

Deep Dive Into The Submeters

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Goals

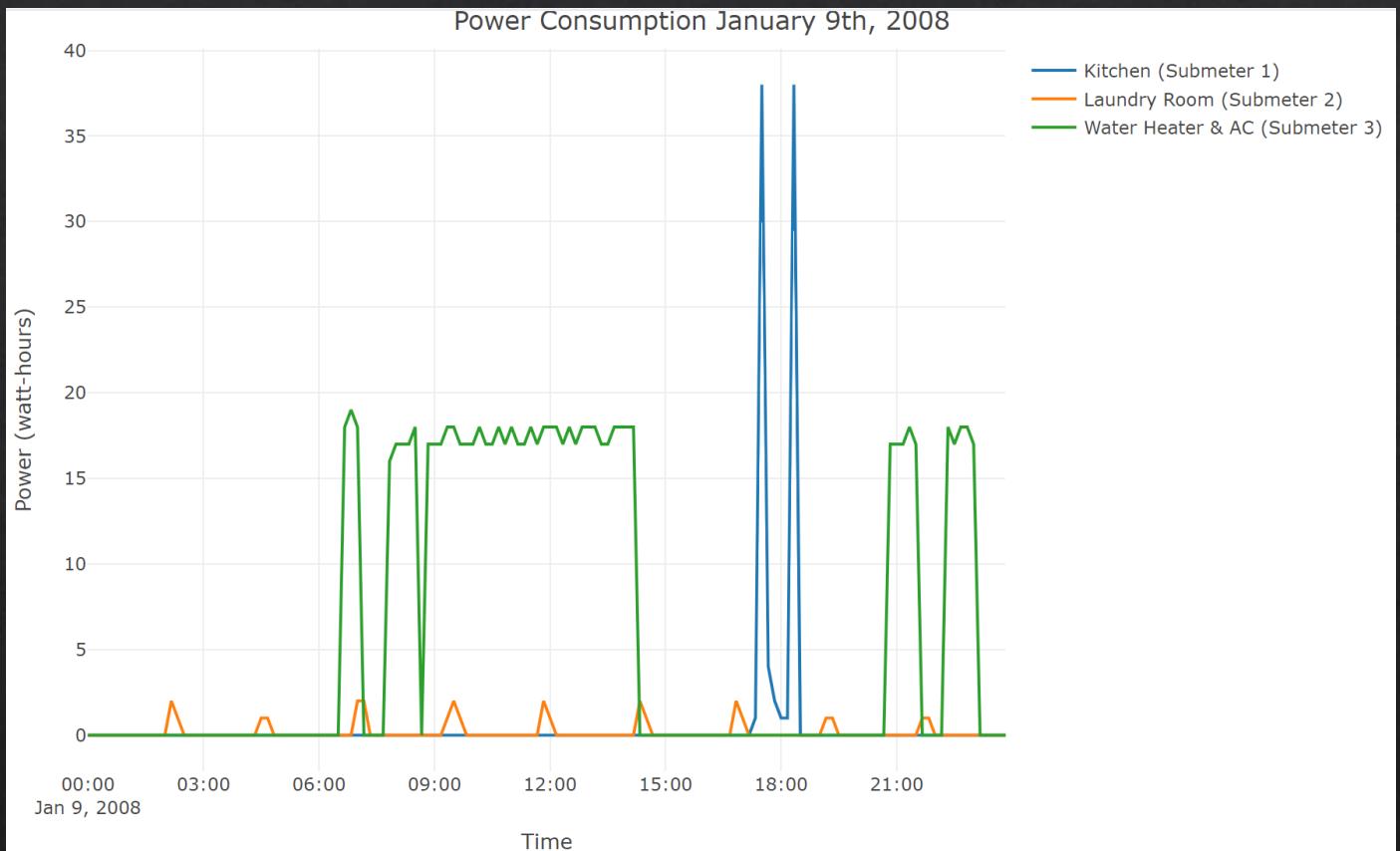
Previously, we explained why we should install Submeters, today we will talk about:

- ❖ Patterns in energy usage
- ❖ Forecasting future energy usage
- ❖ Discuss recommendations

One day's Energy usage

Some interesting observations are:

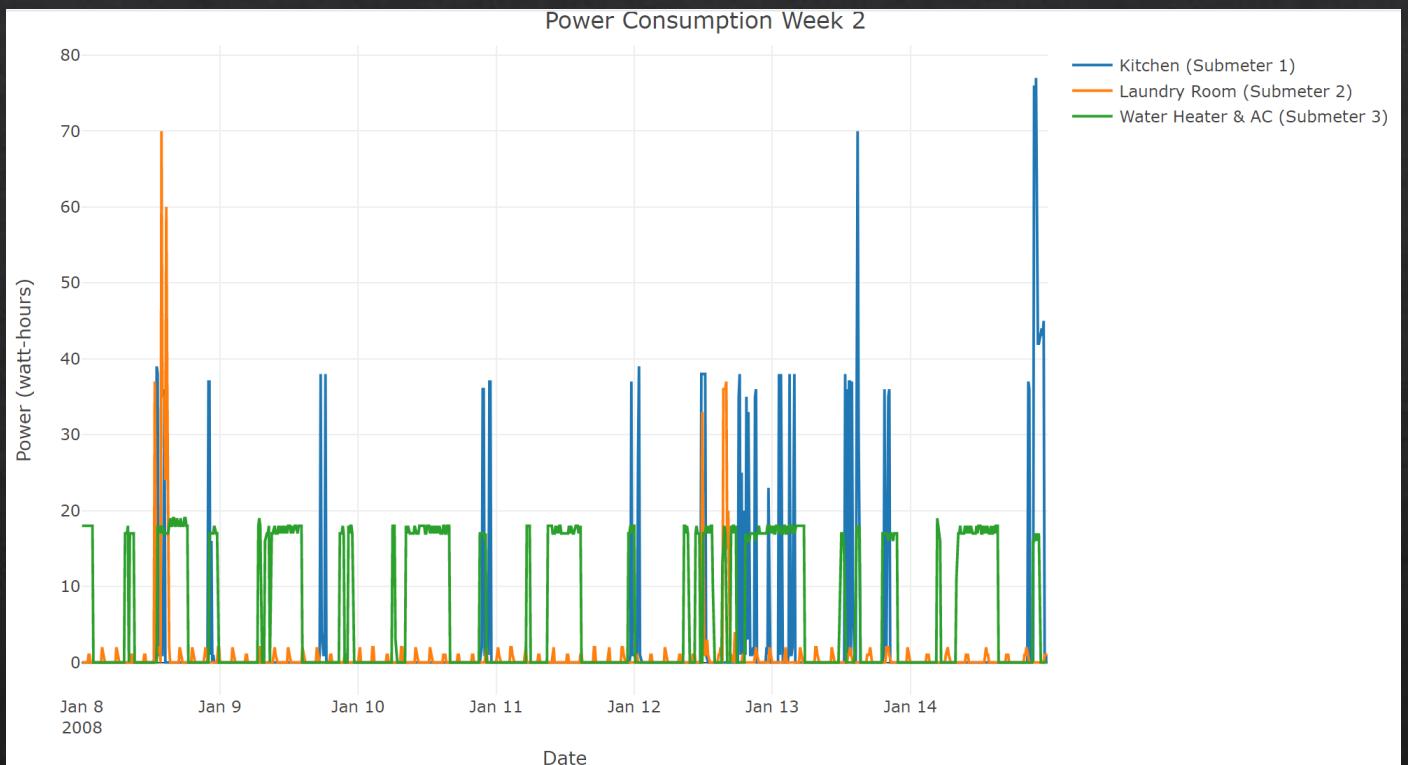
- ◊ The first green spike is likely when they took a hot shower as that one is a little higher than the others.
- ◊ We can tell when they turned the heater on.
- ◊ We can also tell when they cooked in their kitchen.
- ◊ The consistent spikes in the laundry room are from the refrigerator found in that room.



