



February 7th

**– HVAC Tech Guide – Sales Data –
– Model Building – Capacity Integration—**





BONNIE
WATSON

**A New Report from
Our Team!**

HVAC Technology Guide

January 2018



A Reference for All-Things HVAC

How It Works

An improperly installed furnace may lead to effective transfer of heated air to the conditioned spaces, resulting in more heating hours and lower overall efficiency.

Strengths



Low fuel price



Effective at maintaining comfortable temperatures

Contractors determine furnace size in one of two ways:

- 1) Using tables developed by HVAC vendors that consider total

Major Components

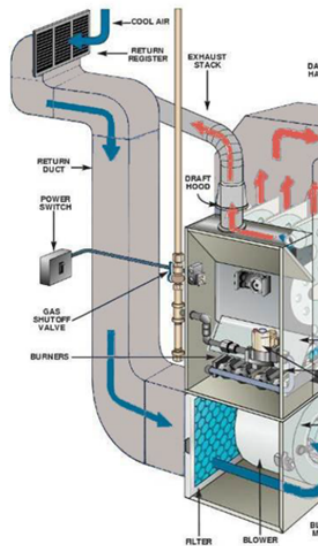


Image Source: Bonneville Power Administration, 2017

53

Gas Forced Air Furnaces

All gas forced air furnaces include

Regulations & Cost



The DOE reported that from 1997 to 2006 sales of ENERGY STAR qualified room air conditioners grew more than 40% which is an indicator of market demand for high efficiency equipment.

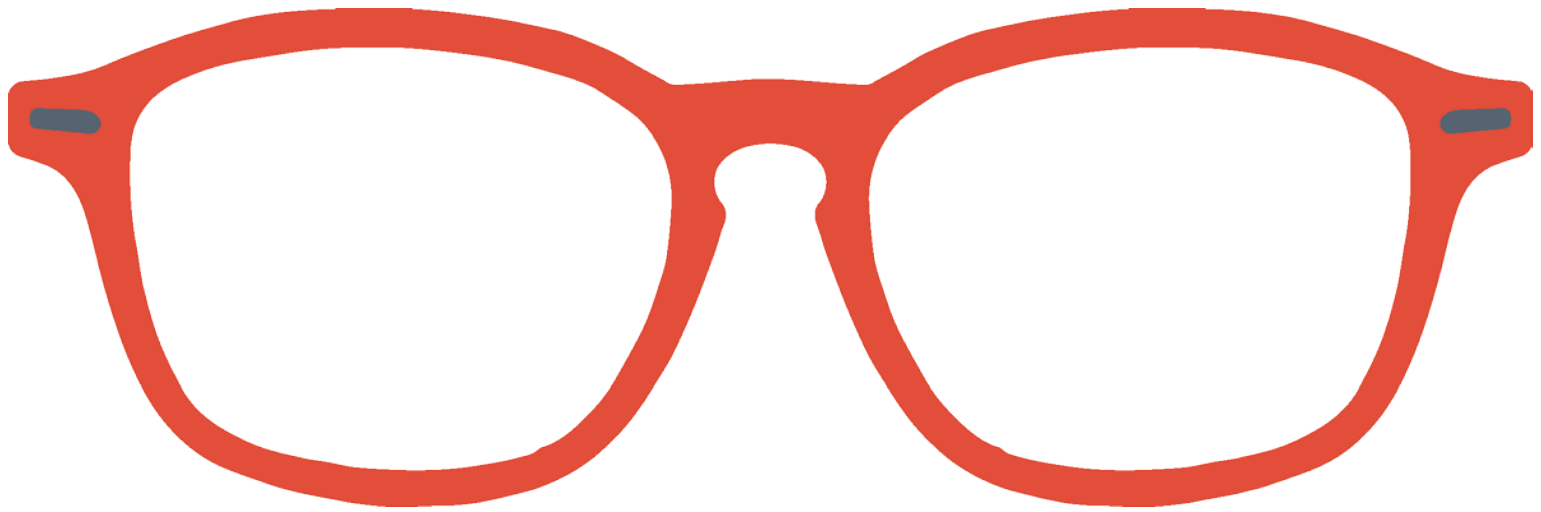
New ENERGY STAR room air conditioners have connected functionality which can lead to additional energy savings.

