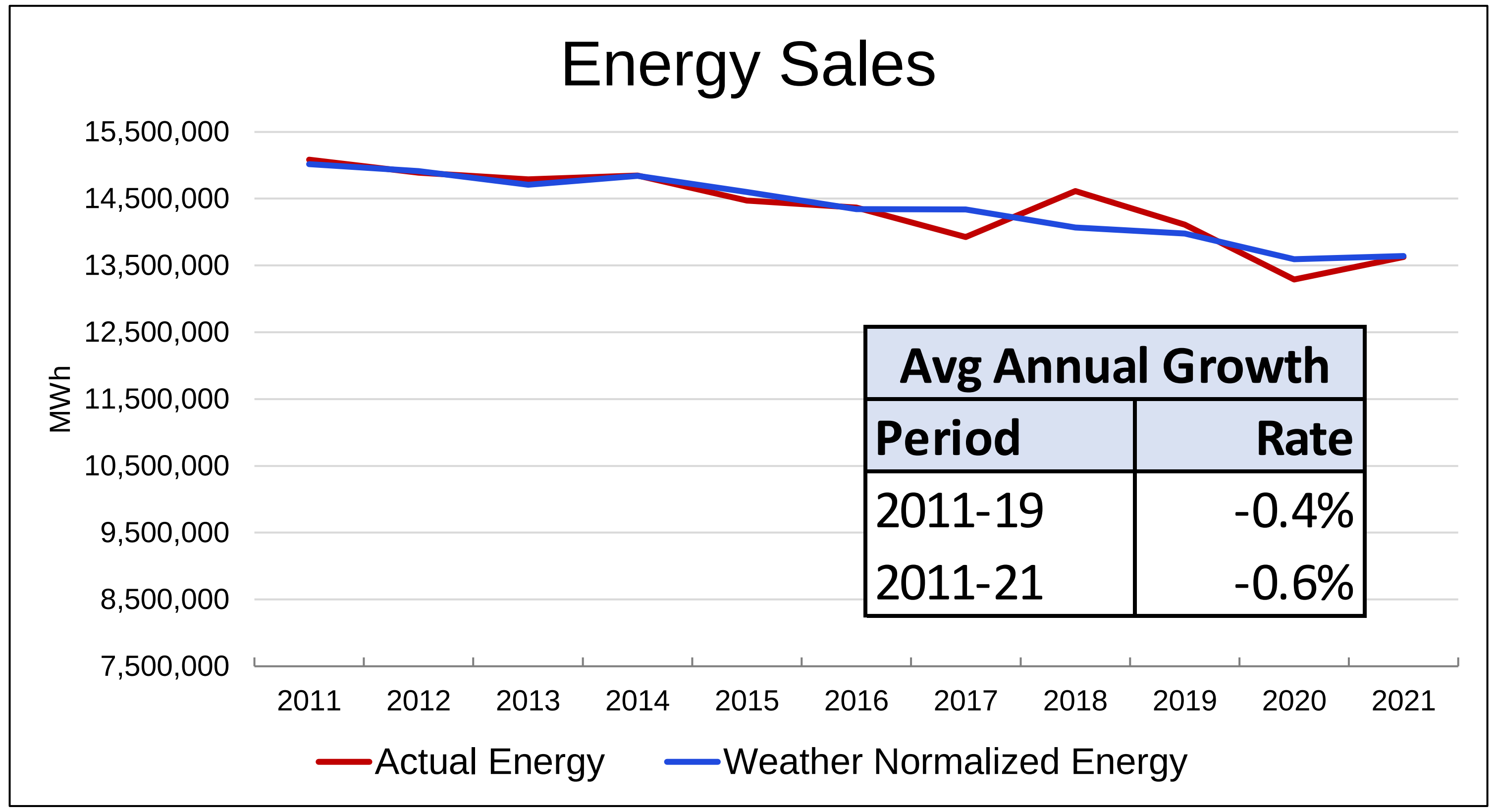
Historical Energy, Peak, and Customer Trends



Avg Annual Growth	
Period	**Rate**
2011-19	0.8%
2011-21	0.8%



Avg Annual Growth	
Period	**Rate**
2011-19	-0.9%
2011-21	-1.0%



Avg Annual Growth	
Period	**Rate**
2011-19	-0.4%
2011-21	-0.6%

Despite relatively strong customer growth, system energy and peak demand has been declining as efficiency gains have outweighed customer growth

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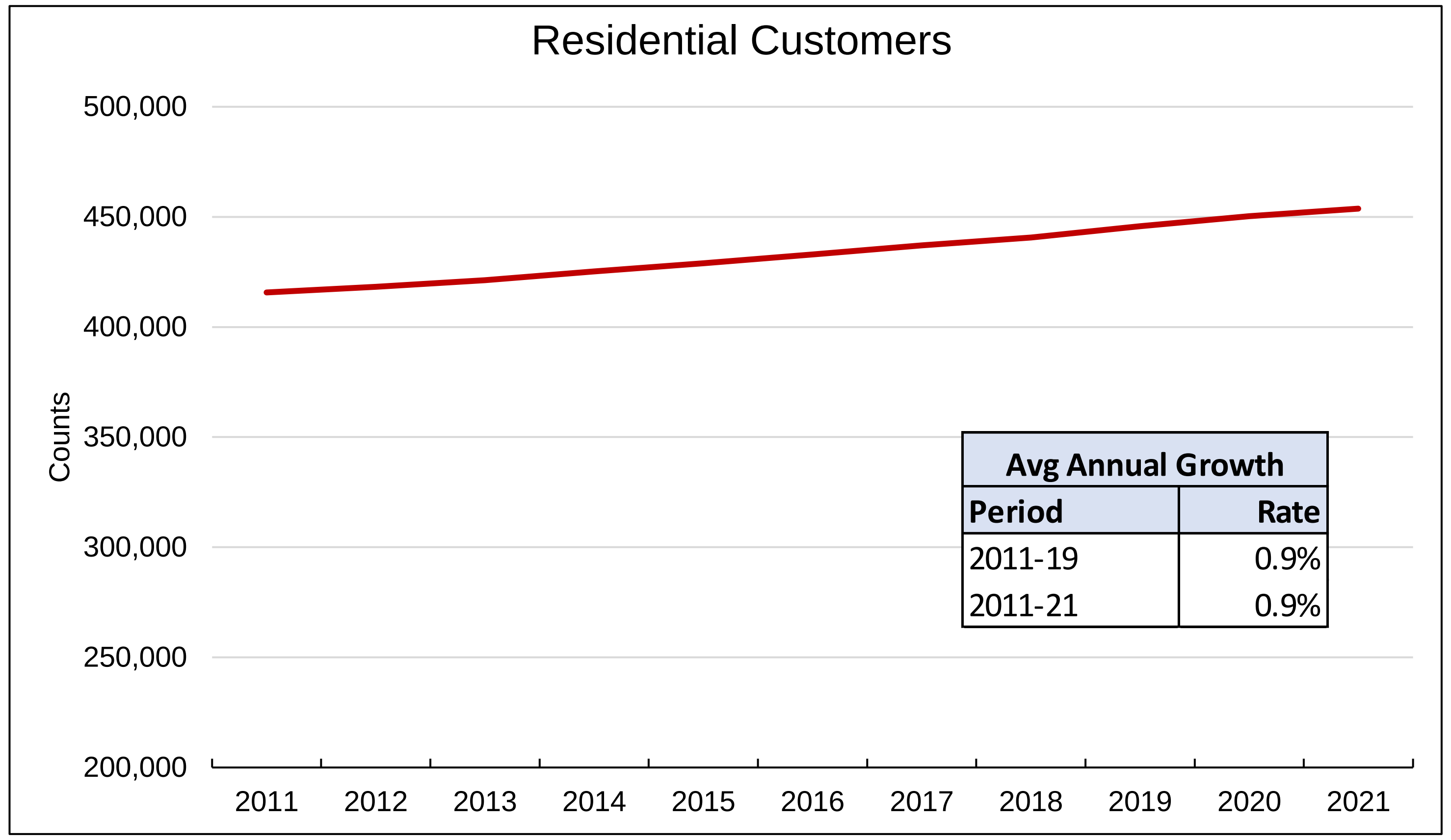
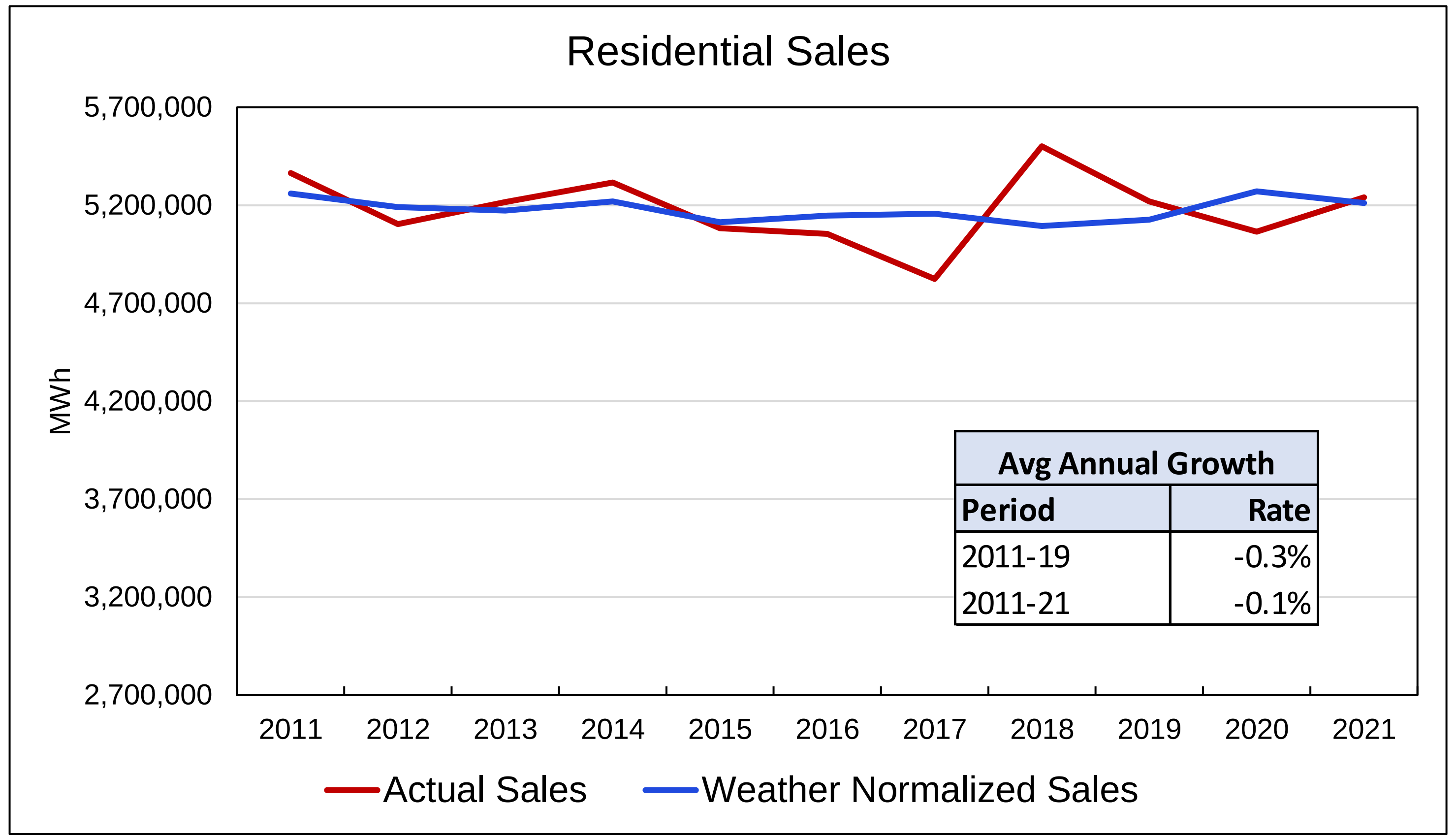
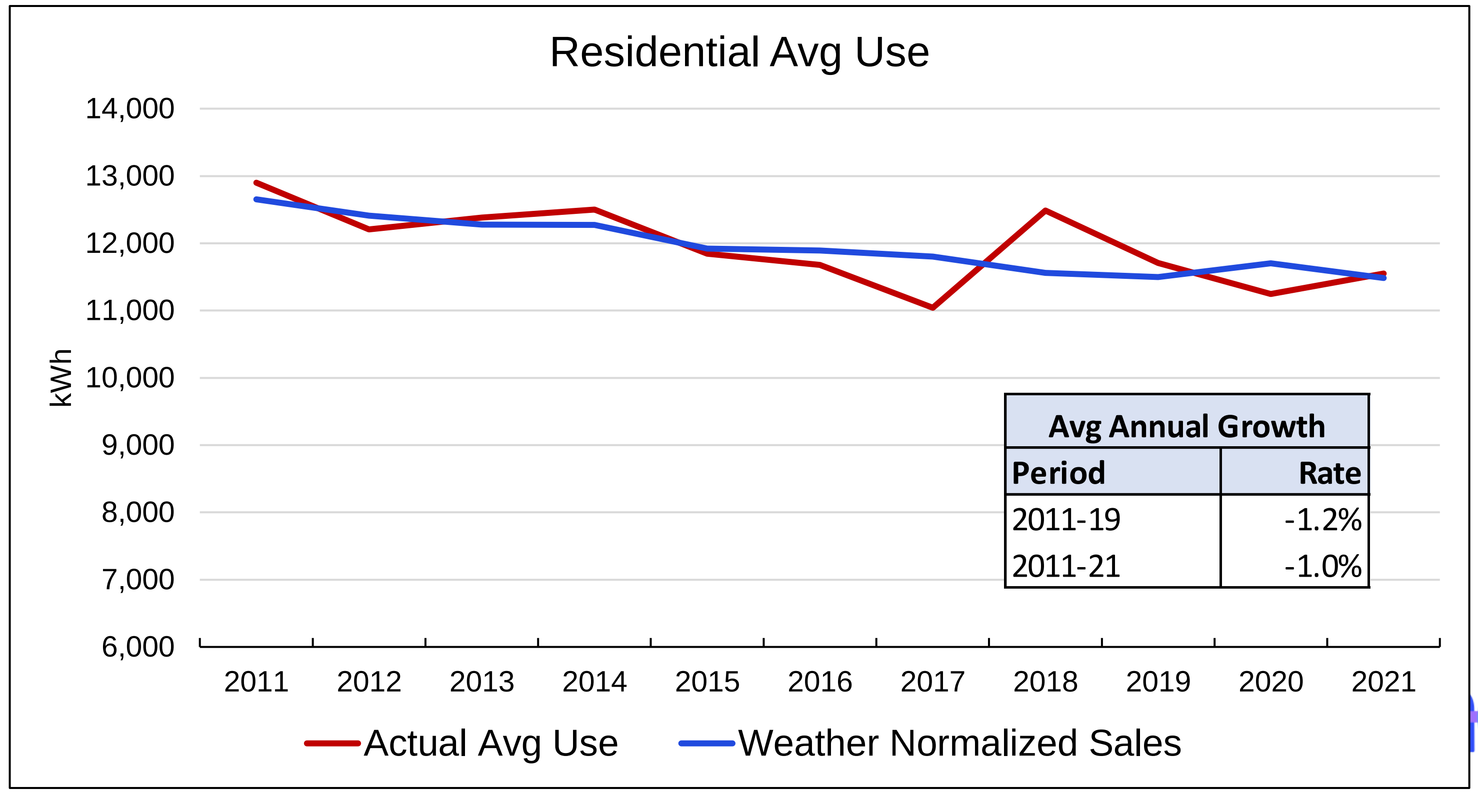
Residential Customer and Sales Trends





The number of customers has increased from 417,000 in 2010 to 455,500 by year-end 2021. Adding approximately 3,500 new customers per year.

But despite strong customer growth, sales have been flat with average use declining at roughly the same rate as customer growth.



Indiana

What's Driving Customer Growth

Strong population and household growth

→ Home to over 876,000 people and more than 2 million residents in the metropolitan area. Third most populous city in the Midwest behind Chicago and Columbus. Population projected to grow 26% over the next 30 years

Strong regional economy

→ Regional GDP over $126 billion (Fed Reserve Bank of St. Louis)

→ Employment growth 1.7% year over year, over 1 million employed in the metro area

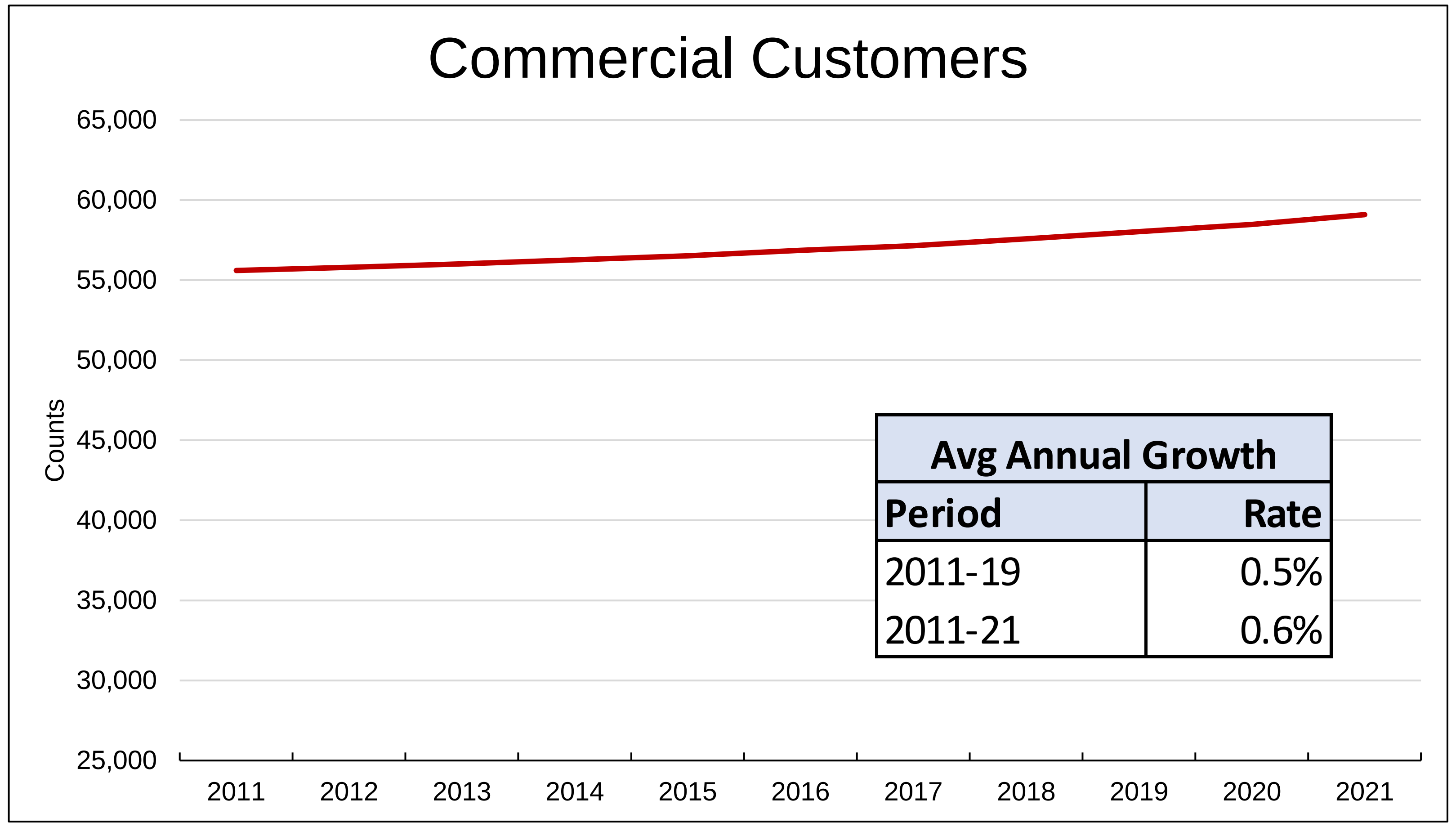
Affordable Housing

→ According to Kiplinger's, Indianapolis has an affordability index of 1 out of 10, (based on percent of income needed to buy a median price home, $185,000)

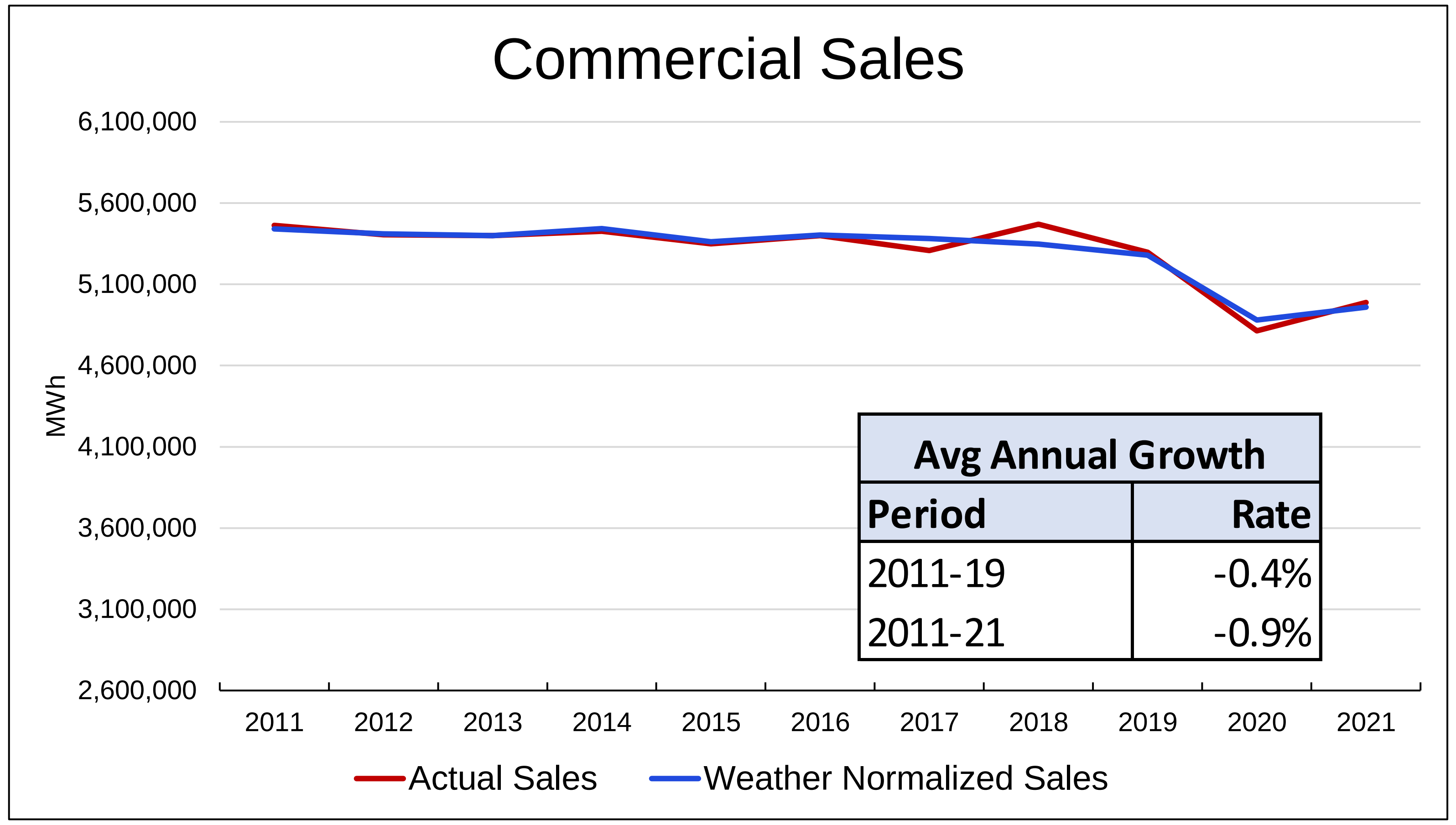
The Indianapolis real estate market: stats & trends for 2021 (roofstock.com)

https://www.kiplinger.com/article/real-estate/t010-c000-s002-home-price-changes-in-the-100-largest-metro-areas.html