One week's Energy usage

Some interesting observations are:

- ◊ We can see a reoccurring pattern for the kitchen and water heater & AC.
- ◊ We can also see when they likely washed their clothes as that is when the laundry room has large spike.

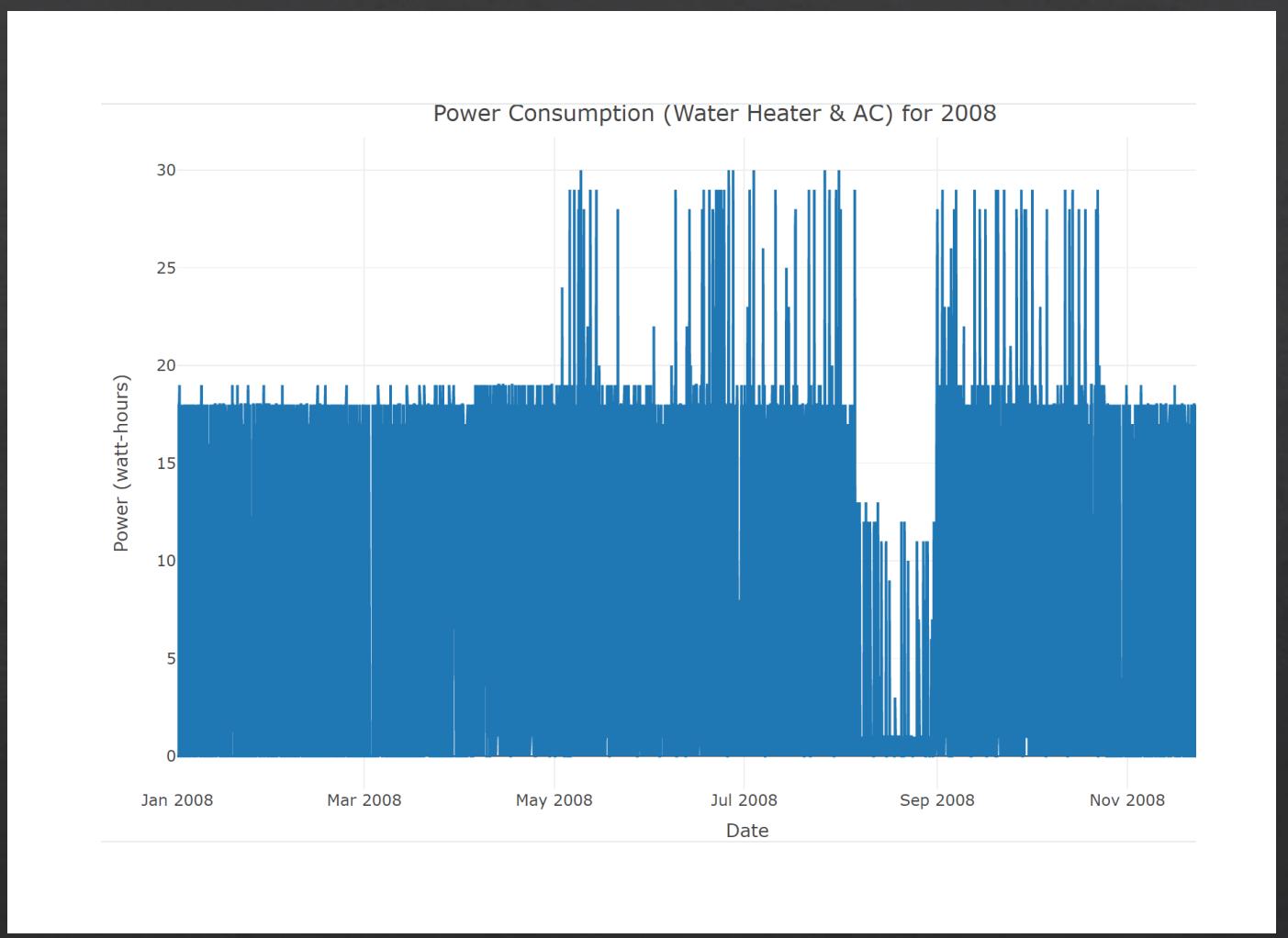


One year's Energy usage

For the year version, we omitted Submeter 1 and 2 as we felt that their pattern is best seen on a smaller scale.

