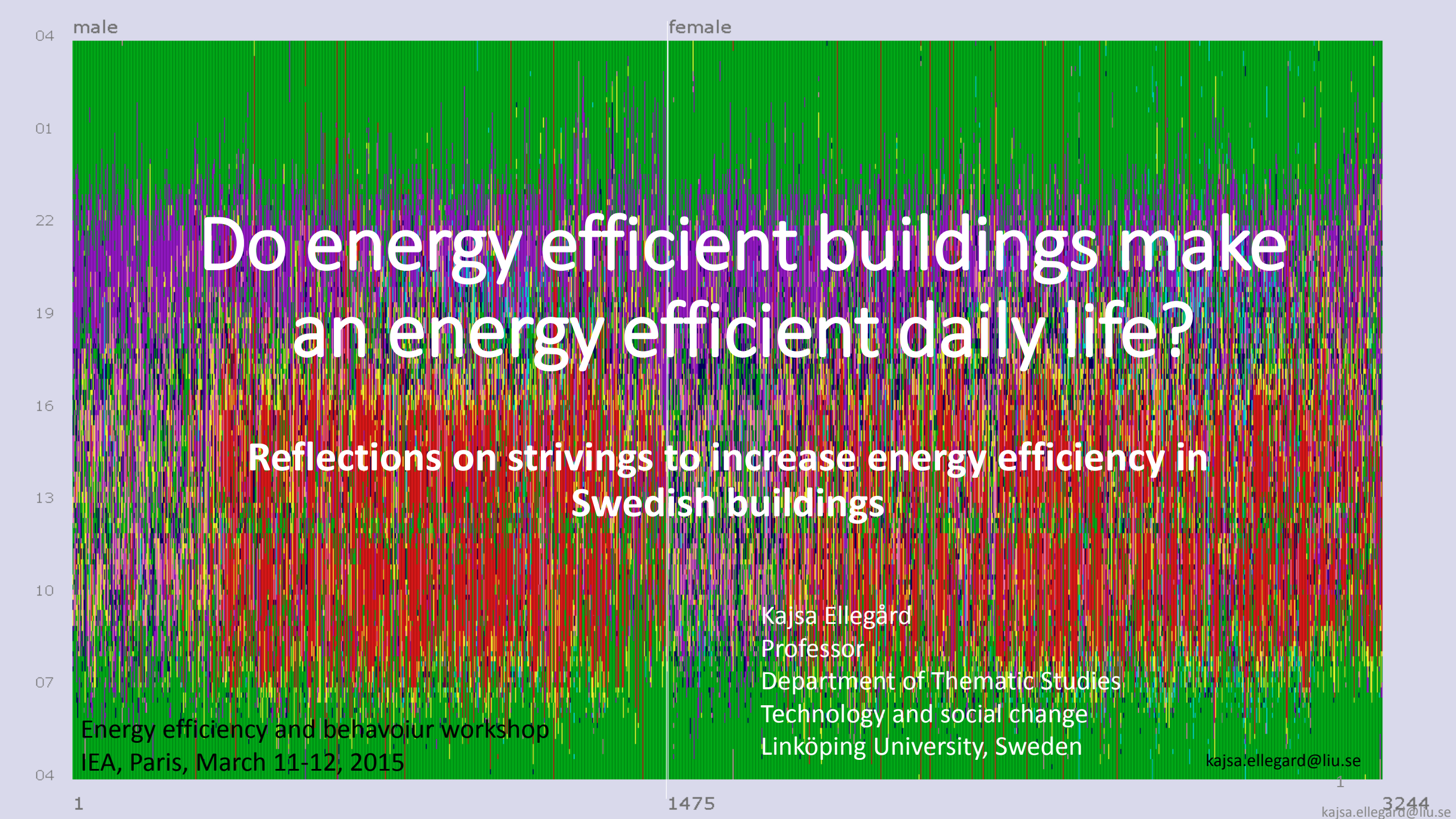

Do energy efficient buildings make an energy efficient daily life?

Reflections on strivings to increase energy efficiency in Swedish buildings

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Energy efficiency and behavoiur workshop
IEA, Paris, March 11-12, 2015

Focus

- How do housing companies meet the needs for energy efficiency in order to fulfill the EU 2020 targets?

- How do they take tenants' living their everyday life into consideration?
- When in the course of the day, is electricity used by individuals in their homes?

- With more unpredictable renewable energy in the energy system – can households move their activities to use less electricity during periods of low generation? Which are the constraints?

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Swedish housing companies make efforts to increase energy efficiency when constructing new homes and renovating old ones

and they lean heavily on technological solutions by

- installing energy efficient technologies in the building shell (isolation, energy efficient windows, ventilation systems)
- equipping apartments with energy efficient cold appliances
- supplying tenants with energy efficient kitchen, washing and drying appliances
- making arrangements to take care of household waste
- introducing ”individual” metering for the use of electricity, hot water and heat

And companies get disappoined when technologies are not used in the way they ”should”

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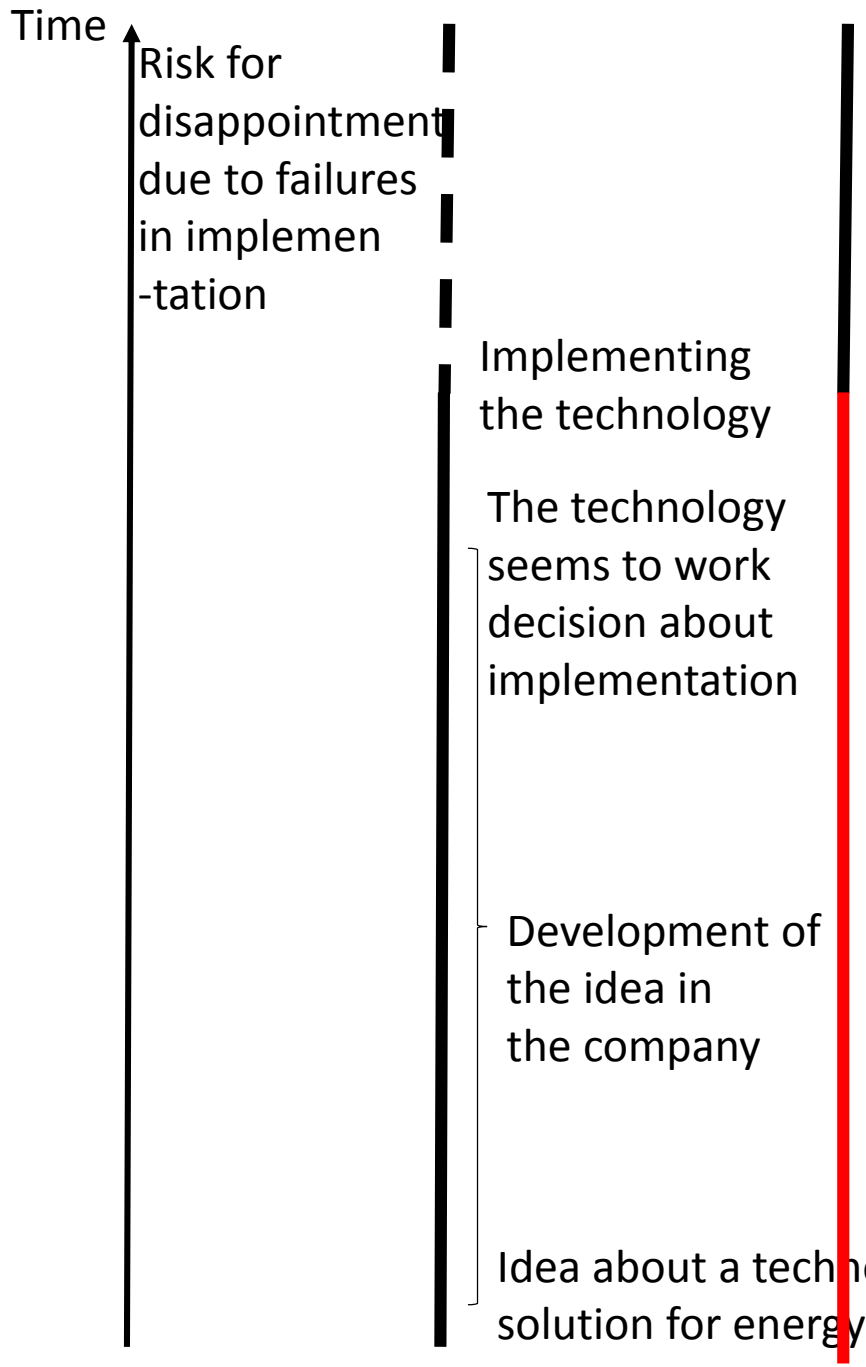

