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APEX ANALYTICS

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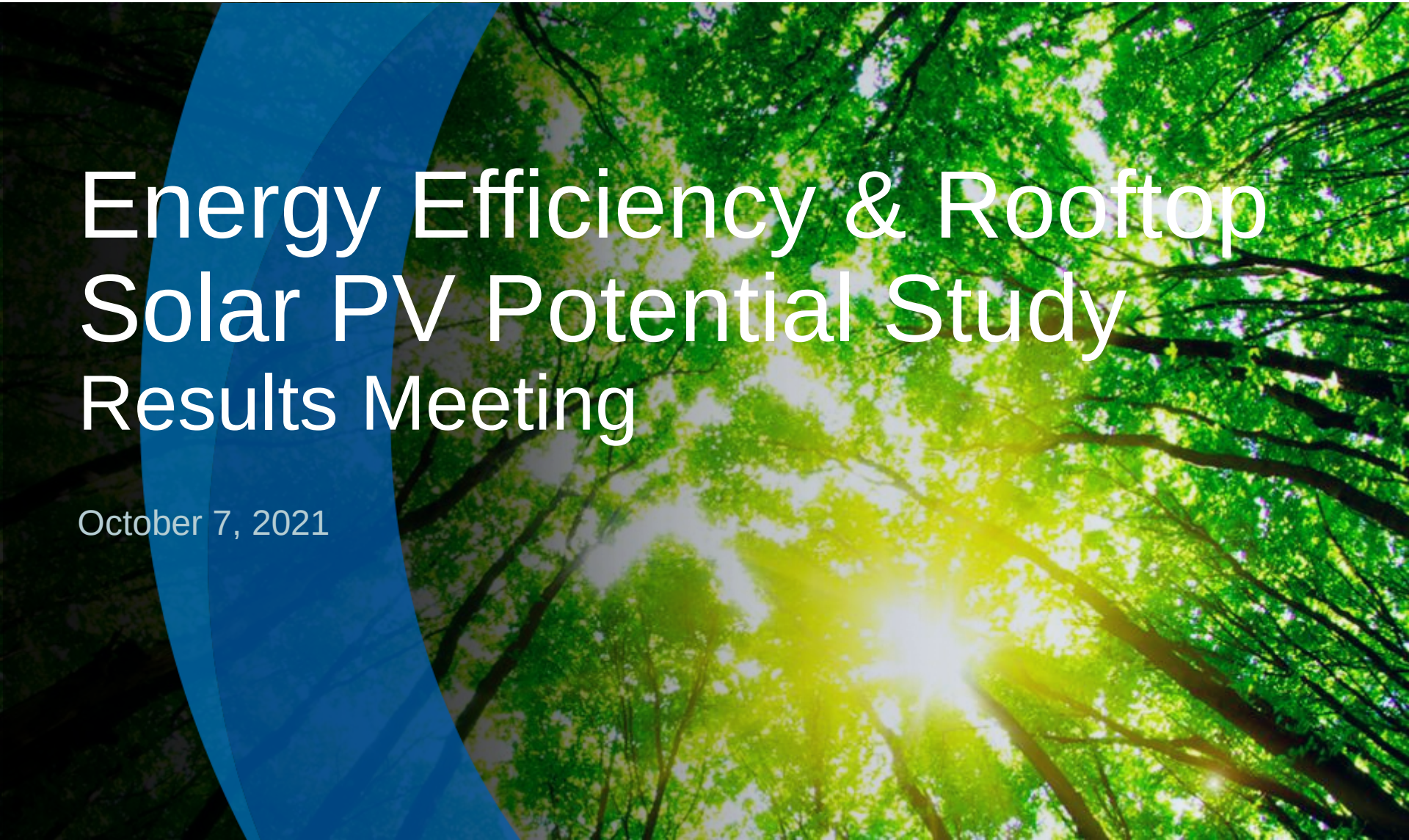


Energy Efficiency & Rooftop Solar PV Potential Study

Results Meeting

October 7, 2021

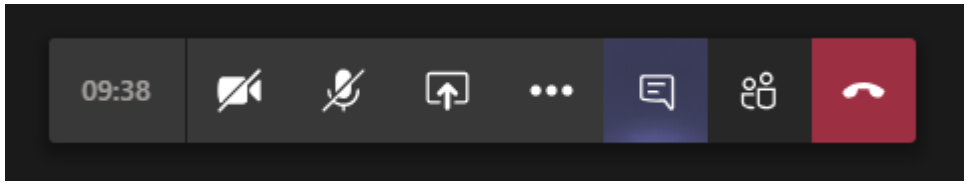
Webinar Logistics & Guidelines

All parties except presenter muted to avoid unnecessary noise distraction

If you have an immediate question, or audio or video is poor please send an instant message to the moderator

We will stop today's presentation several times to take questions

Your Settings



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Agenda

1. **Energy Efficiency Potential**
   - General Overview
   - Results and Conclusions
   - Stakeholder Feedback

2. **Rooftop Solar PV Potential**
   - General Overview
   - Results and Conclusions
   - Stakeholder Feedback

