Measuring Demand Savings with Smart Thermostat Data

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Demand Response Pilot

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Lincoln Electric System

Final report: https://www.epri.com/#/pages/product/000000003002011250/

These Are Not kW Meters

9,969,421 Rows of Event Data

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349578   CoolingActive,200-2,2016-07-15 18:05:42,,f,
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349580   compressorFurnaceStatus,200-2,2016-07-15 18:00:00,,t,
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349582   CoolSetpointAbsolute,200-2,2016-07-15 18:00:00,25.5555555555556,,
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349586   DisplayTemperature,200-2,2016-07-15 16:57:09,25,,
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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,,
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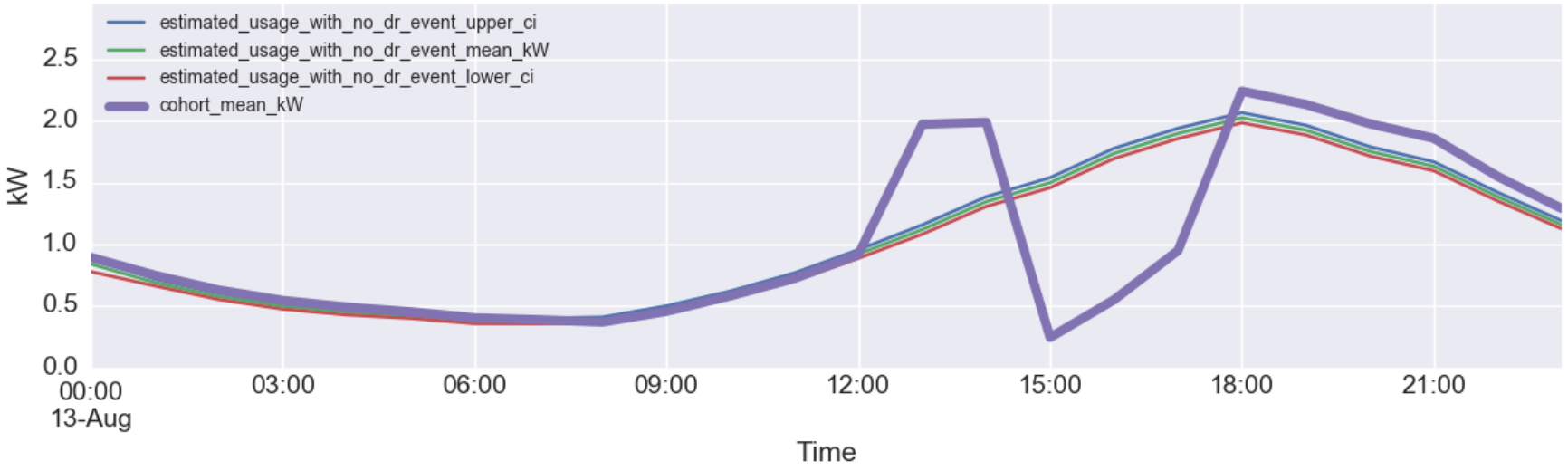
The Goal: DR Impact in kW



How Do We Get There From Here?

