

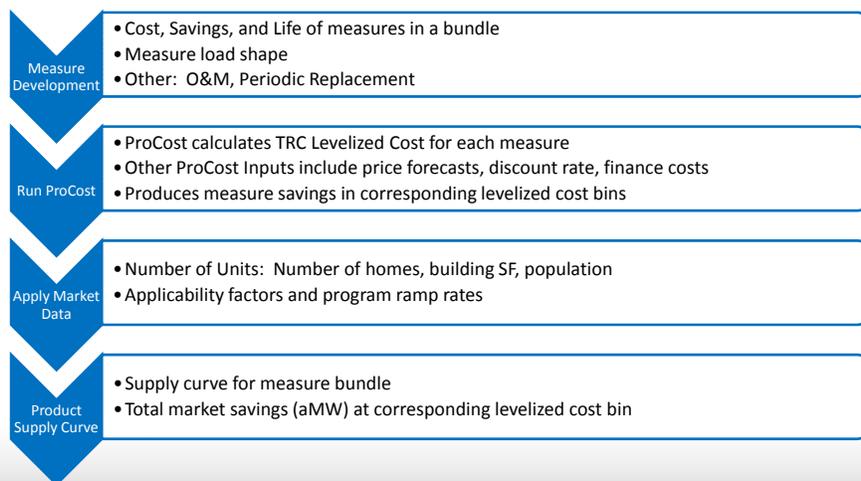
# Overview of Seventh Plan EE Measure Workbook Structure

