

HVAC Status READi / MASControl / Etc...



CALIFORNIA

TECHNICAL FORUM

**AYAD AL-SHAIKH
PROF. MARK MODERA
UC DAVIS TEAM
JUNE 2018**

HVAC Measure List – for Q2 Consolidation

3

- **Draft HVAC Measure List for Q2**
 - ❑ 5.03 Space Heating Boilers
 - ❑ 5.51 Water Source Heat Pumps
 - ❑ 5.22 Variable Refrigerant Flow - Commercial (*POU only*)
 - ✦ Heat Pump & Heat Recovery Systems, 5 – 80 tons
 - ❑ 5.05 Water-Cooled Chillers
 - ❑ 5.39 Air-Cooled Packaged Chiller
 - ❑ 5.09 Res Duct Test & Seal
 - ❑ 5.17 Whole House Fan
 - ❑ 5.18 High Efficiency Furnaces - Residential
 - ❑ 5.24 Unitary Air-Cooled - Commercial
 - ✦ Air Conditioners and Heat Pump ≥ 65 kBtu/h
 - ❑ 5.25 Unitary Air Cooled - Commercial
 - ✦ Air Conditioners and Heat Pump Units Under 65 kBtu/h
 - ❑ 5.27 High Efficiency Package Terminal AC and Heat Pump
 - ✦ 24kBtu/h (2 tons) and under
 - ❑ 5.40 Upstream Residential HVAC (*splitting offerings*)

Parallel Path Approach – eTRM / HVAC

5

- DEER Measure ID:

- D08-NE-HVAC-airAC-Pkg-55to64kBtuh-17p0seer

Bldg Type	BldgVint	BldgLoc	NormUnit
Com	Ex	CZ05	Cap-Tons
AStdEUkWh	AStdEUkW	AStdEUtherm	
282	0.106	1.85	

EX = weighted
average of
Vintages

Vintage

- 1975 existing building stock built before 1978
- 1985 existing building stock built between 1978 and 1992
- 1996 existing building stock built between 1993 and 2001
- 2003 existing building stock built between 2002 and 2005
- 2007 existing building stock built between 2006 and 2009
- 2011 existing building stock built between 2010 and 2013
- 2014 existing building stock built after 2013

COM = weighted
average of
Commercial
Building Types

Building Type

- | | | | |
|-------|-------------------------------|-------|-----------------------------|
| • Asm | Assembly | • Mtl | Lodging - Motel |
| • ECC | Education - Community College | • OfL | Office - Large |
| • EPr | Education - Primary School | • OfS | Office - Small |
| • ERC | Education – Reloc. Classroom | • RFF | Restaurant - Fast-Food |
| • ESe | Education - Secondary School | • RSD | Restaurant - Sit-Down |
| • EUn | Education - University | • Rt3 | Retail - Multistory Large |
| • Gro | Grocery | • RtL | Retail - Single-Story Large |
| • Hsp | Health/Medical - Hospital | • RtS | Retail - Small |
| • Nrs | Health/Medical - Nursing Home | • SCn | Storage - Conditioned |
| • Htl | Lodging - Hotel | • SUn | Storage - Unconditioned |
| | | • WRf | Warehouse - Refrigerated |