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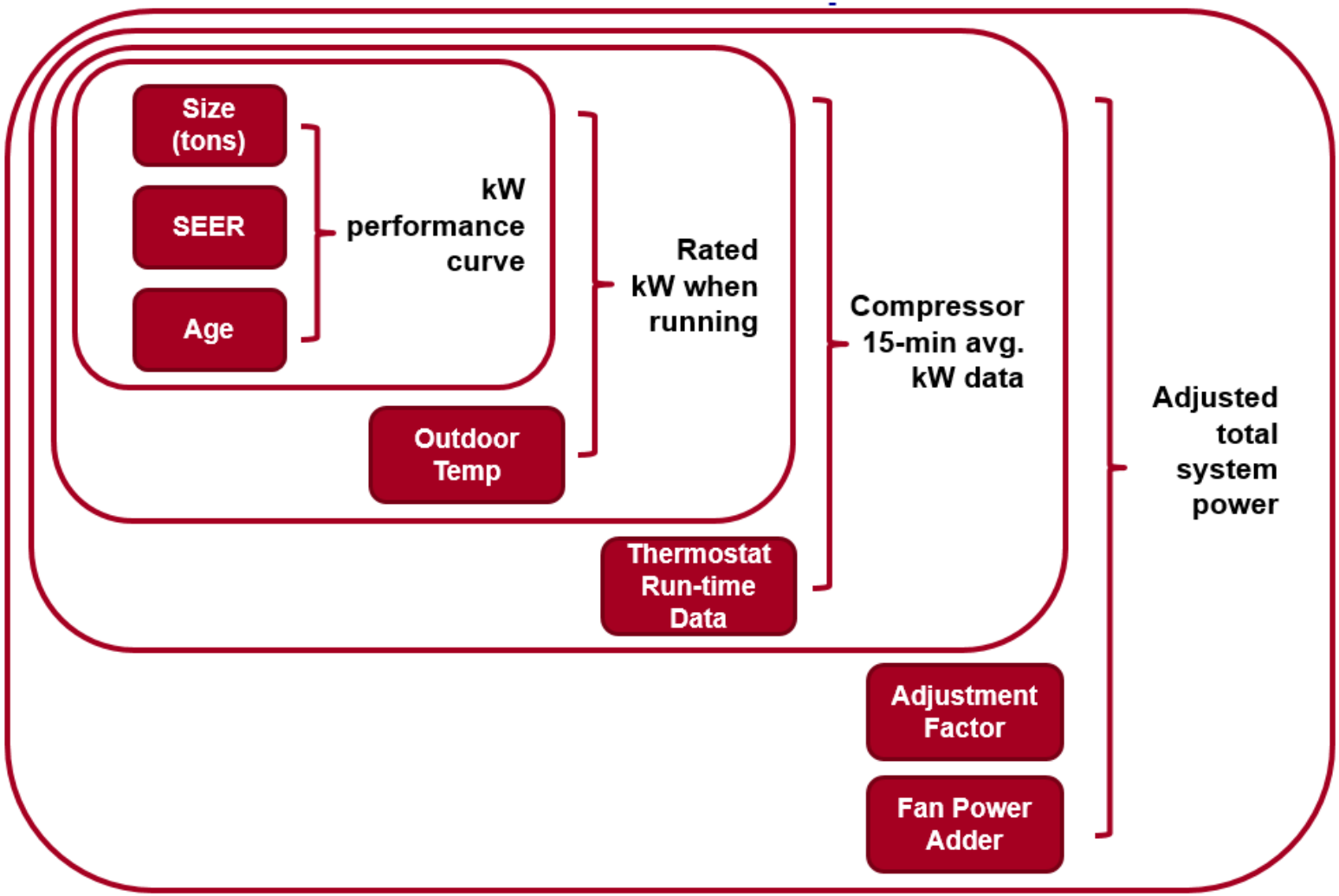