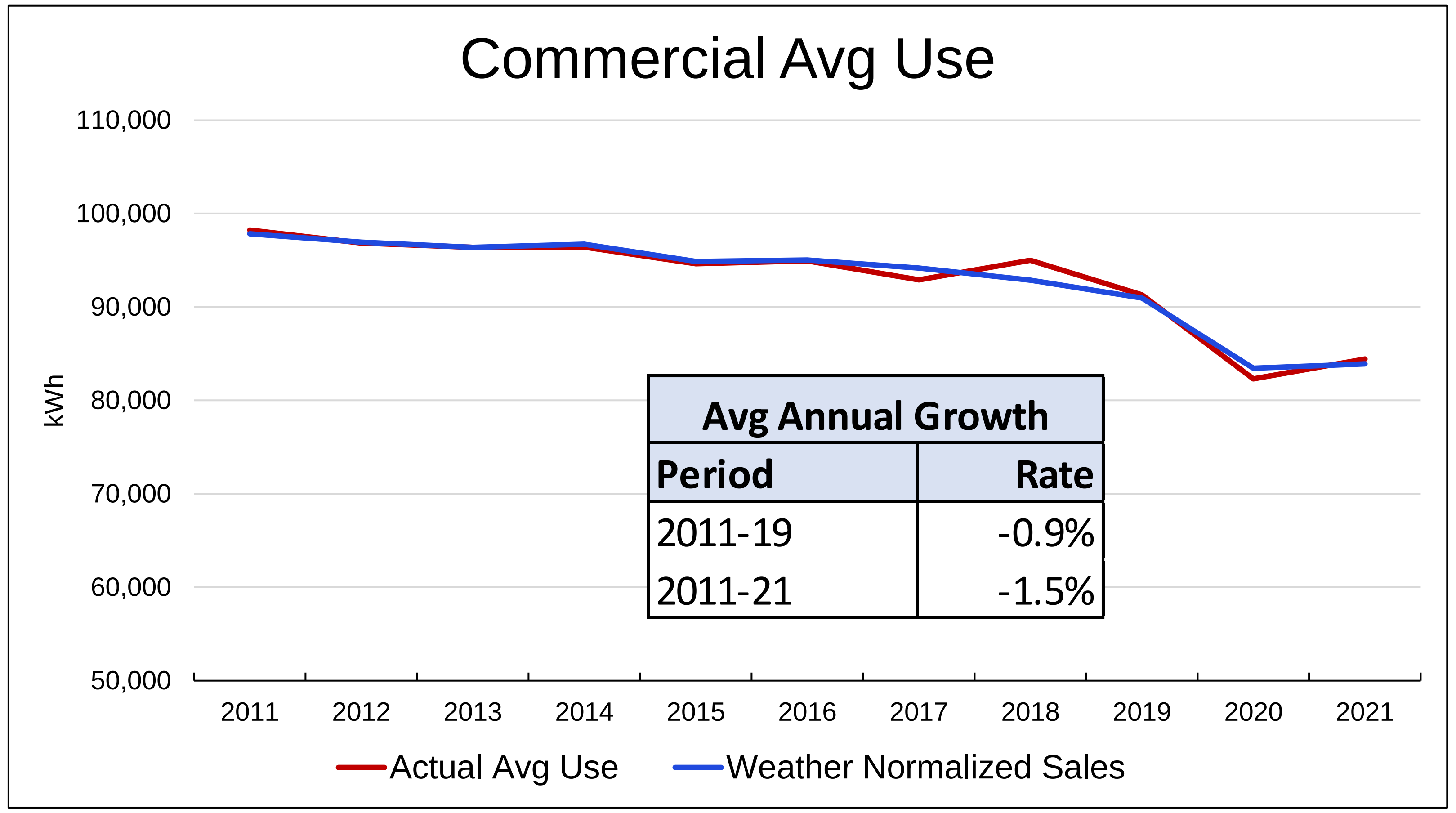
Commercial Sales and Customer Trends



Avg Annual Growth	
Period	**Rate**
2011-19	0.5%
2011-21	0.6%



Avg Annual Growth	
Period	**Rate**
2011-19	-0.4%
2011-21	-0.9%



Avg Annual Growth	
Period	**Rate**
2011-19	-0.9%
2011-21	-1.5%

→ Strong efficiency improvements in the commercial sector

→ AES Energy Efficiency Program Activity

→ LED Adoption

→ Sharp drop in 2020 sales due to COVID-19

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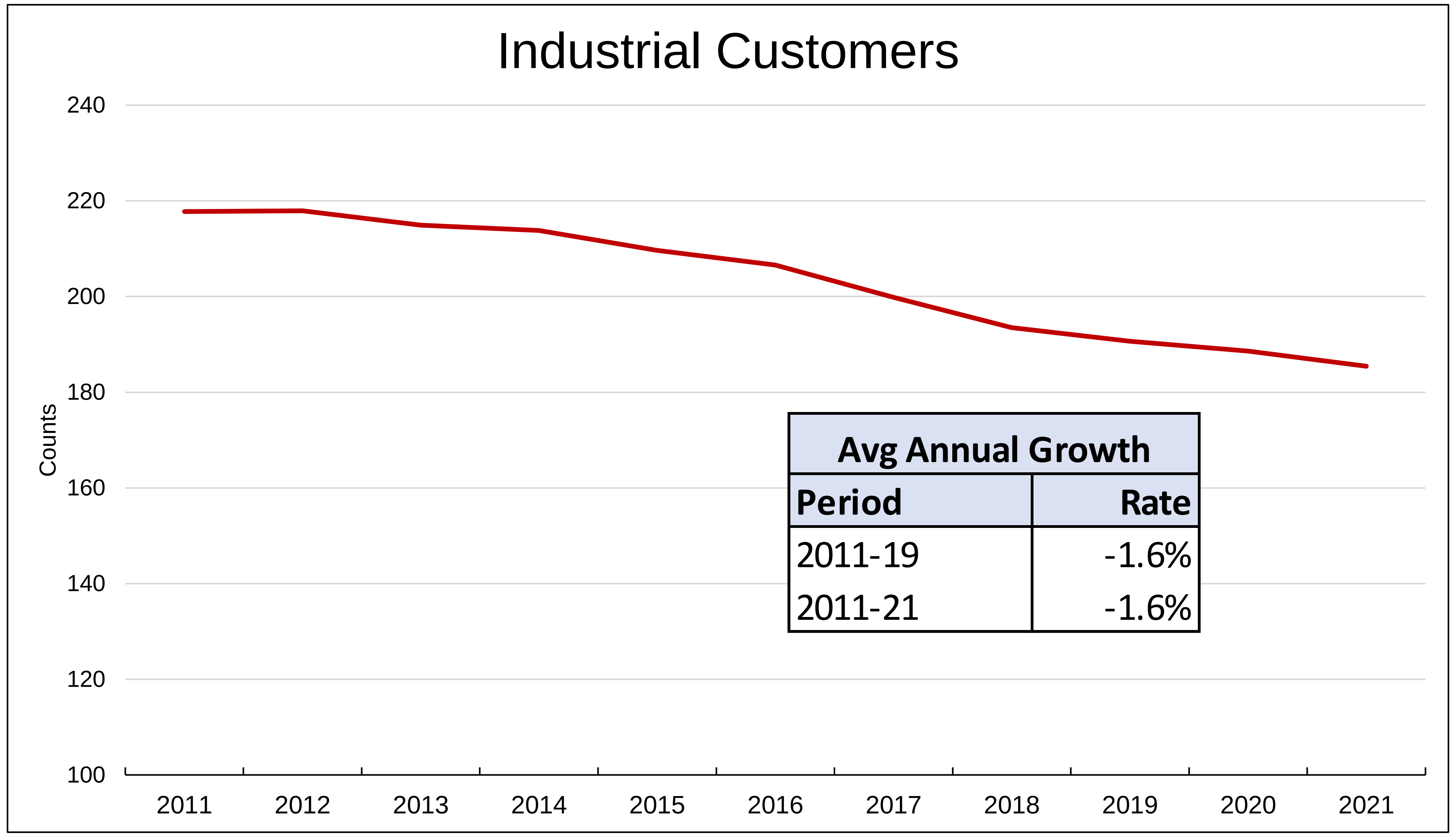
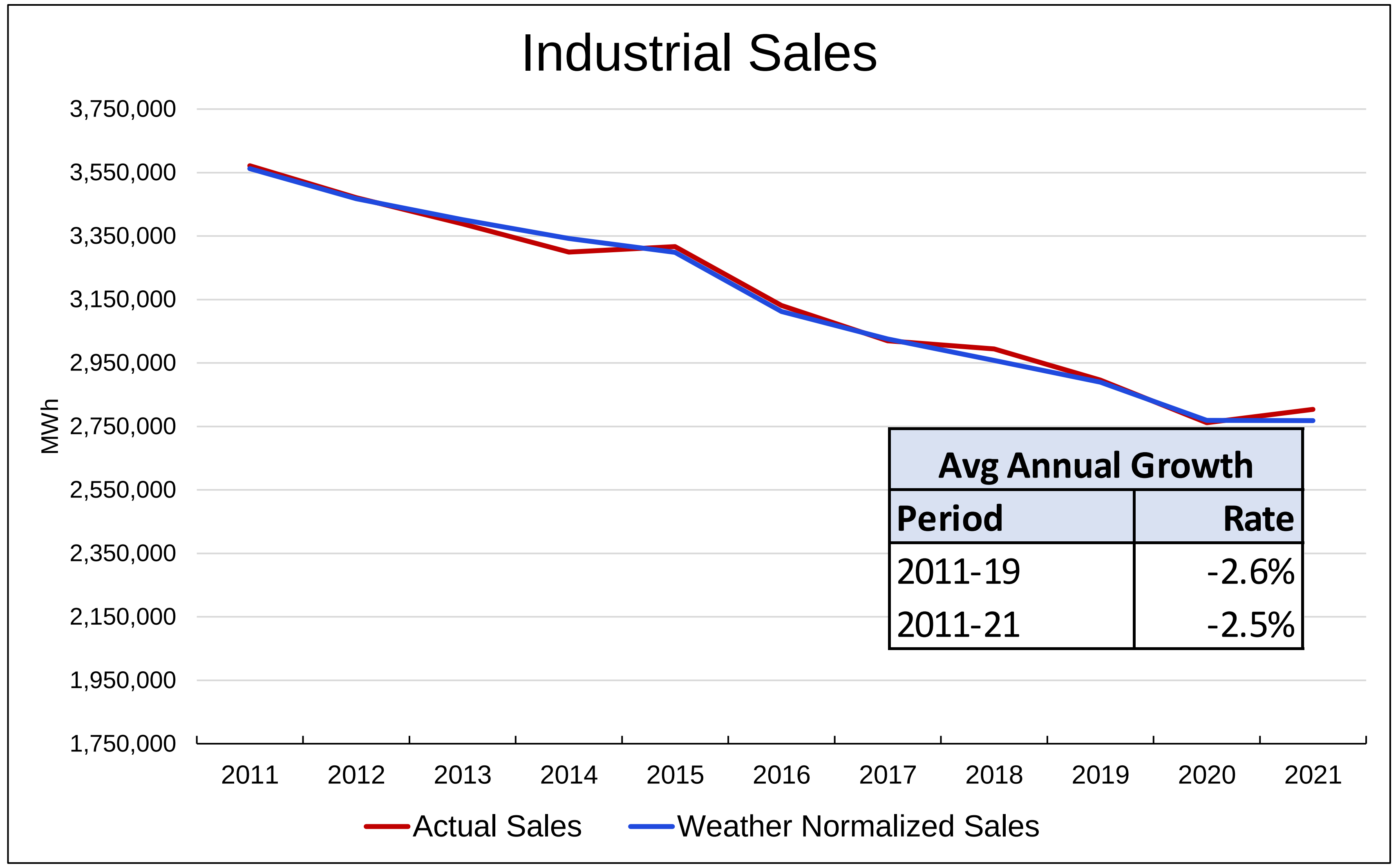
Industrial Trends – AES's Largest Customers





→Industrial customers and sales have been trending down since 2010, but appears to be leveling off

→Manufacturing transitioning to less energy intensive industry mix and end-use processes, and strong efficiency gains.

Who are AES's largest customers

INDIANAPOLIS MSA TOP EMPLOYERS

	# EMPLOYEES
ST. VINCENT HEALTH	± 30,000
IU HEALTH	± 30,000
COMMUNITY HEALTH	± 14,000
ELI LILLY AND CO	± 10,000
KROGER	± 9,000
IUPUI	± 7,000
SIMON PROPERTY GROUP	± 5,000
ANTHEM BLUE CROSS BLUE SHIELD	± 5,000
ROCHE DIAGNOSTICS	± 4,000
FEDEX HUB	± 4,000
ROLLS ROYCE	± 4,000
ALLISON TRANSMISSION	± 3,000
ONE AMERICA	± 2,000
IU SCHOOL OF MEDICINE	± 2,000

- → What is classified as industrial, includes significant commercial activity
- → Health care
- → Education
- → Office - Management/Administrative
- → Distribution
- → The distinction between commercial and industrial activity is blurring
- → AES's 10 largest customers account for approximately 14% of sales

CBRE
indianapolis-multifamily-market-overview-2020-e.pdf (cbre.us)

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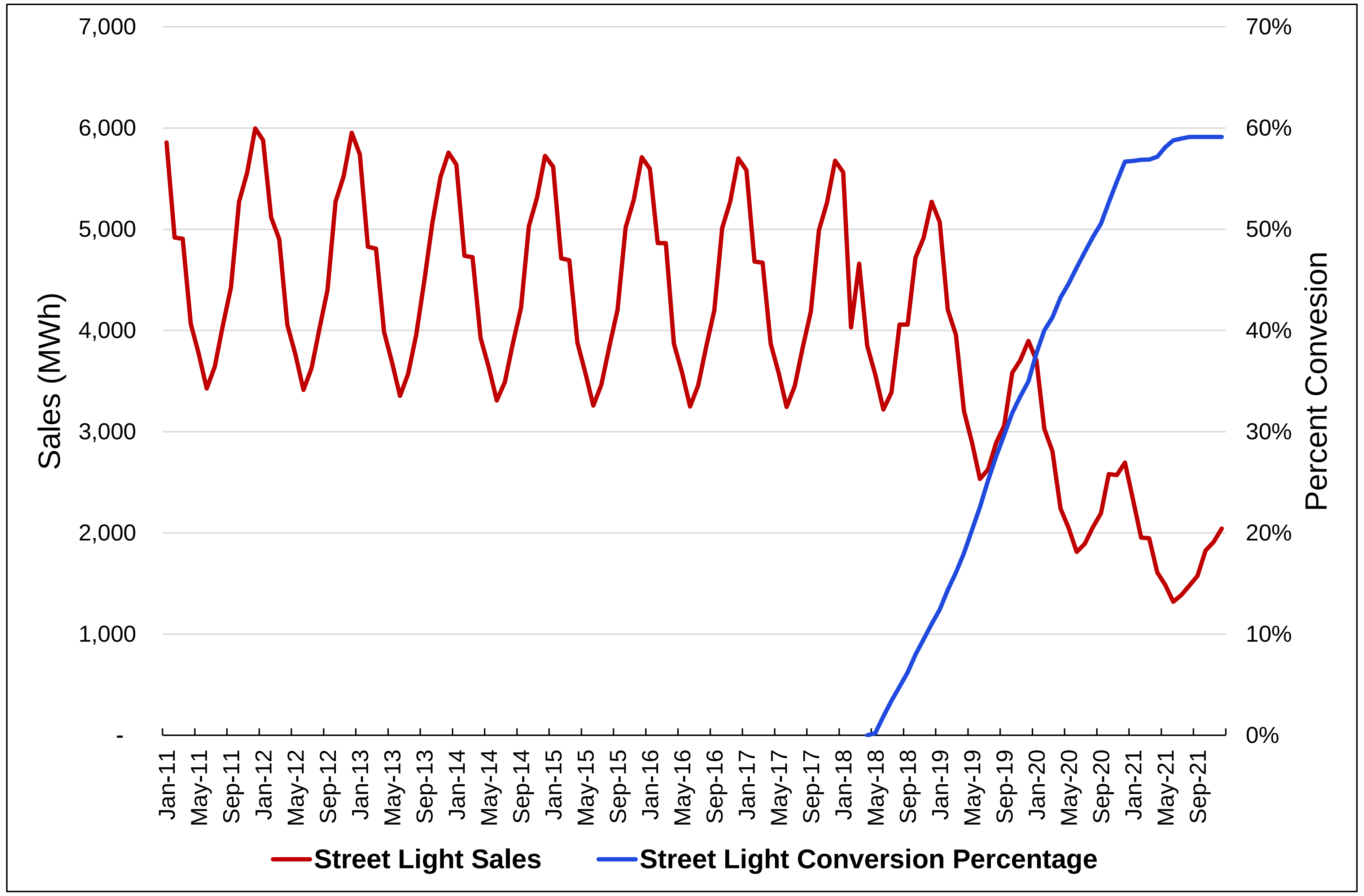
Street Lighting: LED Conversion Program

Operation Night Light is a public-private sector partnership that began in 2016 between the City of Indianapolis and AES Indiana. By converting to high-efficiency LED technology, the city would see savings generated due to lower maintenance costs and energy usage.

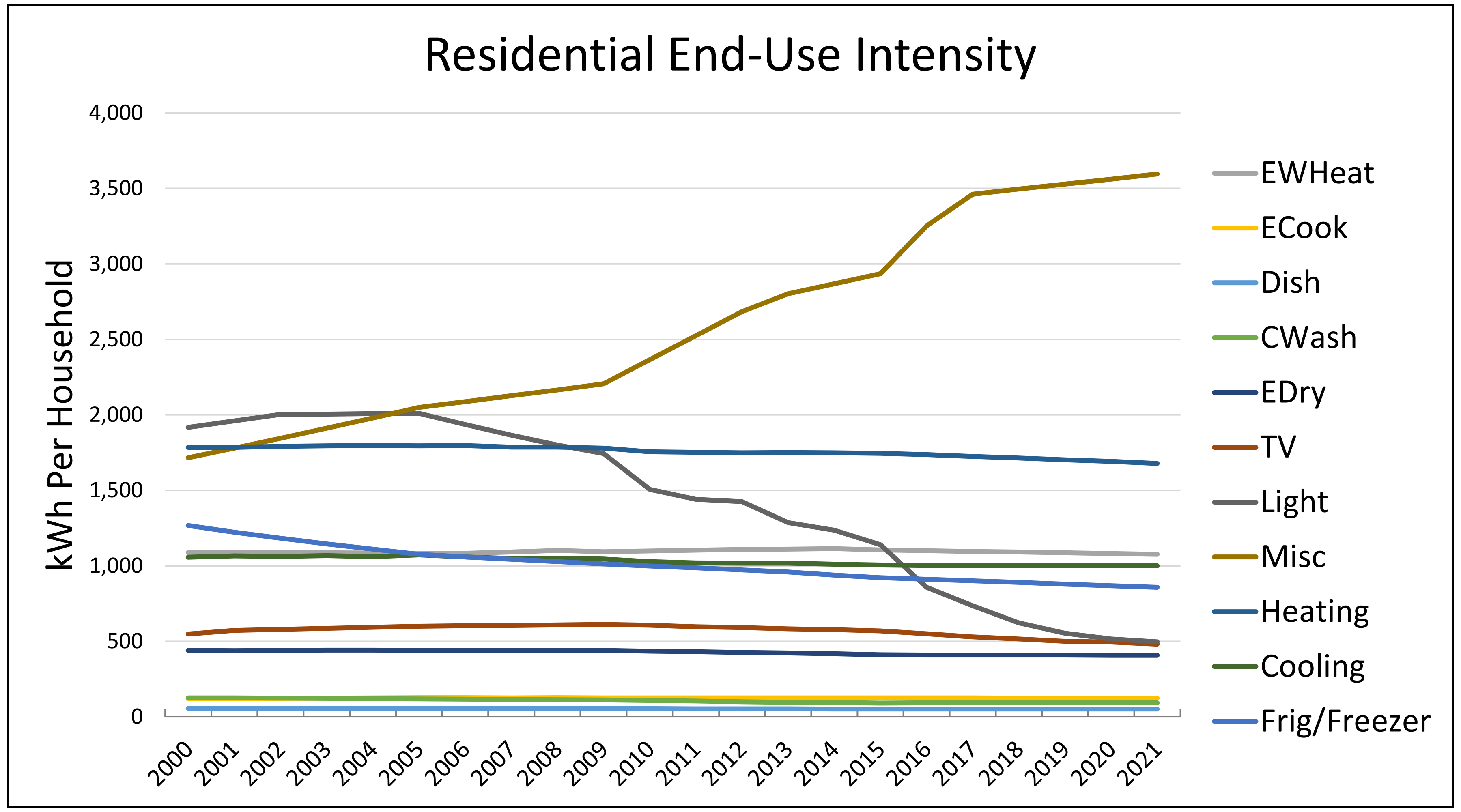
→27,000 streetlights across Marion County have been converted to high-efficiency LED fixtures

→Since the LED program began, electricity usage is down over 67%

→New lights will continue to be installed through 2025



Why is Average Use Declining ?

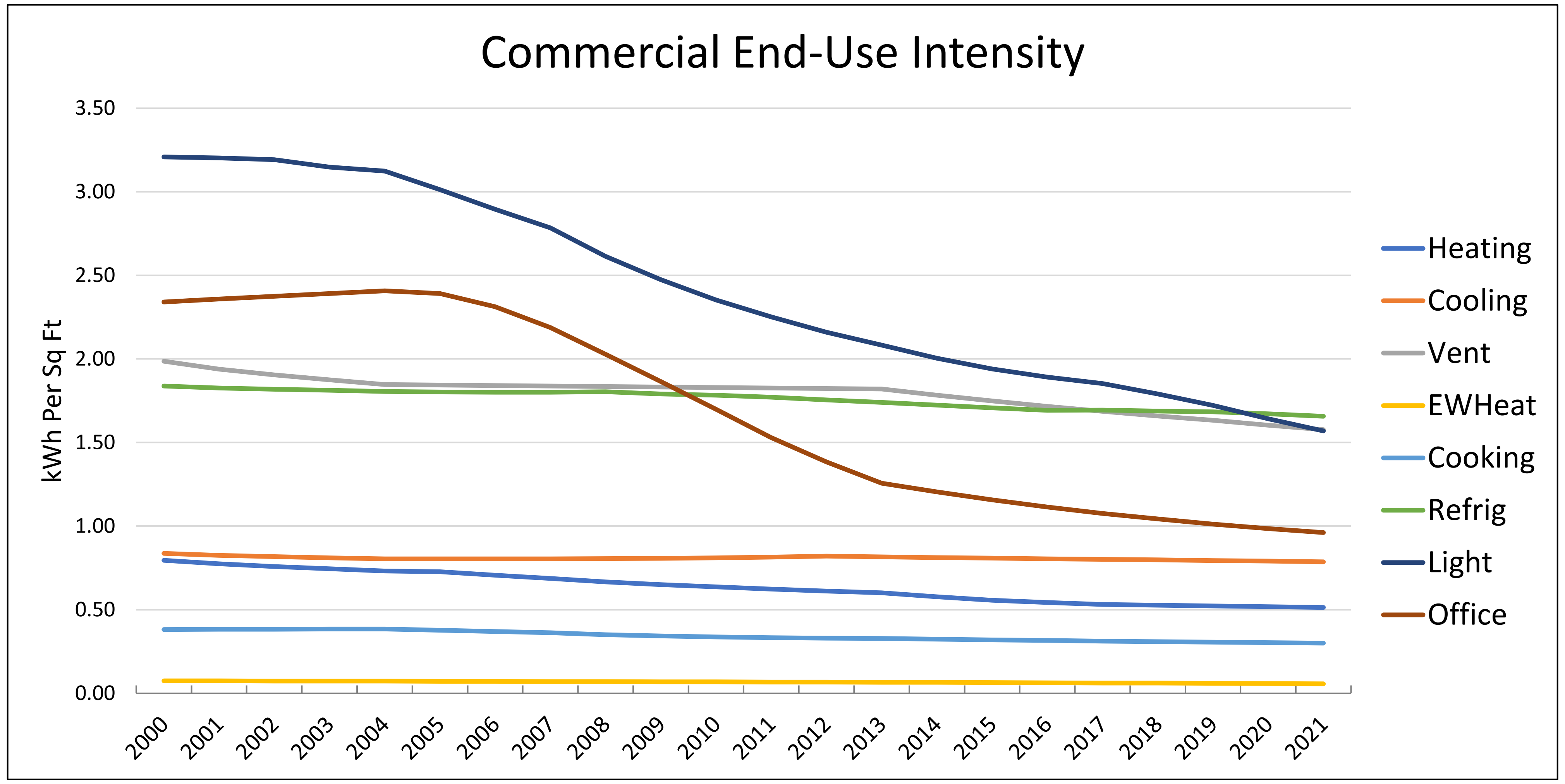


→ Residential. End-use intensities have been declining across nearly all end-uses except miscellaneous. Over the last 10 years:

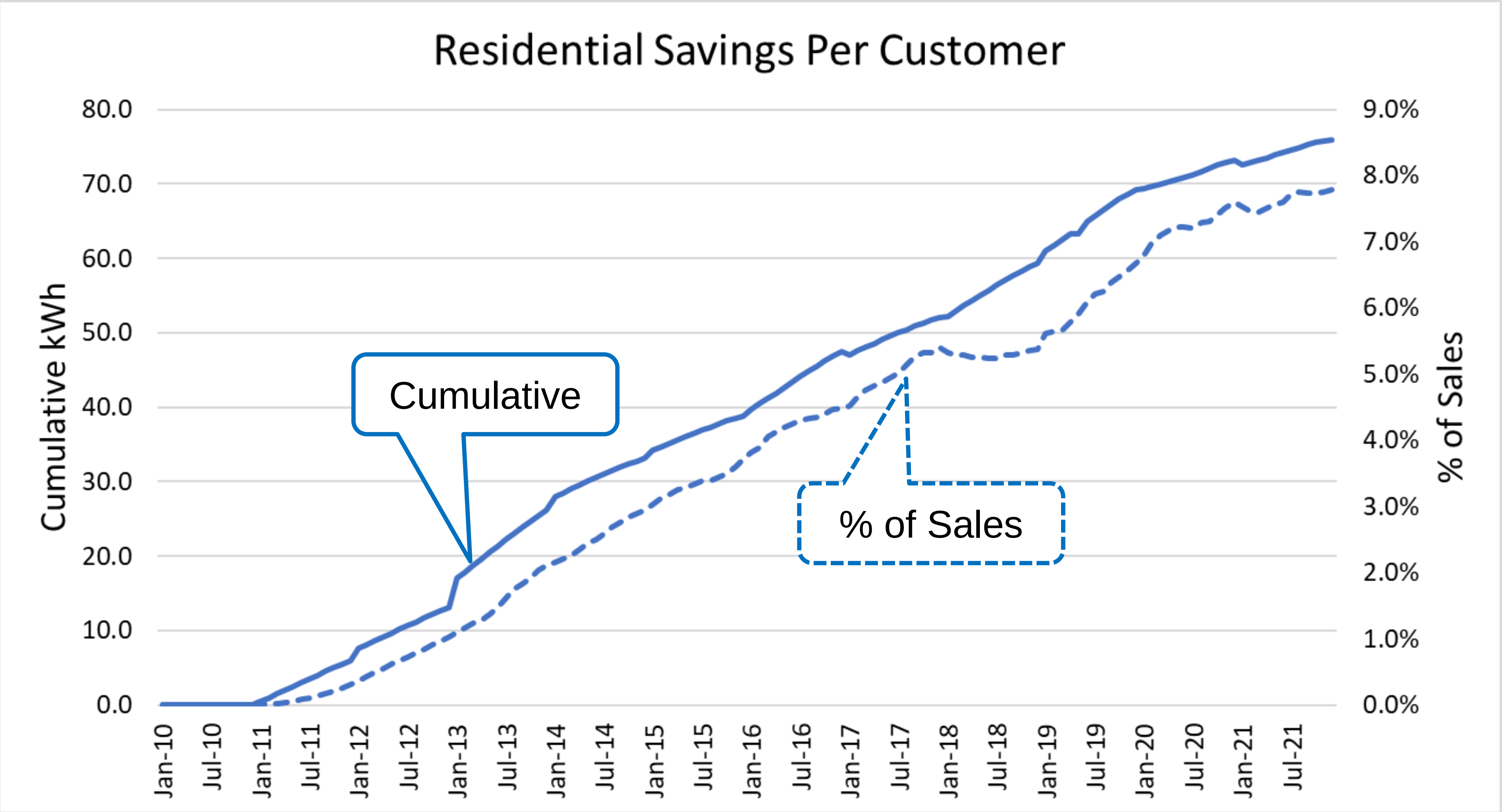
- → Heating down 0.5%
- → Cooling down 0.4%
- → Base down 0.2%

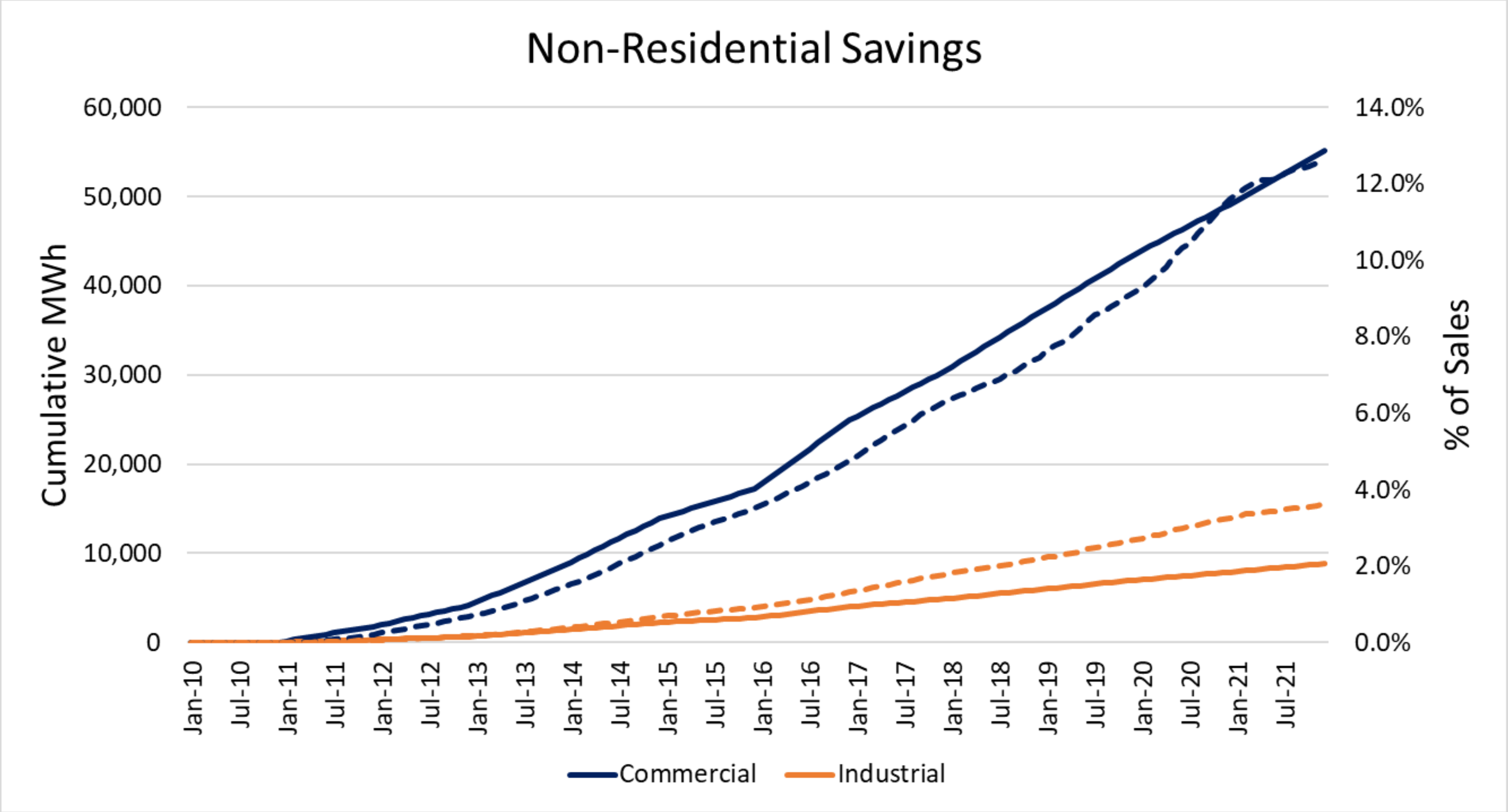
→ Similar trends in the commercial sector with the strongest decline in lighting and computer related loads. Over the last 10 years:

- → Heating down 1.9% (minimal commercial heating)
- → Cooling down 0.2%
- → Base down 1.2%



Significant Energy Efficiency Program Activity





- → Energy Efficiency Programs have had a significant impact on sales
  - → Reduce residential average use by 8% over the last ten years
  - → And reduce commercial sales by 13%

Annual Cumulative Saving (MWh)

Year	Res	Com	Ind
2011	30,123	21,547	3,456
2012	66,290	49,406	7,923
2013	133,328	103,074	16,530
2014	170,356	166,836	26,756
2015	201,208	206,761	33,158
2016	247,829	299,311	48,001
2017	274,827	365,279	58,580
2018	315,502	444,192	71,235
2019	372,124	522,340	83,768
2020	396,524	589,484	94,536

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Modeling Approach

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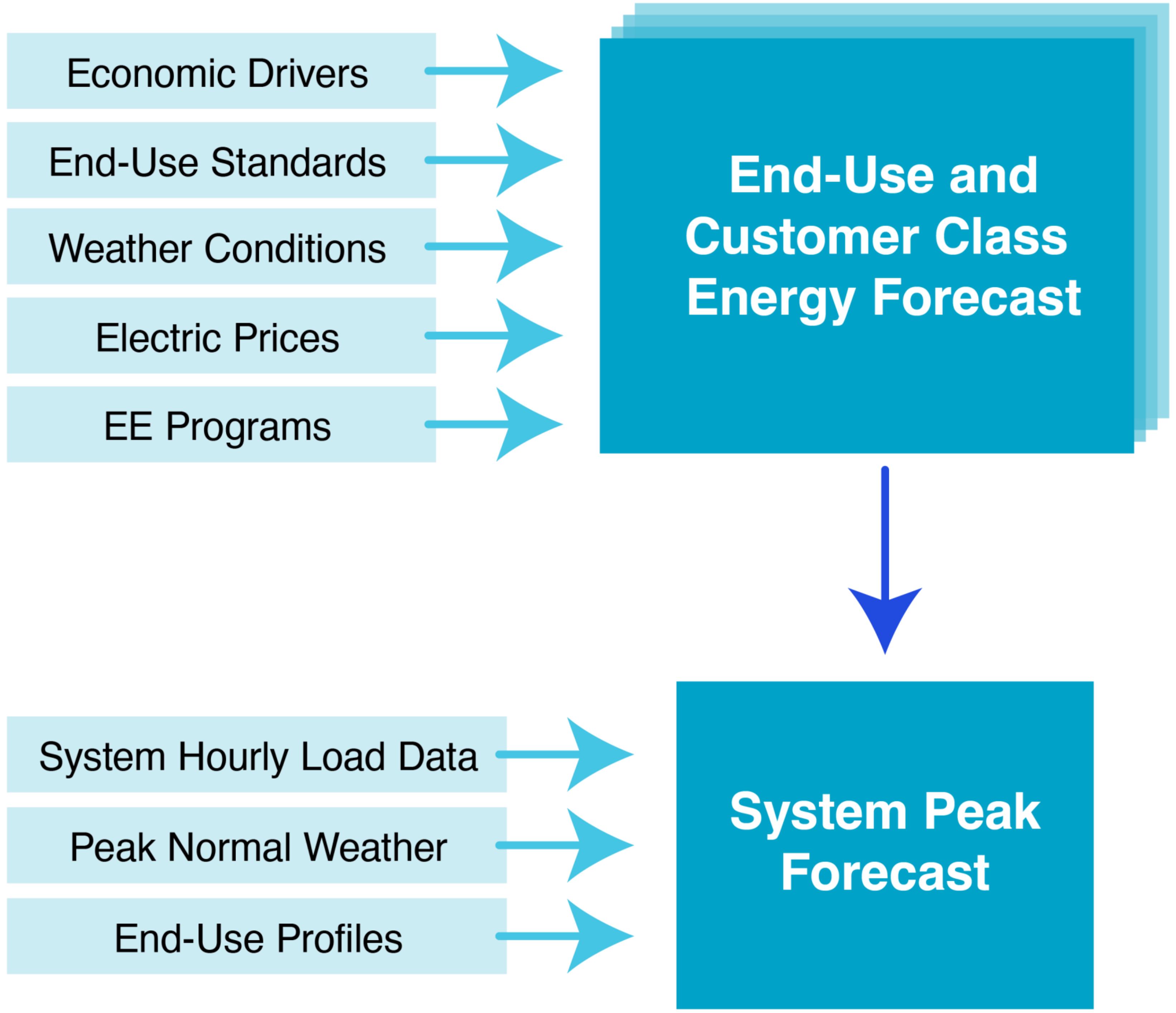
Baseline Modeling Approach

- → Bottom-up Modeling Approach
- → Estimate rate-class level sales and customer models from historical billed sales data
- → Sales/energy driven by households, economic forecasts, expected weather conditions, price, and end-use efficiency improvements. End-use demand drives system peak demand

Monthly sales and customer models are estimated for:

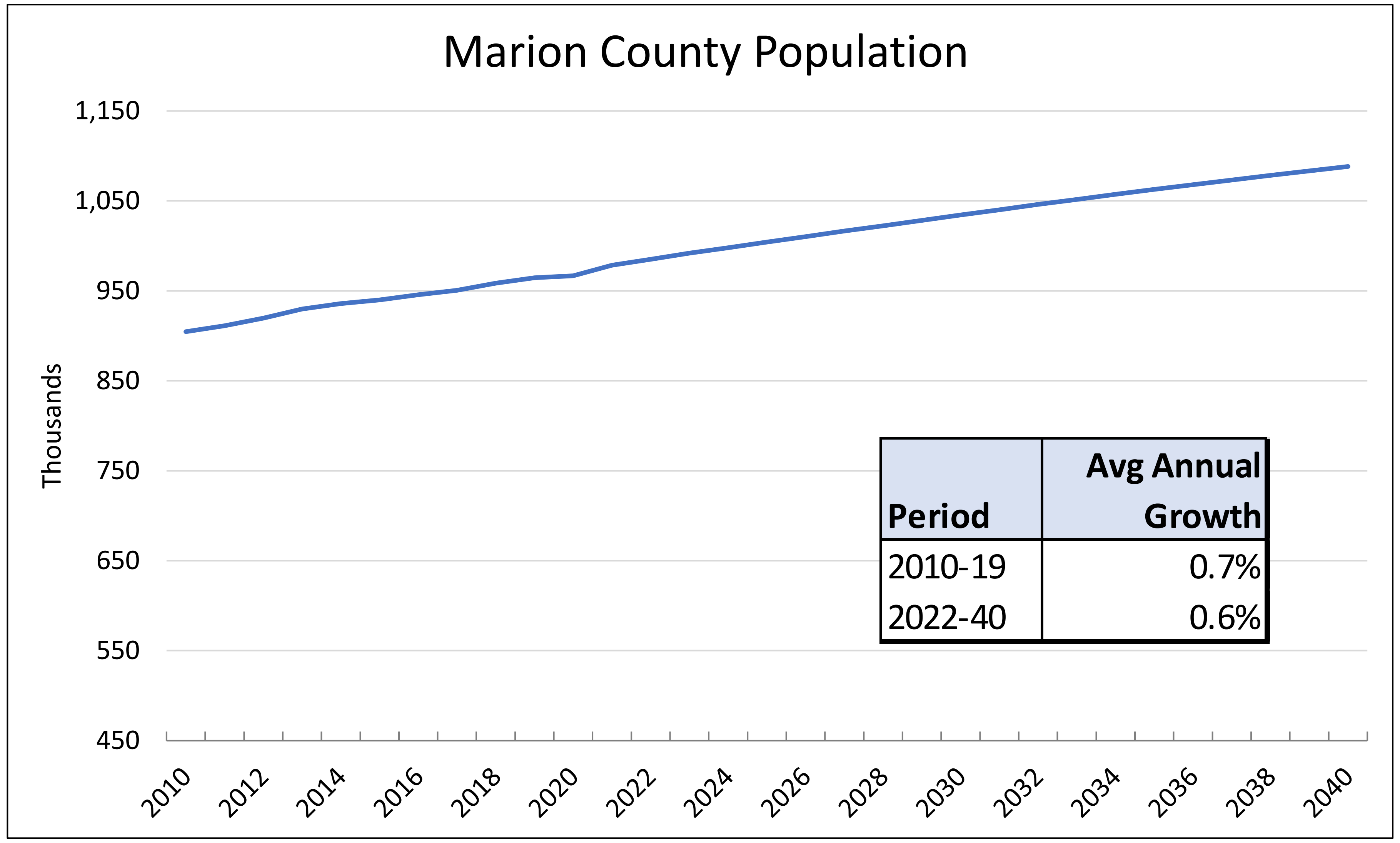
- → Residential
- → Commercial
- → Industrial
- → Other (Lighting)

Monthly peak model driven by end-use energy forecasts



THE BASELINE FORECAST EXCLUDES BEHIND THE METER SOLAR, ELECTRIC VEHICLE LOADS, AND FUTURE EE PROGRAM SAVINGS

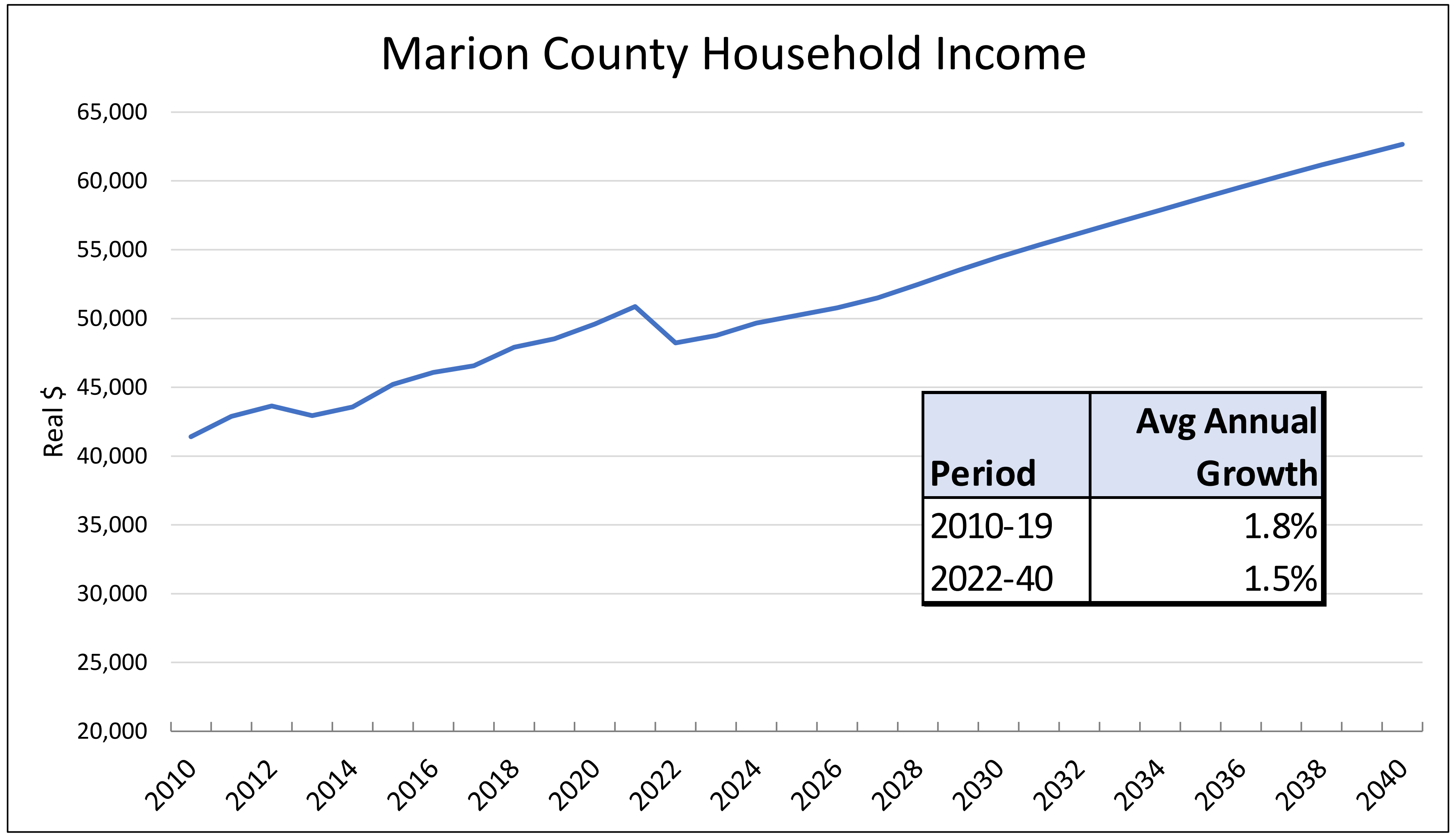
Residential Economic Drivers



Period	Avg Annual Growth
2010-19	0.7%
2022-40	0.6%

→ Moody Analytics (August 2021), economic forecast for Marion County.

→ Population projections drive the residential customer forecast. Expected population growth slightly slower than the last ten years.

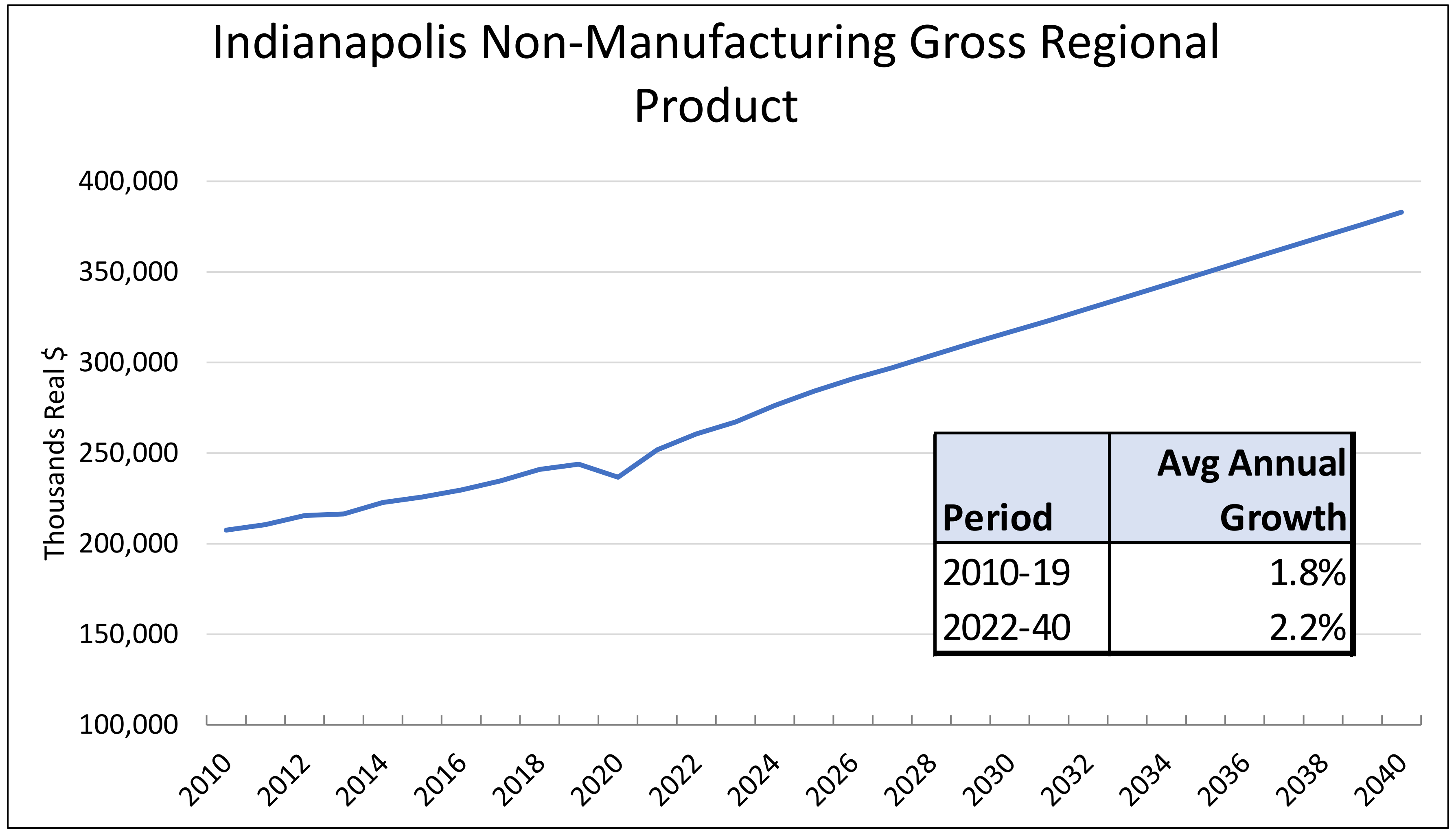


Period	Avg Annual Growth
2010-19	1.8%
2022-40	1.5%

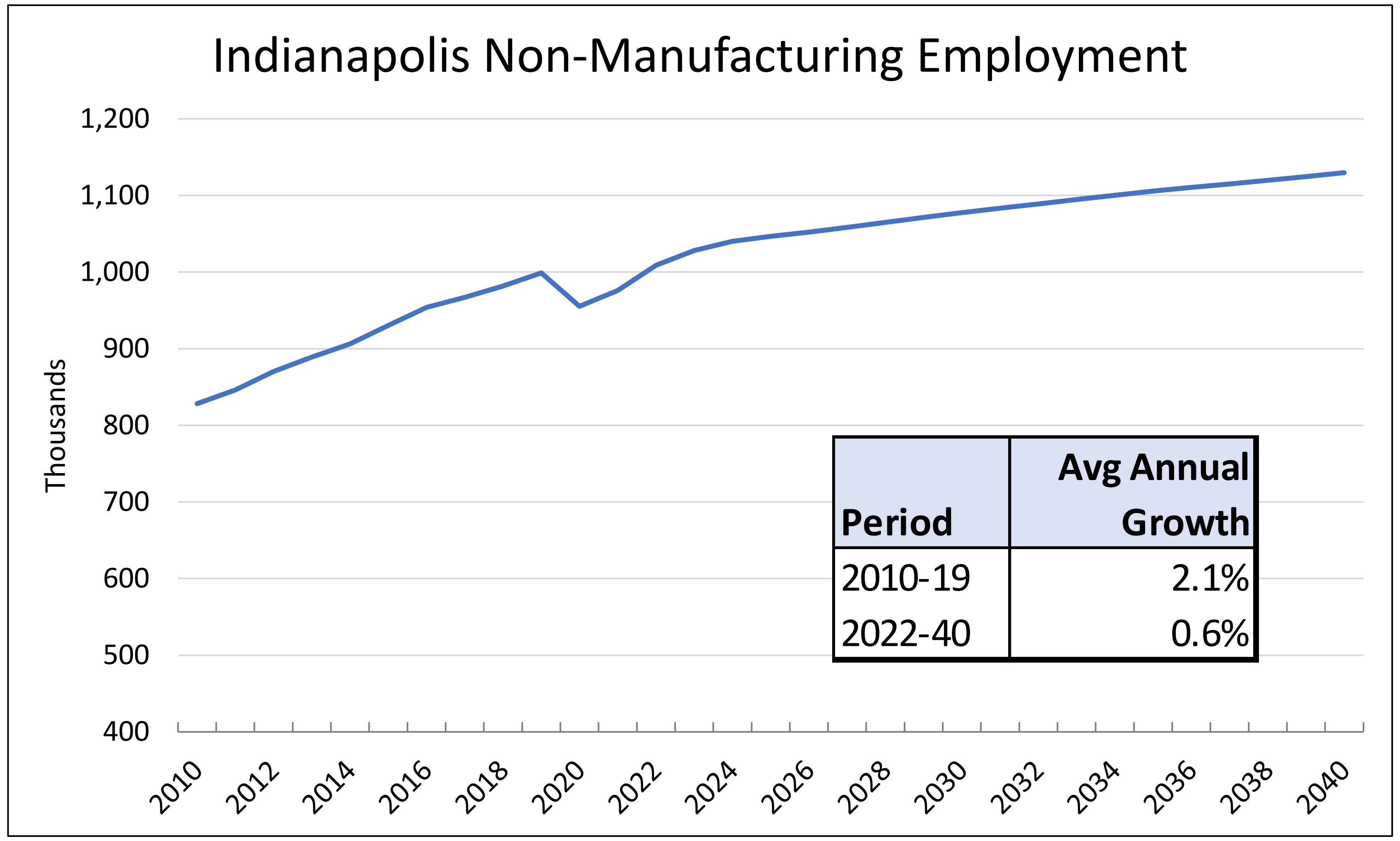
→ Household income influences customer use.

→ Real income growth slightly lower than prior ten-years.

C&I Economic Drivers



Period	Avg Annual Growth
2010-19	1.8%
2022-40	2.2%



Period	Avg Annual Growth
2010-19	2.1%
2022-40	0.6%

→Non-manufacturing output tracks U.S. growth

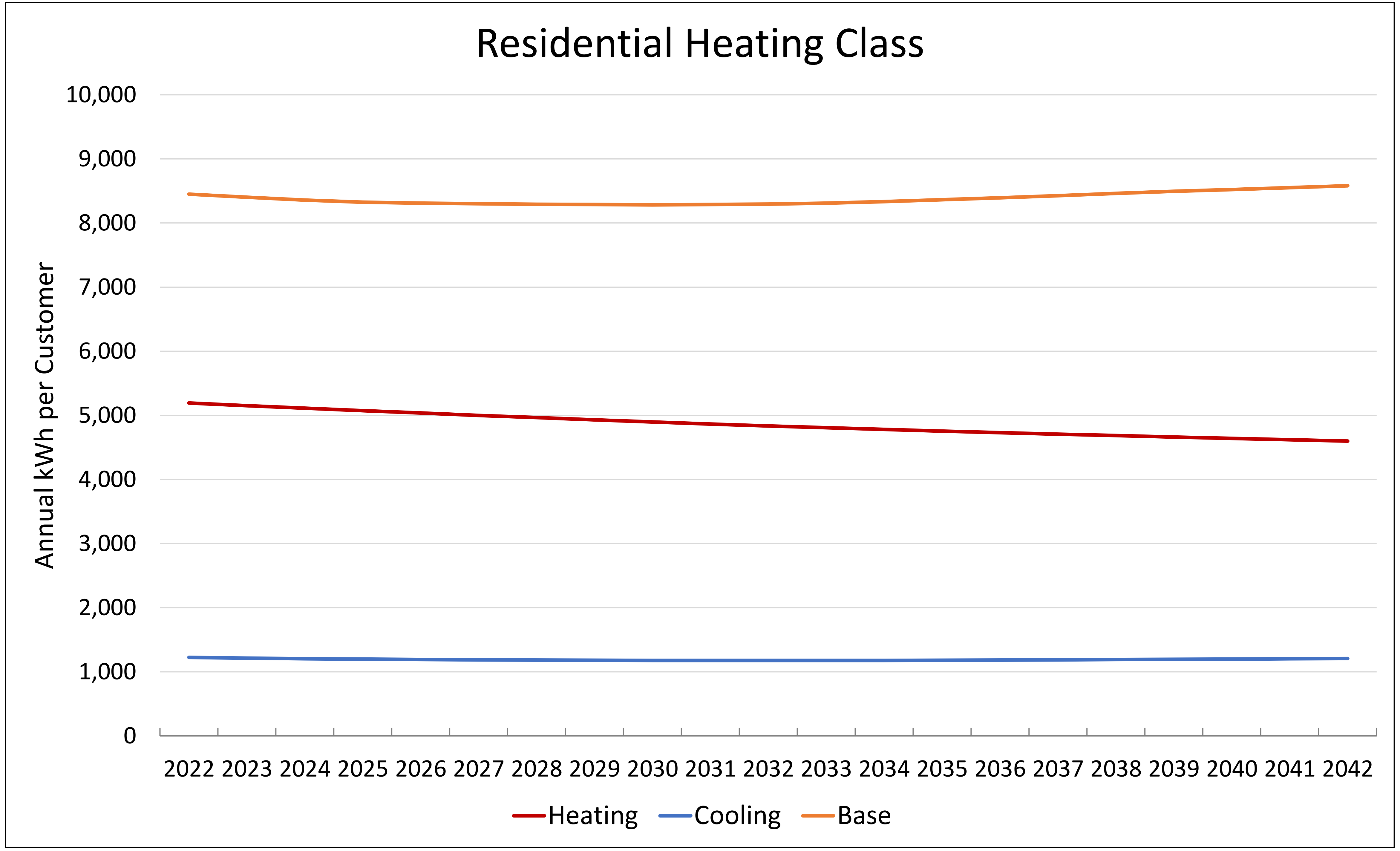
→Slower employment growth in the out years. Implies higher long-term productivity.

Residential End-Use Intensity Projections

→ End-Use intensities based on end-use saturation and average stock efficiency derived from EIA' Annual Energy Outlook (AEO) for East North Central Census Division.

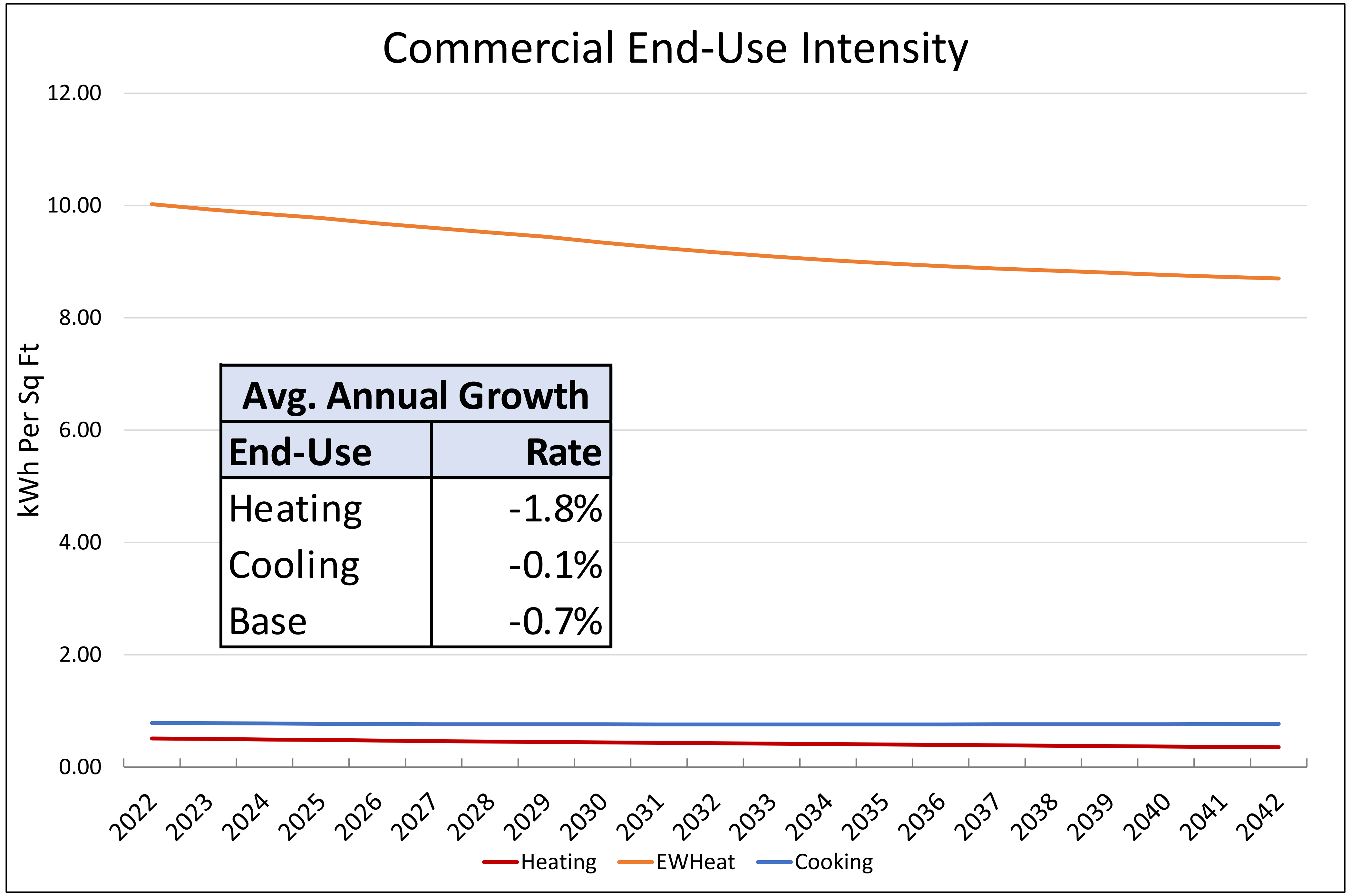
→ Residential calibrated to AES service area based on historical appliance saturation surveys and DSM potential study.

Avg. Annual Growth	
End-Use	**Rate**
Heating	-0.6%
Cooling	-0.1%
Base	0.1%



Commercial End-Use Intensity Projections

- →End-Use intensities (kWh per square ft) projected for 9 end-uses and 11 building types
- →Derived from EIA' Annual Energy Outlook (AEO) for East North Central Census Division.
- →Building-type intensities weighted to the AES service area based on AES commercial sales
- →Projected efficiency gains in lighting and ventilation have the largest impact on base use



Avg. Annual Growth	
End-Use	**Rate**
Heating	-1.8%
Cooling	-0.1%
Base	-0.7%

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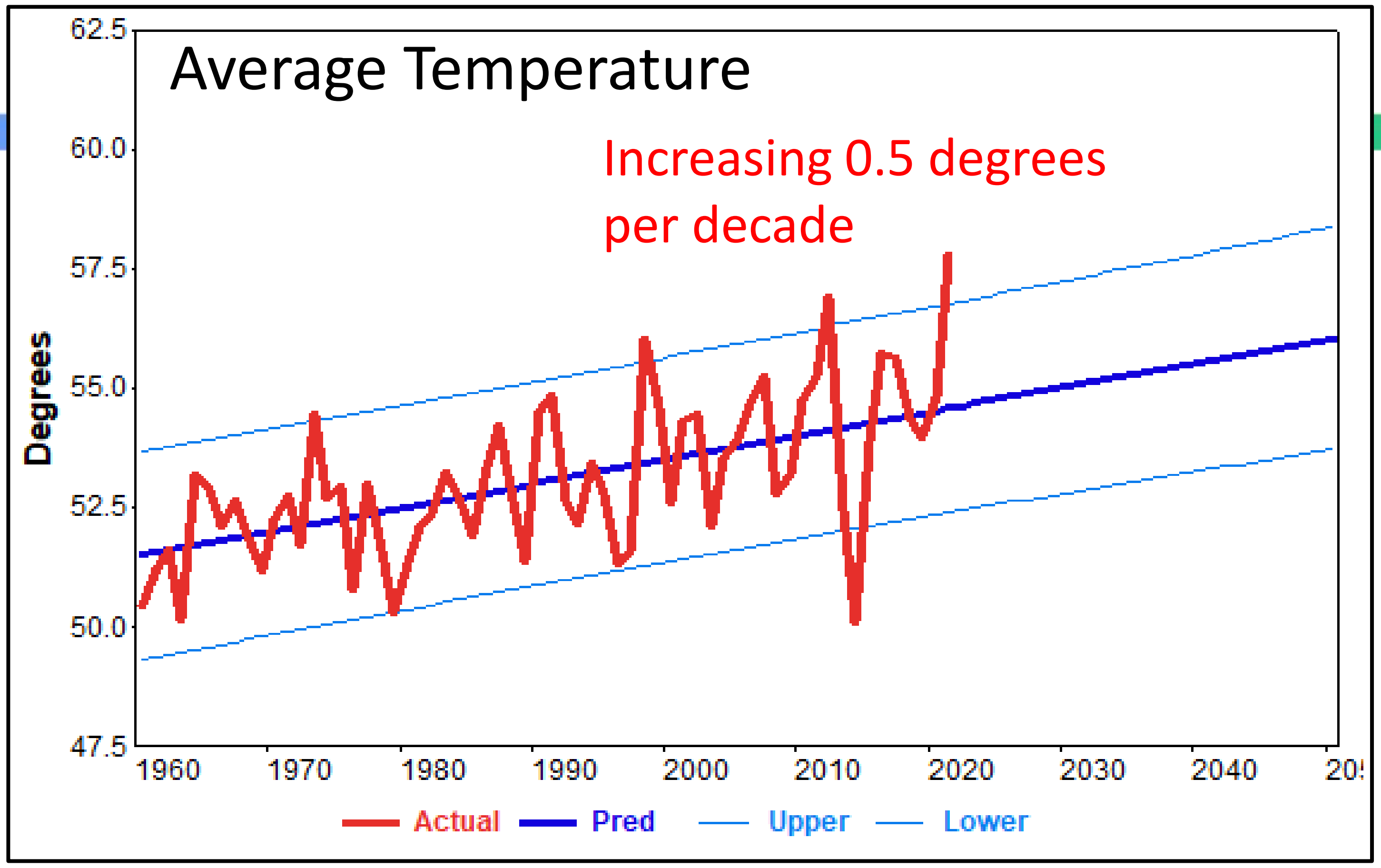
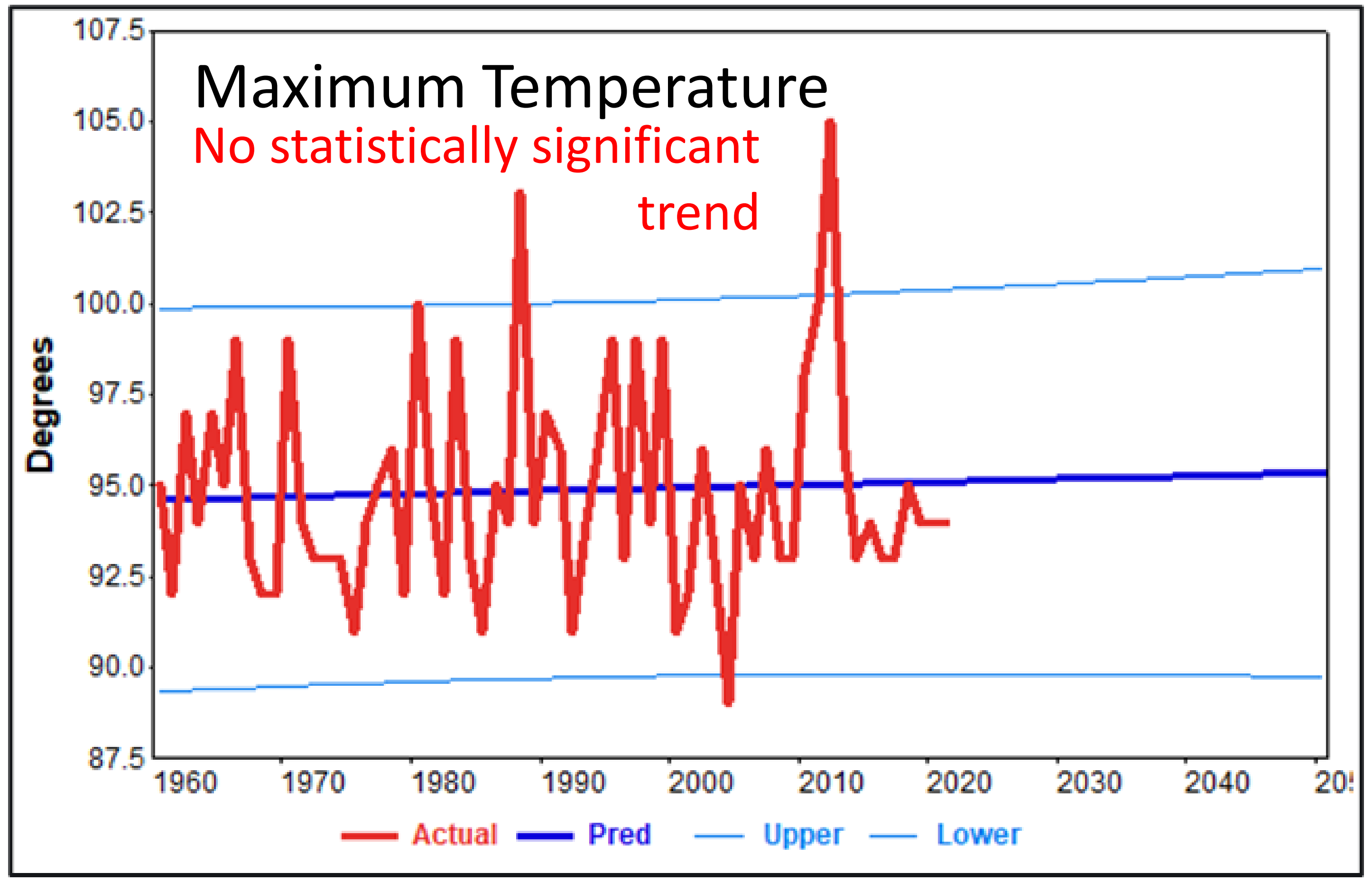
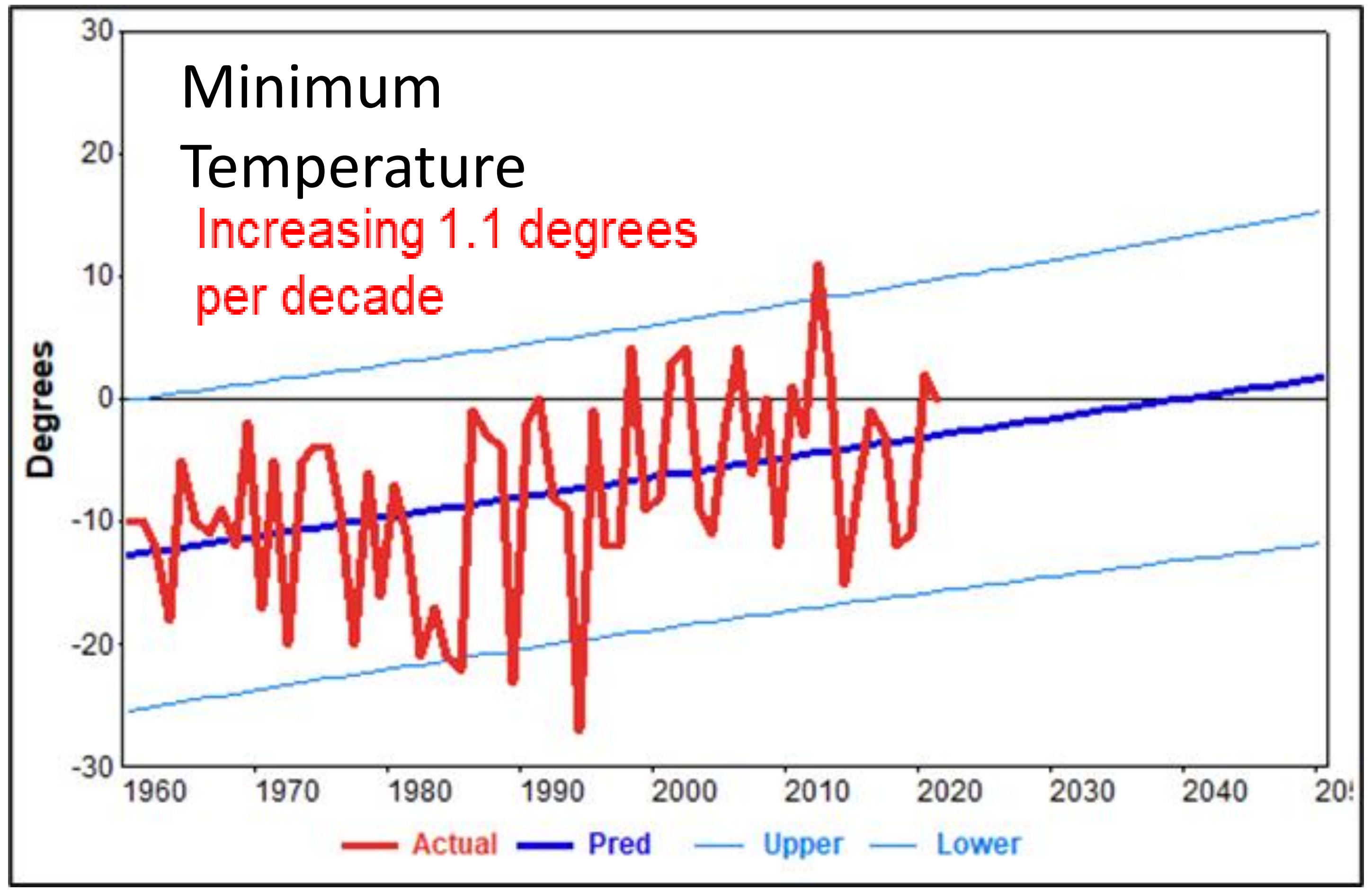
Temperature Trends

