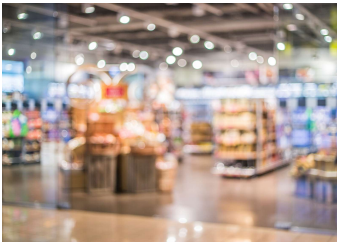


January 11, 2019



Board Workshop:

Savings and Cost Effectiveness



Agenda Topics

Part 1: Overview of Current Process and Data

1. Reporting process overview
2. Savings reporting
3. Cost effectiveness reporting
4. ACE model walk through

Part 2: Overview of Data Resources

1. Online resources, current
2. Online resources, new
3. Additional data sets

Part 3: Future Workshop Scoping

Q&A Throughout

Part 1: Overview of Current Process and Data

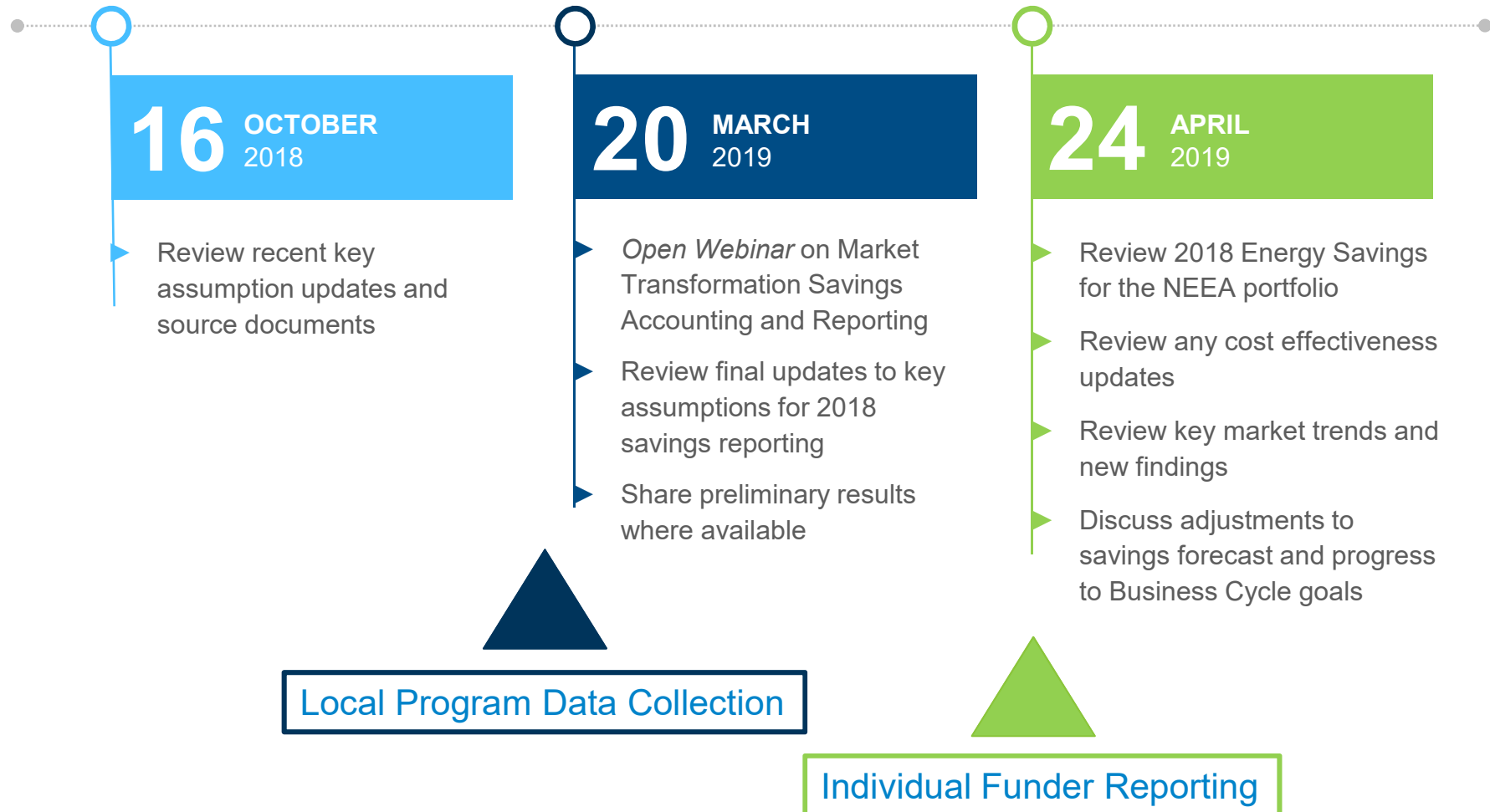
Reporting Process Overview

Responsibilities of CEAC (Cost Effectiveness Advisory Committee)

(from CEAC Charter)

1. Conduct an annual review of NEEA cost effectiveness and aMW savings information for reporting purposes.
2. Review market transformation cost and savings measurement and estimation methods.
3. Lead the annual process of providing funder-incentive data for your organization.
4. Provide feedback on evaluation methodologies.