3. **Next Steps**
   - Final Reports
   - Quad Planning

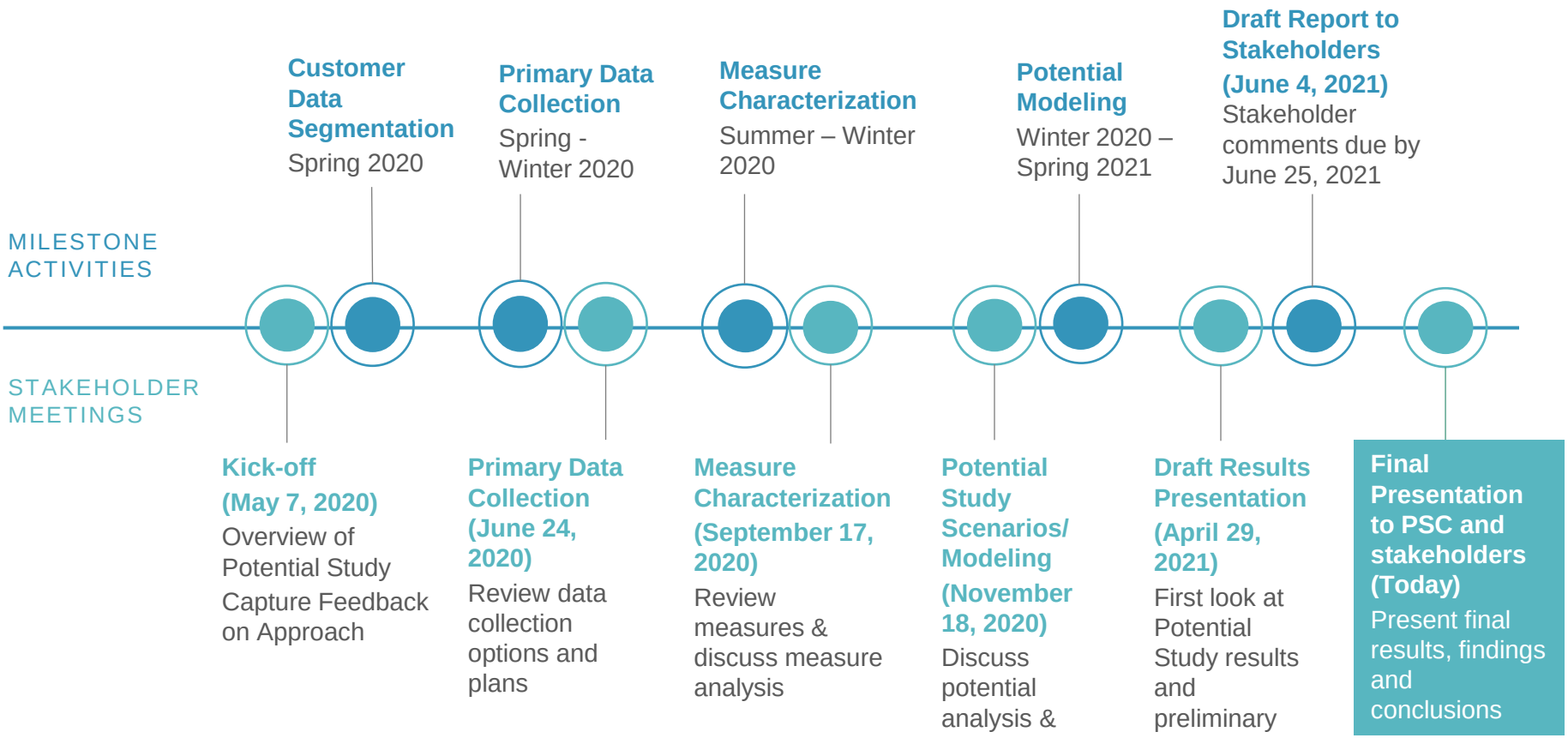
3. **Q&A**
   - General Discussion

1. Energy Efficiency Potential

Energy Efficiency Study Objectives

- Assess statewide energy efficiency potential through 2034
- Scenario modeling exploring alternative policy conditions
- Program Potential not included
- Inform Quad IV program planning and goal setting
- Incorporate stakeholder input and guidance

Energy Efficiency Potential Study Timeline



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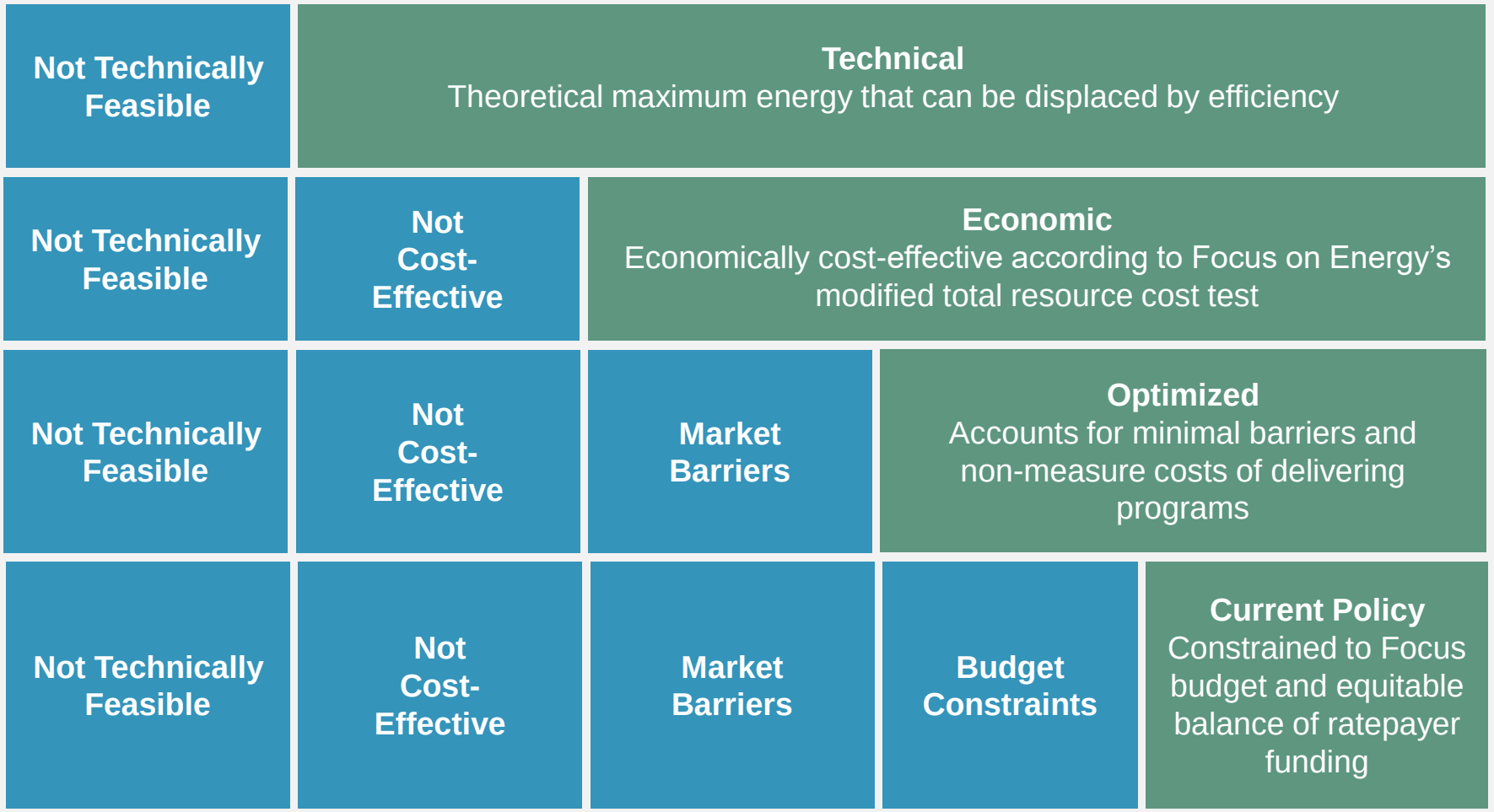
Types of Potential Estimated