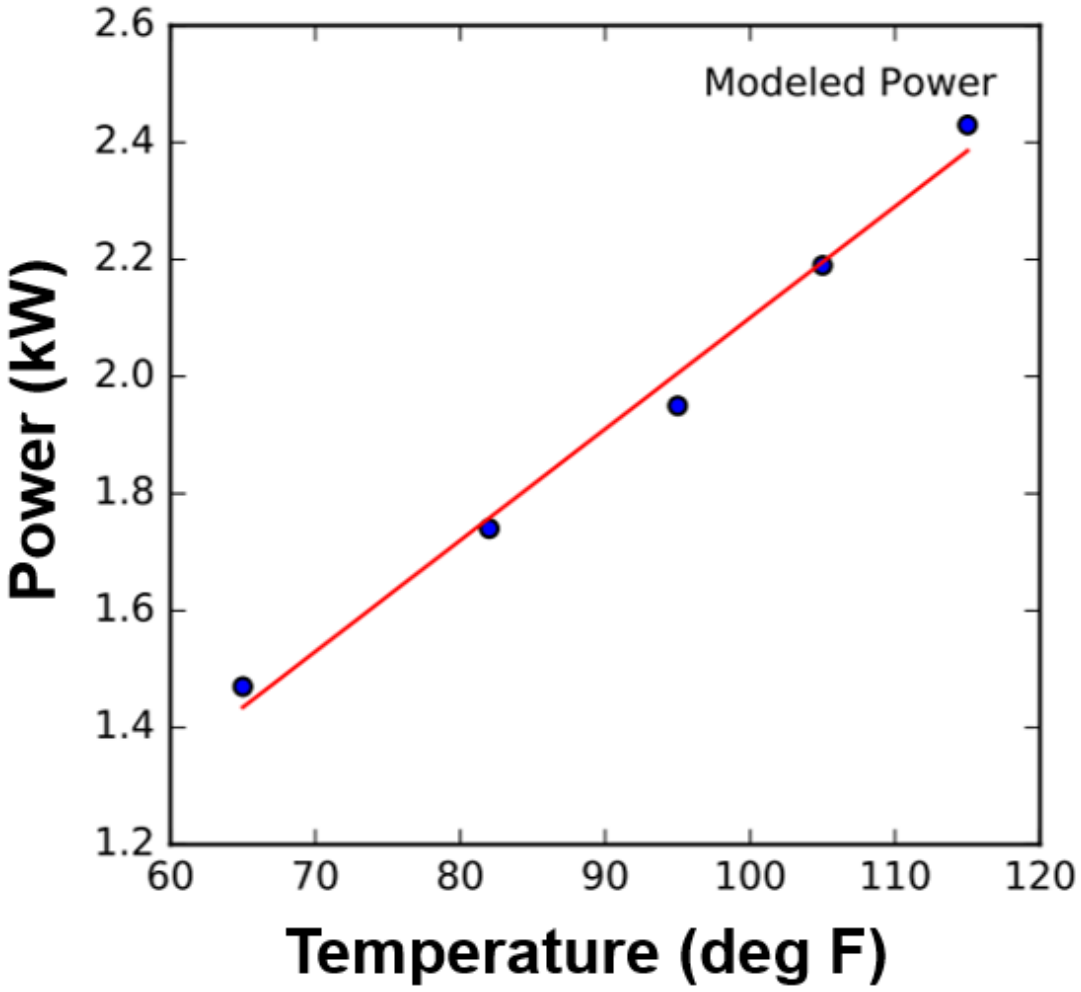
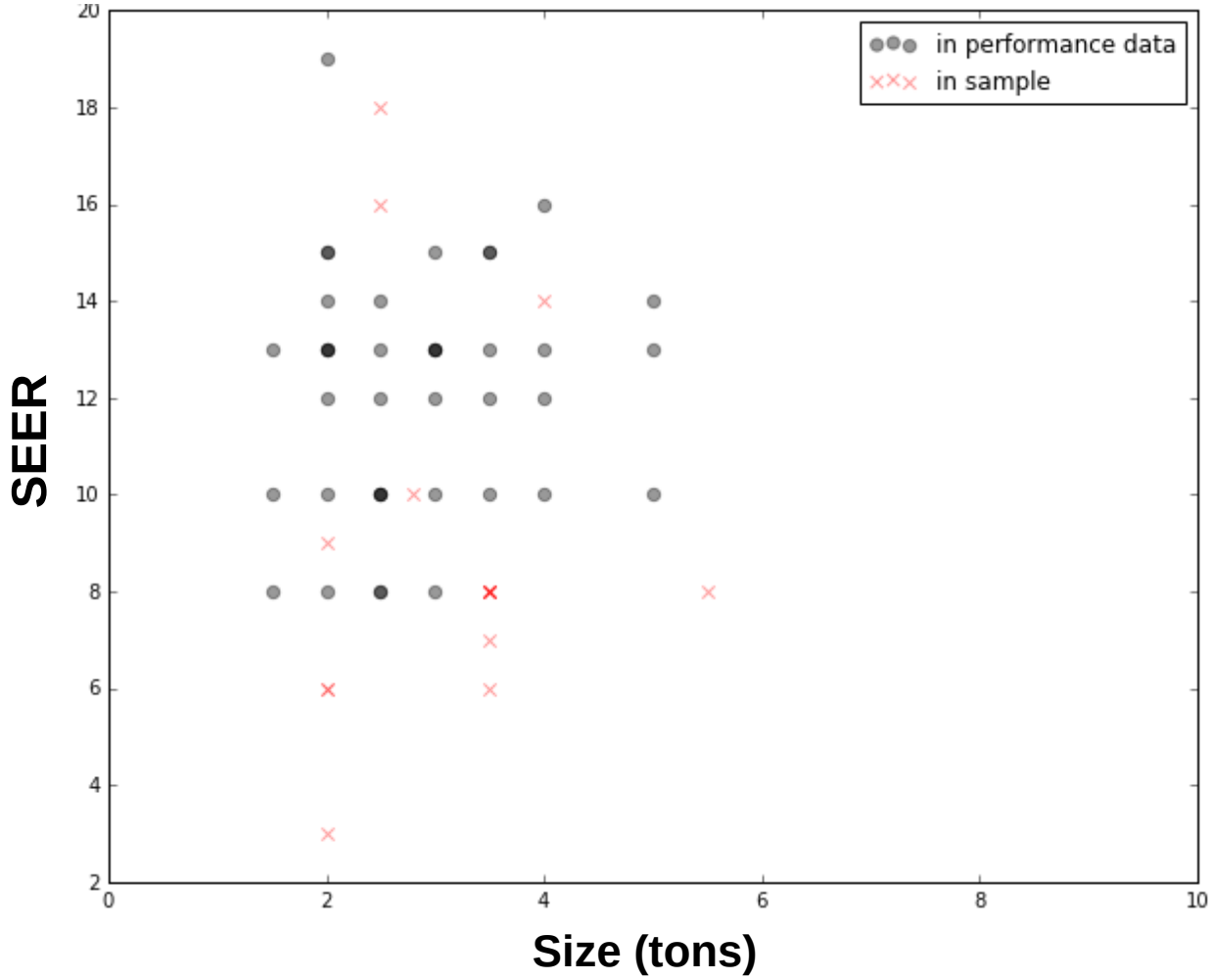
Thermostat Data and HVAC “Nameplate” Method



