



THULE INSTITUTE

Smart grid research Centre of Northern Environmental Technology (NorTech Oulu)

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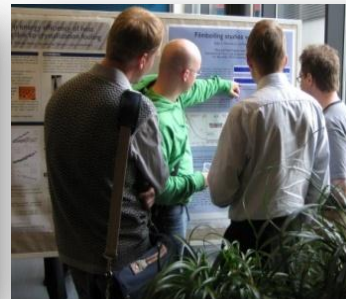
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What do we do?

<http://nortech oulu.fi/>

<http://www.facebook.com/NorTechOulu>

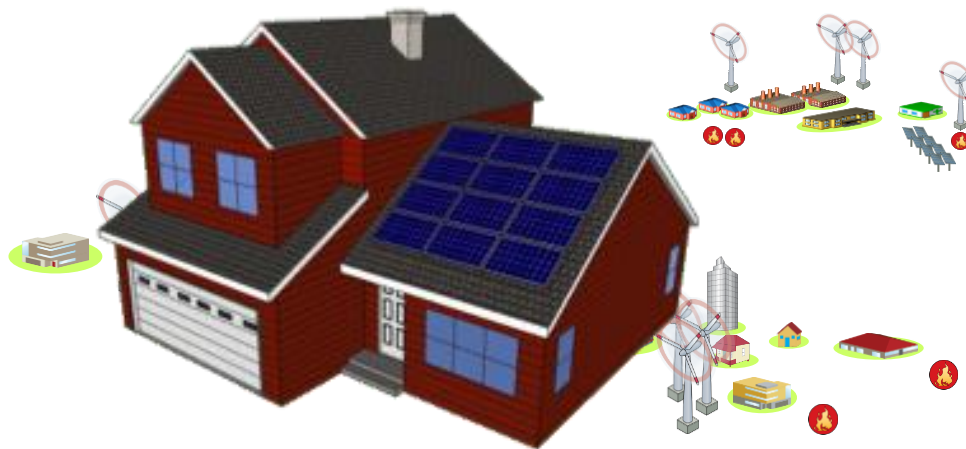
- NorTech Oulu conducts northern environmental technology research
 - Part of the Thule Institute, which is a Research Centre in northern and environmental issues
- Our activities:
 - Environmental technology research & education
 - Coordinate research on environmental technology and sustainable northern communities at the University level
 - Organize seminars and workshops in environmental technologies
 - International projects especially in the Barents Region and in the Northern Periphery



Smart grids for Decarbonisation

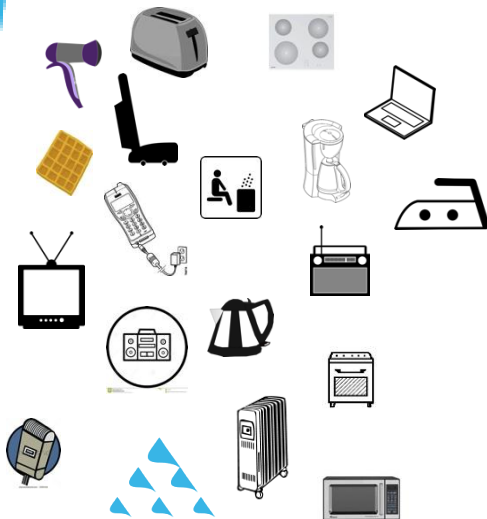
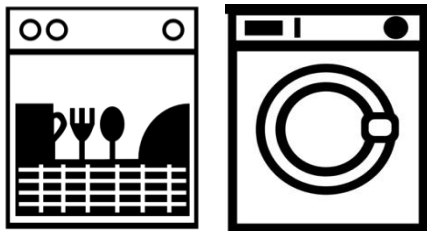
nortech OULU Research

- Smart Buildings
 - Simulation on users interface response
 - Home automation
 - Sustainability Impacts of Smart Buildings
 - Peak load reduction
 - Small-Scale Energy generation RES