Potential Study does not provide program targets

Program targets developed through comprehensive quad planning process

Electric Energy Efficiency Potential

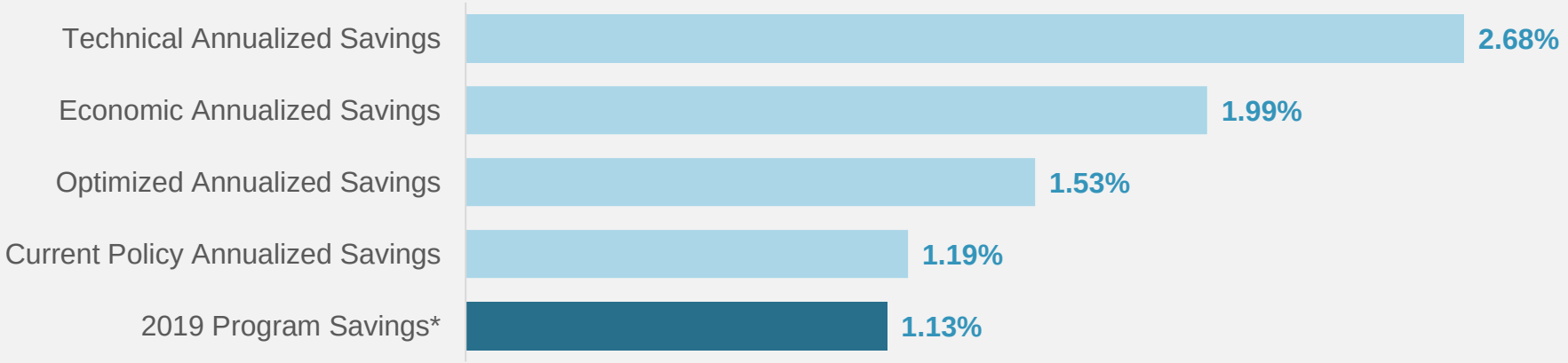
2034 Electric Potential Estimates (GWh) and Percent of Baseline Sales

Technical: **19,380 (27%)**
Economic: **15,010 (21%)**
Optimized: **11,859 (17%)**
Current Policy: **9,408 (13%)**

Percent of Electric Optimized Potential

Residential	Commercial	Industrial	Agriculture
35%	26%	37%	2%

Electric Energy Efficiency Potential as a Percent of Sales



**Program savings do not account for spillover or free ridership*

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Natural Gas Energy Efficiency Potential

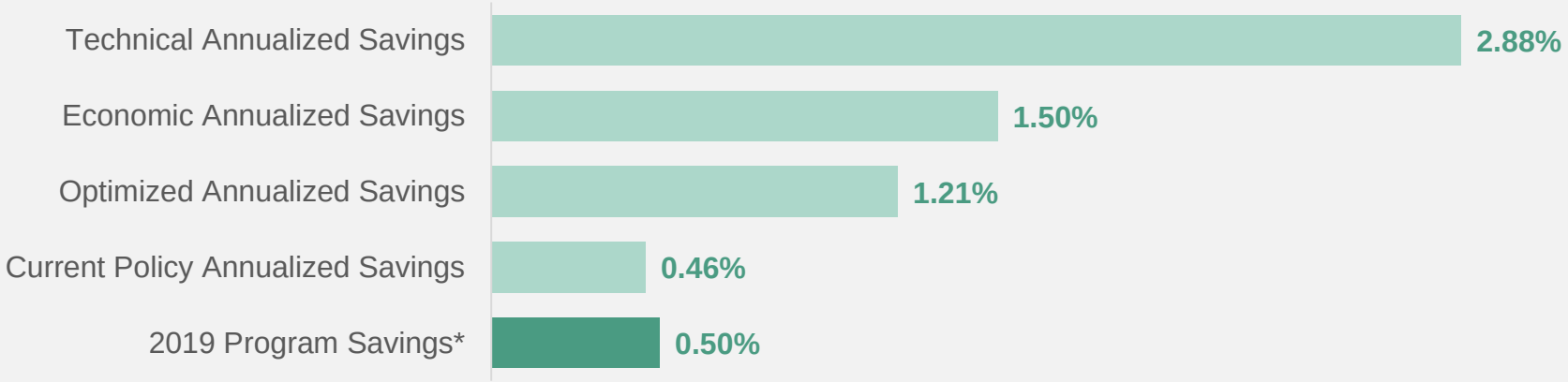
2034 Natural Gas Potential Estimates (Million Therms) and Percent of Baseline Sales

Technical: **780 (29%)**
Economic: **443 (16%)**
Optimized: **362 (13%)**
Current Policy: **144 (5%)**

Percent of Natural Gas Optimized Potential

Residential	Commercial	Industrial	Agriculture
59%	**26%**	**15%**	**<1%**

Natural Gas Energy Efficiency Potential as a Percent of Sales



**Program savings do not account for spillover or free ridership*

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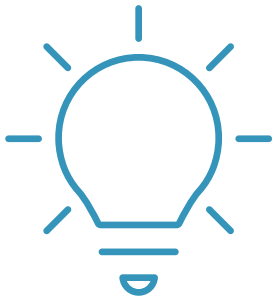
Residential Electric Conclusions



12-Year Residential **Lighting** Economic Potential **Decreased** by More Than **50% (1,142 GWh)** Compared to the 2017 Focus on Energy Potential Study

What's Driving This Outcome?

- Rapidly maturing market and federal policies
- Longstanding and successful Focus on Energy residential lighting offerings

What Opportunities are Emerging?

- Increase in technologies that show large potential, such as water heating and advanced CAC
- New program designs or more emphasis in those that can scale (i.e. midstream)