Performance Curve From Datasheet



Datasheet Coverage is Spotty



How Do We Know If It's Right?

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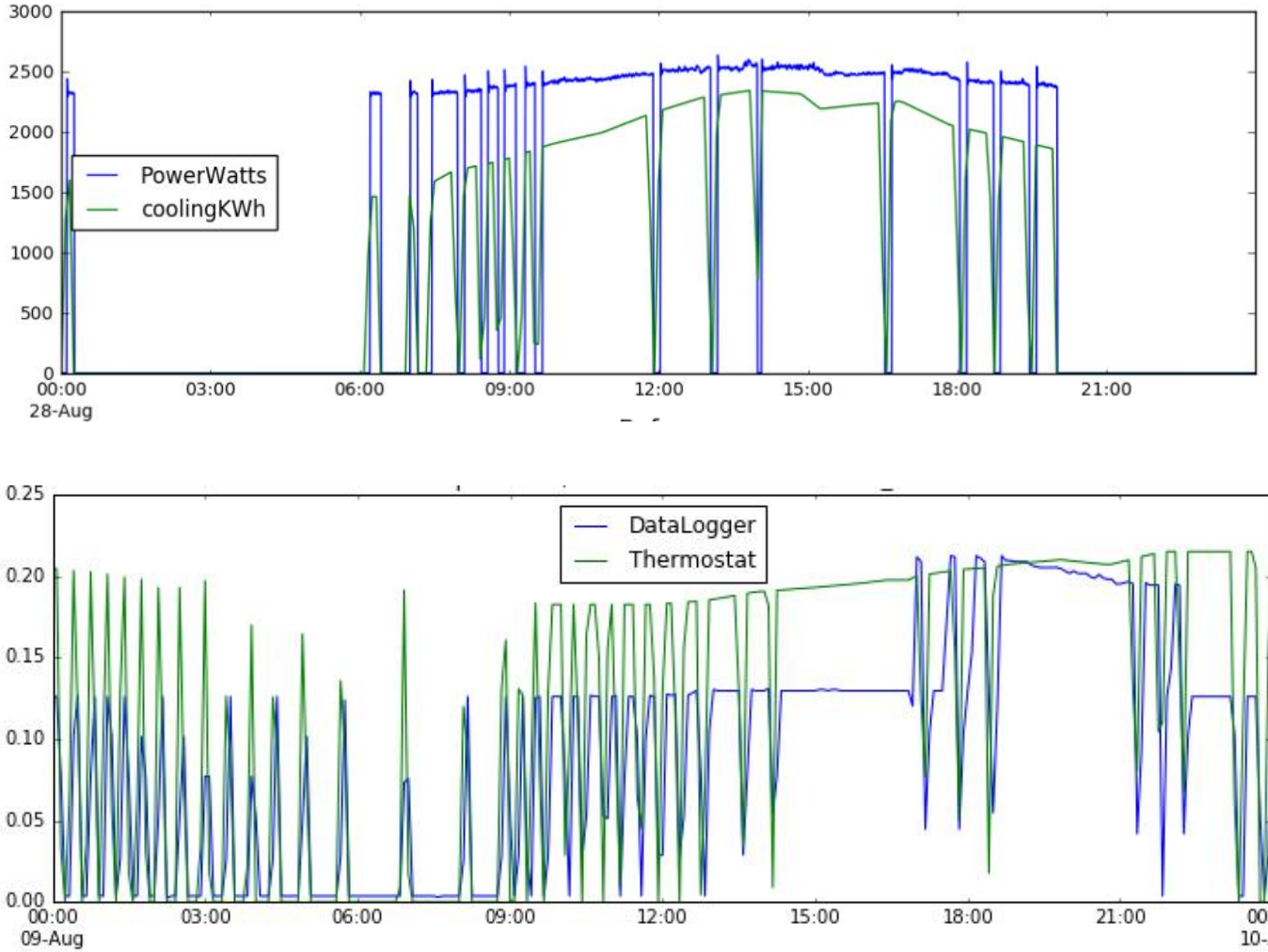
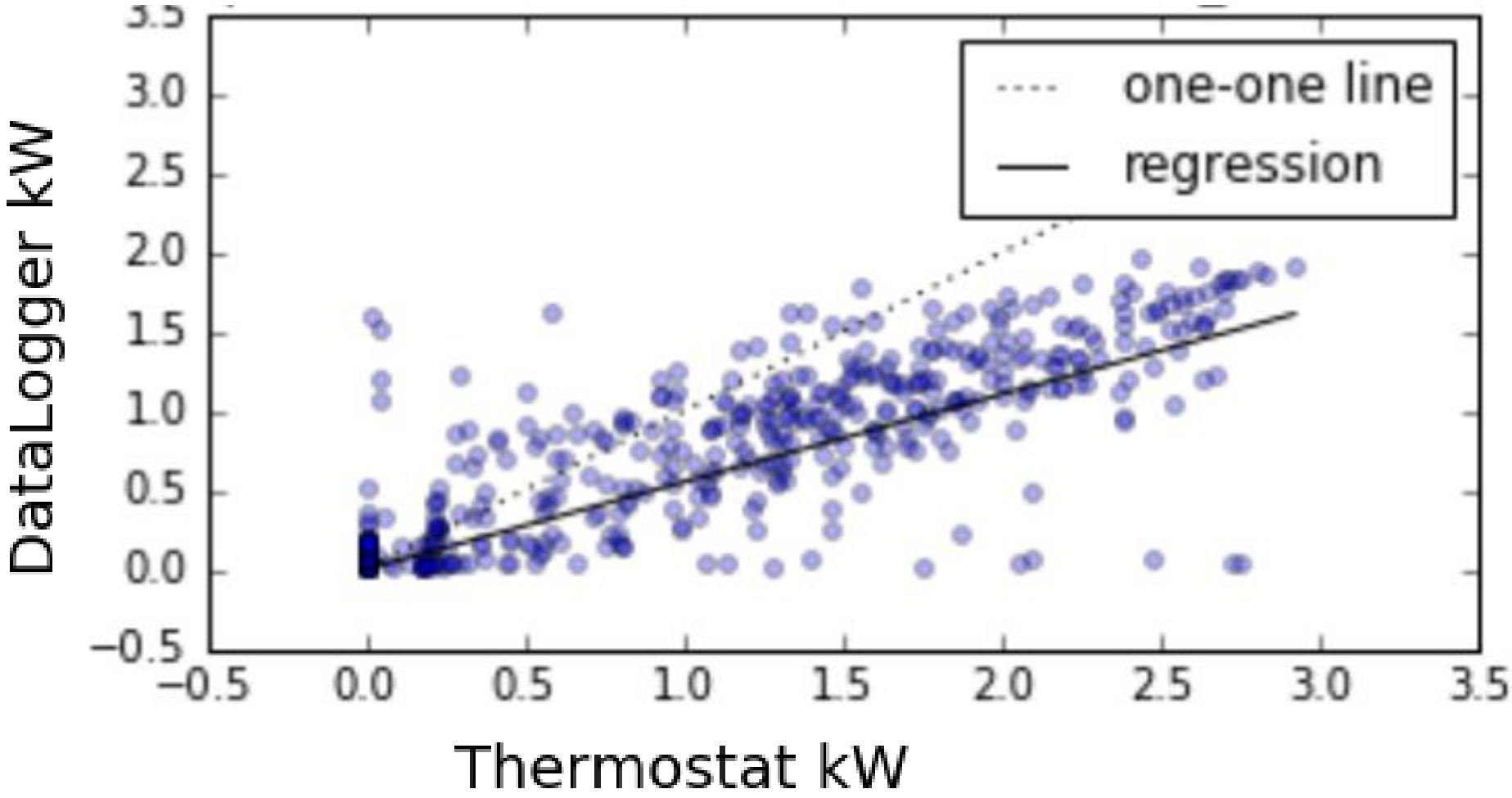
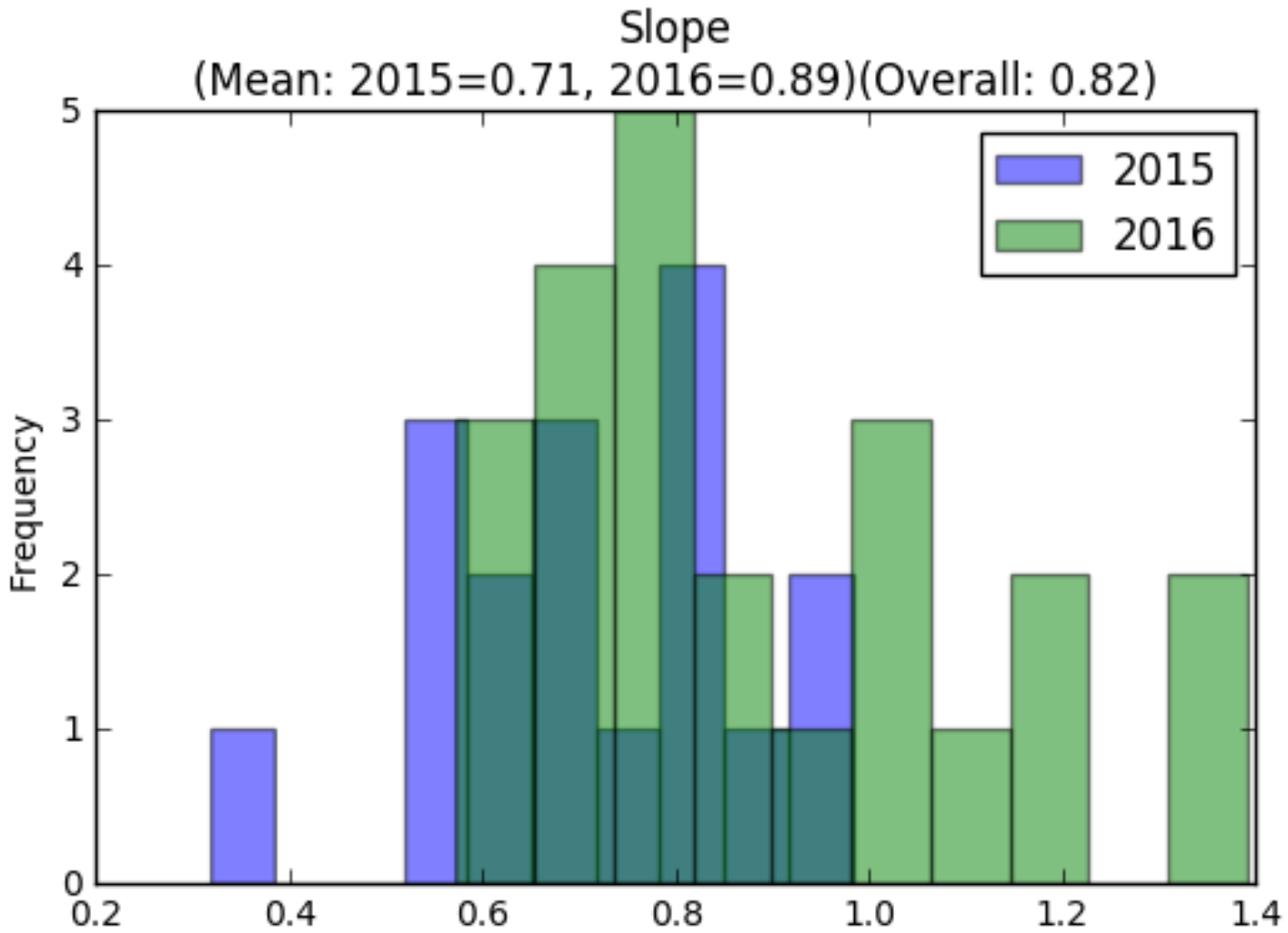
Calibrating Against Amp-loggers



