INDIANA MICHIGAN POWER
An AEP Company

Indiana Michigan Power:
2021 Integrated Resource Plan
Public Stakeholder Meeting #2

April 14, 2021

Presented via GoToWebinar -> *https://attendee.gotowebinar.com/register/4716397322613361422*

BOUNDLESS ENERGY℠

Agenda

Time		
9:30 a.m.	WELCOME	**Toby Thomas,** President & COO
9:35 a.m.	MEETING GUIDELINES	**Jay Boggs**, Siemens
9:40 a.m.	INTRODUCTION OPENING REMARKS	**Dona Seger-Lawson**, I&M Director of Regulatory Services **Andrew Williamson,** I&M Director of Regulatory Services
9:50 a.m.	GRID SOLUTIONS INTRODUCTION	**Bob Bradish,** SVP Regulated Investment Planning
Developing DSM/EE/DER Inputs for the Integrated Resource Plan		
10:20 a.m.	MARKET POTENTIAL STUDY	**Jon Walter,** Manager EE & Consumer Programs **Jeffrey Huber**, GDS Associates
12:00 p.m.	LUNCH	
1:00 p.m.	IMPACTS ON LOAD FORECAST	**Chad Burnett**, AEP Load Forecasting
1:30 p.m.	PRELIMINARY APPROACH FOR IRP	**Art Holland,** Siemens
2:00 p.m.	BREAK	
2:30 p.m.	STAKEHOLDER ENGAGEMENT	**Jay Boggs**, Siemens
2:45 p.m.	STAKEHOLDER PRESENTATION	
3:00 p.m.	NEXT STEPS AND CLOSING REMARKS	**Andrew Williamson,** I&M Director of Regulatory Services
3:30 p.m.	ADJOURN	

WELCOME

TOBY THOMAS | PRESIDENT AND COO

MEETING GUIDELINES

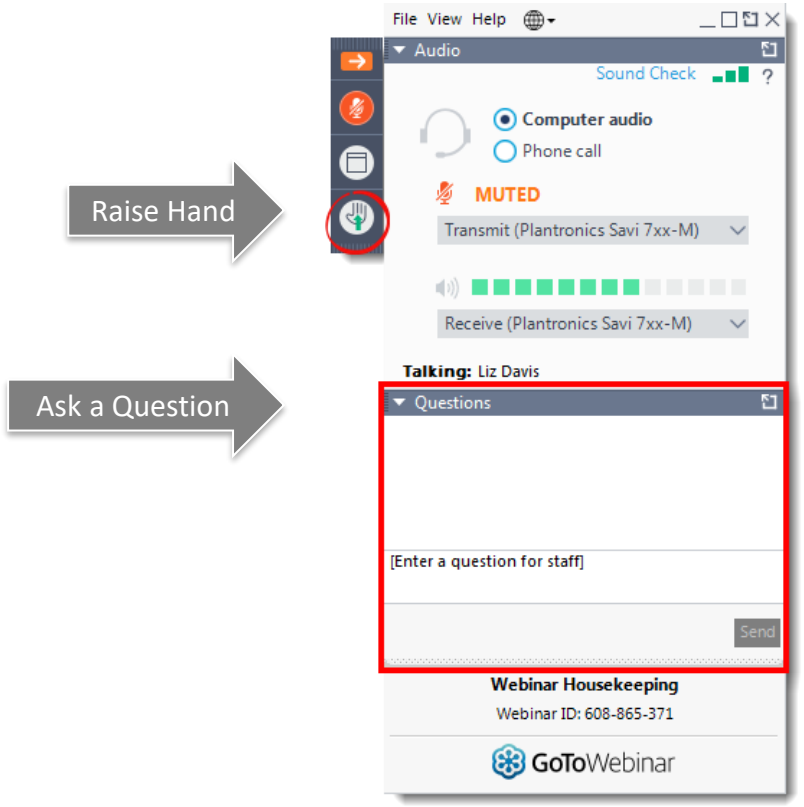
JAY BOGGS | SIEMENS PTI

Questions and Feedback

The purpose of today's presentation is to explain the Demand Side Management (DSM) process and collect feedback from stakeholders. Stakeholder feedback will be posted on the I&M website IRP portal and will be considered as part of the Final IRP.

If you have a question about the IRP process during this presentation:

- Type your question in the Questions area of the GoToWebinar panel
- During the feedback and discussion portions of the presentations, please raise your hand via the GoToMeeting tool to be recognized
- Time permitting, we will address all questions and hear from all who wish to be heard
- Any questions that cannot be answered during the call will be addressed and posted on the website below.



If you would like to make a comment or ask a question about the IRP process after the presentation has concluded:

- Please send an email to I&MIRP@aep.com
- Stay informed about future events by visiting the I&M IRP Portal located at www.indianamichiganpower.com/info/projects/IntegratedResourcePlan

Guidelines

1. Due to the number of participants scheduled to join today's meeting, all will be in a "listen-only" mode by default.

2. Please enter questions at any time into the GoToWebinar portal. Technical questions related to the GoToWebinar tool and its use will be addressed by the support staff directly via the chat feature.

3. Time has been allotted to answer questions related to the materials presented. Unanswered questions will be addressed after the presentation and posted in accordance with the Questions and Feedback slide.

4. At the end of the presentation, we will open-up the floor for "clarifying questions," thoughts, ideas, and suggestions.

5. Please provide feedback or questions on the Stakeholder Meeting #2 presentation within ten business days of the conclusion of the meeting.

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INTRODUCTION AND OPENING REMARKS

DONA SEGER-LAWSON | DIRECTOR, REGULATORY SERVICES
ANDREW WILLIAMSON | DIRECTOR, REGULATORY SERVICES

Safety Moment

BBQ Safety

- Inspect and clean your gas barbecue before using it for the first time each season.
- Clean the grill to ensure there is no grease buildup. Grease fires cannot be easily extinguished.
- If the fittings, flex hose, or burners are worn or rusted, replace them and replace missing or worn ‘O’ rings.
- Use a flexible brush to clean tubes between gas valve and burner.

On the Call Today

I&M Leadership Team

Toby Thomas | President and COO

Dave Lucas | Vice President, Regulatory and Finance

Dona Seger-Lawson | Director, Regulatory Services

Andrew Williamson | Director, Regulatory Services

Marci Grossman | Director, Communications

Tammara Avant and Christen Blend | Legal

I&M IRP Planning Team

Kelly Pearce | Managing Director, Resource Planning and Strategy

Scott Fisher | Manager, Resource Planning and Grid Solutions

Greg Soller | Staff, Resource Planning and Grid Solutions

Jon Walter | Manager, EE & Customer Programs

Siemens IRP Planning Team

Arthur Holland | Managing Director, Siemens PTI

Jay Boggs | Managing Director, Siemens PTI

Holt Bradshaw | Managing Director, Siemens PTI

Peter Berini | Project Manager, Siemens PTI

I&M Transmission and Distribution Planning Team

Nick Koehler | Director, Transmission Planning

Carlos Casablanca | Managing Director Distribution Planning & Analysis

Subin Mathew | Director, Reliability and Grid Modernization

GDS Associates – Market Potential Study Team

Jeffrey Huber | Project Manager, GDS

Patrick Burns | Brightline Group Lead

Jacob Thomas | Load Forecast & Segmentation Lead, GDS

OPENING REMARKS

ANDREW WILLIAMSON | DIRECTOR, REGULATORY SERVICES

Opening Remarks

- Purpose of the meeting
  - Continue Stakeholder Engagement
  - Focus on EE, DR & DER / EWR Opportunities in the IRP
- IRP Updates
- Introduction to Grid Solutions

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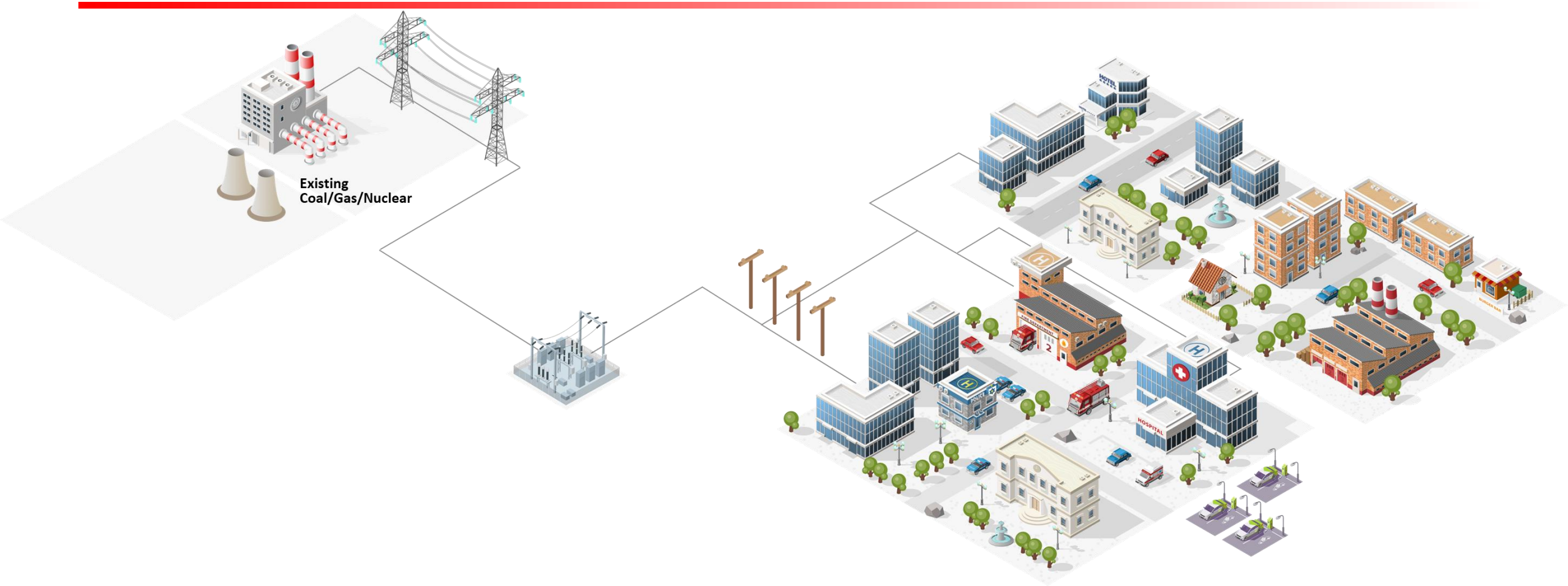
INTEGRATED GRID PLANNING

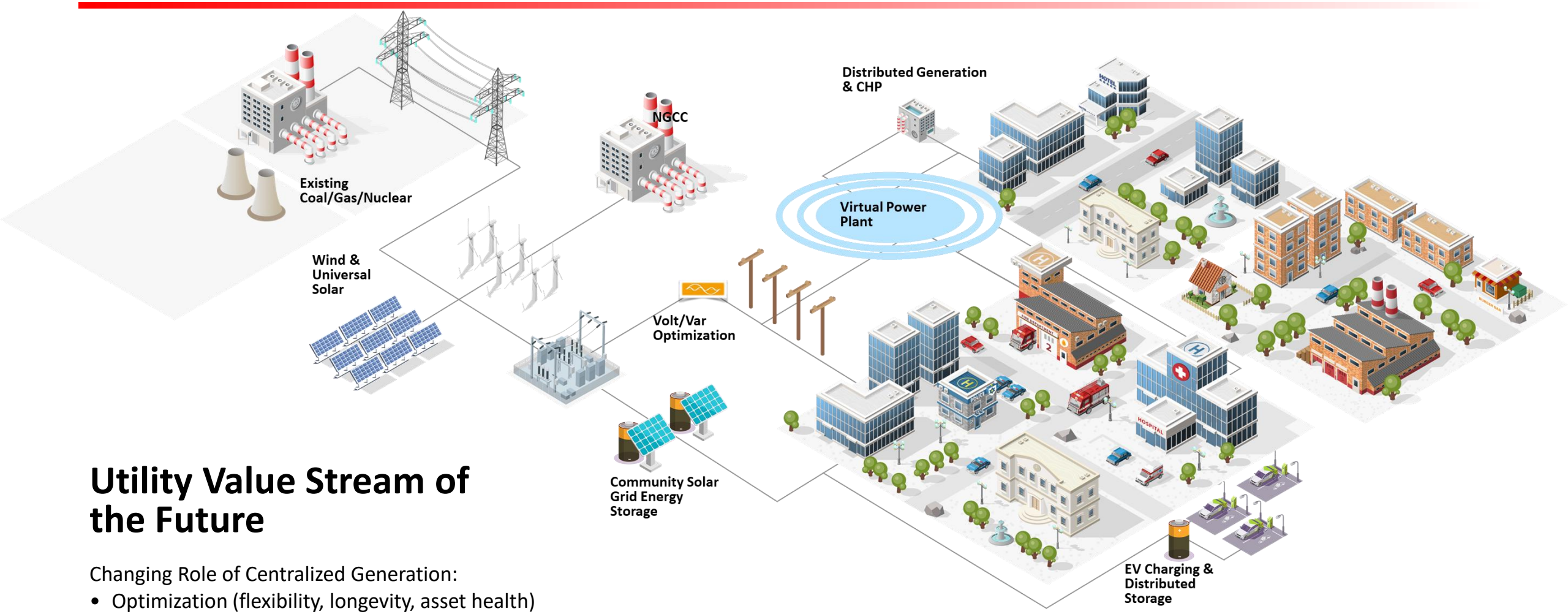
BOB BRADISH | SVP REGULATED INVESTMENT PLANNING

AMERICAN ELECTRIC POWER
BOUNDLESS ENERGY

Evolving Grid – Current State



Evolving Grid – Future State



Utility Value Stream of the Future

Changing Role of Centralized Generation:

- Optimization (flexibility, longevity, asset health)
- Innovation (analytics, technology, operations)
- “Glide Path” (extracting value over remaining life)

Grid Solutions – Regulated Investment Planning (G, T & D)

Organizational and Leadership Overview

INDIANA MICHIGAN POWER
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Regulated Investment Planning (G, T & D)

Integrated Resource Planning & Analysis

Kelly Pearce, Managing Director

In collaboration with Operating Companies transform the regulated generation fleet to meet all goals -

- Continuing affordable and reliable service for our customers
- Lowering carbon and other emissions for a sustainable Future Forward

Results in greater value to customers and regulators and reducing risks to our business

Transmission Planning & Analysis

Kamran Ali, VP

- In collaboration with Operating Companies and RTOs develop 5-year Transmission plans to enhance customer experience and reliability
- Find integrated solutions to offset and reduce costs to our customers
- Prepare for a seamless grid of the future that will require enhanced alignment, collaboration, data governance, and analytics

Distribution Planning & Analysis

Carlos Casablanca, Managing Director

- In collaboration with Operating Companies develop 5-year Distribution plans to enhance customer experience and reliability across all regions
- Evolve our tools, processes, and standards to thrive in a world with dynamic distributed energy resources and increased electrification of transportation