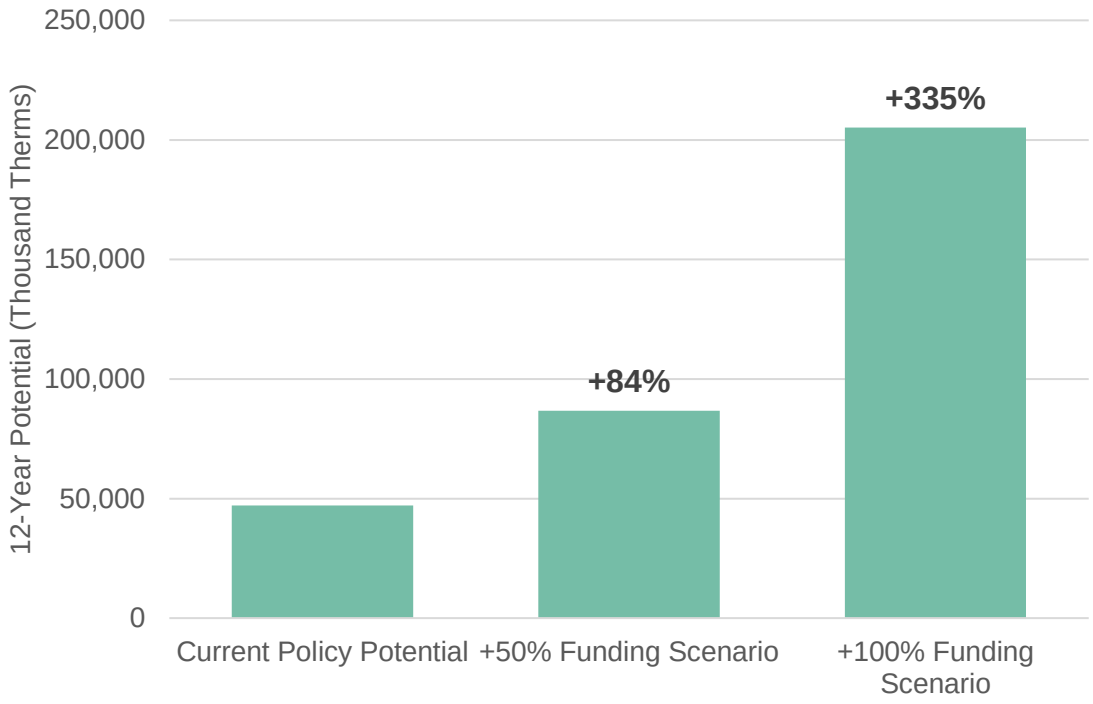
Residential Natural Gas Conclusions

Top-Savings Residential Natural Gas Measures:

Low Flow Showerheads + Faucet Aerators
34% of Residential
NG Economic Potential

Premium Efficiency Furnaces
12% of Residential
NG Economic Potential

Residential Natural Gas Potential is ***Incredibly*** **Responsive to Increases in Program Funding and Removal of Sector Level Funding Constraints**



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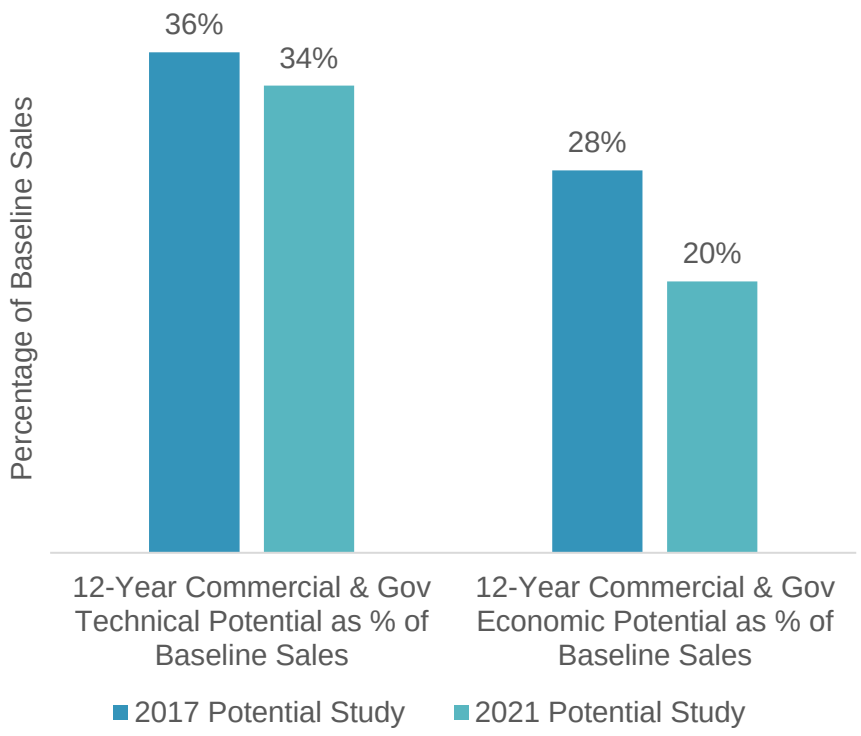
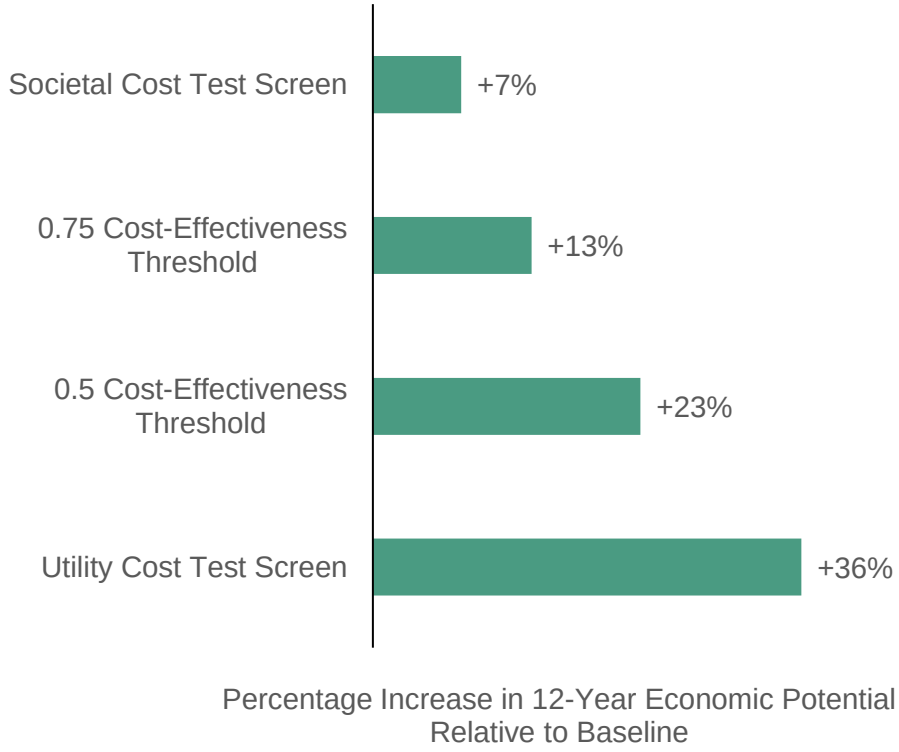
Non-residential Natural Gas Conclusions

Lower Avoided Costs Lead to **34% Decrease** in Commercial & Government **Economic Potential** Relative to 2017 Energy Efficiency Potential Study



Nonresidential Natural Gas Economic Potential **Highly Sensitive** to **Changing Cost-Effectiveness** Assumptions



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Non-residential Electric Conclusions

Nonresidential **screw-based lighting** represents a significant source of economic potential savings (**34%** of total lighting potential), despite the increased prevalence of LED lighting technologies

Commercial refrigeration measures account for **15%** of electric commercial economic potential, or approximately **525 GWh**

99% of the industrial sector technical potential is **cost-effective**

Process measures accounted for the largest share of electric economic potential in the industrial sector, providing more than **2,390 GWh** of cumulative 12-year electric potential

Incorporation of Stakeholder Feedback

Cadmus Hosted **6** Stakeholder Engagements

Cadmus addressed **113** Draft Report Comments from Stakeholders at **5** Different Groups

Received Feedback from **25** Market Experts/ Stakeholders to **Assign Ramp Rates** to Measures in the Study

Major Report Adjustments

Process Adjustments

- Rename achievable potential to optimized potential
- Methodology for estimating optimized potential
- Conducted rooftop solar potential study

Reporting Changes

- Presentation of income qualified findings
- Clarification on study potential compared to program potential
  - Additional detail: current policy and optimized potential
  - Additional detail: portfolio cost-effectiveness versus measure level cost-effectiveness
- Highlight demand impacts
- Combined electric and natural gas potential reporting
- Many other edits throughout the report

The Floor is Open – Feedback Welcome!

