2023 IEEE PES ISGT-Europe

October 23rd-26th, 2023, Grenoble, France

Collecting French Smart Meter Data for Residential Flexibility

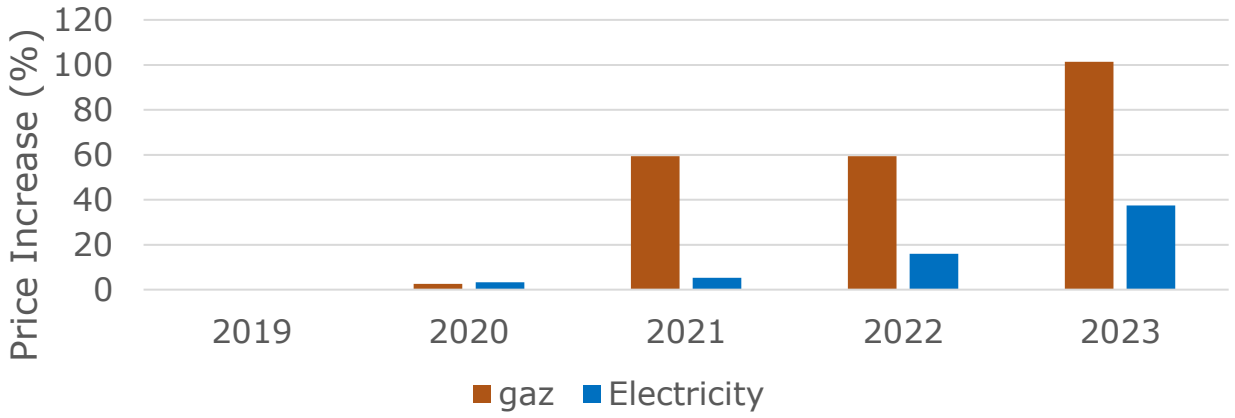
Benoit Couraud – Pierre-Jean Barre – David Flynn

University Nice Côte d'Azur - University of Glasgow

Paper №: A9157

Introduction

- Energy Transition and gas-electricity prices evolution



⇨ residentials move from Gas heating to Electric

⇨ they request for a power rating increase

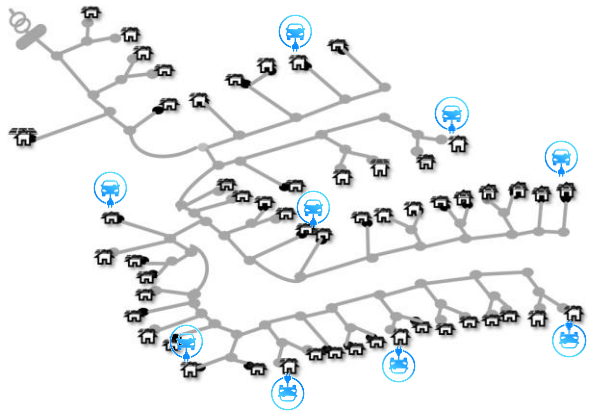
- **Challenge**: Distribution System Operators cannot easily increase Residentials power rating

⇨ Residential Flexibility could help deferring the grid reinforcement

Similarly…

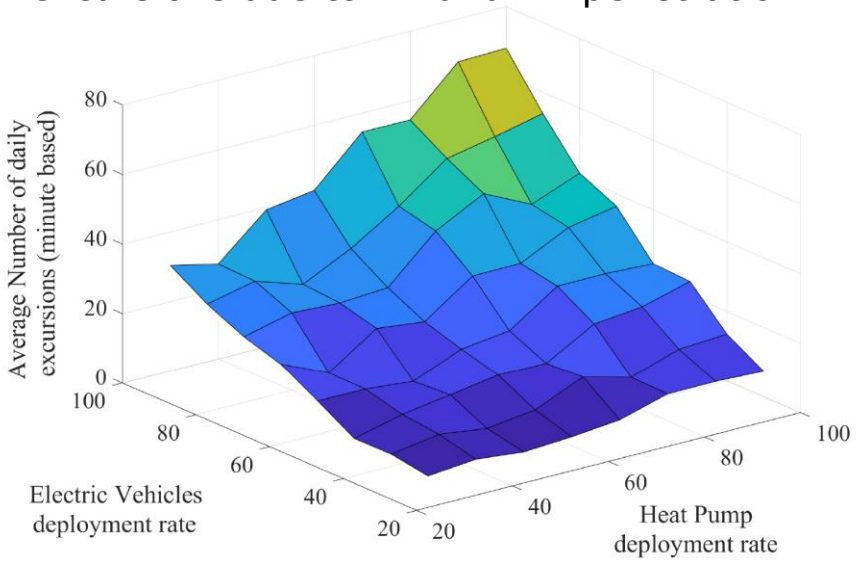
- How **EV roll-out** will affect local grid?

