



Integrated Resource Plan 2019 IRP Conservation Potential Assessment (CPA) Webinar - July 23, 2018





CPA Measure List

Measure List Spreadsheets



- The measure list spreadsheets contains the measures/ technologies/ options considered in CPA
- Measures are separated into three (3) categories:
 - Equipment Measures
 - Non-Equipment Measures
 - Emerging Technologies

Measure Source Hierarchy



Priority	Resource	Details
1	Client program data	Project Information and Evaluations
2	Well-Vetted Sources Within Region	RTF, NWPCC 7th Power Plan, CA DEER in California
3	National DOE Sources	AEO 2017, EIA Reference Cases, ENERGY STAR, etc.
4	Well-Vetted Sources Outside Region	CA DEER for other states, etc.
5	AEG Technical Research	Various Resources as Required



Measure List Tab

- Multiple equipment options may be considered – most efficient option is prioritized (under an LCOE threshold)

	B	C	D	E	F	G
1	End Use	Technology	Label	Emerging	Revisions from Previous Study (if Applicable)	Measure Description
8	Cooling	Room AC	CEER 11.2		EER 11.2	Room air conditioners are designed to cool a single room or space. They incorporate a complete air-cooled refrigeration and air-handling system in an individual package. Room air conditioners come in several forms, including window, through-the-wall, and mini-split systems. Packaged terminal units are also included in this category for the residential sector. As of June 1, 2014, energy efficiency is rated according to the size and product class of the unit using the Combined Energy Efficiency Ratio (CEER).
9	Cooling	Room AC	CEER 12.0 (ENERGY STAR)		EER 12.1 (ENERGY STAR 2016)	
10	Cooling	Room AC	CEER 13.0		EER 13.0	
11	Cooling	Room AC	Evaporative Room AC			



Measure List Changes Tab

- Includes comparison with prior-study measure lists
- Emerging tech screen includes more details where new measures were excluded

Residential - Equipment Removed / Evaluate Next Time			
End Use	Technology	Still In Study?	Description
Appliances	Freezer - ENERGY STAR - Tier 3, Tier 4, Tier 5	FALSE	Removed various ENERGY STAR tiers for consistency with level in RTF workbook
Electronics	Personal Computers - ENERGY STAR v7.0	FALSE	Left out of study since 7.0 specifications are in draft mode; no data available. Will revisit.
Electronics	Laptops - ENERGY STAR v7.0	FALSE	Left out of study since 7.0 specifications are in draft mode; no data available. Will revisit.
Electronics	Small Network Equipment - ENERGY STAR	FALSE	Left out of study since specifications are too new and no consumption or cost data is available. Will revisit.
Cooling	Evaporative AC - Advanced Cooler Media	FALSE	Screened out as experimental emerging technology

Emerging Technology Tab



Residential - Emerging Technology Measure Screen							
Measure	Added to Study?	Enough Data to Include?	Biggest Estimation Challenge	Recommendation	Measure Description	Screen	Current Source
Advanced New Construction Design - Zero Net Energy	FALSE	TRUE	Cost	Include	Zero net energy (ZNE) buildings are ultra-efficient new construction and deep energy retrofit projects that consume only as much energy as they produce from clean, renewable resources.	This measure could be added, and BPA has "Zero Energy Ready New Multifamily Construction" measure.	BPA, PG&E
Integrated Heat Pump - Combination HVAC and DHW	FALSE	TRUE	Cost	Include	A heat pump system providing residential heating, cooling and domestic water heating. Heat pump can be central (ducted) or ductless air-source heat pump.	Incremental cost is significant, but possible to include measure. NEEA has studied DHP + DHW, showing that this measure is important to the region. These have been widely implemented in some foreign markets as well.	E3TNW, NEEA



