Lara Cobler Moncunill

IOT analytics

POWER USAGE ANALYTICS FOR ELECTRICAL SUB-METERING DEVICES

INSTALLING SUB-METERS ADDS VALUE TO THE PROPERTY

Laundry room

Kitchen

Water boiler + AC

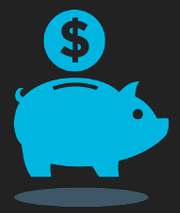
Other

SMART HOME

Real-time monitoring

ECO-FRIENDLY

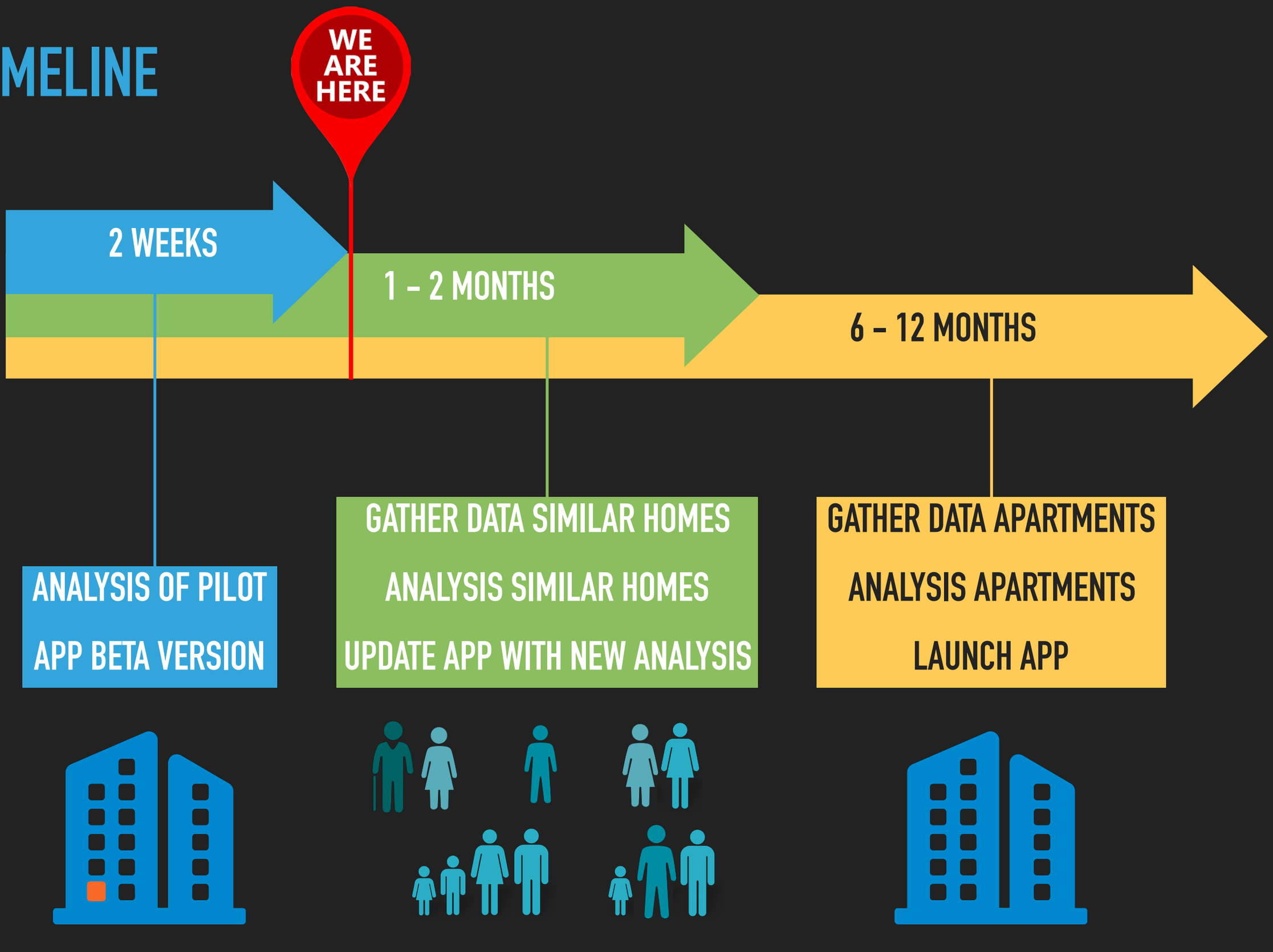
Reduce wasted energy



REDUCE EXPENSES

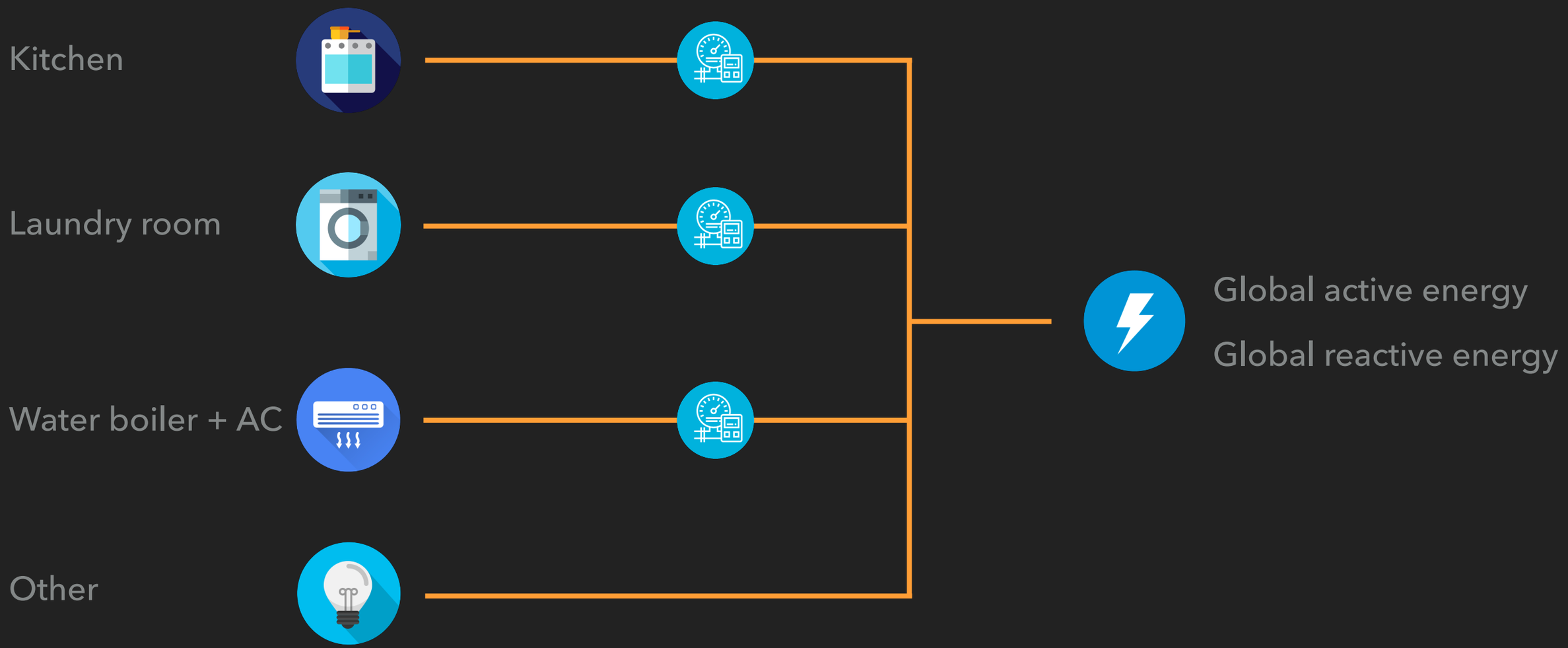
Lower energy costs

TIMELINE


WE ARE HERE
2 WEEKS
1 – 2 MONTHS
6 – 12 MONTHS
ANALYSIS OF PILOT
APP BETA VERSION
GATHER DATA SIMILAR HOMES
ANALYSIS SIMILAR HOMES
UPDATE APP WITH NEW ANALYSIS
GATHER DATA APARTMENTS
ANALYSIS APARTMENTS
LAUNCH APP

PILOT APARTMENT

47 months: December 2006 - November 2010



ANALYSIS FRAMEWORK

1. Real-time monitoring
   - Control energy usage based on real-time energy costs
   - Detection of transitory malfunctioning of appliances
   - Detection of hidden habits other householders
2. Uncover trends in behaviour of appliances performance
   - Flag appliances degradation
   - Flag increased energy waste
