

# Energy Efficient Behavior Interventions on a Smart Apartment Residents

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# 1.E-sogo Smart Apartment Project?



the south view



the north view



- ▶ E-sogo project: Zero Energy House in Apartment type
- ▶ Total floor spece:36,000sft
- ▶ Room: 24 Living units, about 800sft/room

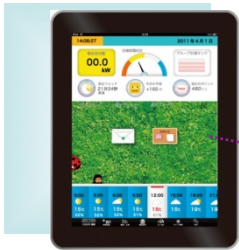


# E-sogo main facilities and passive design

## ▼ PV system



## ▼ HEMS



## ▼ windows for aeration



## ▼ surrounded green



## ▼ Solar heat system

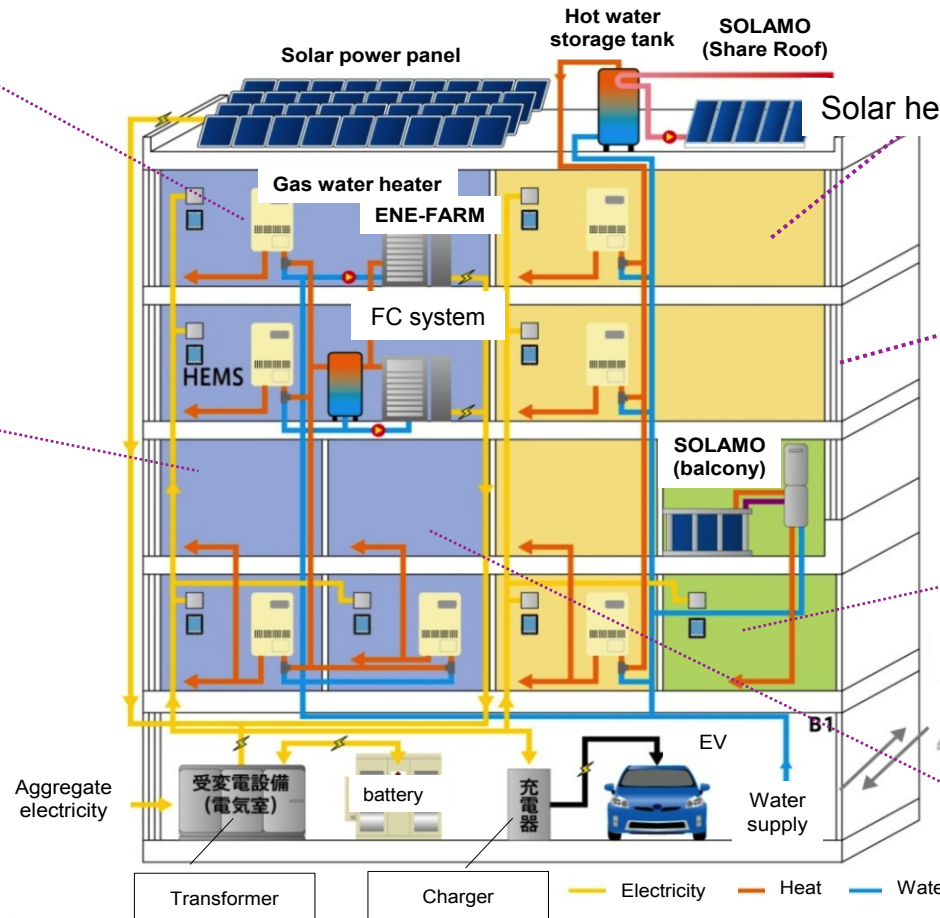


## ▼ highest level of thermal envelope

## ▼ Solar heat system



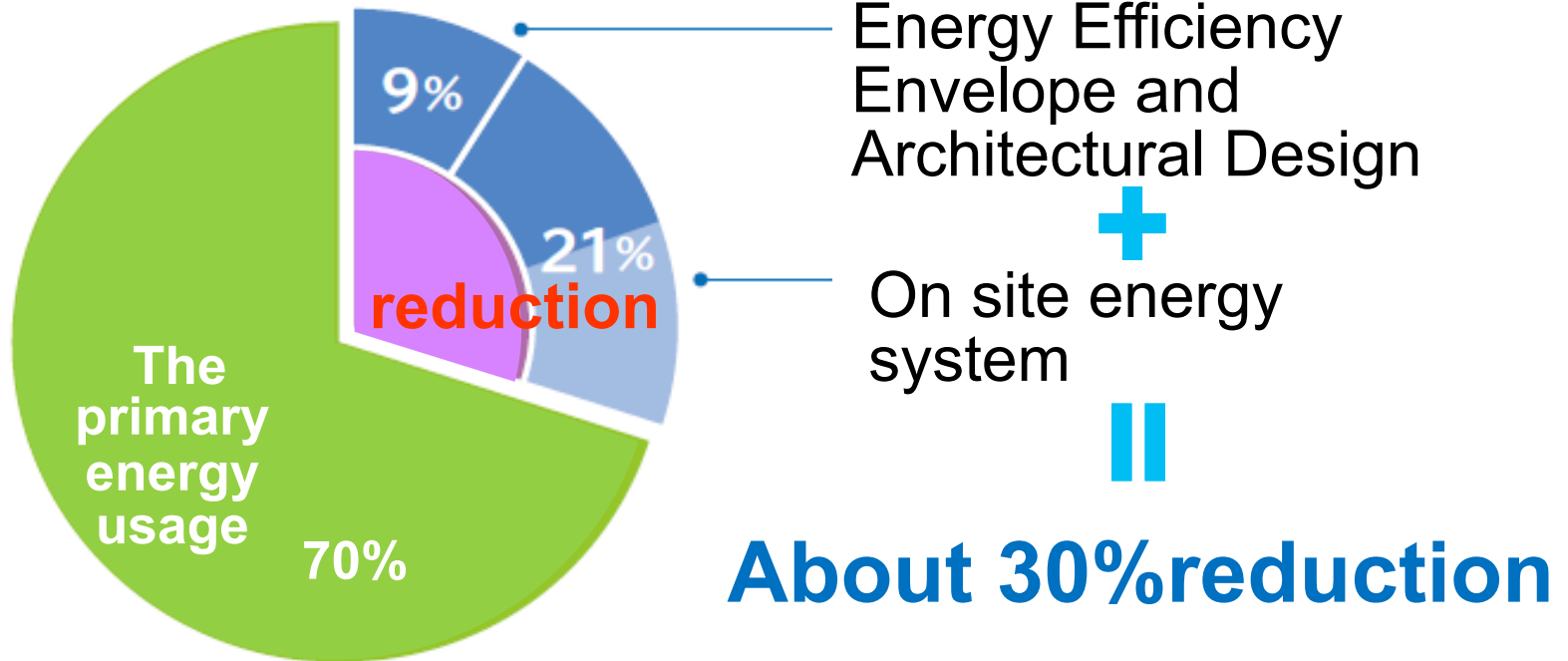
## ▼ FC system



CEMS

## 2. How much primary energy reduction was achieved?

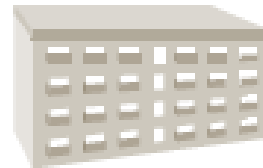
The result of the first study(2012)