Conservation Resource Advisory Committee

November 13, 2014



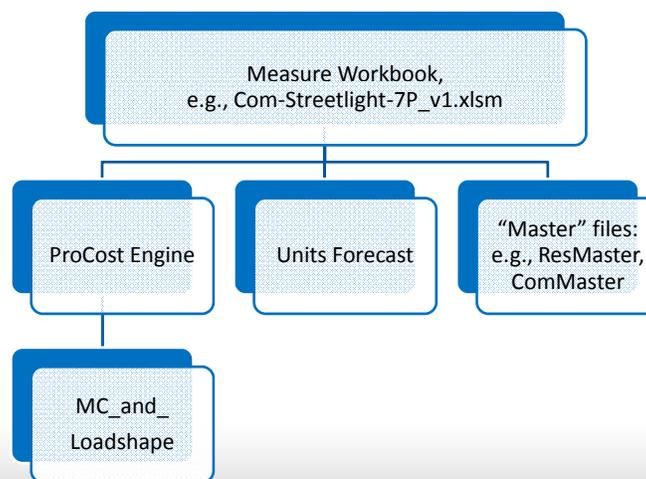
## Measure Supply Curve Development



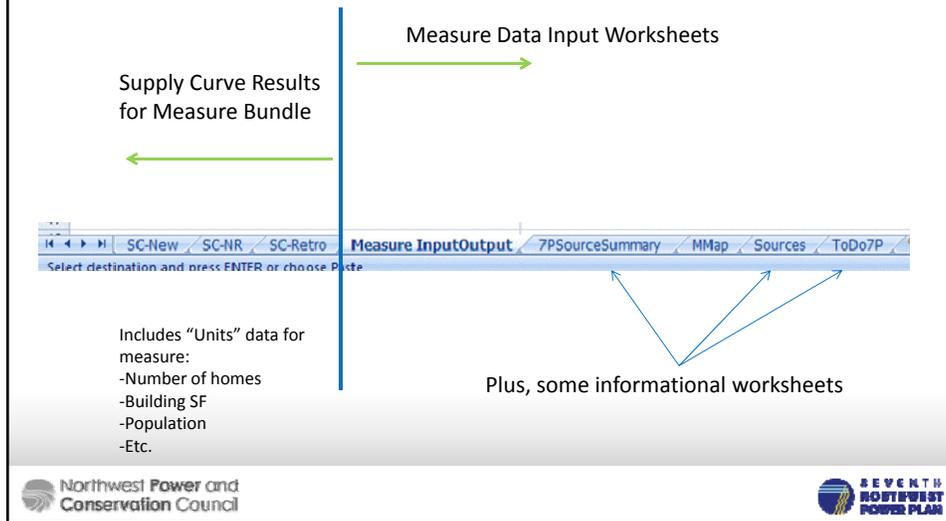
## Measure Workbook Names

- Naming convention:
  - Sector<>Measure Abbreviation<>7P<>Version
  - Example: **Com-Streetlight-7P\_V1.xlsm**
- Other Linked workbooks
  - ProCost engine
    - Also, MC\_and\_Loadshape
  - Units Forecast
    - Contain all the units data from the Council forecast
  - “Master” files, ResMaster, ComMaster
    - Contains all measure baseline and applicability factors

## 7P Measure Workbook and Links



# Typical Components of Measure Workbooks



## 7PSourceSummary

- This is the best place to start

Measure: LED Streetlight		
Item	Methods & Sources	7P Updates
Measures Described	Reduced wattage streetlight, photocell control	
Energy Savings Calculation Basis	Delta watts time hours	
Applicable Stock	All street and roadway lighting. Muni and State	Updated stock estimate from several sources including, PNL survey, 2012 Navigant study, and FERC Form 1. Added decorative, and arterial.
Baseline Equipment	HPS or Metal Halide. Various wattages.	
Baseline Saturation	About 15% as of 2016.	Forecast by end of 2015. From survey of municipalities, PNL & Navigant 2012. Portland, Seattle and other finished by 2016. See sheet SatPen
Hours of Operation	4300 hours per year	Updated 2014
HVAC Interaction Factors	None	
Measures	Primarily LED. Some induction.	Expanded to higher wattage and high mast applications
Capital Costs	Recent municipal data	Updated from Seattle, LA, Tacoma, Portland
Periodic Replacement Costs	Two methods used, 1) Utility rate schedule 2)Data from local utilities	
Savings Shapes	Streetlight	Rebuilt measure shape based on astrological data, three cites and KEMA shape tool from Joe Lopes
Measure Life	Estimated at 70,000 hours. 16 year life on photocell control.	Updated 2014. Use Navigant standards model with forecast to 2017. Modest increase in forecast lifetime.
Achievability Ramp Rate	LO Fast for New, LO Medium NR due to large volume of NR	Increased from 6P. Uptake on the increase.

# Measure InputOutput

- Workbooks will link to a single version of ProCost, rather than have ProCost built into each workbook.
- Measure input and output will consist of three worksheets:
  - Measure InputOutput – this will be just measure data (input for ProCost)
  - Batch Output\_All Results1
    - Primary results from ProCost.
    - Typical results you would see from an RTF ProCost run
  - Batch Output\_ShapedResults1 – Shaped results