Interconnection Services

Michele Bair, Director

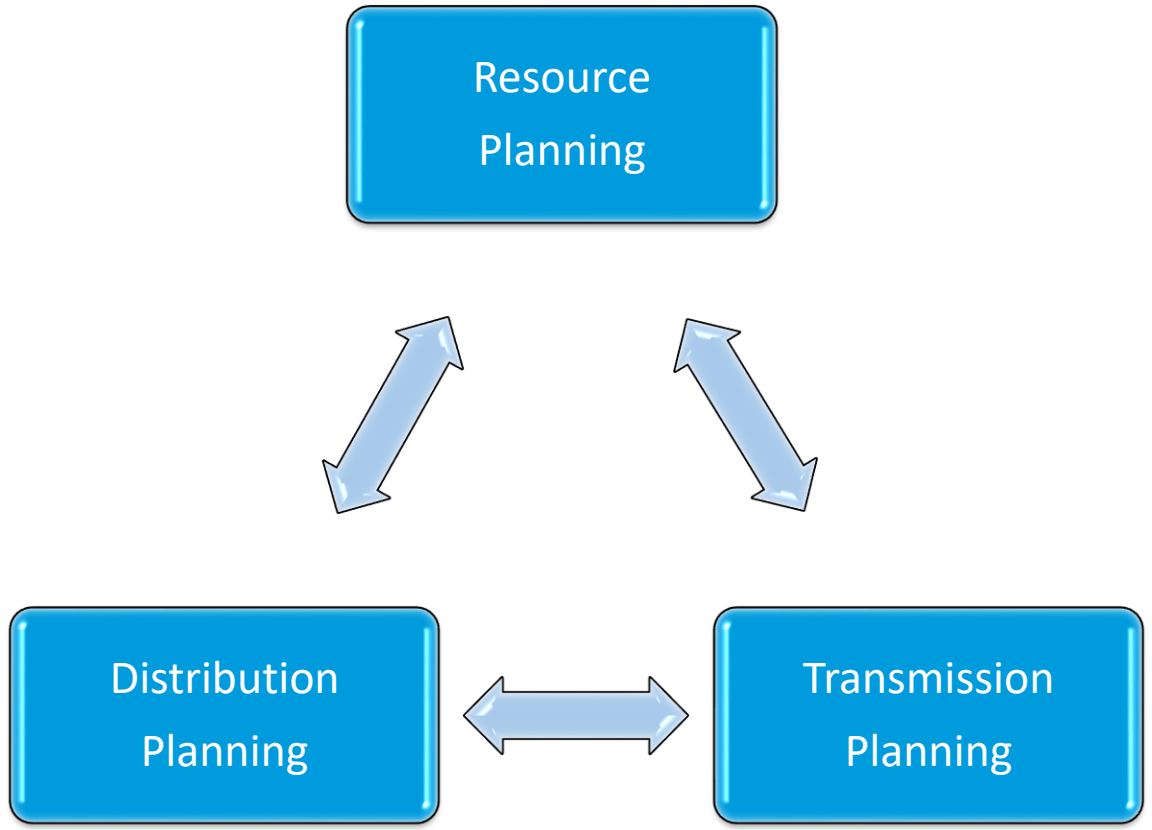
- Facilitate transmission facility interconnection services for interconnecting entities focusing on studies, agreements and performance

Regulated Investment Planning will plan AEP's regulated infrastructure programs across G, T, and D and work with Grid Solutions to commercialize new regulated solutions that best meet the needs of our customers

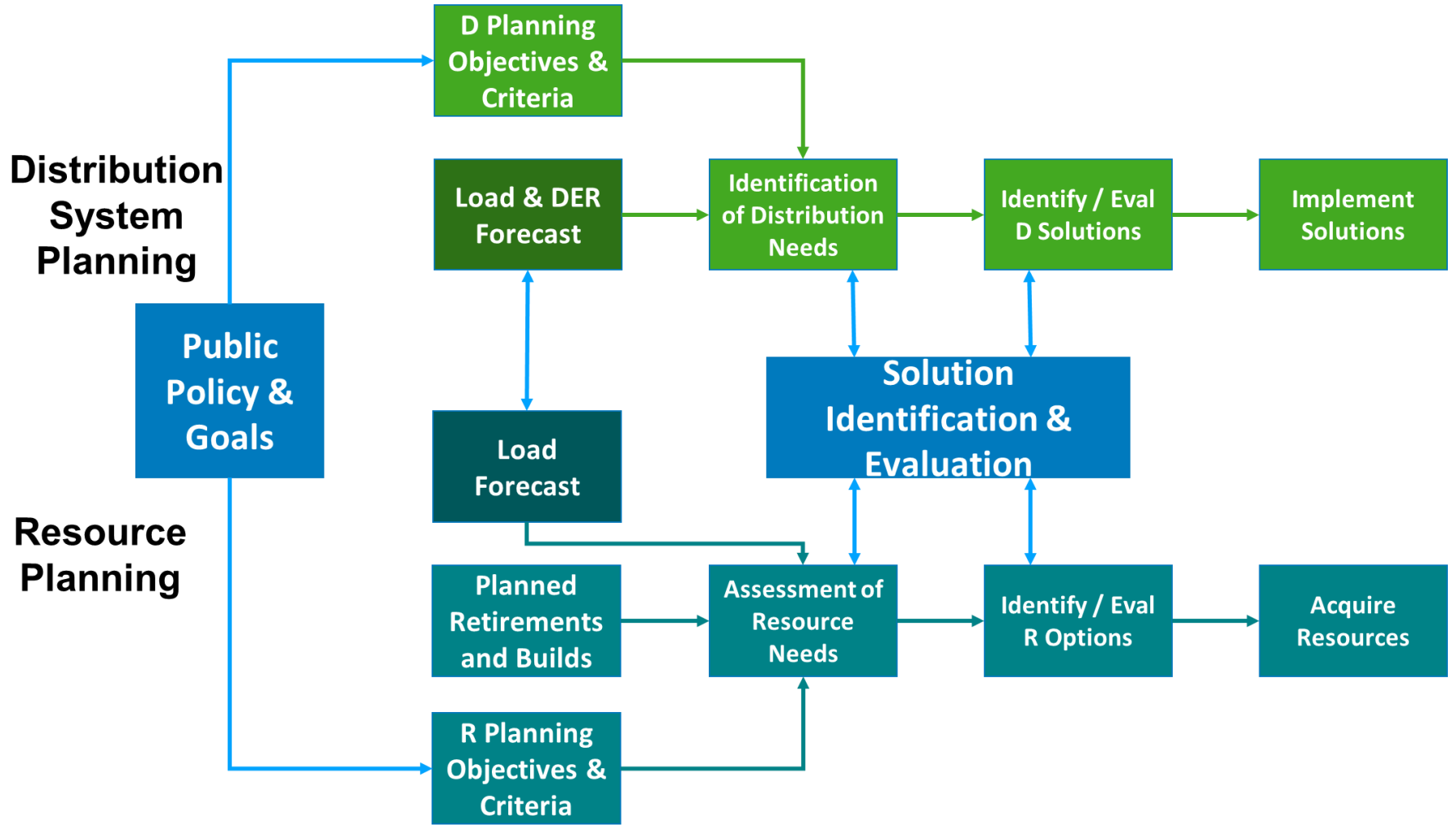
Aligning Planning within AEP

Planning alignment occurs by bringing the processes together

- Direction provided through consistent set of policy objectives
- Input assumptions driven from a common foundation
- Decisions informed through information exchange



Integration of Distribution & Resource Planning



Distribution Planning & Analysis

- Importance of Non-Wires Alternatives as we consider the future needs of the system
- Today we will review key data from our Market Potential Study that will inform our Resource and Distribution plan
- Evolve our tools, processes, and standards to thrive in a world with dynamic distributed energy resources and increased electrification of transportation
- Leverage new technologies, analytics, and automation as needed to deliver value for all stakeholders

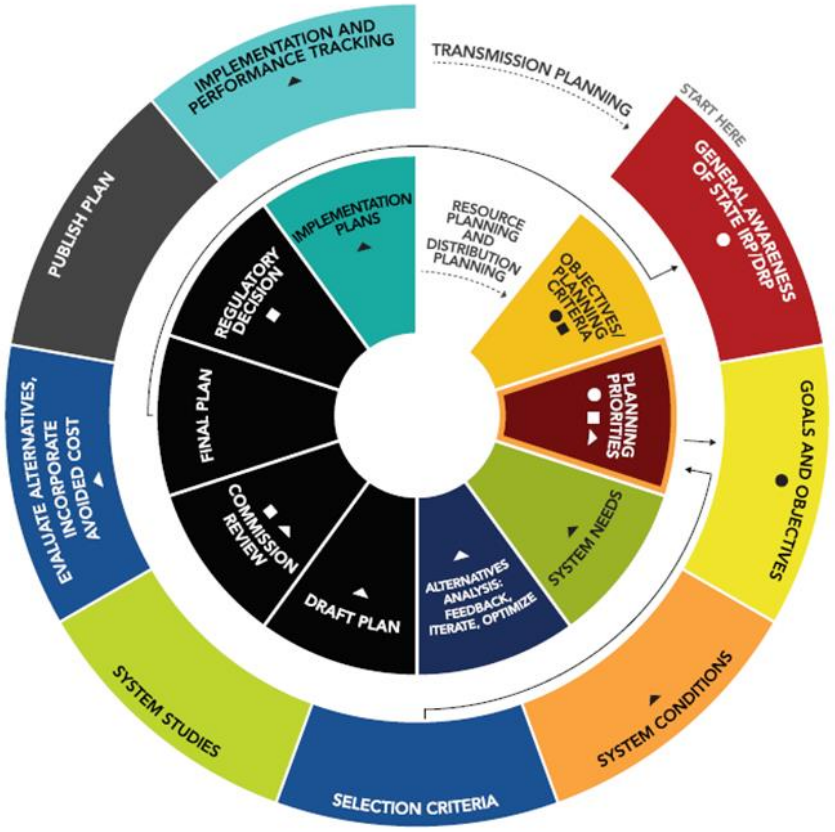
Transmission Planning & Analysis

- Importance of Non-Wires Alternatives as we consider the future needs of the system
- Current Activities:
  - Understanding and guiding Interconnection values and opportunities to be utilized in our Fundamental Commodity Forecast
  - Evaluating delivery potential for the Renewable RFP
- Evolve our tools, models, processes and standards to thrive in a world with dynamic system planning requirements
- Leverage new technologies, analytics, and automation as needed to deliver value for all stakeholders
- Coordination with RTOs

Regulated Investment Planning

Path Forward:

- Continue to work with EPRI and NARUC-NASEO on coordinated utility planning
- Reviewing recommendations from NARUC-NASEO task force, currently considering the Coral and Amber Cohort Roadmaps
- Evolve our tools, processes, and standards to thrive in a world with dynamic system planning requirements



Coral Cohort Roadmap — NARUC-NASEO Task Force on Comprehensive Electricity Planning | 19

MARKET POTENTIAL STUDY

JON WALTER | EE & CONSUMER PROGRAMS

I&M Market Potential Study for End-Use Resources

I&M's MPS will develop residential and C&I portfolios containing the following IRP resource models for each I&M jurisdiction (Indiana and Michigan):

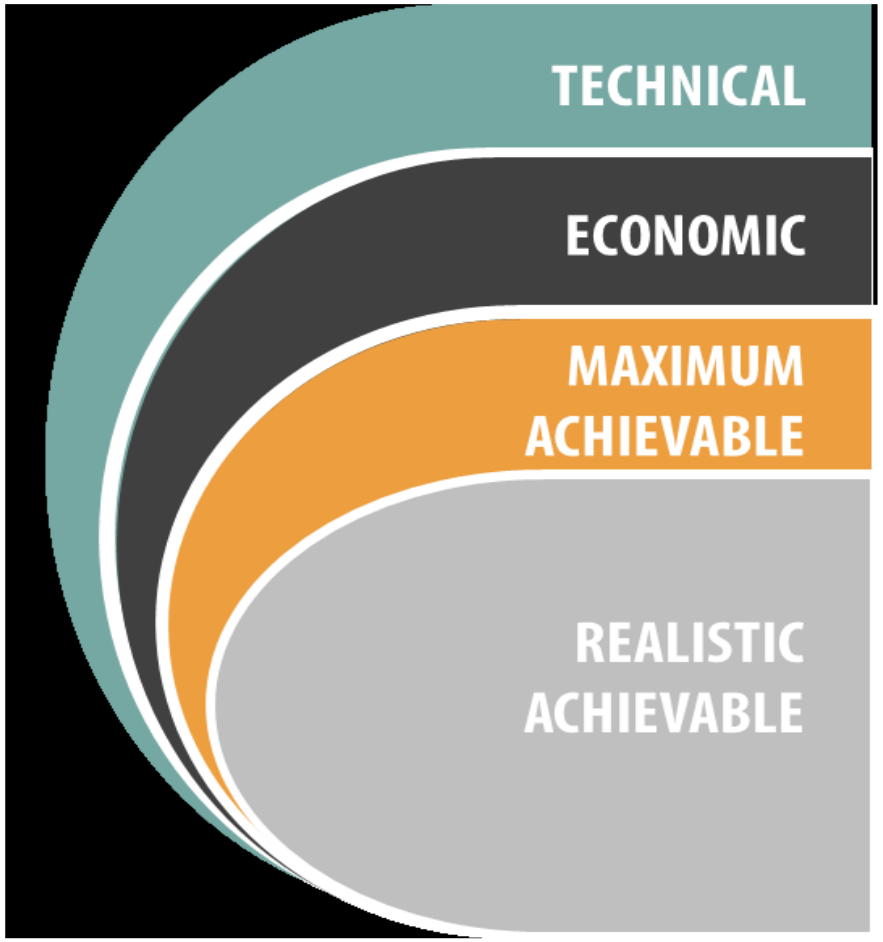
- Utility sponsored Energy Efficiency (EE) Program Potential
- Demand side Management (DSM) Program Potential
  - Demand Response
  - Direct Load Control
  - Tariff-based electricity pricing options potential
  - Customer owned Distributed Energy Resource (DER) Potential
- Automated Metering Infrastructure (AMI) Consumer Program Potential
- Conservation Voltage Reduction (CVR) Potential

I&M Market Potential Study for End-Use Resources

I&M has partnered with GDS & Associates for the development and characterization of consumer end-use resource “inputs” to the IRP.

The MPS will assess Technical, Economic, Maximum Achievable and Realistic Achievable Potential for all MPS resources studied.

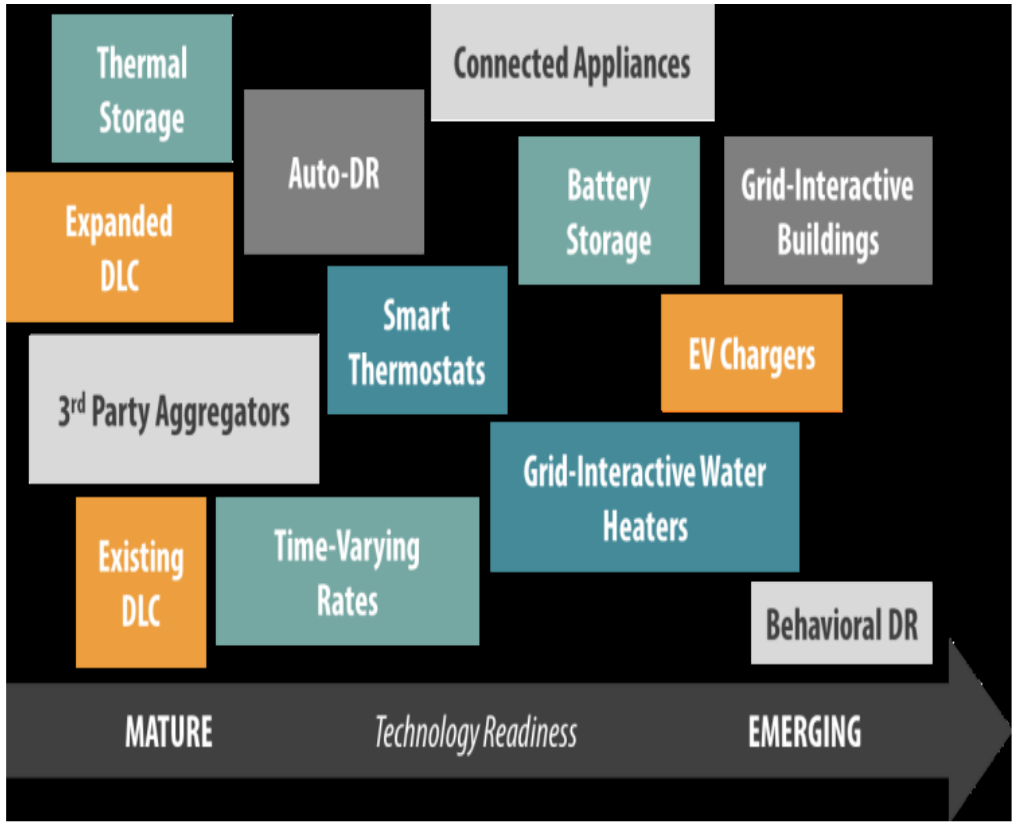
Generally, the MPS “outputs” of achievable potential will be used as IRP “inputs”.