Low Voltage European Reference Network
(~ 55 households)



Monte-Carlo random allocation of EV roll-out using EV charging profiles from ***My Electric Avenue*** large scale experiment

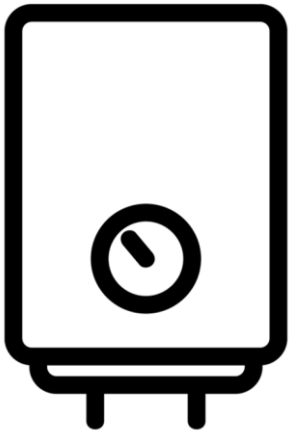
Simulation results: Number of voltage excursions due to EV and HP penetration



⇨ Residential Flexibility could help deferring the grid reinforcement

Residential Flexibility

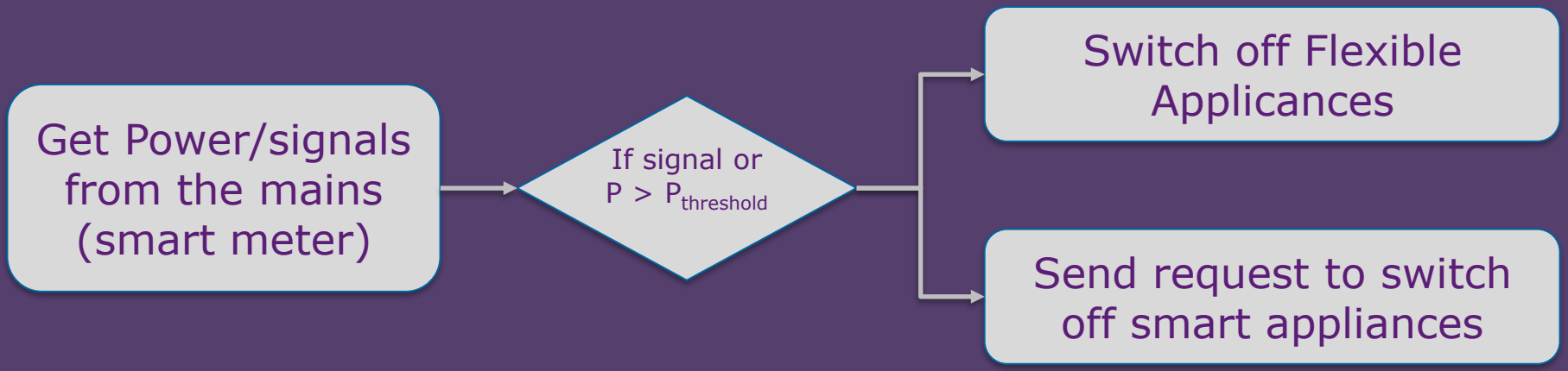
- Shifting of energy usage to prior / future times to reduce energy cost / avoid disconnection / …



- Can be done through smart appliances – smart controller or … using a device connected to the Smart Meter ?

