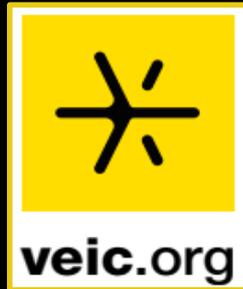


Measuring Demand Savings with Smart Thermostat Data

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IEPEC
August 2017

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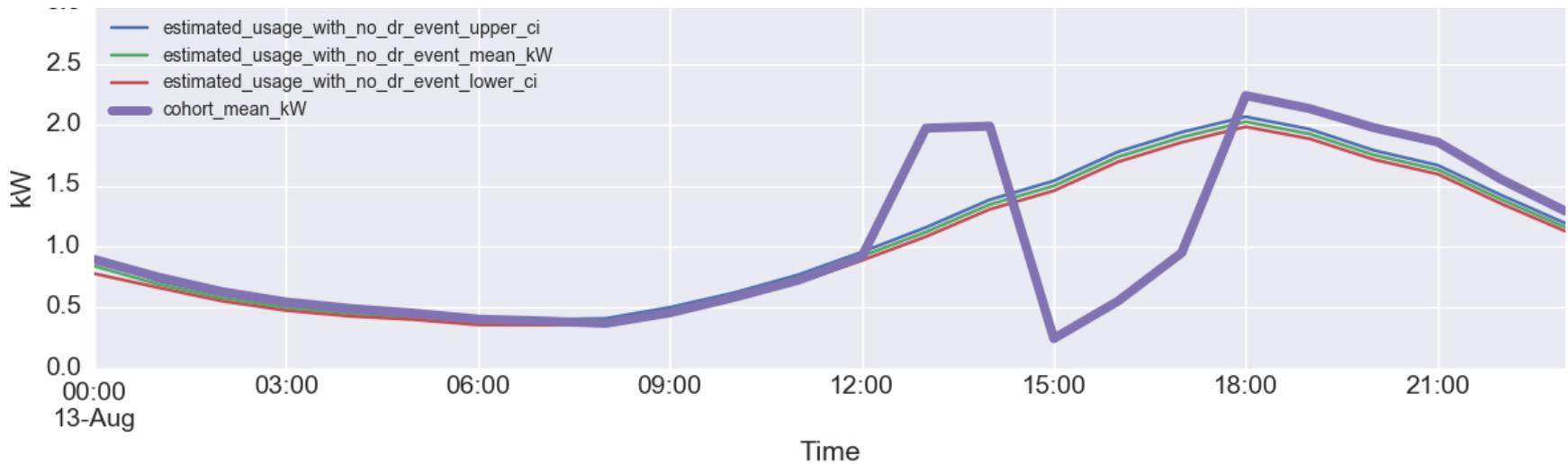
These Are Not kW Meters



9,969,421 Rows of Event Data

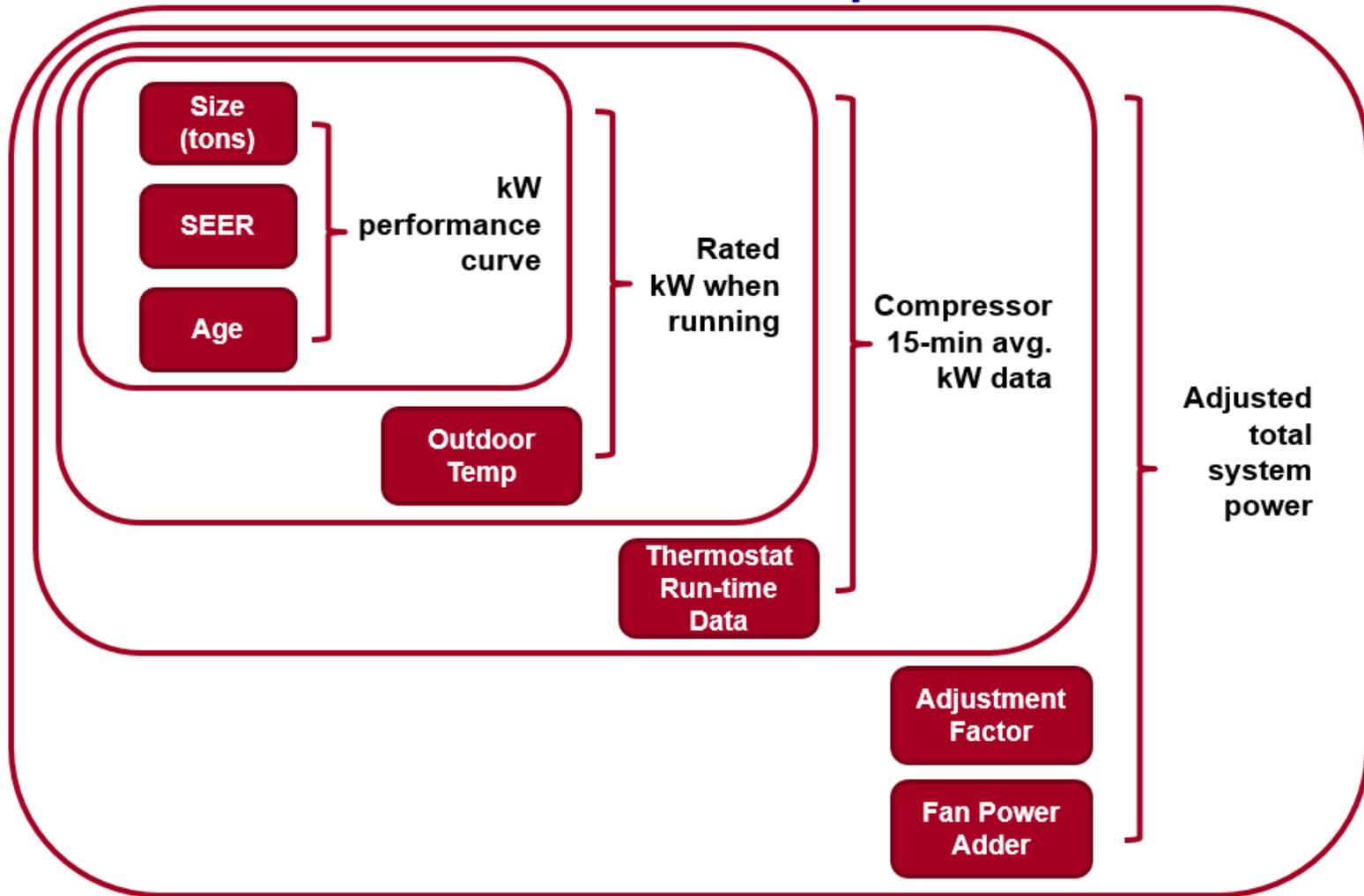
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349581 CoolingActive,200-2,2016-07-15 18:00:00,,t,  
349582 CoolSetpointAbsolute,200-2,2016-07-15 18:00:00,25.5555555555556,,  
349583 FanActive,200-2,2016-07-15 18:00:00,,t,  
349584 HeatSetpointAbsolute,200-2,2016-07-15 18:00:00,20,,  
349585 DisplayTemperature,200-2,2016-07-15 16:57:29,25.5555555555556,,  
349586 DisplayTemperature,200-2,2016-07-15 16:57:09,25,,  
349587 DisplayTemperature,200-2,2016-07-15 16:56:49,25.5555555555556,,  
349588 DisplayTemperature,200-2,2016-07-15 15:50:09,25,,  
349589 DisplayTemperature,200-2,2016-07-15 13:43:49,24.4444444444444,,  
349590 CoolRate,200-2,2016-07-15 11:59:58,-2.41265190972222,,  
349591 HeatRate,200-2,2016-07-15 11:59:58,2.87489149305556,,  
349592 DisplayTemperature,200-2,2016-07-15 11:17:29,23.8888888888889,,  
349593 DisplayTemperature,200-2,2016-07-15 11:17:09,23.3333333333333,,  
349594 DisplayTemperature,200-2,2016-07-15 11:16:49,23.8888888888889,,  
349595 DisplayTemperature,200-2,2016-07-15 08:44:29,23.3333333333333,,  
349596 CoolSetpointAbsolute,200-2,2016-07-15 07:59:58,26.6666666666667,,  
349597 HeatSetpointAbsolute,200-2,2016-07-15 07:59:58,16.6666666666667,,
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The Goal: DR Impact in kW