I&M Market Potential Study for End-Use Resources

As an example, demand response (DR) will be assessed for potential using the following:

- System impacts (e.g. generation, transmission, and distribution savings)
- Saturation/applicability
- Effective useful life (EUL)
- Participant Costs (Equipment and Labor)
- Participant Incentives (e.g. per device, per kW, per year)
- Utility Costs (Equipment and Labor)
- Savings (e.g. per device, per premise)
- Program Costs (e.g. development, administration, marketing, consulting, evaluation)



I&M Market Potential Study for End-Use Resources

The MPS is well underway and is in the potential development phase, with (3) stakeholder engagement meetings held to-date.

Current Stage:

MPS Task 5 Deliverables: Fully transparent Excel models demonstrating technical, economic, and achievable potentials by sector.

Final MPS Deliverable for all resources studied:

Task 15: Produce 8,760 hourly inputs that reflect time-differentiated savings for the input into the IRP.

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 Ameren Missouri, California POU, and Pennsylvania PUC evaluation and market research projects.

JEFFREY HUBER
Overall Project Manager
GDS Associates

PATRICK BURNS
Brightline Group Lead & Regulatory Compliance/IRP Support
Brightline Group

JACOB THOMAS
Load Forecast & Segmentation Lead
GDS Associates

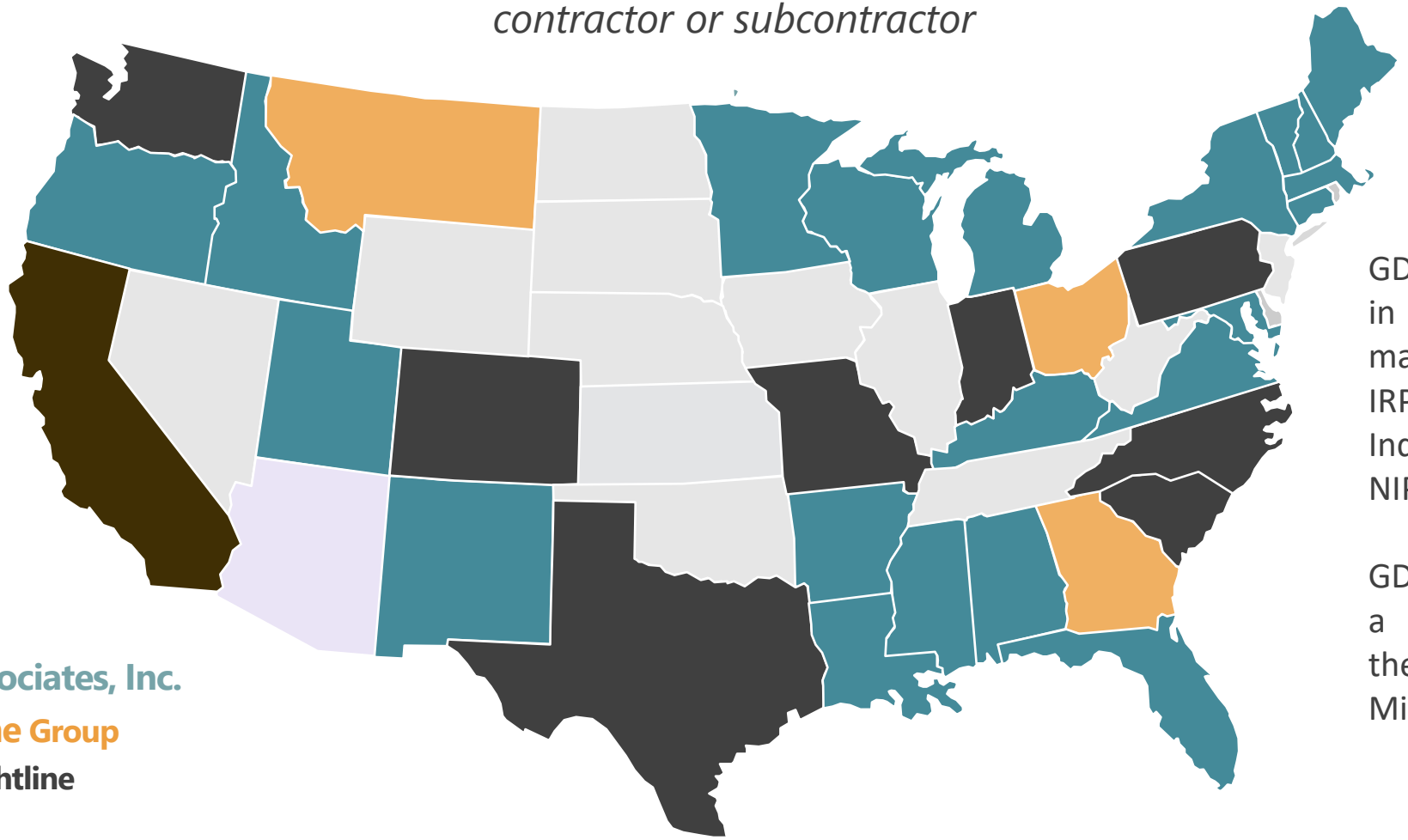
WARREN HIRONS
Residential Sector EE & Reporting Lead
GDS Associates

MARY HALL-JOHNSON
Demand Response/ CVR Lead
Brightline Group

WYLEY HODGSON
Distributed Energy Resources Lead
Brightline Group

PRIOR POTENTIAL STUDY EXPERIENCE

GDS Team members have completed over 85 potential studies completed as either the prime contractor or subcontractor



GDS Associates, Inc.

Brightline Group

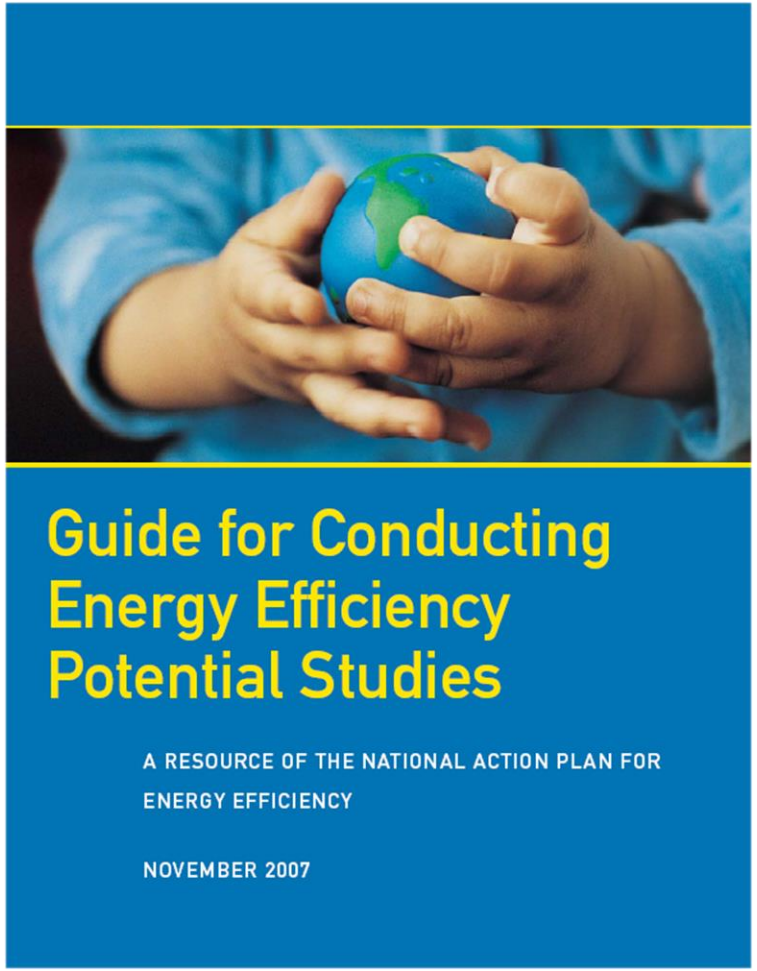
GDS/Brightline

GDS has recently completed or in the process of completing market potential studies and IRP support for Centerpoint, Indianapolis Power & Light, and NIPSCO.

GDS also previously completed a market potential study for the Lower Peninsula in Michigan.

WHAT IS A MARKET POTENTIAL STUDY (MPS)?

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.



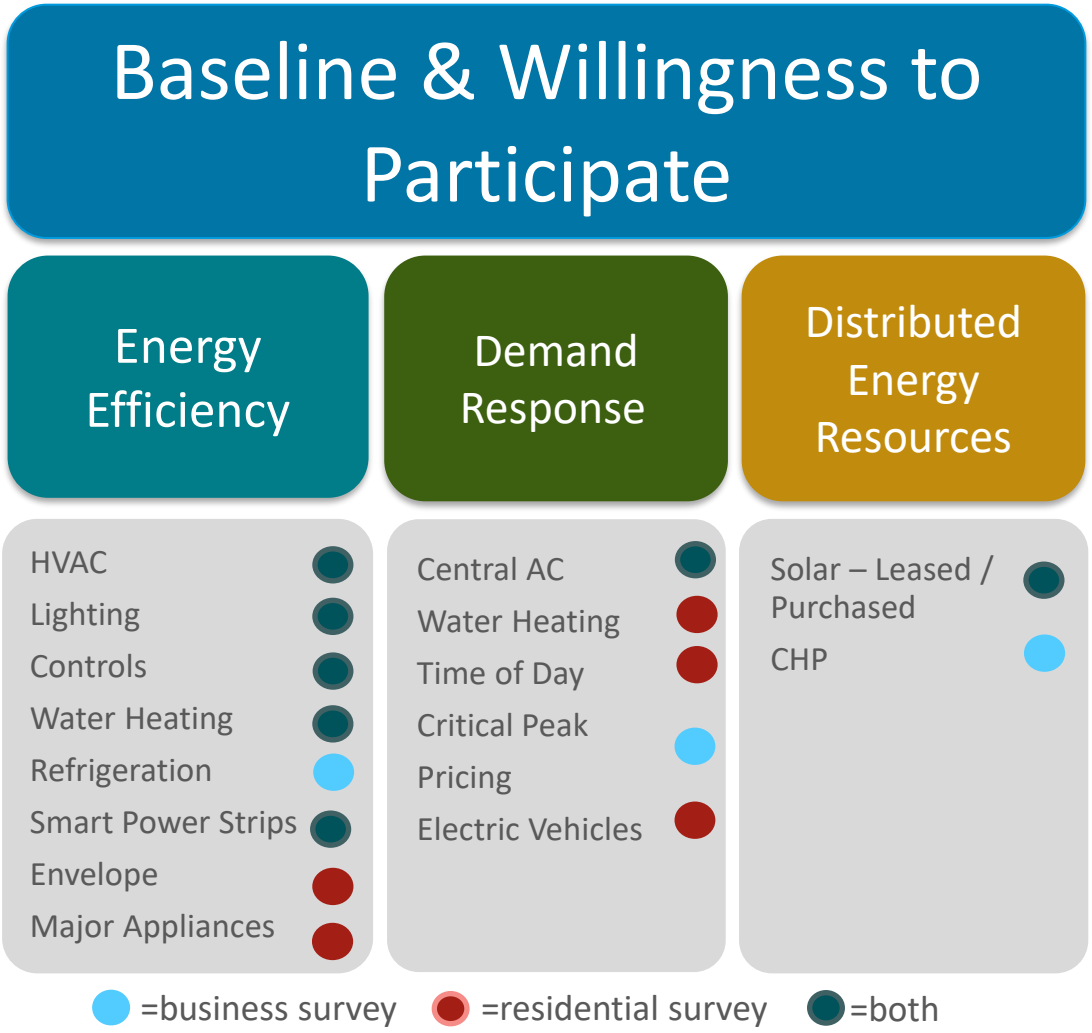
I&M MARKET POTENTIAL STUDY TASKS

I&M MARKET POTENTIAL STUDY KEY CONSIDERATIONS

- The assessments of potential for I&M's separate jurisdictions will be customized and tailor-made to each jurisdiction to the extent possible, though the study will culminate in an overall assessment for I&M that will yield results which can be used in subsequent IRP planning.

- Key differentiating factors across the jurisdictions are expected to include:
  - Unique measure-level savings assumptions as applicable (i.e. weather-sensitive savings estimates)
  - Unique measure-level saturation estimates
  - Incorporation of jurisdictionally separate sales and customer forecasts
  - Recognition of any state-specific regulatory requirements or other Stakeholder concerns

MARKET RESEARCH PERFORMED FOR MPS



Purpose: Assemble baseline data and information to inform technology adoption curves.

Topics:

- Willingness to participate
- Baseline / Saturation data
- Program awareness
- Barriers
- Limited demographic / firmographic information

Audiences:

- Business customers
- Residential customers
- Residential rental property owners / managers

Format: Web survey with recruitment via email.

Timing: Surveys fielded January 26 – February 19

EQUIPMENT CHARACTERISTICS FROM MARKET RESEARCH
(Draft Results)

- Data collection elements limited to items that may be answered accurately
- Nonresidential survey focused on key electric end-uses
  - Ex: Lighting, Cooling, Heating, Ventilation, Water Heating, Refrigeration
  - Key Equipment Penetration
  - Limited Efficiency Saturation Characteristics
- Residential survey collected limited saturation characteristics as well, but most saturation data will come from the most recent Residential Appliance Saturation Survey (RASS)

NONRESIDENTIAL EQUIPMENT CHARACTERISTICS	TOTAL	IN	MI
% of Lighting			
LED Linear	23%	22%	26%
LED Nonlinear	17%	15%	22%
Linear Fluorescent	38%	40%	31%
Incandescent/Halogen	10%	10%	10%
CFL	6%	5%	6%
HID	4%	4%	4%
Lighting Controls (% of all lighting)			
Occupancy Sensors	15%	16%	15%
Daylight Dimming	5%	5%	7%
Timing Controls	11%	11%	10%
Advanced Networked Controls	4%	2%	7%
Exterior Lighting			
LED (% of all Mounted Lighting)	45%	46%	42%
LED (% of all Site Lighting)	40%	41%	40%

RESIDENTIAL WILLINGNESS TO PARTICIPATE (WTP) DATA
(Draft Results)

- Residential WTP Survey Data is used to help estimate the long-term adoption rates that might be expected across various end-uses and technologies.
- Residential consumers were asked about their likelihood to purchase and install measures given a range of incentive scenarios.
- Awareness Adjustment is also applied to reflect non-financial barrier to participation. Based on JD Power survey research, awareness adjustment is estimated at 74%. *(i.e. WTP Factor * Awareness Adjustment = Long Term Adoption Rate)*

EE/EWR/DER End-Use /Technology	Incentive Level				
	0%	25%	50%	75%	100%
Appliances	19%	27%	41%	56%	73%
Water Heating	20%	30%	43%	56%	75%
HVAC Equipment	32%	42%	55%	67%	81%
HVAC Shell					
Solar Panels	6%	14%	28%	45%	72%
Electric Vehicles	5%	12%	24%	36%	56%

Demand Response – Load Control	Incentive Level				
	$0	$15	$25	$35	$50
DR- Central AC	25%	35%	40%	44%	57%
DR- WH	17%	24%	28%	33%	44%

Demand Response – Rate Option	Off Peak Rate ($/kWh)			
	$0.08	$0.06	$0.04	$0.03
Time of Use Rate	26%	31%	40%	49%

NONRESIDENTIAL WILLINGNESS TO PARTICIPATE (WTP) DATA
(Draft Results)

- Similar WTP questions were also posed to nonresidential survey participants to understand their likelihood to purchase and intall energy efficiency equipment and/or DER technologies, as well as participate in demand response programs.
- For nonresidential participants, WTP were typically structured to around measure payback periods in lieu of overall incentive levels.