Smart Building Modeling

- Each appliance is rated according to the European Energy Labelling System
- Standby Power integration



Nbr of wash/week, A_{w-max}

| | | |
|-----------|-----|-----|
| 1 person | 2.1 | 1.4 |
| 2 person | 3.4 | 2.8 |
| 3 person | 4.9 | 4.2 |
| 4 person | 6.4 | 5.6 |
| 5 person | 6.3 | 7 |
| 6 persons | 7 | 7 |

Temperature
Temperature

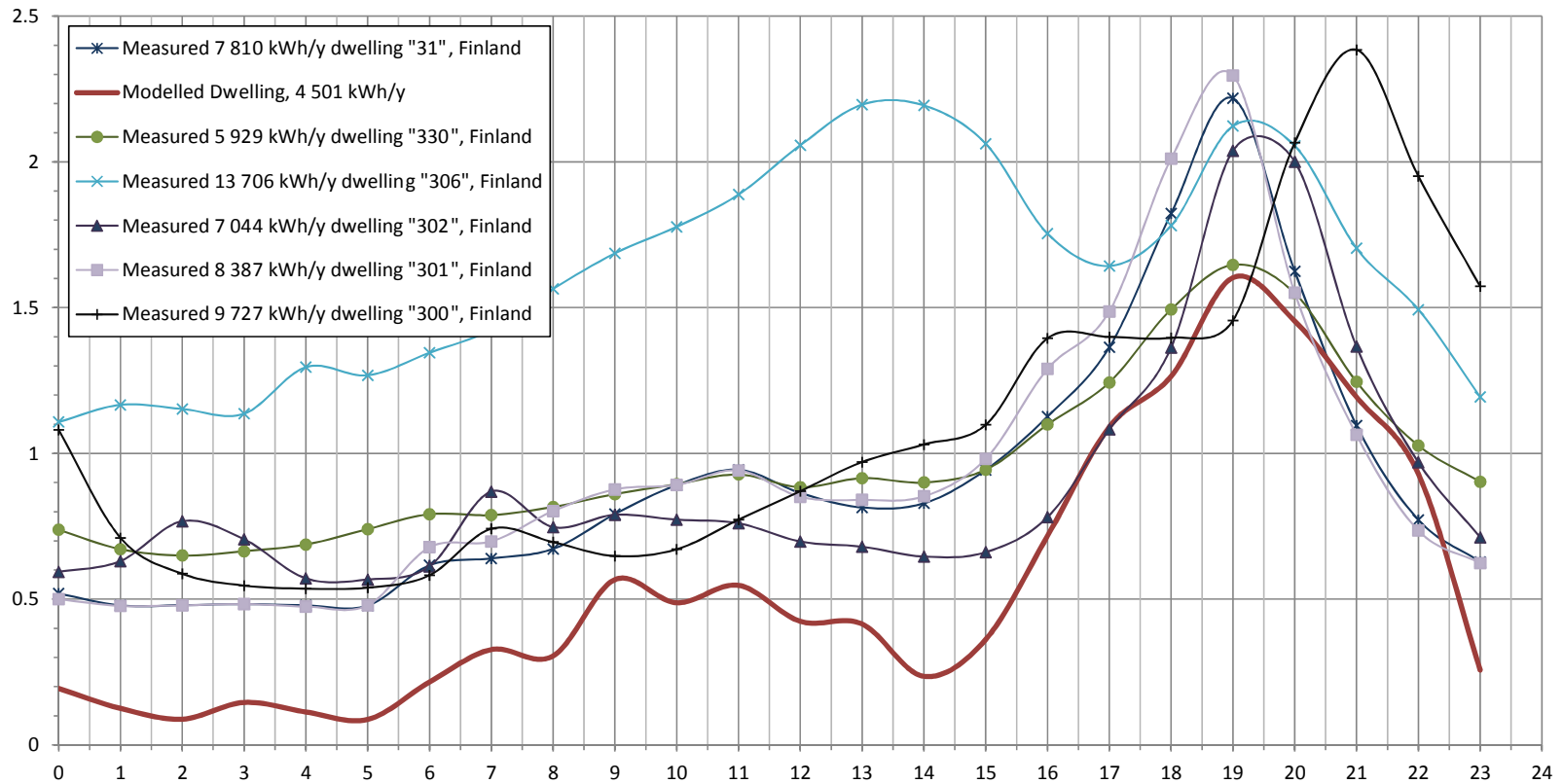
| | | |
|------|-----|------------|
| Cold | 2% | Time [min] |
| 35°C | 9% | 45 |
| 55°C | 49% | 60 |
| 65°C | 38% | 80 |
| 70°C | 27% | 90 |
| 90°C | 6% | |

