Stakeholder Meeting

Energy Waste Reduction (EWR) and Demand Response (DR) Statewide Potential Studies for 2021 to 2040

For the State of Michigan

Department of Licensing and Regulatory Affairs

December 2, 2020

Meeting Goals

1 Provide project overview and schedule

2 Highlight opportunities for stakeholder input

3 Present DR Options List and EWR Measure List

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Agenda

1 Introductions and Meeting Overview

2 Key Objectives and Approach

3 Schedule Overview

4 Market Characterization

5 DR Options

6 EWR Measures

7 Customer Survey

8 Modeling

A Appendix

MPSC Project Team

Lynn Beck
Project Manager

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EWR Lead

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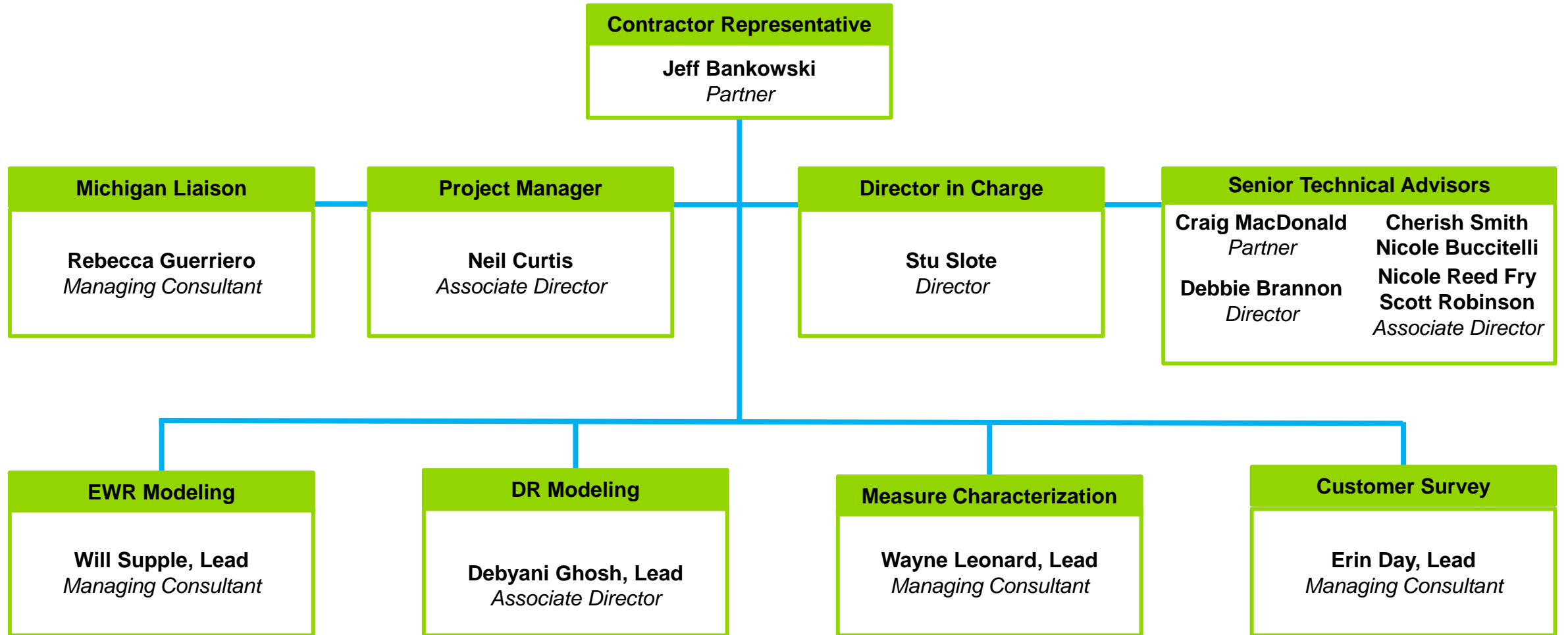
Utilities Providing Market Data

Utility	Fuel
Alpena Power Company	Electric Only
Consumers Energy	Dual-Fuel
DTE Energy	Dual-Fuel
Indiana & Michigan Power	Electric Only
Michigan Gas Utilities	Gas Only
Northern States Power (Xcel)	Dual-Fuel
Semco Energy Gas Company	Gas Only
Upper Michigan Energy Resources Corporation	Dual-Fuel
Upper Peninsula Power Company	Electric Only

- Electric Only: 3 utilities
- Gas Only: 2 utilities
- Dual-Fuel: 4 utilities
- Some dual-fuel utilities have overlapping service territories

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Key Objectives and Approach

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Key Objectives
Energy Waste Reduction (EWR)

PURPOSE: Assess technical, economic and achievable potential for reducing electricity and natural gas use, and peak electric demand in Michigan through EWR measures