EE/EWR/DER End-Use /Technology	Payback Period				
	10 yrs	5 yrs	3 yrs	1 yrs	0 yrs
HVAC	43%	53%	62%	70%	76%
Lighting	34%	41%	49%	58%	64%
Refrigeration	46%	56%	67%	48%	83%
Water Heating	40%	49%	57%	68%	73%
Purchased Solar	n/a	37%	50%	65%	71%

DER	Incentive Level				
	$0	MIN	LOW	HIGH	MAX
Leased Solar	16%	24%	33%	42%	49%

Demand Response – Load Control	Incentive Level				
	$0	$15	$25	$35	$50
Leased Solar	29%	33%	37%	40%	46%

Demand Response – Rate Option	On Peak 5X Higher, but Off Peak Rate (% Lower)			
	5%	10%	20%	40%
Critical Peak Pricing	25%	31%	42%	55%

MARKET SEGMENTATION

- Market segmentation is conducted to better understand the make-up of the I&M service area and quantify remaining efficiency opportunities for future programs.
- Market segmentation relies on data underlying I&Ms load forecast and other supporting market data

- ***Residential market segmentation includes analysis by:***
  - Housing Type
  - Income Type
  - End Use
- ***Nonresidential market segmentation includes analysis by:***
  - Building/Industry Type
  - End Use

Residential Segmentation

Housing Type	Indiana	Michigan
Single Family (SF)	84.5%	94.2%
Multifamily (MF)	15.5%	5.8%

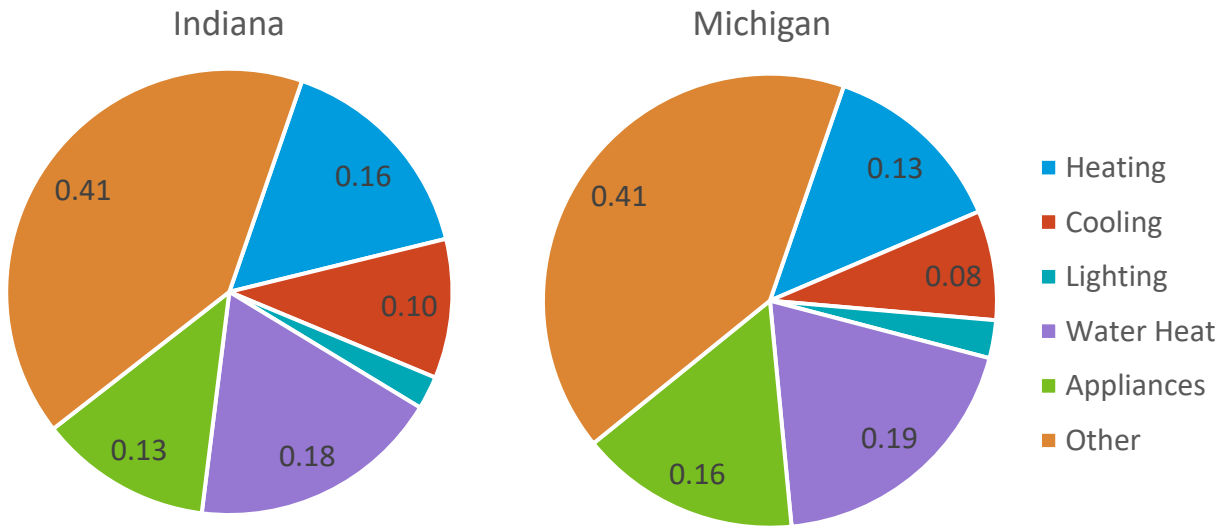
** From I&M Residential Appliance Saturation Survey*

Housing/Income Type	Indiana	Michigan
SF IQ	20.9%	23.8%
SF MR	63.6%	70.4%
MF IQ	7.7%	3.1%
MF MR	7.8%	2.7%

IQ: Income Qualified
MR: Market Rate

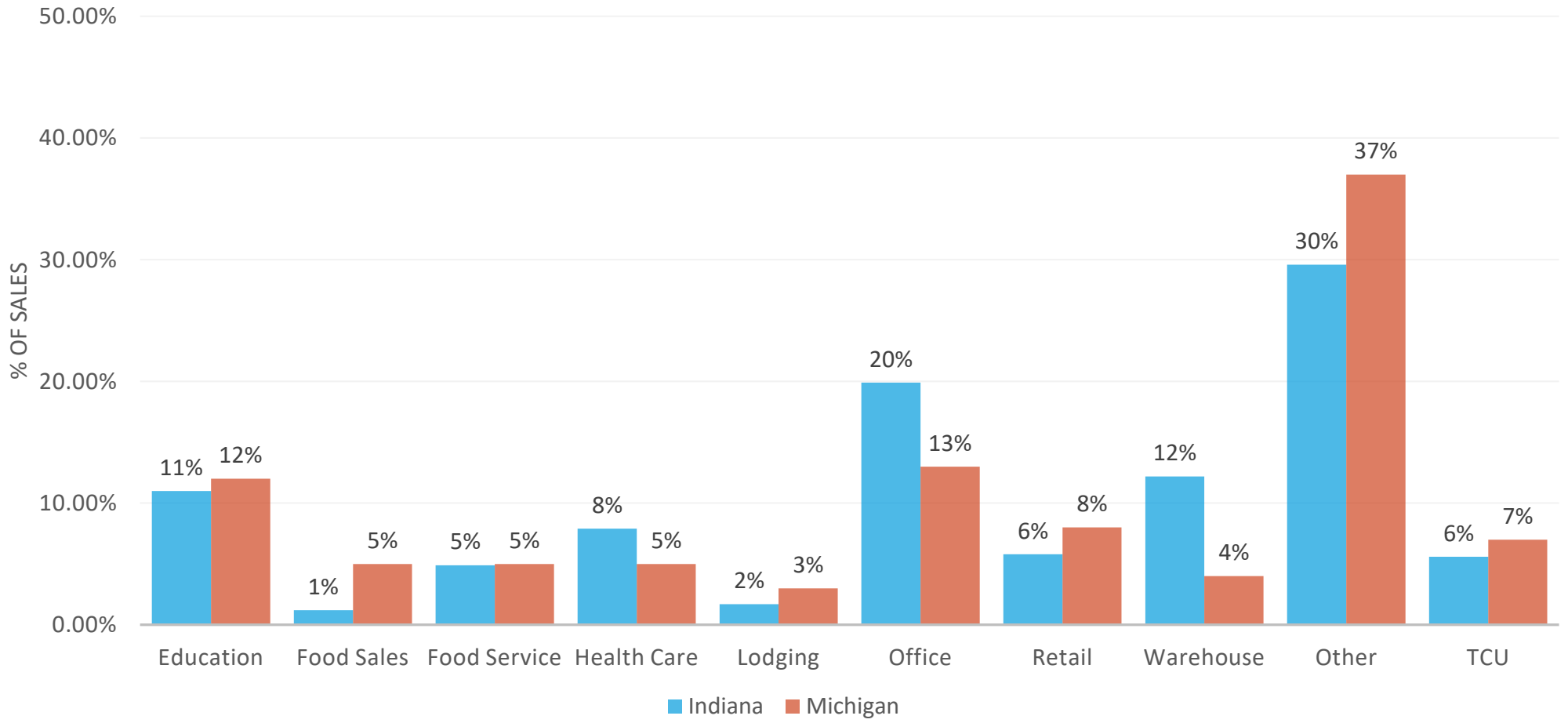
** 2019 5-YR American Community Survey + I&M RASS*

2041 Sales Breakdown by End-Use
(primarily derived from I&M long-term sales forecast data)



COMMERCIAL SECTOR SEGMENTATION

(Percent of Commercial Sales by Building Type)

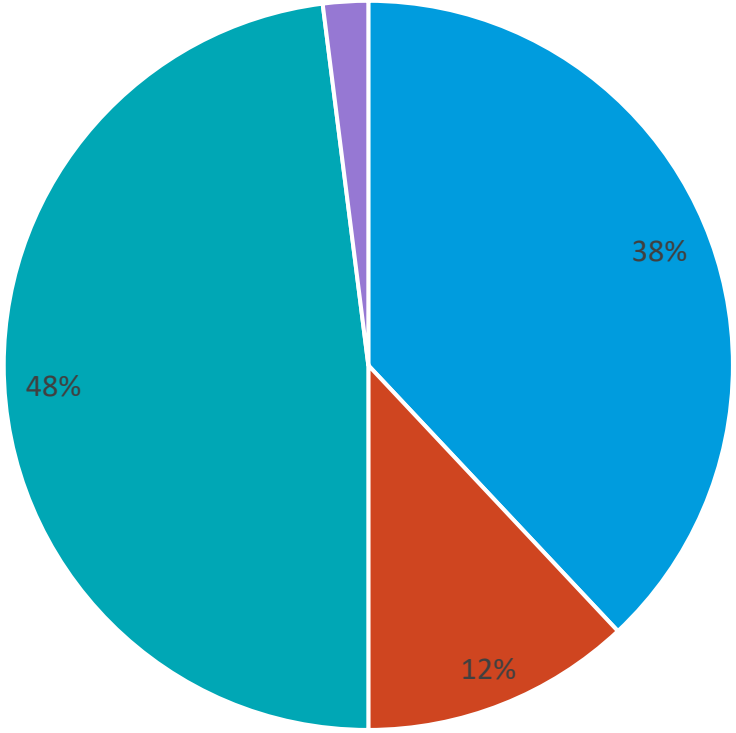


** Commercial segmentation for Indiana excludes current opt-out customers*

INDUSTRIAL MARKET SEGMENTATION

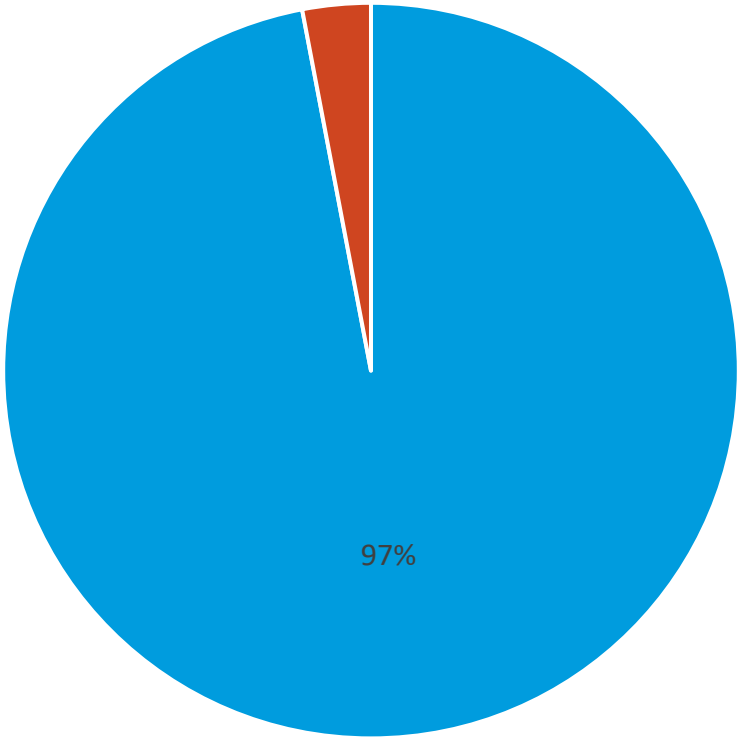
(Percent of Industrial Manuf. Vs. Non-Manuf. Sales)

Indiana



Eligible Manufacturing
Eligible Non-Manufacturing
Opt-Out Manufacturing
Opt-Out Non-Manufacturing

Michigan

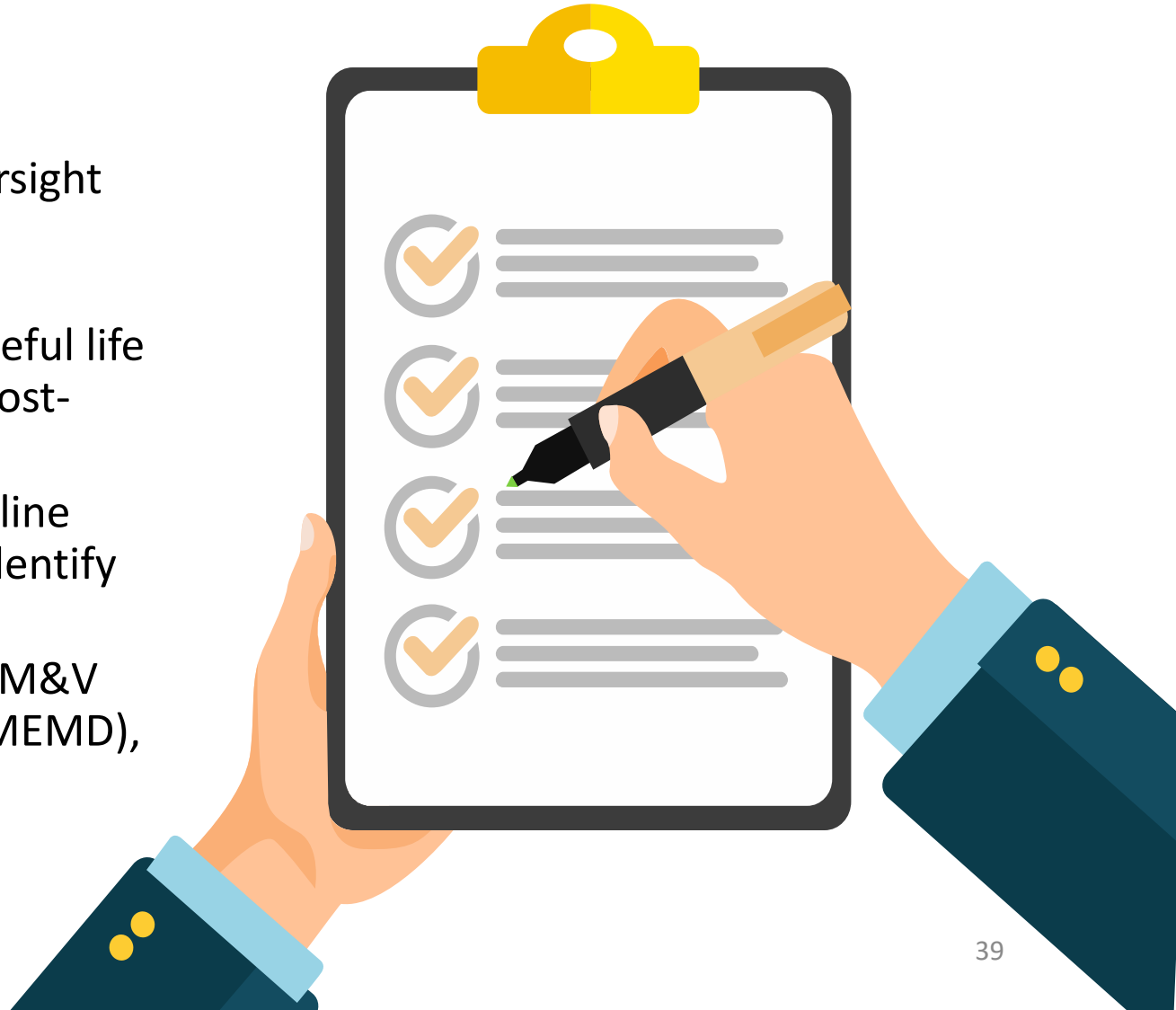


Manufacturing
Non-Manufacturing

** Eligible refers to industrial load that currently is eligible to participate in I&M's energy efficiency programs*

MEASURE CHARACTERIZATION

- 264 EE/EWR measures will be considered (91 residential, 173 C/I)
- Draft list was shared with I&M, the Indiana Oversight Board, and MPSC Staff
- Key measure data inputs: kWh and savings, incremental and full cost estimates, measure useful life – all of these data will allow for measure-level cost-effectiveness and potential to be calculated
- Measure market data inputs: estimates of baseline saturation and energy efficiency saturation to identify remaining opportunities
- Key data sources: I&M DSM/EWR Filings, I&M EM&V reports, Michigan Energy Measures Database (MEMD), Illinois TRM, and Indiana TRM, market research baseline / saturation data