- → Average annual temperature is increasing .05 degrees per year or 0.5 degrees per decade.
- → Consistent with temperature trends across the country 0.4 degrees to 1.0 degrees per decade.
- → Minimum temperature increasing twice as fast as the average temperature. No increase in the maximum temperature.







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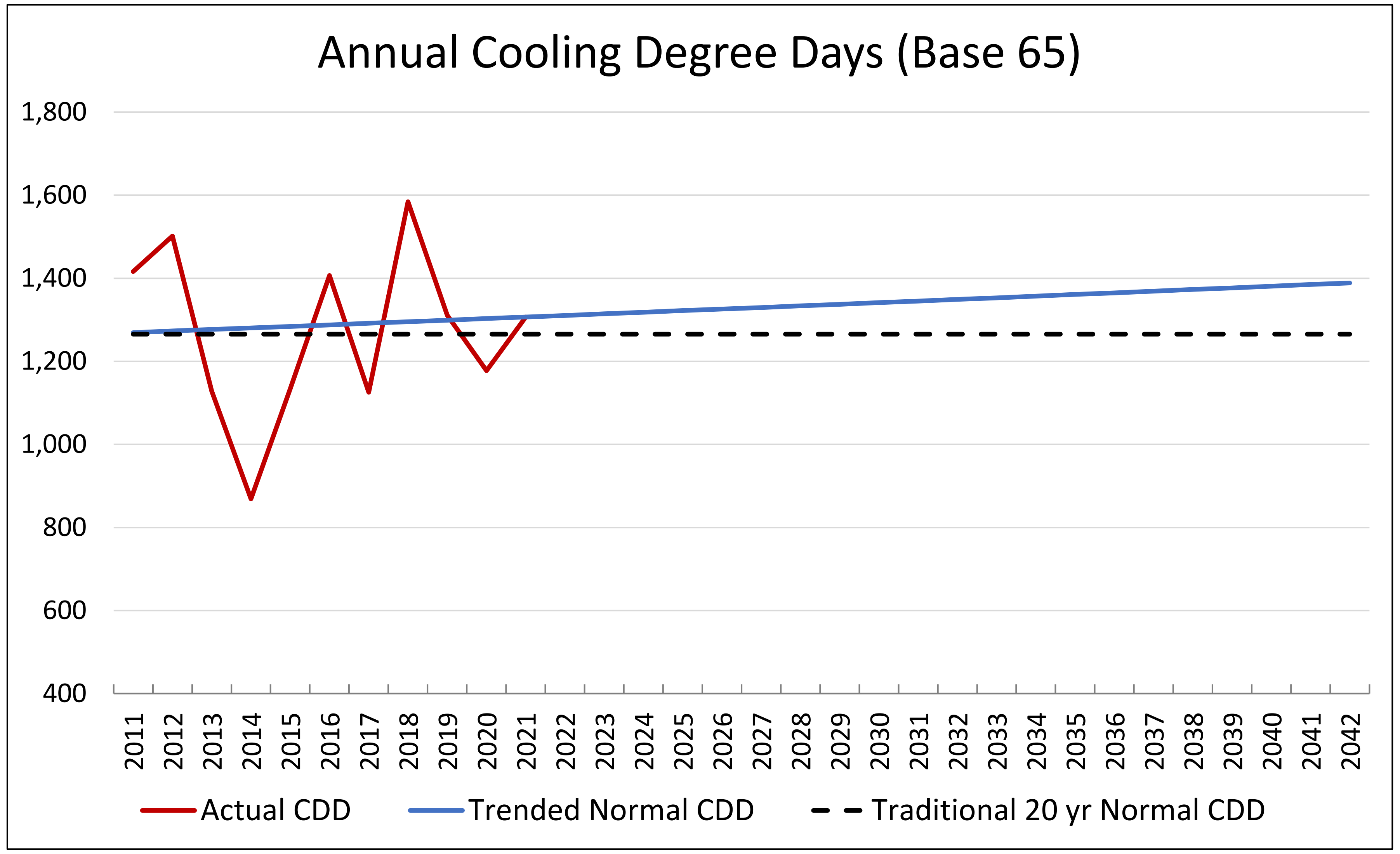
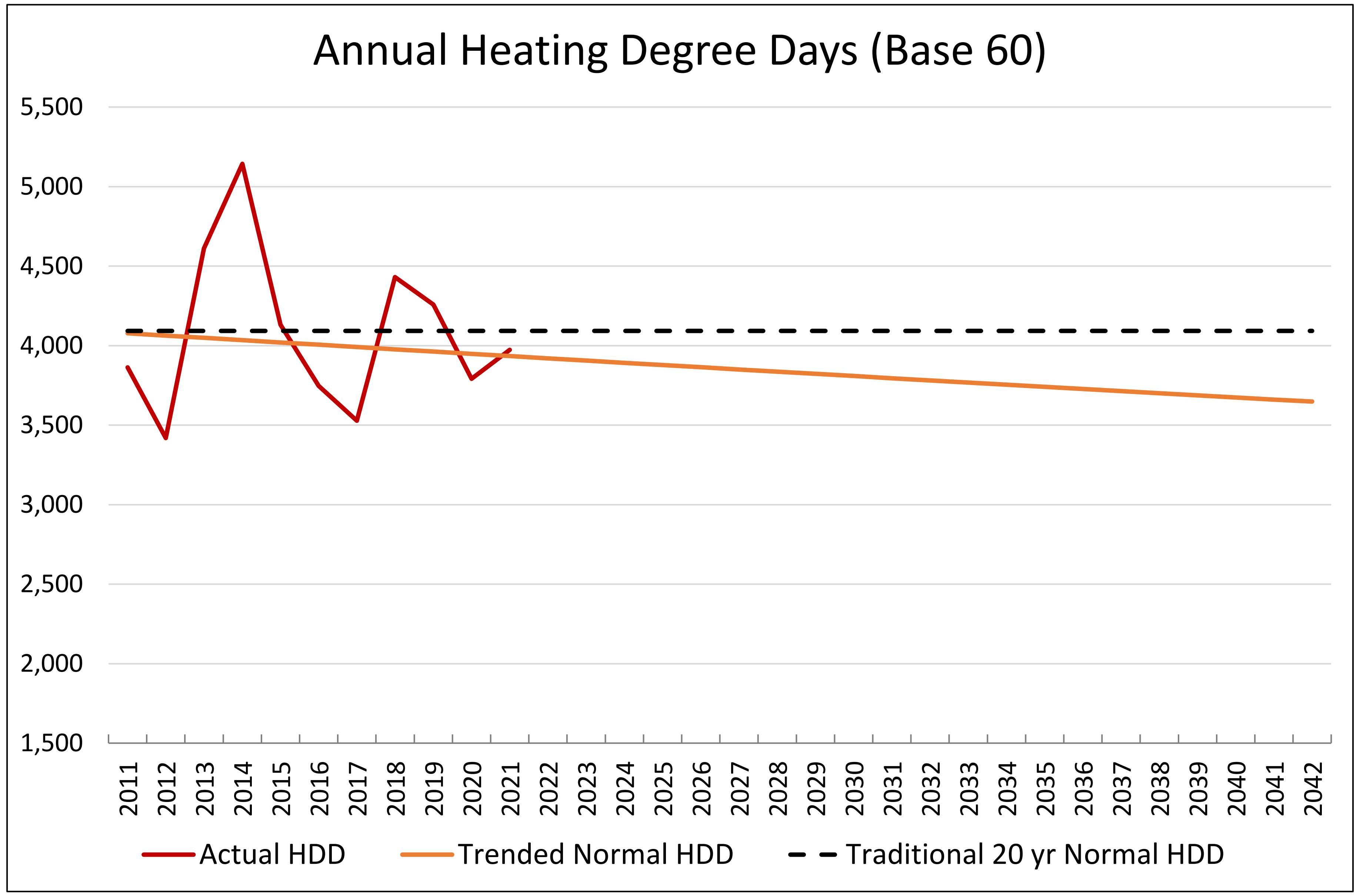
Trending Degree Days



Increasing average temperature translates into 0.3% annual growth in cooling degree days.

And 0.4% annual decline in heating degree days.



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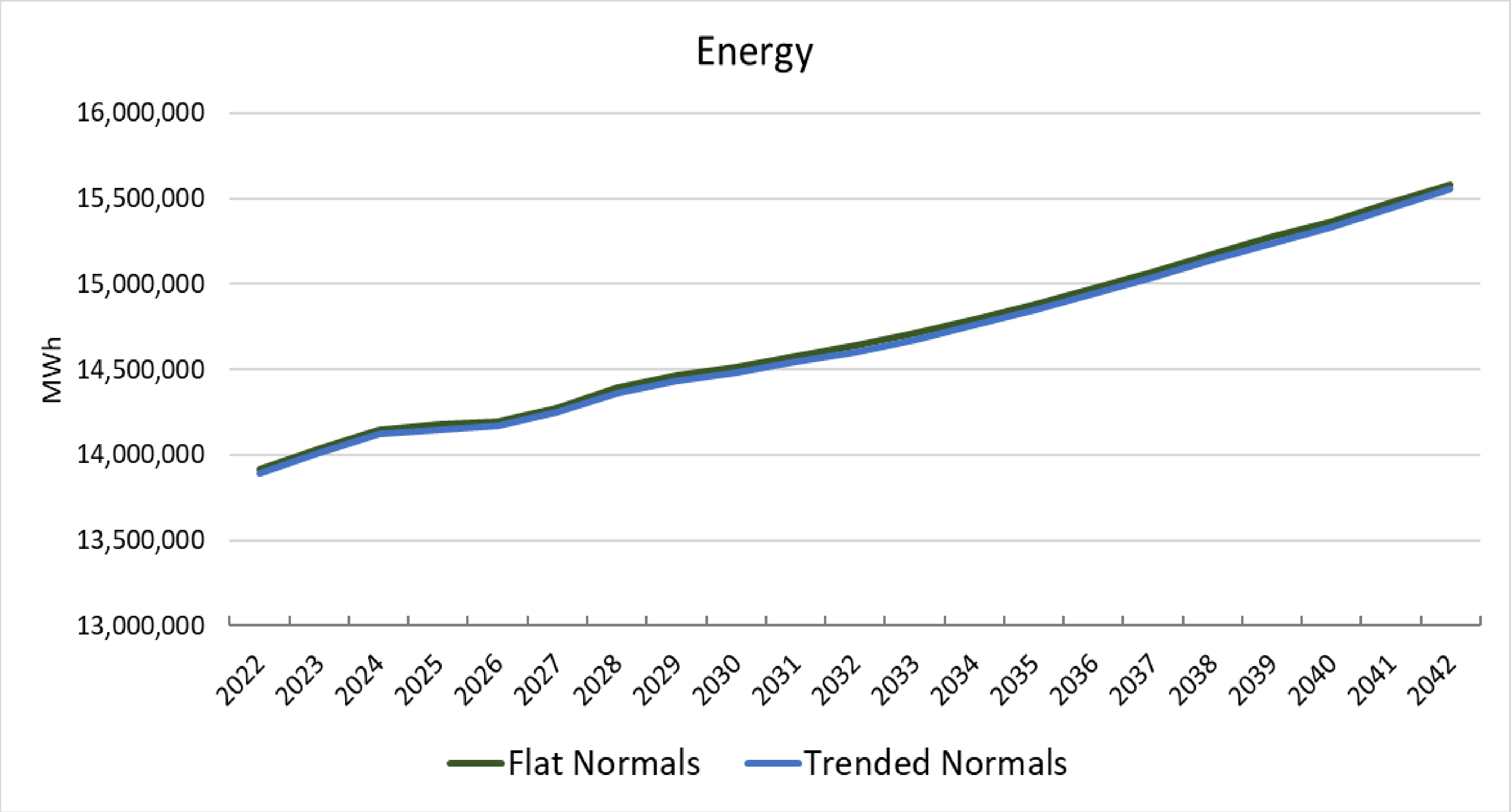
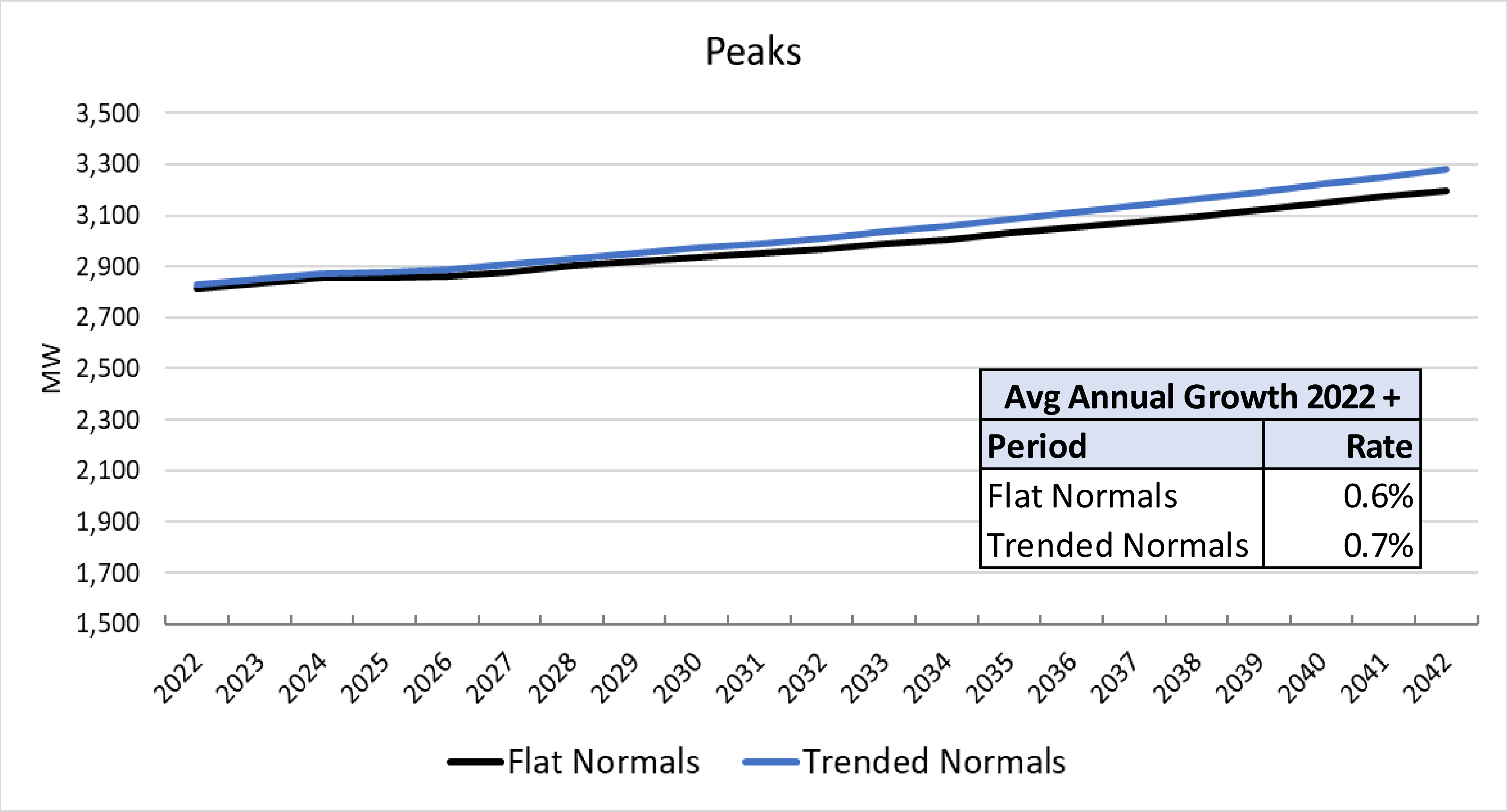
Impact of Increasing Temperatures



→Increasing temperatures contribute to cooling load growth in turn driving system peak demand.

→0.05% annual temperature change contributes to 0.1% annual increase in baseline peak demand adding 82 MW by 2042.



→Little change in energy requirements as increase in cooling loads is offset by decrease in heating loads.

Peak Model

Peak demand is driven by heating, cooling, and base load requirements derived from the rate class sales forecast models.

Cooling Load Requirements

→ Residential
→ Commercial
→ Industrial

Peak day CDD

Peak day cooling demand

Heating Load Requirements

→ Residential
→ Commercial
→ Industrial (if applicable)

Peak day HDD

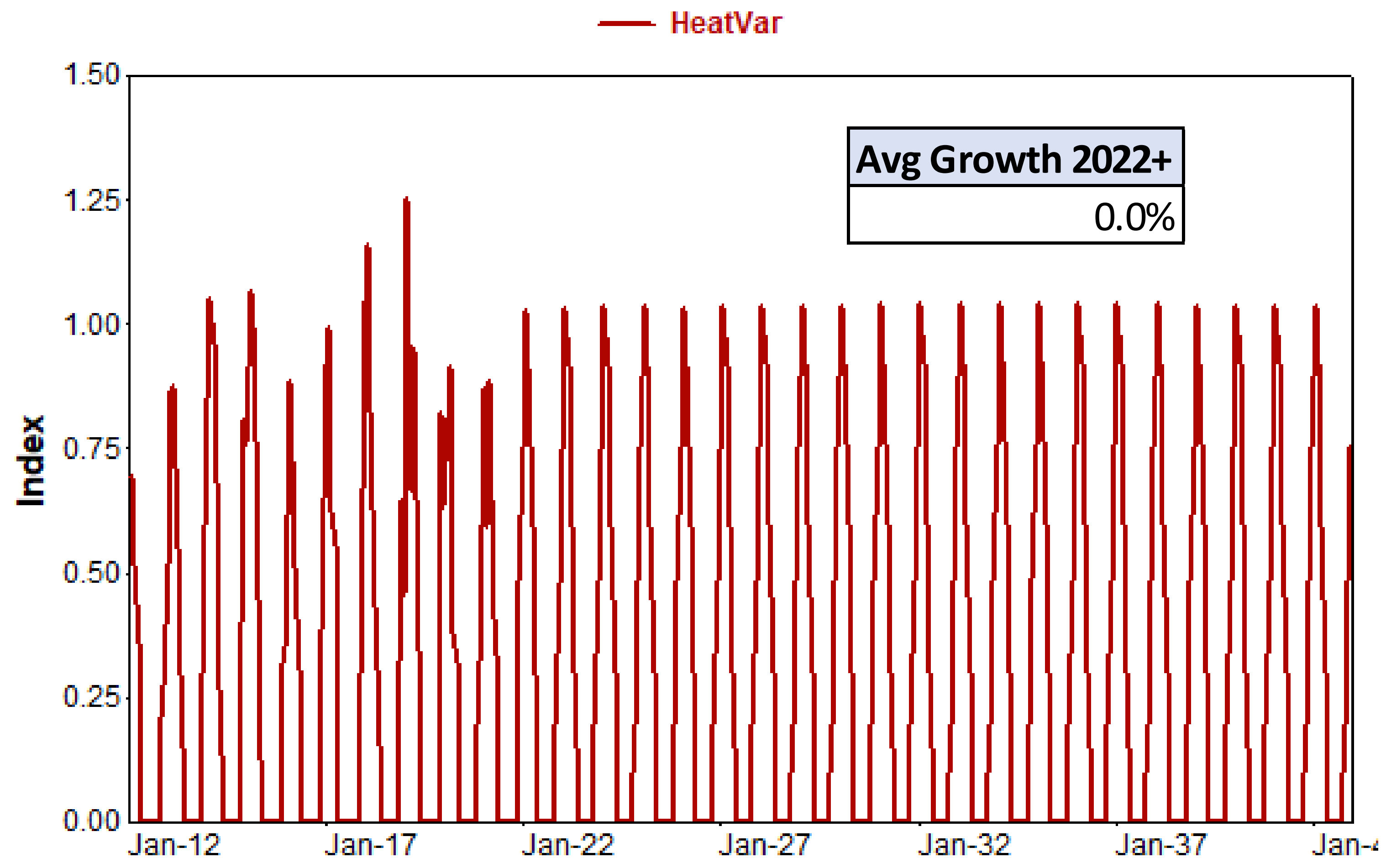
Peak day heating demand

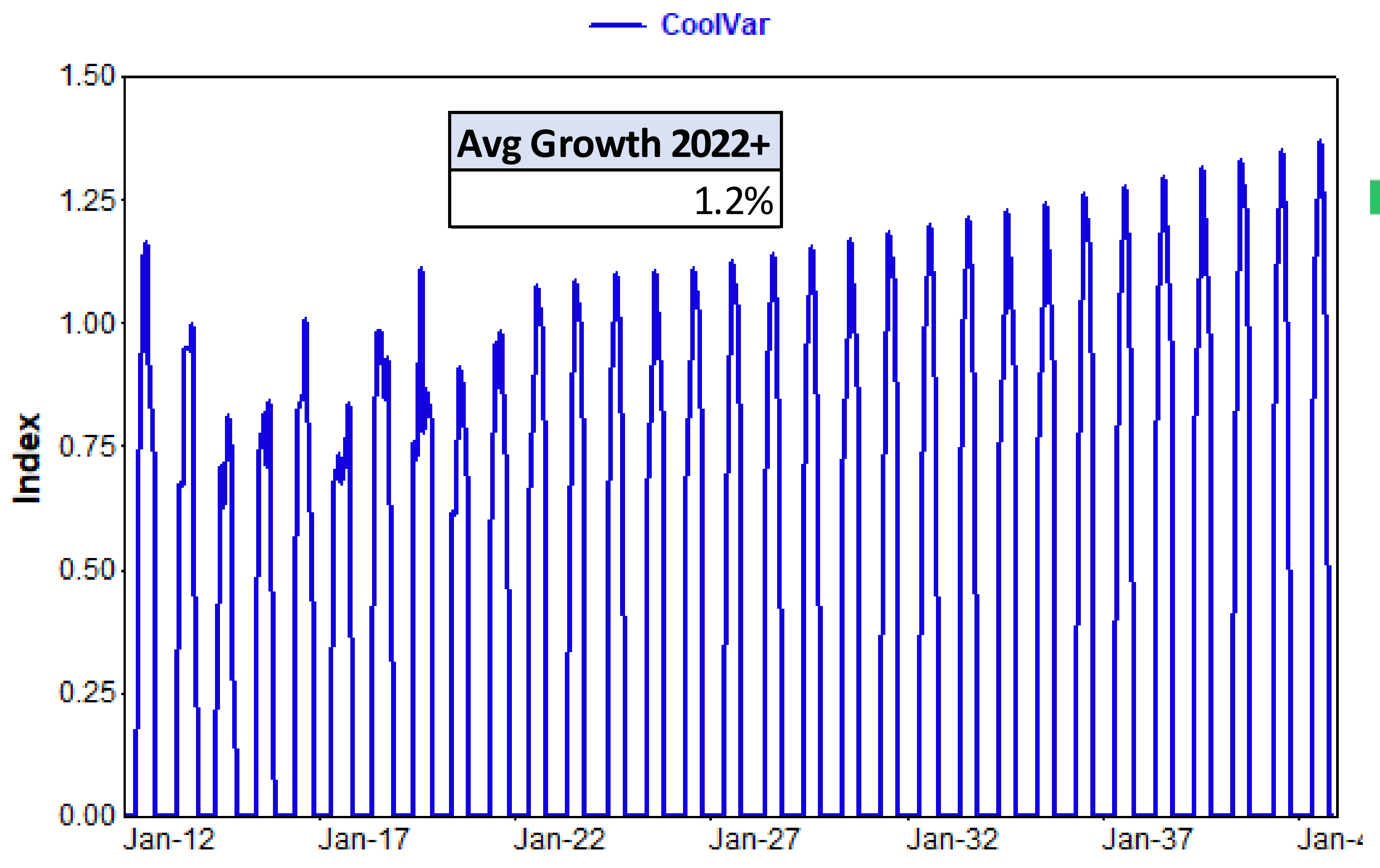
Base Load Requirements

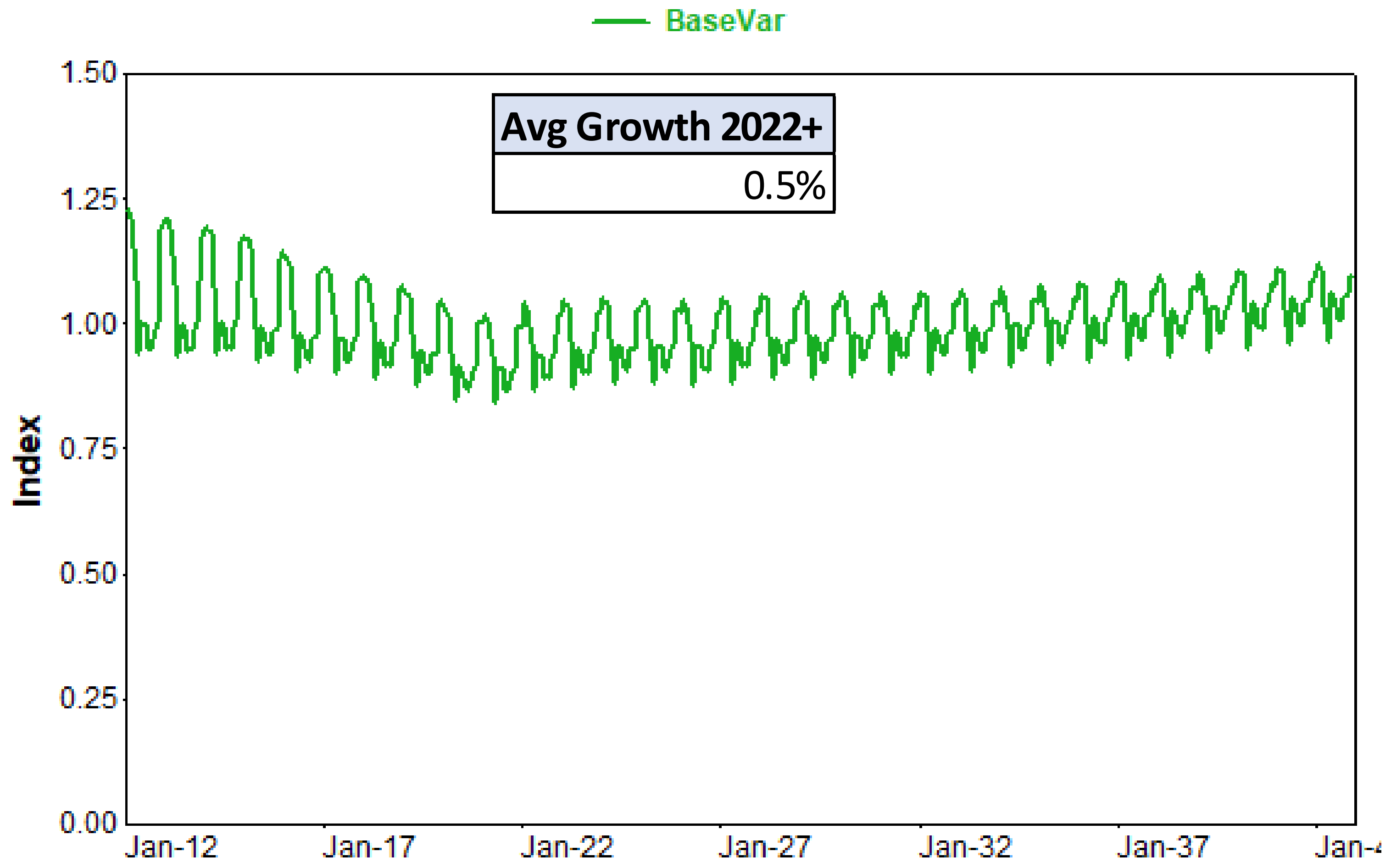
→ Residential
→ Commercial
→ Industrial
→ Lighting