This indicates a knowledge time gap between housing companies and tenants

It does not work according to the plans of the developers

Tenants meet the technology for the first time

The persons using a new technology without success the first time they try it are not stupid!

Knowledge time gap

User experiences, habits and interests influence the implementation.

Involving tenants might soften the clash between the habits/interest/ experiences and the new technology – and reduce the negative effects of the knowledge time gap.

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Improvements of energy efficiency

Housing companies claim that they save about 20+ percent energy from changing technical solutions. Is that good enough?

Much research shows that there is more to save if the tenants also take measures to use energy more efficiently.

But housing companies seldom make efforts to get closer to their tenants when introducing new technologies. Then they create knowledge time gaps.

They hesitate to enter the private sphere of their tenants.

An approach based on analysis of large time diary materials might help increasing the knowledge about peoples' activity patterns at an overall level without intruding on the private sphere.

This is what I will discuss later.

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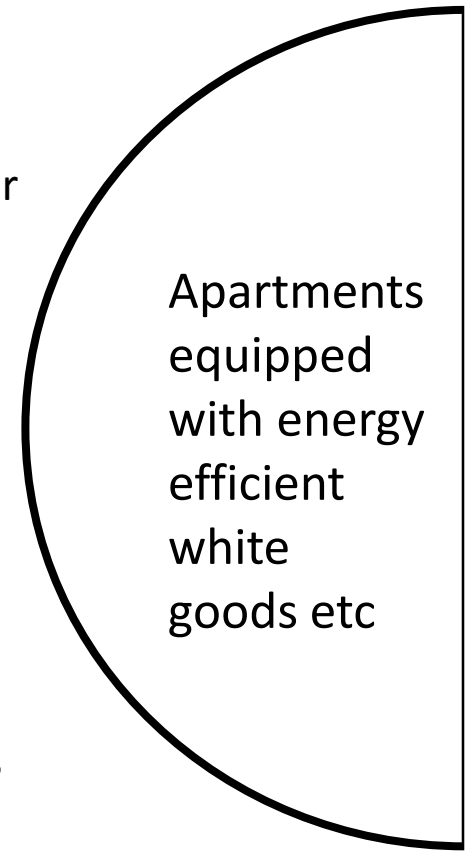
Two sides of the building 1) a heated and equipped space

Housing
companies
making business

Policy and goals for
energy efficiency and
energy savings influence their
decisions on
- retrofitting
- construction
- maintenace

Economic incentives,
laws and regulations
stimulate measures towards
energy efficiency.

Result: investment in various
technological solutions



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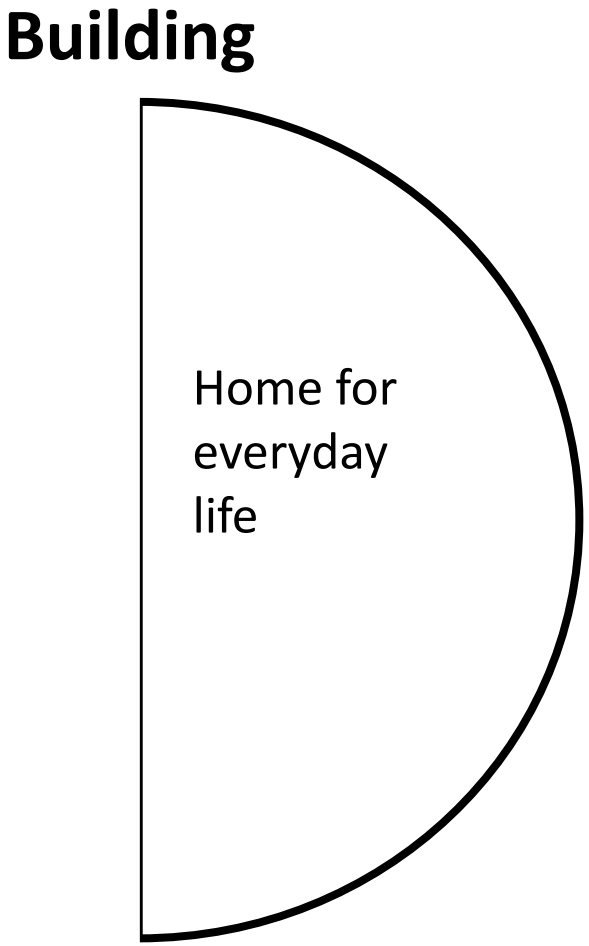
Two sides of the building 2) a home for everyday life activities



Individuals in households living their life

Strive to live a life as good as possible

- Suitable to their daily projects
- Convenience and comfort
- Not too expensive
- Environmentally sound

Then: new energy efficient technologies ought to fit to the interests, projects and experiences of the household members