BENCHMARKING DATA AND RESULTS

Residential	Incentive as a % of Incremental Measure Cost	
	IN	MI
HEP		
Hot Water	31%	31%
HVAC Equipment	29%	28%
Lighting	57%	60%
Other	25%	25%
IQW		
Direct Install	100%	100%
Hot Water	64%	64%
HVAC Equipment	93%	93%

C&I	Incentive as a % of Incremental Measure Cost	
	IN	MI
Prescriptive		
Cooking	31%	31%
HVAC Equipment	11%	11%
Lighting	36%	45%
Other	27%	27%
Refrigeration	25%	25%
VFDs	39%	39%
Custom		
Lighting	$.07/kWh	$.07/kWh
Non-Lighting	$.08/kWh	$.08/kWh

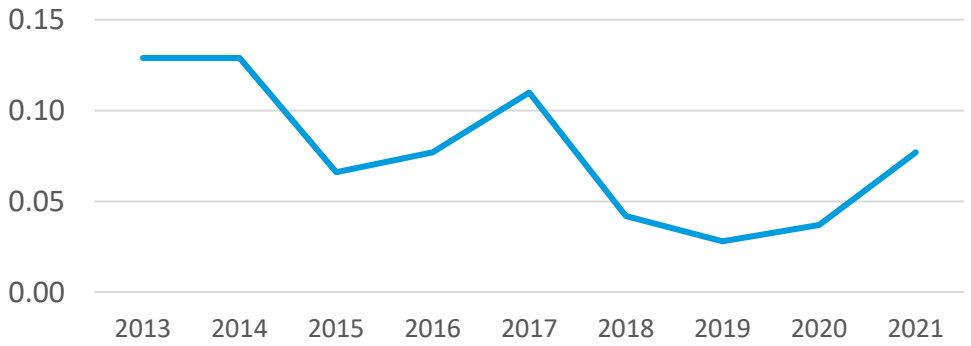
- Initial benchmarking of historical data to understand typical incentive levels offered by I&M as well as historical non-incentive costs.
- Additional benchmarking to understand historical performance (energy and costs) by program for near-term calibration

- ***Final benchmarking*** *will be performed to understand results in relation to other similar studies*

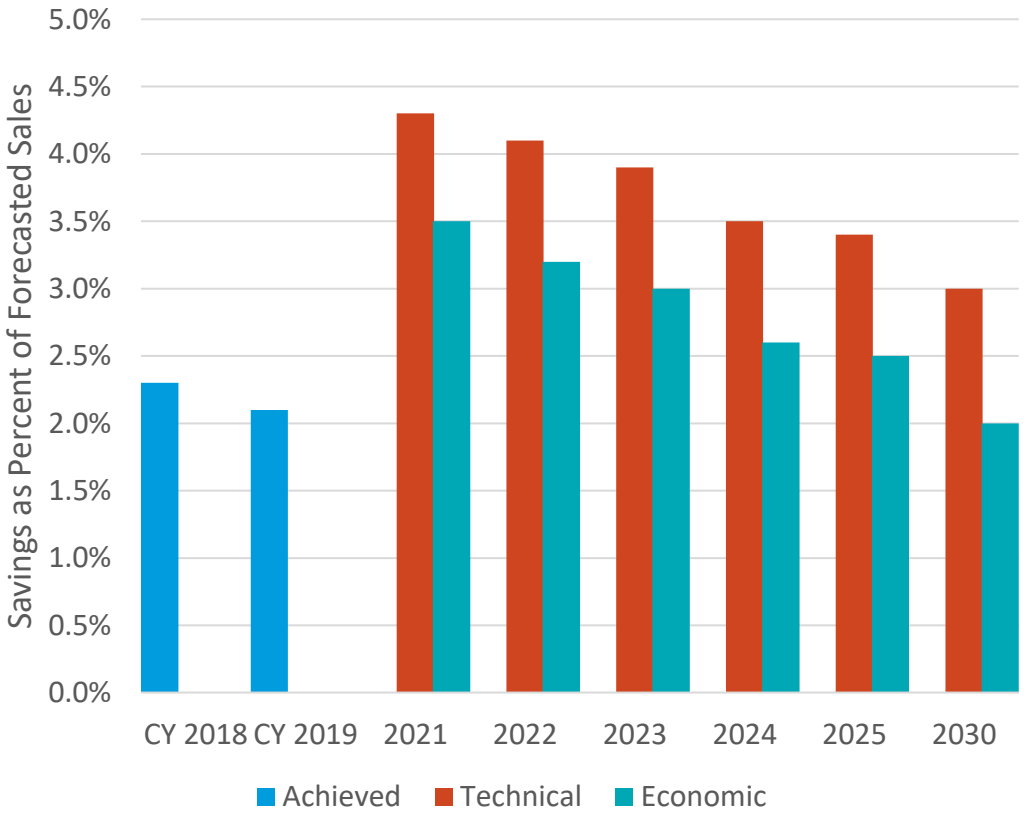
RESULTS BENCHMARKING & TRENDS

- Comparison to other recent market potential study assessments will help understand recent trends.
- Perceptions around the market baseline for lighting can influence the remaining future potential in both the residential and nonresidential sectors.

Average Annual Potential Savings Rate – Economic Potential

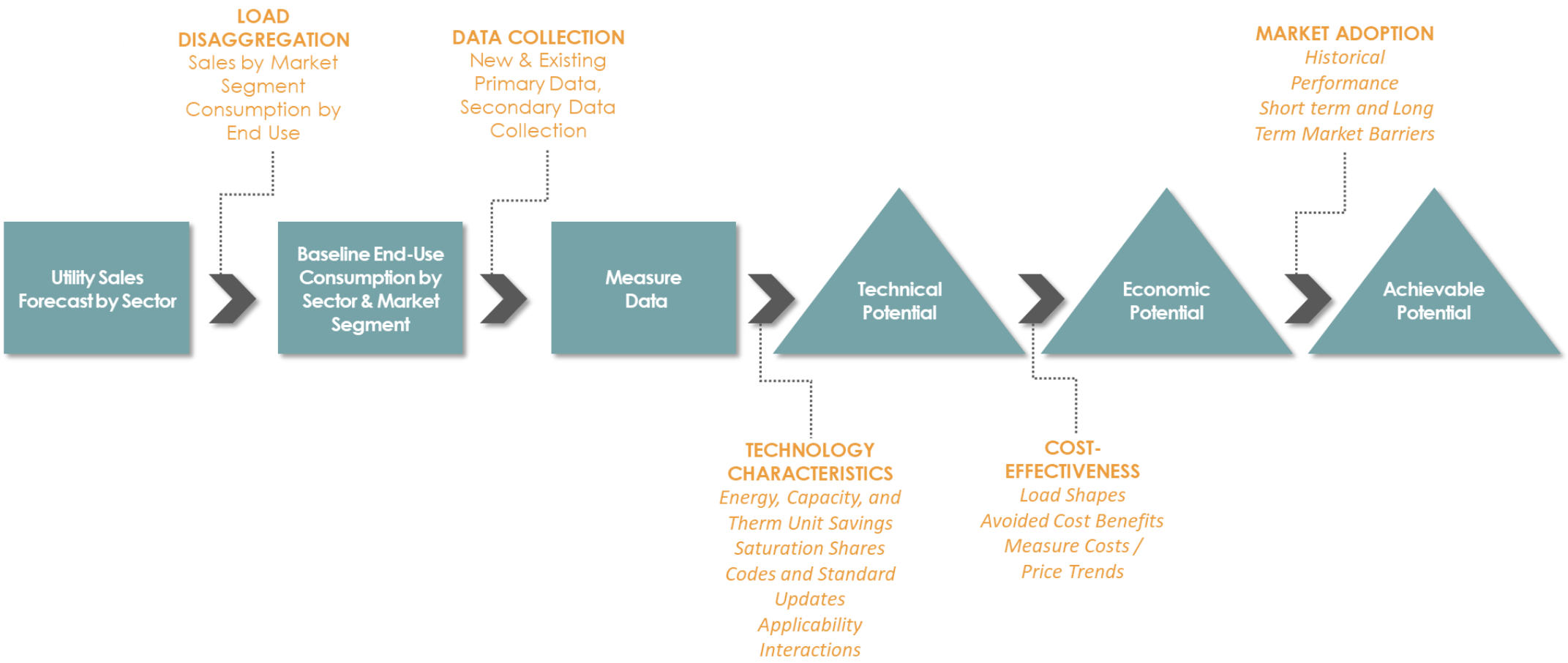


** Data from DOE EE Potential Studies Catalog*



** Reproduced from 2020 ComEd Potential Study*

ENERGY EFFICIENCY POTENTIAL



ENERGY EFFICIENCY POTENTIAL

TECHNICAL POTENTIAL

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

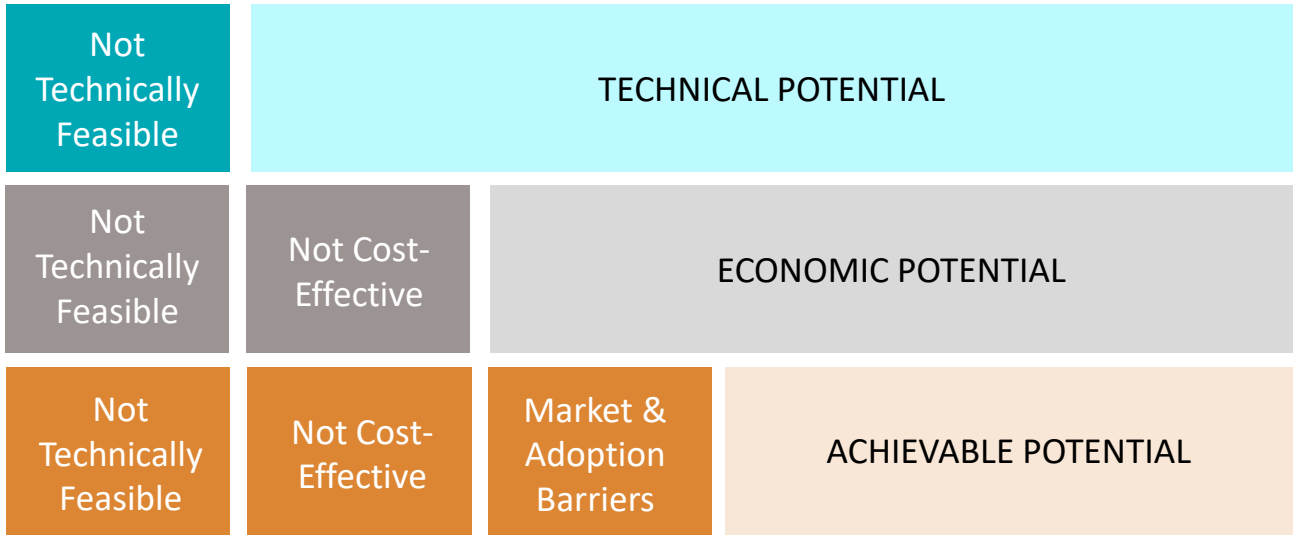
ECONOMIC POTENTIAL

All measures are screened for cost-effectiveness using the UCT Test. Only cost-effective measures are included. Screening includes avoided energy, capacity, and T&D costs.

ACHIEVABLE POTENTIAL

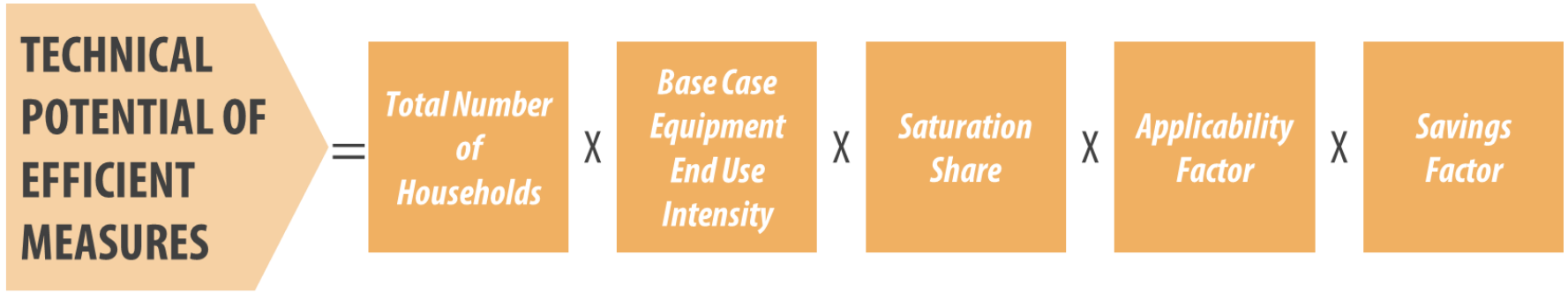
Cost-effective energy efficiency potential that can practically be attained in a real-world program delivery case, assuming that a certain level of market penetration can be attained.