Calibrating Against Amp-loggers



Calibrating Against Amp-loggers



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

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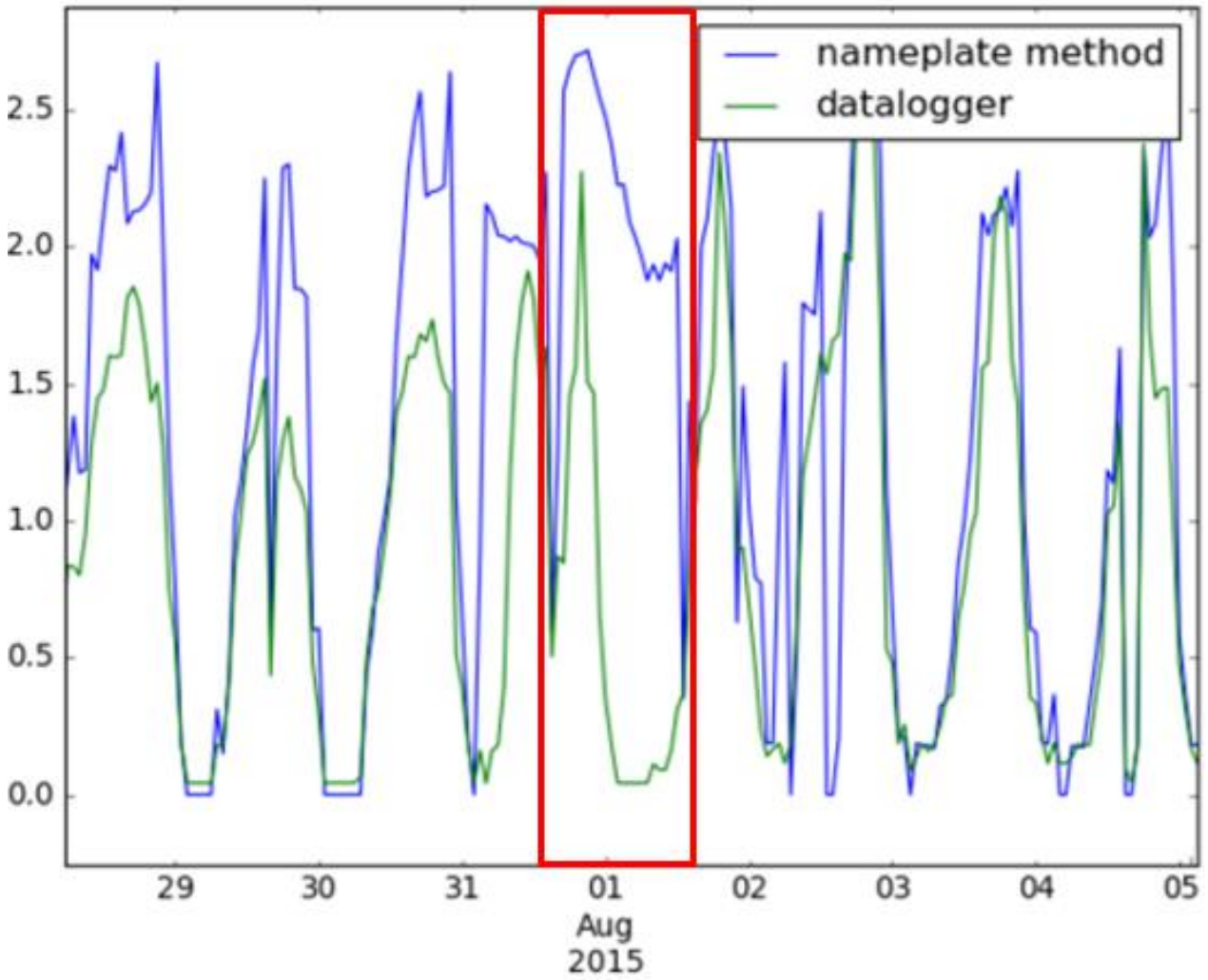
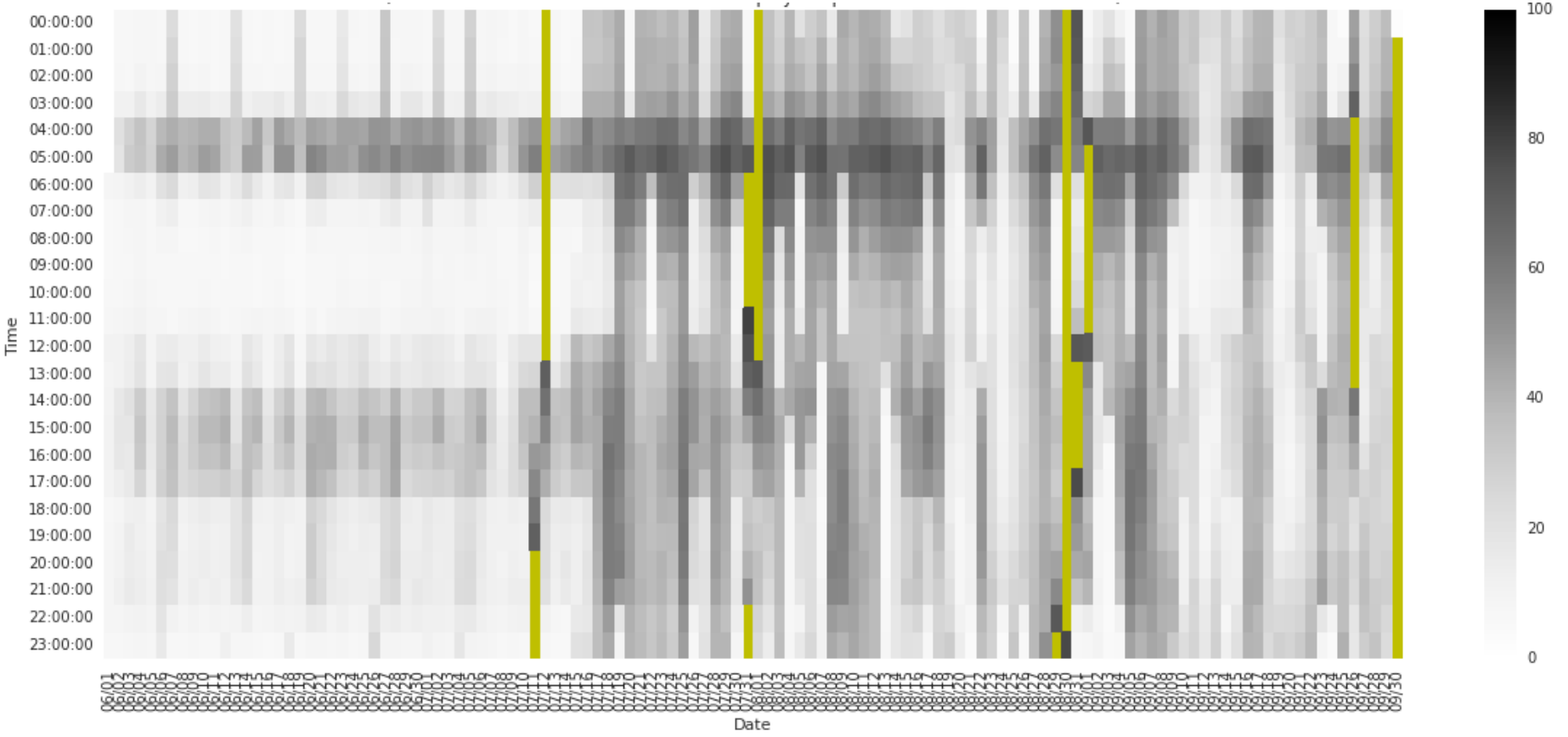
Other Data Discrepancies

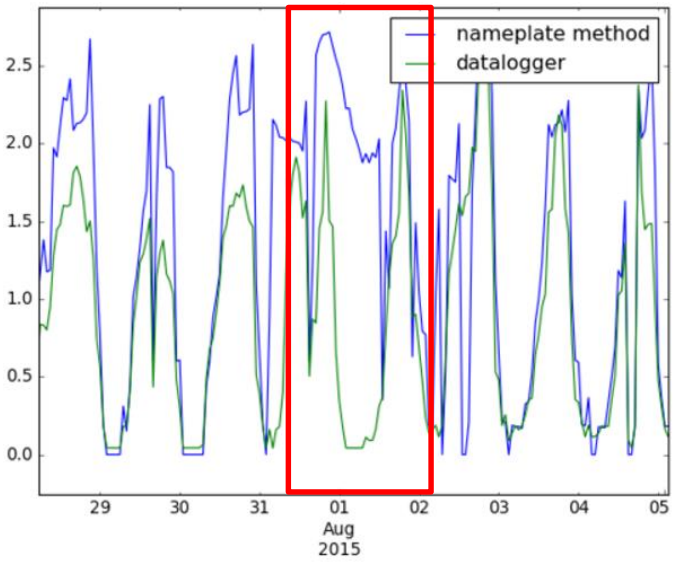


Data Outages – Search and Destroy!