Cost. EIA estimates the following incremental cost for more efficient room air conditioners:

- Baseline to high efficiency 35% increase in total cost

Standards. The DOE has energy efficiency standards for room air conditioners. The minimum efficiency standards are in terms of CEER and went into effect in 2014. On June 18, 2015 DOE published a request for information to consider increasing the current standards for room ACs.

Room Air Conditioners



Sneak peek...

Washington – Residential

Scope

Residential buildings include one- and two-family dwellings and multiple single-family dwellings (townhouses), as well as residential buildings three stories or less in height above grade plane. Applies to new construction and major remodels.

Residential HVAC efficiency provisions do not apply to systems that serve multiple units.

HVAC Efficiency Requirements & Sizing

Requires Federal minimum efficiency units for new or replacement HVAC systems.

- **New in 2015:** Contractors must install ductless HPs in the largest zone of the home for buildings with electric zonal heating as the primary heating source.

Contractors must size heating and cooling equipment in accordance with ACCA Manual S based on building load calculations per ACCA Manual J.

- Must select equipment in next available size to meet load.

Controls

Each heating and cooling system must have at least one thermostat.

For homes with FAF, at least one thermostat must be programmable on a 5-2 schedule and control zone temps between 55°F and 85°F, with default setpoints of 70°F for heating and 78°F for cooling.

Unitary air-cooled heat pumps must include controls that minimize supplemental heat by using vapor compression as first stage of heating, controls that minimize use of ER heating above 40°F, and a visual indicator. During final inspection, the compressor lock-out temp is to be 35°F or less.

Residential boilers must have an outdoor temperature reset that lowers boiler supply water temperature based on outdoor air temperature.

Additional HVAC Load-Related Requirements

Ducts outside the building envelope must be insulated to R-8 and in-ground ducts to R-10. Ducts must be sealed and tested to have less than 4cfm/100 sf of conditioned floor area of air leakage. This includes a requirement that air handlers must have less than 2% leakage at design flow rate when tested with ASHRAE 193.*

Ventilation design must be generally in accordance with ASHRAE 62.2, which may increase HVAC load, although not appreciably.

More aggressive shell requirements that result in reduced heating and cooling loads.

*State code interpretation does not require strictly meeting this threshold, but testing is still required.

Federal Regulations

Current energy conservation standards going into effect

Equipment Type	Cooling Capacity	Subcategory	Heating Type	Efficiency Level	Compliance Date
SMALL Commercial Package Air-Conditioning and Heating Equipment (Air-Cooled, 3-Phase, Split-System)	<65,000 Btu/h	AC	All	SEER = 13	June 16, 2008
		HP	All	SEER = 14	January 1, 2017
SMALL Commercial Package Air-Conditioning and Heating Equipment (Air-Cooled, 3-Phase, Single-Package)	<65,000 Btu/h	AC	All	SEER = 14	January 1, 2017
		HP	All	SEER = 14	January 1, 2017
SMALL Commercial Package Air-Conditioning and Heating Equipment (Air-Cooled)	≥65,000 Btu/h and <135,000 Btu/h	AC	No Heating or Electric Resistance Heating	EER = 11.2	January 1, 2010
			All Other Types of Heating	EER = 11.0	January 1, 2010
		HP	No Heating or Electric Resistance Heating	EER = 11.0	January 1, 2010
			All Other Types of Heating	EER = 10.8	January 1, 2010
LARGE Commercial Package Air-Conditioning and Heating Equipment (Air-Cooled)	≥135,000 Btu/h and <240,000 Btu/h	AC	No Heating or Electric Resistance Heating	EER = 11.0	January 1, 2010
			All Other Types of Heating	EER = 10.8	January 1, 2010
		HP	No Heating or Electric Resistance Heating	EER = 10.6	January 1, 2010
			All Other Types of Heating	EER = 10.4	January 1, 2010
VERY LARGE Commercial Package Air-Conditioning and Heating Equipment (Air-Cooled)	≥240,000 Btu/h and <760,000 Btu/h	AC	No Heating or Electric Resistance Heating	EER = 10.0	January 1, 2010
			All Other Types of Heating	EER = 9.8	January 1, 2010
		HP	No Heating or Electric Resistance Heating	EER = 9.5	January 1, 2010
			All Other Types of Heating	EER = 9.3	January 1, 2010

Federal Regulations

On January 15, 2016, DOE adopted new energy conservation levels for commercial package air conditioners and heat pumps. In addition, DOE transitioned the efficiency metric from a full load energy efficiency ratio ("EER") to an IEER metric which accounts for part loading.

