

Possibilities of Submetering Analysis

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IOT Analytics

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Agenda

Background

- What is Submetering?

- What are the Possibilities of Submetering for IOT?

Analysis

- The Data

- Basic Stats

- Missing Data and Other Problems

Possible Applications

- Predictive Analytics

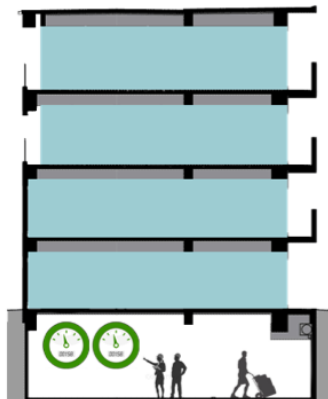
- Dashboards

Recommendations

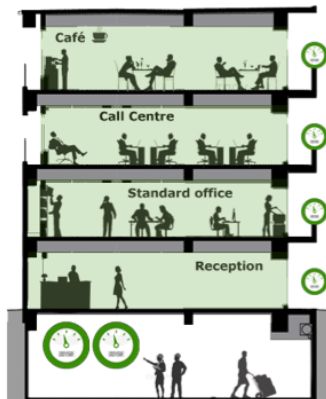


What is Submetering?

Building-level metering



Submetering by floor



What are the Possibilities of Submetering for IOT?

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1. Make it easier to save energy by finding out what is actually using it
2. Pinpoint possible failure points fast and precisely
3. Easily gather data for future analysis

The Data

- ▶ Minute level readings from 3 submeters and overall energy usage between December 2006 and November 2010 in a house in Sceaux



Sceaux

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- ▶ Minute level readings from 3 submeters and overall energy usage between December 2006 and November 2010 in a house in Sceaux
- ▶ The three submeters cover the kitchen, the laundry room and the combination of the water-heater and air-conditioning



Sceaux

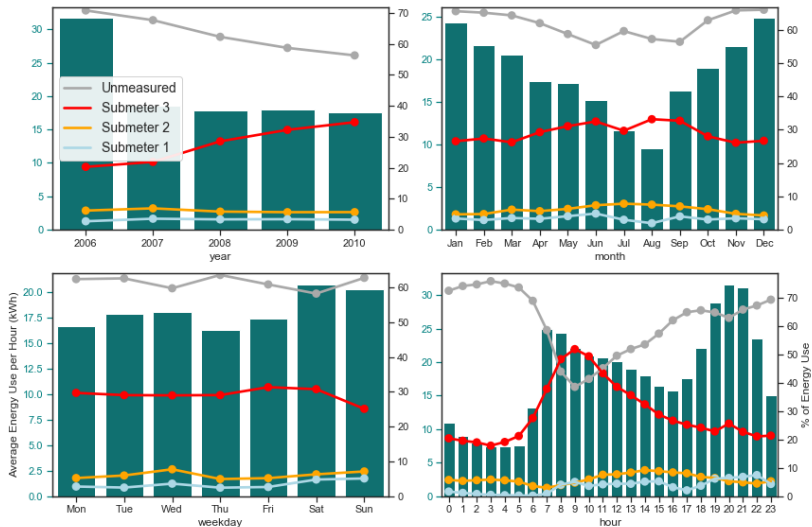
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- ▶ Minute level readings from 3 submeters and overall energy usage between December 2006 and November 2010 in a house in Sceaux
- ▶ The three submeters cover the kitchen, the laundry room and the combination of the water-heater and air-conditioning
- ▶ Electricity use not covered by submeters can be calculated by deducting the submeter readings from overall electricity use



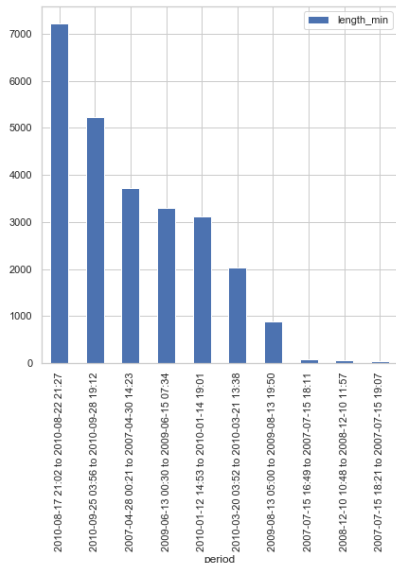
Sceaux

Basic Stats



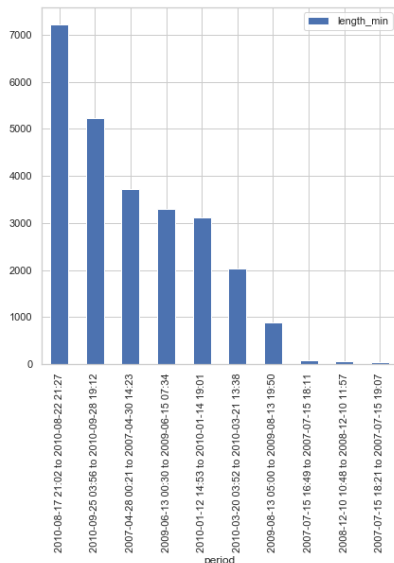
Missing Data and Other Problems

- ▶ 1.25 % of values missing. Sometimes in stretches over a day
 - ▶ Fixed with a predictive model