Start time delay

| | |
|--------------|-----|
| Never | 36% |
| Once a month | 19% |
| Once a week | 24% |
| every time | 21% |

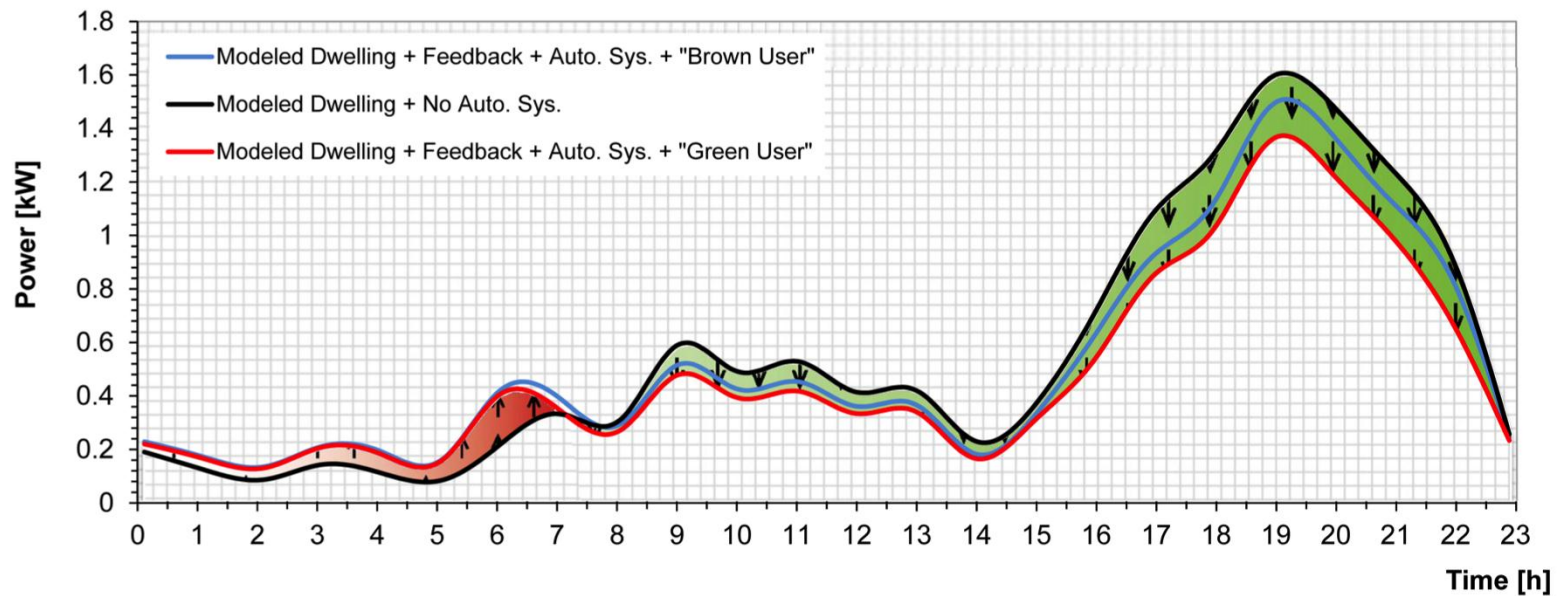
Daily Profiles – Electricity Consumption