Future energy conservation standards going into effect

Equipment Type	Cooling Capacity	Subcategory	Heating Type	Efficiency Level	Compliance Date
SMALL Commercial Packaged Air-Conditioning and Heating Equipment (Air-Cooled)	≥65,000 Btu/h and <135,000 Btu/h	AC	Electric Resistance Heating or No Heating	IEER = 12.9	January 1, 2018
			All Other Types of Heating	IEER = 14.8	January 1, 2023
		HP	Electric Resistance Heating or No Heating	IEER = 12.7	January 1, 2018
			All Other Types of Heating	IEER = 14.6	January 1, 2023
LARGE Commercial Packaged Air-Conditioning and Heating Equipment (Air-Cooled)	≥135,000 Btu/h and <240,000 Btu/h	AC	Electric Resistance Heating or No Heating	IEER = 12.2	January 1, 2018
			All Other Types of Heating	IEER = 14.1	January 1, 2023
		HP	Electric Resistance Heating or No Heating	IEER = 12.0	January 1, 2018
			All Other Types of Heating	IEER = 13.9	January 1, 2023
VERY LARGE Commercial Packaged Air-Conditioning and Heating Equipment (Air-Cooled)	≥240,000 Btu/h and <760,000 Btu/h	AC	Electric Resistance Heating or No Heating	IEER = 12.4	January 1, 2018
			All Other Types of Heating	IEER = 14.2	January 1, 2023
		HP	Electric Resistance Heating or No Heating	IEER = 12.2	January 1, 2018
			All Other Types of Heating	IEER = 14.0	January 1, 2023

Link to Tech Guide

A red callout bubble with a white border and a small tail pointing upwards and to the left. Inside the bubble, the text "Click here!" is written in white, bold, sans-serif font.

Click here!

email Bonnie if you want a hard copy mailed to you: bfwatson@bpa.gov

...but wait, there's more!

HVAC Market Actor Interviews





Who did we talk to?

- Distributors & manufacturer reps (11)
- Installation contractors (10)
- SF Home Builders (5)
- Manufactured Homes Builders (4)





What did we ask about?

- Market structure and operations
- Technology changes
- Decision making
- Installation and maintenance trends



****Presentation Coming Soon
(with AHR Expo findings in it, too!)***

Link to Findings Memo

Click here!