Questions/Comments?

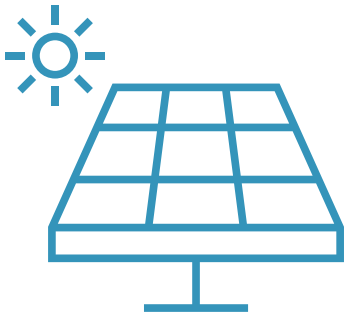
- Energy Efficiency Potential Results
- New Potential Opportunities
- Other questions or comments?

Please add your questions to the meeting chat: we will address questions in the order that they are received & provide opportunity for clarification

Please remain muted until your question is announced

2. Rooftop Solar PV Potential

Rooftop Solar PV Objectives



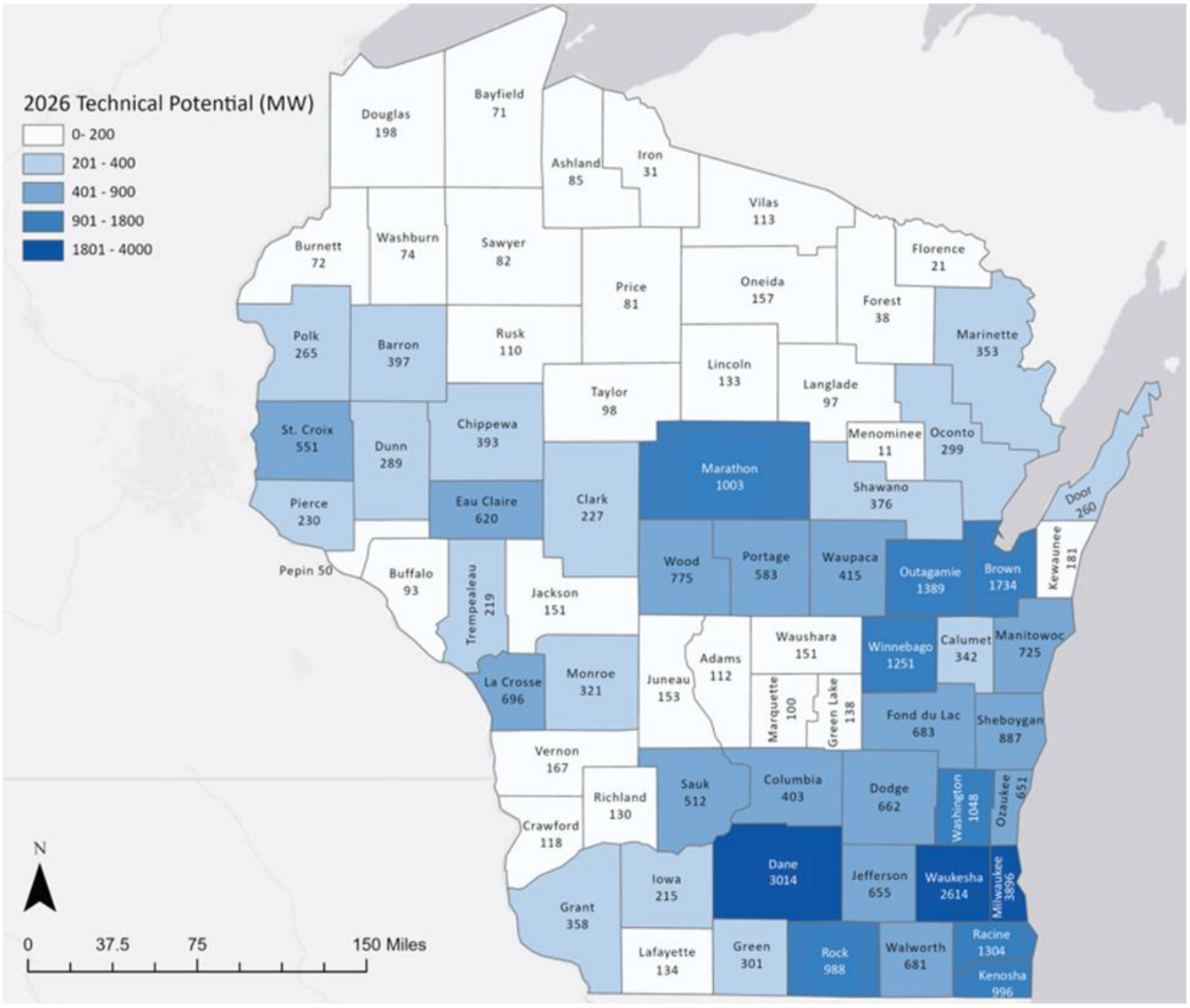
- Assess technical rooftop solar potential
- Simulate market adoption potential
- Economic scenario modeling to explore alternative policy conditions
- Understand barriers to income qualified rooftop solar adoption
- Inform Quad IV program planning and goal setting
- Incorporate stakeholder input and guidance

Spring 2021: Potential Study Launch ▶ **May 27, 2021:** First Stakeholder Engagement ▶ **June 30, 2021:** Stakeholder Engagement to Determine Economic Scenarios ▶ **August 26, 2021:** Draft Results Presentation ▶ **September 2021:** Draft Report & Stakeholder Review ▶ **October 4, 2021:** Final Report ▶ **Today:** Final Stakeholder Results Presentation

Methodology & Types of Potential Estimated

Rooftop Areas not Suitable for Solar	**Technical** Theoretical maximum system (nameplate) capacity deployed and energy produced accounting for available rooftop square footage including shading, solar PV panel production per square foot, and solar irradiation.	
Rooftop Areas not Suitable for Solar	**Not Adopted by Building Owners**	**Simulated Market Adoption Potential** Rooftop solar capacity deployed and energy produced based on simulations and economic parameters that affect the financial attractiveness from a customer perspective.