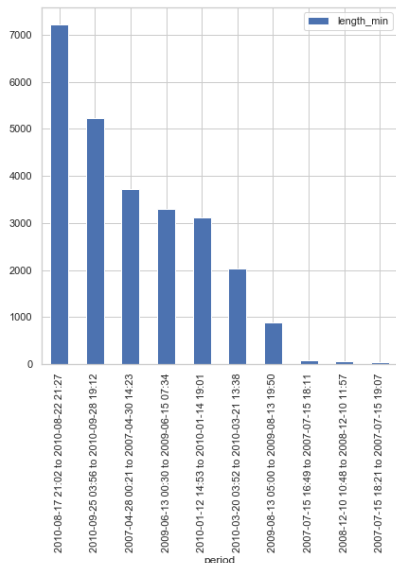
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- ▶ Grouping of submeters is based on room and not function
 - ▶ Refrigerator is in the laundry room
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- ▶ Grouping of submeters is based on room and not function
 - ▶ Refrigerator is in the laundry room
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- ▶ Electricity use not covered by submeters makes up over half of the energy consumption



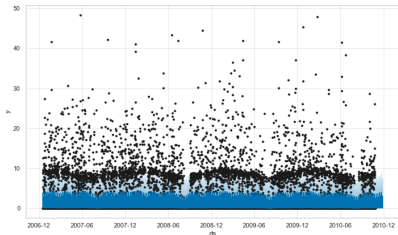
Predictive Analytics

- Multiple seasonal patterns easily modeled

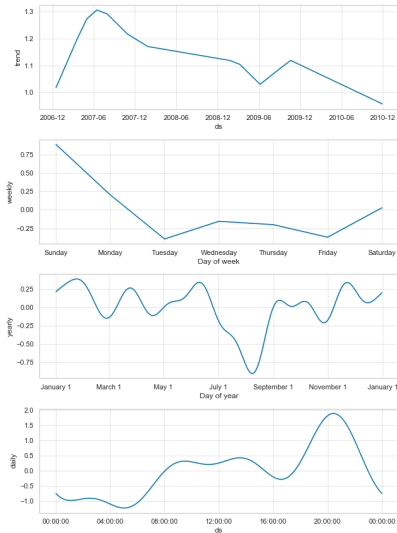


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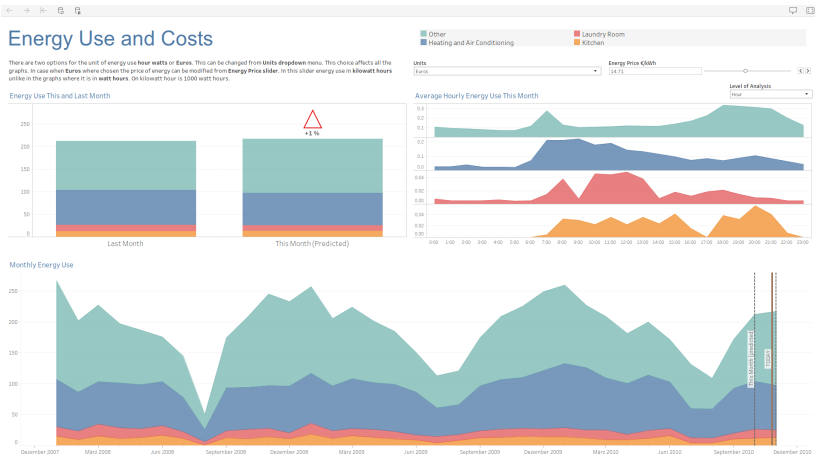
- ▶ Multiple seasonal patterns easily modeled
- ▶ Minute level data impossible to model \Rightarrow have to aggregate
- ▶ Hourly level realistic in overall use and daily level in submeters



Submeter-level energy use has distinctive on/off states that are impossible to predict



► Dashboard for the breakdown of electricity use by period combined with predictions



Recommendations

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2. The data lends itself nicely to customer facing dashboards, but...
 - ▶ Submeter groupings should be more intuitive and grouped by use rather than location
 - ▶ What is the right number of submeters?

The End

Questions?