⇨ Leveraging the French Smart Meter to enable Residential Flexibility

⇨ We proposed a device that:

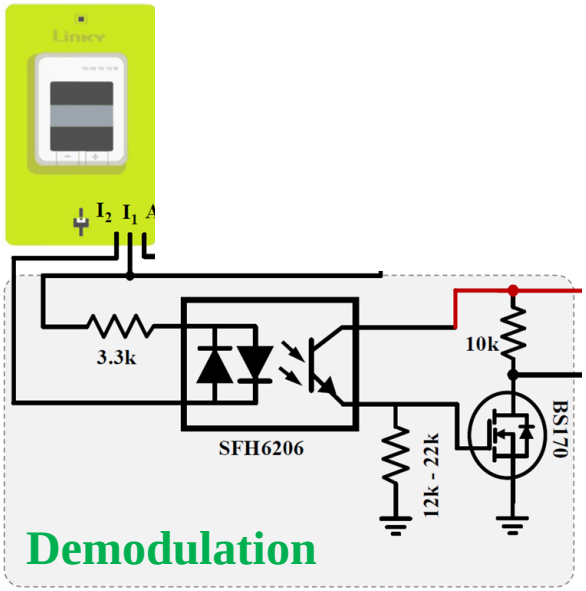


French Smart Meter

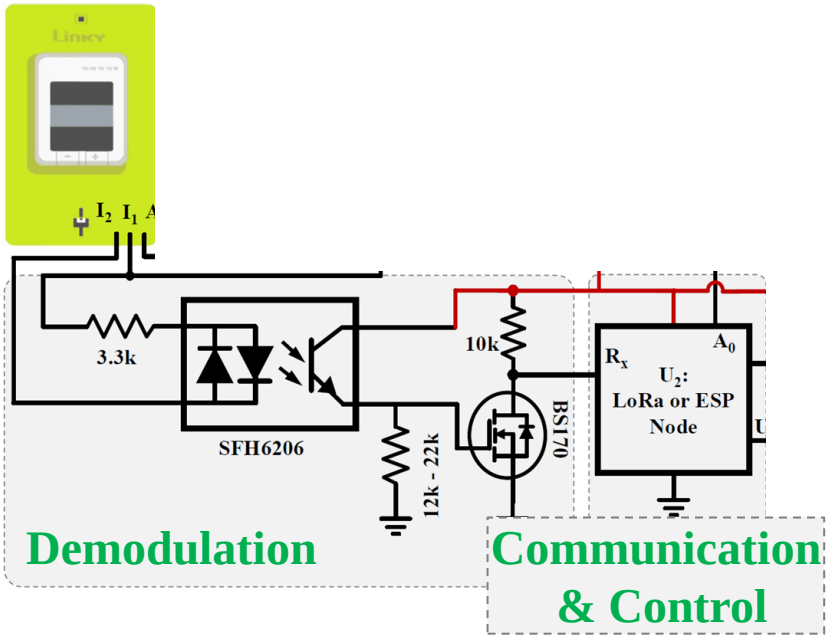
- Disconnects household if overall power greater than rated power
- Collects load data and publish it every 30 min (next day publication) through PLC
- Local data available at a higher frequency (> 3s) through custom protocol (~modulated UART) + very small local supply (< 130mW)

⇨ **Concept** = monitor data in real time and disconnect specific loads (Evs, water heater) when overall power increases dangerously