# Measure InputOutput

Measure Index Name	Measure Name	Symbol (kWh/yr)	Life (yr)	Capital Cost	Annual O&M	Shape	Point	Non-E
8	Streetlight - HPS 100W - New	Streetlight - HPS 100W - Group Rolamp - to LED 45W - New	85	16.3	8	1	S-AIR-Left-Streetlight-AIR-AIR-U	
9	Streetlight - HPS 100W - New	Streetlight - HPS 100W - T-Utility Rolamp - to LED 45W - New	85	16.3	8	1	(14) S-AIR-Left-Streetlight-AIR-AIR-U	
10	Streetlight - HPS 100W - New	Streetlight - HPS 100W - Group Rolamp - to LED 55W - New	66	16.3	12	1	S-AIR-Left-Streetlight-AIR-AIR-U	
11	Streetlight - HPS 100W - New	Streetlight - HPS 100W - T-Utility Rolamp - to LED 55W - New	66	16.3	12	1	(14) S-AIR-Left-Streetlight-AIR-AIR-U	
12	Streetlight - MH 200W - New	Streetlight - MH 200W - Group Rolamp - to LED 100W - New	280	16.3	70	1	S-AIR-Left-Streetlight-AIR-AIR-U	
13	Streetlight - MH 200W - New	Streetlight - MH 200W - T-Utility Rolamp - to LED 100W - New	280	16.3	70	1	S-AIR-Left-Streetlight-AIR-AIR-U	
14	Streetlight - HPS 250W - New	Streetlight - HPS 250W - Group Rolamp - to LED 100W - New	409	16.3	70	1	S-AIR-Left-Streetlight-AIR-AIR-U	
15	Streetlight - HPS 250W - New	Streetlight - HPS 250W - T-Utility Rolamp - to LED 100W - New	409	16.3	70	1	S-AIR-Left-Streetlight-AIR-AIR-U	
16	Streetlight - MH 400W - New	Streetlight - MH 400W - Group Rolamp - to LED 190W - New	576	16.3	155	1	S-AIR-Left-Streetlight-AIR-AIR-U	
17	Streetlight - MH 400W - New	Streetlight - MH 400W - T-Utility Rolamp - to LED 190W - New	576	16.3	155	1	S-AIR-Left-Streetlight-AIR-AIR-U	
18	Streetlight - MH 1000W - New	Streetlight - MH 1000W - Group Rolamp - to LED 450W - New	1075	16.3	320	1	S-AIR-Left-Streetlight-AIR-AIR-U	
19	Streetlight - MH 1000W - New	Streetlight - MH 1000W - T-Utility Rolamp - to LED 450W - New	1075	16.3	320	1	S-AIR-Left-Streetlight-AIR-AIR-U	
20	Streetlight - HPS 100W - NR	Streetlight - HPS 100W - Group Rolamp - to LED 45W - NR	85	16.3	39	1	S-AIR-Left-Streetlight-AIR-AIR-U	
21	Streetlight - HPS 100W - NR	Streetlight - HPS 100W - T-Utility Rolamp - to LED 45W - NR	85	16.3	39	1	S-AIR-Left-Streetlight-AIR-AIR-U	
22	Streetlight - HPS 100W - NR	Streetlight - HPS 100W - Group Rolamp - to LED 55W - NR	66	16.3	43	1	(14) S-AIR-Left-Streetlight-AIR-AIR-U	
23	Streetlight - HPS 100W - NR	Streetlight - HPS 100W - T-Utility Rolamp - to LED 55W - NR	66	16.3	43	1	(14) S-AIR-Left-Streetlight-AIR-AIR-U	
24	Streetlight - MH 200W - NR	Streetlight - MH 200W - Group Rolamp - to LED 100W - NR	280	16.3	150	1	S-AIR-Left-Streetlight-AIR-AIR-U	
25	Streetlight - MH 200W - NR	Streetlight - MH 200W - T-Utility Rolamp - to LED 100W - NR	280	16.3	150	1	(28) S-AIR-Left-Streetlight-AIR-AIR-U	
26	Streetlight - HPS 250W - NR	Streetlight - HPS 250W - Group Rolamp - to LED 100W - NR	409	16.3	150	1	S-AIR-Left-Streetlight-AIR-AIR-U	
27	Streetlight - HPS 250W - NR	Streetlight - HPS 250W - T-Utility Rolamp - to LED 100W - NR	409	16.3	150	1	(28) S-AIR-Left-Streetlight-AIR-AIR-U	
28	Streetlight - MH 400W - NR	Streetlight - MH 400W - Group Rolamp - to LED 190W - NR	576	16.3	250	1	S-AIR-Left-Streetlight-AIR-AIR-U	
29	Streetlight - MH 400W - NR	Streetlight - MH 400W - T-Utility Rolamp - to LED 190W - NR	576	16.3	250	1	(28) S-AIR-Left-Streetlight-AIR-AIR-U	
30	Streetlight - MH 1000W - NR	Streetlight - MH 1000W - Group Rolamp - to LED 450W - NR	1075	16.3	320	1	S-AIR-Left-Streetlight-AIR-AIR-U	
31	Streetlight - MH 1000W - NR	Streetlight - MH 1000W - T-Utility Rolamp - to LED 450W - NR	1075	16.3	320	1	(28) S-AIR-Left-Streetlight-AIR-AIR-U	