3. Detect unexpected increase of energy consumption
   - Energy theft

USER COMMUNICATION

User Dashboard

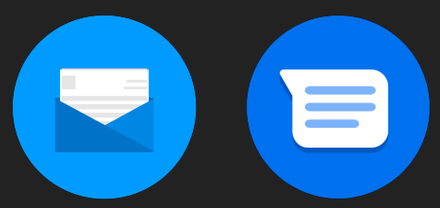
Monthly summary

Alerts

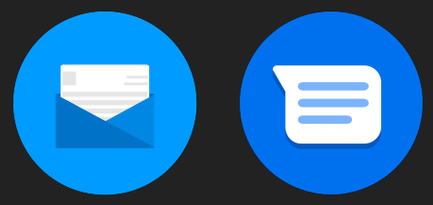
ANALYSIS FRAMEWORK

1. Real-time monitoring

2. Uncover trends in behaviour of appliances performance



3. Detect unexpected increase of energy consumption



USER COMMUNICATION

User Dashboard

https://laracobler.shinyapps.io/energy_consumption/

Monthly summary

Alerts

MONTHLY STATS

HI USER!
These are your stats of energy consumption for October 2010

View Dashboard

Energy cost:
11.69 €

Expected next month: 13.13 €

View Bill

CO_2 emission:
69.25 Kg

Hours of max usage:
8pm - 10pm

Within peak energy demand

Tips

866 kWh Total Energy

Within expected

Tips

48 kWh
Kitchen
Within expected

Tips

60 kWh
Laundry Room
Within expected

Tips

315 kWh
Boiler + AC
Within expected

Tips

102 kWh
Reactive Energy
Within expected

Tips

CONGRATULATIONS!

You earned your energy saving badge by using less energy than expected.