Peak day base Load demand

Peak Model Drivers





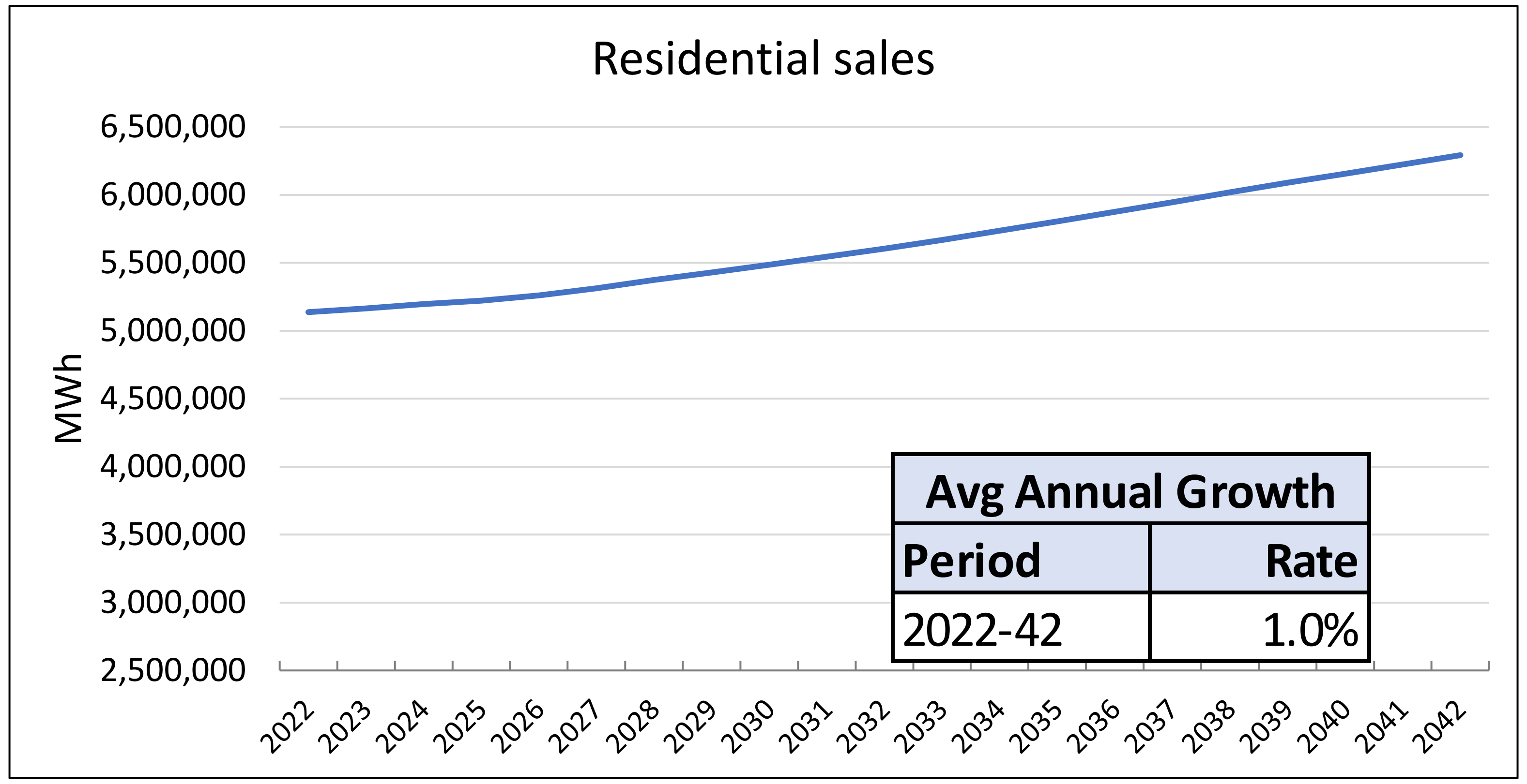


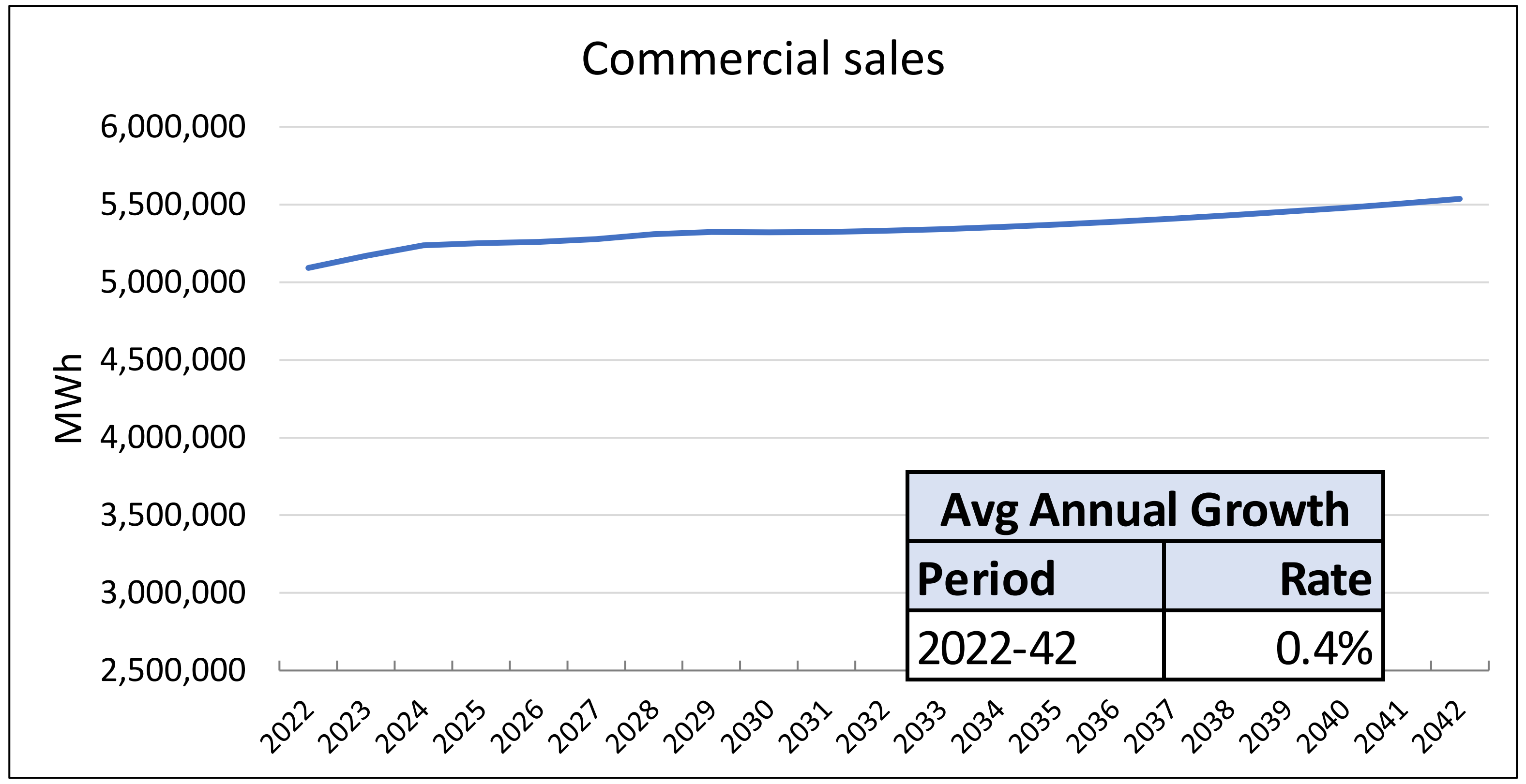
→ Heating, cooling, and base-use energy requirements derived from sales forecast models.

→ Base-use energy allocated to end-use coincident peak loads. Highest load in winter – lighting load.

Baseline Forecast

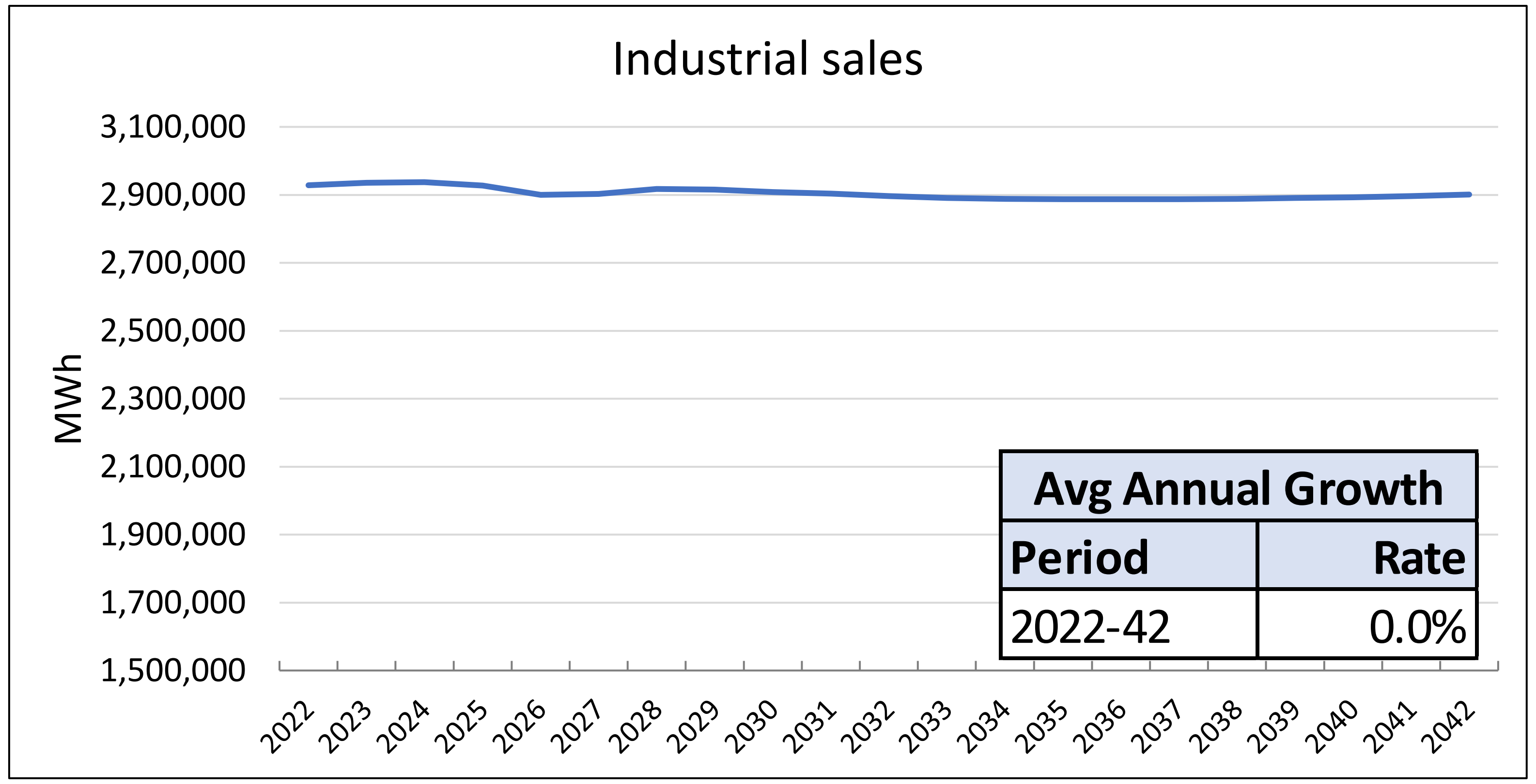
Baseline Class Sales Forecast





→Excludes

- Future Energy Efficiency Program savings
- Electric vehicle charging loads
- Future Behind-the-Meter solar adoption



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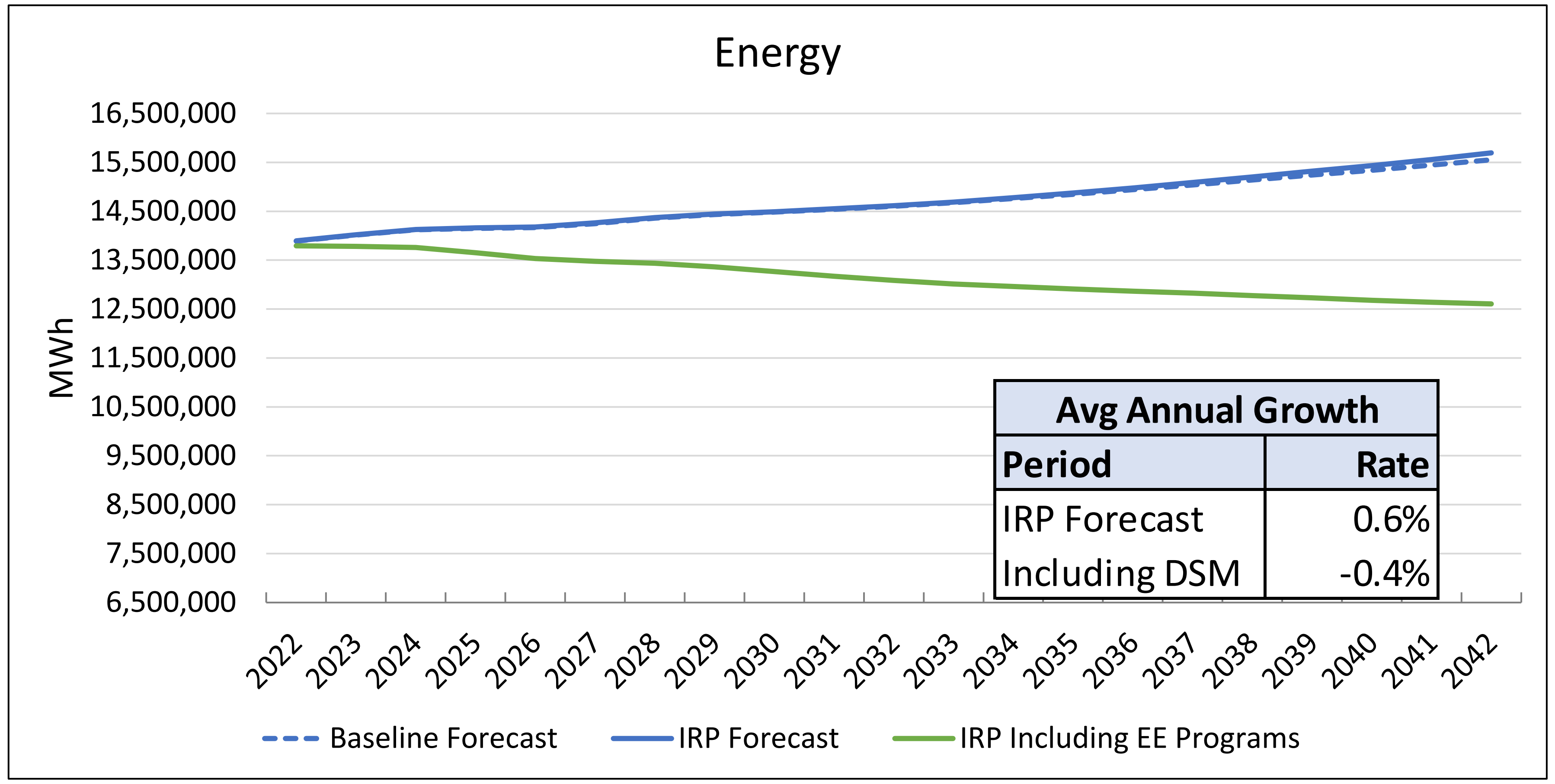
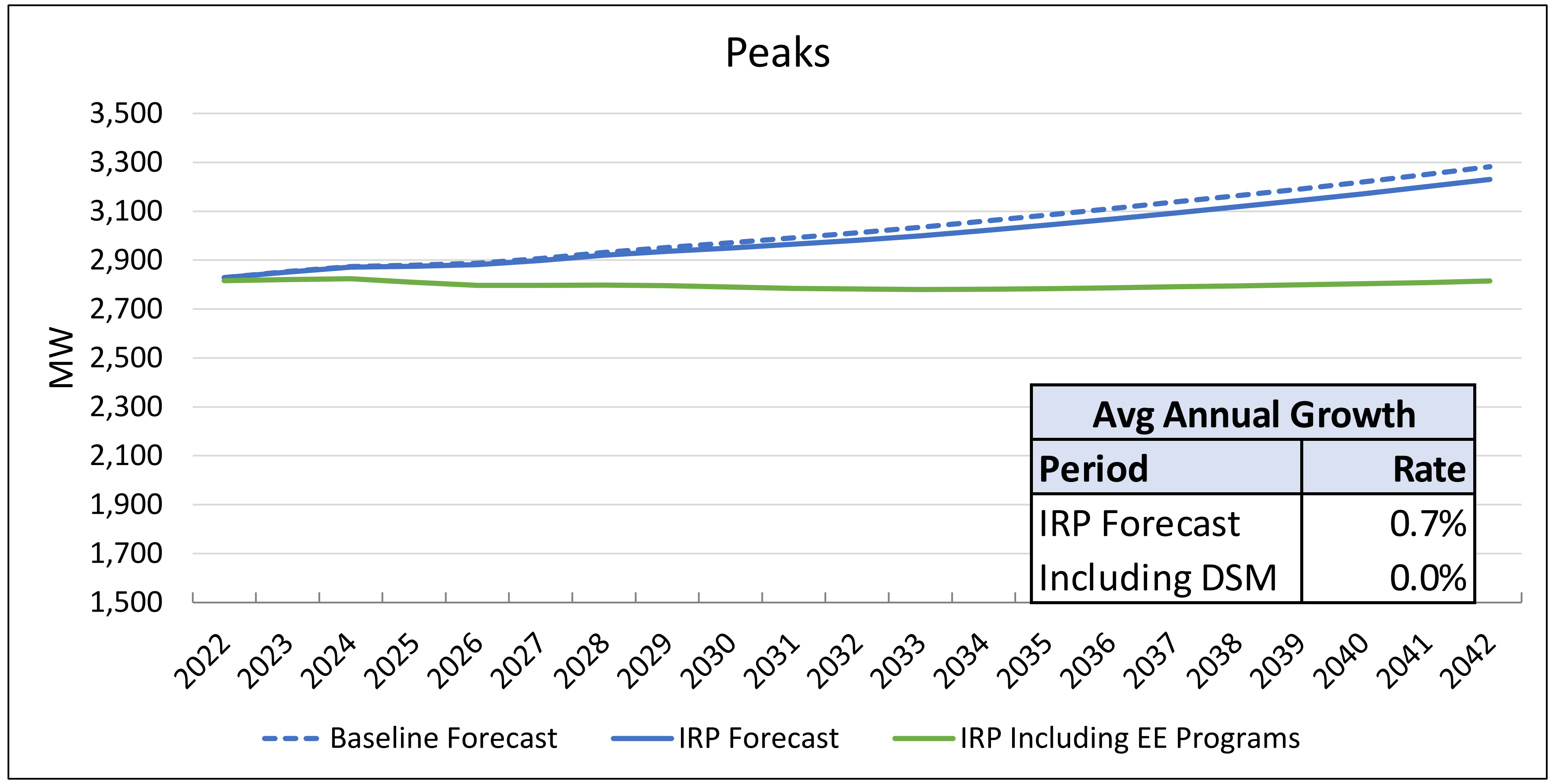
Energy & Peak Forecast





- Baseline Forecast excludes energy efficiency programs (EE), electric vehicles, and solar impact
- IRP Forecast includes the impact of electric vehicles and solar but excludes EE
- Green line shows energy and peak demand with future EE continuing at current levels
  - With EE, energy and peak trend is consistent with the last ten-years

2022 Integrated Resource Plan (IRP)

Electric Vehicle (EV) and Solar PV Forecasts

Presented by IRP Partners

GDS Associates, Inc. ENGINEERS & CONSULTANTS

brightline GROUP

aes Indiana

Introduction to the GDS team

GDS Associates, Inc.
ENGINEERS & CONSULTANTS

GDS will serve as the prime contractor for these studies. GDS is a privately-held multi-service engineering and consulting firm, with more than 175 employees. Our broad range of expertise focuses on clients associated with, or affected by electric, natural gas, water and wastewater utilities. GDS has completed over 75 energy efficiency and demand response potential studies over the last two decades. GDS also has significant experience in: Statistical & Market Research Services, Integrated Resource Planning, Load Forecasting Services, and Regulatory Support Services.

brightline GROUP

Woman-owned collective of industry experts in DSM program planning and evaluation, with over 60 years of combined experience in the energy efficiency and engineering industry. Members of the Brightline Group has previously worked for GDS on I&M, Ameren Missouri, California POU, and Pennsylvania PUC evaluation and market research projects.

JEFFREY HUBER
Overall Project Manager & MPS Lead
GDS Associates

JACOB THOMAS
Market Research & End-Use Analysis Lead
GDS Associates

PATRICK BURNS
PV Modeling Lead & Regulatory/IRP Support
Brightline Group

MELISSA YOUNG
Demand Response Lead
GDS Associates

JORDAN JANFLONE
EV Modeling/Forecasting
GDS Associates

Electric Vehicle (EV) / Solar PV Forecasts

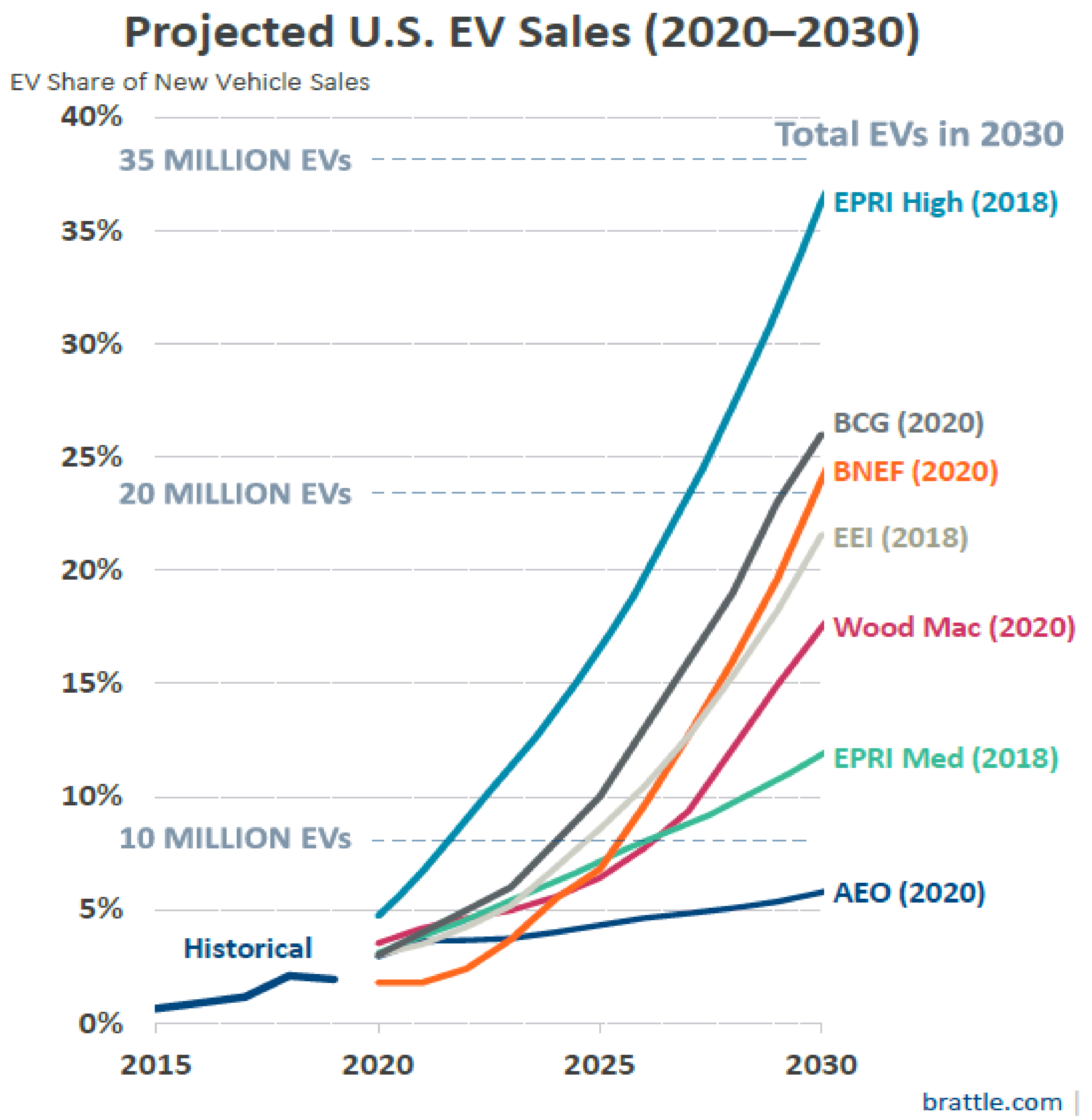
Patrick Burns, PV Modeling Lead and Regulatory/IRP Support, Brightline Group
Jordan Janflone, EV Modeling Forecasting, GDS Associates

Residential Electric Vehicle Forecast

→Goal is to forecast total number of EVs and resulting energy use in AES-IN service territory

→Various assumptions are needed as inputs

→Very broad ranges for EV penetration in the market, various sources have differing opinions and projections



Residential Electric Vehicle Forecast

→EV Unit forecast informs EV Total Energy Forecast

→Similar process to a typical customer class forecast

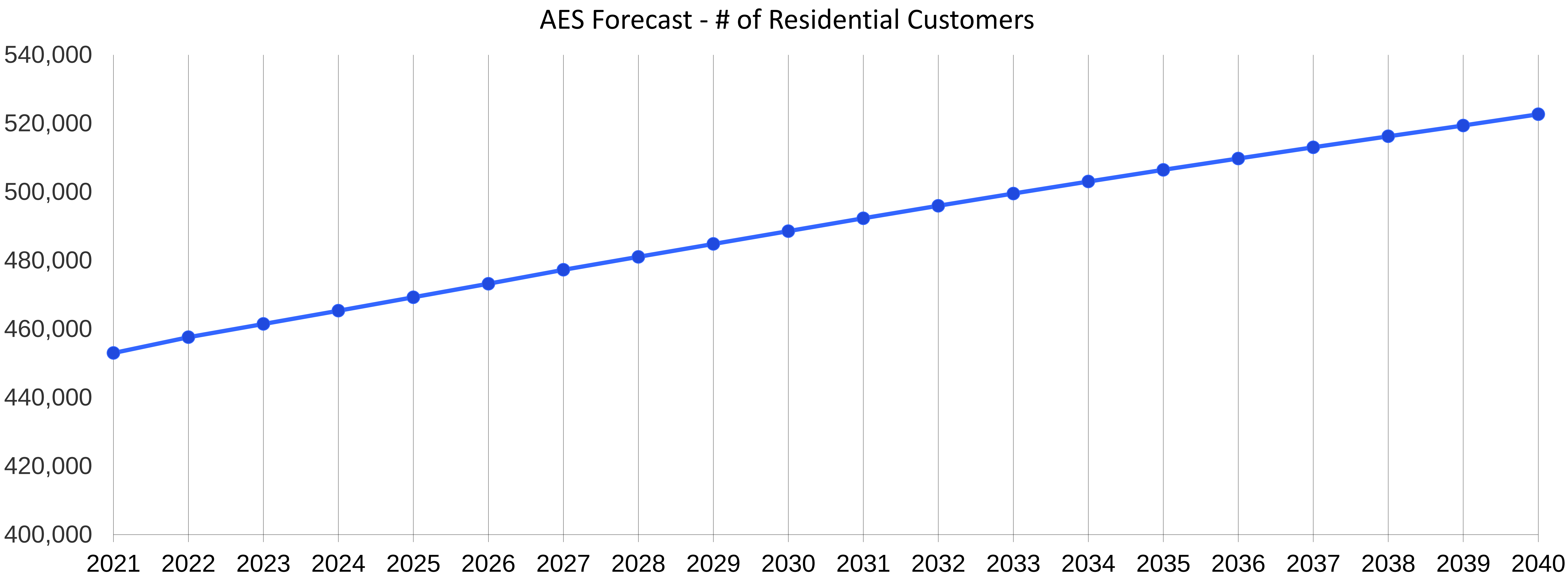
Total number of EVs

Total energy consumed by EVs

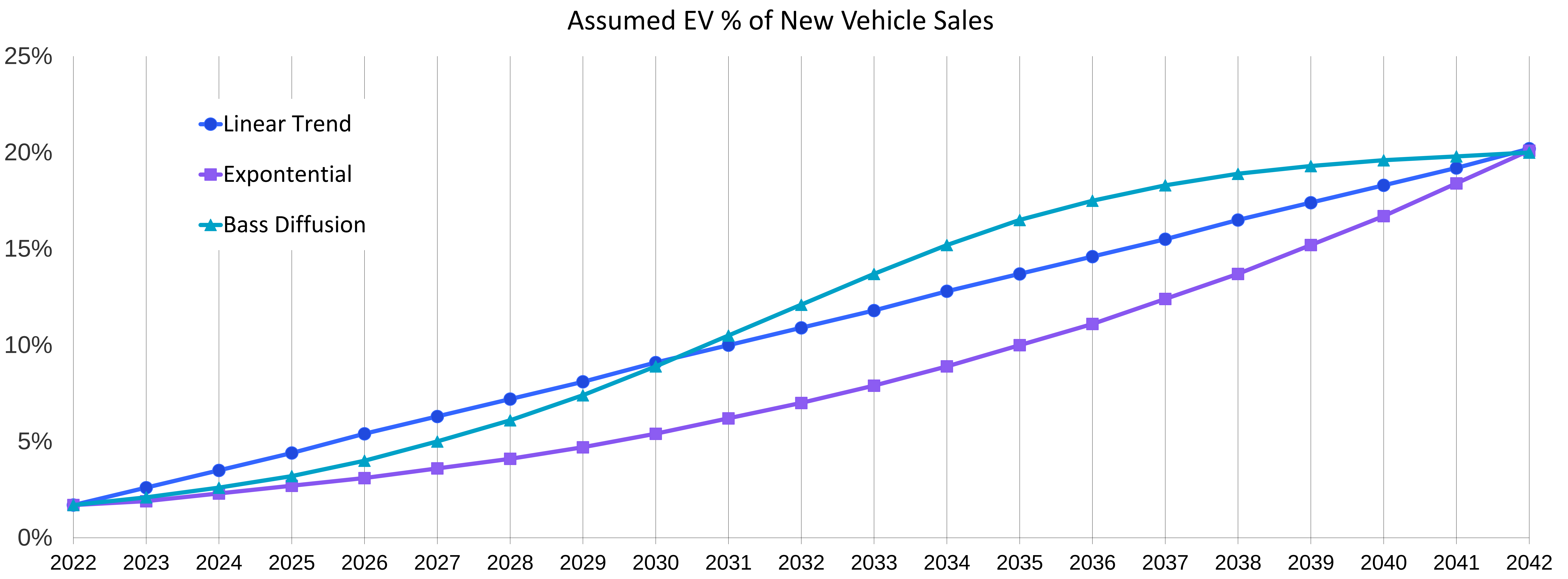
Residential Electric Vehicle Forecast

Input	Source
Number of residential customers	AES-IN Load Forecast
Average number of vehicles per household	U.S. Census – Indianapolis Metropolitan Area
Average vehicle life	U.S. Department of Transportation
Initial number of EVs	EV Registration data from AES-IN
Passenger car to light truck ratio	Energy Information Administration (EIA)
EV sales as percentage of total vehicle sales	Multiple scenarios and studies considered
Average kWh per mile	U.S. Department of Energy
Average miles per year driven by EV	Car & Driver EV Owner Study