Types of Energy Efficiency Potential



ENERGY EFFICIENCY POTENTIAL

RESIDENTIAL EQUATION

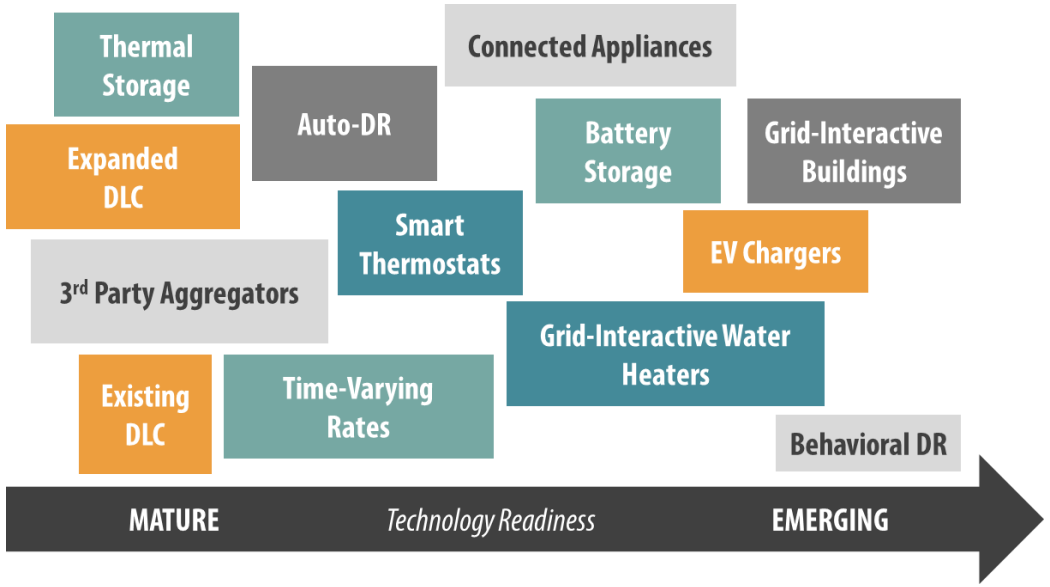


- Technical and Economic Potential utilize the equation shown above, with 100% of eligible measures being converted to the efficient alternative over time.
- Achievable potential includes an assumed long-term adoption rate (derived the WTP primary research noted earlier)

- Two Achievable Potential Scenarios:
  1. High Case Achievable Potential: Assumes 75% incentives (relative to measure cost) and increased program awareness.
  2. Realistic Achievable Potential: will reflect more traditional (i.e., current) incentive levels and program delivery efforts.

DEMAND RESPONSE POTENTIAL

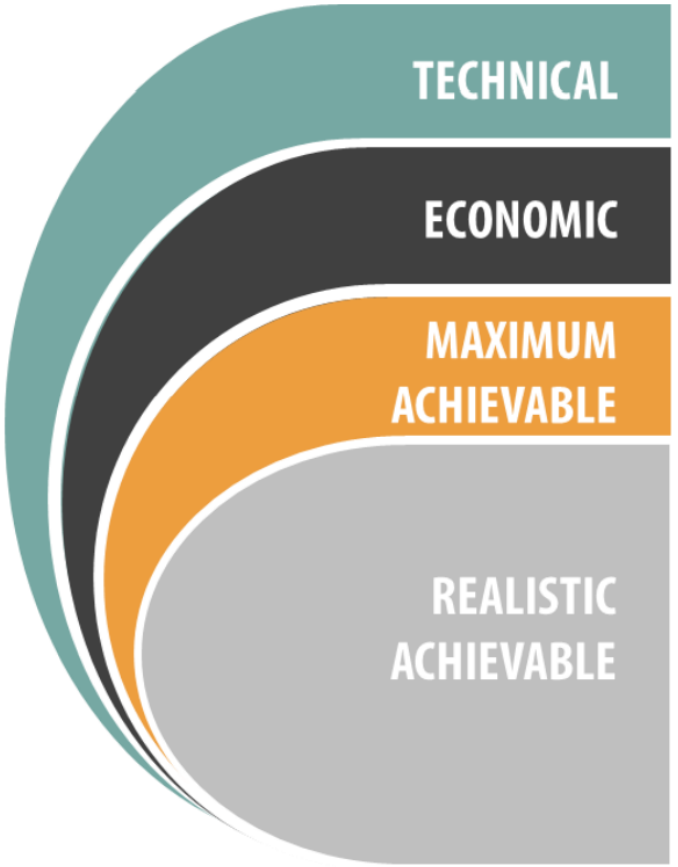
- Characterize Available Technologies
  - Assess and screen load shifting options for IM's territory and customer base
  - Measure List:
    - 37 Sector/Technology Permutations



  - 20 performance and cost metrics researched for each permutation

DEMAND RESPONSE POTENTIAL

- Technical Potential
  - Characterize potential using:
    1. IM current, past, pilot offering results
    2. Other PJM utility offerings
    3. Non-PJM utility offerings aligned to PJM peak definition
  - Measure competition
    - Participation weighted to most impactful option



DISTRIBUTED ENERGY RESOURCES (DER) POTENTIAL

- Study focuses on solar PV and combined heat & power (CHP)
- Measures screened at permutation-level based on TRC
- Sectors modeled include:
  - Solar PV: residential and non-residential
  - CHP: non-residential
- Market adoption based on Bass diffusion theory

DISTRIBUTED ENERGY RESOURCES (DER) POTENTIAL

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An AEP Company

Solar PV

- Potential area suitable for solar PV
  - Primarily focuses on rooftops but also considers ground systems
  - Rooftop eligible area based on NREL criteria
    - Net of existing systems
- Define solar generation
  - Model using PVWatts
  - Region-specific azimuth based on Google Project Sunroof data
  - System efficiencies based on PVWatts

Combined Heat & Power

- Potential number of available host sites
  - Based on customer electric usage
  - Without natural gas usage data, thermal factor applied to identify eligible sites
    - Screen sites for consistency in thermal and electric loads
    - Net of existing systems
- CHP generation
  - Electricity impacts modeled using system parameters and benchmarked capacity factors

DISTRIBUTED ENERGY RESOURCES (DER) POTENTIAL

Solar PV

- Economic screening based on TRC
  - 1.0 hurdle
  - Costs based on system installation fees inclusive of ITC
    - Cost research based on Solar Sage and NREL studies
- Achievable derived from Bass adoption curves
  - Curves based on market research data as well as NREL adoption research

Combined Heat & Power

- Economic screening based on TRC
  - 1.0 hurdle
  - Costs based on EPA studies
    - ITC cost savings included but are minimal
- Achievable derived from Bass adoption curves
  - Curves based on historic adoption benchmarks

PROGRAM PORTFOLIO RECOMMENDATIONS

- **Purpose**: Convert achievable potential results (measure-level) into a format that reflects program implementation-related considerations (e.g., potential delivery options, and alignment with I&M's program framework) and can serve as inputs to the IRP modeling process.
- **Process**:

Map Measures to Potential Programs & Delivery Channels

- Further characterize measures, adding implementation-related characteristics (e.g., costs of alternative delivery channels).
- Consider potential new program offerings to address market needs.
- Align with existing program structure / framework.

Create Delivery Streams / Measure Bundles to Interface with IRP Model

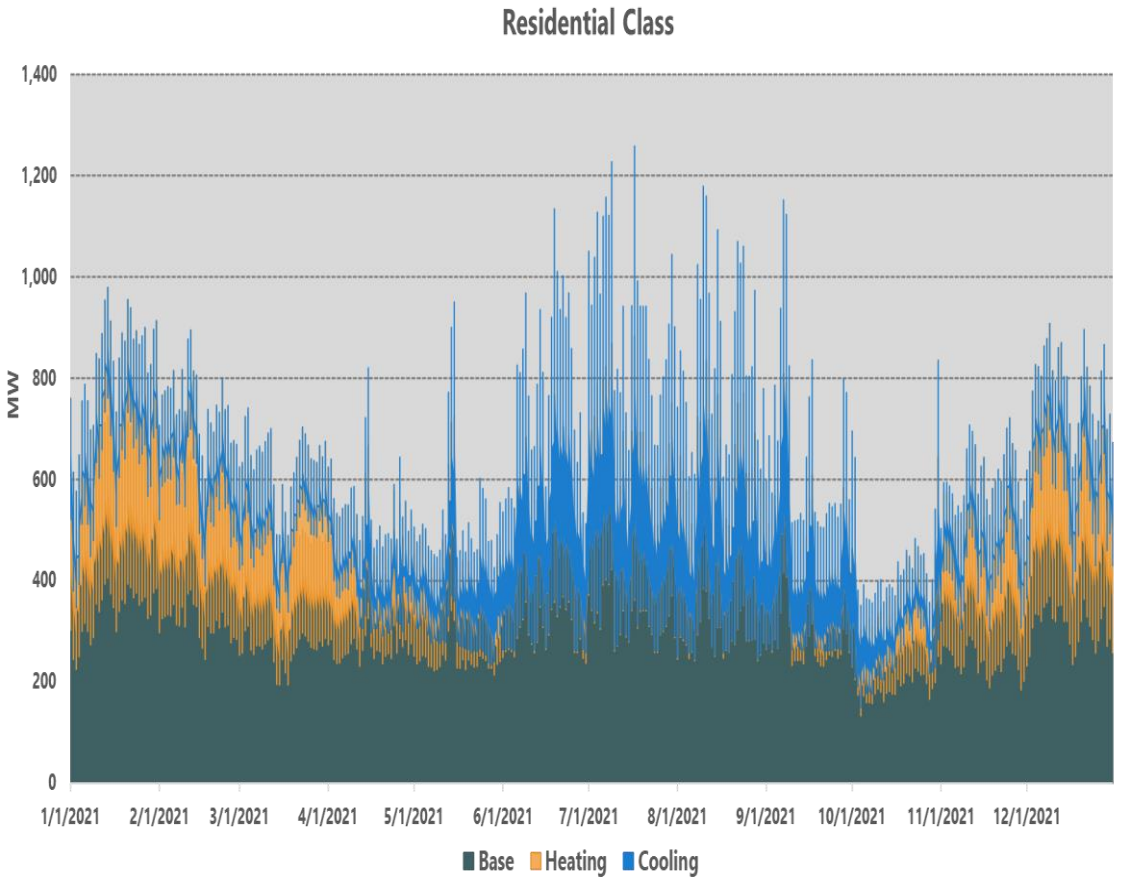
- Group measures by end use, program, delivery channel / cost characteristics.
- Seek to group measures in a way that aligns with I&M's program framework and would not undermine program infrastructure if "turned off."

Recommend a Portfolio of Programs for Consideration

- Recommend a cost-effective portfolio that includes measure groupings addressing the range of market needs, and evolving market conditions.
- Optimizing a portfolio is outside the scope.

DSM INPUTS FOR IRP

- DSM Savings identified in MPS (beginning in 2023) will be aggregated for inclusion in the IRP both by vintage (years) as well as measure characteristics
- Vintage groups will be for 2023-2025, 2026-2028, and 2029-2040. 3-year vintage cycles were chosen to algin with current I&M planning cycles.*
- Measure characteristic grouping may include: cost-based, load shape-based, or value based (see next slide)
- Recognizing potential value in time-differentiated savings, GDS will breakout the annual DSM savings into hourly (8760) impacts, typically at the end-use level.
  - Total number of 8760 load shapes is TBD.



***Example 8760 load data for I&M.*

*** In accordance with I&M's DSM Plan Order (#45285), I&M will utilize the results of the MPS to examine the potential and estimated cost of additional reasonably achievable potential in 2021 and 2022.*

DSM INPUTS FOR IRP – "EE BUNDLING"

(Discussion will be continued later in slide deck)

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VALUE BASED APPROACH

Bundles in which the avoided cost values are similar (e.g. a bundle of programs designed to reduce summer peak demands might be one bundle)

- PROS: Provides analysis and selection based on value creation; Will likely result in similar bundles as the "load curve" bundle approach ; Provides more detailed analysis of timing of DSM measures and how that relates to avoided costs
- CONS: The tie between load curve, timing of costs, and DSM measures is looser than the load curve approach

LOAD-SHAPE BASED APPROACH

Bundles in which the manner in which the program impacts the load curve are grouped together (e.g., all programs with primary effectiveness during summer on-peak periods bundled together)

- PROS: Provides analysis and selection based on details of load curves ; Programs within a bundle will likely have similar avoided cost characteristics ; Mimics how a generation resource would be included in a model (base DSM bundles would be effective nearly all the time just as a baseload resource runs nearly all the time)
- CONS: May create many different bundles to most effectively achieve the granularity sought by such an approach

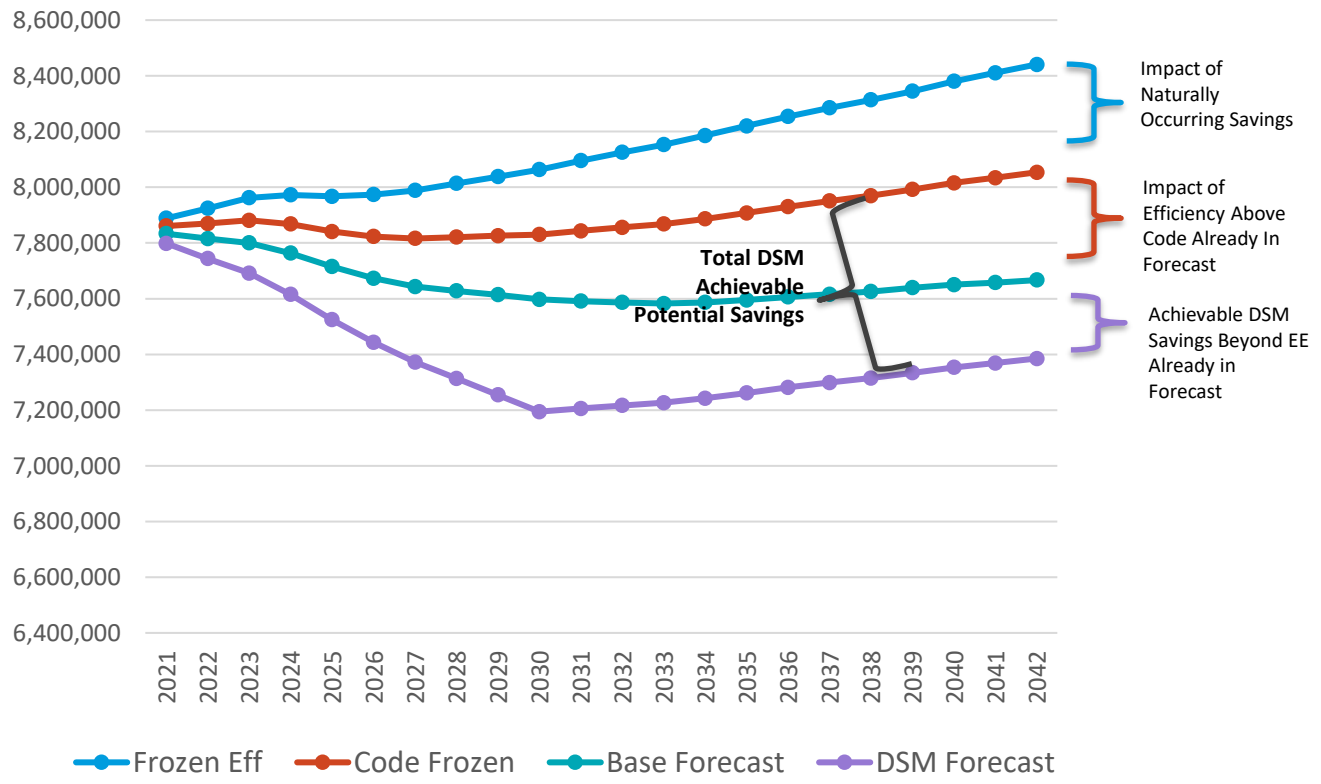
COST-BASED APPROACH

Bundles based lowest cost to highest cost measures (may be on a $/kWh basis)

- PROS: Bundles can be created to likely lead to acceptance of most cost-effective bundles ; Allow for greater differentiation in cost effectiveness relative to single bundle approach ; Easy to define a certain number of bundles
- CONS: No granularity with respect to load curve and timing of costs (on/off peak energy and timing of peak demands) ; Risk of model selecting some bundles that are less cost effective than other bundles that are rejected and having to explain why that happened

DSM INPUTS FOR IRP – SUPPLEMENTAL EFFICIENCY ADJUSTMENT

- DSM Savings are typically quantified relative to federal code versus the market baseline
- I&M's base forecast has an assumed level of increased efficiency (above and beyond federal codes) over time, resulting in average equipment well above current known standards/codes.
  - Ex: the average equipment efficiency of central air conditioning approaches SEER 15 in the East North Central region over the 20-year forecast horizon.
- GDS intends to estimate efficiency impacts first relative to a "frozen code efficiency" forecast and coordinate with I&M to adjust for EE savings already recognized in the base case forecast.