USER COMMUNICATION

User Dashboard

Monthly summary

Alerts

ALERTS

Hour peak energy demand

Refrigerator malfunctioning

Monthly consumption higher than expected

- Total
- Reactive
- Kitchen
- Laundry Room
- Boiler + AC

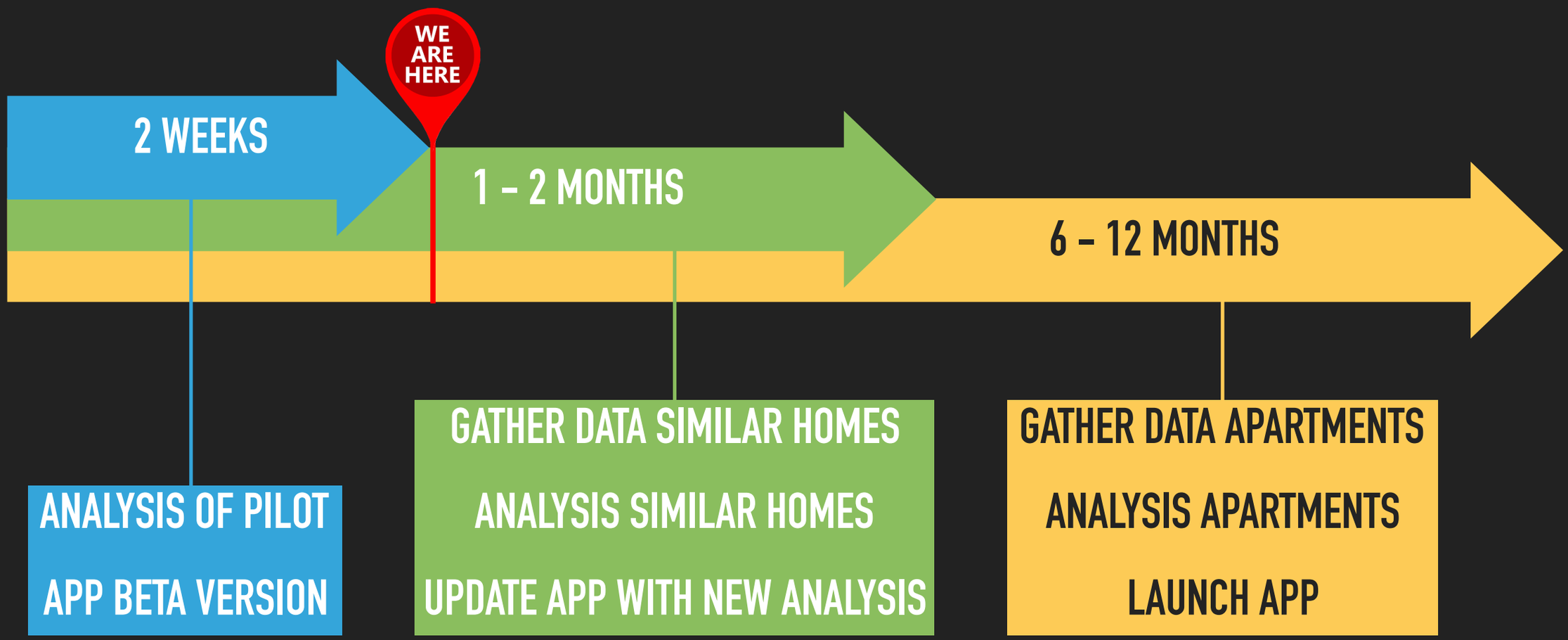
Accumulated consumption higher than

- Daily
- Weekly
- Monthly

Total	1000 kWh
Reactive	100 kWh
Kitchen	60 kWh
Laundry Room	70 kWh
Boiler + AC	350 kWh

Get challenged!

FUTURE PERSPECTIVES / SUGGESTIONS



Analysis of all apartments may unmask malfunctioning of the building electricity supply.