Residential Customer Forecast



EV Sales Trend Forecast



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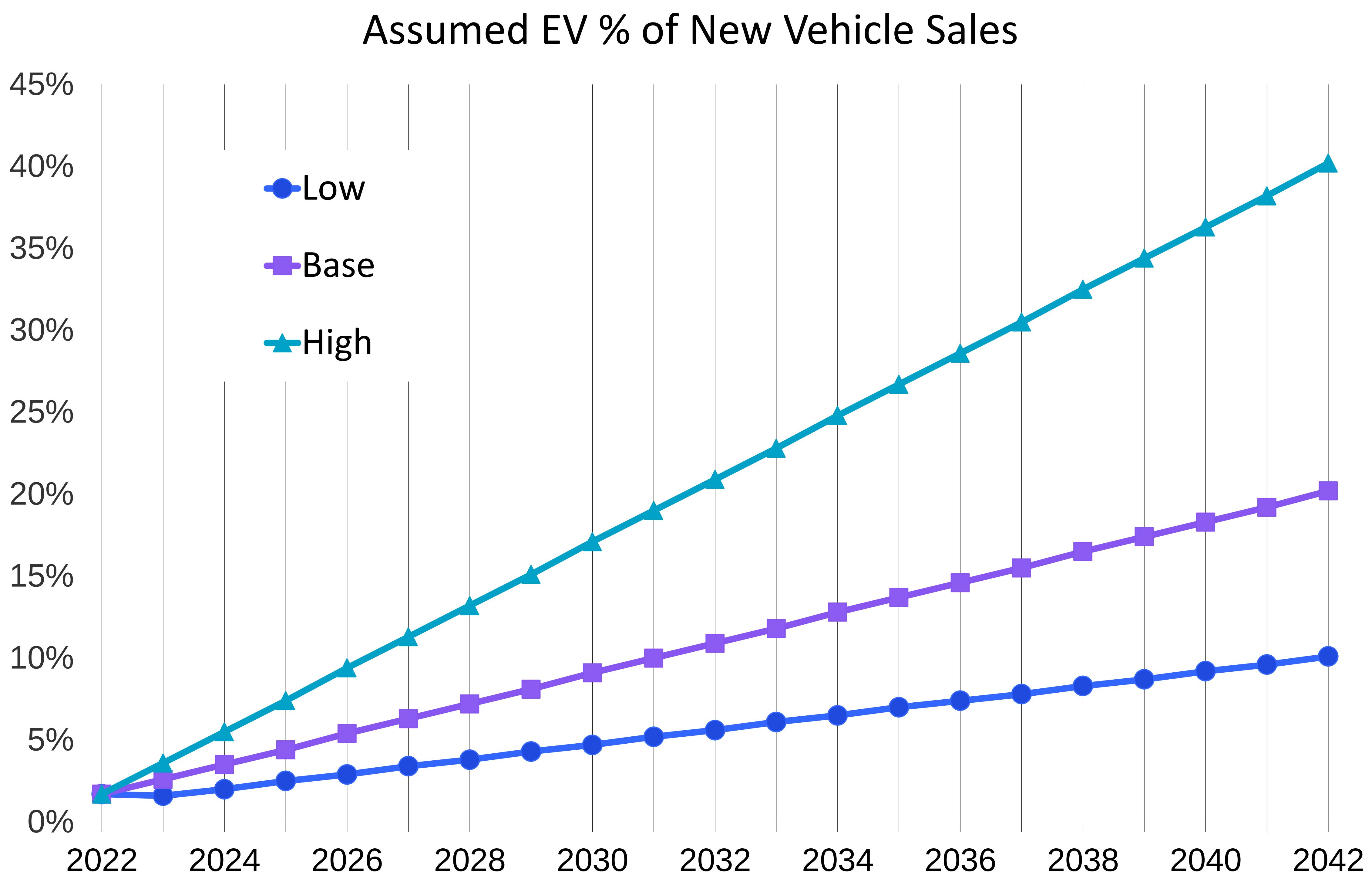
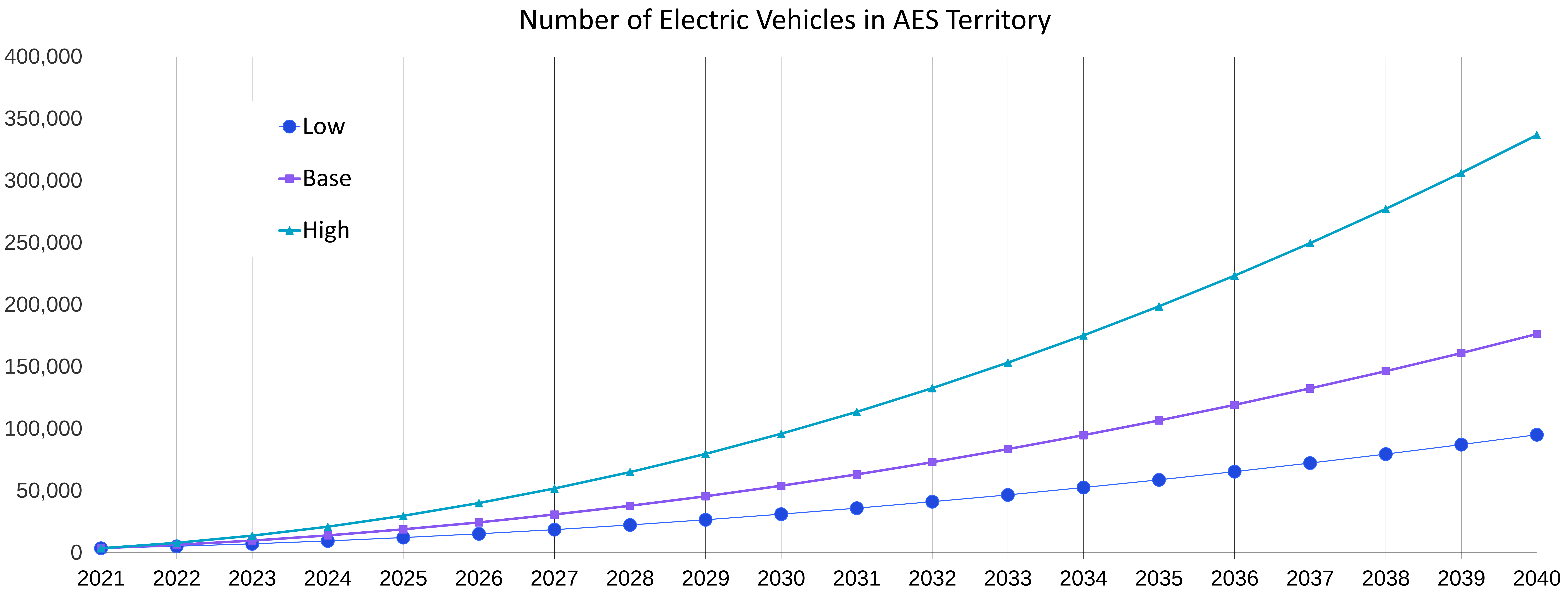
EV Sales Scenarios

- →Linear trend was selected for scenario modeling
- →EIA uses a linear trend sales trend
- →3 trend scenarios were modeled
  - → Low projections are similar to current EIA forecast
  - → Medium aligns with a blend of the BCG and EPRI medium projections
  - → High projections are similar to EPRI High.



EV Sales Scenarios



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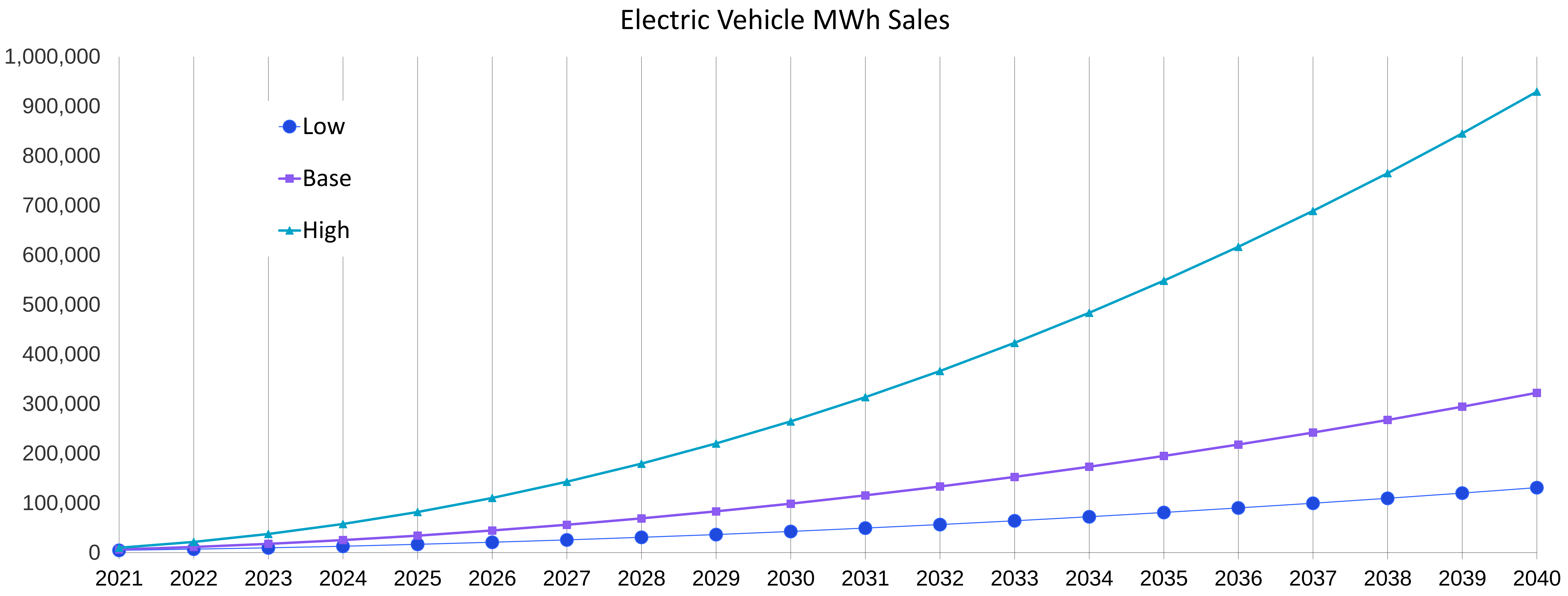
Electric Vehicle Energy (MWh) Forecast

- Energy is a function of total EV units, average kWh/mile, and total number of miles/year/EV

- 3 trend scenarios were modeled
  - Low, Base, High

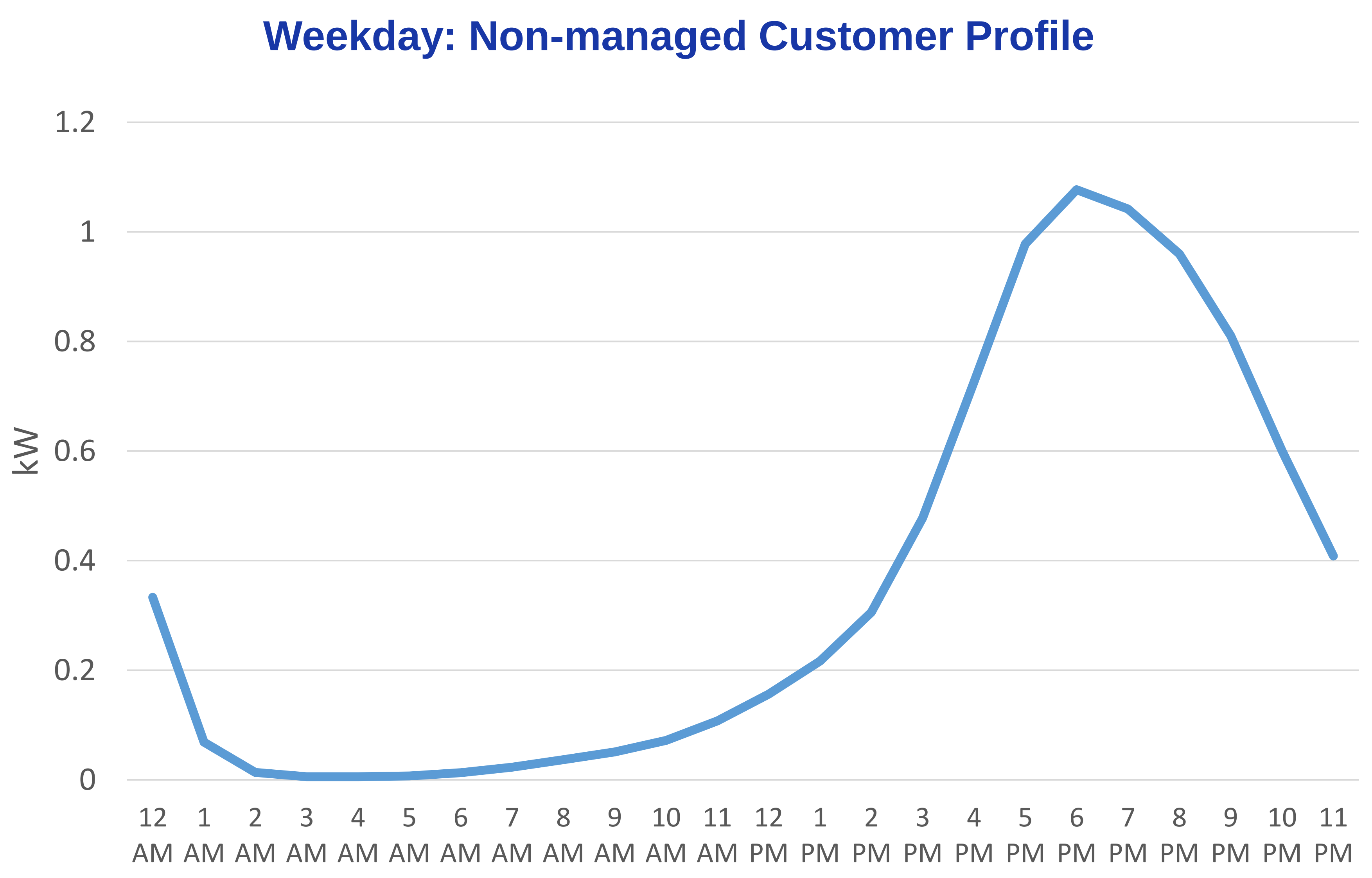
Input	Base	High	Low
Number of Vehicles in 2021	3,575	3,575	3,575
% of EV Sales in 2030	11%	21%	6%
% of EV Sales in 2040	20%	40%	10%
Miles/year/vehicle	5,300	8,000	4,000
Average kWh/mile	0.345	0.345	0.345

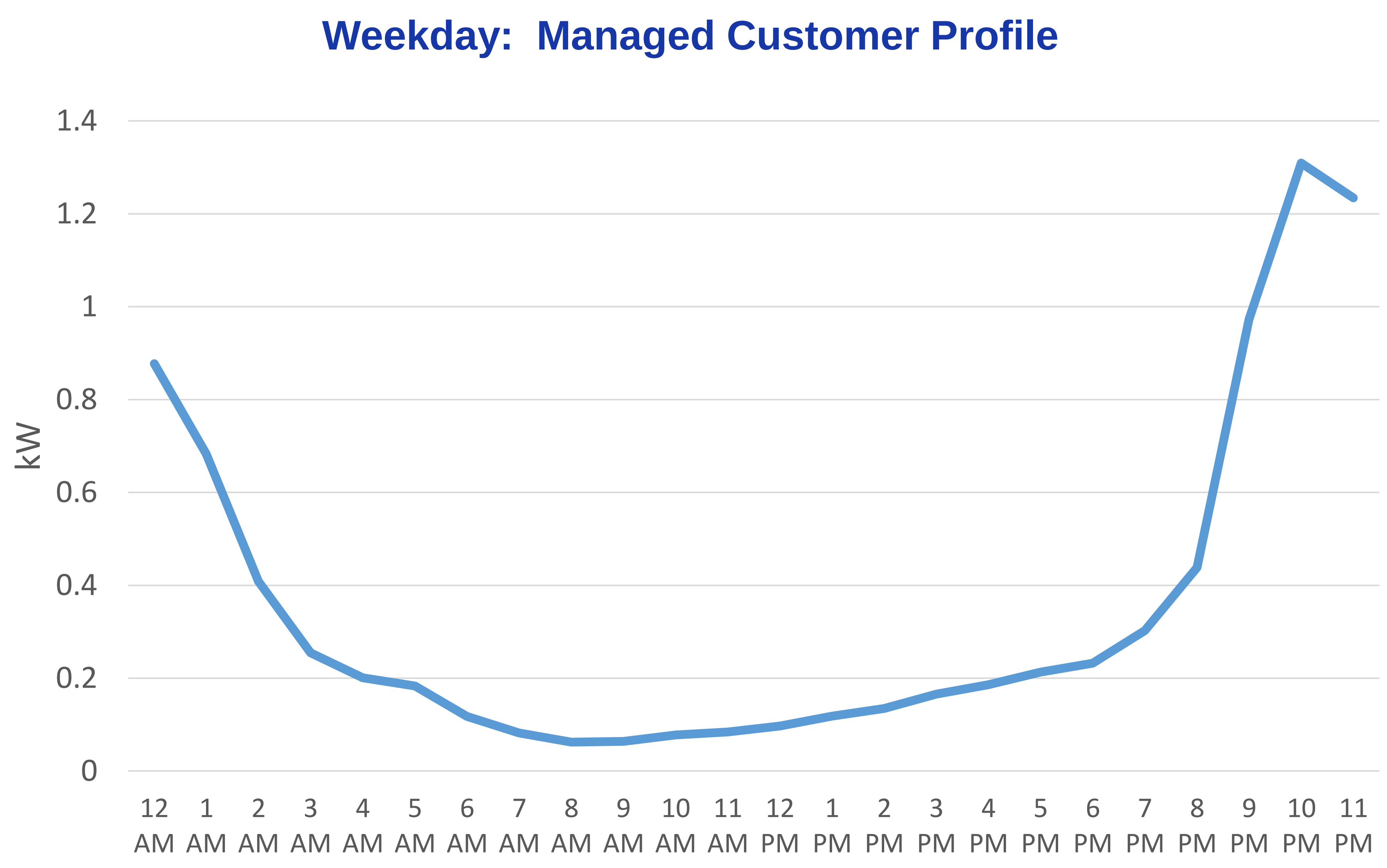
EV Energy (MWh) Forecast



Residential Electric Vehicle Load Shape

→ Load shapes for electric vehicles come from:
  → Non-managed Charging – Guidehouse which uses a blend of utility EV metering programs and synthetic datasets from US National Labs
  → Managed Charging – AES Indiana AMI data from EVX customers





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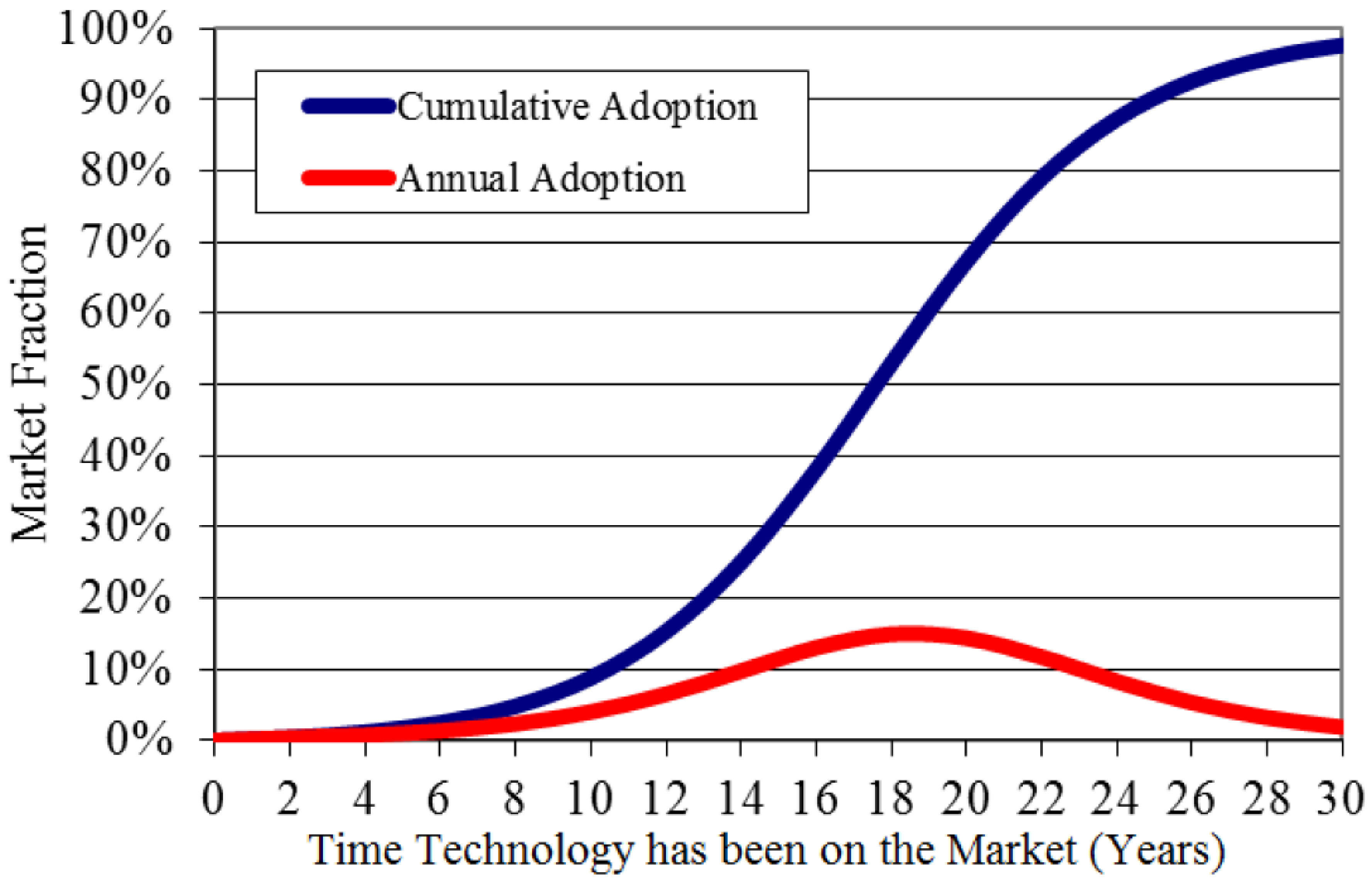
PV Preliminary Forecast

Forecast Framework – Bass diffusion model

→Key parameters:

- → Existing market share
- → Maximum market share
- → Coefficients of innovation (p) and imitation (q)



PV Preliminary Forecast – Bass model parameters

- →Existing market share:
  - → AES IN 2021 Q3 cumulative net metering data
    - 625 existing residential systems
    - 46 existing non-residential systems
- → Maximum market share:
  - → AES IN customer forecast
  - → PV technical constraint factor
    - 48% residential; 79% non-residential
    - Based on NREL NSRDB data which accounts for constraints such as shading, contiguous roof area, panel orientation, etc.
- → Coefficients of innovation (p) and imitation (q):
  - → NREL dGen model (based on state-level EIA DGPV interconnection and Census data)

PV Preliminary Forecast – Scenario Analysis

3 Business-As-Usual (BAU) Scenarios Considered

→ Scenarios based on adoption probability:
  - → Currently estimated based on CAGR of historically installed systems within AES IN territory and regional customer WTP survey data
  - → Will be updated based on findings from AES IN market research

→ Residential:
  - → High: 29% market adoption
  - → Medium: 15% market adoption
  - → Low: 6% market adoption

→ Non-Residential:
  - → High: 35% market adoption
  - → Medium: 19% market adoption
  - → Low: 7% market adoption

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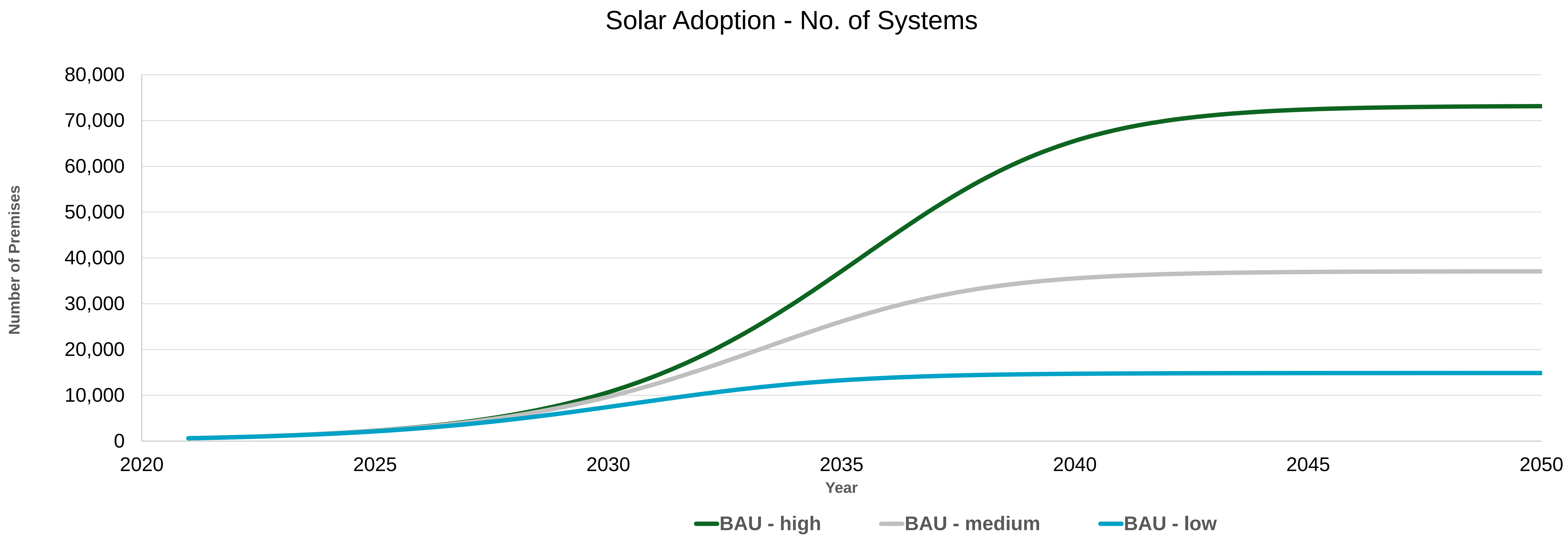
PV Preliminary Forecast