Quantify technical, economical and achievable potential energy efficiency savings for system planning and GHG reduction:
- Differentiate Upper and Lower Peninsulas
- Sectors: Residential, Commercial, Industrial (C&I)

Propose energy savings targets through various scenarios

Propose appropriate EWR program funding levels

Provide program recommendations for residential and C&I customers to achieve EWR

Research and report on findings related to customer attitudes, beliefs and behaviors affecting their energy use

Examine effect of deployment and use of smart meters and interface with smart grid on enhancement of program opportunities

Market segment nuances:
- Income-eligible residential customers
- Agricultural customers
- Small commercial customers annual utility bill of $65,000 or less (for electric and gas combined)
- Upper / Lower Peninsula

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Key Objectives
Demand Response (DR)

- If possible, identify benefits of integrating DR with EWR programs
- Program benefits for DR and EWR should be reported separately

Purpose: Assess technical, economic, and achievable potential for reducing on-peak electricity usage through DR programs for all customer classes

Calculate technical, economic, and achievable potential for demand response

Discuss barriers to achieve the identified potential and how these will affect the recommended program designs

Quantify potential demand Megawatt (MW) savings at system peak for each DR program

Identify cost per MW of potential demand savings

Identify benefits from DR programs, such as utility avoided costs or benefits in the ancillary services market

Identify DR availability potential during non-peak times as well as a seasonal look at demand response programming, and emergency potential for each DR program
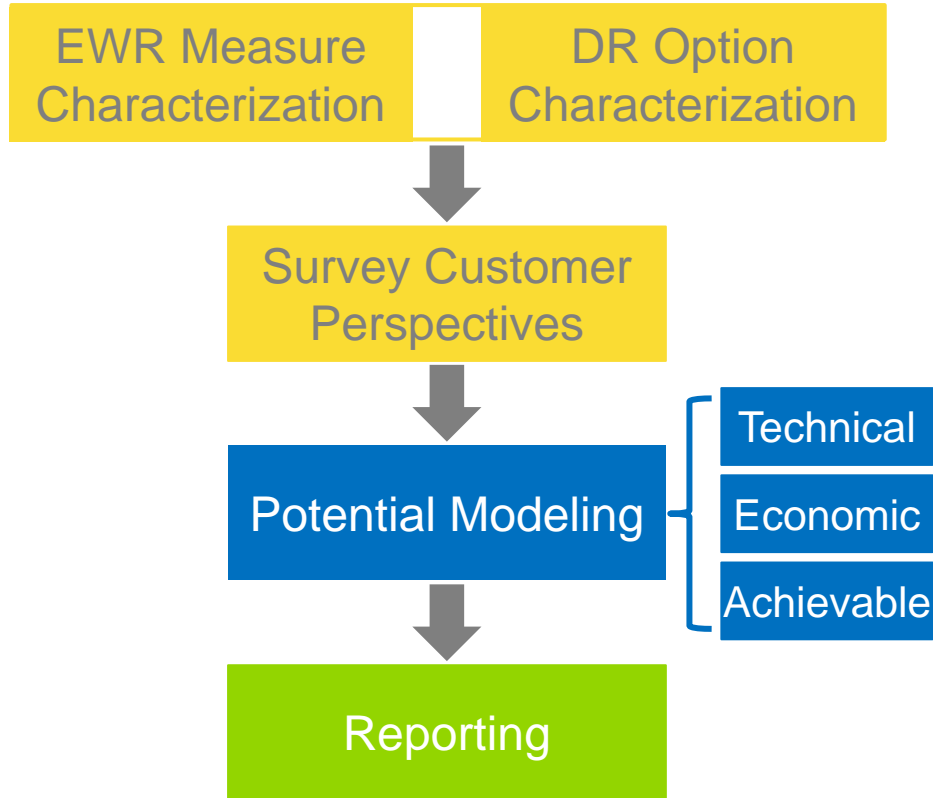
Assess how to maximize DR potential using AMI already installed in Michigan

Assess natural gas DR potential

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Schedule Overview

Project Approach

EWR Measure Characterization | **DR Option Characterization**

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Survey Customer Perspectives

↓

Potential Modeling — Technical / Economic / Achievable

↓

Reporting

Conduct Research

- Support characterization of EWR measures and DR options, customer decision-making and market adoption, codes and standards, emerging technologies, incremental costs, and other inputs and parameters necessary to estimate potentials

- All primary and secondary data collection and analysis

Develop and Run Models

- Adapt suite of potential models – DSMSim™, DRSim™ – to meet all requirements and provide all outputs desired by MPSC