Some interesting observations are:

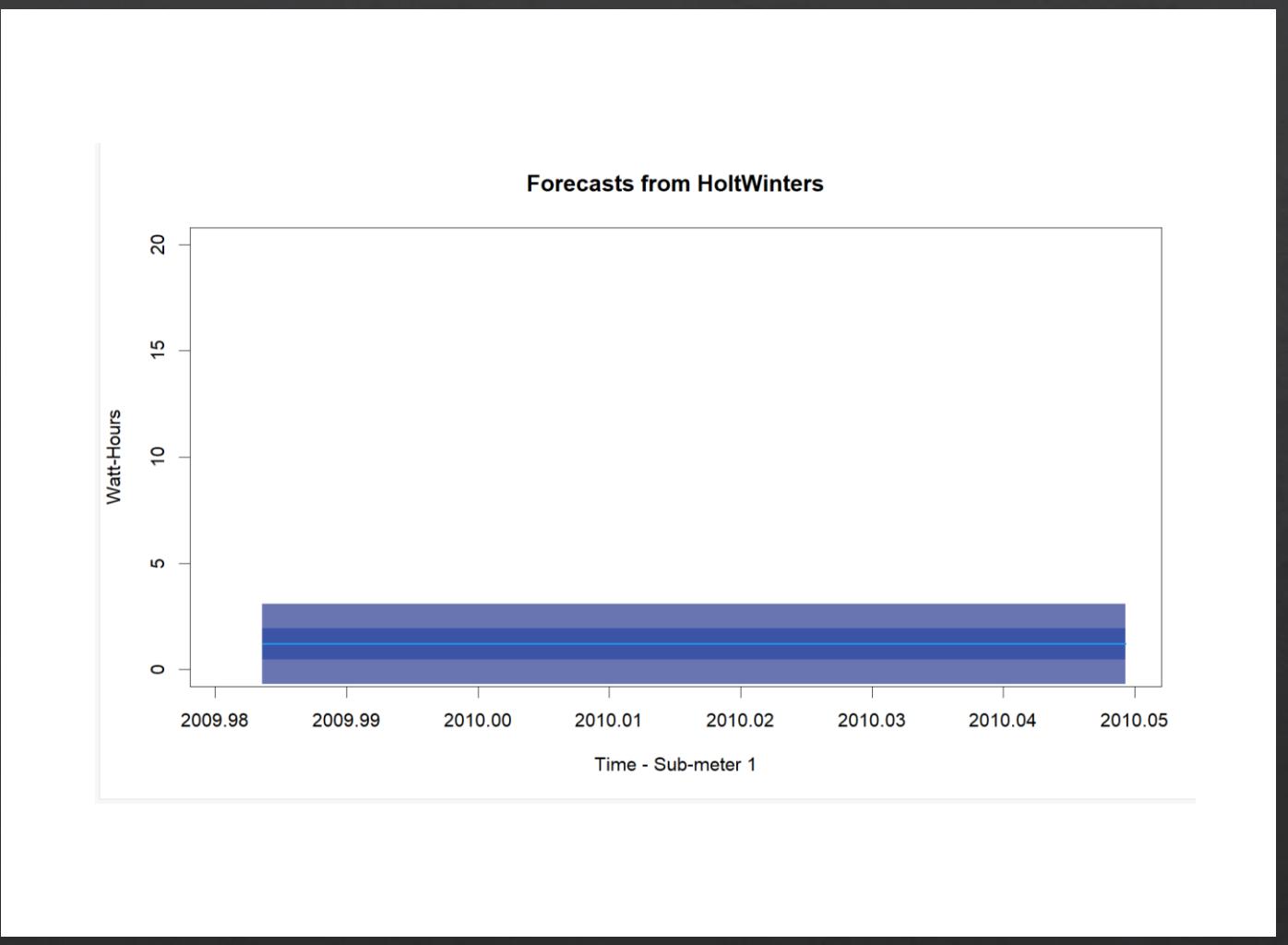
- ❖ From around October to June, we see a consistent power usage, which is likely from the heater.
- ❖ We see some larger spikes in the other months. These are likely from the AC being turned on and, since its warmer, they might be taking more showers.
- ❖ There seems to be a dip around end of summertime, this could indicate they went on vacation in this time.