Model forecast results – Residential



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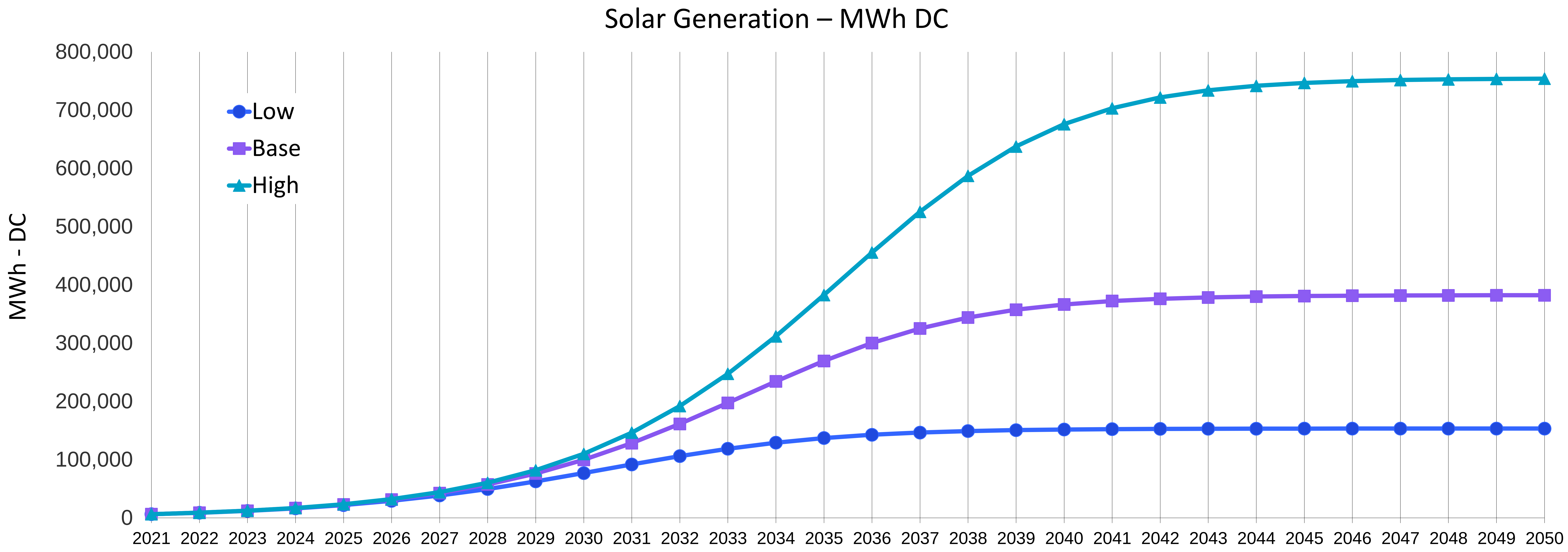
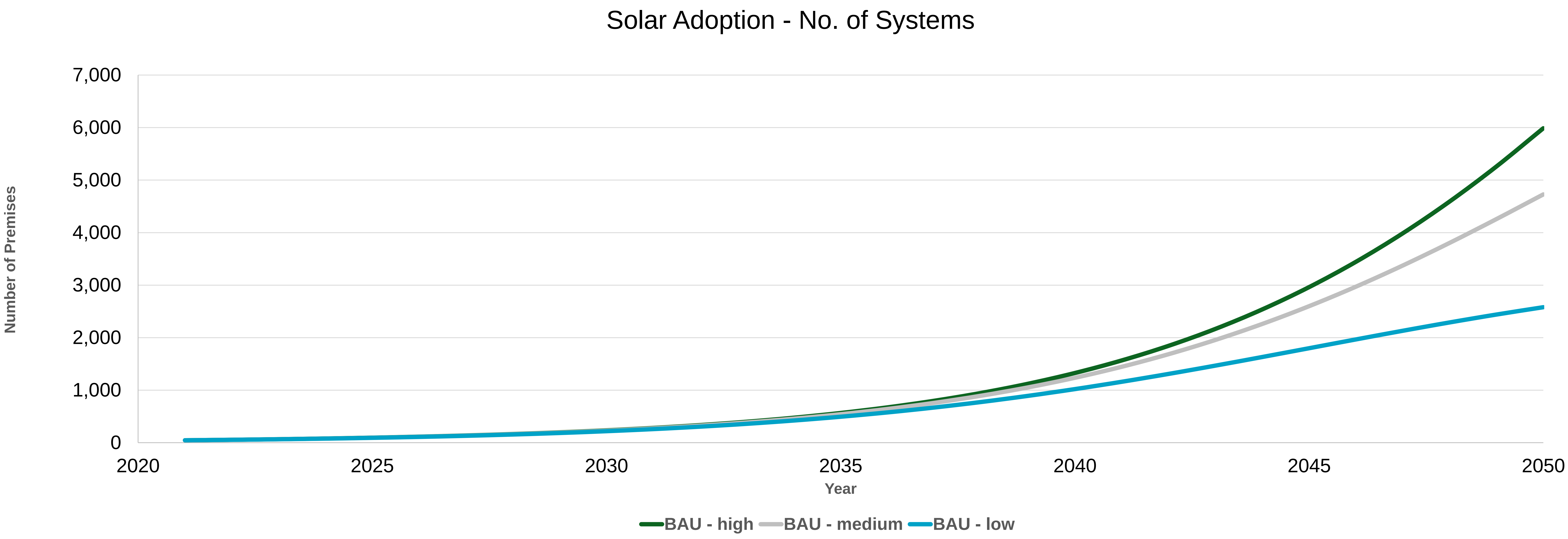
PV Preliminary Forecast

Model forecast results – Residential



PV Preliminary Forecast

Model forecast results – Non-Residential



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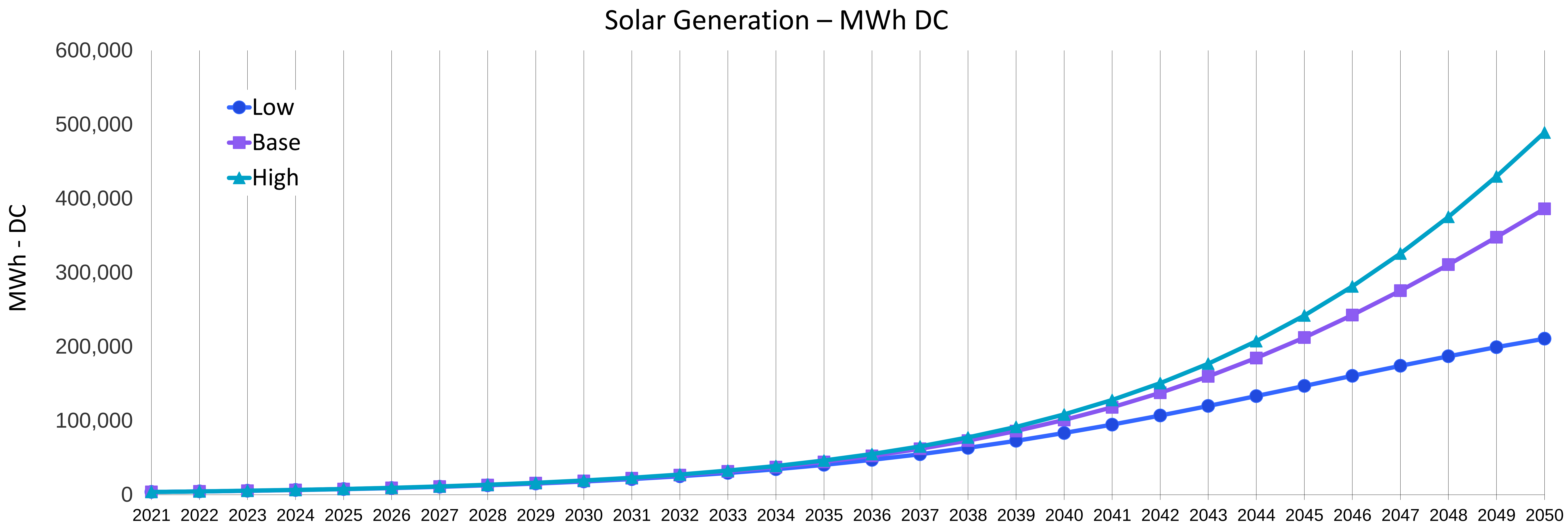
PV Preliminary Forecast

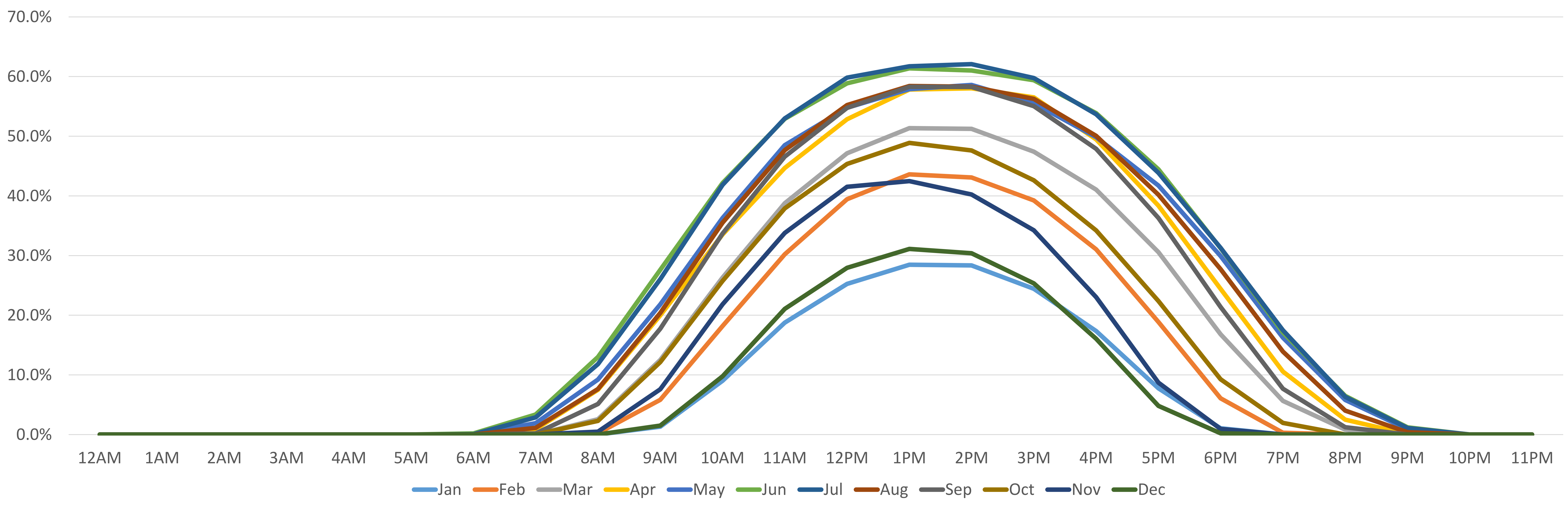
Model forecast results – Non-Residential



PV Load Shape

→ Load shapes for solar come from:

  → Residential customer AMI data for ground (50%) and roof (50%) solar installations



2022 Integrated Resource Plan (IRP)

DSM Market Potential Study Introduction

Presented by IRP Partners

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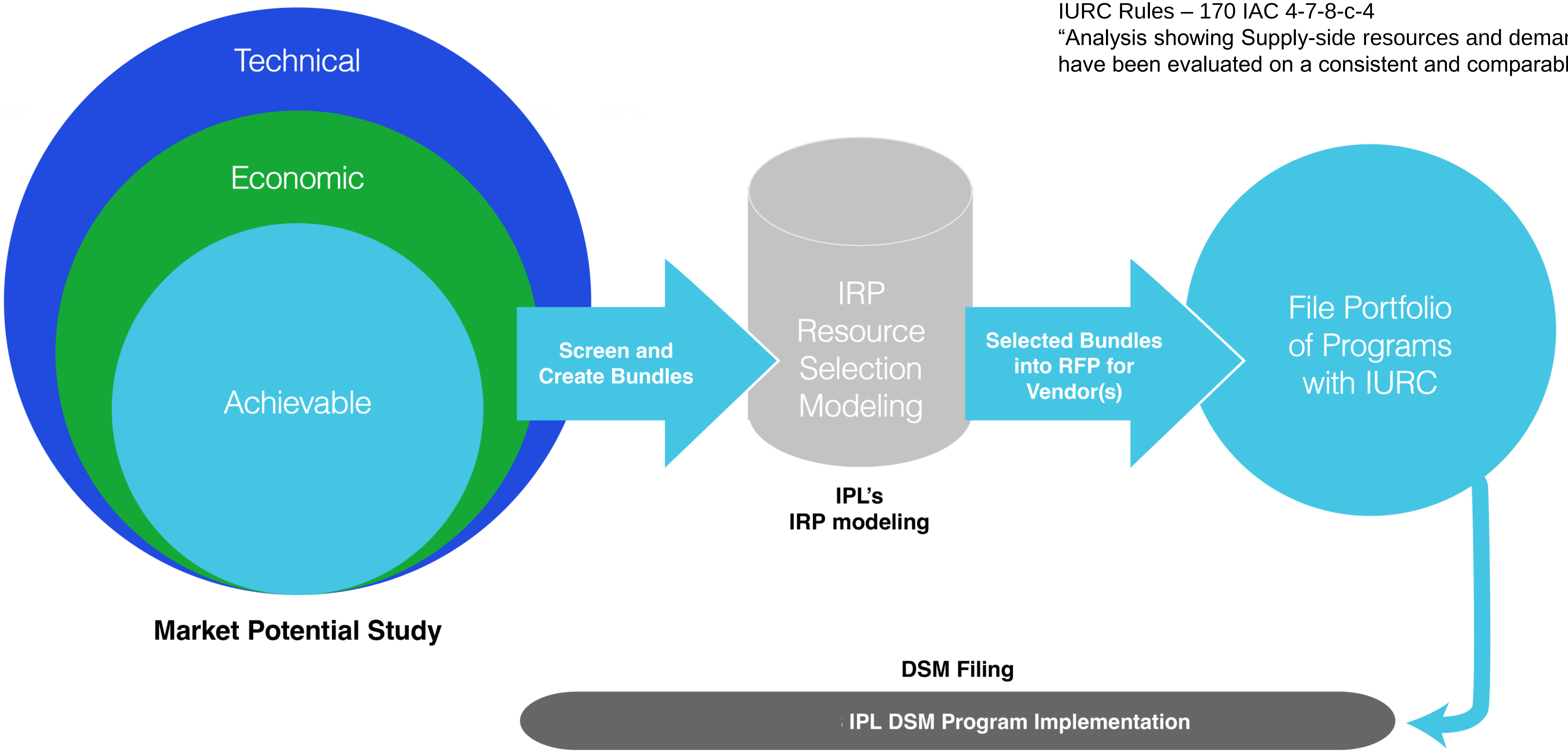
Introduction to the DSM Process in the IRP

IURC Rules – 170 IAC 4-7-8-c-4
"Analysis showing Supply-side resources and demand-side resources have been evaluated on a consistent and comparable basis."



AES Indiana

Agenda

→ Overview

- Team Introduction
- Purpose of a Market Potential Study (MPS)
- MPS/IRP Related Work

→ Market Research

- End-Use Analysis
- Willingness to Participate in DSM Programs

→ Energy Efficiency (EE) Potential

→ Demand Response (DR) Potential

→ Initial EV/PV Forecasts

Introduction to the GDS team

GDS will serve as the prime contractor for these studies. GDS is a privately-held multi-service engineering and consulting firm, with more than 175 employees. Our broad range of expertise focuses on clients associated with, or affected by electric, natural gas, water and wastewater utilities. GDS has completed over 75 energy efficiency and demand response potential studies over the last two decades. GDS also has significant experience in: Statistical & Market Research Services, Integrated Resource Planning, Load Forecasting Services, and Regulatory Support Services.

Woman-owned collective of industry experts in DSM program planning and evaluation, with over 60 years of combined experience in the energy efficiency and engineering industry. Members of the Brightline Group has previously worked for GDS on I&M, Ameren Missouri, California POU, and Pennsylvania PUC evaluation and market research projects.

JEFFREY HUBER
Overall Project Manager & MPS Lead
GDS Associates

JACOB THOMAS
Market Research & End-Use Analysis Lead
GDS Associates

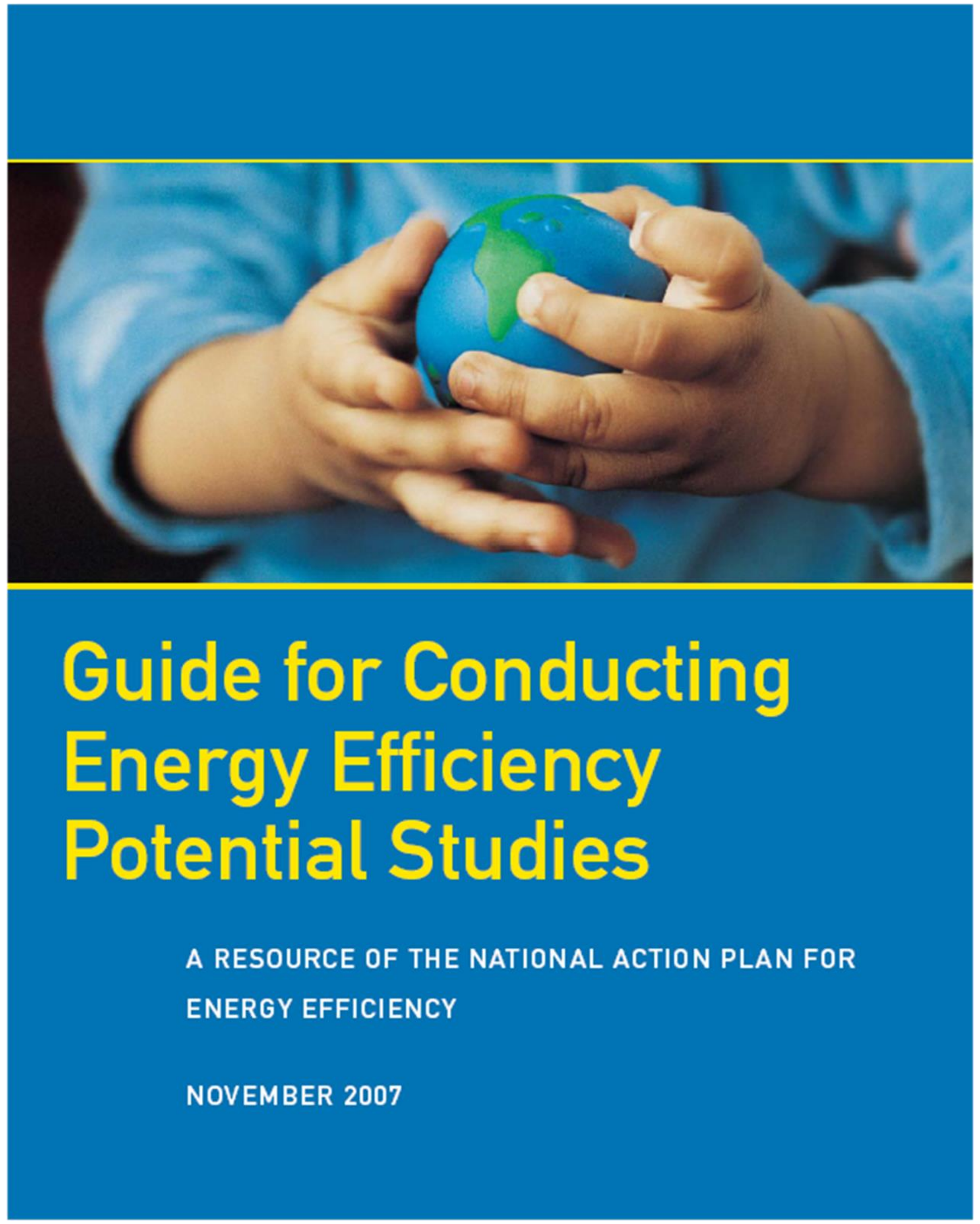
PATRICK BURNS
PV Modeling Lead & Regulatory/IRP Support
Brightline Group

MELISSA YOUNG
Demand Response Lead
GDS Associates

JORDAN JANFLONE
EV Modeling/Forecasting
GDS Associates

What is a Market Potential Study?

Simply put, a potential study is a quantitative analysis of the amount of energy savings that either exists, is cost-effective, or could be realized through the implementation of energy efficiency programs and policies.



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Purpose of a Market Potential Study

Market Potential Study identifies the remaining amount of EE/DR potential in the AES-IN service territory

The savings potential from this analysis will be used to create EE/DR resources to be modeled in the IRP.

EE/DR selections from the IRP will be used to inform AES-IN DSM plan for 2024-2026.

DSM Market Potential Study Introduction

Market Research

Jeffrey Huber, Overall Project Manager and MPS Lead, GDS Associates
Jacob Thomas, Market Research and End-Use Analysis Lead, GDS Associates
Melissa Young, Demand Response Lead, GDS Associates

Market Research Activities

RESEARCH TO IMPROVE UPON INPUTS TYPICALLY USED IN BOTH LOAD FORECAST & MPS

- ***Primary & Secondary Research***
  - Surveys & onsite visits
  - Building energy simulation models
  - CBECS
- ***Residential***
  - End Use Market Share
  - Unit Energy Consumption
- ***Small Commercial & Industrial***
  - End-use intensity
  - Distribution of customers by building type
  - End-use saturation

RESEARCH TO HELP UNDERSTAND MOTIVATIONS AND BARRIERS TO ADOPTION

- ***Willingness to Participate (WTP) at varying incentive levels***
  - Residential /Commercial
  - Asked for EE / DR / DER
- ***Importance of financial/non-financial motivations and barriers toward adoption***
  - Motivations: *Energy/bill savings, personal sustainability goals, improved comfort, increased reliability, quieter operation, etc.*
  - Barriers: *Upfront cost, access to financing, uncertainty about savings, lack of knowledge, limitations of building characteristics, unwanted features or negative impacts on aesthetics/comfort, etc.*
- ***Awareness of current AES-IN Programs***

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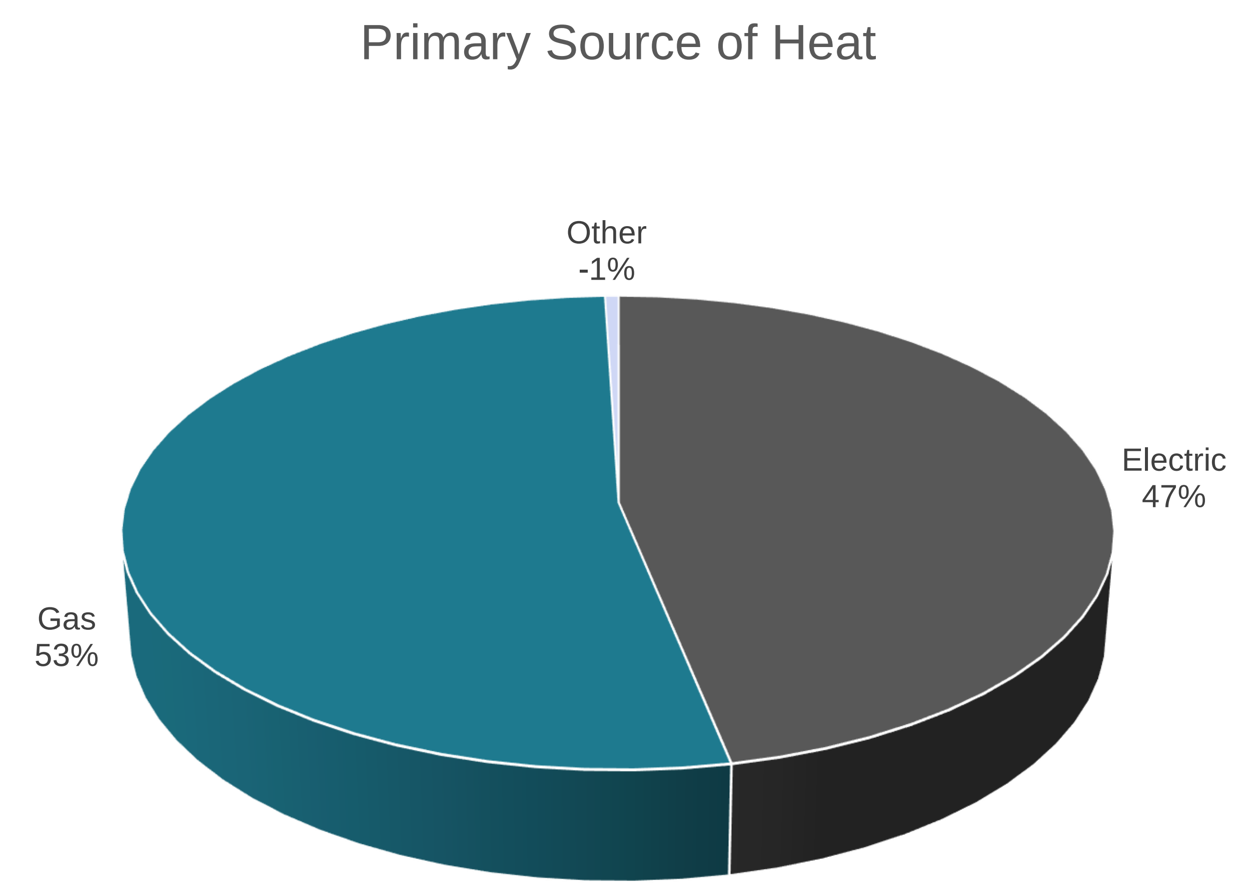
Residential Baseline Survey Statistics

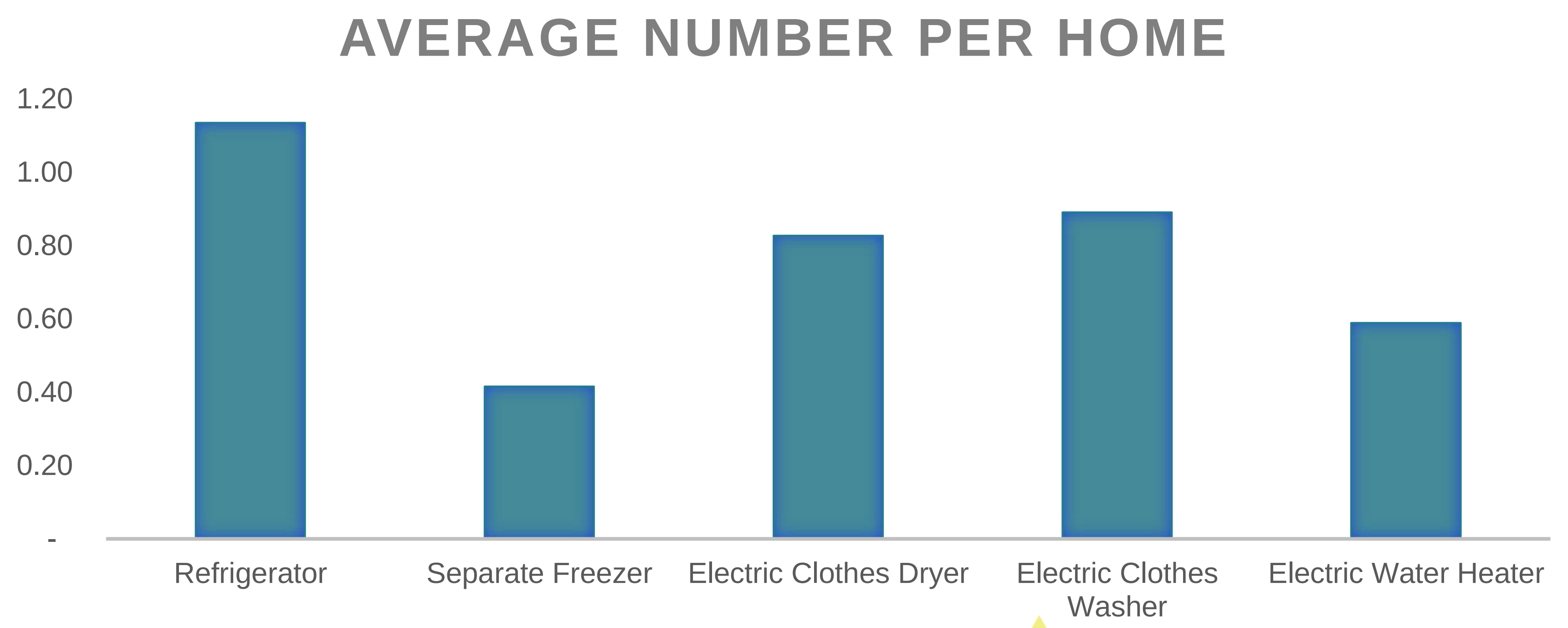
Market Segment	Sample Design	Sample Frame	# of Responses	Response Rate	Achieved Precision
Total Residential Population	95/5 Design = 384 Responses	15,000 (100%)	972	6.5%	3.1% @ 95% Conf.
Multifamily Homes	90/10 Design = 68 Responses	2,720 (18%)	231	8.5%	5.4% @ 90% Conf.
Single Family Homes	316 Responses	12,280 (82%)	741	6.0%	3.0% @ 90% Conf.

* *Commercial survey underway. Roughly 9,000 accounts in sample frame.*

Equipment Characteristics

- *Data collection elements limited to items that may be answered accurately*
- Residential survey collected
  - Ownership, age, and count of electric end-use appliances
  - Information on smart appliances and electric vehicles
- Nonresidential survey focused on key electric end-uses
  - Ex: Lighting, Cooling, Heating, Ventilation, Water Heating, Refrigeration
  - Key Equipment Penetration
  - Limited Efficiency Saturation Characteristics





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Willingness to Participate (WTP) Sample Sizes

Residential Modules	Est # of Completions	Actual # of Completions	Achieved Precision @ 90% Confidence
Water Heater Efficiency	180	349	4.4%
Clothes Dryer Efficiency	146	264	5.1%
Insulation Efficiency	230	279	4.9%
HVAC Efficiency	195	283	4.9%
DER – Solar PV	180	269	5.0%
DER – Electric Vehicles	195	236	5.4%
Water Heater Control DR	146	229	5.4%
Smart Thermostat DR	158	157	6.6%
Time of Use Rate DR	72	88	8.8%

** Commercial WTP survey underway. Similarly targets several commercial EE end-uses (HVAC, Water Heating, Refrigeration, Lighting), DER (Solar Purchase/Leased) and DR (AC Control, Critical Peak Pricing) options.*

WTP Survey Research

- → Represents the proportion of customers who can be reasonably expected to perform energy efficiency upgrades through DSM programs
- → Used to estimate likely long-term adoption rates for achievable potential scenarios

→Long-term adoption rates will be estimated at the end-use or measures level for key end uses:

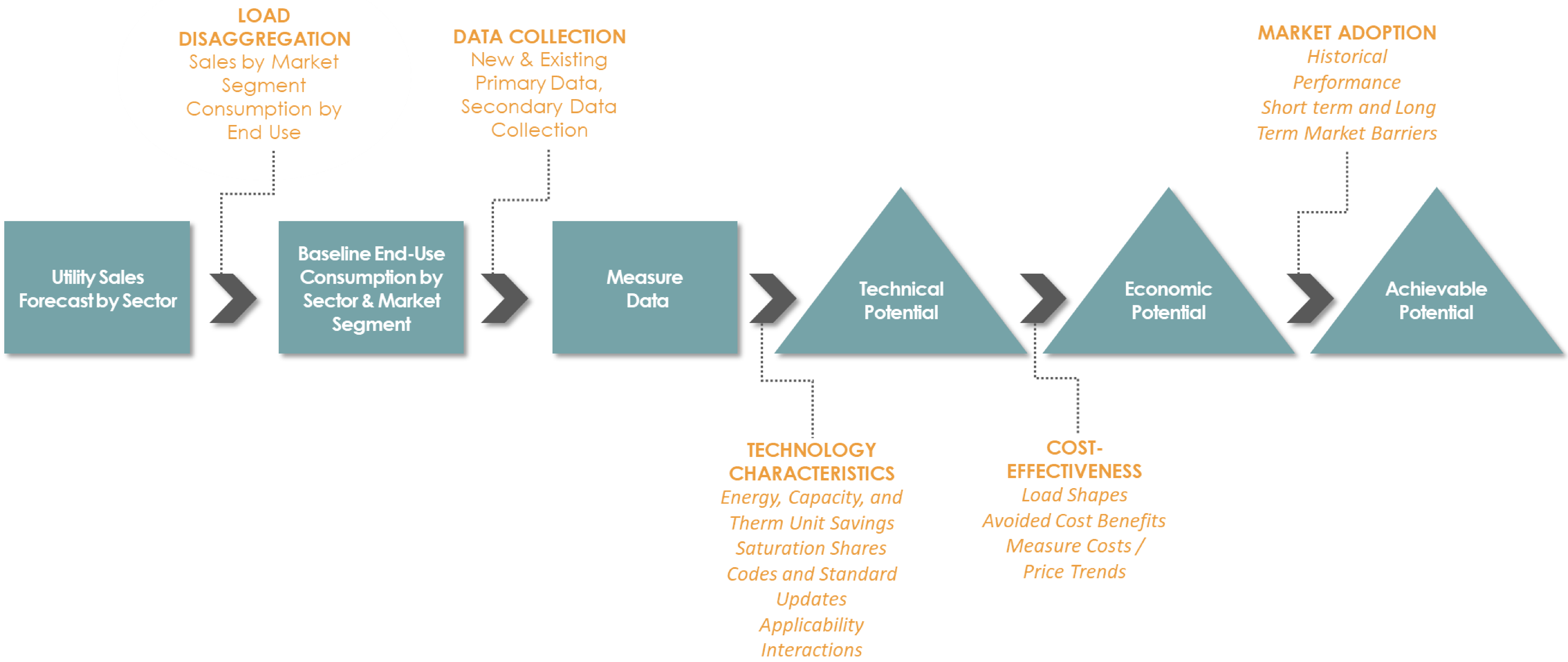
- HVAC
- Appliances
- Water Heating
- Building Shell
- Lighting
- Distributed Energy Resources
- Refrigeration
- Demand Response

DSM Market Potential Study Introduction

Energy Efficiency (EE) Potential

Jeffrey Huber, Overall Project Manager and MPS Lead, GDS Associates
Jacob Thomas, Market Research and End-Use Analysis Lead, GDS Associates
Melissa Young, Demand Response Lead, GDS Associates

Overall Market Potential Study Process



MPS Segmentation

Residential		Commercial		Industrial	
Home Types	**End-Uses**	**Building Types**	**End-Uses**	**Industry Types**	**End-Uses**
Single Family – Market Rate	Whole Building	Education	Whole Building	Chemicals	HVAC
Multifamily – Market Rate	Heat	Food/Liquor	Heat	Electronics	Lighting
Single Family – Income Qualified	Cool	Health Care	Cool	Fabricated Metals	Machine Drive
Multifamily – Income Qualified	WH	Hotel	Vent.	Food	Process Heat
	Int. Lighting	Miscellaneous	Refrigeration	Lumber & Furniture	Process Refrigeration
	Ext. Lighting	Office	WH	Average	Other Process
	Refrigeration	Restaurant	Cook	Nonmetallic Mineral	Other Facility
	Other Appliances	Retail Store	Interior Lighting	Paper	
	Electronics	Warehouse	Exterior Lighting	Chemicals	
	Pools		Office Equip.	Plastics	
	Misc.		Misc.	Primary Metals	
			Air Comp.	Transportation	
			Motors		
			Proc.		