- Models will be used for all potential scenarios

- Deliver Excel or web-enabled locked versions of model inputs and outputs

Draft and Final Reporting

- Draft report provided to MPSC for review; may result in questions and requests for further explanations

- Guidehouse will present draft findings at Technical Conference for stakeholders (July)

- Final report will include feedback from MPSC and Technical Conference
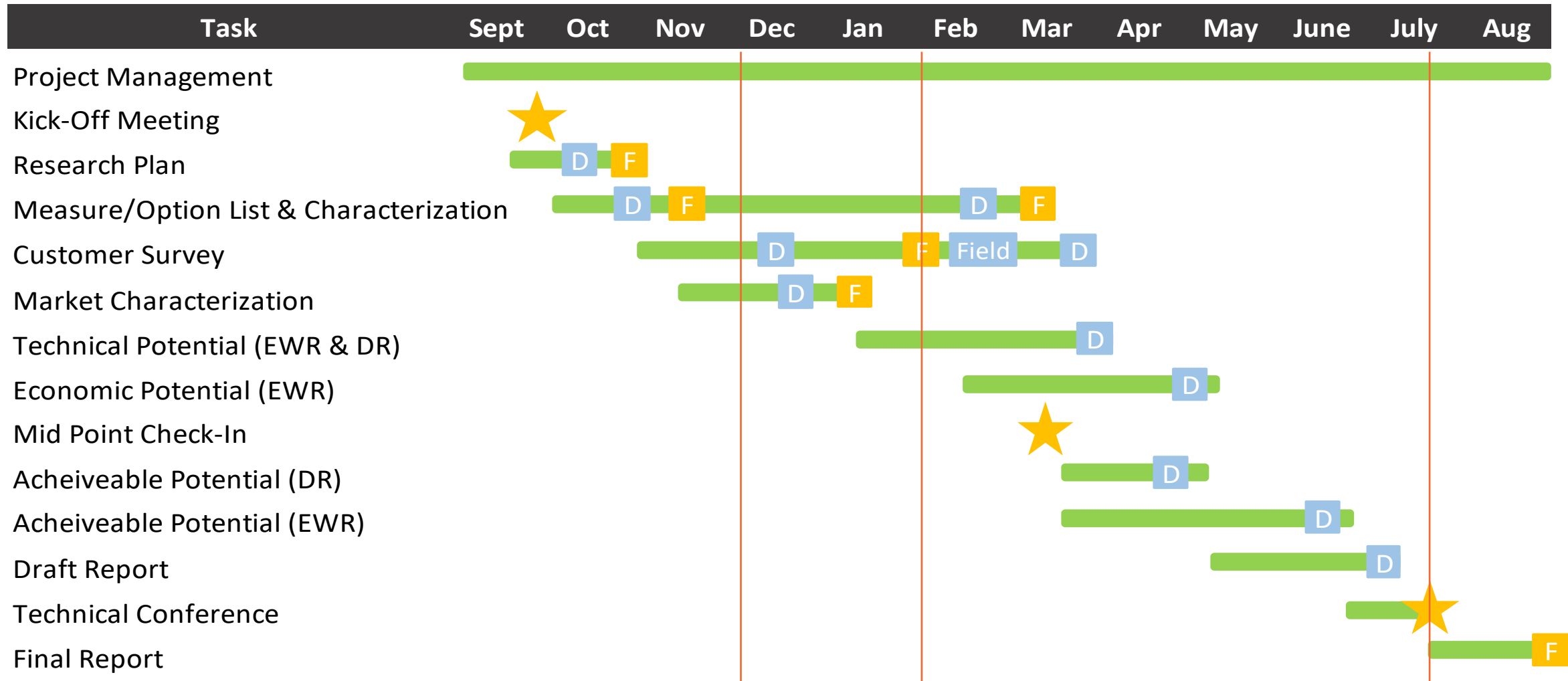
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Stakeholder Engagement and Feedback

Meeting	Topic	Timeframe
Initial Stakeholder Meeting	Project overview, stakeholder feedback of EWR Measure and DR Option lists *Today!*	December 2, 2020
Second Stakeholder Meeting	Project update, stakeholder feedback of Market Characterization results and customer survey questions	Late January 2021
Third Stakeholder Meeting *(Technical Conference)*	Review Draft Report results	Late July 2021

Questions, comments, feedback: Michigan.energystudy@guidehouse.com

Project Schedule

D = Draft   F = Final | = Stakeholder Engagement

Task	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug
Project Management												
Kick-Off Meeting	★											
Research Plan		D F										
Measure/Option List & Characterization		D F				D F						
Customer Survey			D			F Field	D					
Market Characterization			D F									
Technical Potential (EWR & DR)							D					
Economic Potential (EWR)								D				
Mid Point Check-In						★						
Acheiveable Potential (DR)								D				
Acheiveable Potential (EWR)										D		
Draft Report										D		
Technical Conference											★	
Final Report												F