Annual Reporting Process and Engagement with CEAC



Key Assumptions and Inputs

Examples of data employed for calculating savings and cost effectiveness

- Tracked Units
- Local Program Units
- Baseline Units
- Savings Rate
- Incremental Cost per unit
- Non-Energy Benefits value
- Measure Life
- O&M Costs
- Usage assumptions
- Etc.

NEEA has a process to review Key Assumptions

Developing Key Assumptions:

NEEA staff develops Key Assumptions through internal analysis, external studies, and the Regional Technical Forum and its Subcommittees (objective being full collaboration and alignment)

Validating Key Assumptions:

NEEA staff commissions 3rd party evaluations for new Key Assumptions and for changes to Key Assumptions used in the reporting of savings

Reporting Key Assumptions:

NEEA staff reviews new and updated Key Assumptions with the CEAC every quarter. Additionally, NEEA staff will highlight any Key Assumptions that may warrant updating, and solicit input from the committee for better data to inform a Key Assumption

Documenting Key Assumptions:

Provided online and in meeting materials to CEAC every quarter. Documentation includes the Key Assumption name, the value and the source of the assumption

Key Assumptions are provided in the reporting process

- Quarterly summary published and distributed to CEAC every quarter
 - Highlights changes
- Quarterly documentation of full key assumption set provided via link to CEAC every quarter
- All CEAC materials posted on-line
 - Conduit, now neea.org
- Key assumptions documentation provided within each individual savings report

Q&A

Savings Reporting

NEEA Has Two Primary Reports

They all contain the **Calculations** and the **Key Assumptions Sources and Inputs**.

1. NEEA baseline reports
2. Power Plan baseline reports

Each Annual Report includes a summary memo and spreadsheet

Memorandum

March 31, 2018

TO: XXXX

CC: XXX

FROM: Christina Steinhoff, Planning Analyst

SUBJECT: 2017 Annual Savings Report



This report provides NEEA's electric energy savings estimates for 2010-2017. These savings estimates are part of NEEA's 2017 Annual Report. This memo summarizes savings results and explains changes from previous savings reports. The appendix provides a brief description of the savings allocation and baseline approaches.

Also attached is a spreadsheet providing additional detail about NEEA's savings calculations.

Please do not hesitate to contact Christina Steinhoff at 503.688.5427 with any questions about this report.

2017 Savings Estimate Summary

XXXX's 2017 (calendar year) energy savings associated with NEEA initiatives is 9.7 aMW (Table 1). These energy savings are above the Northwest Power and Conservation Council's 7th Power Plan baseline and exclude an estimate of savings that Energy Trust of Oregon, Bonneville Power Administration and local utilities claim through locally run programs. NEEA allocates energy savings based on funder share.

Three Elements Common to Each Report Type

1. Summary Tables
2. Calculations
3. Key Assumptions

Spreadsheets have calculations for as many as 200 measures

Measure Detail	Sector	Residential
	Initiative	Ductless Heat Pumps
	Measure	Install Ductless Heat Pump in Single Family Home with Existing Electric Forced Air Furnace Heat- Any Climate Zone- Weighted for Supplemental Fuel Use
	Product	DHP FAF
	Tier	Tier 1
	Code or Standard	0
	Load Shape(s)	R-All-HVAC-ERconvertDHP-HZ1-All-N, R-All-HVAC-ERconvertDHP-HZ2-All-N, R-All-HVAC-ERconvertDHP-HZ3-All-N
	Measure Life (yrs.)	15
	Year	2018
	Forecast/ Estimate	Forecast
Regional Summary	Regional Units	1,789
	Local Programs	1,470
	NEEA Baseline	151
	Retirements	-
	Net Market Effects Units	292
	Savings Rate (kWh/ Unit-Year)	2,456
Allocation	Funder Share	100%
Per Savings	Share of Total Regional Savings (aMW)	0.5
	Share of Local Programs (aMW)	0.4