Measure Characterization

- ❑ Several hundred energy efficiency measures will be considered
- ❑ Draft list of measures to be considered were shared with AES-IN Staff and members of the AES-IN Oversight Board (OSB)
- ❑ Key data source: AES-IN planning and evaluation databases and Illinois TRM
- ❑ Measure assumptions include:
  - Savings
  - Incremental/full costs
  - Measure interaction
  - Measure life
  - Measure Applicability

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Emerging Technologies

- →Emerging technologies and practices are defined as those that are either: (1) not yet commercialized but are likely to be commercialized and cost-effective for a significant proportion of end-users (on a life-cycle cost basis) over the next few years; or (2) commercialized, but currently have penetrated no more than 2% of the appropriate market (ACEEE)
  - →Reviewed latest TRMs, DOE databases, and the Northwest Energy Efficiency Alliance Emerging Tech Advisory Committee.
- →Require some documented estimate of savings and/or costs for inclusion.
- →**MPS does not include a placeholder for "future unknown technologies"**

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Energy Efficiency Potential Types

TECHNICAL POTENTIAL

All technically feasible measures are incorporated to provide a theoretical maximum potential.

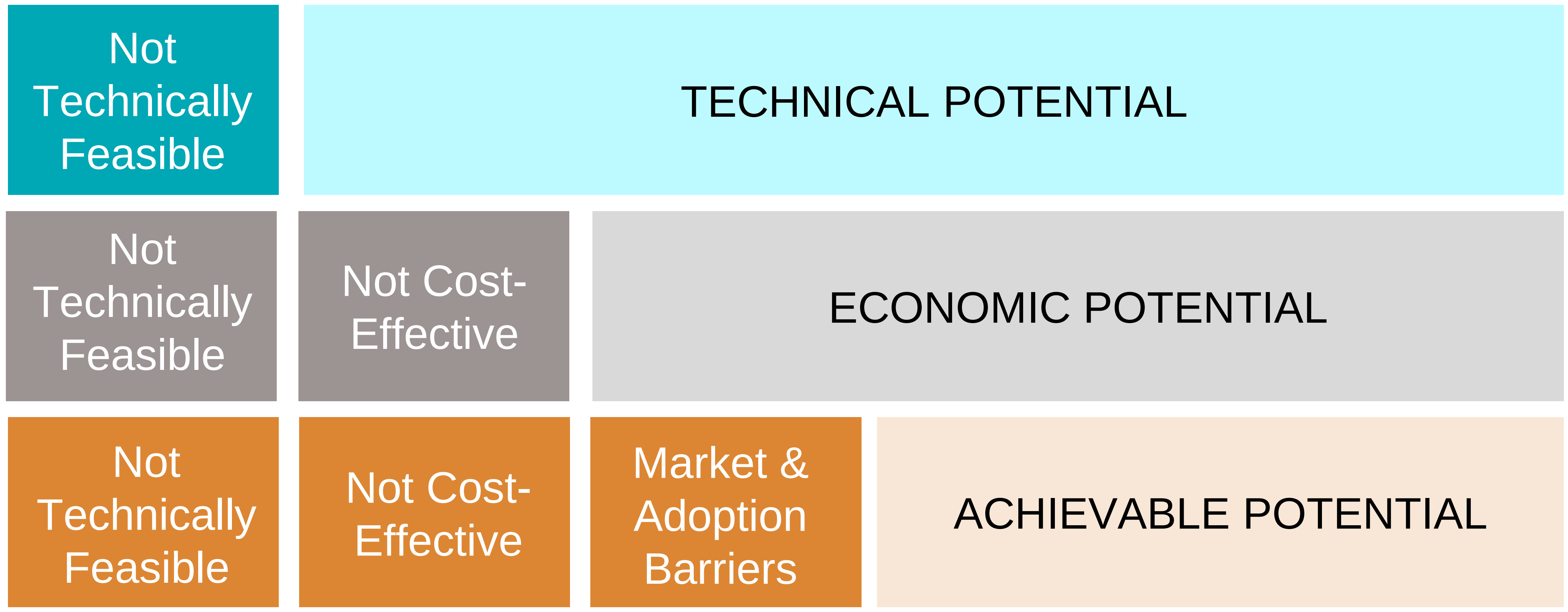
ECONOMIC POTENTIAL

All measures are screened for cost-effectiveness using the UCT Test. Only cost-effective measures are included.

ACHIEVABLE POTENTIAL

Cost-effective energy efficiency potential that can practically be attained in a real-world program delivery case, assuming that a certain level of market penetration can be attained.

Types of Energy Efficiency Potential



Technical Potential Calculation

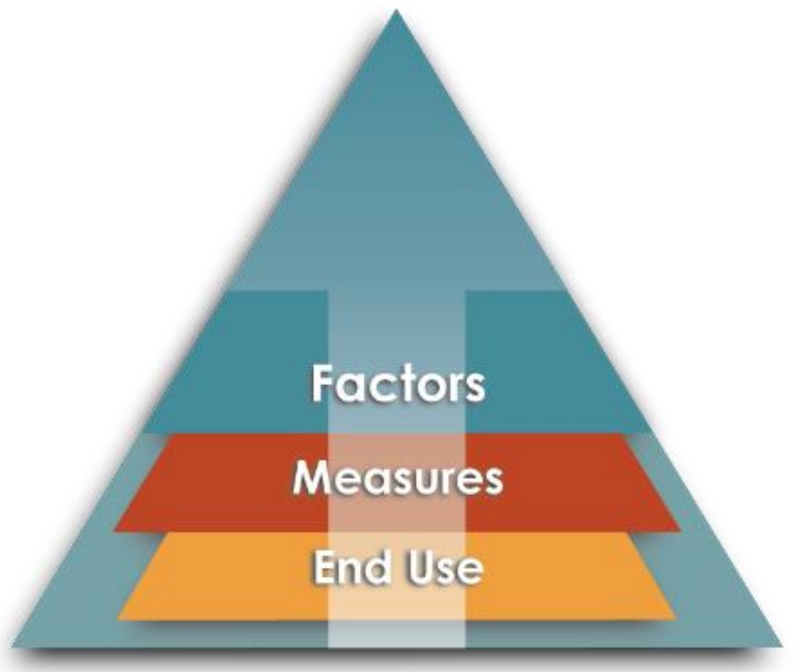
RESIDENTIAL EQUATION

TECHNICAL POTENTIAL OF EFFICIENT MEASURES = *Total Number of Households* X *Base Case Equipment End Use Intensity* X *Saturation Share* X *Applicability Factor* X *Savings Factor*

NON-RESIDENTIAL EQUATION

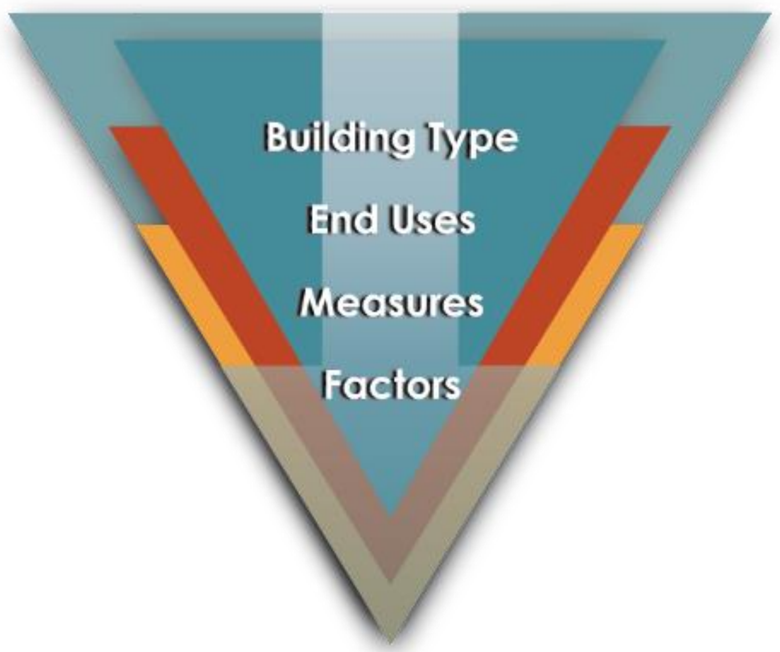
TECHNICAL POTENTIAL OF EFFICIENT MEASURES = *Total End Use Sales By Industry Type* X *Base Case Factor* X *Remaining Factor* X *Convertible Factor* X *Savings Factor*

"BOTTOM-UP APPROACH"
Residential Energy Savings



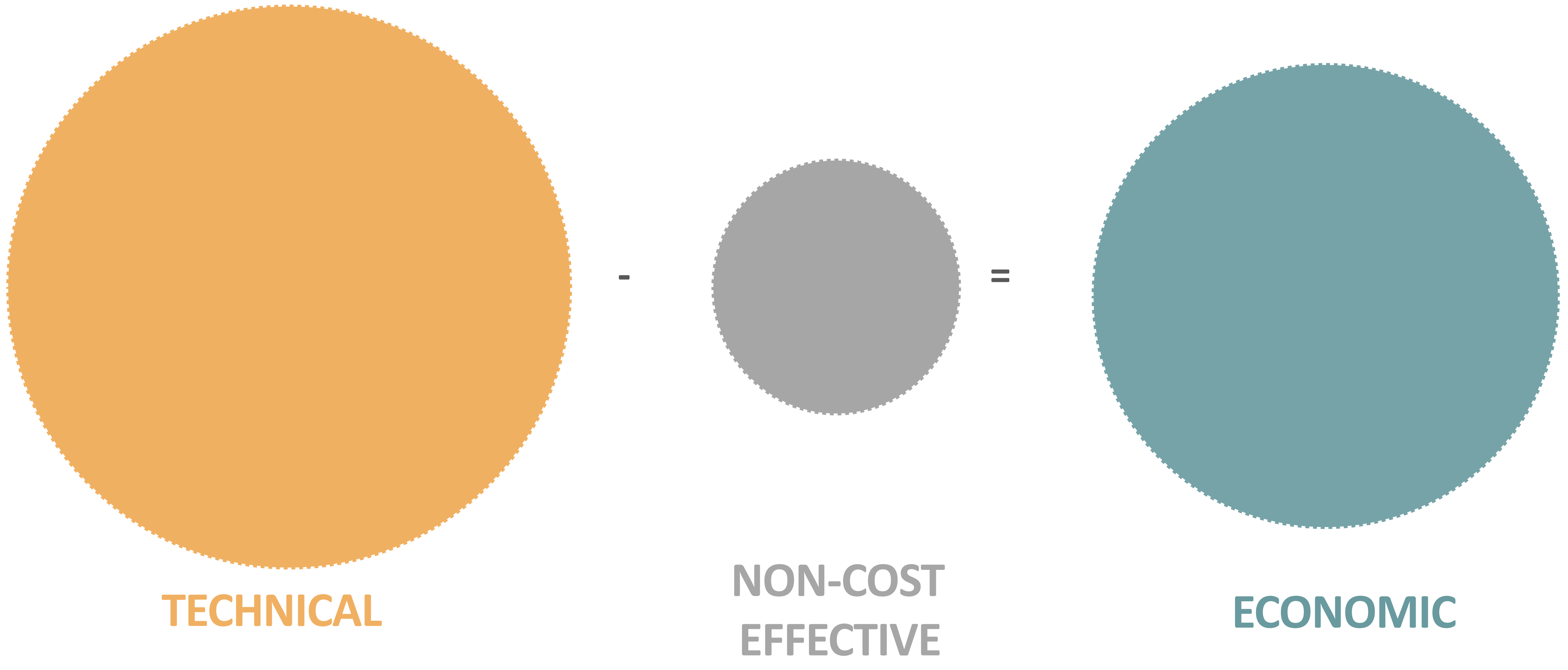
# of Residential Homes

"TOP-DOWN APPROACH"
Commercial Energy Sales



Commercial Energy Savings

Economic Potential

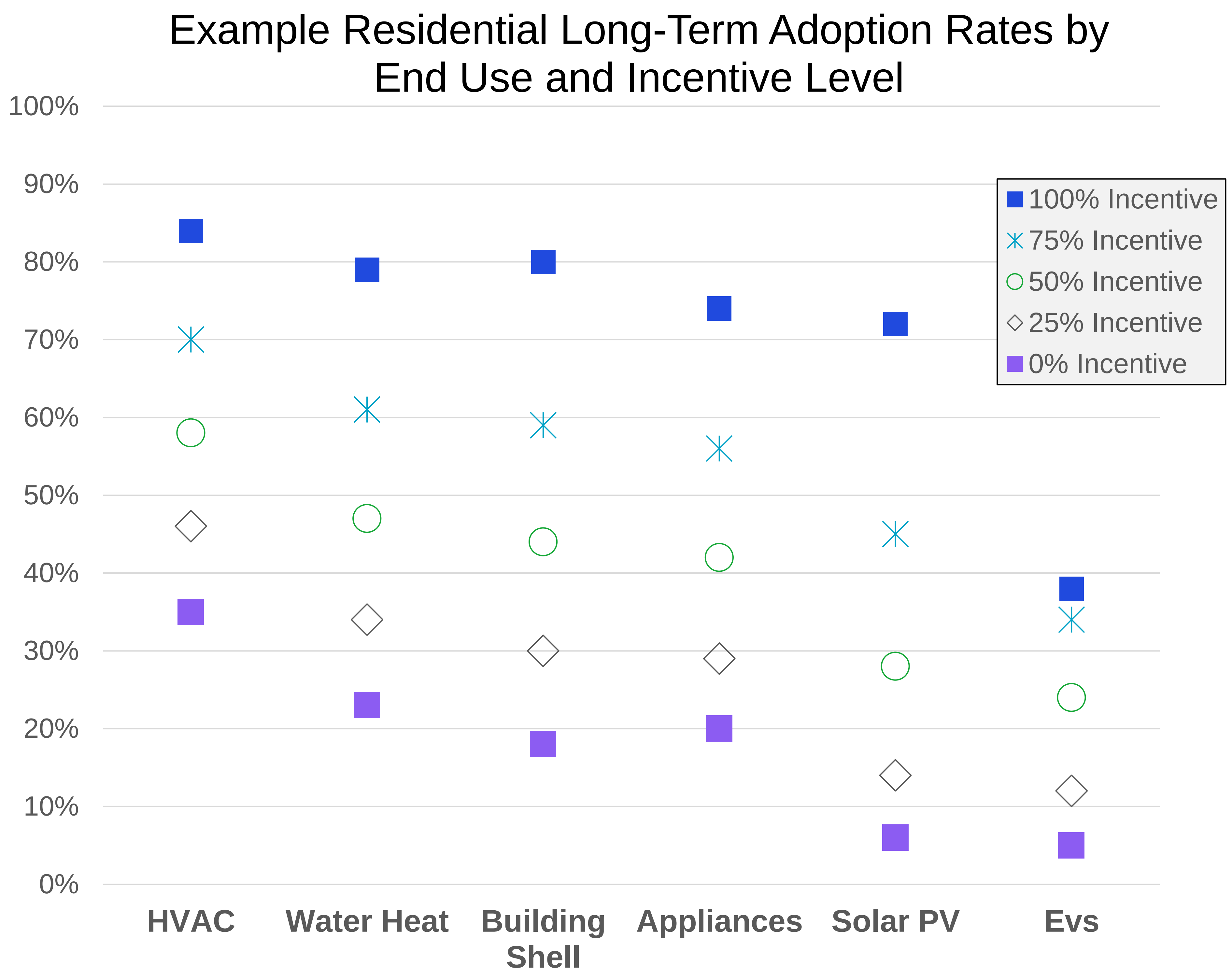


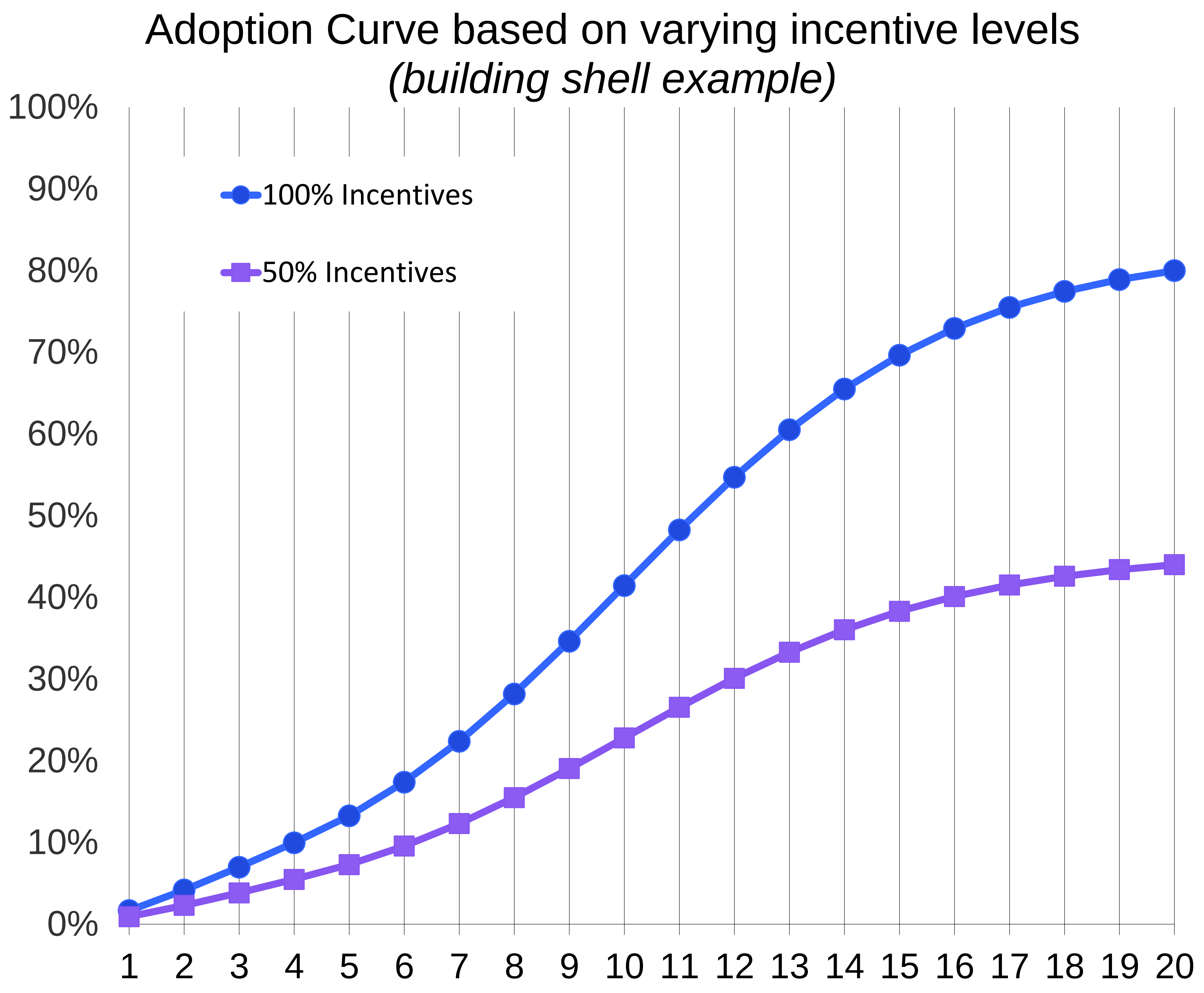
ECONOMIC POTENTIAL

Subset of the Technical Potential that is economically cost effective (based on screening with the Utility Cost Test)

Screen measures for cost-effectiveness over the 20-year forecast horizon

Achievable / Program Potential





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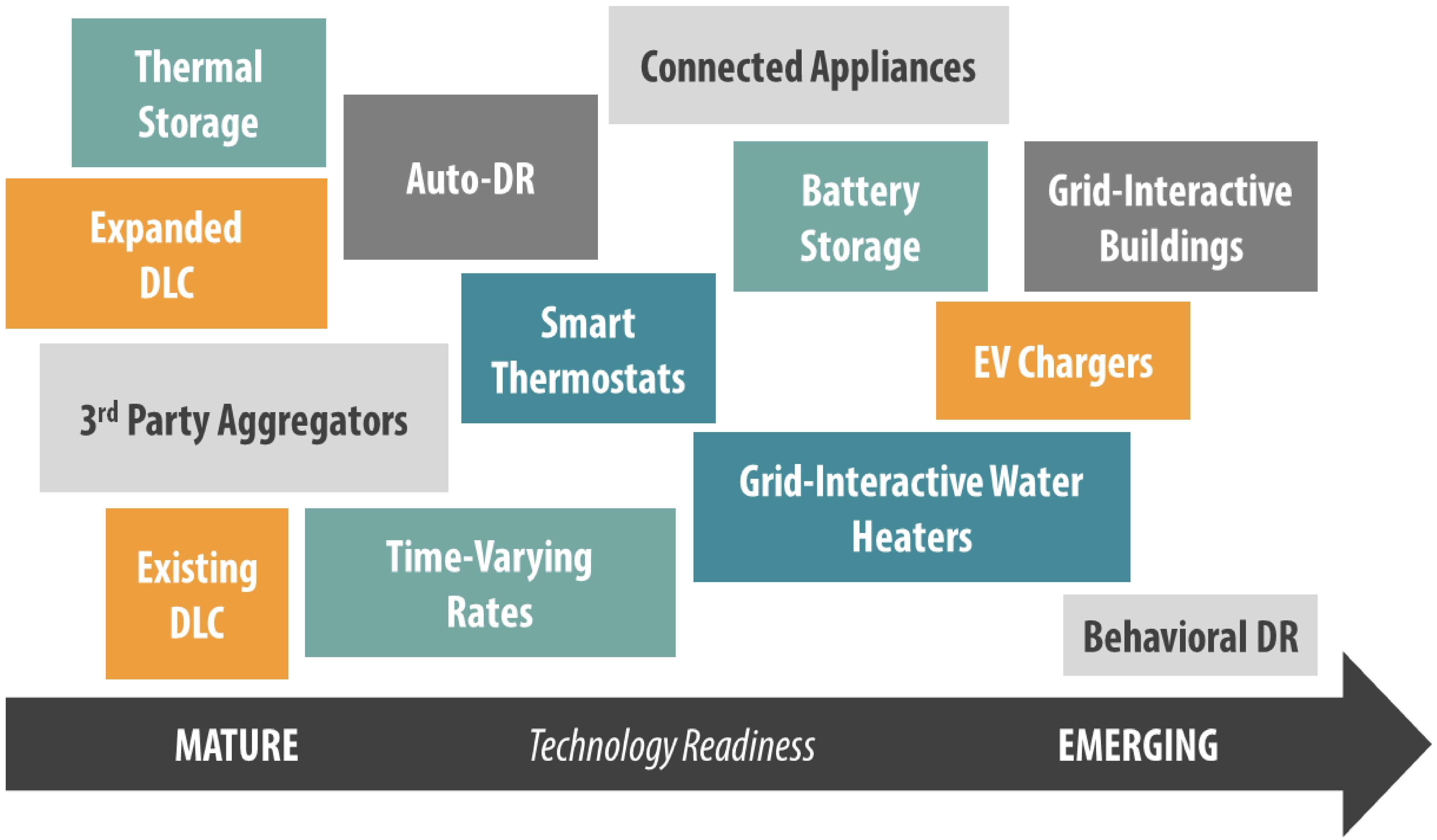
DSM Market Potential Study Introduction

Demand Response (DR) Potential

Jeffrey Huber, Overall Project Manager and MPS Lead, GDS Associates
Jacob Thomas, Market Research and End-Use Analysis Lead, GDS Associates
Melissa Young, Demand Response Lead, GDS Associates

Demand Response Programs Considered

- → DLC – Central ACs
- → DLC –Room ACs
- → DLC – Smart Appliances
- → DLC – Water Heaters
- → DLC – Electric Space Heat
- → DLC – Lighting
- → Battery Energy Storage
- → Electric Vehicle Charing
- → Curtailment Agreements
- → Demand Bidding
- → Capacity Bidding
- → Time of Use Rates
- → Behavior DR



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Demand Response Methodology

- → Analysis will be conducted using GDS Demand Response Model (DR Model)
- → Utility-specific data on avoided costs, line losses, and discount rates will be incorporated
- → Participation rates will be developed to simulate the rate at which load reductions can be attained over time
- → Current data on the estimated coincident peak (CP) load reduction per participant will be used to calculate the achievable potential

Demand Response Equations

Achievable Potential Calculation:

- If the model user chooses to base estimated potential demand reduction on percent of total per participant CP load, then:

Achievable Demand Response Potential = **Potentially Eligible Customers** X **Eligible Customer Participation Rate** X **Per Customer CP Load for Eligible Customer Segment (kW)** X **Percent CP Load Reduction per Participant**

- If the model user chooses to base estimated potential demand reduction on a per customer CP load reduction value, then:

Achievable Demand Response Potential = **Potentially Eligible Customers** X **Eligible Customer Participation Rate** X **Per Customer CP Load Reduction for Eligible Customer Segment (kW)**

Final Q&A and Next Steps

Thank You

APPENDIX

IRP Acronyms

Note: A glossary of acronyms with definitions is available at https://www.aesindiana.com/integrated-resource-plan.

IRP Acronyms

- ACEE: The American Council for an Energy-Efficient Economy
- AMI: Advanced Metering Infrastructure
- BESS: Battery Energy Storage System
- BNEF: Bloomberg New Energy Finance
- BTA: Build-Transfer Agreement
- C&I: Commercial and Industrial
- CAA: Clean Air Act
- CAGR: Compound Annual Growth Rate
- CCGT: Combined Cycle Gas Turbines
- CCS: Carbon Dioxide Capture and Storage
- CDD: Cooling Degree Day
- COD: Commercial Operation Date
- CONE: Cost of New Entry
- CP: Coincident Peak
- CPCN: Certificate of Public Convenience and Necessity
- CT: Combustion Turbine
- CVR: Conservation Voltage Reduction
- DER: Distributed Energy Resource
- DG: Distributed Generation
- DGPV: Distributed Generation Photovoltaic System
- DLC: Direct Load Control
- DOE: U.S. Department of Energy
- DR: Demand Response
- DRR: Demand Response Resource
- DSM: Demand-Side Management
- DSP: Distribution System Planning
- EE: Energy Efficiency
- EFORd: Equivalent Forced Outage Rate Demand
- EIA: Energy Information Administration
- ELCC: Effective Load Carrying Capability
- EM&V: Evaluation Measurement and Verification
- EV: Electric Vehicle
- GDP: Gross Domestic Product
- GT: Gas Turbine
- HDD: Heating Degree Day
- HVAC: Heating, Ventilation, and Air Conditioning
- IAC: Indiana Administrative Code
- IC: Indiana Code
- ICAP: Installed Capacity
- ICE: Internal Combustion Engine
- IRP: Integrated Resource Plan
- ITC: Investment Tax Credit
- IURC: Indiana Regulatory Commission
- kW: Kilowatt
- kWh: Kilowatt-Hour
- LED: Light Emitting Diode
- LMR: Load Modifying Resource
- LNBL: Lawrence Berkeley National Laboratory
- Max Gen: Maximum Generation Emergency Warning
- MIP: Mixed Integer Programming
- MISO: Midcontinent Independent System Operator
- MPS: Market Potential Study
- MW: Megawatt
- NDA: Nondisclosure Agreement
- NOX: Nitrogen Oxides
- NREL: National Renewable Energy Laboratory
- PPA: Power Purchase Agreement
- PRA: Planning Resource Auction
- PTC: Renewable Electricity Production Tax Credit
- PRMR: Planning Reserve Margin Requirement
- PV: Photovoltaic
- PVRR: Present Value Revenue Requirement
- PY: Planning Year
- RA: Resource Adequacy
- RAN: Resource Availability and Need
- REC: Renewable Energy Credit
- REP: Renewable Energy Production
- RFP: Request for Proposals
- RIIA: MISO’s Renewable Integration Impact Assessment
- SAC: MISO’s Seasonal Accredited Capacity
- SCR: Selective Catalytic Reduction System
- SMR: Small Modular Reactors
- ST: Steam Turbine
- SUFG: State Utility Forecasting Group
- TRM: Technical Resource Manual
- UCT: Utility Cost Test
- UCAP: Unforced Capacity
- WTP: Willingness to Participate
- XEFORd: Equivalent Forced Outage Rate Demand excluding causes of outages that are outside management control