Connecting to the French Smart Meter



Connecting to the French Smart Meter



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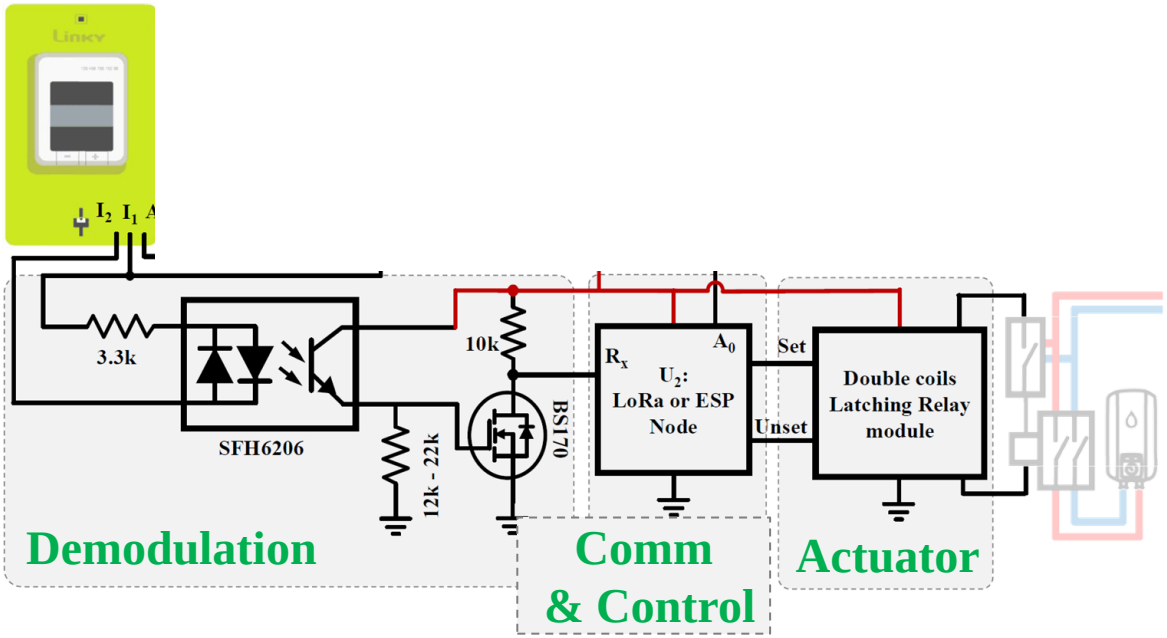