Spreadsheets have key assumptions for each product

Ductless Heat Pumps

Report: NEEA Baseline and Technical Assumptions

2016 Market Transformation Status

Ductless Heat Pumps	Currently Funded	Initiative Lifecycle Phase: Market Development
---------------------	------------------	--

Ductless Heat Pumps	Accelerate the adoption and market acceptance of inverter-driven ductless heat pumps in electrically heated homes.
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aMW Savings			Total Resource Cost Metrics		
Total	Regional	Co-Created	Levelized Cost / kWh	B/C Ratio	
2016	3.9	0.7	2.8	4.00	1.2
2015-2019	26.9	7.2	19.9	5.90	

2016 Data Sources and Market Research and Evaluation Reports

Market Research and Evaluation Report	ILLUME, 2016. Ductless Heat Pump Market Progress Evaluation Report #4. Cadmus, 2017. DHP/HPWH ACE Model Review Memo.
Sources:	CLEARresult, 2017. Compilation of Program Data. (dataset). NEEA, 2017. Annual Local Programs Survey. (dataset).
Tracked Units	Granularity: At the service territory level for incented units or approximately 80% of reported data. The remaining data are collected at the state level.

Key Assumptions

DHP SF Existing Displace annual			
Measure	Install Ductless Heat Pump in Single Family House with Existing Zonal Heat-Any Climate Zone- Weighted for Supplemental Fuel Use	Drivers	Source
Stock	Number of existing single-family homes in the NW with electric zonal heat	Estimated: The estimate is based on the share of existing single-family homes with electric zonal heating systems.	Ecofys, Inc. 2012. Residential Building Stock Assessment (RBSA) Single-Family Homes. (dataset).
Tracked Units	30,100 [19,346 cumulative (37% penetration)]	Estimated: In 2016, 75% of the installations were tracked through the local programs survey. NEEA estimates the remaining installations using state-level sales data from distributors and a 2015 survey of installers to apportion the non-tracked units to housing types and heating systems.	NEEA, 2017. Annual Local Programs Survey. (dataset). CLEARresult, 2017. Completion of Program Data. (dataset). ILLUME, 2015. Market Progress Evaluation Report.
Local Program Units	7,470	Tracked: Results of 2016 Local Programs Survey. Update: Adjusted for savings differential between Unit Energy Savings for 'Any Heating Seasonal Performance Factor' about 3.0' and the tracked Unit Energy Savings NEEA uses.	NEEA, 2017. Annual Local Programs Survey. (dataset). CLEARresult, 2016. Completion of Program Data. (dataset).
Baseline Units	4,200	Estimated: Less than 1% of the market would have installed a DHP without market intervention by NEEA and its partners.	Evergreen Economics, 2013. Review of Cost-Effectiveness Modeling Assumptions for the Northwest Ductless Heat Pump Project.
Savings Rate	2,090 kWh/ installation of one indoor and one outdoor unit	Estimated: NEEA is using the 2015 RTF proven rate, weighted by climate zone. Update: NEEA has applied a distribution of efficiency levels observed in the sales data to the RTF's tiered measures to reflect the increased savings from higher performance equipment.	Regional Technical Forum, 2015. DHP for Zonal Heat SF. Proven. Reviewed: Cadmus, 2017. DHP/HPWH ACE Model Review Memo.
Incremental Cost (\$/unit)	\$ 4,043 \$/installation of one indoor and one outdoor unit in 2016 dollars	Estimated: ILLUME recommended that the Consumer First Cost be in a range of \$3,000 to \$4,000.	CLEARresult, 2015. Northwest ACE Approved Install Data-20110204. (dataset). Reviewed: ILLUME, 2015. Ductless Heat Pump ACE Model Evaluation - Initial Findings Memo.
Non Energy Benefits	\$ 431 Present value of non-energy benefits accrued over lifetime of system	Estimated: The additional cooling and heating comfort to homeowners (backlog) are valued at the residential retail rate of electricity.	Regional Technical Forum, 2015. DHP for Zonal Heat SF. Proven.
Measure Life	15 years	Estimated: DHPs are replaced every 15 years on average.	Regional Technical Forum, 2015. DHP for Zonal Heat SF. Proven.
O&M Costs	\$ (48) \$/year	Estimated: The supplemental fuel (wood) displaced by the DHP has been valued as an avoided cost.	Regional Technical Forum, 2015. DHP for Zonal Heat SF. Proven.