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Market Characterization

EWR Study Segmentation

- One model encompass all segments, electric and natural gas; calibration at sector and end use level
- Results to be presented by sector, segment, fuel, geographic location, and end use

Area	Metric
Location	Upper / Lower Peninsula
Fuel	Electric, Natural Gas
Sector	Residential, Commercial, Industrial
Income	Residential: Low Income / Non-Low Income
Characteristics	Multifamily, C&I Small Business, Agricultural

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EWR Study Segmentation

End Use
Agriculture
Appliance
Compressed Air
Consumer Electronics
Controls
Electric Vehicles
HVAC
Information Technology
Kitchen & Refrigeration
Lighting
Miscellaneous
Motors & Pumps
Water Heating
Whole Building

Customer Segment	Mapping to Customer Segment Sector
Single Family Market-Rate	Residential
Single Family Low-Income	Residential
Multifamily Market-Rate	Residential
Multifamily Low-Income	Residential
Industrial	Industrial
Large Commercial	Commercial
Small Commercial	Commercial

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EWR Market Characterization

Data Category	Description
Segmentation	• Territory (Upper and Lower) • Sector and Segment (Income Level) • End Use
Utility Data	• Building Stock (# of Homes, 1000 sq. ft. building space, sector consumption) • Sales Forecast • Load Shapes • Avoided Costs • Retail Rates • Discount Rates • Line Losses
Customer Data	• End Use Allocations (% of segment consumption) • Space Heating and Hot Water Fuel Type Distribution • Willingness to Pay and Technology Awareness
Design Framework	• Fixed and Variable Program Administrative Costs • Historical Program Achievements • Incentive Strategy

State-Wide Approach:

1. Utility data request

2. Combine results, weight by utility sales where appropriate to develop state-wide model inputs

3. Fill utility data gaps with estimates based on data reported from comparable MI utilities

DR Market Characterization

Level	Description
Level 1: Region	• Lower Peninsula, Upper Peninsula
Level 2: Sector	• Residential, Commercial and Industrial (C&I), Irrigation

Level 3: Customer Class	• Residential
	• C&I customers (based on maximum demand values)*:
	  ▪ Small C&I <=30 kW
	  ▪ Medium C&I >30 and <=200 kW
	  ▪ Large C&I >200 and <=1000 kW
	  ▪ Extra Large C&I >1000 kW
	• Irrigation/water pumping customers

Level 4: Segment / Building Type	• Residential customers
	  ▪ Market rate customers
	  ▪ Low Income customers
	• C&I customers, by business type (aligned with EWR)
	  ▪ Commercial – Office, Retail, Education, Warehouse, Restaurant, Health, Grocery, Lodging, Other
	  ▪ Industrial – Primary Metals, Automobile Manufacturing, Plastics and Rubber, Food, Fabricated Metals, Chemicals, Equipment, Paper, Others

Level 5: End Use	• Residential (space cooling, electric water heating, lighting, appliances, others) • C&I (HVAC, lighting, water heating, refrigeration, industrial processes, water pumping, thermal energy storage, etc.) • Irrigation (irrigation/water pumping) • Cross-cutting (battery, electric vehicles)

Guidehouse *The size threshold for classification by size will be firmed once we complete the data review, which is currently in progress

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DR Options

DR Options

DR Options	Eligible Customers
1. Direct Load Control (DLC) - Switch for Space cooling and heating, Water Heating	All residential, small C&I, and medium C&I customers with eligible end uses
2. Direct Load Control (DLC) - Smart Thermostat BYOT	All residential, small and medium C&I customers with smart thermostats
3. Direct Load Control (DLC) - Smart Thermostat-Direct Install	Residential, small and medium C&I with central A/C and heat pumps
4. Smart Appliances Control (including Room AC)	Residential customers with smart appliances
5. Behavioral DR	All residential
6. Irrigation Load Control	Irrigation customers
7. Capacity Bidding Program	Large C&I, Extra-large C&I
8. Demand Bidding Program	Large C&I, Extra-large C&I
9. Emergency DR	Large C&I, Extra-large C&I
10. C&I Interruptible Rates	Large C&I, Extra-large C&I
11. Time-Of-Use Rates	Residential, All C&I, Irrigation
13. Critical Peak Pricing	Residential, All C&I, Irrigation
14. Peak Time Rebate	Residential, Small C&I
15. Real Time Pricing	Large C&I, Extra Large C&I
16. DR for Ancillary Services	All customers
17. EV Load Control	Customers with PHEV and EVs
18. Behind the Meter (BTM) battery	Customers with BTM batteries
19. Thermal Energy Storage	C&I customers with TES system
20. Voltage Optimization	All