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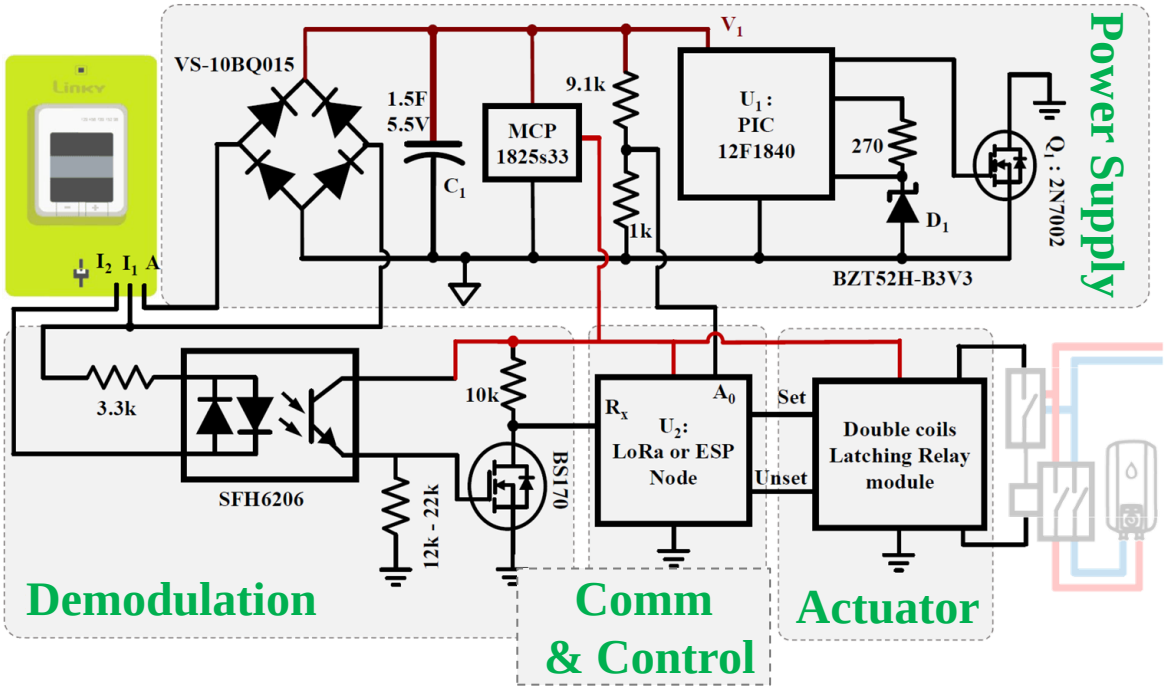