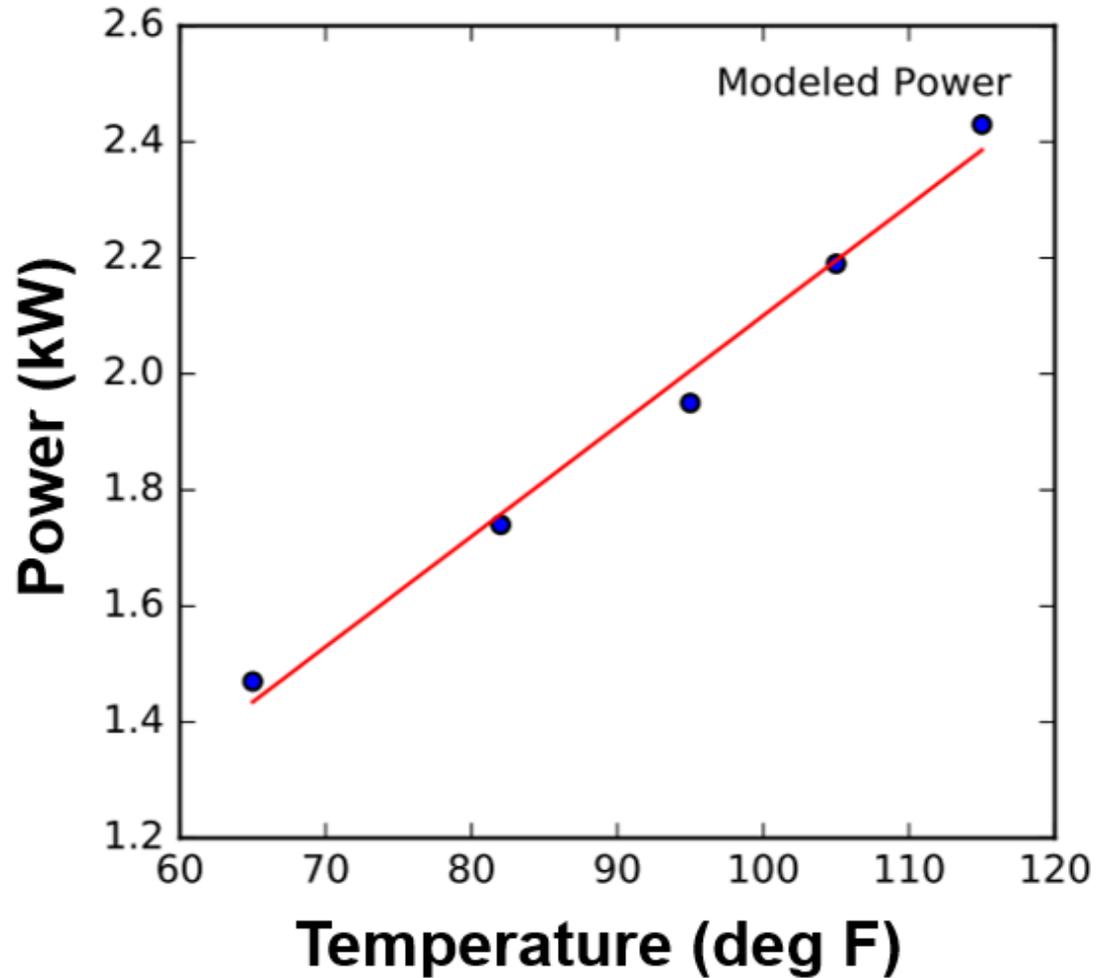


How Do We Get
There From Here?