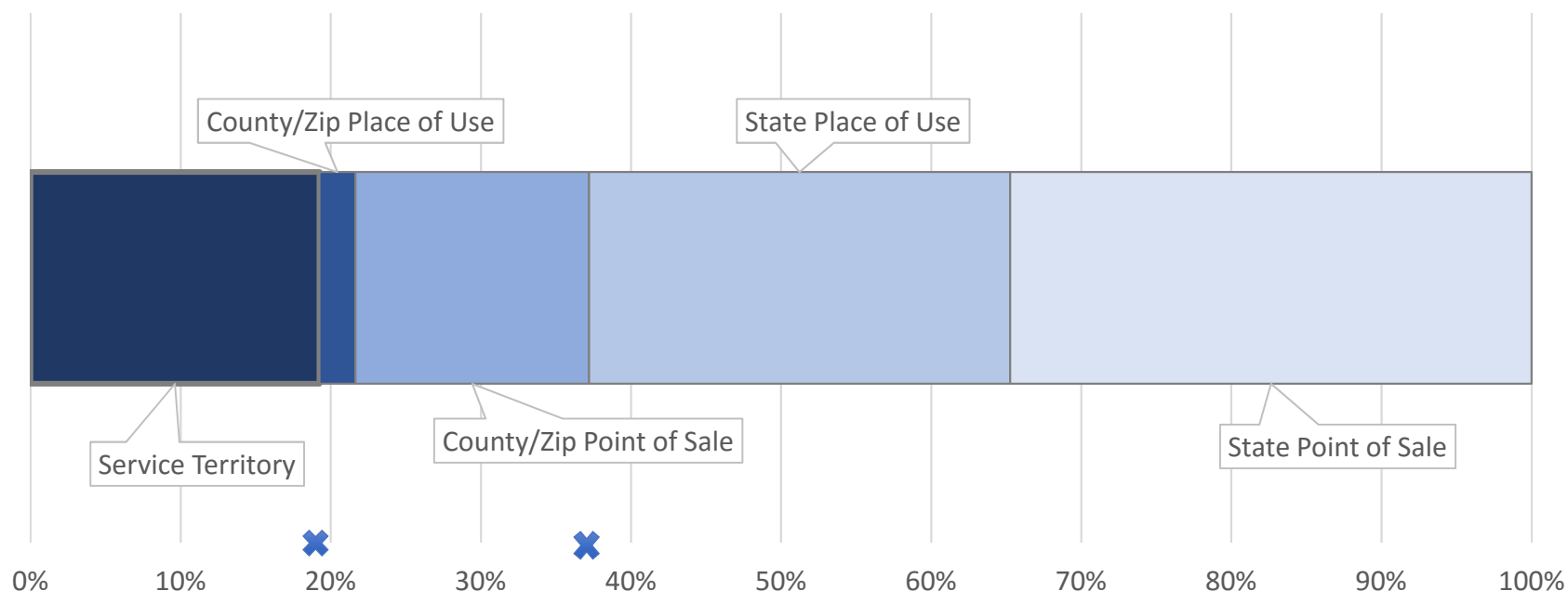
Spreadsheets include data sources (also available online)

Measure Detail	Sector	Residential
	Program	Retail Product Portfolio
	Product(s)	Freezers- Chest
	Code	No
	Standard	No
Due Diligence	Last Evaluation	<ul style="list-style-type: none"> -Evaluation in process by Apex Analytics. -Research into Action. 2016. RPP Pilot Evaluation. -Research into Action. 2016. NEEA Baseline Analysis Support. -Research into Action. 2017. Market Test Assessment. -Market approach presented to the Market Analysis Subcommittee in 2017/2018
Sources	Data Description	<ul style="list-style-type: none"> -Total Sales: County-level shipment data from the Association of Home Appliance Manufacturers. -Market Share: Regional-level estimates
	Track Units	<ul style="list-style-type: none"> -Analysis by: Energy Solutions. 2018. Consumer Products UES- Energy Solutions. (dataset). -Data from: ICF. 2018. Retail Products Platform. (dataset). -Association of Home Appliance Manufacturers. 2018. Sales Report. (dataset).
	Savings Rate	<ul style="list-style-type: none"> -Analysis by: Energy Solutions. 2018. Consumer Products UES- Energy Solutions. (dataset). -Data from: ICF. 2018. Retail Products Platform. (dataset). AND Association of Home Appliance Manufacturers. 2017. Sales Report. (dataset).
	Baseline	The NEEA baseline is based on the 2015 market share.