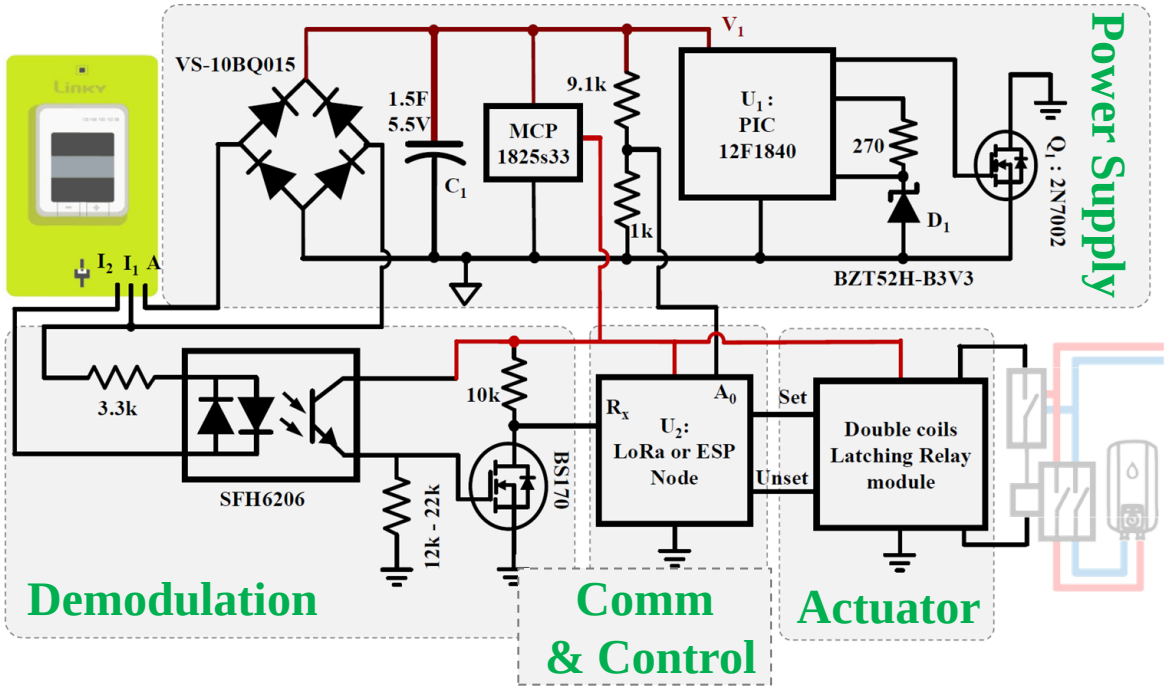
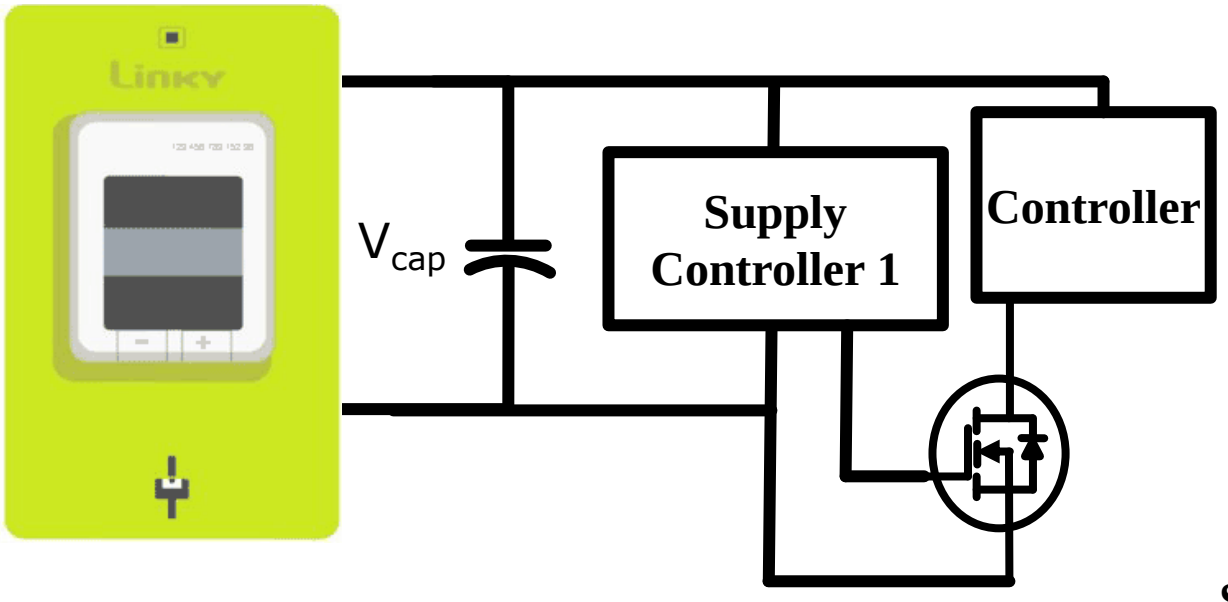