Forecasting Submeter's 1 Energy Usage

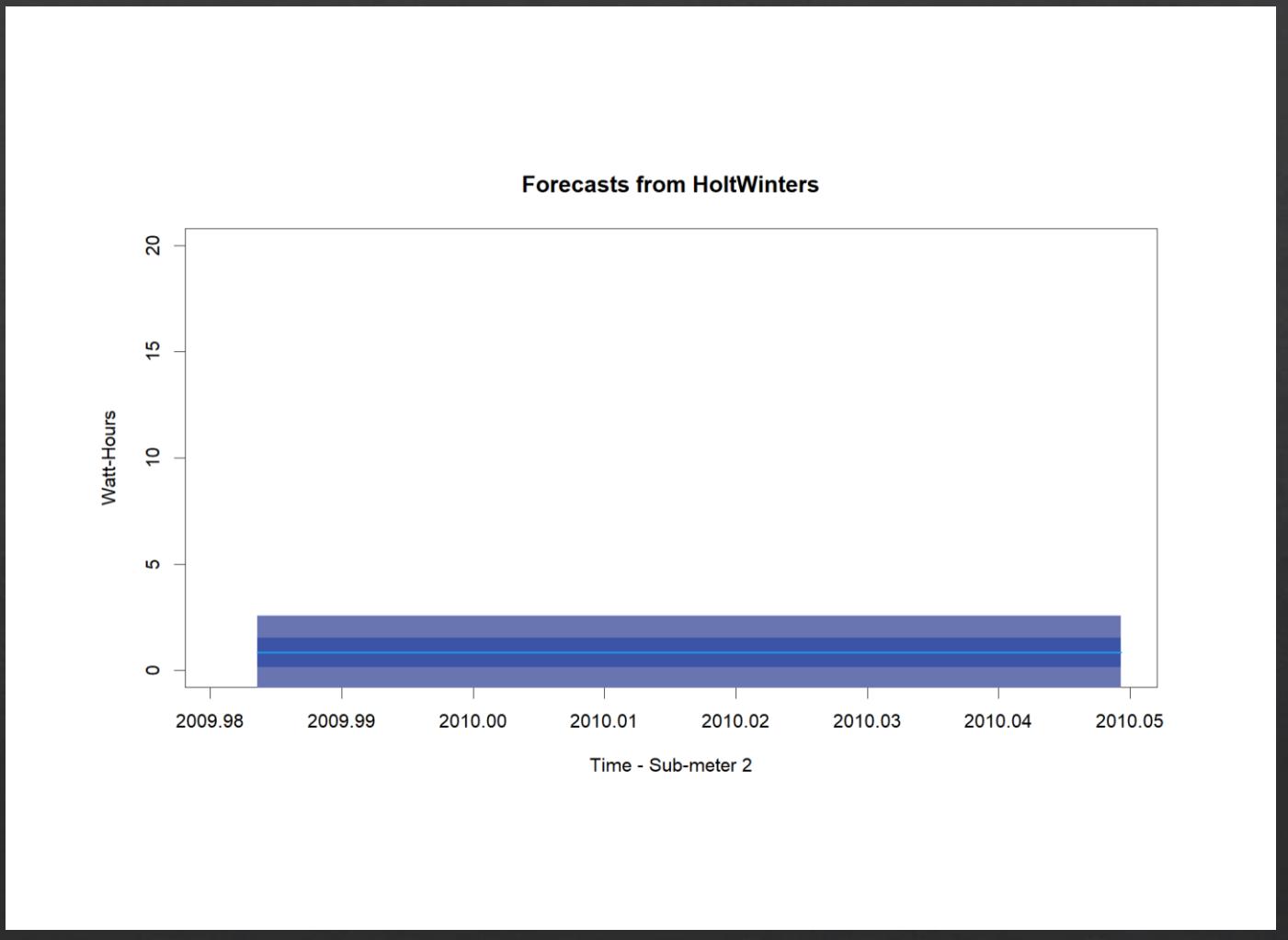
Here we used the HoltWinter to forecast energy usage. The shaded area represents what we can expect the energy to be on average. The duller area means more confidence of where the energy usage will be but with the caveat of the range increasing.