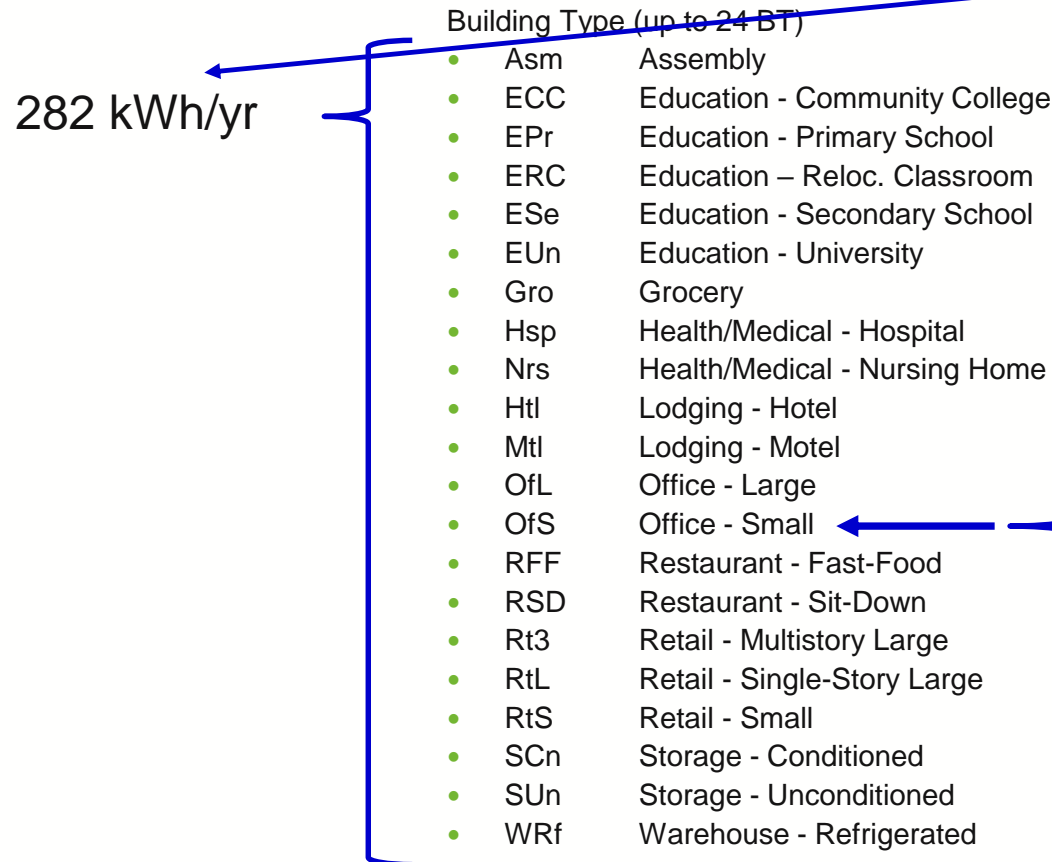
Parallel Path Approach – eTRM / HVAC

6

- DEER Measure ID:

- D08-NE-HVAC-airAC-Pkg-55to64kBtuh-17p0seer

Bldg Type	BldgVint	BldgLoc	NormUnit
Com	Ex	CZ05	Cap-Tons
AStdEUkWh	AStdEUkW	AStdEUtherm	
282	0.106	1.85	



24 x 8 x 2 = 384 models

Vintage (up to 8 Vint)

- 1975, existing building stock built before 1978
- 1985, existing building stock built between 1978 and 1992
- 1996, existing building stock built between 1993 and 2001
- 2003, existing building stock built between 2002 and 2005
- 2007, existing building stock built between 2006 and 2009
- 2011, existing building stock built between 2010 and 2013
- 2014, existing building stock built after 2013

Base Case



eQUEST

Measure Case



eQUEST

Parallel Path Approach – eTRM / HVAC

7

- DEER Measure ID:

- D08-NE-HVAC-airAC-Pkg-55to64kBtuh-17p0seer

Bldg Type	BldgVint	BldgLoc	NormUnit
Com	Ex	CZ05	Cap-Tons
AStdEUkWh	AStdEUkW	AStdEUtherm	
282	0.106	1.85	

Base Case



eQUEST

Measure Case



eQUEST

(versus)