RECOMMENDATION

PROVIDE HOMEOWNERS WITH ANALYTICS ON THEIR POWER USAGE

Dashboard

Monthly summary

Alerts

INCREASES THE PROPERTY VALUE

Real-time monitoring

Smart home

Reduce wasted energy

Eco-friendly

Lower energy costs

Reduce expenses

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POWER USAGE ANALYTICS FOR ELECTRICAL SUB-METERING DEVICES

ANALYSIS FRAMEWORK

1. Real-time monitoring
   - Control energy usage based on real-time energy costs
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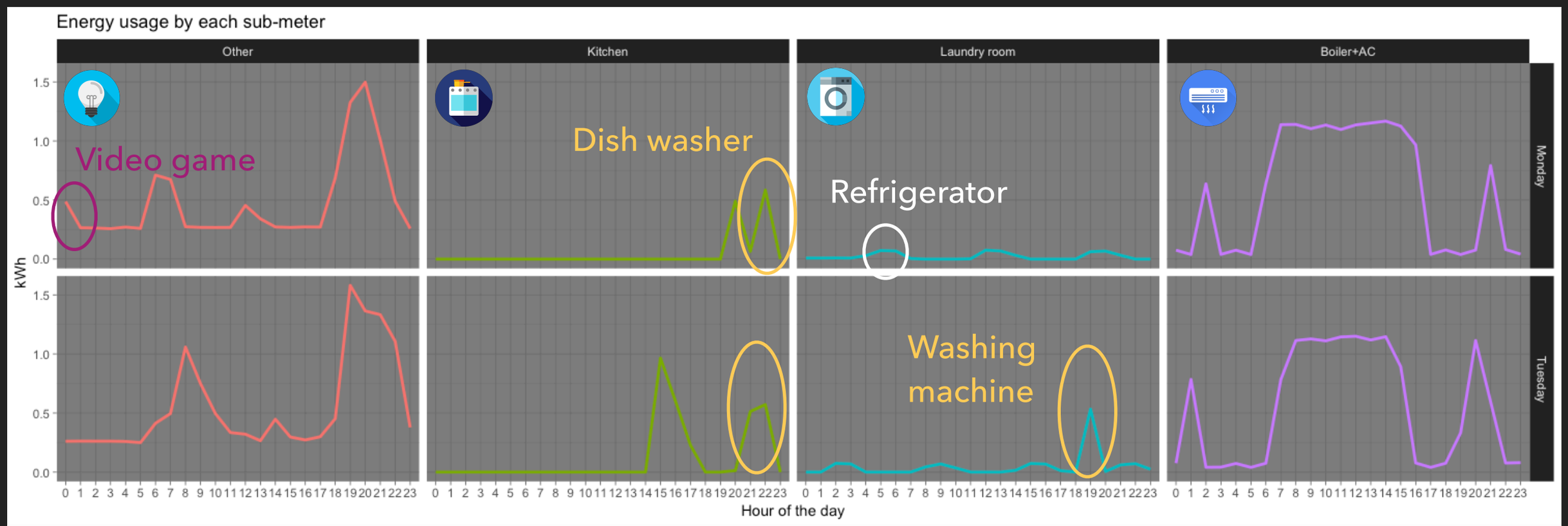
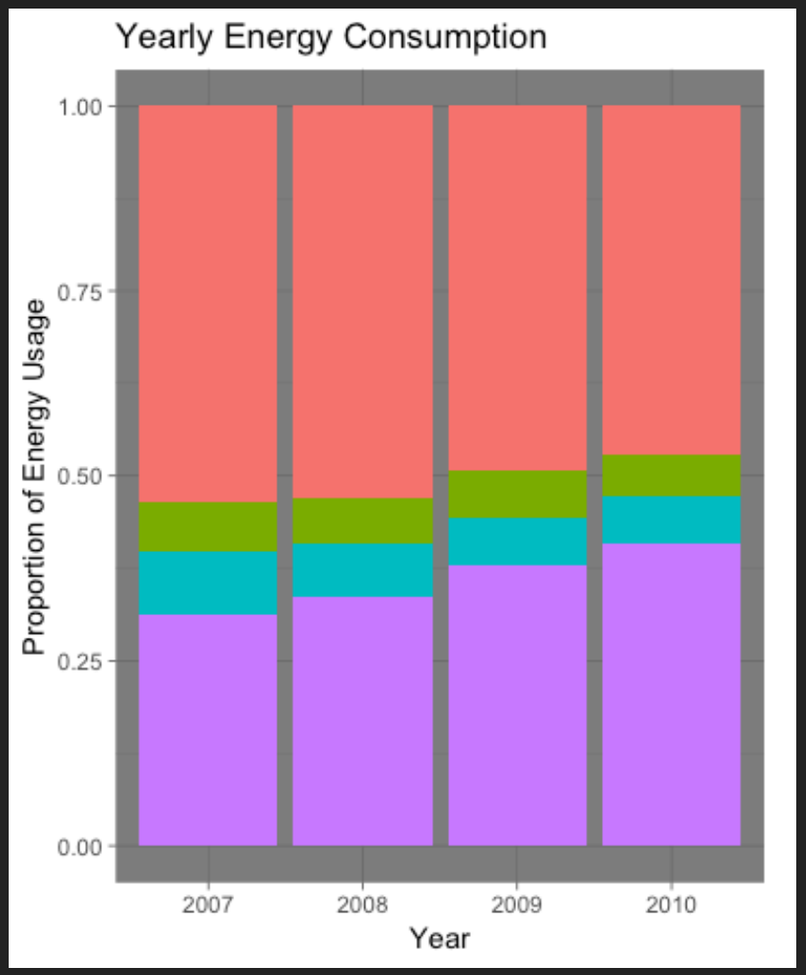
   - Detection of hidden habits other householders