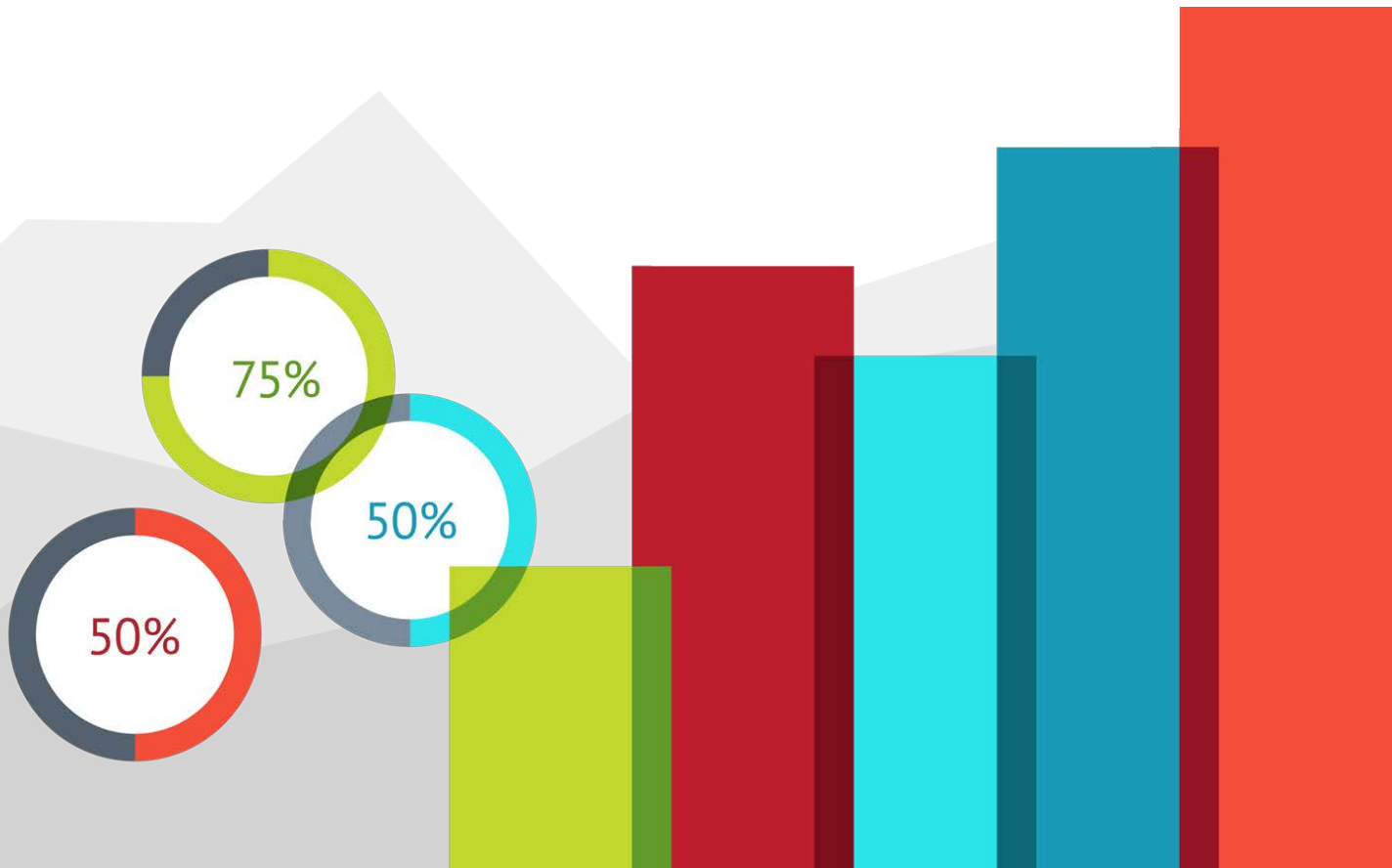


ETHAN

MANTHEY



2018 Non-Residential Lighting Sales Data Collection



59 Distributors Regionally

- ↳ 24 Distributors Shown Interest

- ↳ 11 Have Already Submitted Data





Hot Water Model Sprint Plan



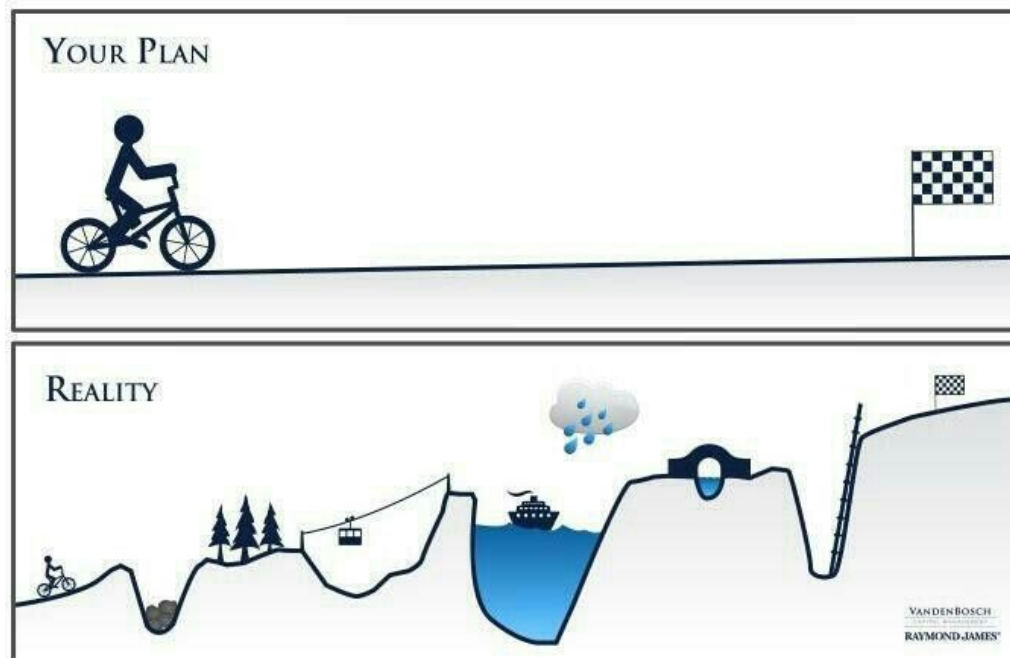
Sprints

- Monthly, iterative development phases
- Allows for
 - frequent check-ins
 - risk management
 - flexible development approach