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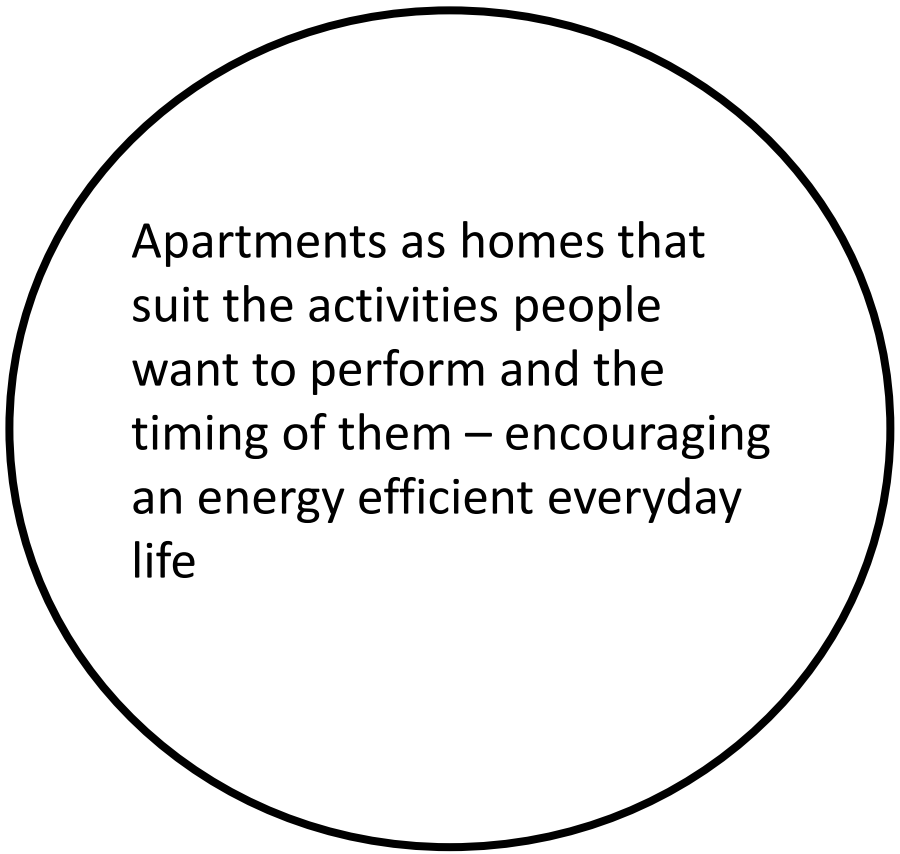
The building as a whole:
The heated and equipped building space is a home for peoples' everyday activities

Housing
companies
making business

Building



Individuals in
households
living their life

Dialogues between housing companies and tenants about apartments and energy might ground for energy efficient living. Knowledge about the aggregate activity pattern and the use of the home might serve as a starting point.

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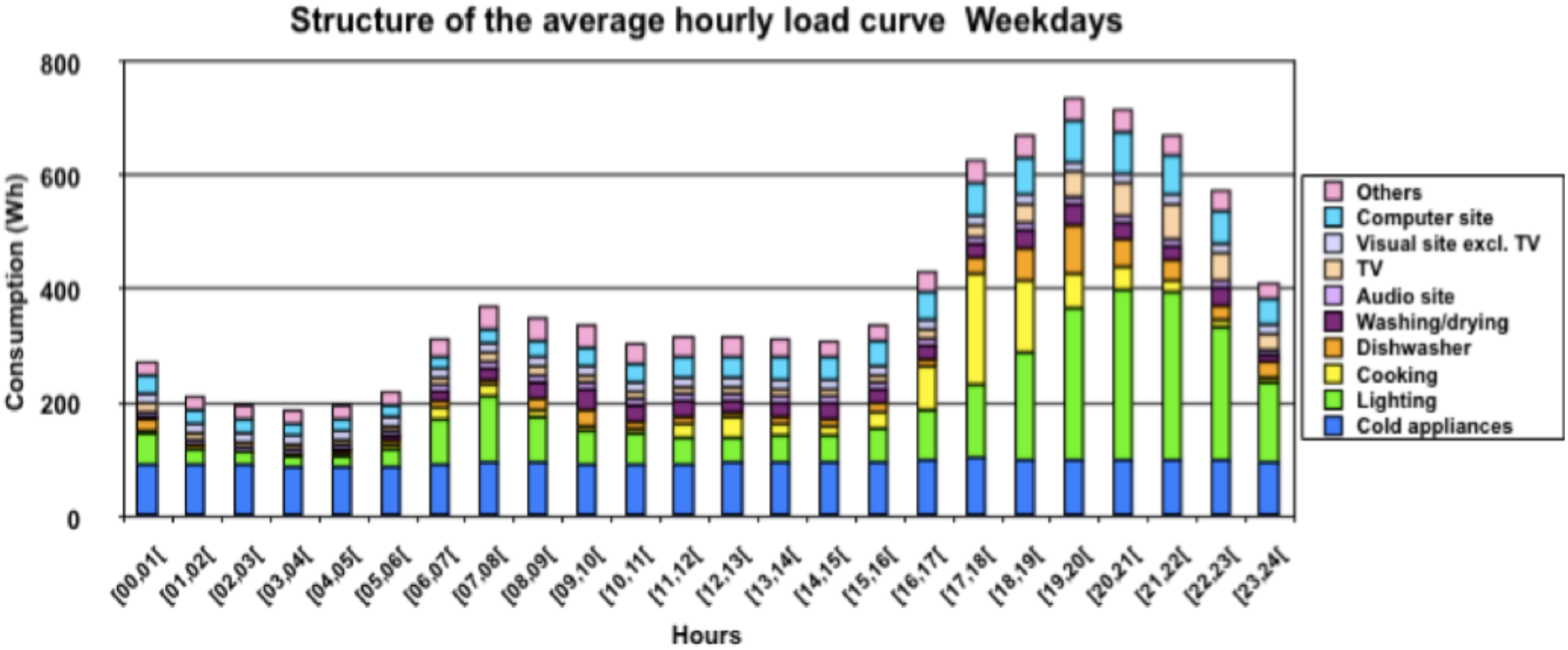
There is detailed knowledge about the aggregate demand for electricity: Electricity load profile in Sweden from detailed metering in 400 homes in 2006



Source: Swedish Energy Agency. P Bennich & Anna Johansson

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What explains the shape of the demand profile?

- When people are at home

influence when they can perform energy intensive activities there

- Then

Who perform energy intensive activities and for what purposes?

What possibilities and constraints influence the opportunities for a leveling out of the aggregate demand profile to meet an unpredictable electricity generation from renewables like solar and wind energy?

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Diary data gives information about individuals' everyday activities in the homes

- Data from 2010/2011 time-use survey in Sweden
- About 3250 individuals wrote individual diaries about their activities
- Each person was asked to write diary for 1 weekday and 1 weekend day
- **OBSERVE**: The figures presented are very preliminar!

- An older time-use survey showed that people spent 65% of the day in the home on weekdays

and about 75% of the weekend days

I will show some activities performed in the homes and give a rough calculation of the electricity use derived from the activities