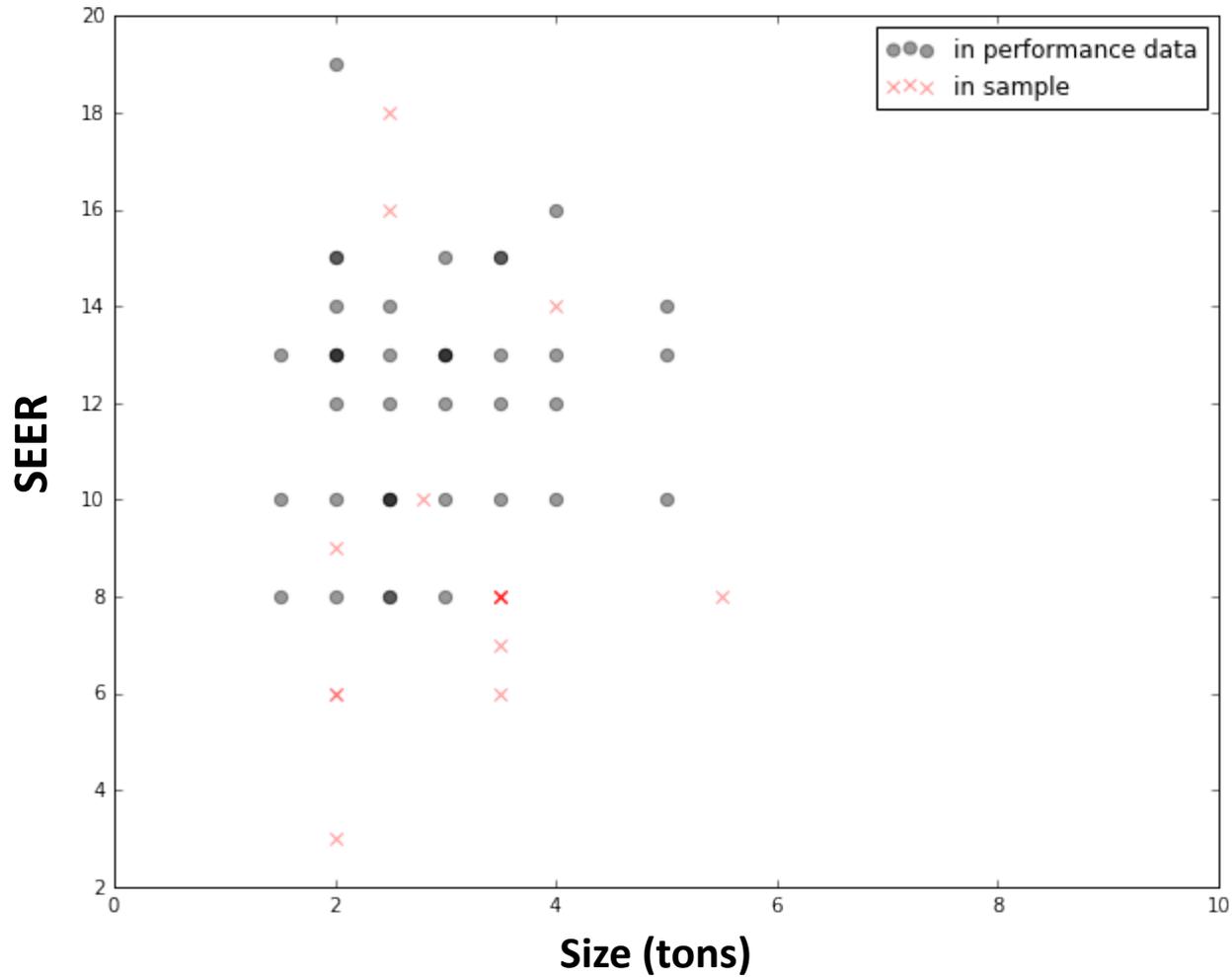
Thermostat Data and HVAC “Nameplate” Method



Performance Curve From Datasheet

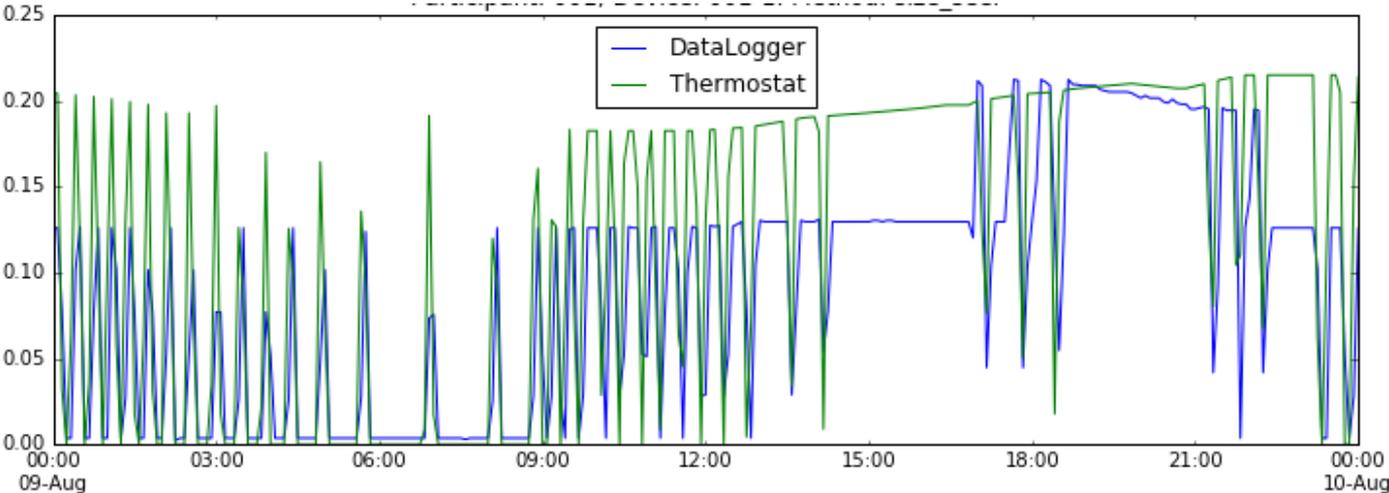
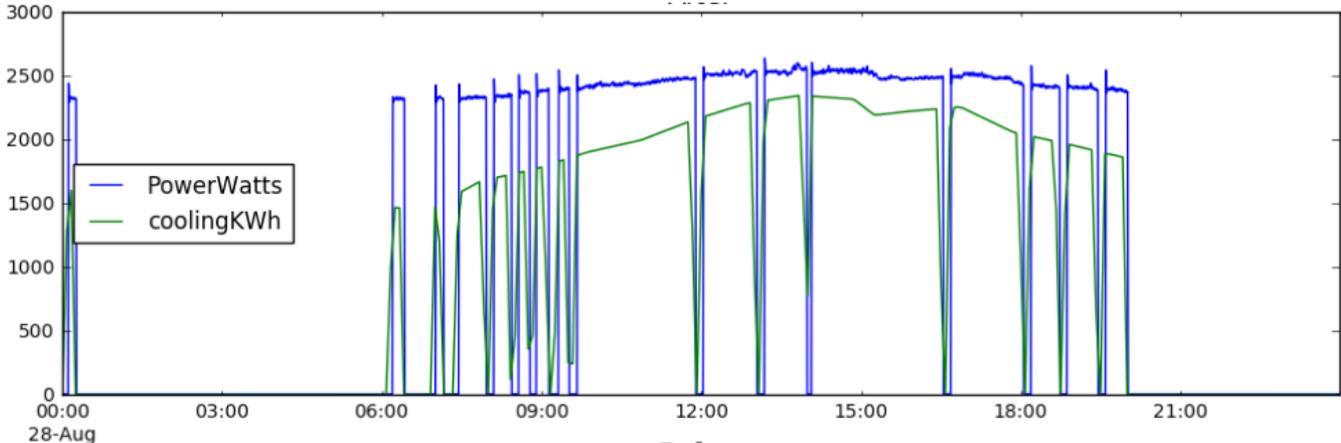