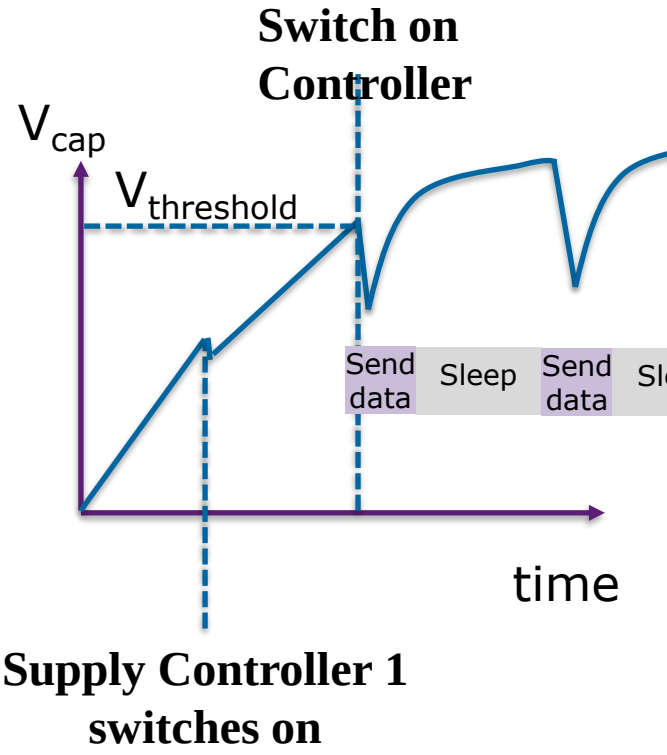
Connecting to the French Smart Meter



Challenge: Power Supply Strategy

- Very low power supply from the Smart Meter

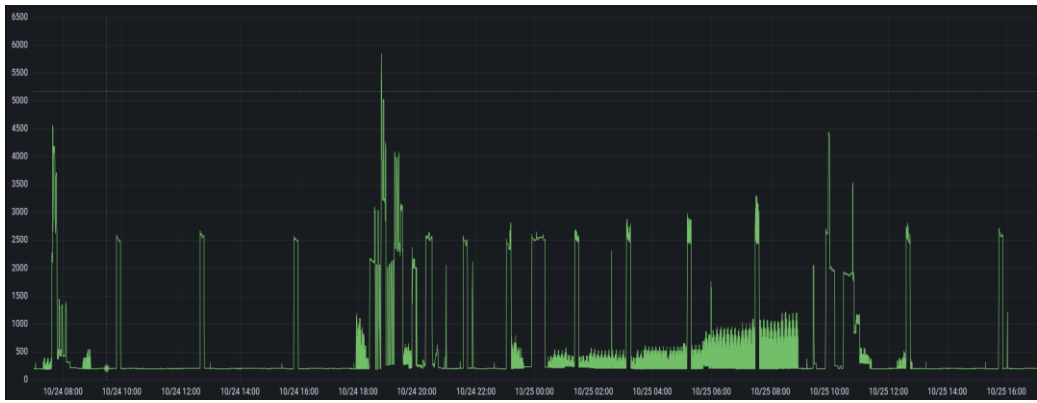




Experimental Results

Experimentation

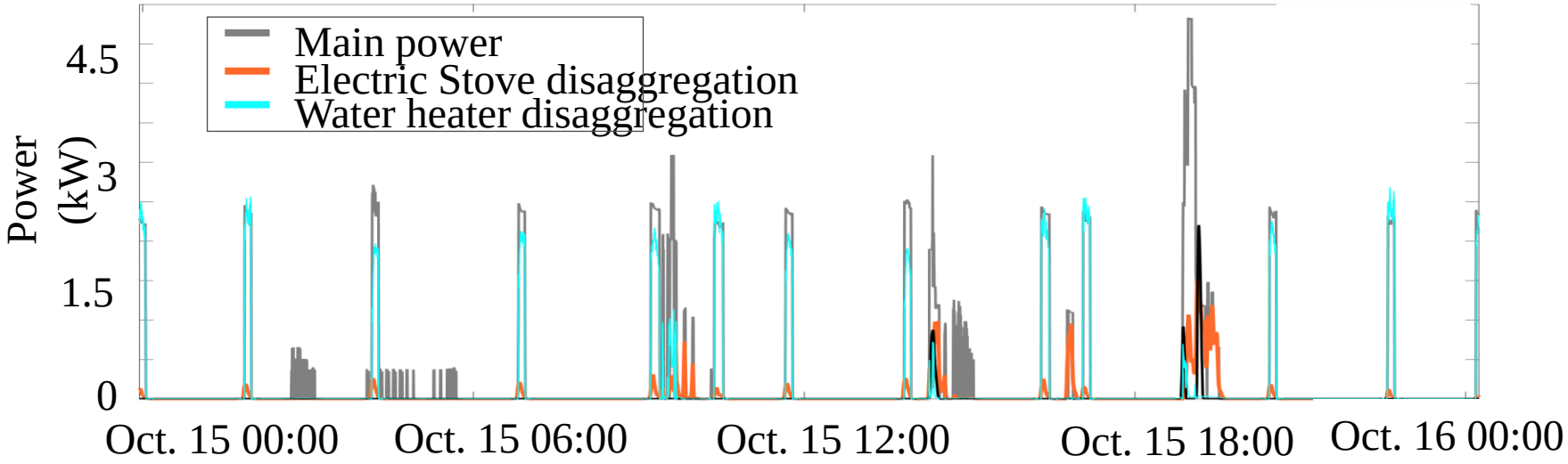
- Successfully installed in 6 Households with correct switching behaviour when overloading