Solar PV Technical Potential



Technical Potential is concentrated in counties with most unobstructed Rooftop SQFT

Rooftop solar PV technical potential is **nearly 3x l**arger than current capacity in Wisconsin

Statewide technical potential is **70%** of statewide electric energy production

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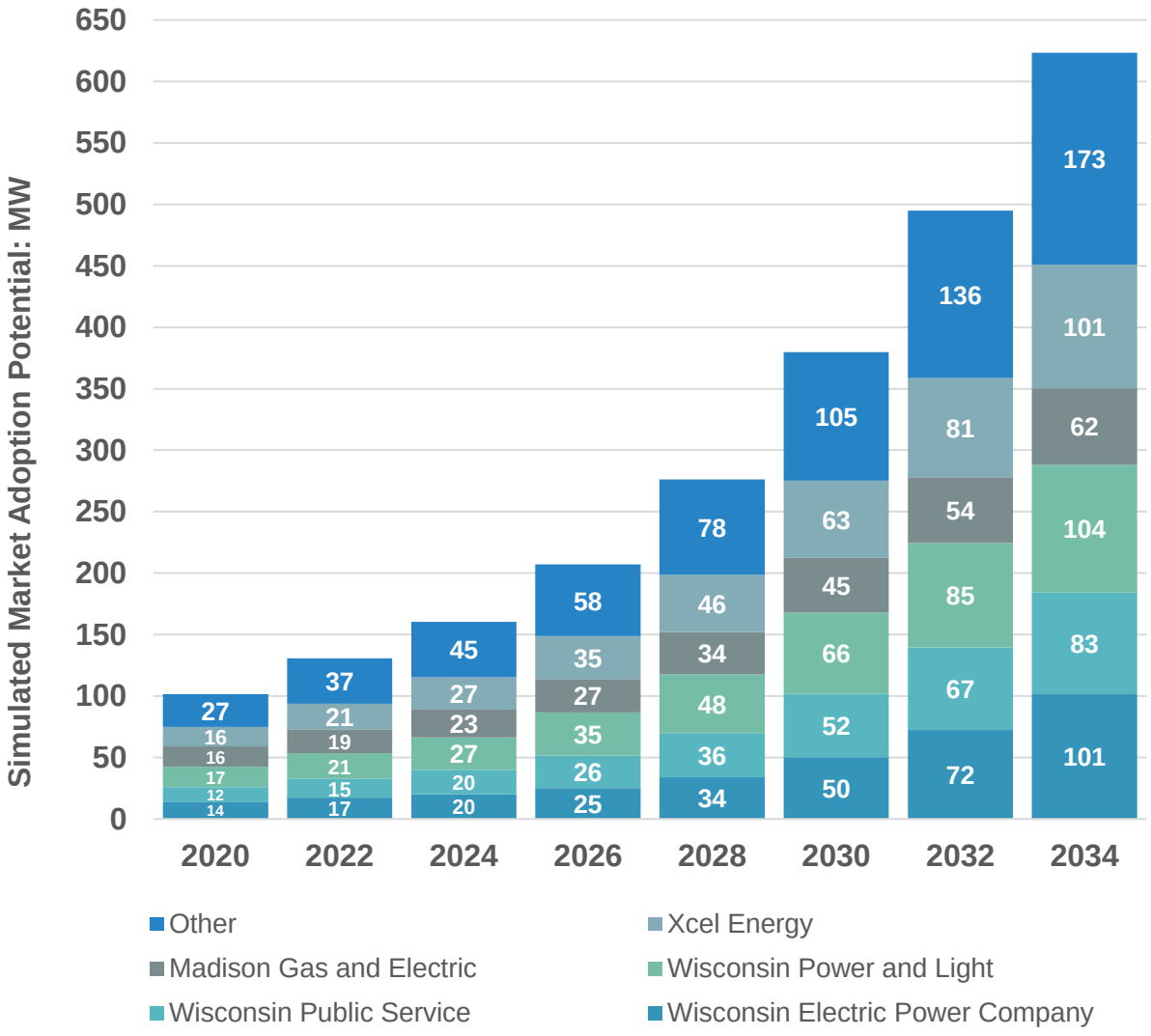
Solar Simulated Market Adoption Potential



Total Simulated Market Adoption Potential represents **less than 2%** of Technical Potential in 2034

2034 Percent of Total Simulated Market Adoption Potential

Residential

48%

Standard Income

23%

Income-Qualified

Commercial

29%

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Simulated Market Adoption Potential Scenarios