Comparison



E-sogo apartment



Equivalent Size apartment with a conventional design and system

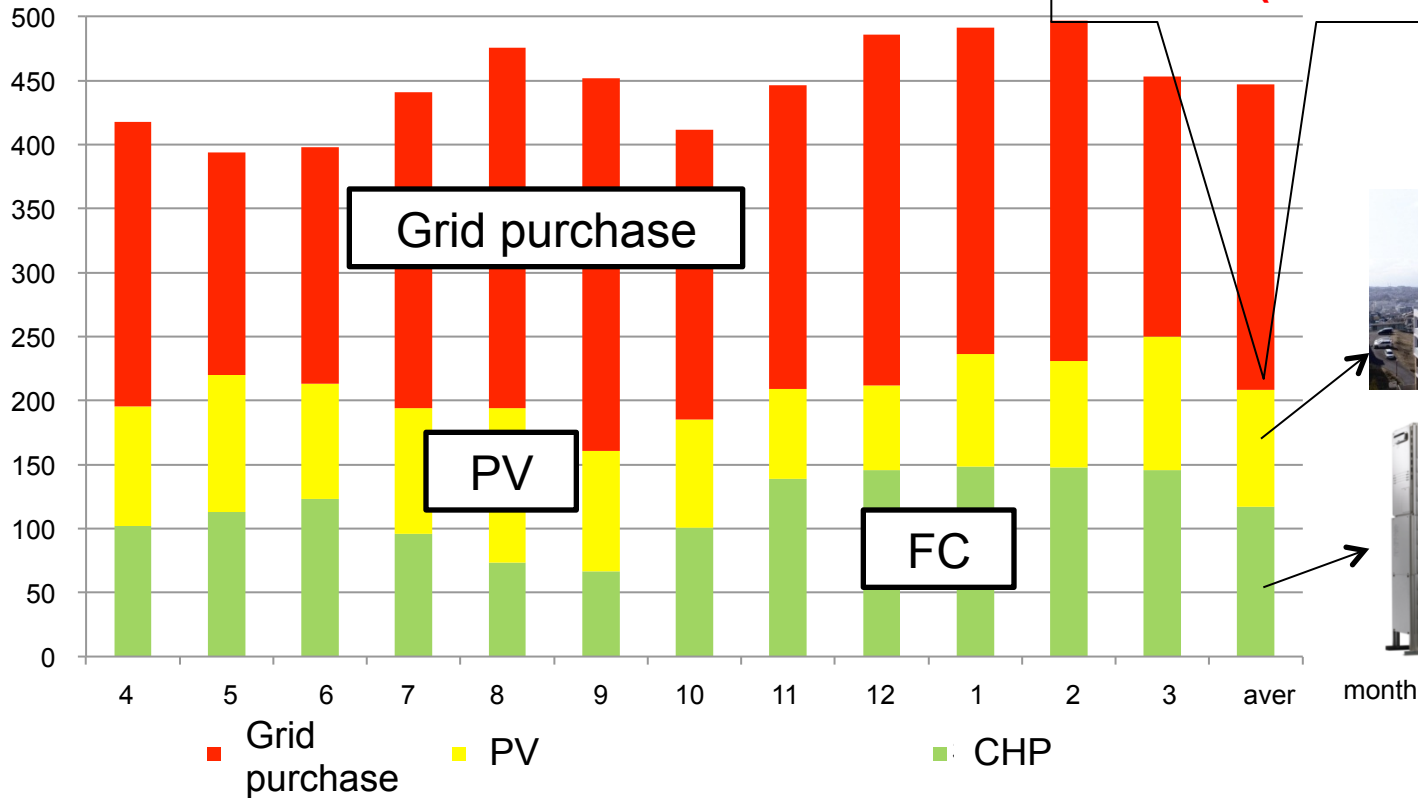
# The breakdown of electricity demand

## ◆ Electricity demand/supply balance in 2012

Average demand (Total Apartment)  
(kWh/Day)



The power Dependency is 48% (kWh/day)



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### 3. How can we achieve more energy savings by IHD?

# Visualization of energy



Home screen



Energy usage history



Ranking of the least energy use



# Demand Shift Behavioral Studies with Incentives



## ➤ Peak Shift action

Incentive points are provided to residents who shift their using time from regular time to the time which have excess to on site energy supply. They can engaged that on the tablet.

## ➤ Peak Cut action

Incentive points are provided to residents who cut their energy use in the case of electricity supply tight.