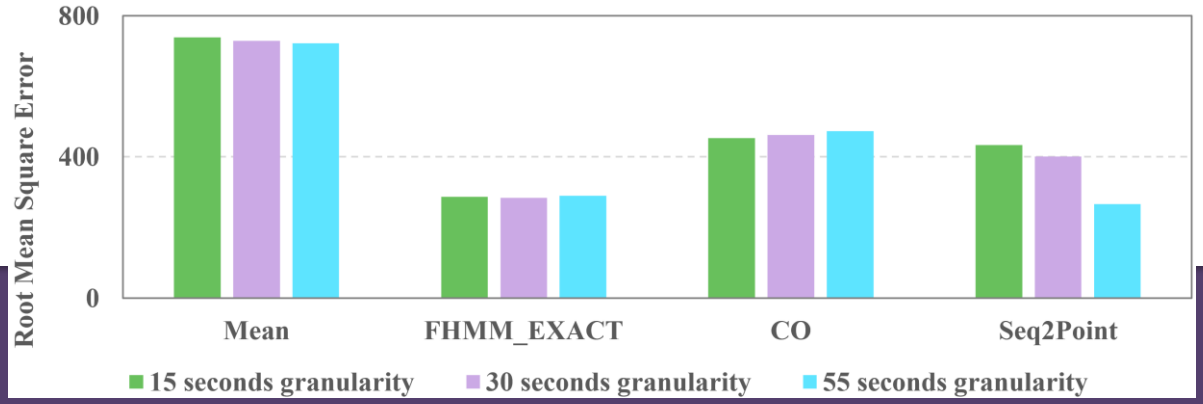


- Also used for other purposes…

Leveraging Smart Meter Data

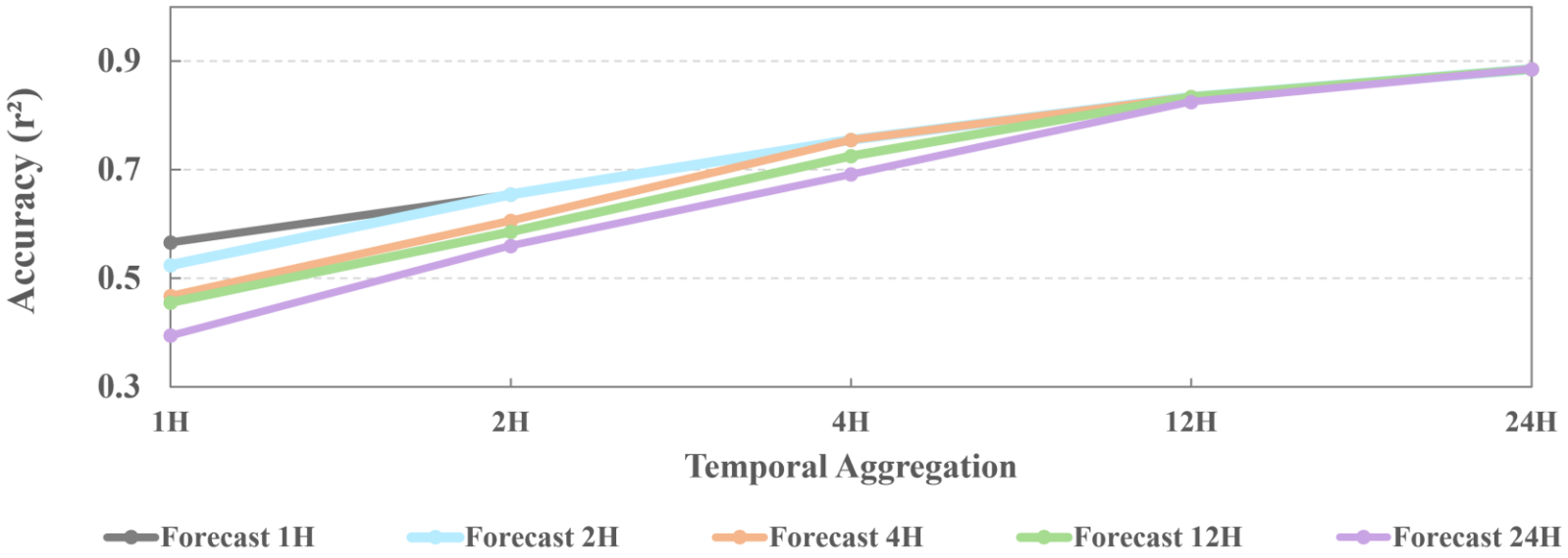
- Residential Non-Intrusive Load Monitoring from Smart Meter Data





Leveraging Smart Meter Data

- Residential Load Forecasting Assessment study



Conclusions

- Successfully provided a small device to collect data and activate flexible appliances
  → open access: https://github.com/bcouraud/Linky-TIC-Reader

- Smart Meter data has potential for NILM → need more datasets

- Smart Meter Data for single house's load prediction can be used but accuracy > 70% only if temporal aggregation > 4h

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Thank you !