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EWR Measures

EWR Measure List and Characterization

Measure Definitions

- Measures are defined by a unique combination of end-use, sector (Res., Com., Ind.), and fuel type (electric, gas)
  - Replacement type distinctions delineate between technologically similar measures (E.g., retrofit/early replacement, replace on burnout (ROB), new construction, dual baseline, or behavior)
- A Competition Group is a sub-set of measures that may replace the same baseline technology
- Emerging Technology measures are known / existing technologies with reasonable chance of customer adoption within study timeframe, with rapidly changing costs or efficiencies through economies of scales or R&D
- Fuel switching measures are not included

Core Measure Development Process

- Compile comprehensive measure list, and recommend 100 EWR measures for inclusion
  - A high-level screen is applied based on savings potential (high, medium, low) and measure market maturity
  - Review and finalize 100 measures with greatest savings potential or market opportunity
- Refine analysis for 100 measures; with savings algorithms, baseline measure characteristics, load shapes, measure costs, researching regionally appropriate inputs
- Analysis is passed through automated QC process, reviewed and checked for cost effectiveness

Result

- Characterize 100 EWR measures, including near-term emerging technology measures
- Measure savings not included in the top 100 will be incorporated as uncharacterized potential (less than 10% of total potential)

Measure List: Top 100 Roll-Up
Measure Example

Top 100 Measure List

	Sector	Measure Name	MEMD Measure Category	GH Measure Classification	Replacement Type (RET, NEW, ROB)	Electric/ Gas
1						
28	Residential	LED Tube - RET Only - Electric	Lighting	LED Tube	RET Only	Electric
29	Residential	Lighting Controls - RET Only - Electric	Lighting	Lighting Controls	RET Only	Electric
30	Residential	Low Flow Aerators - RET Only - Electric	Water Heating	Low Flow Aerators	RET Only	Electric
31	Residential	Low Flow Aerators -				
32	Residential	Pipe Insulation - RET				
33	Residential	Showerheads - NEW				

Residential Single Family Measure Roll-Up Detail

	Measure Name	Measure Category	Measure Classification	Proposed Technologies for Measures Library
1				
64	LED Tube - RET Only - Electric	Lighting	LED Tube	1L 2' LED Tube replacing T12 1L 2' lamp
65	LED Tube - RET Only - Electric	Lighting	LED Tube	1L 2' LED Tube replacing T8 1L 2' lamp
66	LED Tube - RET Only - Electric	Lighting	LED Tube	1L 3' LED Tube replacing T12 1L 3' Lamp
67	LED Tube - RET Only - Electric	Lighting	LED Tube	1L 3' LED Tube replacing T8 1L 3' Lamp
68	LED Tube - RET Only - Electric	Lighting	LED Tube	1L 4' LED Tube replacing T12 1L 4' lamp
69	LED Tube - RET Only - Electric	Lighting	LED Tube	1L 4' LED Tube replacing T8 1L 4' lamp
70	LED Tube - RET Only - Electric	Lighting	LED Tube	2L 4' LED tube replacing T12 1L 8'
71	LED Tube - RET Only - Electric	Lighting	LED Tube	2L 4' LED tube replacing T8 1L 8'
72	LED Tube - RET Only - Electric	Lighting	LED Tube	1L 2' LED tube replacing T5 1L 2'
73	LED Tube - RET Only - Electric	Lighting	LED Tube	1L 3' LED tube replacing T5 1L 3'
74	LED Tube - RET Only - Electric	Lighting	LED Tube	1L 4' LED tube replacing T5 1L 4'
75	LED Tube - RET Only - Electric	Lighting	LED Tube	2L 4' LED tube replacing T5 2L 4'
76	LED Tube - RET Only - Electric	Lighting	LED Tube	1L 4' LED tube replacing T5HO 1L 4'
77	LED Tube - RET Only - Electric	Lighting	LED Tube	2L 4' LED tube replacing T5HO 2L 4'
78	Lighting Controls - RET Only - Electric	Lighting	Lighting Controls	Daylighting Control
79	Lighting Controls - RET Only - Electric	Lighting	Lighting Controls	Occupancy Sensor
80	Low Flow Aerators - RET Only - Electric	Water Heating	Low Flow Aerators	Low Flow Faucet Aerators 1.5gpm electric water

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Customer Survey

Customer Survey

Survey Fielding

- **Residential Customer Online Survey**
  - Stratification: geographic region (upper / lower peninsula), income level, residence type (single family and multi-family)
- **Commercial / Industrial Customer Online Survey**
  - Stratification: geography (upper/lower peninsula), business/industry type, commercial customer class (small/large)