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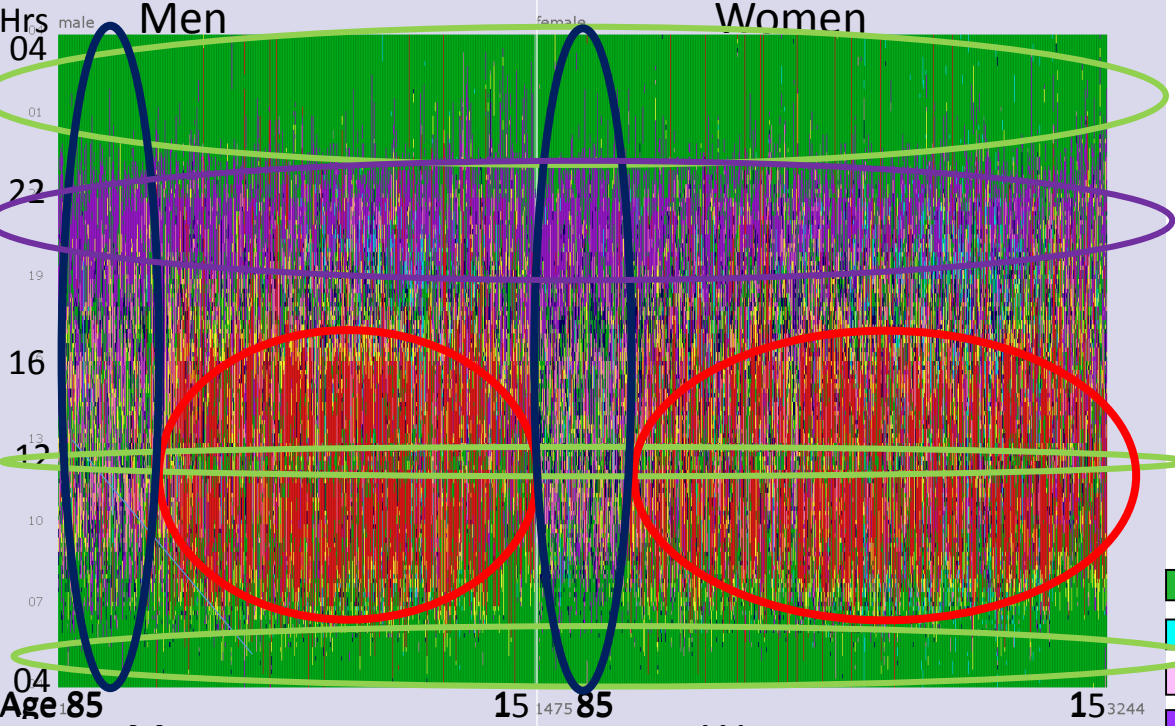

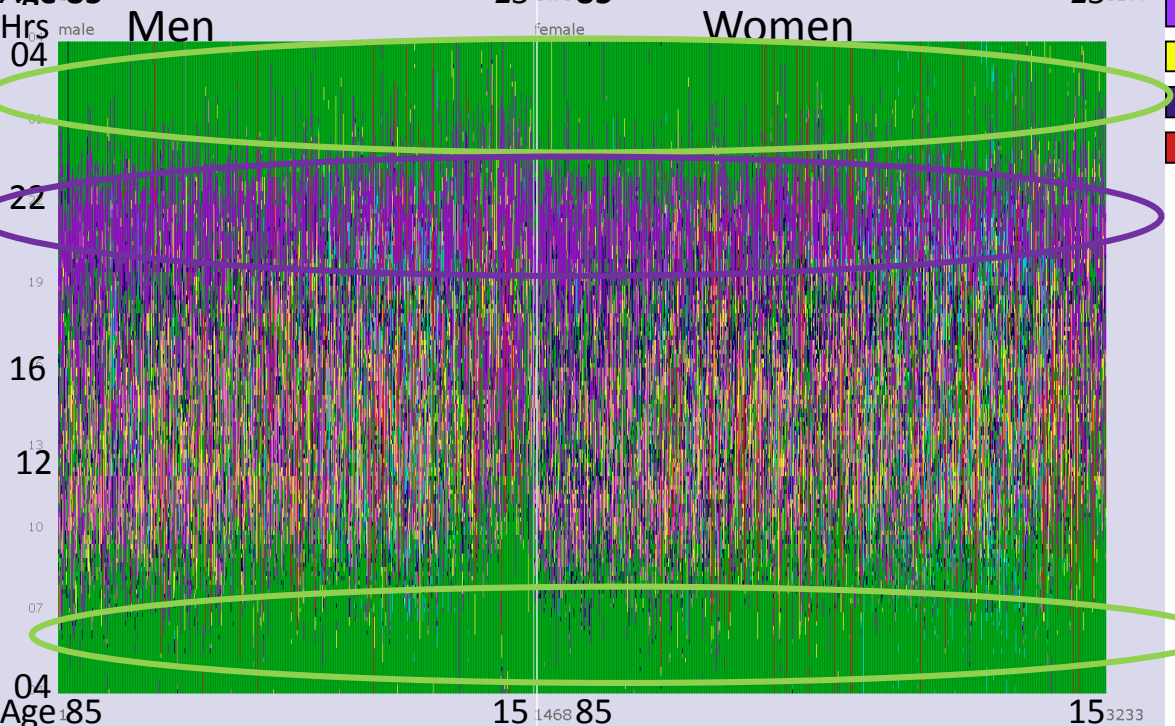

Weekdays, 3244 diaries, individuals 15-84 years old

- Care for oneself
- Care for others
- Household care
- Reflection/recreation
- Travel
- Procure & prepare food
- Employed work/school