ANALYSIS FRAMEWORK

2 Uncover trends in behaviour of appliances performance

Flag appliances degradation



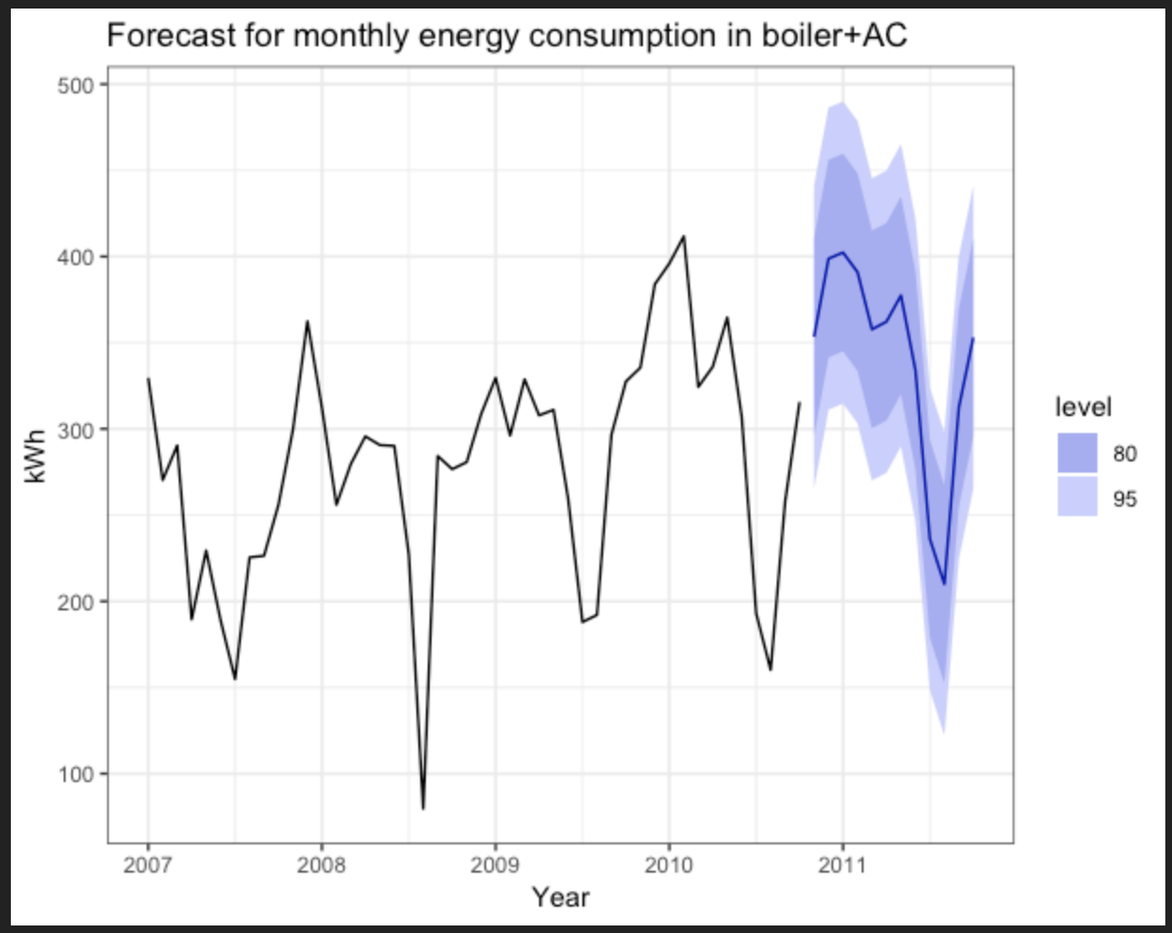
Other

Kitchen

Laundry room

Water boiler + AC

Increase in the energy consumed yearly may indicate water boiler/AC malfunctioning