Survey Objectives

- Awareness and willingness to pay, including effect of COVID-19 to inform modeling
- Customer perspectives on EWR and DR, barriers and recent energy use decisions, and associated impacts on achievable potential
- Awareness of current EWR and DR programs, and willingness to participate in DR
- Customer willingness to adopt joint EWR-DR technologies (e.g., smart thermostats, networked LEDs, smart water heaters)
- Final survey design goals will be informed by preliminary review of existing baseline studies

Survey Outreach

- Guidehouse will address customers as "Michigan energy user" in survey invitations
- Survey questions may be addressed to: Michigan.energystudy@guidehouse.com

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Modeling

EWR Modeling Technical Potential

What is the theoretical maximum savings that could be achieved with no barriers or time delays?
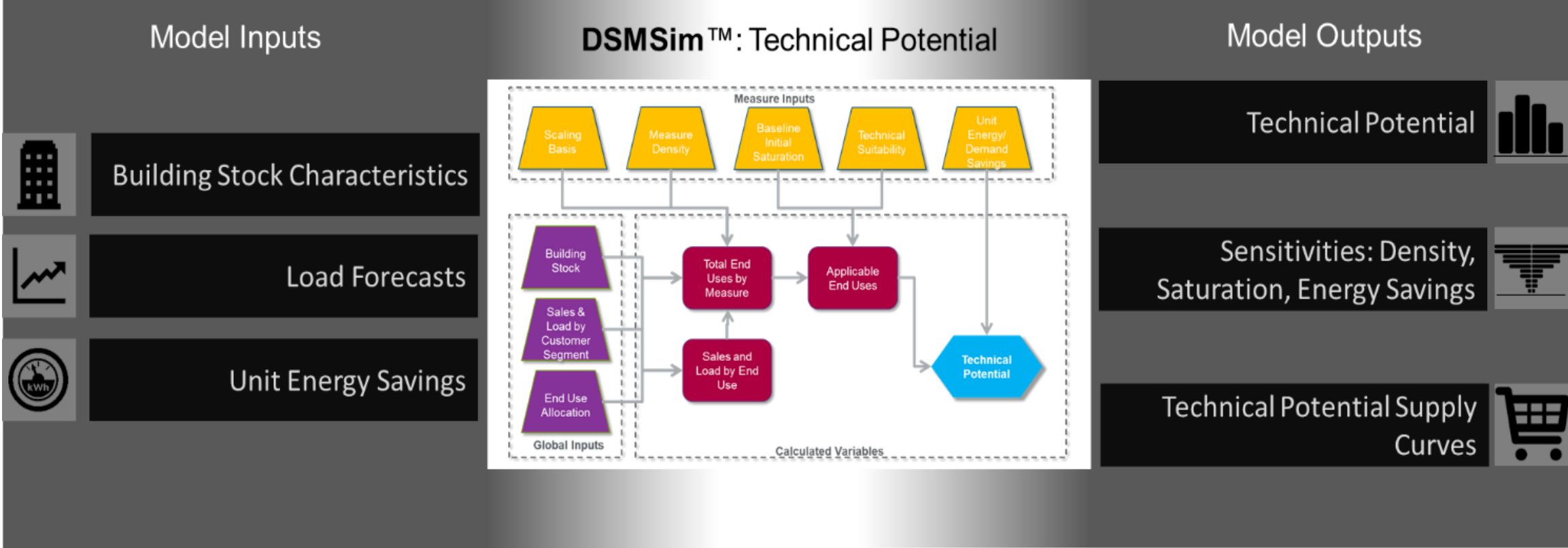
EWR Modeling Economic Potential