FEEDBACK AND DISCUSSION

Time	
9:30 a.m.	WELCOME
9:35 a.m.	MEETING GUIDELINES
9:40 a.m.	OPENING REMARKS
9:50 a.m.	GRID SOLUTIONS INTRODUCTION
10:20 a.m.	MARKET POTENTIAL STUDY
12:00 p.m.	LUNCH
1:00 p.m.	IMPACTS ON LOAD FORECAST
1:30 p.m.	PRELIMINARY APPROACH FOR IRP
2:00 p.m.	BREAK
2:30 p.m.	STAKEHOLDER ENGAGEMENT
2:45 p.m.	STAKEHOLDER PRESENTATION
3:00 p.m.	NEXT STEPS AND CLOSING REMARKS
3:30 p.m.	ADJOURN

LUNCH

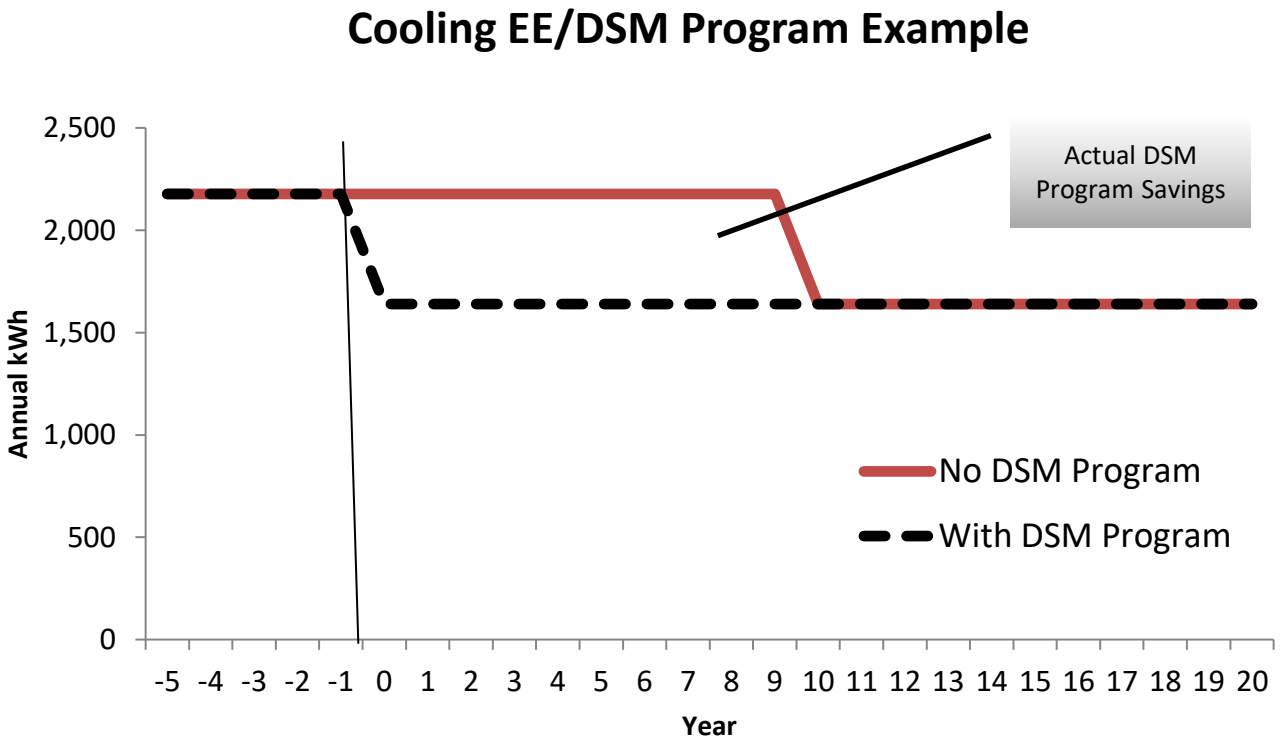
PLEASE PLAN A RETURN BY 1:00PM EST

IMPACTS ON LOAD FORECASTING

CHAD BURNETT | LOAD FORECASTS

Accounting for DSM/EWR in Load Forecast

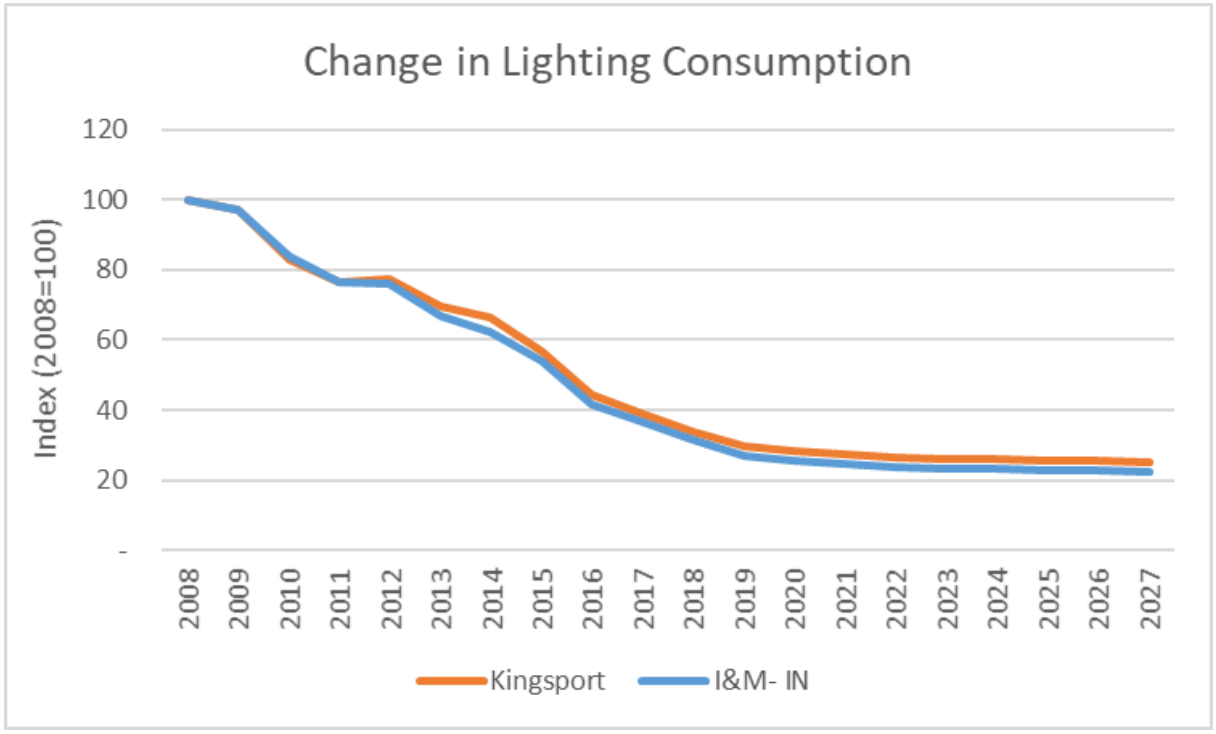
The purpose or effect of the Company's DSM/EE programs is to accelerate the adoption of energy efficient technology to enable our customers to be more efficient consumers of energy.

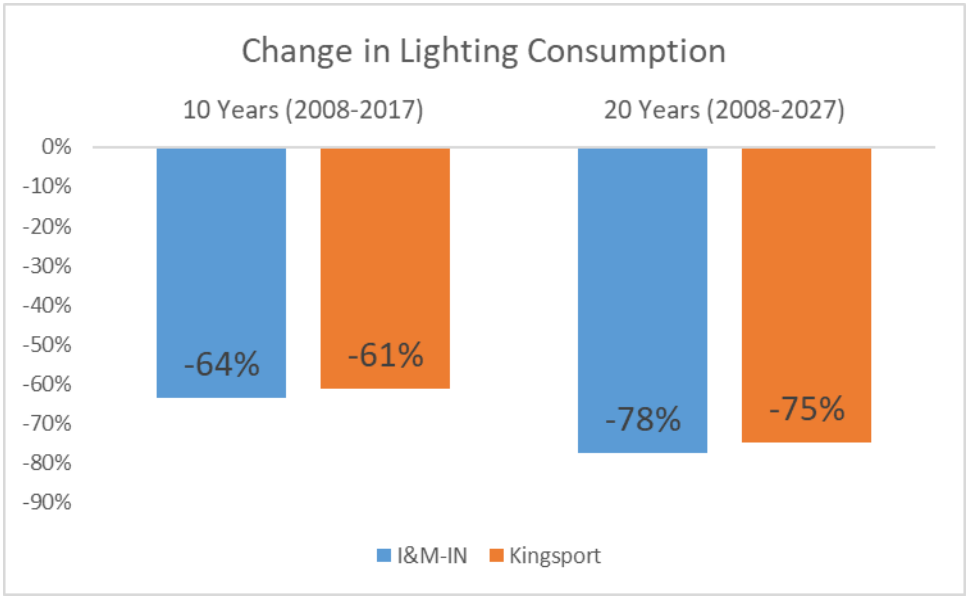


Example: The J Doe family replaced their HVAC system 5 years ago with a SEER 13 system. Since then, the industry has introduced more efficient (SEER 15) units. 10 years from now, J. Doe will have to replace the system with whatever is available in the market at that time (SEER 15). Today, the utility offers an incentive to help J. Doe replace his HVAC system now with a SEER 15 and begin saving energy immediately.

Residential Lighting Example

- I&M started its DSM programs in IN in 2008 with a particular emphasis on lighting programs.
- Kingsport (I&M's affiliate in TN) has yet to implement a DSM program.
- I&M's DSM programs in IN accelerated the adoption of energy efficient lighting faster than Kingsport, where there were no utility sponsored energy efficiency programs.





TRANSLATING MPS SAVINGS INTO THE IRP OPTIMIZATION

- There are benefits to leveraging the market intelligence from the Market Potential Study (MPS) in the Integrated Resource Plan (IRP) optimization.
- The load forecast is a common link between the MPS and IRP.
- However, the way EE savings are measured in a MPS are different than the way EE savings are modeled in the load forecast that is used in the IRP optimization.

Chips

US

UK

Biscuits

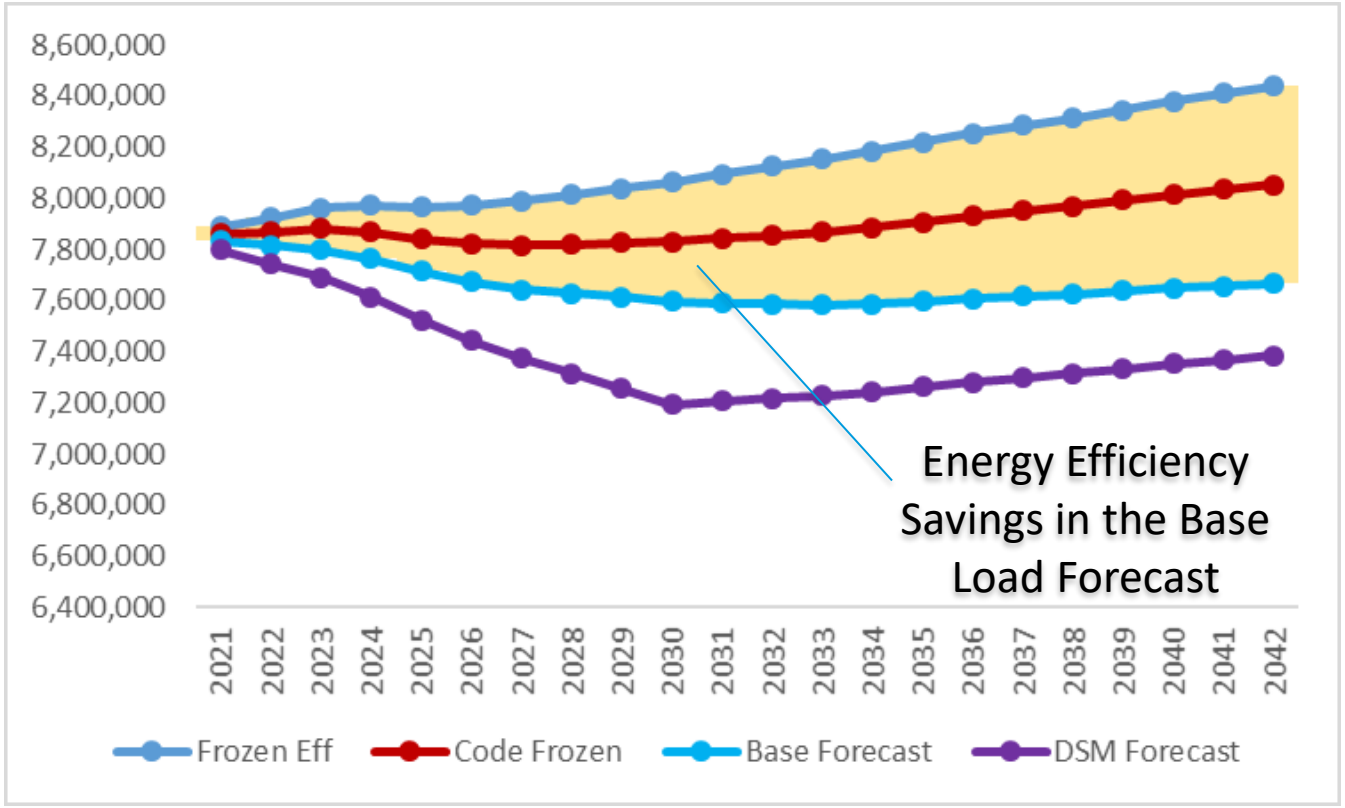
US

UK

DSM/EWR Savings ???