Modelled daily profile vs. Measured daily profile, Oulu Finland



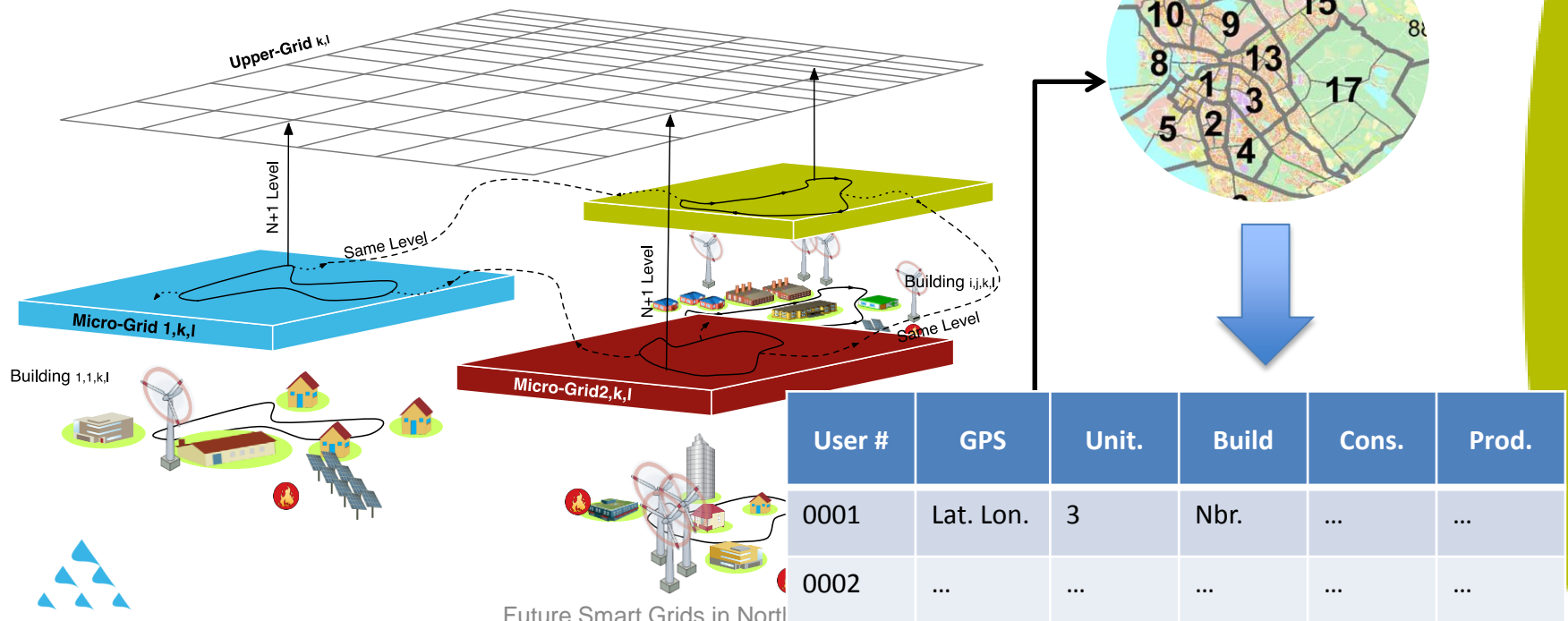
Load Shifting

- ▲ Integrating home automation allowed to slightly shift daily profile
- ▲ Consumer's behaviour is a key factor that can influence the daily profile
- ▲ A single detached house can increase its night electricity usage by 50 %



Networks of buildings

- Micro-Grid energy and information optimization
- Integration of EV and PHEV



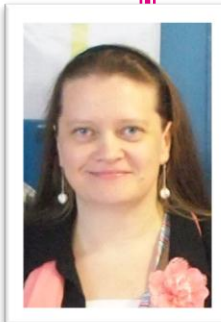


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