We believe that for most of the times, the energy usage will average out to about 2 watt-hours with the possibly it going up to 3.5 watt-hours and down to about 0 watt-hours.



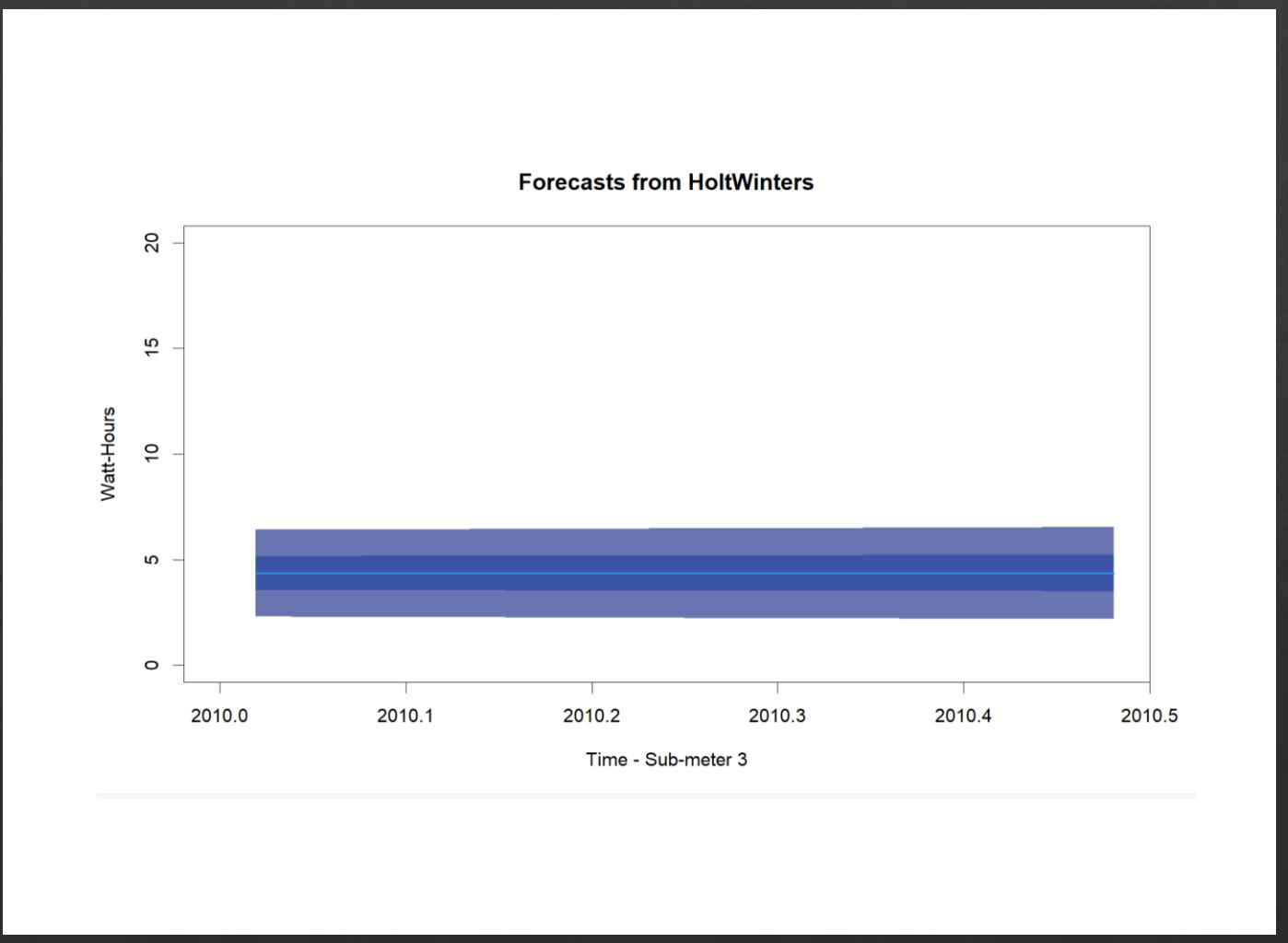
Forecasting Submeter's 2 Energy Usage

We believe that for most of the times, the energy usage will average out to about 1 watt-hours with the possibly it going up to 3 watt-hours and down to 0 watt-hours.



Forecasting Submeter's 3 Energy Usage

We believe that for most of the times, the energy usage will average out to about 4.5 watt-hours with the possibly it going up to 6 watt-hours and down to about 3 watt-hours.



Observations/Notes

We predict that, on average, Submeter 3 (AC and Heat) will use the highest energy in the long run, however, at peak times, Submeter 1 and 2 (The kitchen and laundry room) can spike higher. This makes sense as those appliances can consume a lot of power for short bursts of time. Yet, in the long run, they still average out to less than heating and cooling.

Observations/Notes (Cont.)

We also tested another form of forecasting, one that forecasts fluctuating power usage for a given time. But we felt that showing the average is probably more useful for one big reason: accurately predicting something like this has lots of uncertainty and even a small unforeseen circumstance can skew the results.