How much of that theoretical potential is cost-effective based on a Utility Cost Test ratio threshold of 1.0?
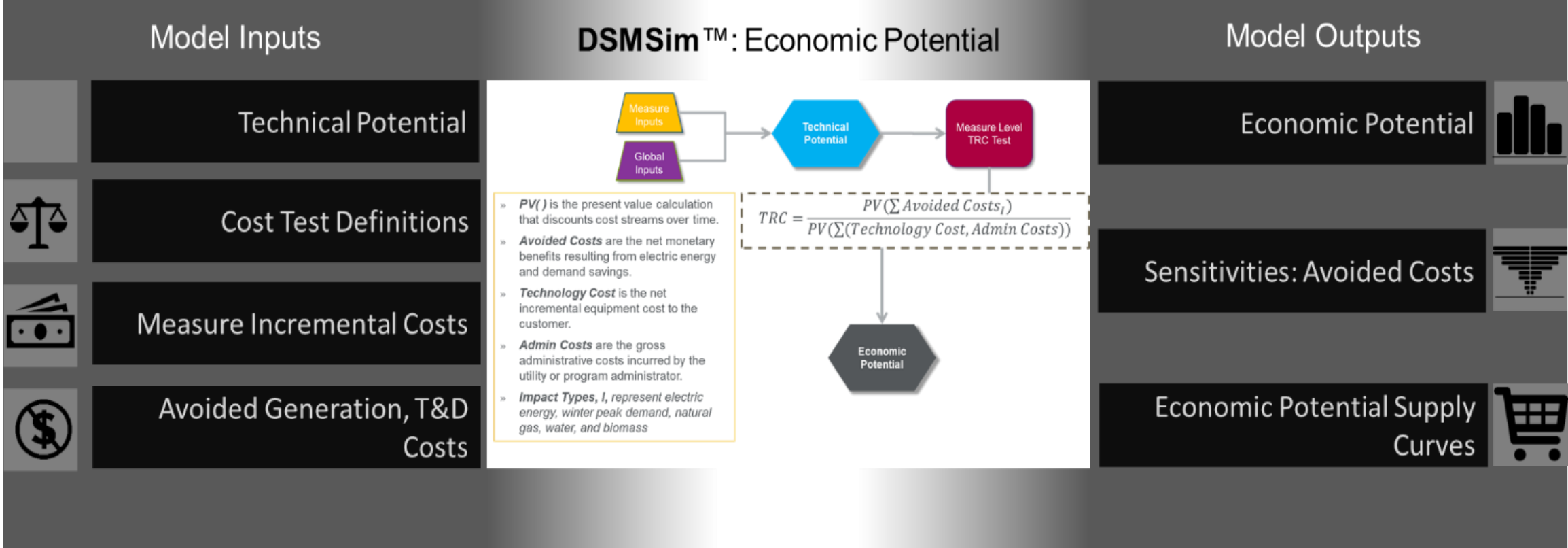
EWR Modeling Achievable Potential

How much savings can be achieved given customer technology awareness, willingness to pay, and utility spending and marketing strategy?
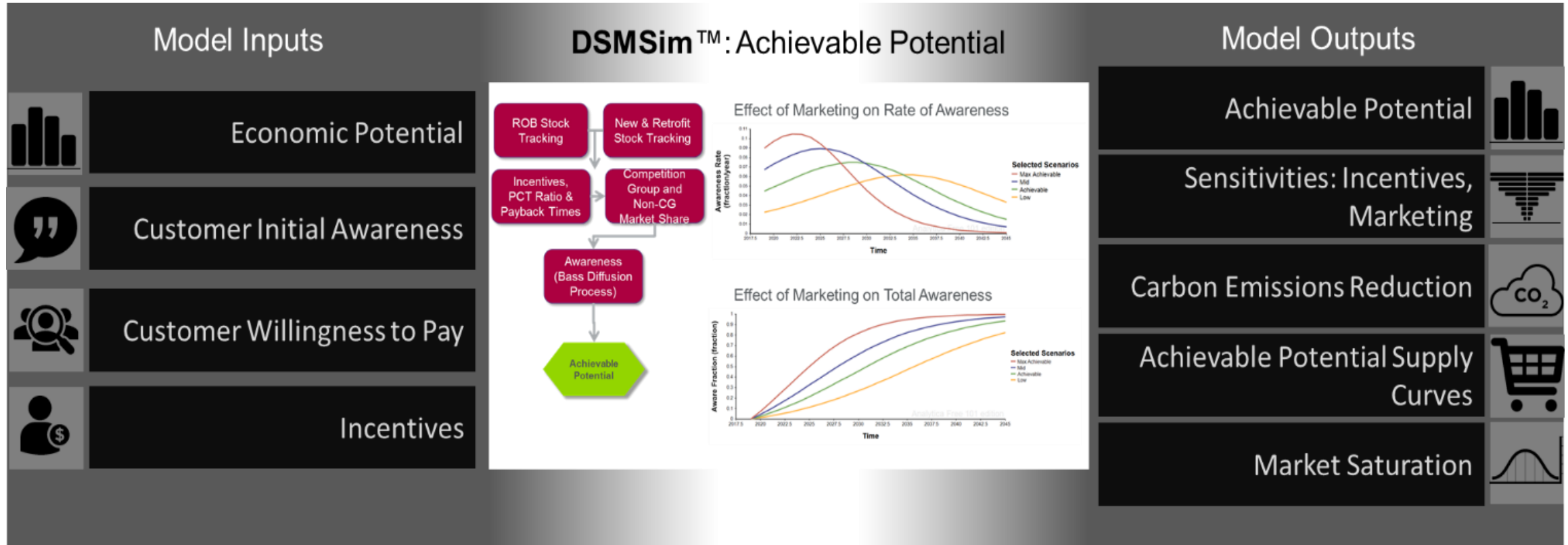
EWR Modeling