The Plan Ahead

“Planning is essential, plans are useless.”
-D.D. Eisenhower





Post-Sprint Review

Post sprint check-in scheduled for second week of each month

- Review progress and key outcomes of previous sprint
- Discuss any issues
- Outline what we plan to accomplish in next sprint

We'll share relevant info with this group regularly, as well as with RTF M.A. Subcommittee.



Timeline

Key	
	= Sprint Activity
	= Reporting Activity
	= Key Interim Result

Activity	Sprints														
	Jan-Feb	Feb-Mar	Mar-April	Apr-May	May-Jun	Jun-July	July-Aug	Aug-Sept	Sept-Oct	Oct-Nov	Nov-Dec	Dec-Jan	Jan-Feb	Feb-Mar	Mar-April
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Water heating stock development															
Hot water techs stock development and UWCs															
RBSA 2016 review															
Hot water baseload															
Water heating efficiency UECs															
Hot water techs actual efficiency mix															
Model build - consumption															
Program savings															
HVAC interaction															
Model build - reporting															
Draft Methodology Report															
Final Methodology Report*															

ESTIMATED

Total Market Savings
(not adjusted for HVAC interaction)

Program Savings

*Final methodology report is only through part of the 7th Plan period. Model will need to be updated later with more program and market data as it comes in through 2021.

*Want to learn more
about our method?*

Click here!




Link to Methodology Memo















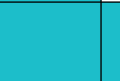


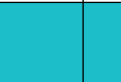



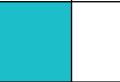





HVAC Sprint Plan



Timeline

Key	
	= Sprint Activity
	= Reporting Activity
	= Key Interim Result

Activity	Sprints											
	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	
HVAC stock development												
RBSA 2016 review												
HVAC UEC development												
Model build – stock turnover												
HVAC techs efficiency mix												
Model build - consumption												
Program savings												
Model build - reporting												
Draft Methodology Report												
Final Methodology Report*												