For example, if a household chooses to go to on vacation or not, that can affect their power usage that we forecast. Additionally, suppose we had 5 years' worth of data on a given household and they used x amount of power on average. However, one year they decide to upgrade their heating/cooling system (to make it more efficient) or they buy more items that can consume a ton of energy (desktop computer, high-end sound system, etc.). That will affect our forecasted energy usage. Therefore, we feel it is best to predict what we believe the energy will average out to instead of the specifics.

However, do note that we can use the visualizations to get a rough idea of how the power usage will fluctuate throughout the day/week/year.

Future Recommendations

- ❖ As mentioned last time, we would like if the data was a bit clearer on “other” power usage. For example, what about regular outlets found in the other rooms? Which submeter they are tapped into? It’s possible a household could have a portable heater/AC unit that plugs into regular outlets and could skew the results.
- ❖ We could recommend customers to switch to more efficient appliances and heating/cooling system. While this means they will pay us less money monthly, but we benefit as our grid is less hit during peak hours. As such, we save money on potential fixes and repairs. So, in the long run, we would earn a higher net profits.

Conclusion

In the end, we were to show patterns found in energy usage. While we don't feel confident in forecasting specific energy usage for a given time, we are able to predict what the overall energy will come out to in the long run as that is much safer bet. Additionally, we had some business recommendations that you could investigate.