Walk through the savings report

- The reports are:
 - Emailed
 - Online
 - » Stored in the savings reports section of the website

A majority of units are tracked at the state-level



Notes:

- *NEEA does not forecast savings at a sub-regional level*
- *The level of geographic detail varies year-to-year*
- *Analysis is an approximation based on the 2015-2017 Net Market Effects.*
- *Analysis does not include savings from codes and standards*

Q&A

Cost Effectiveness Reporting

Calculating Benefit/Cost Ratios

NEEA calculates cost effectiveness at the measure, program and portfolio level

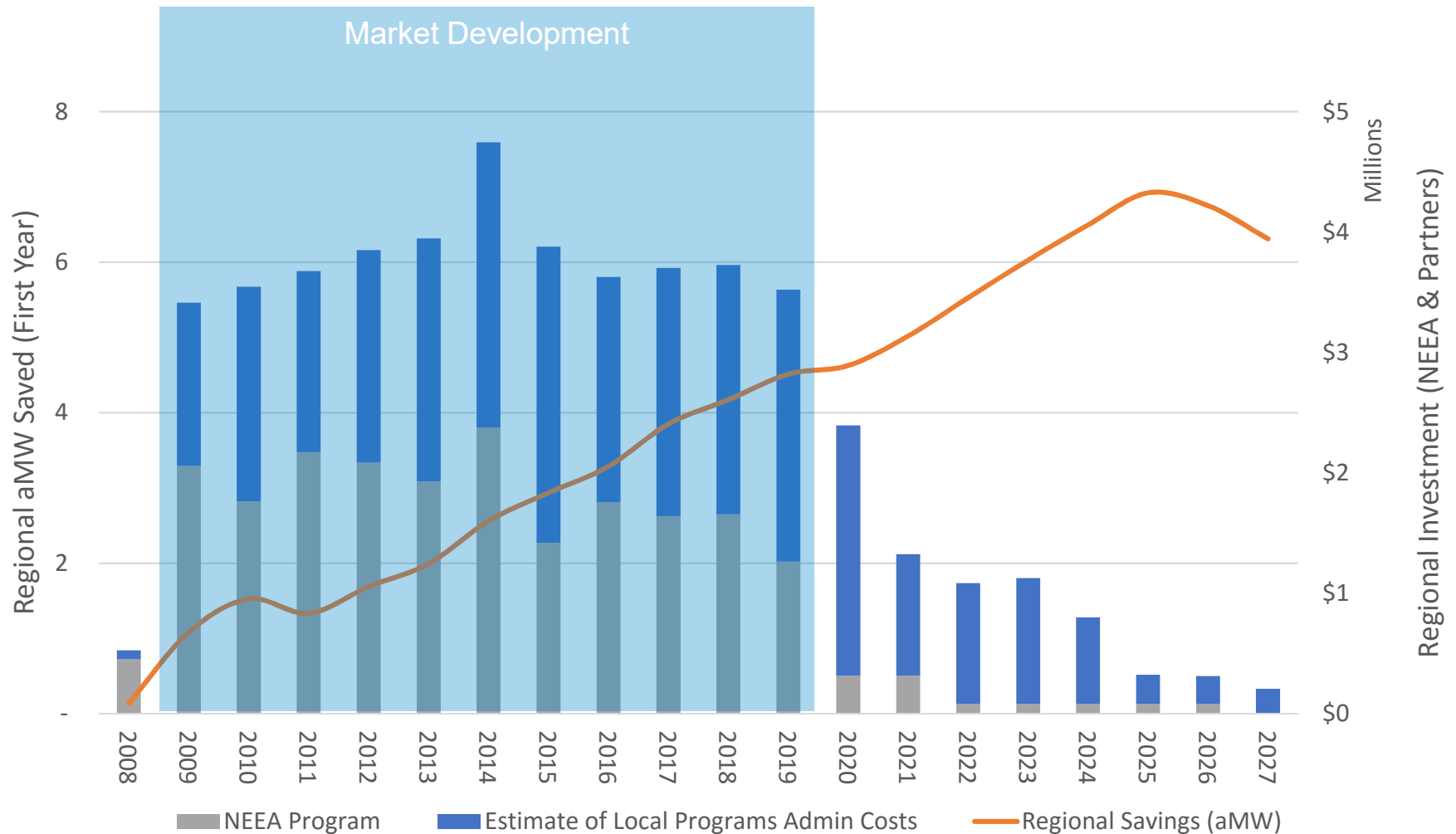
Perspective:

- Total Resource Cost
- Regional
- 20-year horizon

Tool:

- Northwest Power and Conservation Council's Regional ProCost Model

Calculating Benefit/Cost Ratios



Calculating Benefit/Cost Ratios

- Regional
 - Administrative Costs
 - » NEEA Budget
 - » Local Program Administration Costs
 - Costs to Consumer
 - » First Cost
 - » Change in O&M
 - » Non-energy Benefits
 - ProCost Assumptions
 - » Carbon
 - » Avoided Cost
 - » Line Loss Benefits