Measure Input

Measure Savings

Measure Cost

Category Name

Measure Name

Measure Life

## Measure Output/Results

- **Worksheet: “Batch Output\_All Results1”**
  - **Typical ProCost Results**
    - Measure level results
    - Category level results (includes admin costs)
    - Supply curve results
    - Shaped Savings
- **Worksheet: “Batch Output\_Shaped Results1”**
  - The supply curve worksheets pull data from this portion of the measure results

## Savings and Cost Analysis

- **The background for generating the savings and cost that end up in the Measure InputOutput worksheet**
- **This portion typically has multiple worksheets**
- **Best way to start is to follow the links from the Measure InputOutput to here.**

# Supply Curve Results



- Separate worksheets for New, Natural Replacement (NR), and Retrofit supply curves
- Pulls the supply curve information from the Measure InputOutput worksheet
- Then, applies the units data, applicability factors, ramp rates.
- Results is a supply curve for the measure bundle



## SC Results Worksheet Structure

This portion referred to as the "Stock Model"

•Link to Units Forecast workbook

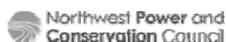
•Selection for region or state

•Forecast unit data

•Applicability, Saturation, and Turnover Rate

•Applicable Units

Methodology	Report Year	Output Range	Existing Region	2016	2017	2018
Methodology: For the Natural Replacement case. Start with 2015 Stock decayed over time for demolition and retirement.						
Vintage: Microwave						
Measure Bundle: Microwave						
Report Year: 2016						
Output Range: MeasureOutput						
# Homes FOR EXISTING STOCK				Homes_2016	Homes_2017	Homes_2018
Single Family	4203528	4193983	4184459	41		
Multifamily - Low Rise	826243	824140	822041	9		
Multifamily - High Rise	211180	210791	210222	0		
Manufactured	572006	565893	559846	5		
REG_TOTAL_STOCK_# HOMES	Total Regional Stock			5912958	5894717	5876568
# Homes NOT TREATED FROM NEW STOCK AND THUS AVAILABLE FOR AIR POOL FROM SC-NEW						
ONLY INCLUDE AFTER ONE EUL						
Single Family	0	0	0	1	2	3
Multifamily - Low Rise	0	0	0	0	0	0
Multifamily - High Rise	0	0	0	0	0	0
Manufactured	0	0	0	0	0	0
New Stock into NR/Retro Pool						
Single Family	0	0	0	0	0	0
Multifamily - Low Rise	0	0	0	0	0	0
Multifamily - High Rise	0	0	0	0	0	0
Manufactured	0	0	0	0	0	0
EXISTING STOCK AVAILABLE TO NR/RETROFIT POOL				2	3	4
Single Family	4203528	4193983	4184459	41		
Multifamily - Low Rise	826243	824140	822041	9		
Multifamily - High Rise	211180	210791	210222	0		
Manufactured	572006	565893	559846	5		
REG_TOTAL_STOCK_# HOMES	Total Regional Stock			5912958	5894717	5876568
APPLY MEASURE APPLICABILITY, SATURATION TURNOVER RATE FOR MAX ANNUAL # UNITS						
Applicability	Saturation	Turnover Rate	Microwave - NR	2016	2017	2018
100%	95%	9%	Single Family	372526	371481	370637
100%	95%	9%	Multifamily - Low Rise	82042	81865	81699
100%	95%	9%	Multifamily - High Rise	18705	18653	18620
100%	95%	9%	Manufactured	50665	50124	49588
				523738	522122	520515
APPLY MEASURE APPLICABILITY, SATURATION TURNOVER RATE FOR MAX ANNUAL # UNITS						
Applicability	Saturation	Turnover Rate	Microwave - NEW	2016	2017	2018
100%	95%	9%	Single Family	0	0	0
100%	95%	9%	Multifamily - Low Rise	0	0	0
100%	95%	9%	Multifamily - High Rise	0	0	0



# SC Results Worksheet (cont.)

Ramp rates applied to number of units

Measure savings (from Results worksheet)

Levelized cost (from Results worksheet)

Measure potential by year (measure savings x annual applicable units)

Supply curve results – amount of potential by year and levelized cost bin.