Weekend days, 3233 diaries, individuals 15-84 years old

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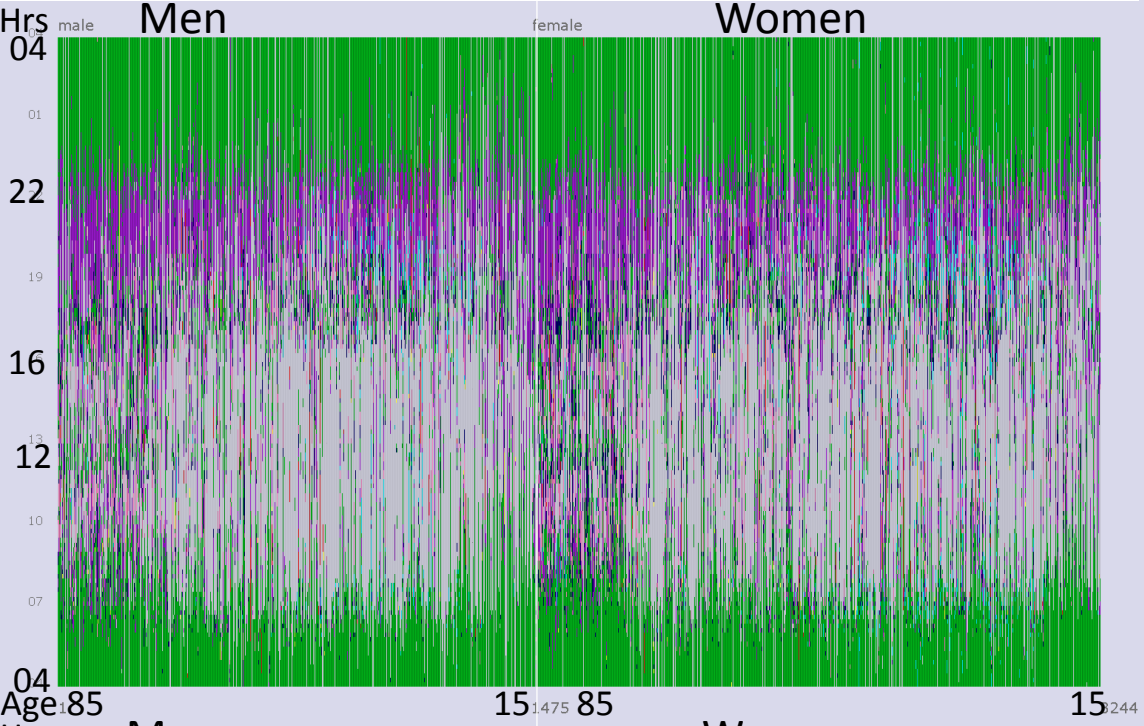
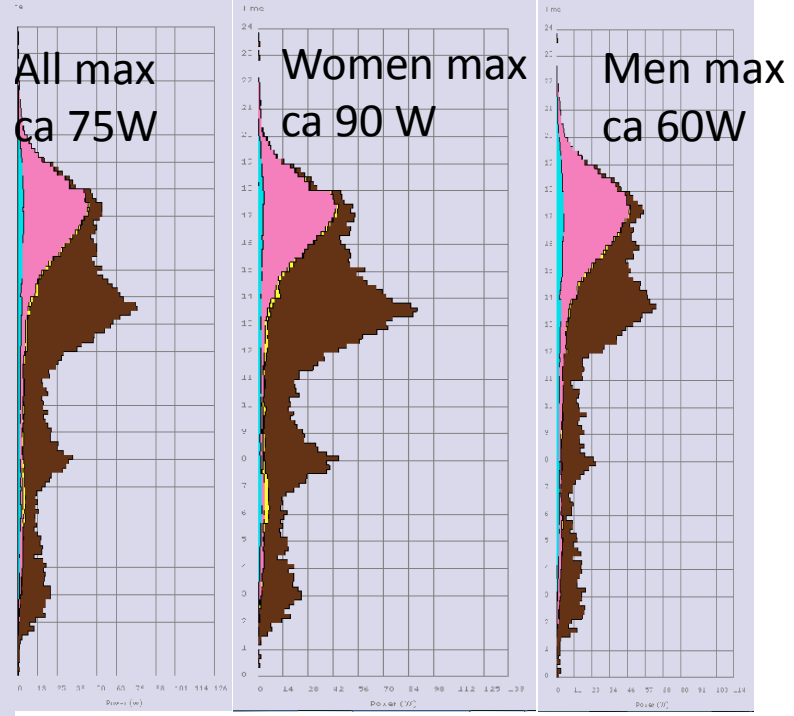
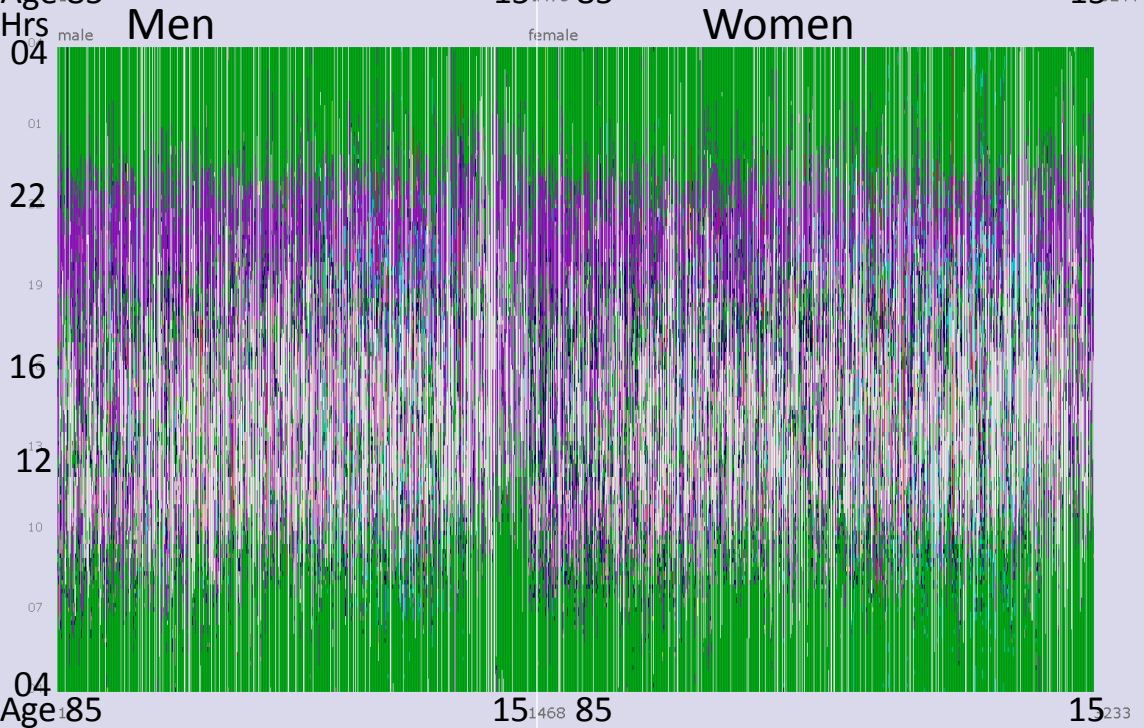
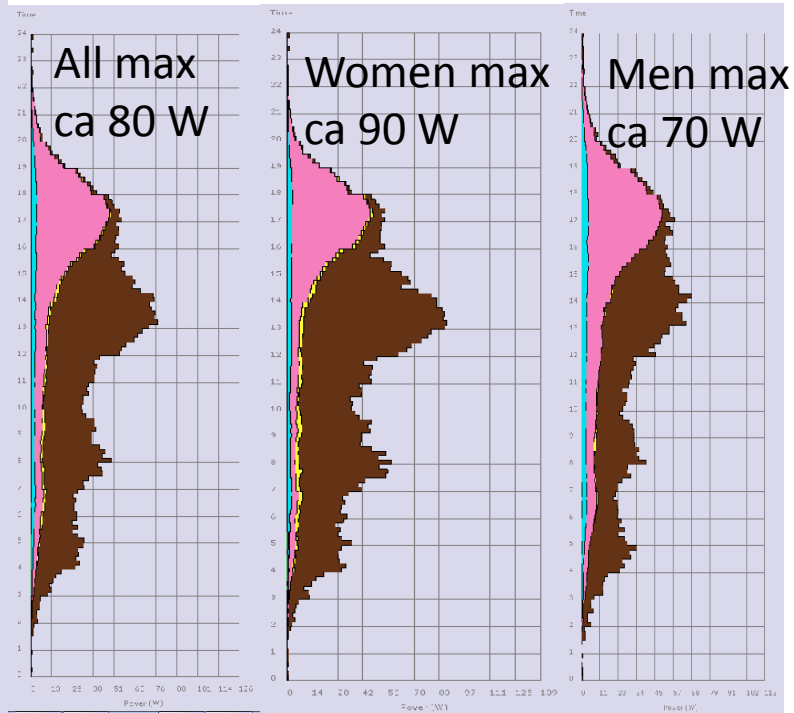




Staying at home, weekdays 2010/11





Staying at home, weekend days 2010/11

Electricity use for some activities (max W/ind 10 min)

- Cooking
- Ironing
- Television
- Computer

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Activities claiming electric appliances

Women are in the home more than men, especially on weekdays. Thereby women have more opportunities to perform energy intensive activities in the home.