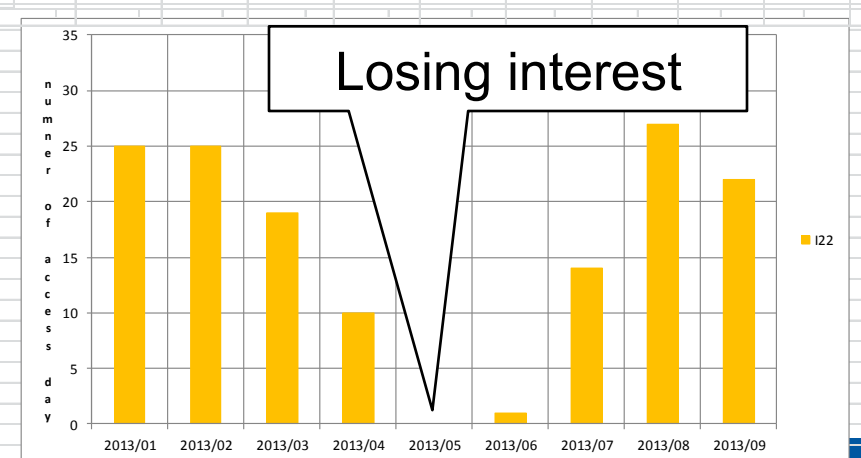
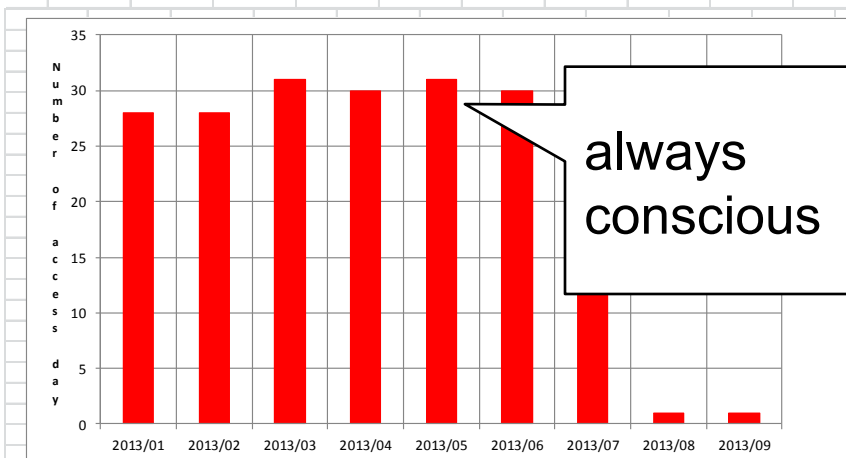
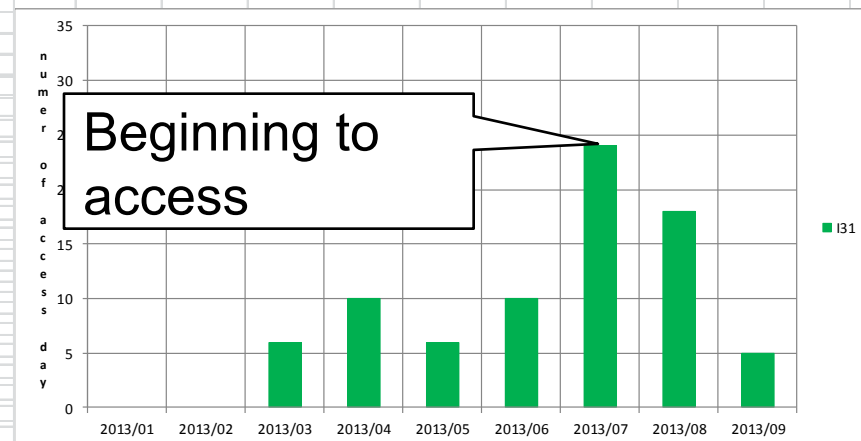
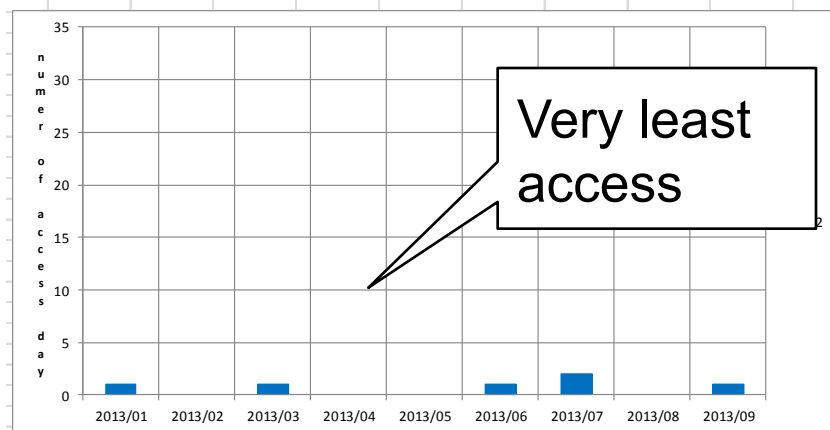
Reservation of energy-saving action