Net Metering Assumptions

Net Metering with a Maximum Capacity of **500 kW** for ALL Customers

Increased Incentive Assumptions

Residential Standard Income: **$0.9/Watt** and **$4.5K** Maximum Incentive

Residential Income Qualified: **$1.5/Watt** and **$10.5K** Maximum Incentive

Commercial: **$0.3/Watt** and **$180K** Maximum Incentive

Attractive Financing Assumptions

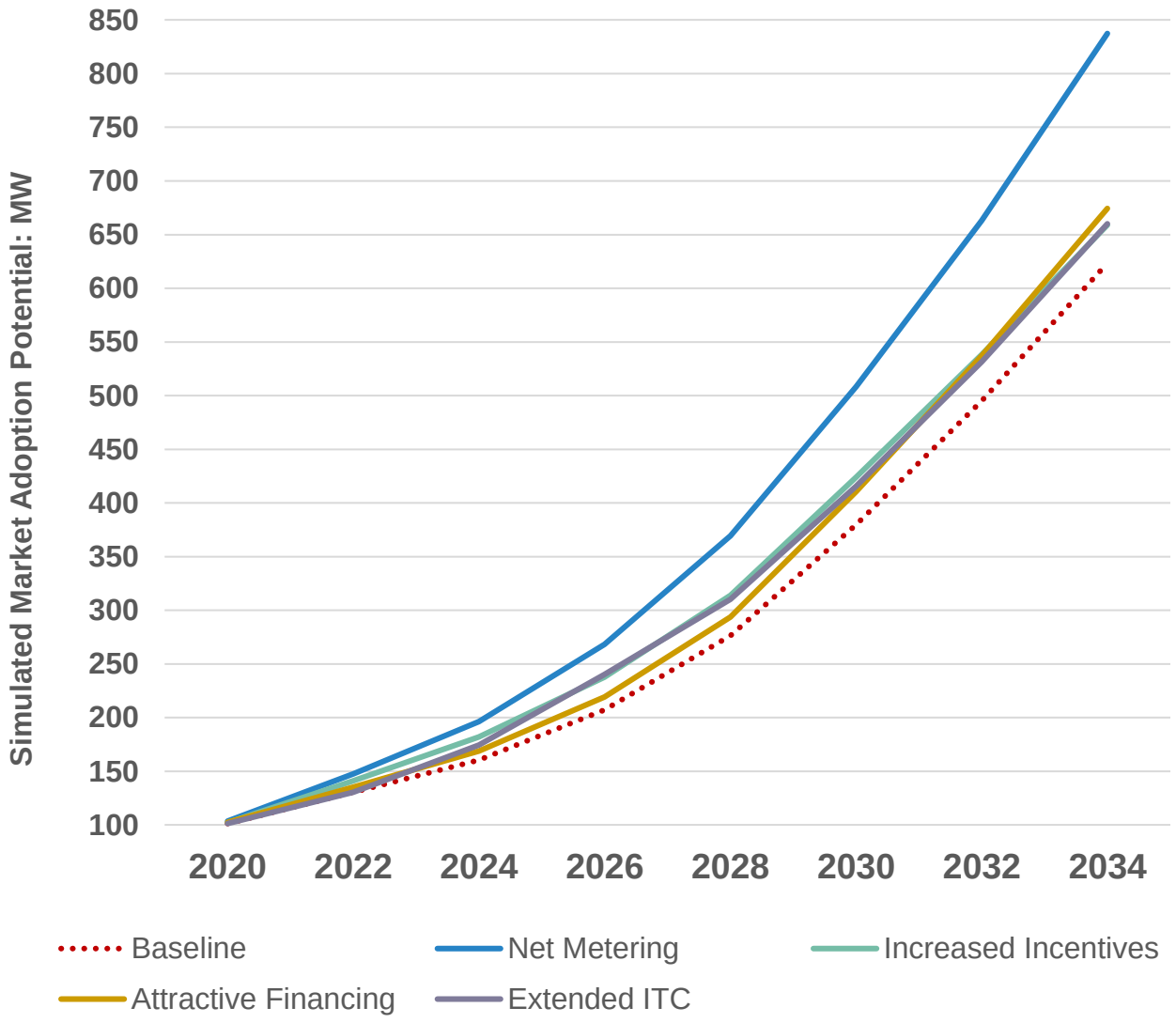
0% Down Payment Fraction

2.5% Loan Interest Rate

Extended Federal ITC Assumptions

Residential:	Commercial:
26% thru **2026**	**26%** thru **2026**
22% in **2027**	**22%** in **2027**
0% after **2027**	**10%** after **2027**

Simulated Market Adoption Potential Scenario Results



Scenario Cumulative Simulated Market Adoption Potential 2034

Baseline:
623 MW

Increased Incentives:
659 MW
(6% Increase)

Extended ITC:
660 MW
(6% Increase)

Attractive Financing:
674 MW
(8% Increase)

Net Metering:
837 MW
(34% Increase)

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Opportunities for Rooftop Solar PV by Building Type

Single family homes offer the greatest opportunity for rooftop solar PV savings

Total 2034 Simulated Market Adoption Potential

Single Family
68%

Manufactured
4%

Commercial
28%

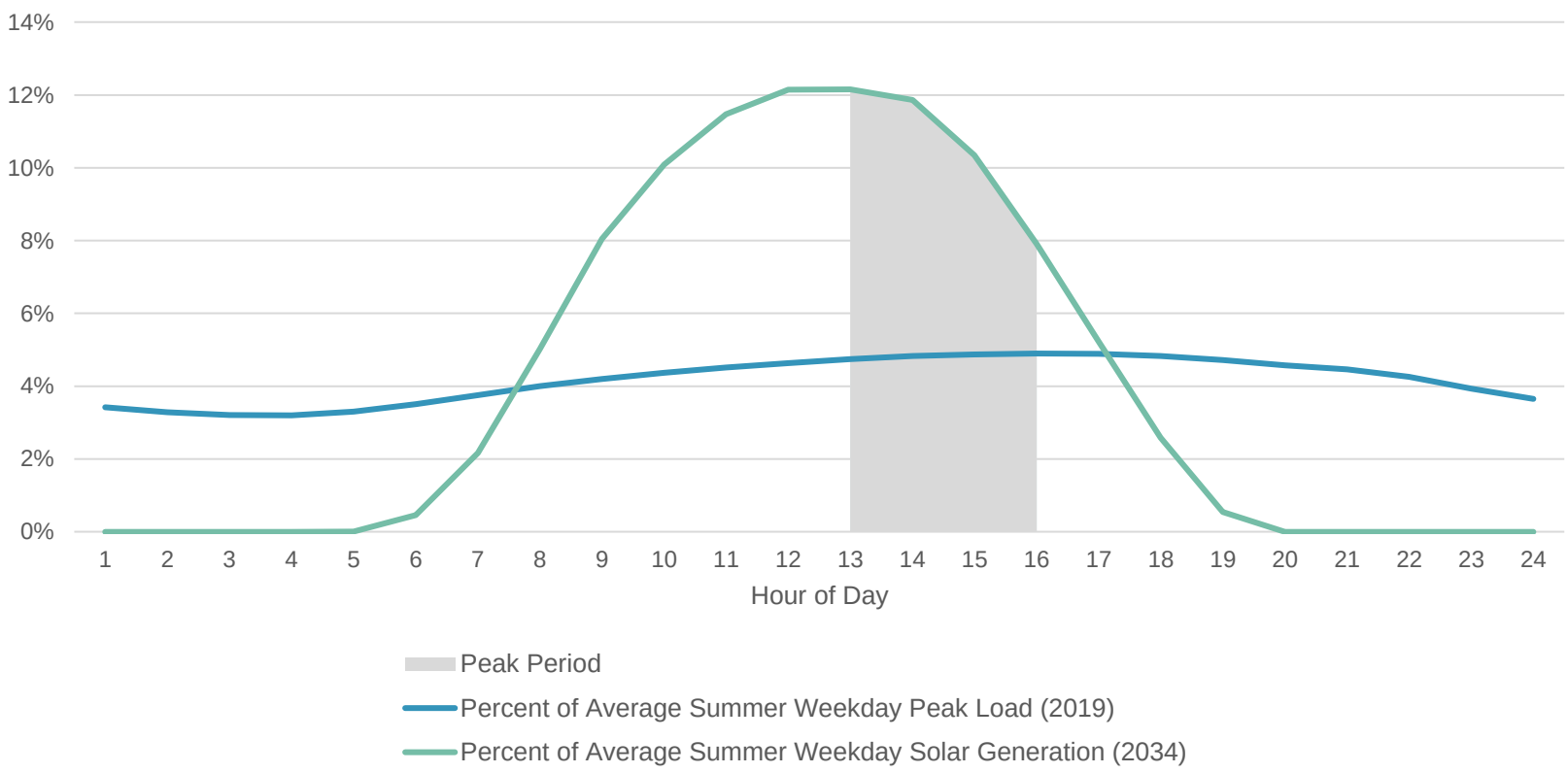
Multifamily
<1%

Largest commercial contributors:

Retail (**44%** of Commercial)
Warehouses (**18%** of Commercial)
Offices (**13%** of Commercial)

Rooftop Solar Peak Period

Rooftop solar PV generation overlaps with the summer peak period, with **42%** of the average summer daily solar generation capacity being captured during the peak hours.



