

The Spin Zone:

Unraveling Clothes Washer and Dryer Usage Behavior from Energy Monitoring Data

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Research Need

Objective: What is the load shifting potential of laundry equipment?

Available Information:

- Energy usage of laundry equipment at different settings, <u>from lab testing</u>
- Energy monitoring data (97 washers 177 dryers)







Benefits of Lab Test Data



Range of runtime durations

Controls for key parameters (e.g., weight)



Fig. 2. Load profiles of the GE WSM2420D3WW clothes washer: (a) normal wash cycle; (b) permanent press cycle; and (c) delicates cycle.

Source: Pipattanasomporn, Manisa & Kuzlu, Murat & Rahman, Saifur & Teklu, Yonael. (2014). Load Profiles of Selected Major Household Appliances and Their Demand Response Opportunities. Smart Grid, IEEE Transactions on. 5. 742-750. 10.1109/TSG.2013.2268664.





Bottom Line: Real World is Messy







Benefits of "Real World" Data

Monitoring data = actual observed usage

Load parameters vary a lot! (weight, density) Interaction between settings, time of day, and behaviors





Determining On/Off







Off Periods within a Load

- Fill/soak/rest periods will appear "off"
- What is the longest "off" period within a load?



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Using Off Periods to Split Loads







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Off Periods within a Load









Using Off Periods to Split Loads



Experimenting with the duration of "off" between loads





Considering All Possibilities







Findings: Run Time







Findings: Behaviors



130 loads per year (2.5 loads/week)



12 "laundry days" per month with 1.6 loads each



17% of washer & 20% of dryer loads started on-peak









Final Thoughts

Appliance standards, efficiency programs & products drive savings.

Monitoring data can provide a glimpse into the "real world" behaviors of households.

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Existing behaviors should inform messaging for behavior-based interventions.





Thank You!

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