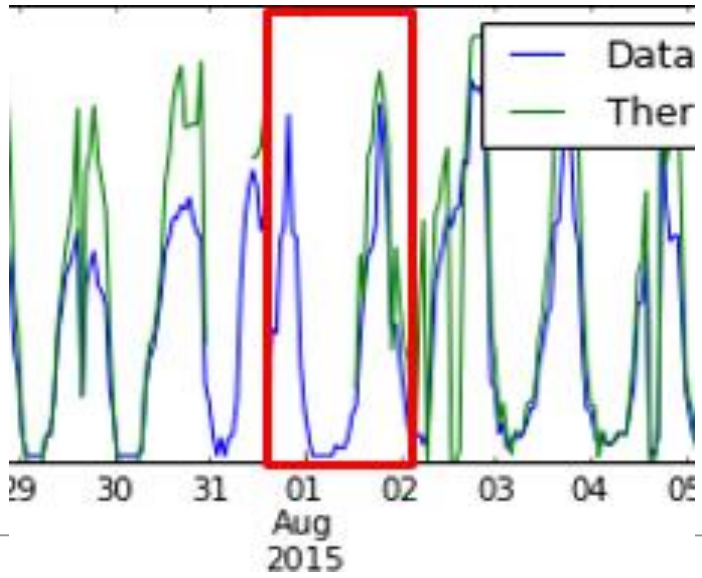


Interpolation: Too Much of a Good Thing

Before

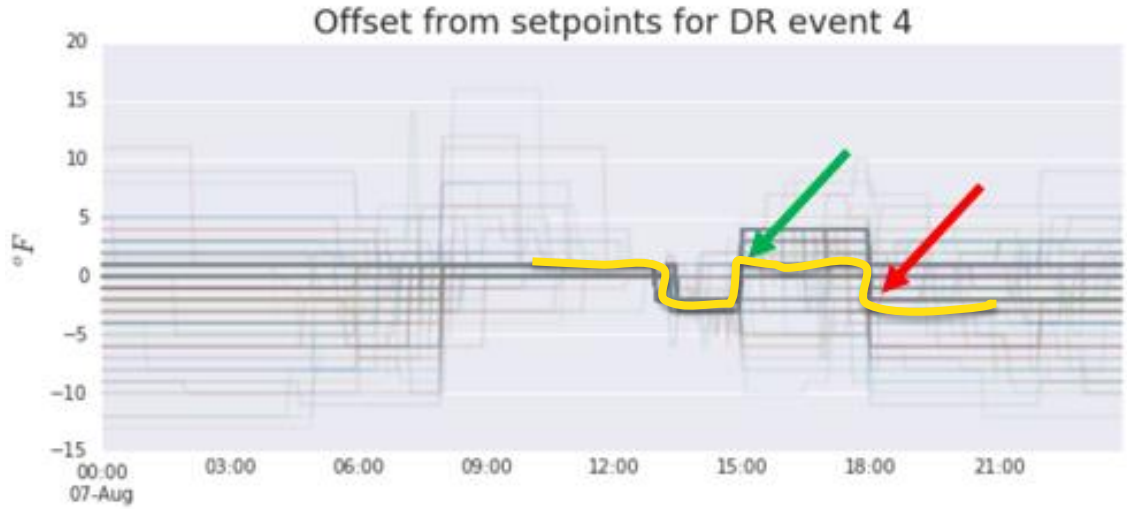


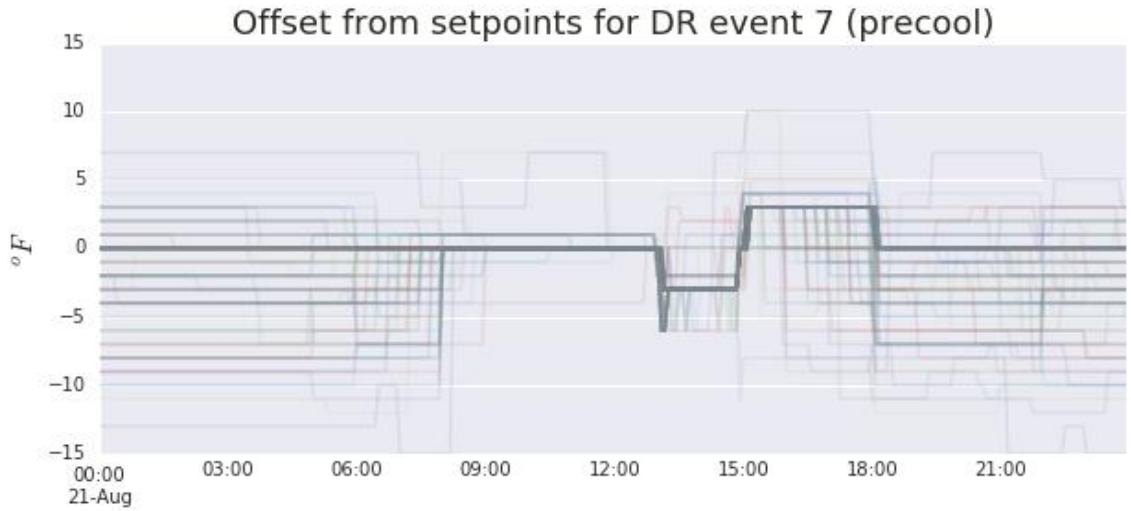
After



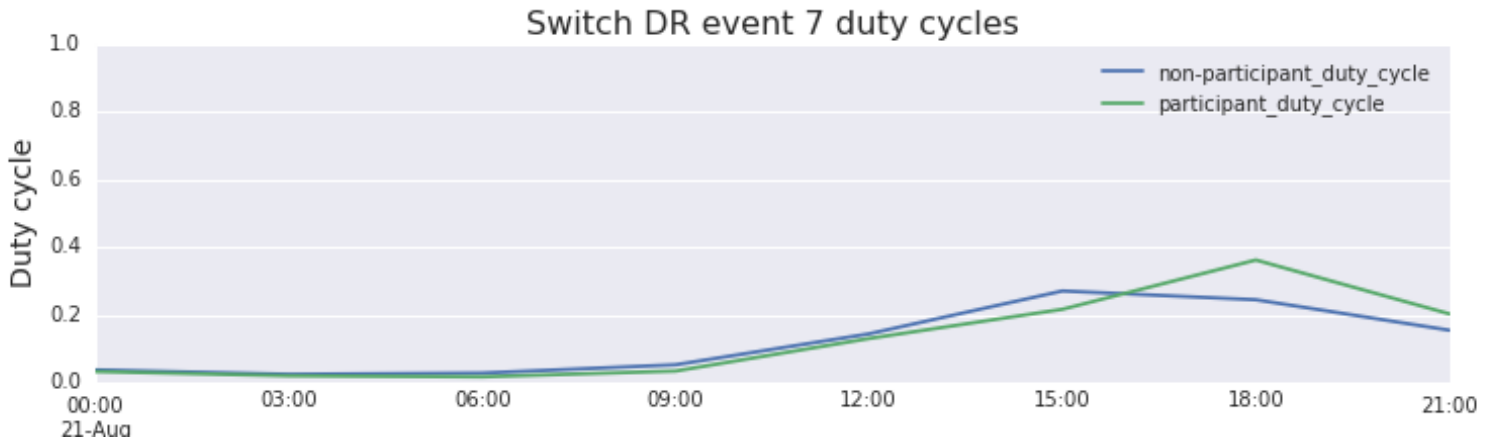
Did We Learn Anything Useful After All That Work?