Datasheet Coverage is Spotty

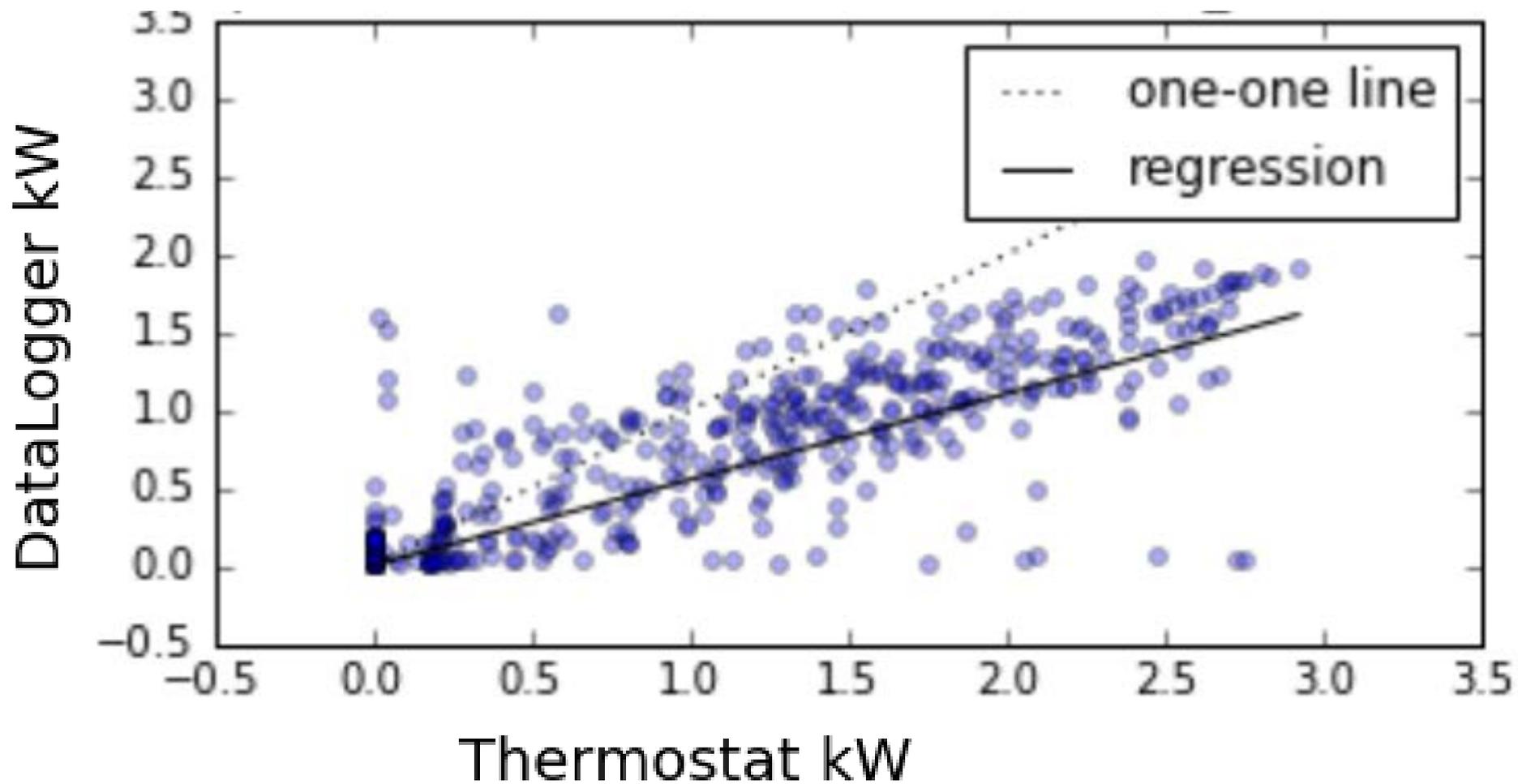


How Do We Know
If It's Right?