INCREMENTAL ACHIEVABILITY		Achievability %			
		5%	10%	15%	20%
Microwave - NR		18516	37112	55764	73756
Single Family		4102	8186	12210	16297
Multifamily - Low Rise		935	1866	2793	3716
Multifamily - High Rise		2533	5062	7592	10120
Manufactured		26187	52374	78561	103783
CUMULATIVE ADOPTION		1	2	3	4
Microwave - NR		18516	55764	111560	165319
Single Family		4102	12288	24579	40825
Multifamily - Low Rise		935	2802	5595	9310
Multifamily - High Rise		2533	7546	14984	24795
Manufactured		26187	78399	156476	260260

SUPPLY CURVE SAVINGS BY BUNDLE		NR		Units			
kW/yr per home		1		2006	2017	2018	2019
TBC Net Levelized Cost (Net of All Benefits) in				Units_2006	Units_2017	Units_2018	Units_2019
Bundle Savings	Cost	Segment	Measure	Units_2006	Units_2017	Units_2018	Units_2019
10	41	Single Family	Microwave Top Tier	0.0	0.0	0.1	0.1
10	41	Multifamily - Low Rise	Microwave Top Tier	0.0	0.0	0.0	0.0
10	41	Multifamily - High Rise	Microwave Top Tier	0.0	0.0	0.0	0.0
10	41	Manufactured	Microwave Top Tier	0.0	0.0	0.0	0.0
	41.2			0	0	0	0

RECOMBINE MEASURE BUNDLES INTO SUPPLY CURVE CUMULATIVE		Units			
		Units_2006	2017	2018	2019
Block 1: <= 0 mths/kWh	<= 25555	0.0	0.0	0.0	0.0
Block 2: <= 10 mths/kWh	> 0	0.0	0.0	0.0	0.0
Block 3: 10-20 mths/kWh	> 10	0.0	0.0	0.0	0.0
Block 4: 20-30 mths/kWh	> 20	0.0	0.0	0.0	0.0
Block 5: 30-40 mths/kWh	> 30	0.0	0.0	0.0	0.0
Block 6: 40-50 mths/kWh	> 40	0.0	0.1	0.1	0.1
Block 7: 50-60 mths/kWh	> 50	0.0	0.1	0.1	0.1
Block 8: 60-70 mths/kWh	> 60	0.0	0.1	0.1	0.1
Block 9: 70-80 mths/kWh	> 70	0.0	0.1	0.1	0.1
Block 10: 80-90 mths/kWh	> 80	0.0	0.1	0.1	0.1
Block 11: 90-100 mths/kWh	> 90	0.0	0.1	0.1	0.1
Block 12: 100-110 mths/kWh	> 100	0.0	0.1	0.1	0.1
Block 13: 110-120 mths/kWh	> 110	0.0	0.1	0.1	0.1
Block 14: 120-130 mths/kWh	> 120	0.0	0.1	0.1	0.1
Block 15: 130-140 mths/kWh	> 130	0.0	0.1	0.1	0.1
Block 16: 140-150 mths/kWh	> 140	0.0	0.1	0.1	0.1
Block 17: 150-160 mths/kWh	> 150	0.0	0.1	0.1	0.1
Block 18: 160-170 mths/kWh	> 160	0.0	0.1	0.1	0.1
Block 19: 170-180 mths/kWh	> 170	0.0	0.1	0.1	0.1
Block 20: 180-190 mths/kWh	> 180	0.0	0.1	0.1	0.1