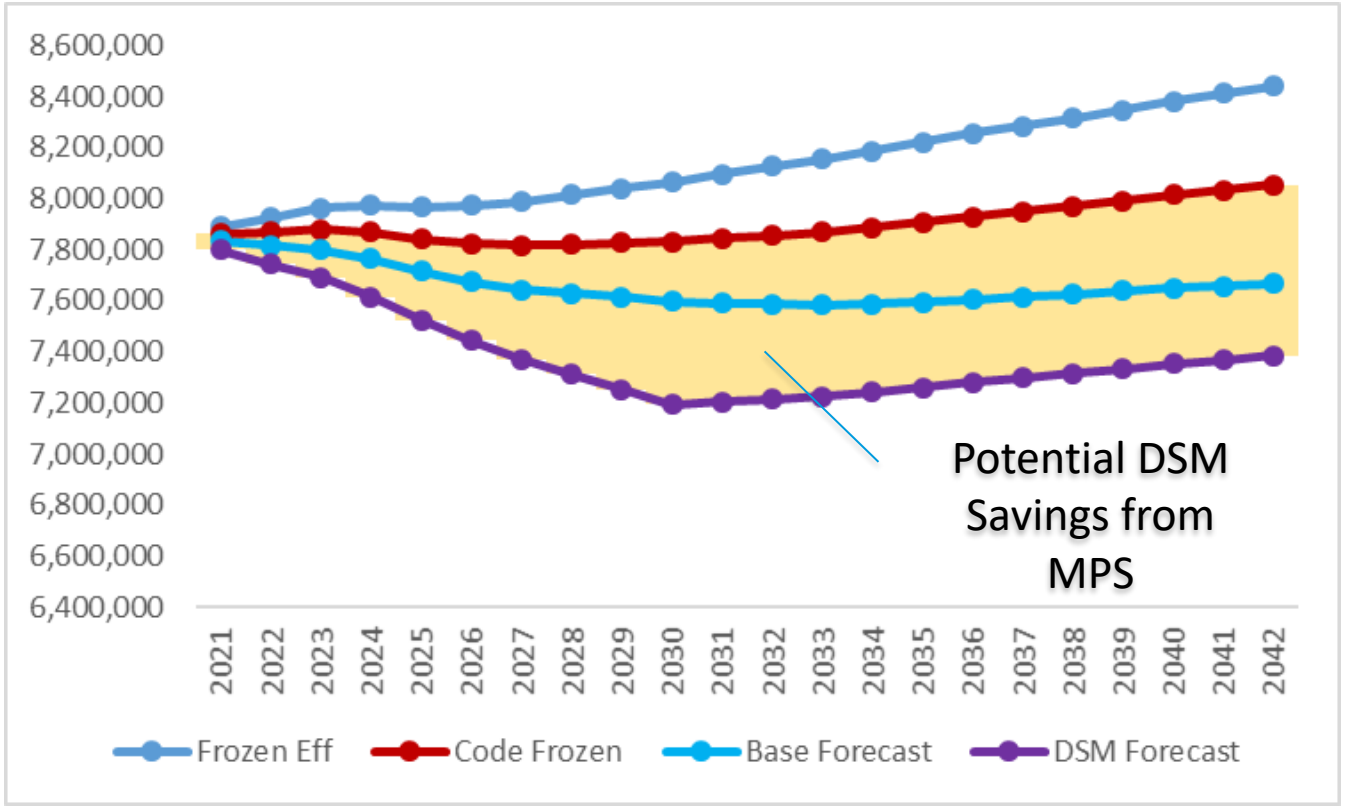
Energy Efficiency in the SAE Load Forecast

- Using the example from slide 52, the total energy efficiency included in the Statistically Adjusted End-Use (SAE) load forecast models is shown as the difference between the frozen efficiency forecast (blue line) and the base forecast (teal line).
- This includes naturally occurring energy efficiency saving.



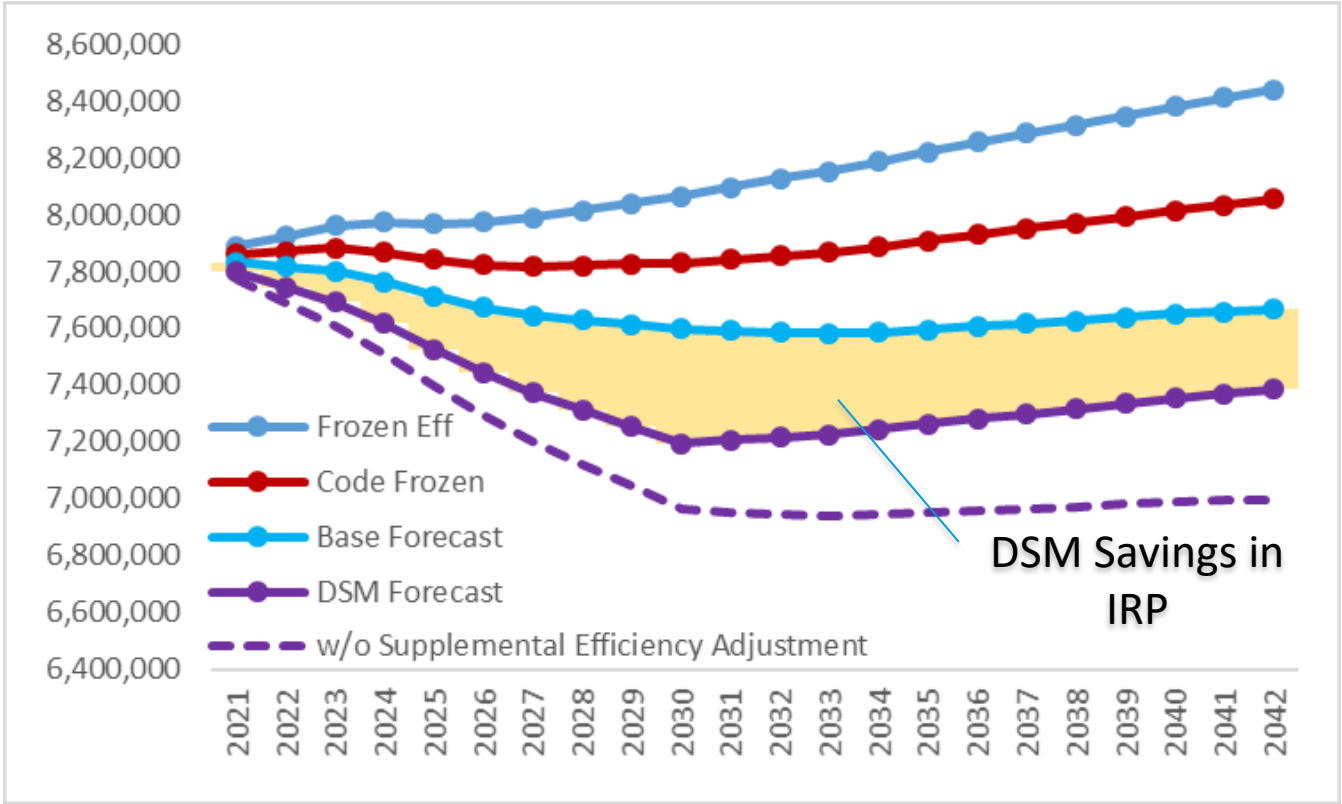
DSM/EWR Savings From Market Potential Study

- In the Market Potential Study, total potential DSM/EWR savings are computed based off the baseline from existing codes (red line).
- Actual DSM/EWR program savings are measured using a similar comparison (to a baseline at a specific point in time).



DSM Saving Used in IRP Optimization

- Since the load forecast models assume greater efficiency savings in the forecast than the MPS baseline, the savings used in the IRP optimization are computed from the teal line.
- A Supplemental Efficiency Adjustment is made to prevent double counting the impact of energy efficiency in the load forecast.
- If the IRP used the same DSM savings from the MPS without the Supplemental Efficiency Adjustment, the total impact of energy efficiency would be overstated in the IRP (purple dashed line).

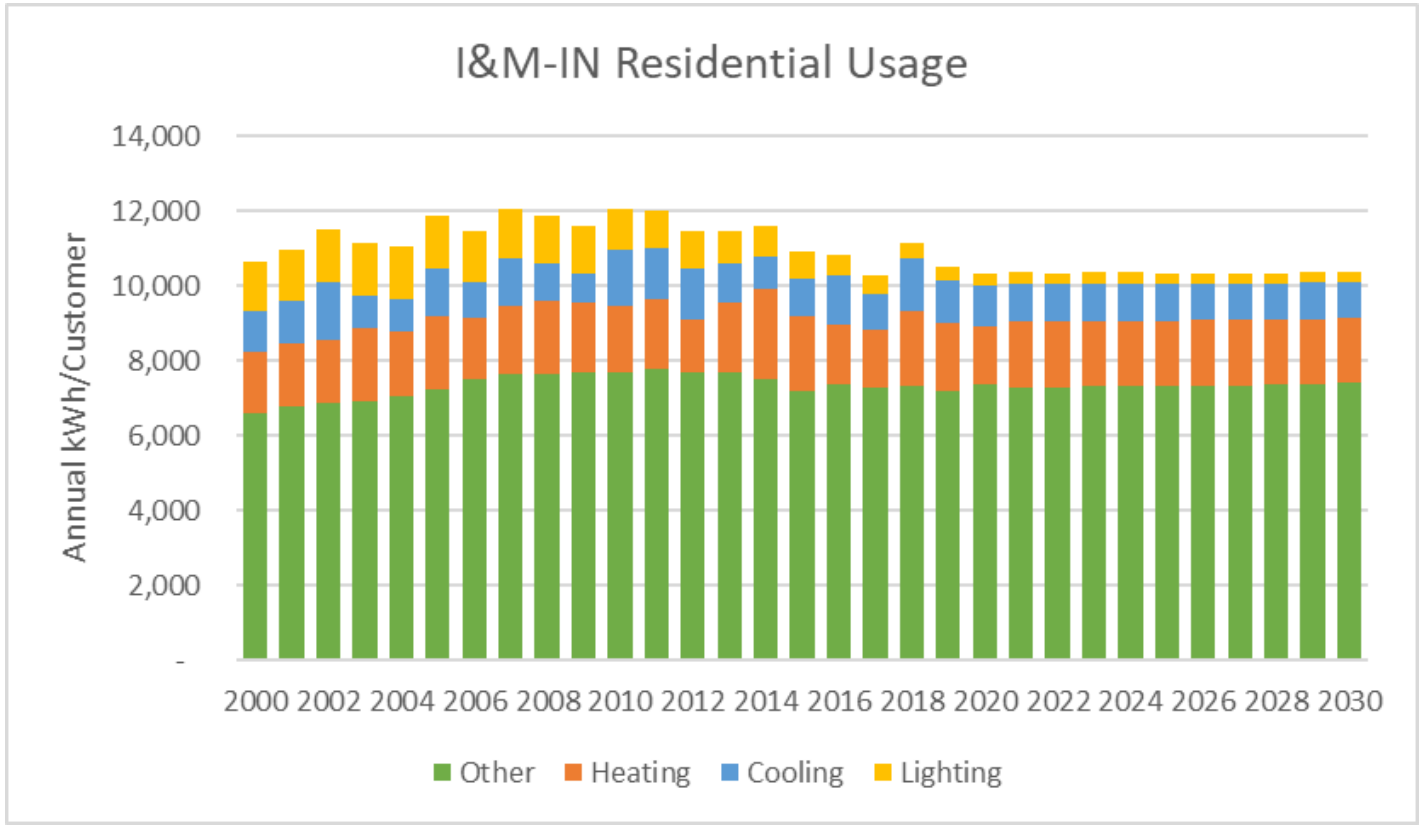


Near-term vs Long-term DSM/EWR Assumptions

- I&M's load forecast has multiple applications:
  - Regulatory (Base Rate Cases, Fuel Filings, Integrated Resource Plans, etc.)
  - Finance (Budgeting, Earnings Guidance, Financing, etc.)
- In every application, the near-term DSM/EWR assumptions come from the most recently filed/approved DSM/EWR portfolio (usually a 3-year cycle).
- Long-term DSM/EWR savings are solved for as part of the IRP optimization modeling. Therefore, the load forecast that goes into the IRP modeling only includes the impact of currently filed programs.
- Long-term financial forecast uses the DSM/EWR savings selected in the most recently completed IRP.

Load Forecast By End Use

- The SAE model provides the ability to dissect the load forecast by end-use type.
- This is important when evaluating DSM/EWR programs that target a specific end-use and it's impact on the I&M system load shape.



FEEDBACK AND DISCUSSION

PRELIMINARY IRP INPUTS

SIEMENS PTI TEAM

Overview – Demand Side Management

Siemens PTI, GDS and the I&M IRP team will collaborate on developing the forecasted inputs needed to include Demand Side Management (DSM) Resources in the analysis.

The AEP I&M IRP will include the following DSM options:

- Energy Efficiency (EE)
- Demand Response (DR)
- Distributed Energy Resources (DER)

Each DSM Resource option will be treated differently in the IRP approach and will be discussed in more detail later.

- Energy Efficiency → Optimized Approach
- Demand Response → Non-Optimized Approach*
- Distributed Energy Resources → Common Portfolio Approach

*Capacity additions of DR resources will be defined for each scenario. Note, however, that the operation of DR resources will be optimized in commitment and dispatch.

Energy Efficiency Approach

Siemens PTI, GDS and the I&M IRP team will collaborate on the appropriate bundling for the Energy Efficiency measures.

- The bundles are driven by increments of Energy Efficiency value. (breakpoints informed by MPS)

- Demand impacts will be represented on an hourly basis (8760 hours per year for the development of the candidate portfolios).

Demand Response Approach

Each candidate portfolio has an assumed quantity of demand response resources defined by the GDS Market Potential Study.

- Different candidate portfolios may have different volumes and costs for demand response.
- Siemens PTI will use the GDS-defined quantities of Demand Response capacity for the AEP I&M system in select scenarios.
- Siemens PTI will optimize the hourly operation of Demand Response resources in each candidate portfolio.

Distributed Energy Resources

Distributed Energy Resources and their associated volume, costs, and performance characteristics are included as a part of all candidate portfolios.

- Distributed Energy Resources forecast will be identified from the Company's MPS
- Each DER technology will be an individual resource

IRP Inputs – DSM Overview

Siemens PTI, GDS and the I&M IRP team will collaborate and develop a forecast and other input parameters to be implemented into the analysis. Each specific DSM measure will be treated differently based on the predetermined approach.

DSM Measure	Approach
Energy Efficiency	Volume Optimized for each candidate portfolio
Demand Response	Volume may vary by candidate portfolio
Distributed Energy Resources	Volume the same for each candidate portfolio

FEEDBACK AND DISCUSSION

BREAK

PLEASE PLAN A RETURN BY 3:00PM EST

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3:30 p.m.	ADJOURN

STAKEHOLDER PROCESS AND Q&A

Stakeholder Timelines

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March 9, 2021 ✓

- 2021 IRP Process
- Objectives and Metrics
- Proposed Scenarios
- Base Case Inputs

April 14, 2021 (this session)

- DSM IRP Inputs and Modeling
- EE/EWR, DR and DER Results
- 2021 IRP Update

May TDB, 2021 (tentative date)

- AURORA Technical Workshop

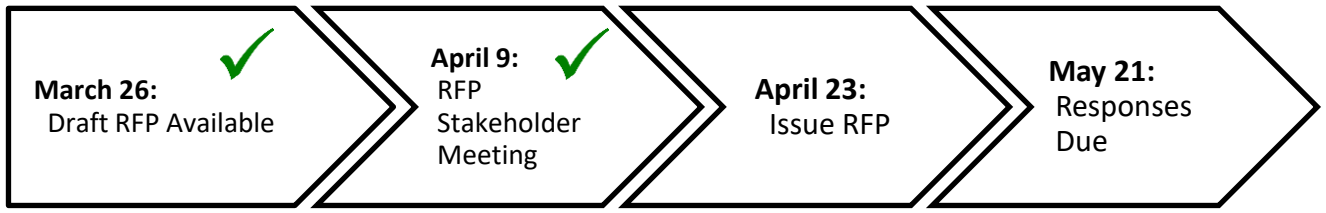
July 14, 2021 (tentative date)

- Draft Candidate Portfolios
- All-Source RFP Results
- Stochastic Modeling Approach and Assumptions

September 14, 2021 (tentative date)

- Probabilistic Modeling Results
- Review of Preferred Portfolio
- Other(s)

All-Source RFP Timeline



FEEDBACK AND DISCUSSION

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STAKEHOLDER PRESENTATION

CLOSING REMARKS

ANDREW WILLIAMSON | DIRECTOR, REGULATORY SERVICES

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THANK YOU!