A somewhat higher max use of electricity per individual and 10 minute period is shown on weekend days than on weekdays

Electricity use is more evenly distributed over the hours of the day on weekend days than on weekdays

Women’s activities demand relatively more electricity than men’s activities on weekdays than on weekend days

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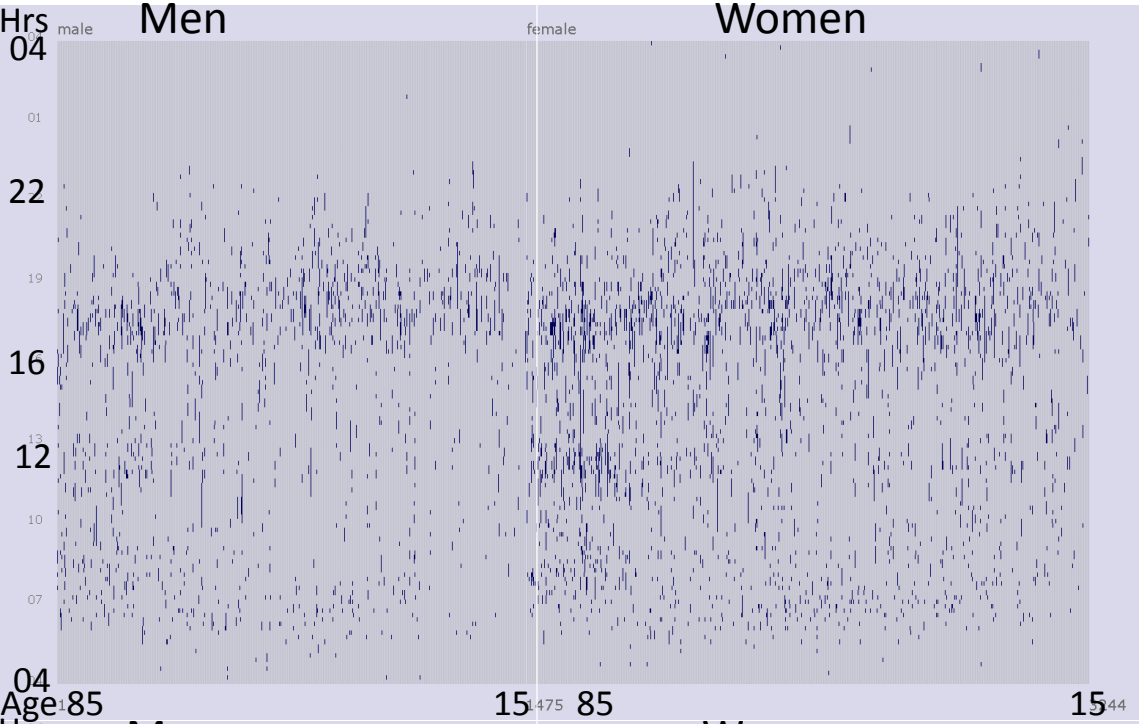
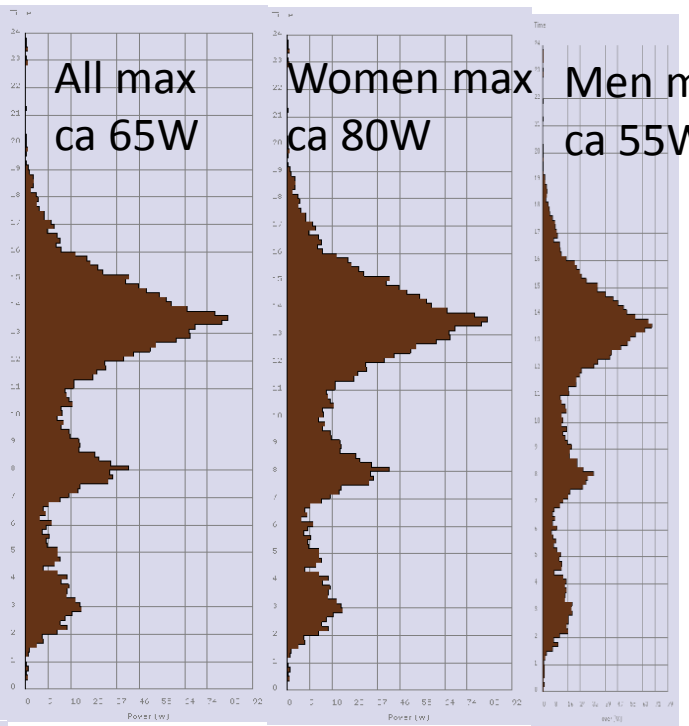
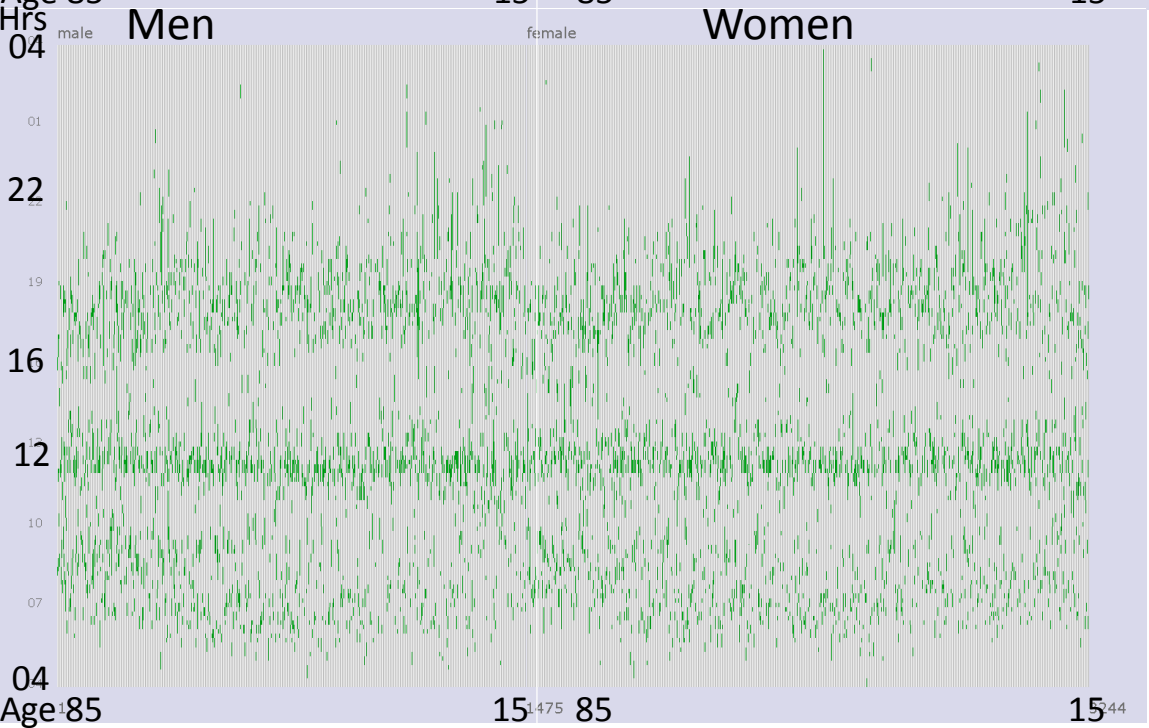