- Heat Maps

- Base, Measure, Savings
 - Electric / Gas

- Daily Profiles

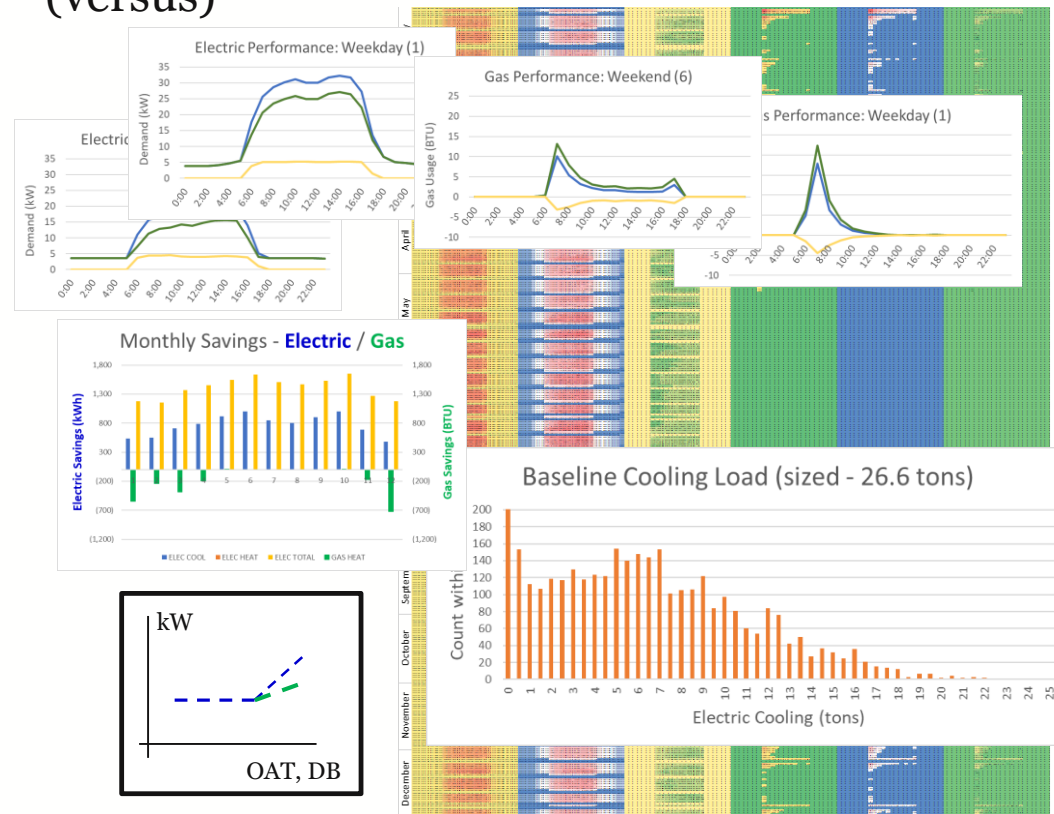
- Weekday, Weekend
 - Electric / Gas

- Monthly Usage

- Cooling Load Histogram

- 3-P Graphs (OAT vs kW)

- And more...



1. Background Info

- Existing Workpapers and EAD tables
- Get “Measure ID” and understand permutations

2. Download Savings

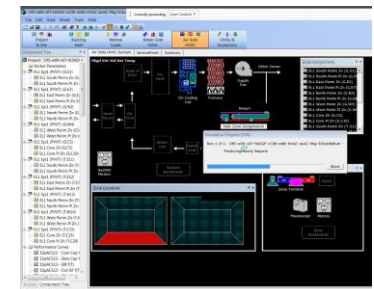
- READi
- Download full set of impact values and measure definition
- Weighting

3. Reproduce Savings

- MASControl
- Generate building models that form basis for permutation values

4. Measure Model Parameters

- *.INP / *.BDL
- Compare Base and Measure Case models



DEER Measure Process (part 2)

9

5. Implementation Summary

- Claims data
- Actually being done in parallel to be available early in the process