Calculating the Benefit/Cost Ratio at the Portfolio Level

Phase	Portfolio Savings Estimates	Portfolio Benefit-Cost Ratio	
	Potential Reportable 2018 Savings	NEEA Costs	All Costs and Benefits
Full Scale Market Development	Heat Pump Water Heater Ductless Heat Pumps Reduce Wattage Lamp Replacement	Heat Pump Water Heater Ductless Heat Pumps Reduce Wattage Lamp Replacement	Heat Pump Water Heater Ductless Heat Pumps Reduce Wattage Lamp Replacement
Emerging Tech/ Programs in Development	Super-Efficient Dryers Luminaire Level Lighting Controls Next Step Homes Retail Products Portfolio Window Attachments Dedicated Outdoor Air Systems Extended Motor Product Labeling Manufactured Homes	Super-Efficient Dryers Luminaire Level Lighting Controls Next Step Homes Retail Products Portfolio Window Attachments Dedicated Outdoor Air Systems Extended Motor Product Labeling Manufactured Homes	
Previous Investments	Televisions Residential CFLs Efficient Homes Drive Power Commercial Desktop Power Supplies Building Operator Certification RETA CRES	Televisions Residential CFLs Efficient Homes Drive Power Commercial Desktop Power Supplies Building Operator Certification RETA CRES	
Other NEEA Investment Activities (e.g. Stock Assessments)	N/A	Included	

The Annual Reports Contain Key Assumptions

Measure Details	Measure Application	DHP Zonal - HZ1CZ1
	Savings Component	DHP Zonal - HZ1
ProCost Inputs	Savings for Period 1 (kwh/yr.)	2,029
	Measure Life (yrs.)	15
	Capital Cost	3828.155213
	Annual O&M	-45.08242781
	Shape Pointer	R-All-HVAC-ERconvertDHP-HZ1-All-N
	Non-E Val (\$/yr.)	38.82814485
Sources	Cost Inputs Source	<p>-Northwest Heat Pump Project. 2008-2016. Average of cost for 1:1 system expressed in 2012 dollars.</p> <p>-Regional Technical Forum. 2016. ResSFExistingHVAC_v4_1.xlsm. O&M and Non-E Vals from RTF assumptions.</p> <p>-Reviewed: ILLUME Advising. 2015. MPER 4 ACE Model Review.</p>

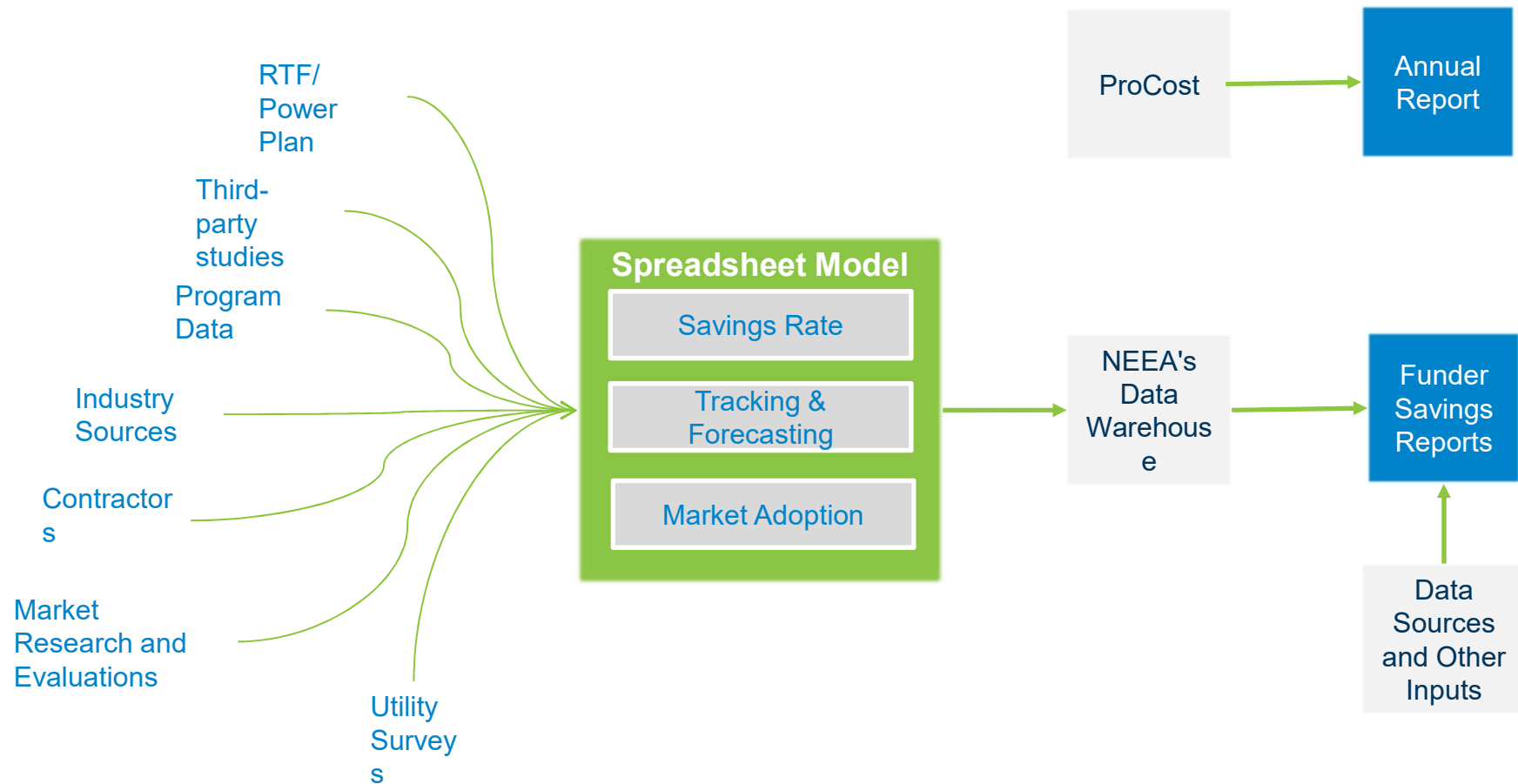
Walk through the process to estimate Cost Effectiveness