Cooking activities
and electricity use
for cooking, weekdays
W/ind and 10 min



Eating activities on weekdays

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Eating and cooking

- Everybody has to eat and on weekdays the meals are steared by schedules outside the home (work, school, daycare etc)
- Young people eat later in the evening than older
- Cooking is closely connected in time to eating
- Women cook more than men (and women spend more time in the home than men)
- There is a big gender difference in cooking among the oldest

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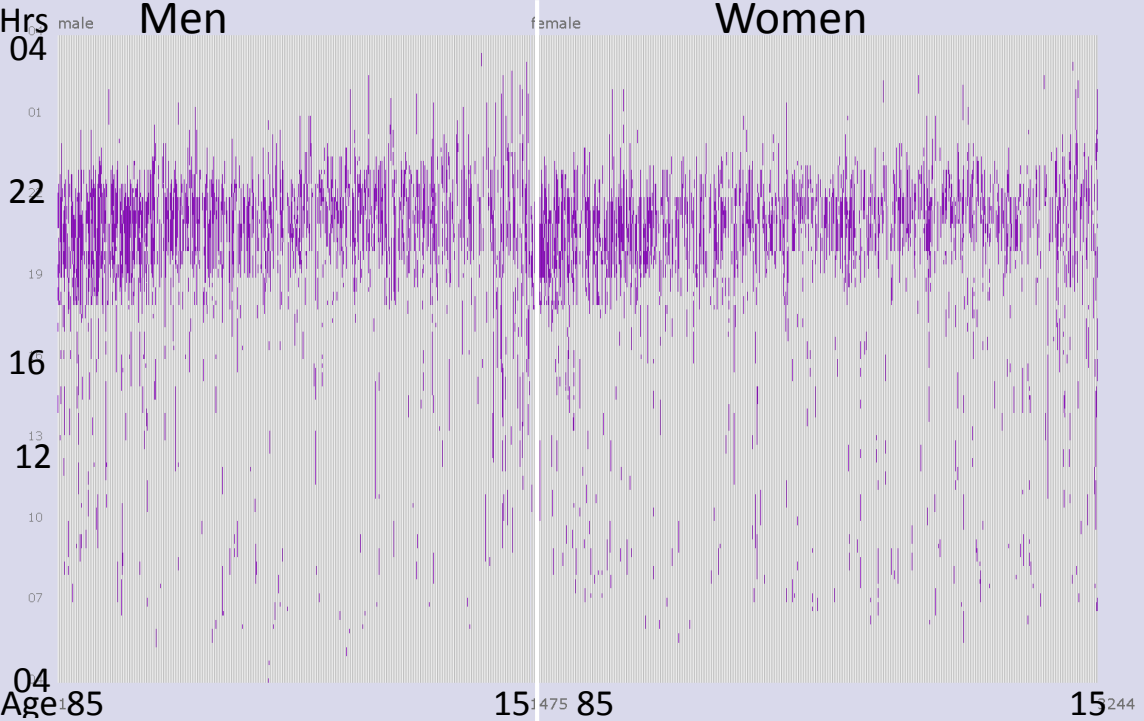
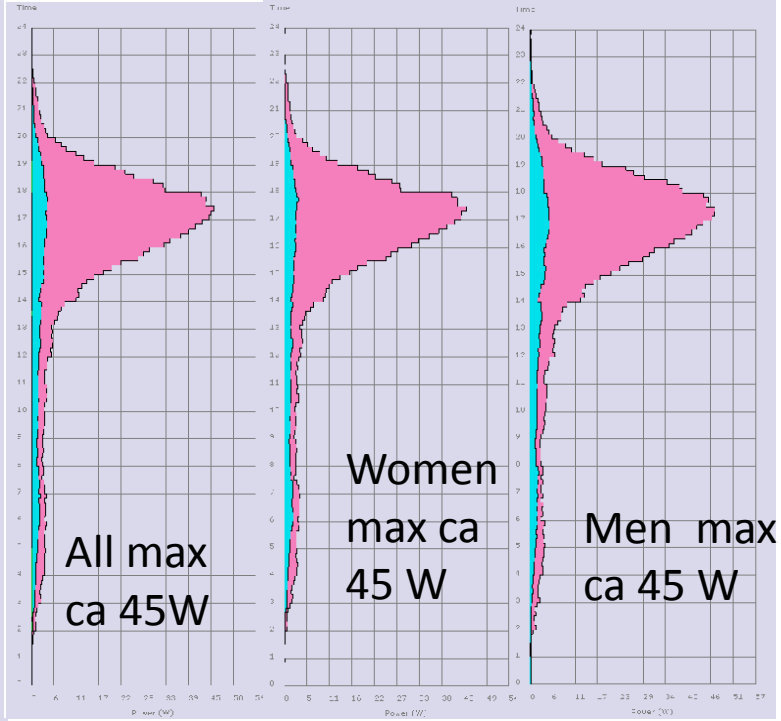
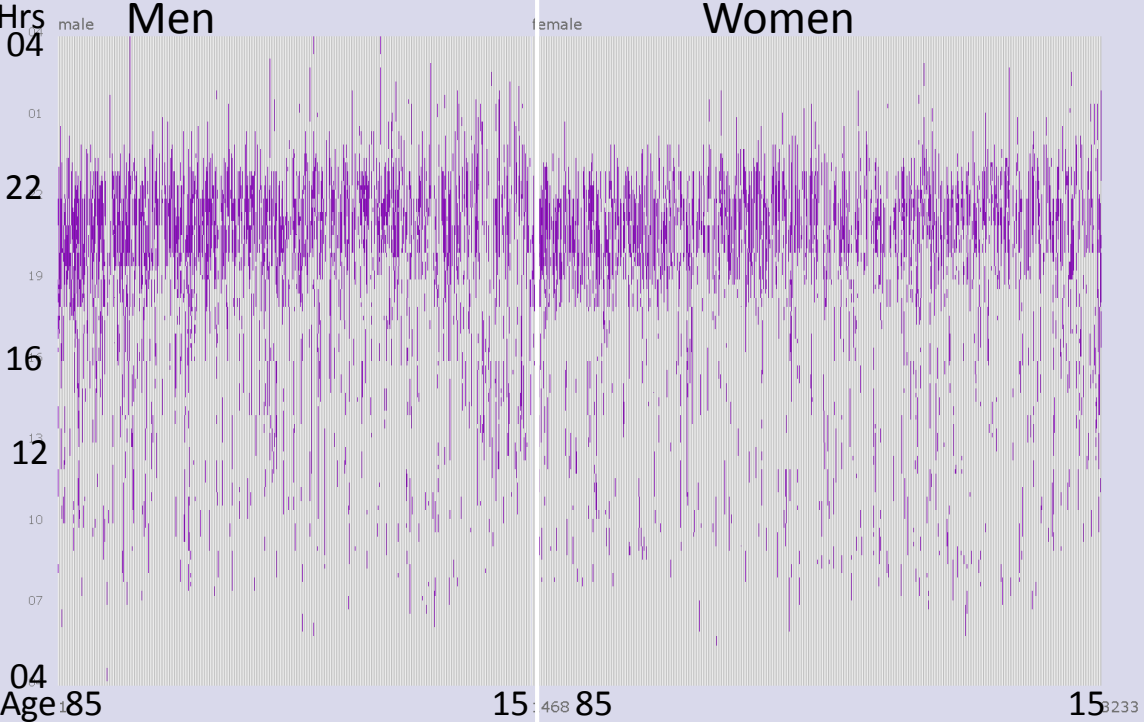
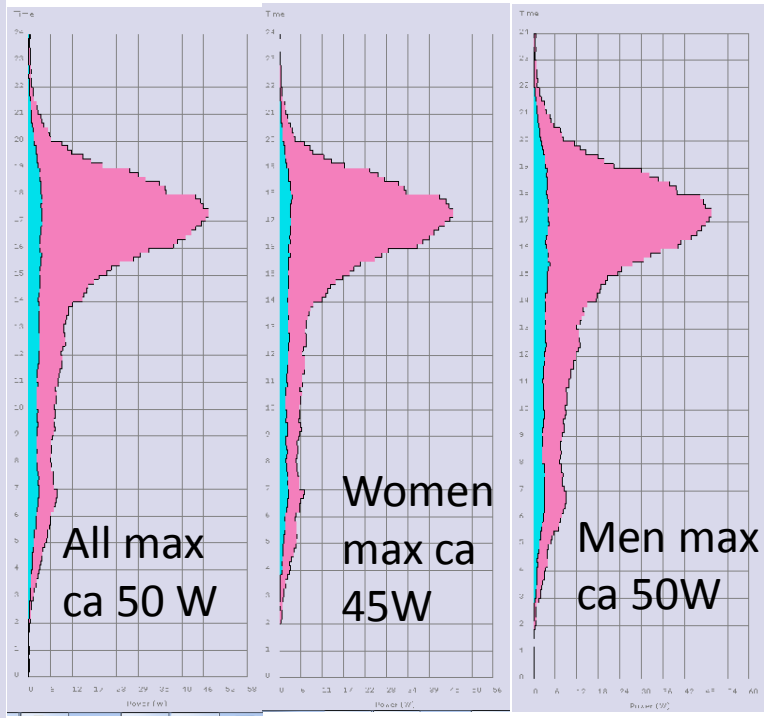