6. Measure Summary

- Measure summary template
- Strategically choose comparison

7. Measure Report

- Power Point
- Summary of key findings and questions

8. Feedback

- Weekly meeting
- Get feedback to define measure; improve process

Est No.	Ref No.	Name	Implement Location	PA	MeasureID	MeasureDescription	MeasureID
15.02	15.02	Economizer Controls	PA		190294	Economizer Control Replacement on AC Unit with 1	190294
					190295	Economizer Control Replacement on Heat Pump	190295
					190296	Economizer Control Adjustment on AC Unit with 1	190296
					190297	Economizer Control Adjustment on AC Unit with 1	190297
					190298	Economizer Control Adjustment on Heat Pump	190298
					190299	Economizer Control Adjustment on Variable Volume	190299
					190300	Economizer Control Adjustment on AC Unit with 1	190300
					190301	Economizer Control Adjustment on Heat Pump	190301
					190302	Economizer Control Adjustment on AC Unit with 1	190302
					190303	Economizer Control Adjustment on Heat Pump	190303
					190304	Economizer Control Adjustment on AC Unit with 1	190304
					190305	Economizer Control Adjustment on Variable Volume	190305
					190306	Economizer Control Adjustment on AC Unit with 1	190306
					190307	Economizer Control Adjustment on Heat Pump	190307
					190308	Economizer Control Adjustment on AC Unit with 1	190308
					190309	Economizer Control Adjustment on Variable Volume	190309
					190310	Economizer Control Adjustment on AC Unit with 1	190310
					190311	Economizer Control Adjustment on Heat Pump	190311
					190312	Economizer Control Adjustment on AC Unit with 1	190312
					190313	Economizer Control Adjustment on Variable Volume	190313
					190314	Economizer Control Adjustment on AC Unit with 1	190314
					190315	Economizer Control Adjustment on Heat Pump	190315
					190316	Economizer Control Adjustment on AC Unit with 1	190316
					190317	Economizer Control Adjustment on Variable Volume	190317
					190318	Economizer Control Adjustment on AC Unit with 1	190318
					190319	Economizer Control Adjustment on Heat Pump	190319
					190320	Economizer Control Adjustment on AC Unit with 1	190320
					190321	Economizer Control Adjustment on Variable Volume	190321
					190322	Economizer Control Adjustment on AC Unit with 1	190322
					190323	Economizer Control Adjustment on Heat Pump	190323
					190324	Economizer Control Adjustment on AC Unit with 1	190324
					190325	Economizer Control Adjustment on Variable Volume	190325
					190326	Economizer Control Adjustment on AC Unit with 1	190326
					190327	Economizer Control Adjustment on Heat Pump	190327
					190328	Economizer Control Adjustment on AC Unit with 1	190328
					190329	Economizer Control Adjustment on Variable Volume	190329
					190330	Economizer Control Adjustment on AC Unit with 1	190330
					190331	Economizer Control Adjustment on Heat Pump	190331
					190332	Economizer Control Adjustment on AC Unit with 1	190332
					190333	Economizer Control Adjustment on Variable Volume	190333
					190334	Economizer Control Adjustment on AC Unit with 1	190334
					190335	Economizer Control Adjustment on Heat Pump	190335
					190336	Economizer Control Adjustment on AC Unit with 1	190336
					190337	Economizer Control Adjustment on Variable Volume	190337
					190338	Economizer Control Adjustment on AC Unit with 1	190338
					190339	Economizer Control Adjustment on Heat Pump	190339
					190340	Economizer Control Adjustment on AC Unit with 1	190340
					190341	Economizer Control Adjustment on Variable Volume	190341
					190342	Economizer Control Adjustment on AC Unit with 1	190342
					190343	Economizer Control Adjustment on Heat Pump	190343
					190344	Economizer Control Adjustment on AC Unit with 1	190344
					190345	Economizer Control Adjustment on Variable Volume	190345
					190346	Economizer Control Adjustment on AC Unit with 1	190346
					190347	Economizer Control Adjustment on Heat Pump	190347
					190348	Economizer Control Adjustment on AC Unit with 1	190348
					190349	Economizer Control Adjustment on Variable Volume	190349
					190350	Economizer Control Adjustment on AC Unit with 1	190350
					190351	Economizer Control Adjustment on Heat Pump	190351
					190352	Economizer Control Adjustment on AC Unit with 1	190352
					190353	Economizer Control Adjustment on Variable Volume	190353
					190354	Economizer Control Adjustment on AC Unit with 1	190354
					190355	Economizer Control Adjustment on Heat Pump	190355
					190356	Economizer Control Adjustment on AC Unit with 1	190356
					190357	Economizer Control Adjustment on Variable Volume	190357
					190358	Economizer Control Adjustment on AC Unit with 1	190358
					190359	Economizer Control Adjustment on Heat Pump	190359
					190360	Economizer Control Adjustment on AC Unit with 1	190360
					190361	Economizer Control Adjustment on Variable Volume	190361
					190362	Economizer Control Adjustment on AC Unit with 1	190362
					190363	Economizer Control Adjustment on Heat Pump	190363
					190364	Economizer Control Adjustment on AC Unit with 1	190364
					190365	Economizer Control Adjustment on Variable Volume	190365
					190366	Economizer Control Adjustment on AC Unit with 1	190366
					190367	Economizer Control Adjustment on Heat Pump	190367
					190368	Economizer Control Adjustment on AC Unit with 1	190368
					190369	Economizer Control Adjustment on Variable Volume	190369
					190370	Economizer Control Adjustment on AC Unit with 1	190370
					190371	Economizer Control Adjustment on Heat Pump	190371
					190372	Economizer Control Adjustment on AC Unit with 1	190372
					190373	Economizer Control Adjustment on Variable Volume	190373
					190374	Economizer Control Adjustment on AC Unit with 1	190374
					190375	Economizer Control Adjustment on Heat Pump	190375
					190376	Economizer Control Adjustment on AC Unit with 1	190376
					190377	Economizer Control Adjustment on Variable Volume	190377
					190378	Economizer Control Adjustment on AC Unit with 1	190378
					190379	Economizer Control Adjustment on Heat Pump	190379
					190380	Economizer Control Adjustment on AC Unit with 1	190380
					190381	Economizer Control Adjustment on Variable Volume	190381
					190382	Economizer Control Adjustment on AC Unit with 1	190382
					190383	Economizer Control Adjustment on Heat Pump	190383
					190384	Economizer Control Adjustment on AC Unit with 1	190384
					190385	Economizer Control Adjustment on Variable Volume	190385
					190386	Economizer Control Adjustment on AC Unit with 1	190386
					190387	Economizer Control Adjustment on Heat Pump	190387
					190388	Economizer Control Adjustment on AC Unit with 1	190388
					190389	Economizer Control Adjustment on Variable Volume	190389
					190390	Economizer Control Adjustment on AC Unit with 1	190390
					190391	Economizer Control Adjustment on Heat Pump	190391
					190392	Economizer Control Adjustment on AC Unit with 1	190392
					190393	Economizer Control Adjustment on Variable Volume	190393
					190394	Economizer Control Adjustment on AC Unit with 1	190394
					190395	Economizer Control Adjustment on Heat Pump	190395
					190396	Economizer Control Adjustment on AC Unit with 1	190396
					190397	Economizer Control Adjustment on Variable Volume	190397
					190398	Economizer Control Adjustment on AC Unit with 1	190398
					190399	Economizer Control Adjustment on Heat Pump	190399
					190400	Economizer Control Adjustment on AC Unit with 1	190400