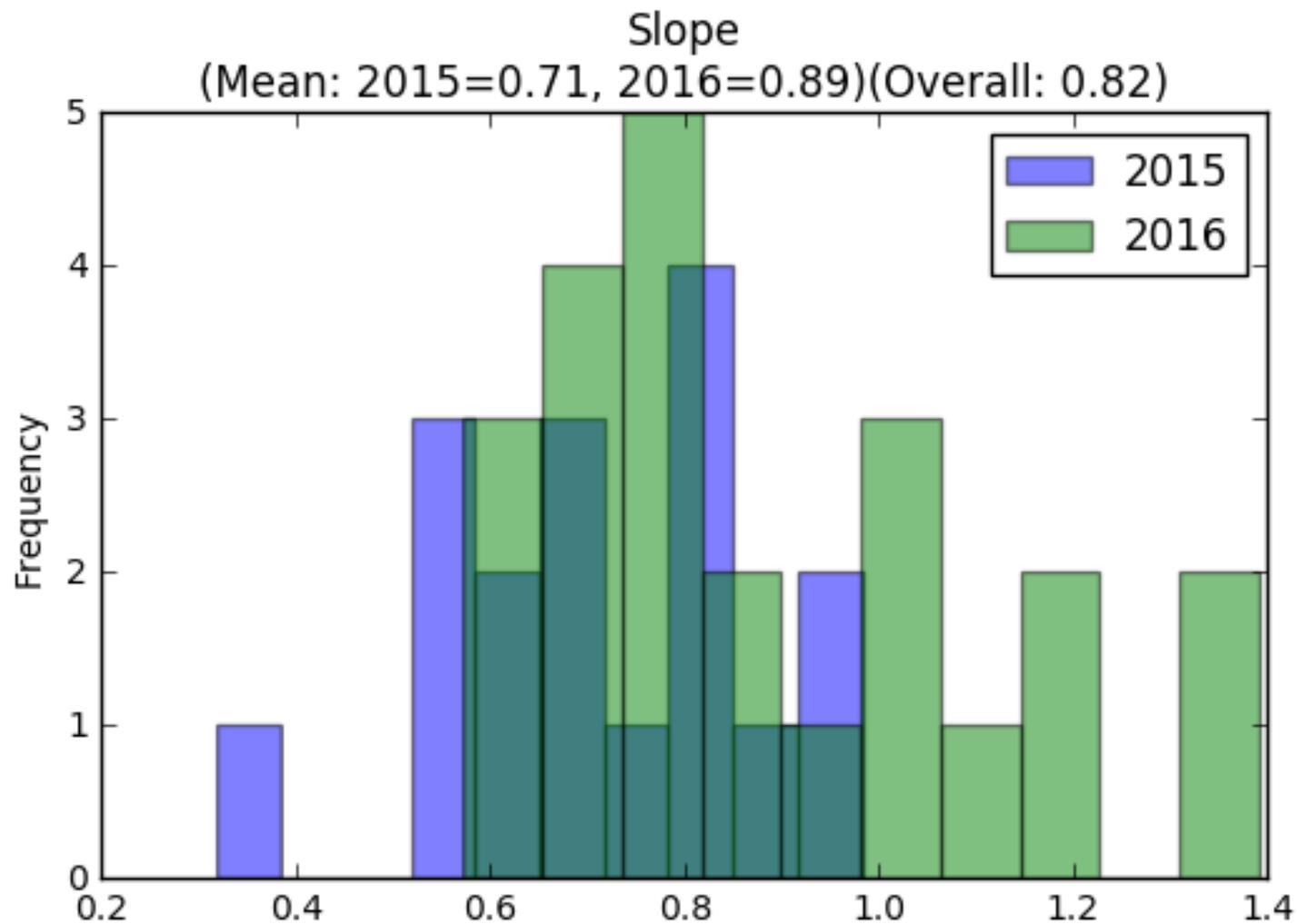
Calibrating Against Amp-loggers



Calibrating Against Amp-loggers

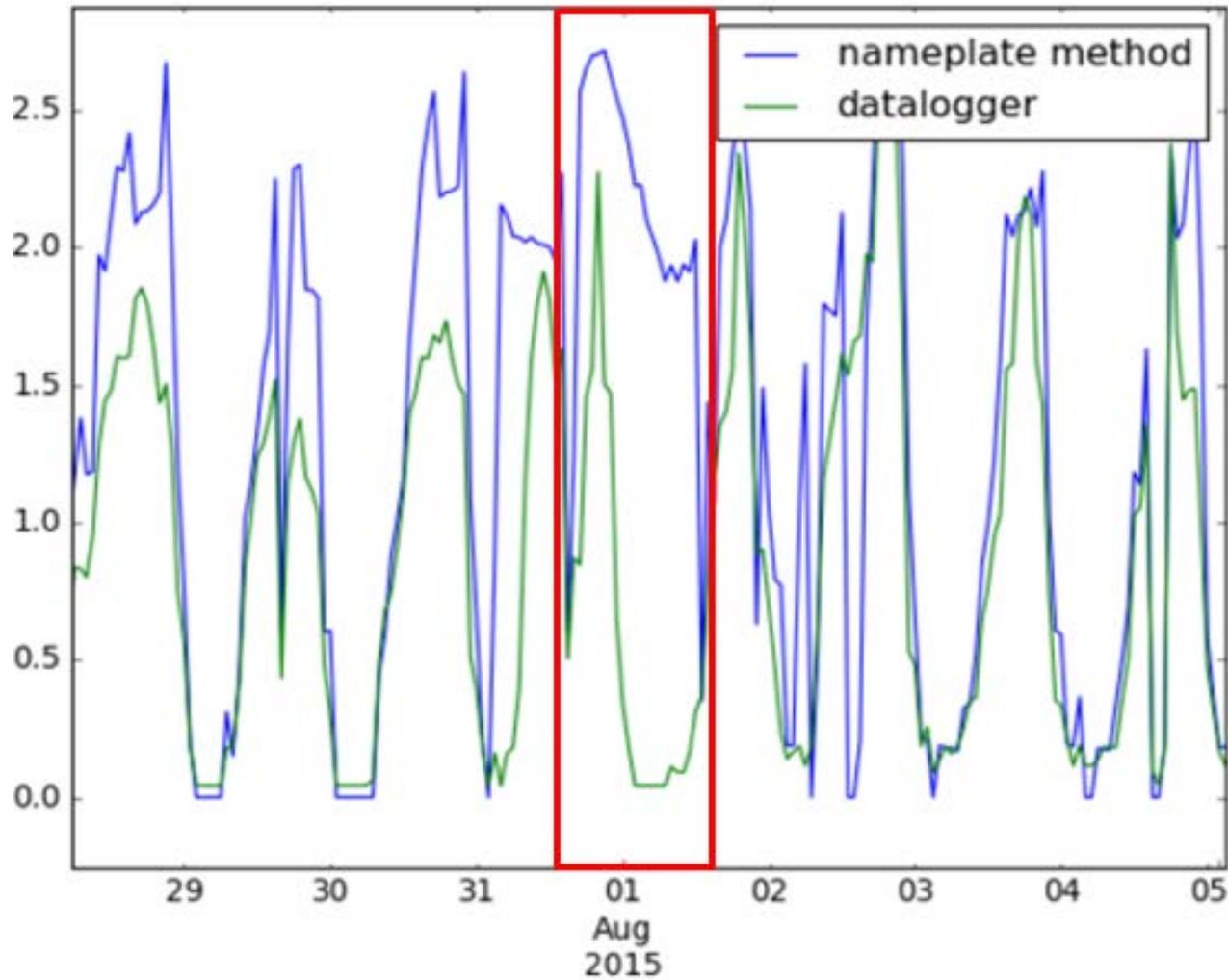


Calibrating Against Amp-loggers

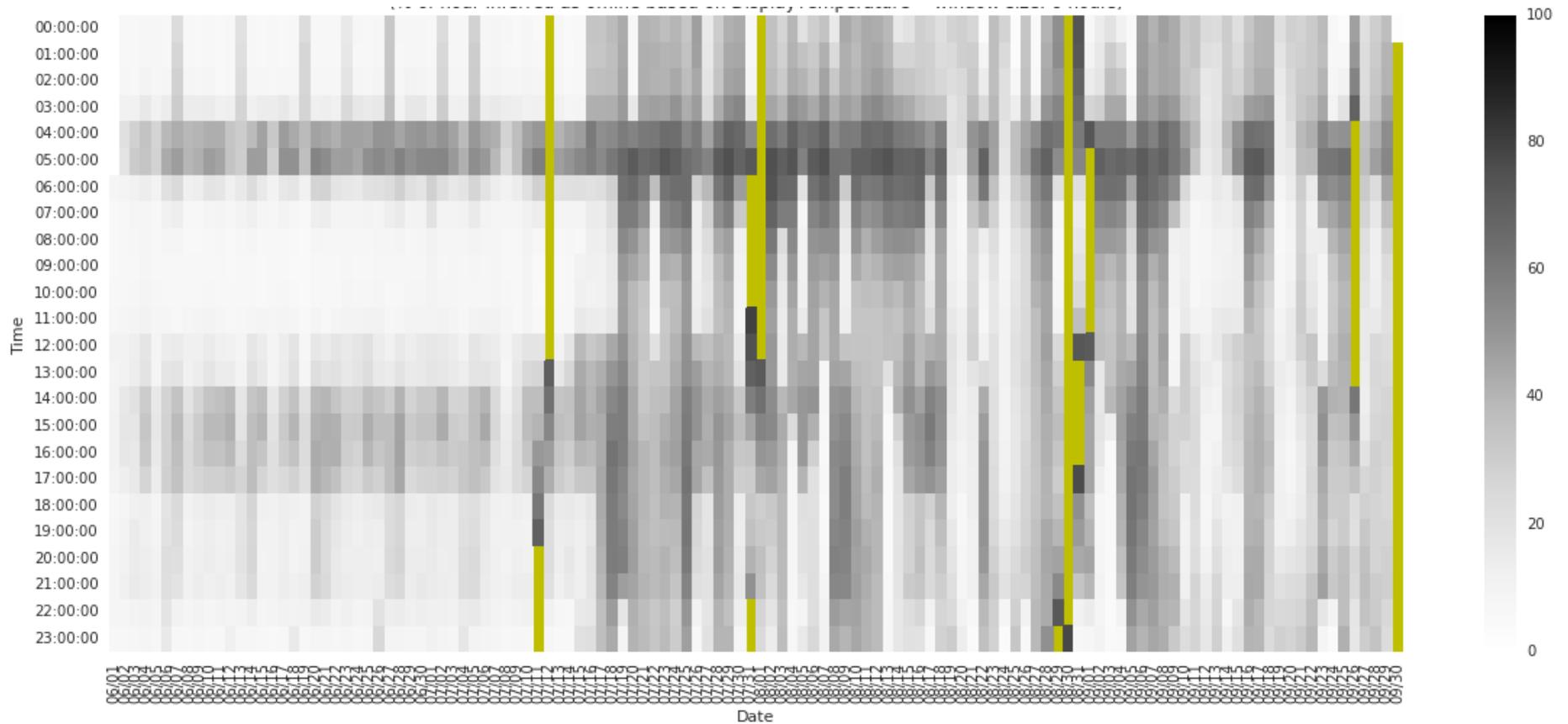


I Sure Hope
There Aren't Any
Data Quality Issues...