# Access log with HEMS

## ◆ Number of days with HEMS access

January: Visualization of energy service to start

July: Demand shift behavioral studies with incentives to start



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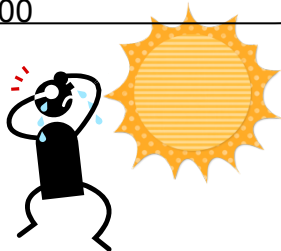
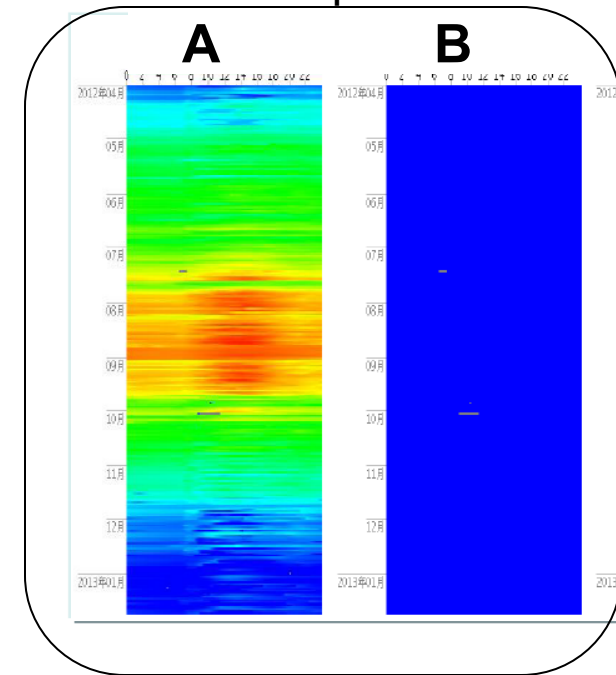
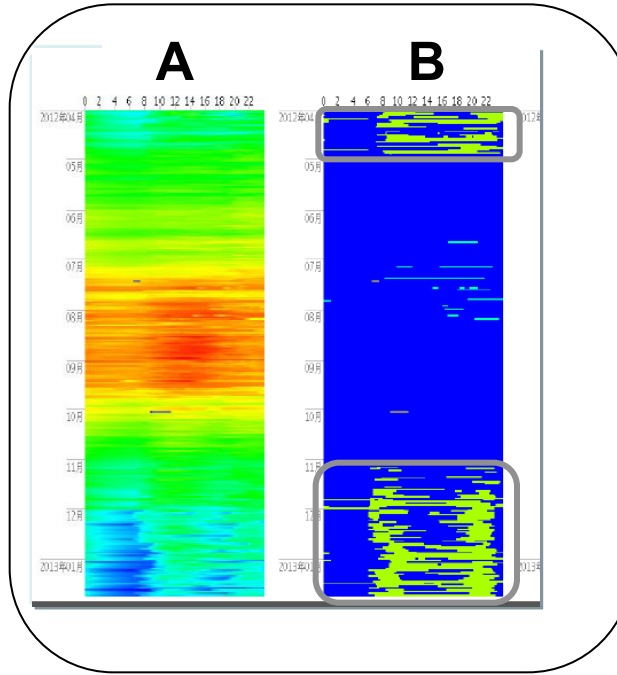
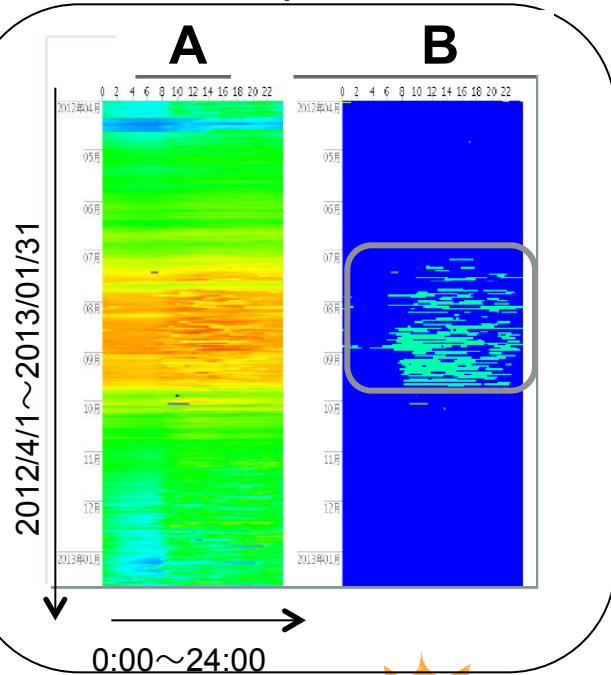
## 4. What elements effect the energy usage?