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Income Qualified Barriers to Adoption

Income qualified customer homes represent 23% of 2034 simulated market adoption potential, but are presented with many barriers to adoption

	Barrier	Potential Solutions
1	**Cost Burden**	Grants/Incentives Replace Loans Flexible Incentives Third-party ownership
2	**Home-Readiness**	Grants/Incentives for Repairs Admin Support Leverage Existing EE Programs
3	**Multifamily Limitations**	Structure Incentives for Property Owners Standardize Net Metering Virtual Net Metering

Incorporation of Stakeholder Feedback

Cadmus Hosted **3** meetings and exchanged emails and documents with stakeholders

Cadmus received **49** Draft Report Comments from Stakeholders at **6** Different Companies

Examples of Stakeholder Feedback Adjustments…

- Finalized multiple modeling inputs (costs, financing assumptions, etc)
- Determined economic scenarios
- Revised final report added...
  - Context on cost effectiveness
  - Study consideration and context regarding ground mounted solar
  - Study limitation regarding granularity of population growth estimates
  - Additional detail about net metering

The Floor is Open – Feedback Welcome!

Questions/Comments?

- Potential Results
- Scenario Analysis / Impacts
- Peak Demand Impacts
- Other questions or comments?

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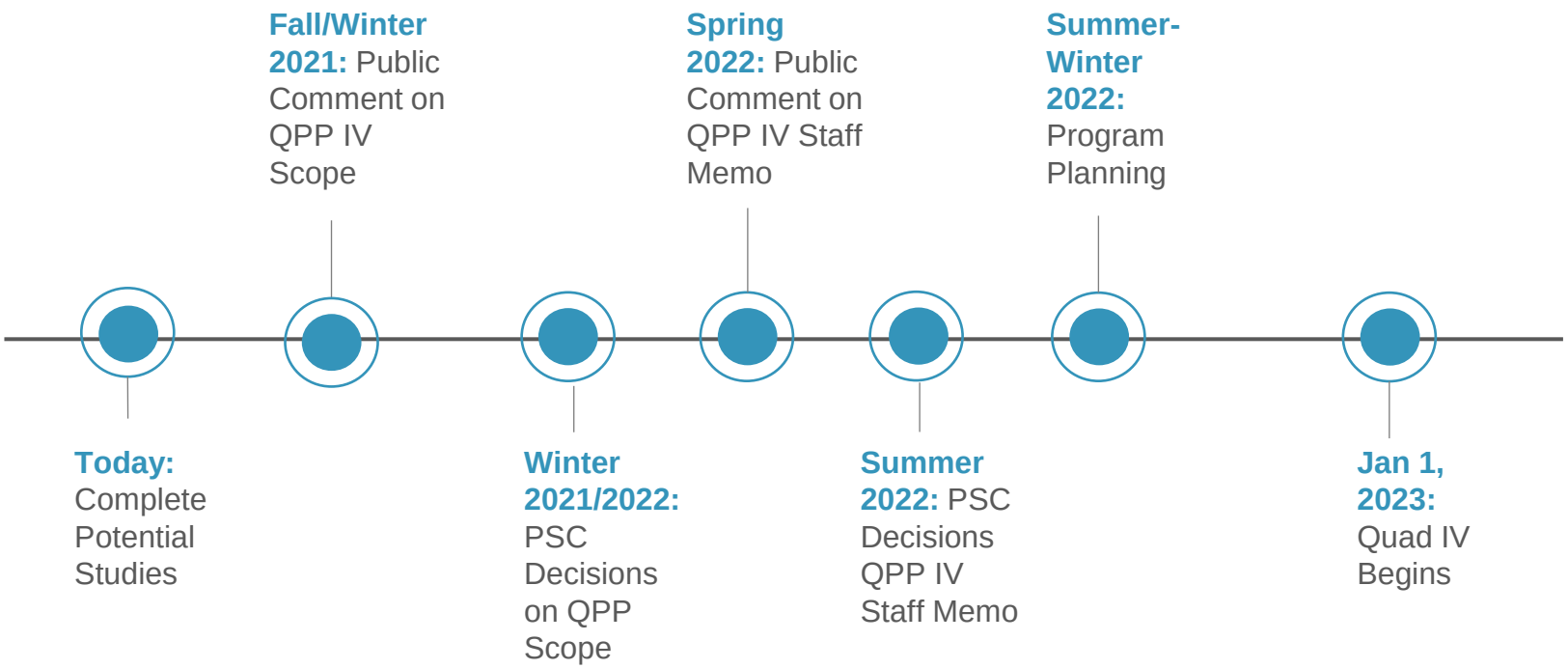
3. Next Steps

Potential Study Integration With Program Planning

Potential Study and Stakeholder Engagement 1st Step in multi-year Quadrennial IV Planning Process, PSC Docket 5-FE-104



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Quadrennial Planning Process IV Timeline

Activity	Approximate Time Period
Potential Study Final Report (Energy Efficiency)	September 10, 2021
Potential Study Final Report on Rooftop Solar PV	October 4, 2021
Presentation to Commission Regarding Potential Studies	October 7, 2021
Scope of Quad IV Planning Process – Out for Comment	Week of October 25, 2021
Comments Due (three week comment period)	November 19, 2021
Commission Decisions on Scope of Quad IV	December 2021
Comment Period on Commission Staff Memo for Quad IV – Macro Policy Decisions (two week comment period)	March 2022
Comment Period on Commission Staff Memo for Quad IV – Micro Focus Implementation Decisions (two week comment period)	May 2022
Commission Decisions on Focus Goals for Quad IV	July 2022
SEERA- APTIM Negotiate Contract for 2023-2026	August –September 2022
Program Administrator Plans/Designs Programs Based on Commission Decisions	August – December 2022
Quadrennial Planning Process IV Period Begins	January 1, 2023

Q & A

Please add questions and comments to the meeting chat.

- Quad Planning Process
- Other questions or comments?

Thank You!

Energy Efficiency Report: Potential_Study_Report-FoE_Efficiency-2021.pdf

Rooftop Solar PV Report: Potential_Study_Report-FoE_Rooftop_Solar_2021.pdf

Quad IV Commission Docket Number: **5-FE-104**