Other Data Discrepancies

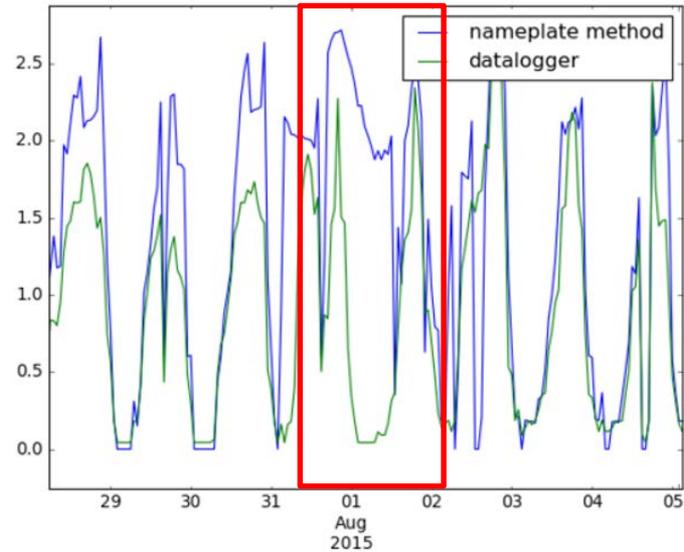


Data Outages – Search and Destroy!

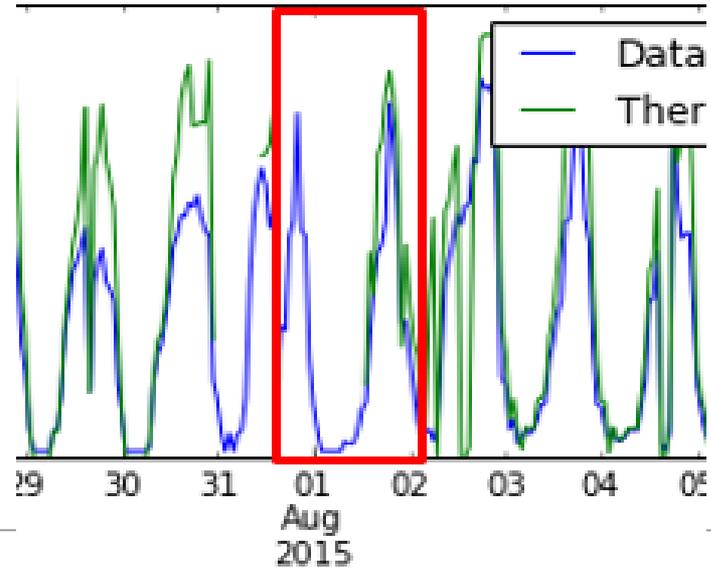


Interpolation: Too Much of a Good Thing

Before

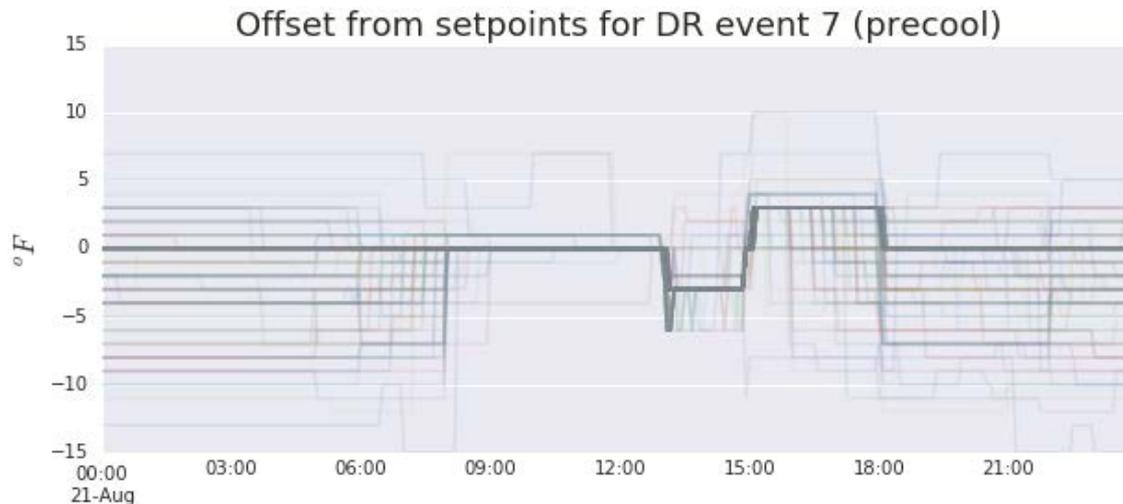
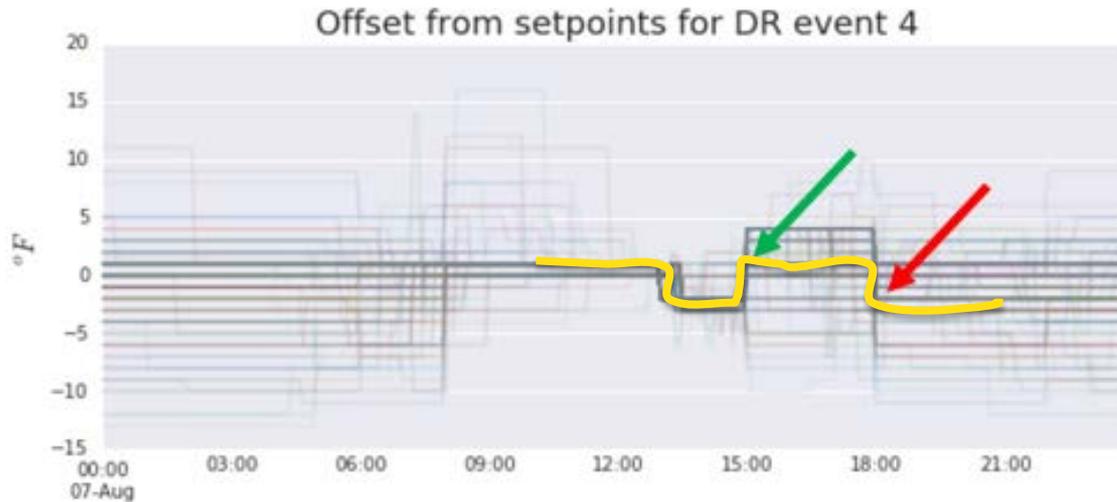