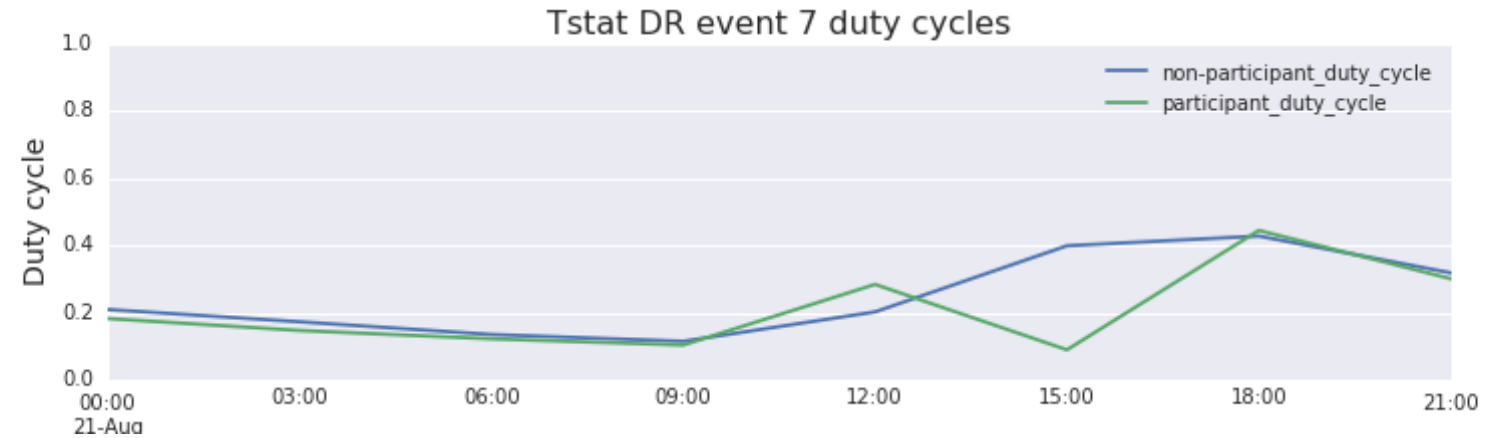
Some DR Events Were Not Executed Correctly



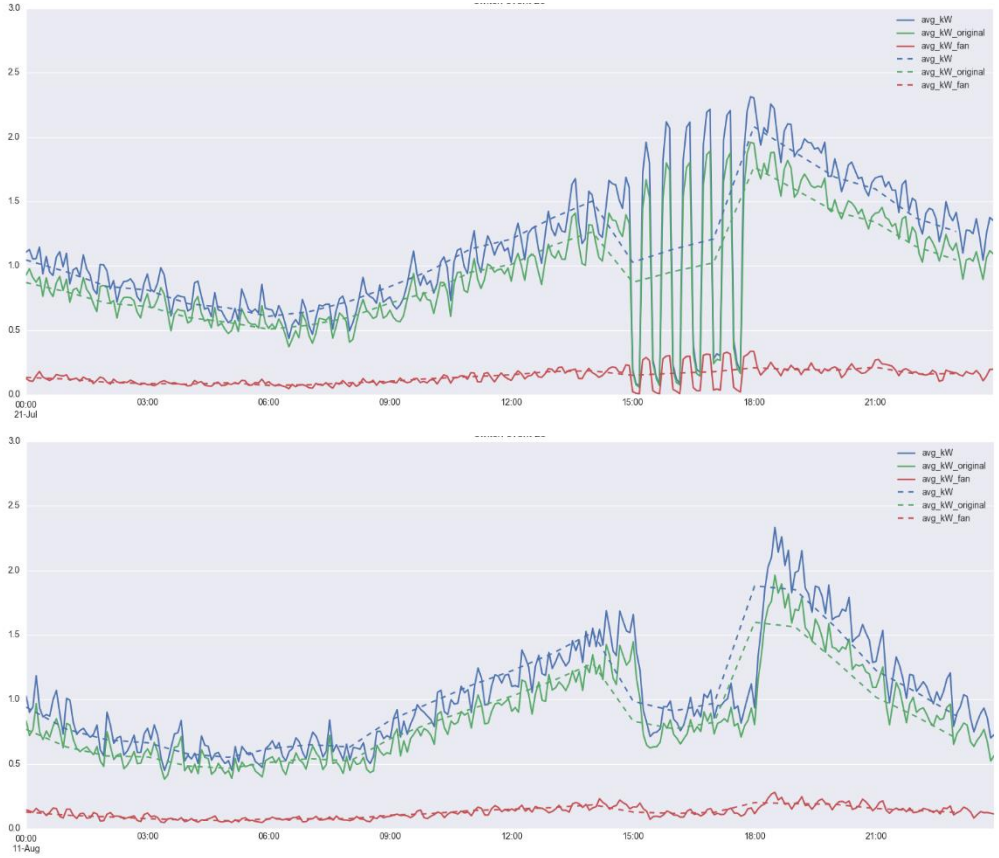


Switch Cycling With Oversized HVAC Units





Synchronized Cycling vs. Randomized Start Times



Got Data?
Get STAT!

Smart Thermostat
Analytics Toolkit

egoldman@veic.org

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