RMSE=44, MAE=32, MAPE=15

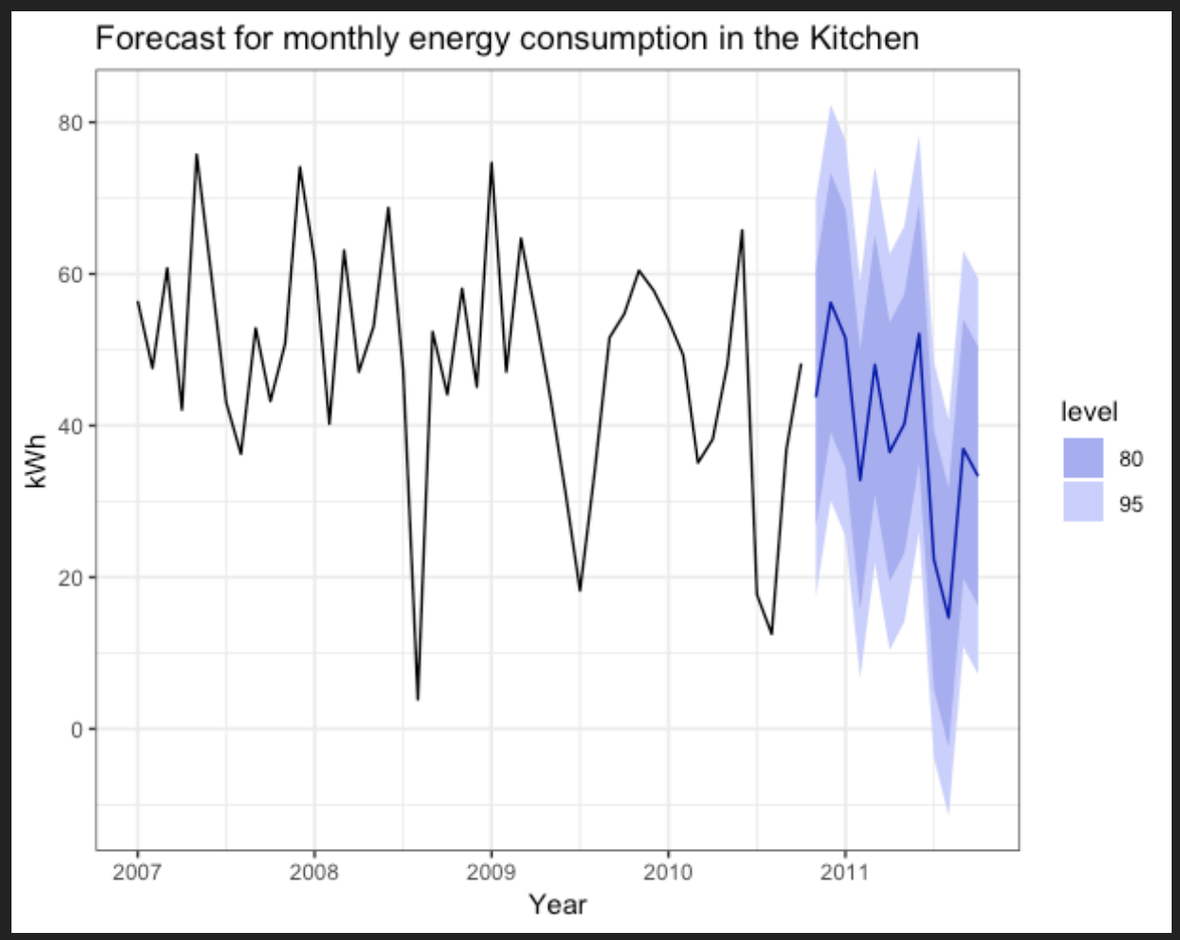
Confidence interval 80%: 114

Confidence interval 95%: 175

ANALYSIS FRAMEWORK

2 Uncover trends in behaviour of appliances performance

Flag appliances degradation



RMSE=13, MAE=10, MAPE=47

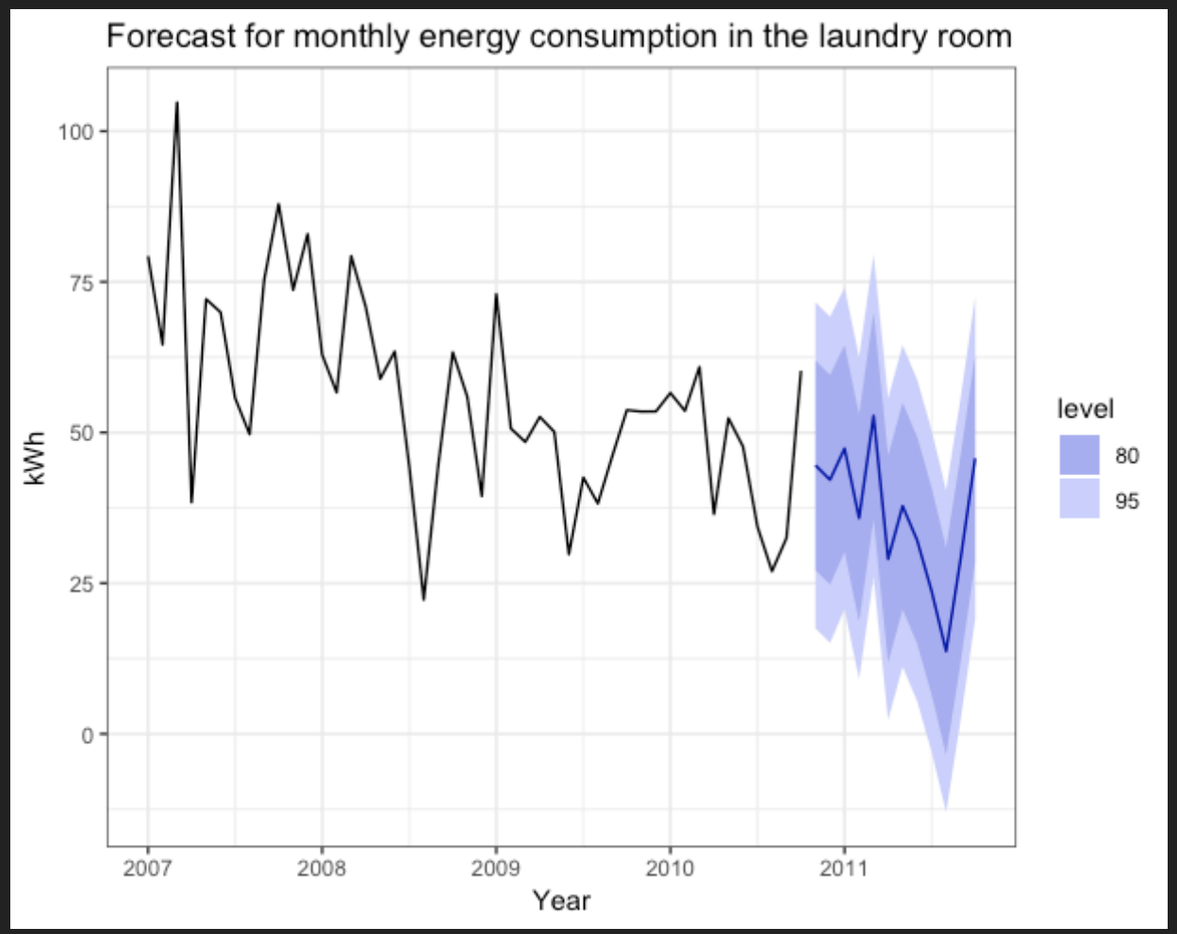
Confidence interval 80%: 34

Confidence interval 95%: 52

ANALYSIS FRAMEWORK

2 Uncover trends in behaviour of appliances performance