Watch TV and use computer, weekdays
Electricity use W/ind, 10 min





Watch TV and use computer, weekend days
Electricity use W/ind, 10 min

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TV and computer use

- Women and men watch TV mainly in the evening on weekdays
- Electricity use for this purpose is evenly distributed among women and men
- Old people use much time at home for TV-activities, esp on weekend days
- Men use more electricity for computer activities than women
- Computer activites are much more evenly spread over the day than watching TV activities

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Reflections

- The timing of activities in peoples' projects and their committments with other people constrain their opportunities to move activities from one time to another. Coupling constraints are decisive
- Then, the scheduing of day care and schools – related to basic household projects – influence the timing of electricity consuming activities in the home
- The scheduling of work influence when electricity consuming activities are performed – less electricity is used when people are not in the home
- The rhythm meals in the course of the day influence the timing of cooking – especially cooking for breakfast and evening meal
- The part of the day spent away from the home per individual (about 35%) might differ from when the home is empty if there are more than 1 household member
- The externally defined timing of basic activities constrain people from moving activities from one point in time to another
- **If housing companies learn about the timing of daily activities they might do better plans for renovation and construction of new homes since they can adjust and dimension the investments in technologies to the needs of people when they are at home.**

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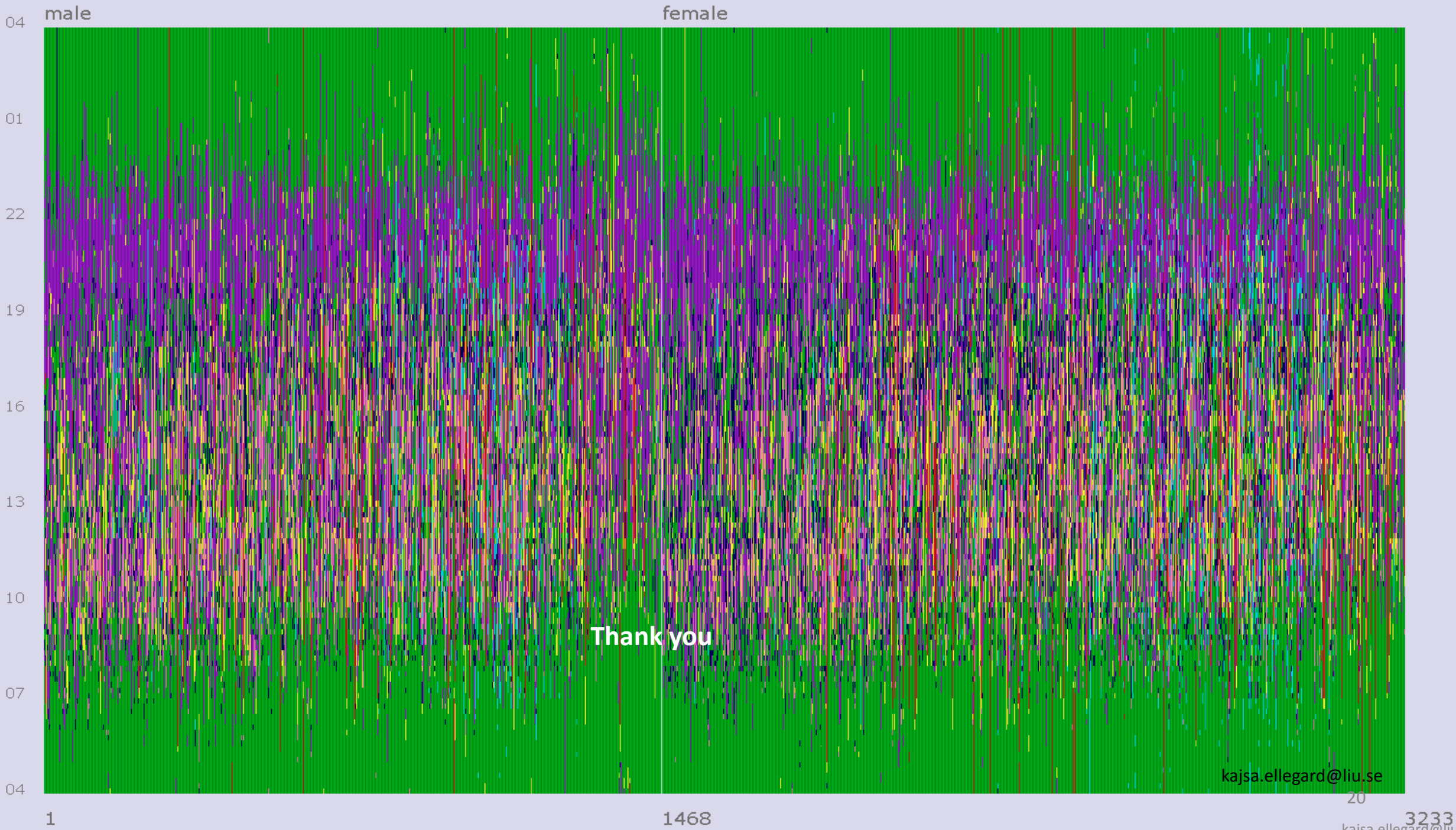

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