# The room temperature preferences

Sample 1

Sample 2

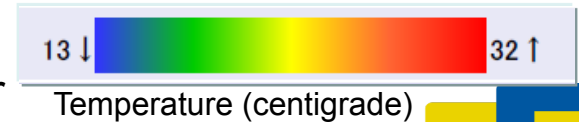
Sample 3



By courtesy of Hitachi Ltd.,  
 Graphs are based on Life Tapestry\* style  
 (\*: Hitachi Hyoron Vol.89, No.12, [http://digital.hitachihyoron.com/pdf/2007/12/2007\\_12\\_04.pdf](http://digital.hitachihyoron.com/pdf/2007/12/2007_12_04.pdf) in Japanese)

A: Room temperature of a living dining room

B: The use situation of an air-conditioner or a floor heater



# Plug loads

Electric power demand graph (average day ) 2012 Dec.3

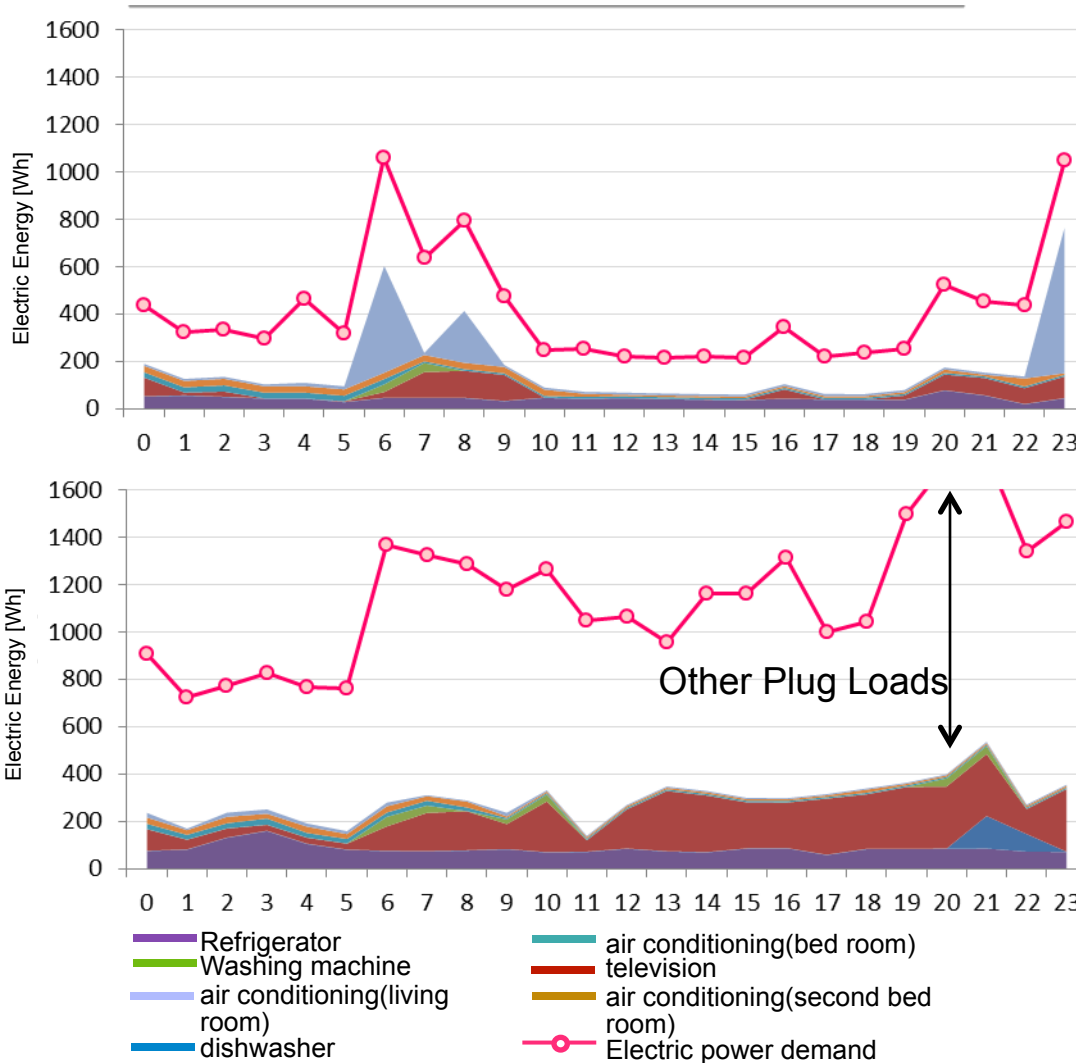
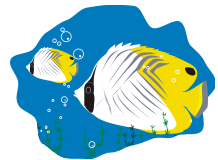
Average temperature:  
5.8 degree centigrade

Typical load curve

This family likes watching television.