ESTIMATED

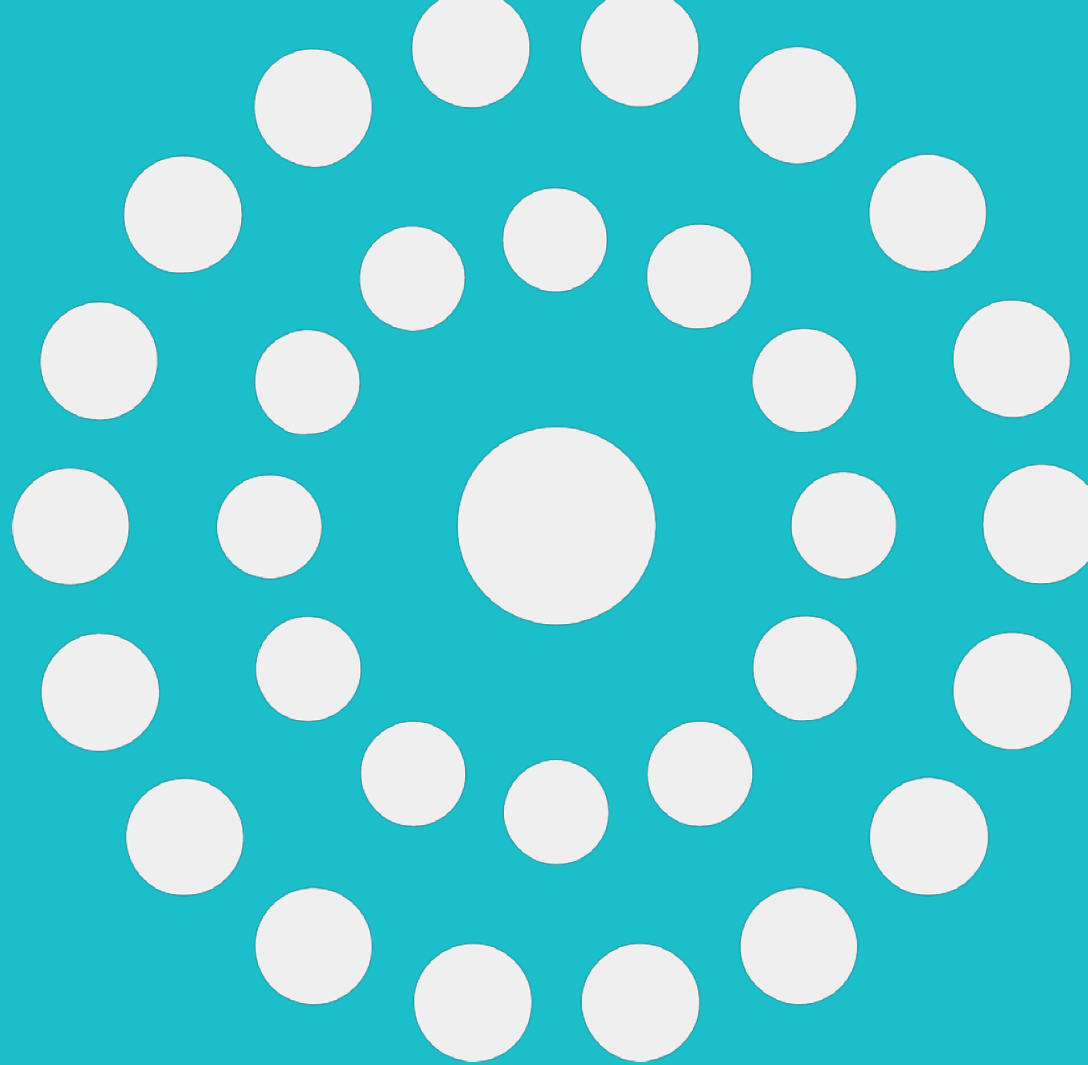
Total Market Savings

Program Savings

*Final methodology report is only through part of the 7th Plan period. Model will need to be updated later with more program and market data as it comes in through 2021.

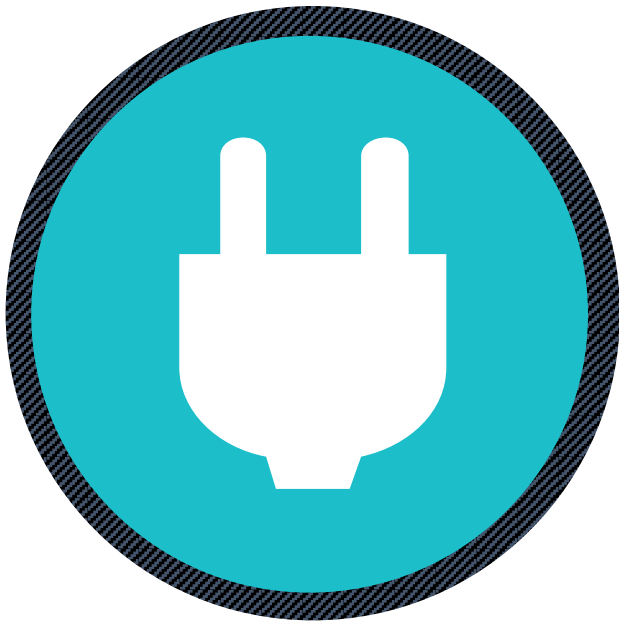
*Want to learn more
about our method?*

Coming Soon!
Methodology Memo



CAPACITY INTEGRATION

Tasks



1

Research load shapes

2

Determine design features

3

Develop methodology

4

Establish implementation plan

Goals

- Market models calculate energy consumption and savings
- Capacity calculations give insight into kW reductions due to energy-efficiency adoption
- Integrate capacity into residential lighting model
- Integrate capacity into all market models

Load Shape Research

- Review load shape data and metering studies
 - Regionally
 - Council
 - NEEA
 - RBSA
 - BPA
 - Outside of region
 - CEC & CPUC
 - EPRI
 - NEEP
 - DOE

What data can you share?

Design Features

- Capacity calculations for:
 - Individual hour/user defined period
 - Council defined peak
 - BPA defined peak
- Stand alone model
- Web based

How will you use the model?

Next Steps

Develop
Methodology

3/8

Create Design
Document

3/23

Develop
Res lighting
capacity model

Q2 - Q3



THX!

See you March 7th!