After

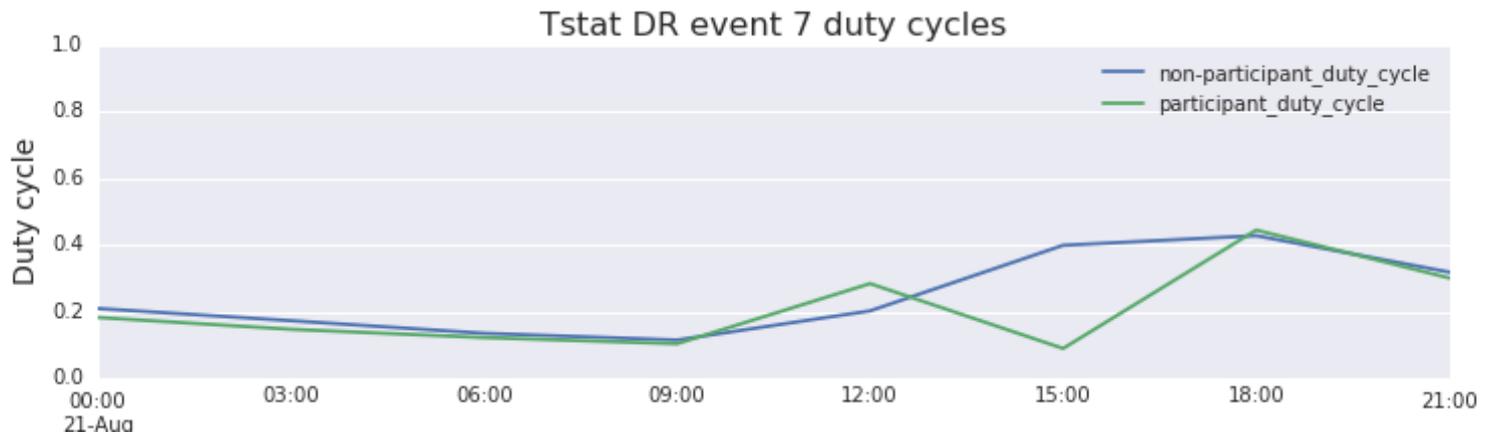
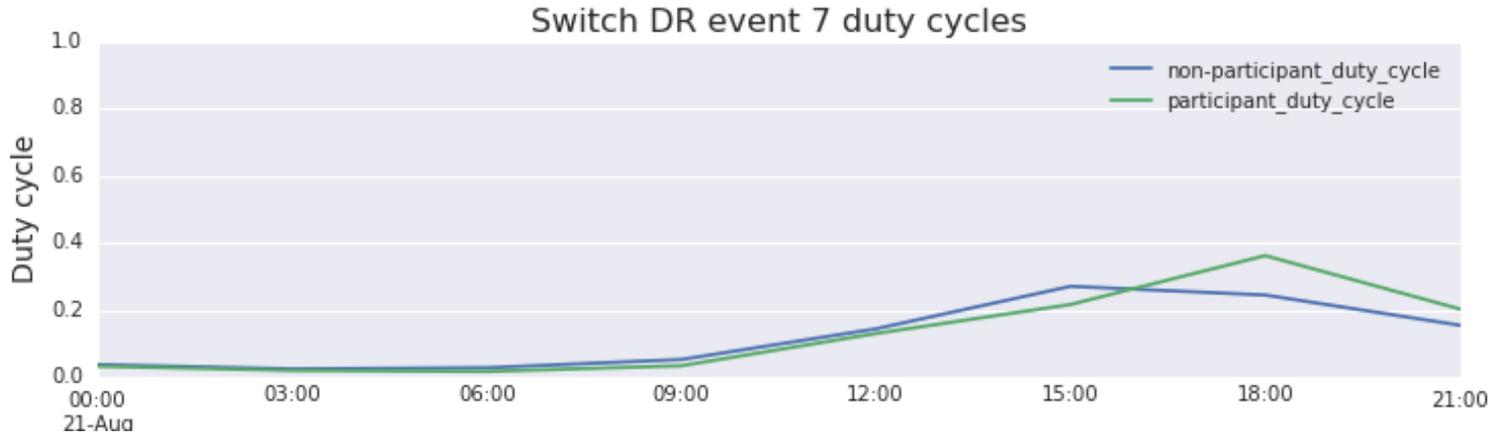


Did We Learn
Anything Useful
After All That Work?