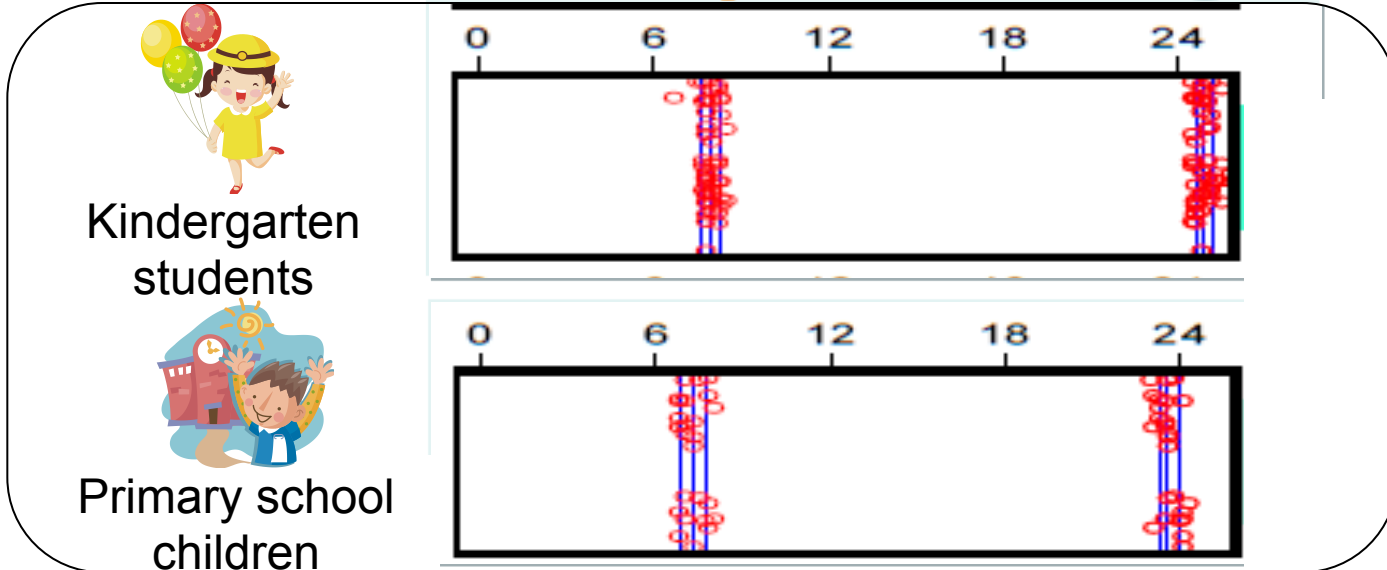


This family keeps

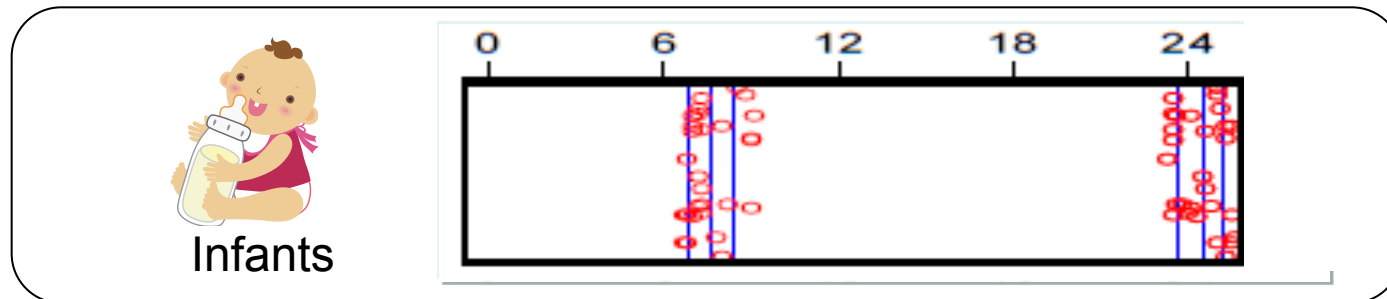


# Living schedules

◆ The schedule is constant.



◆ The schedule varies.



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# 5. Next Challenge



# What is next?

We understood some elements effect on energy usage such as the room temperature preferences, plug loads, living schedules.

We need to understand more ...

Who?



What?



How?





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Thank you for your attention!!