- ProCost files
- Portfolio calculation

Q&A

ACE Model Walk Through

The models join together NEEA's analysis



Walk through NEEA's models

- Ductless Heat Pumps

Q&A

Part 2: Overview of Data Resources

Where can I find this stuff?

- Individual Funder Savings Reports
- Market Research and Evaluation Reports
- Key Assumptions Overview Documentation
- Advisory Committee Materials
- TBD additional materials

neea.org/portal

Additional Data Assets

UNIT ENERGY SAVINGS VALUES (available on neea.org)

- Evaluation Reports
- Lab/Product Test Reports

MARKET RESEARCH AND EVALUATION STUDIES (available on neea.org)

- Residential Lighting Shelf Studies
- Consumer and Trade Behavior
- Market Characterization Studies

MARKET UNITS (housed internally, various levels of confidentiality and data restrictions)

- HVAC Distributors Data

 - Water Heaters, Large Unitary Equipment, Air Conditioners, Boilers, Heat Pumps, Ductless Heat Pumps, etc.

- Commercial Lighting Distributor Data

- Retailer Data

 - Various consumer products, various retailers, shipment and/or sales data

- Local Programs Data Compilation

ADDITIONAL DATA (housed internally, various levels of confidentiality and data restrictions)

- Building Characteristics Surveys: Stock Assessments

- Housing Permits

- New Commercial Building Square Footage

- End Use Load Data

Q&A

Part 3: Future Workshop Scoping

Appendix Materials

EE Market data tends to fall into one of 12 buckets

Structure



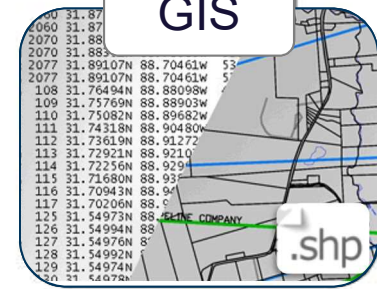
Usage



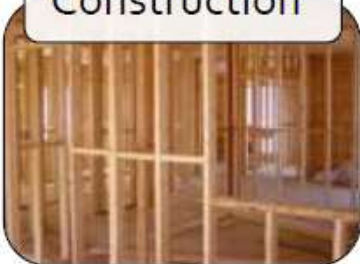
Demo



GIS



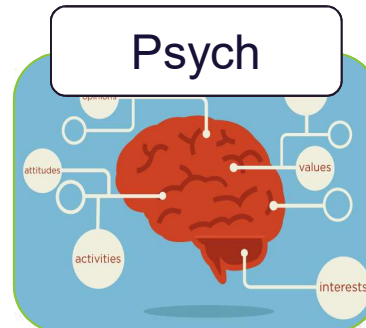
Construction



Sales



Psych



Social



Market



Rebates









GPS


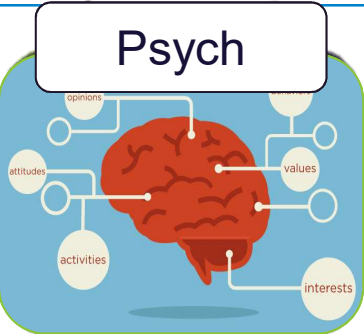



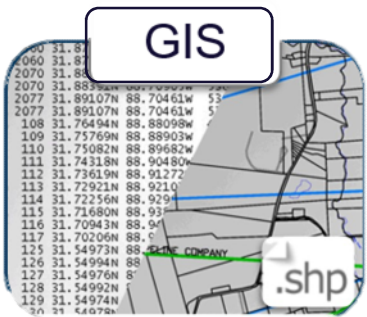

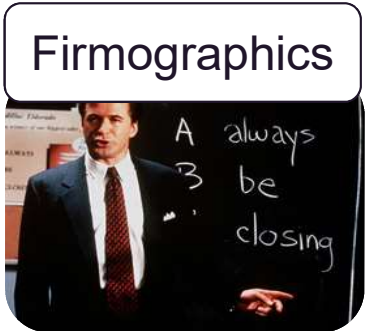
Firmographics



Data Type	Description	Usage	Availability
<div>Structure</div> 	<ul style="list-style-type: none"> ●Residential, Commercial, and Industrial Stock Assessments ●County property data also useful 	Data & reports free to use. Does not include locations of buildings w/o NDA. Regionally representative only	<ul style="list-style-type: none"> ●Stock assessments on neea.org under Resources > Regional Data Sources
<div>Construction</div> 	Dodge Data gives us quarterly state-level construction permits for Res. & Com. major construction types	Used internally to guide forecasts. NEEA must get permission to share from Dodge	<ul style="list-style-type: none"> ●Dodge not directly available to stakeholders ●You may obtain directly from local permitting office
<div>Market</div> 	<ul style="list-style-type: none"> ●Dodge (see above) ●CoStar (Comm.) ●Zillow research is used for current building stock data 	Help to understand conditions that may influence market adoption of new technologies or practices	<ul style="list-style-type: none"> ●CoStar not directly available to stakeholders ●Zillow is available