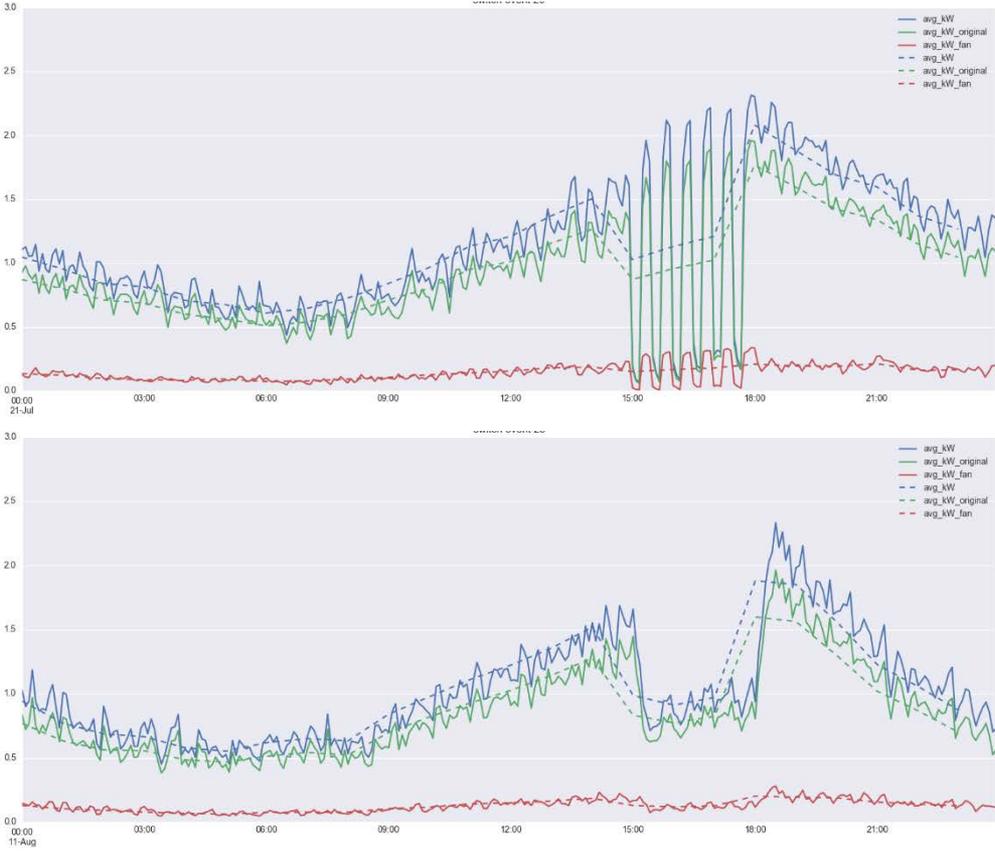
Some DR Events Were Not Executed Correctly

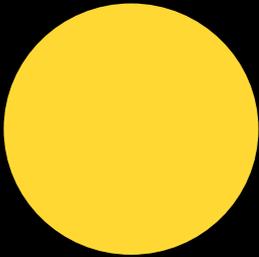
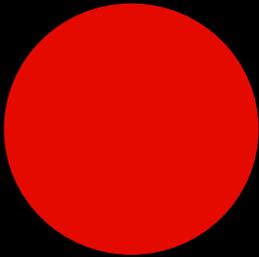
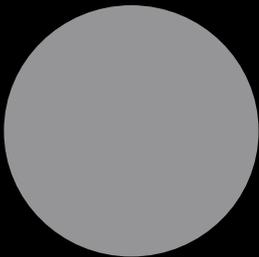
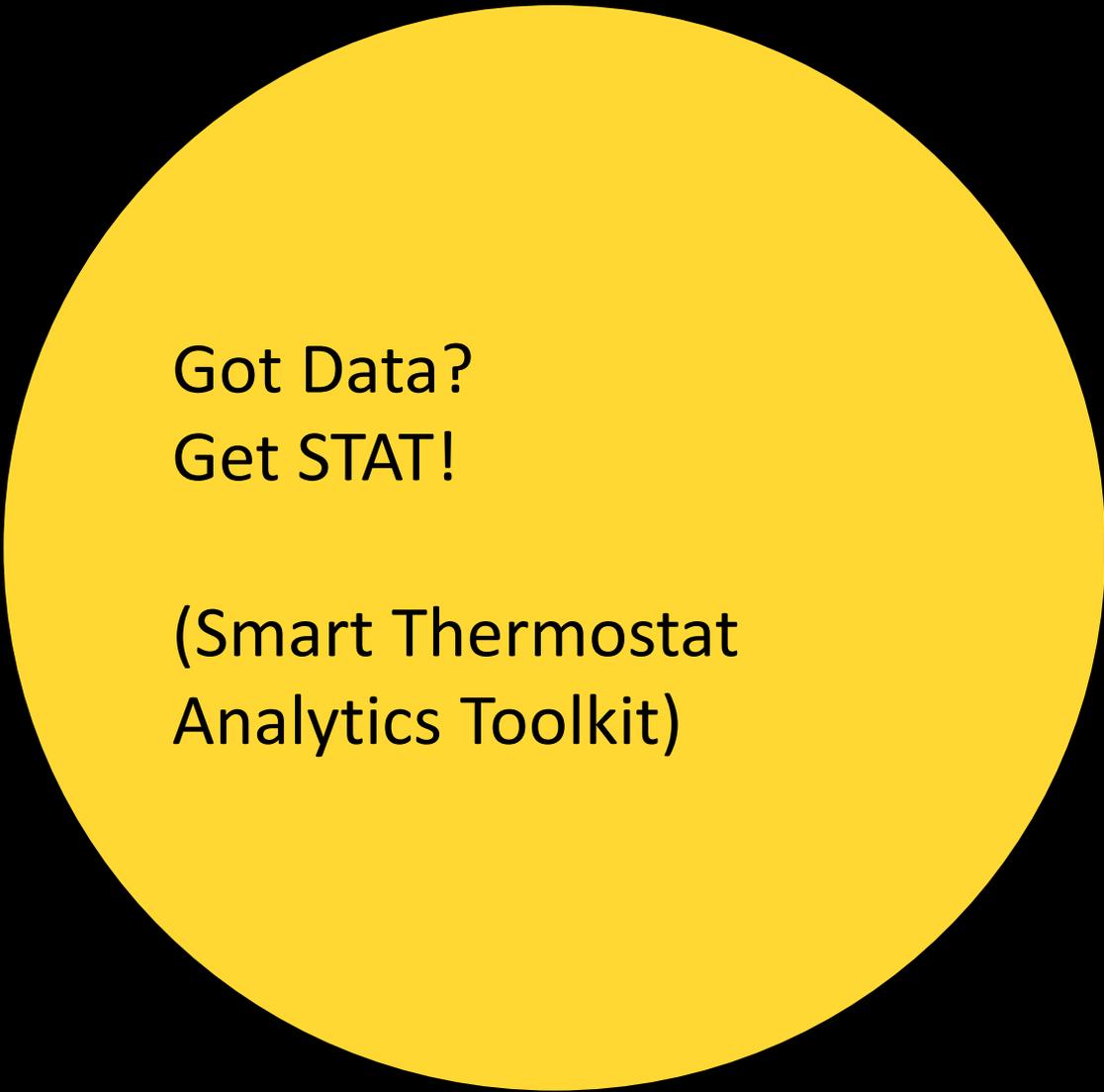


Switch Cycling With Oversized HVAC Units



Synchronized Cycling vs. Randomized Start Times





Got Data?
Get STAT!

(Smart Thermostat
Analytics Toolkit)

egoldman@veic.org