Base-Year Characterization

Base-Year Data – Control Totals



	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC
1	Idaho						Utah							
2														
3	Residential						Residential							
4	Segment		Households	2016 MWh	Intensity (kWh/HH)		Segment		Households	2016 MWh	Intensity (kWh/HH)			
5	Single Family		47,948	627,845	13,094		Single Family		571,668	6,182,160	10,814			
6	Multifamily		9,249	62,199	6,725		Multifamily		169,447	1,002,560	5,917			
7	Mobile Home		6,314	80,245	12,709		Mobile Home		18,891	145,270	7,690			
8	Total		63,511	770,289	12,128		Total		760,006	7,329,990	9,645			
9														
10														
11														
12	Commercial						Commercial							
13	Segment		Floor Area (kft²)	2016 MWh	Intensity (kWh/ft²)		Segment		Floor Area (kft²)	2016 MWh	Intensity (kWh/ft²)			
14	Large Office		1,156	26,663	23.1		Large Office		82,501	1,868,204	22.6			
15	Small Office		6,205	121,902	19.6		Small Office		71,092	1,370,843	19.3			
16	Large Retail		749	16,709	22.3		Large Retail		21,616	473,429	21.9			
17	Small Retail		3,606	59,646	16.5		Small Retail		46,371	752,943	16.2			
18	Restaurant		496	24,956	50.3		Restaurant		9,225	455,376	49.4			
19	Grocery		611	31,925	52.2		Grocery		6,930	355,251	51.3			
20	Health		657	21,198	32.3		Health		12,368	391,850	31.7			
21	College		3,969	71,247	17.9		College		18,862	332,318	17.6			
22	School		2,818	27,097	9.6		School		37,763	356,458	9.4			
23	Lodging		548	7,964	14.5		Lodging		32,568	464,476	14.3			
24	Warehouse		6,545	32,989	5.0		Warehouse		174,662	864,130	4.9			
25	Warehouse, Controlled		1,383	31,999	23.1		Warehouse, Controlled		3,384	76,836	22.7			
26	Data Center		2	381	184.0		Data Center		1,898	342,753	180.6			
27	Miscellaneous		4,659	57,213	12.3		Miscellaneous		110,188	1,328,339	12.1			
28	Total		33,404	531,889	15.9		Total		629,426	9,433,205	15.0			
29														
30														

Market Profile/Saturation - Residential



	Single Family
Total Households:	571,668
Control Total (GWh):	6,182
Intensity (kWh/HH):	10,814

- Residential profile represents consumption for typical home in 2016
- Saturation - % of homes the electrically-powered technology is present
- UEC – annual energy consumed per unit when installed
- Intensity – Saturation*UEC
 - Model is calibrated to total household intensity
- Usage – Intensity*Households
 - Total GWh @generator

Electric Market Profiles

End Use	Technology	Saturation	EUI (kWh)	Intensity (kWh/Sqft)	Usage (GWh)
Cooling	Central AC	76.2%	3,137	2,390	1,366.1
Cooling	Room AC	3.9%	1,405	55	31.3
Cooling	Air-Source Heat Pump	1.6%	3,299	52	29.6
Cooling	Geothermal Heat Pump	0.4%	2,904	12	7.0
Cooling	Evaporative AC	12.6%	707	89	50.9
Space Heating	Electric Room Heat	1.5%	14,673	219	125.4
Space Heating	Electric Furnace	6.2%	16,537	1,032	590.2
Space Heating	Air-Source Heat Pump	1.6%	9,105	143	81.6
Space Heating	Geothermal Heat Pump	0.4%	4,766	20	11.4
Space Heating	Secondary Heating	31.0%	429	133	75.9
Water Heating	Water Heater (<= 55 Gal)	8.8%	3,334	295	168.6
Water Heating	Water Heater (> 55 Gal)	0.7%	3,525	25	14.5
Interior Lighting	General Service Screw-in	100.0%	593	593	339.2
Interior Lighting	Linear Lighting	100.0%	86	86	49.1
Interior Lighting	Exempted Lighting	100.0%	227	227	130.0
Exterior Lighting	Screw-in	100.0%	329	329	188.1
Appliances	Clothes Washer	98.3%	84	83	47.4
Appliances	Clothes Dryer	76.0%	810	616	352.2
Appliances	Dishwasher	91.7%	131	120	68.9
Appliances	Refrigerator	99.9%	658	657	375.6
Appliances	Freezer	61.2%	563	344	196.9
Appliances	Second Refrigerator	42.8%	906	388	221.6
Appliances	Stove/Oven	68.6%	484	332	189.7
Appliances	Microwave	98.5%	136	134	76.6
Electronics	Personal Computers	80.9%	176	142	81.4
Electronics	Monitor	97.3%	67	65	37.4
Electronics	Laptops	267.4%	46	123	70.4
Electronics	TVs	230.3%	124	286	163.4
Electronics	Printer/Fax/Copier	80.9%	46	37	21.3
Electronics	Set-top Boxes/DVRs	267.2%	108	288	164.7
Electronics	Devices and Gadgets	100.0%	92	92	52.6
Miscellaneous	Electric Vehicles	0.4%	4,727	20	11.3
Miscellaneous	Pool Pump	2.5%	3,826	97	55.5
Miscellaneous	Pool Heater	1.0%	3,845	38	21.7
Miscellaneous	Hot Tub/Spa	6.0%	2,221	133	75.9
Miscellaneous	Furnace Fan	89.7%	225	201	115.1
Miscellaneous	Well pump	4.8%	613	29	16.9
Miscellaneous	Miscellaneous	100.0%	887	887	506.9
Total				10,814	6,182