Guidehouse's DSMSim™ model uses custom inputs and a core analytic engine to estimate EWR potential and cost effectiveness
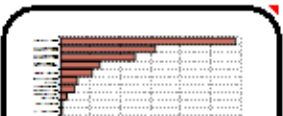
» Flexible platform for multi-dimensional analyses

» User-friendly, graphical interface

» Easy viewing/export of input and output tables

DR Modeling

Guidehouse's DRSim™ model uses custom inputs and a core analytic engine to estimate DR potential and cost effectiveness

» Flexible platform for multi-dimensional analyses

» User-friendly, graphical interface
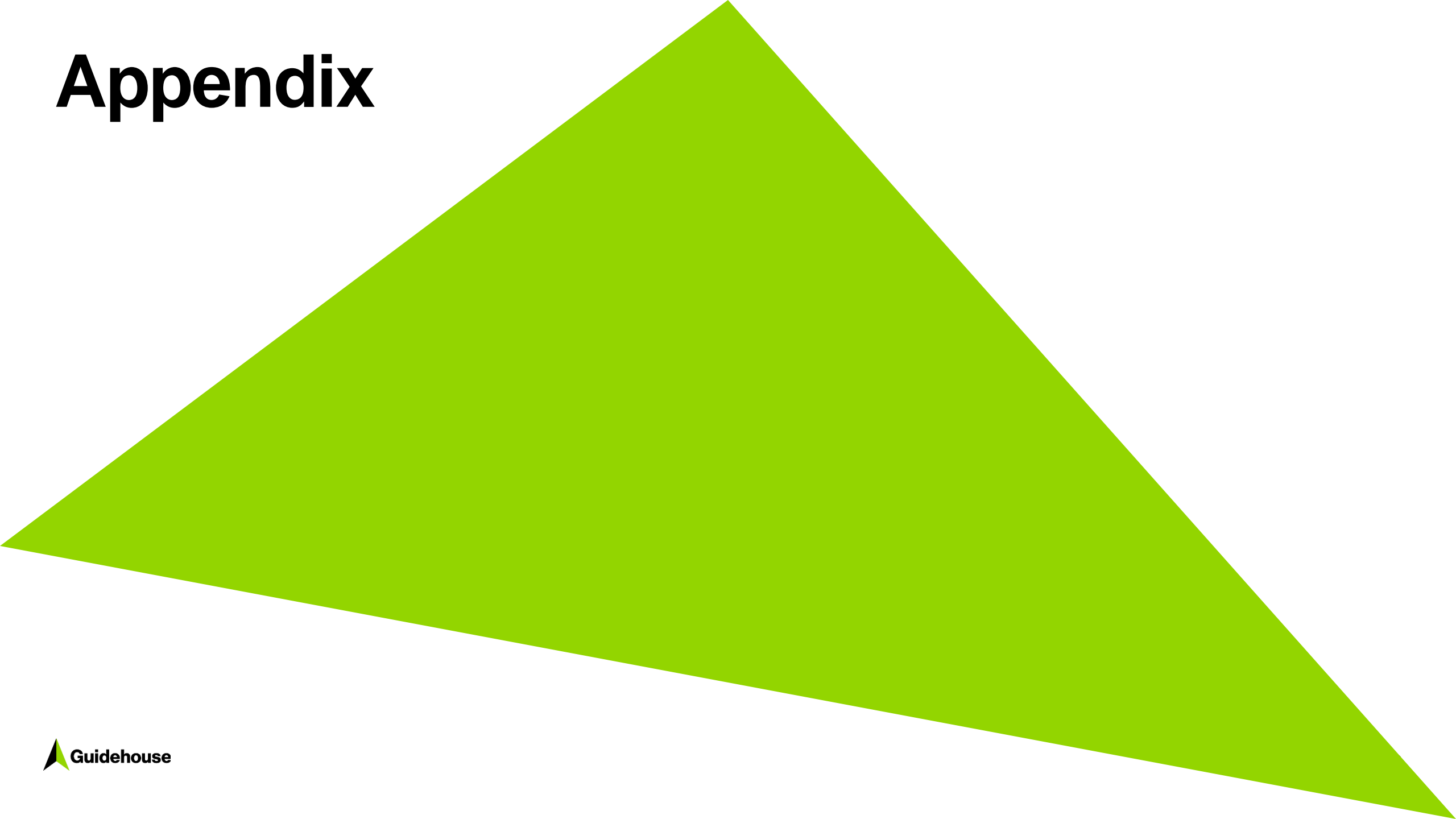
» Easy viewing/export of input and output tables

Next Steps

- EWR Measure and DR Option Lists – Stakeholder Feedback – December 9, 2020

- Draft Customer Survey – early January 2021

- Second Stakeholder Meeting – late January 2021

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Appendix

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Guidehouse Contacts

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