Flag appliances degradation



RMSE=9, MAE=7, MAPE=15

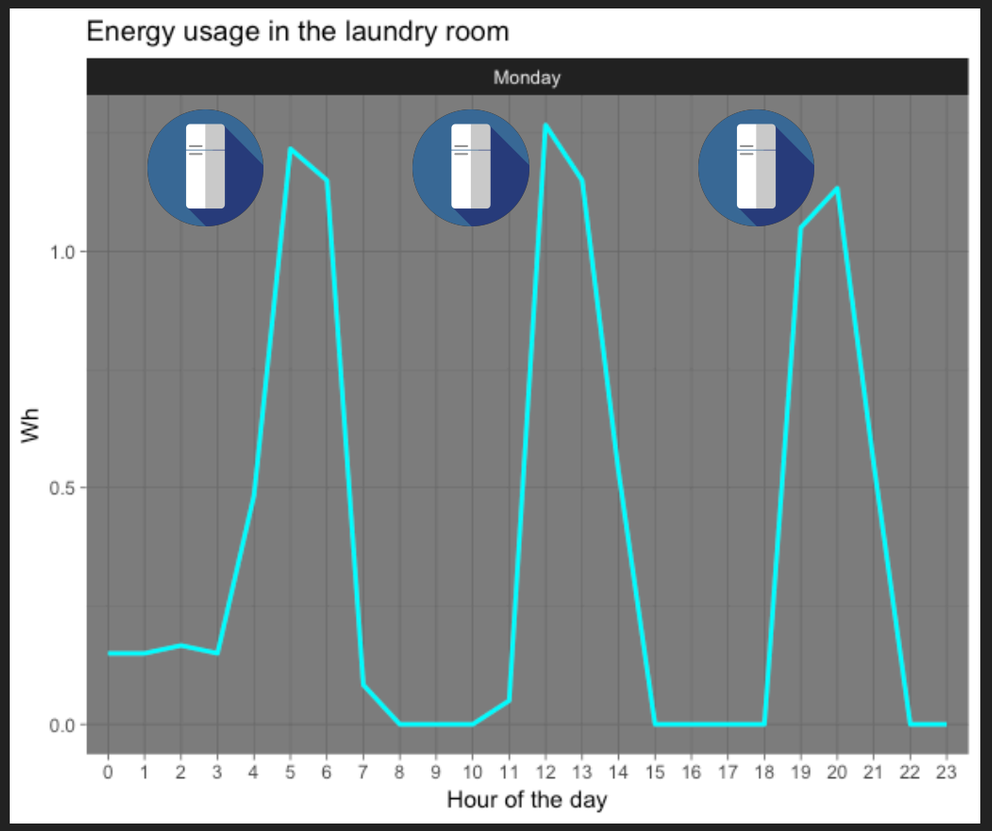
Confidence interval 80%: 34

Confidence interval 95%: 53

ANALYSIS FRAMEWORK

2 Uncover trends in behaviour of appliances performance

- Flag appliances degradation
- Flag increased energy waste

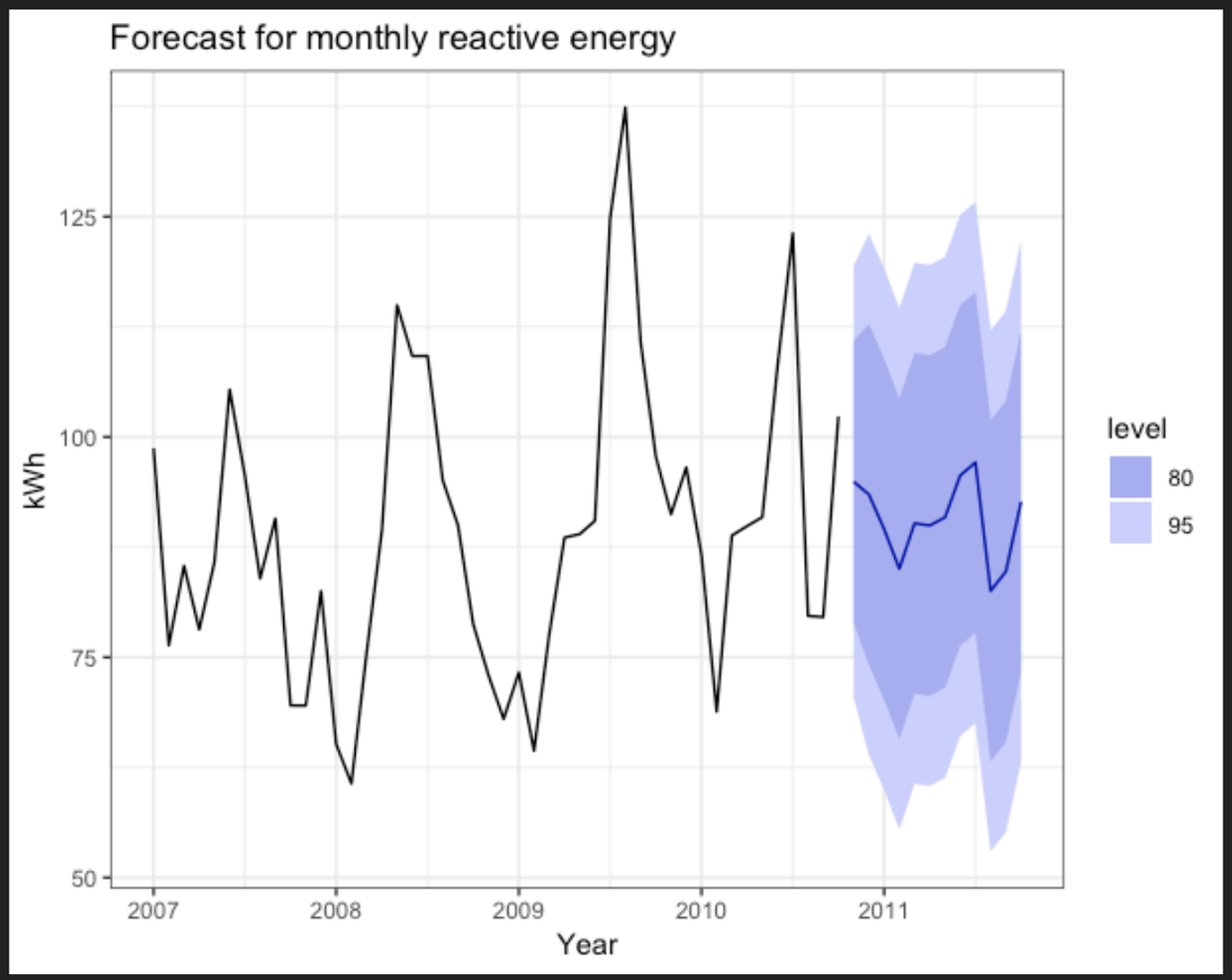


Change in the frequency may indicate refrigerator malfunctioning