Market Profile/Saturation - Commercial



	Small Office
Total Floor Area (kft ²):	71,092
Control Total (GWh):	1,371
Intensity (kWh/ft ²):	19

- Commercial profile represents consumption for typical building square foot in 2016
- EUI – energy utilization index
 - Different from UEC, kWh consumed per square foot when technology is present (not consumption per technology unit)
- Intensity from 2014 CBSA, varied by state due to weather and other building characteristics

Electric Market Profiles

End Use	Technology	Saturation	EUI (kWh)	Intensity (kWh/ft ²)	Usage (GWh)
Cooling	Air-Cooled Chiller	0.0%	0.0	0.0	0.0
Cooling	Water-Cooled Chiller	0.0%	0.0	0.0	0.0
Cooling	RTU	65.9%	6.7	4.5	316.4
Cooling	PTAC	2.3%	7.6	0.2	12.5
Cooling	PTHP	0.7%	7.6	0.1	4.0
Cooling	Evaporative Central AC	0.0%	2.7	0.0	0.1
Cooling	Air-Source Heat Pump	14.1%	6.7	0.9	67.5
Cooling	Geothermal Heat Pump	7.5%	4.1	0.3	22.1
Heating	Electric Furnace	0.9%	6.3	0.1	3.8
Heating	Electric Room Heat	16.4%	6.0	1.0	69.9
Heating	PTHP	0.7%	4.9	0.0	2.6
Heating	Air-Source Heat Pump	14.1%	5.4	0.8	54.1
Heating	Geothermal Heat Pump	7.5%	4.4	0.3	23.4
Ventilation	Ventilation	100.0%	1.3	1.3	90.8
Water Heating	Water Heater	60.0%	0.9	0.6	40.4
Interior Lighting	General Service Lighting	100.0%	0.3	0.3	19.1
Interior Lighting	Exempted Lighting	100.0%	0.1	0.1	10.3
Interior Lighting	Linear Lighting	100.0%	1.7	1.7	119.1
Interior Lighting	High-Bay Lighting	100.0%	1.6	1.6	116.7
Exterior Lighting	General Service Lighting	100.0%	0.2	0.2	12.6
Exterior Lighting	Linear Lighting	100.0%	0.1	0.1	5.6
Exterior Lighting	Area Lighting	100.0%	1.7	1.7	121.9
Refrigeration	Walk-in Refrigerator/Freezer	0.0%	0.0	0.0	0.0
Refrigeration	Reach-in Refrigerator/Freezer	8.8%	0.2	0.0	1.0
Refrigeration	Glass Door Display	0.0%	0.0	0.0	0.0
Refrigeration	Open Display Case	0.0%	0.0	0.0	0.0
Refrigeration	Icemaker	5.1%	0.3	0.0	1.0
Refrigeration	Vending Machine	5.1%	0.1	0.0	0.4
Food Preparation	Oven	3.6%	0.2	0.0	0.5
Food Preparation	Fryer	3.6%	0.3	0.0	0.7
Food Preparation	Dishwasher	3.6%	0.4	0.0	1.0
Food Preparation	Hot Food Container	3.6%	0.1	0.0	0.1
Food Preparation	Steamer	3.6%	0.3	0.0	0.7
Office Equipment	Desktop Computer	100.0%	1.3	1.3	95.9
Office Equipment	Laptop	100.0%	0.2	0.2	14.8
Office Equipment	Monitor	100.0%	0.2	0.2	16.9
Office Equipment	Server	100.0%	0.4	0.4	28.2
Office Equipment	Printer/Copier/Fax	100.0%	0.2	0.2	13.1
Office Equipment	POS Terminal	20.0%	0.1	0.0	1.5
Miscellaneous	Non-HVAC Motors	22.0%	0.3	0.1	4.0
Miscellaneous	Pool Pump	0.0%	0.0	0.0	0.0
Miscellaneous	Pool Heater	0.0%	0.0	0.0	0.0
Miscellaneous	Clothes Washer	0.0%	0.0	0.0	0.0
Miscellaneous	Clothes Dryer	0.0%	0.0	0.0	0.0
Miscellaneous	Miscellaneous	100.0%	1.1	1.1	78.3
Total				19.3	1,371