Data Type	Description	Usage	Availability
	In the last RBSA, NEEA collected 2 years of 15-min load shape data on ~80 homes.	This data is publicly available. Currently being used to guide the End Use Load Research project	On nea.org under Resources > Regional Data Sources
	<ul style="list-style-type: none"> •Reduced Wattage Lamp Replacement •Retail Product Portfolio 	Utility-level reporting depends on # of distributors or retailers in area to aggregate sales data	As part of annual reporting and upon request, but working to make this more accessible
	<ul style="list-style-type: none"> •Ductless Heat Pumps •Heat Pump Water Heaters 	Utility-level reporting if addresses provided or ZIPs captured	As part of annual reporting and upon request, but working to make this more accessible

Data Type	Description	Usage	Availability
	Demographic data includes age, gender, household makeup, and income	Assists in understanding target markets, opportunity assessment, forecasting	<ul style="list-style-type: none"> ● Census data is public, but aggregated ● We purchase Experian Data to give us address-level information
	Psychographic includes personality, values, opinions, attitudes, interests, & lifestyle	Guides more efficient market transformation with product, research, & marketing insights	We purchase Experian Data to give us address-level information
	Global positioning system data aggregates driving information to understand retailer customers	<ul style="list-style-type: none"> ● Targeted marketing ● Knowledge of drive-time gaps 	<ul style="list-style-type: none"> ● May be purchased directly from TomTom ● Licensed with some data packages

Data Type	Description	Usage	Availability
	Spatial or geographic data used to capture, store, manipulate, analyze, manage, & present info	We use to understand data within various boundaries (utility, state, region, along power lines, etc.)	<ul style="list-style-type: none"> ●Utility boundaries purchased from Platts ●Many public 'shapefiles' available
	Data related to the content interests, sharing behaviors, & online buying behavior of people within SoMe	Search or get alerts for mentions of technologies, topics, brands, or organizations	<ul style="list-style-type: none"> ●Many platforms ●Talkwalker is one we use to get a directional sense (freemium)
	Attributes of firms used to aggregate them into meaningful market segments (biz version of psych.)	Understand commercial market segments; combine with building stock data to estimate impact	<ul style="list-style-type: none"> ●We purchase Dunn & Bradstreet ●Other providers include Infogroup, InfoUSA, & many more