ANALYSIS FRAMEWORK

2 Uncover trends in behaviour of appliances performance

Flag increased energy waste



RMSE=12

MAE=9

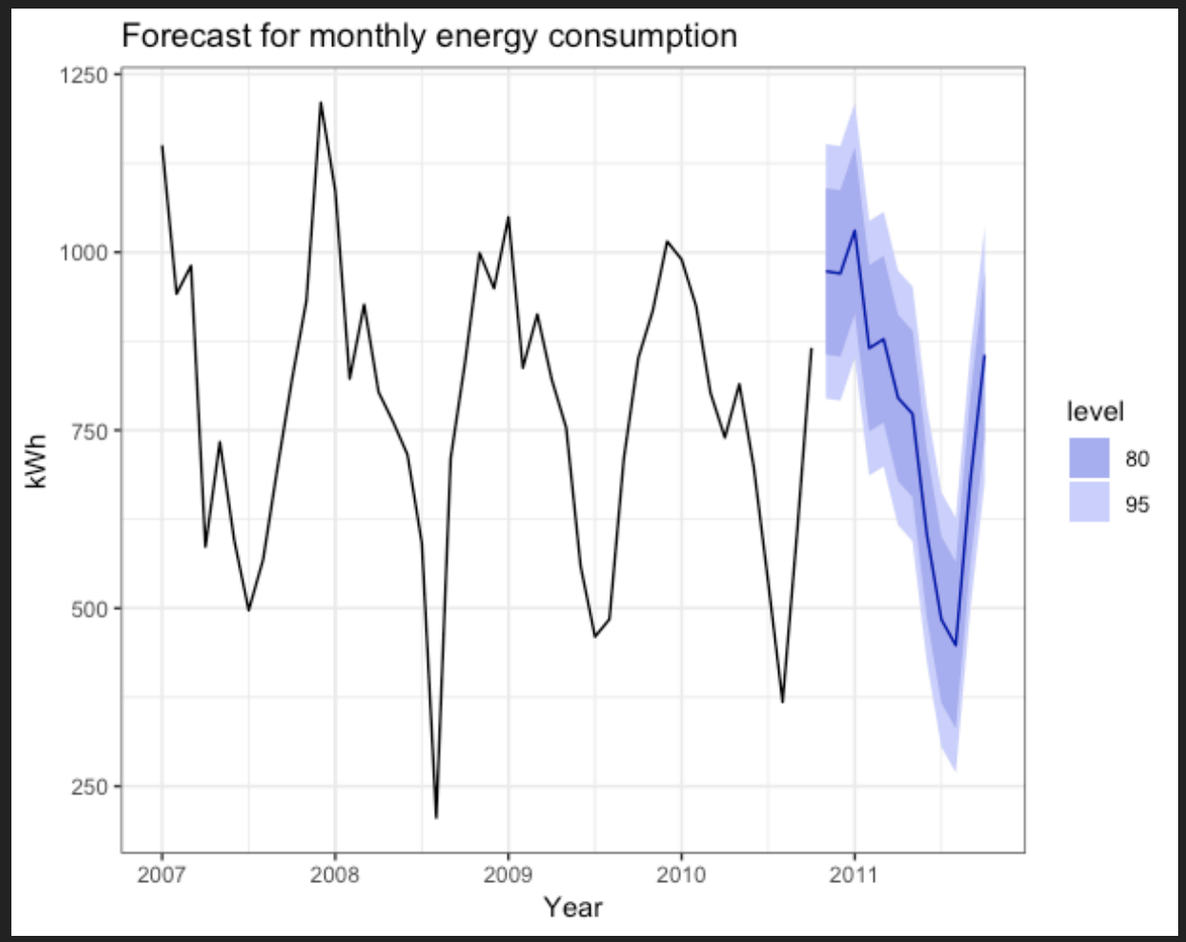
MAPE=11

Confidence interval 80%: 38

Confidence interval 95%: 59

ANALYSIS FRAMEWORK

3 Detect unexpected increase of energy consumption



RMSE=78

MAE=53

MAPE=9

Confidence interval 80%: 233

Confidence interval 95%: 357