Market Profile/Saturation - Industrial



	Mining
Total Employment:	6,670
Control Total (GWh):	1,253
Intensity (kWh/Employee):	187,802

- Industrial profile represents consumption for typical industry per employee in 2016
 - Employment is used as a proxy for energy consumption since floor area is less reliable
 - E.g. 10% of space may use 90% of energy, rest of space could be warehouse
- Began with commercial warehouse market profile by state, added industrial end uses
- Intensity from Bureau of Labor Statistics, cross-referenced with 2014 IFSA

Electric Market Profiles

End Use	Technology	Saturation	EUI (kWh)	Intensity (kWh/Empl.)	Usage (GWh)
Cooling	Air-Cooled Chiller	2.5%	13,736	343	2.3
Cooling	Water-Cooled Chiller	2.5%	12,950	324	2.2
Cooling	RTU	11.6%	15,282	1,779	11.9
Cooling	PTAC	1.7%	15,278	258	1.7
Cooling	PTHP	0.0%	0	0	0.0
Cooling	Evaporative Central AC	0.7%	33,738	239	1.6
Cooling	Air-Source Heat Pump	3.8%	32,132	1,229	8.2
Cooling	Geothermal Heat Pump	1.7%	30,276	512	3.4
Heating	Electric Furnace	0.0%	0	0	0.0
Heating	Electric Room Heat	100.0%	1,211	1,211	8.1
Heating	PTHP	100.0%	321	321	2.1
Heating	Air-Source Heat Pump	100.0%	5,018	5,018	33.5
Heating	Geothermal Heat Pump	100.0%	834	834	5.6
Ventilation	Ventilation	100.0%	59	59	0.4
Water Heating	Water Heater	100.0%	1,119	1,119	7.5
Interior Lighting	General Service Lighting	100.0%	229	229	1.5
Interior Lighting	Exempted Lighting	100.0%	57,604	57,604	384.2
Interior Lighting	Linear Lighting	100.0%	16,001	16,001	106.7
Interior Lighting	High-Bay Lighting	100.0%	24,002	24,002	160.1
Exterior Lighting	General Service Lighting	100.0%	16,801	16,801	112.1
Exterior Lighting	Linear Lighting	100.0%	45,603	45,603	304.2
Exterior Lighting	Area Lighting	100.0%	1,684	1,684	11.2
Refrigeration	Walk-in Refrigerator/Freezer	0.0%	0	0	0.0
Refrigeration	Reach-in Refrigerator/Freezer	0.0%	0	0	0.0
Refrigeration	Glass Door Display	100.0%	1,684	1,684	11.2
Refrigeration	Open Display Case	100.0%	9,264	9,264	61.8
Refrigeration	Icemaker	100.0%	1,684	1,684	11.2
Total				187,802	1,253

Market Profile/Saturation – Irrigation and Street Lighting



- One end-use, presented on “Base-Year Data”

Irrigation

Pump Size	Service Points	2016 MWh	Intensity (kWh/SP)
Pumps (< 100 HP)	1,932	39,953	20,677
Pumps (100 HP+)	1,116	210,250	188,393
Other Motors	358	3,721	10,403
Total	3,406	253,924	74,552

Street Lighting

Equivalent Wattage	Fixtures	2016 MWh	Intensity (kWh/Fixt.)
Company - 100W	21,463	11,244	524
Company - 150W	2,423	1,922	794
Company - 250W	2,184	2,877	1,317
Company - 400W	850	1,740	2,047
Customer - 100W	27,816	14,990	539
Customer - 150W	19,190	16,467	858
Customer - 250W	9,479	10,516	1,109
Customer - 400W	7,386	14,720	1,993
Customer - 1000W	571	311	545
Other	10,242	8,724	852
Total	101,605	83,511	822

Stakeholder Feedback Requested



- PacifiCorp will consider stakeholder feedback working with its CPA technical consultant, AEG in finalizing its CPA
 - Where possible PacifiCorp will incorporate any requested modifications/additions in the current study. All other requests will be considered for the next study.
- Feedback to be submitted using the 2019 IRP stakeholder feedback form at the following location:
<http://www.pacificorp.com/es/irp/irpcomments.html>
- Please be as specific as possible when providing feedback and reference specific measure codes, etc.
- Please provide feedback no later than July 27, 2018.