STOCHASTIC MODEL FOR HOUSEHOLD LOAD PROFILE

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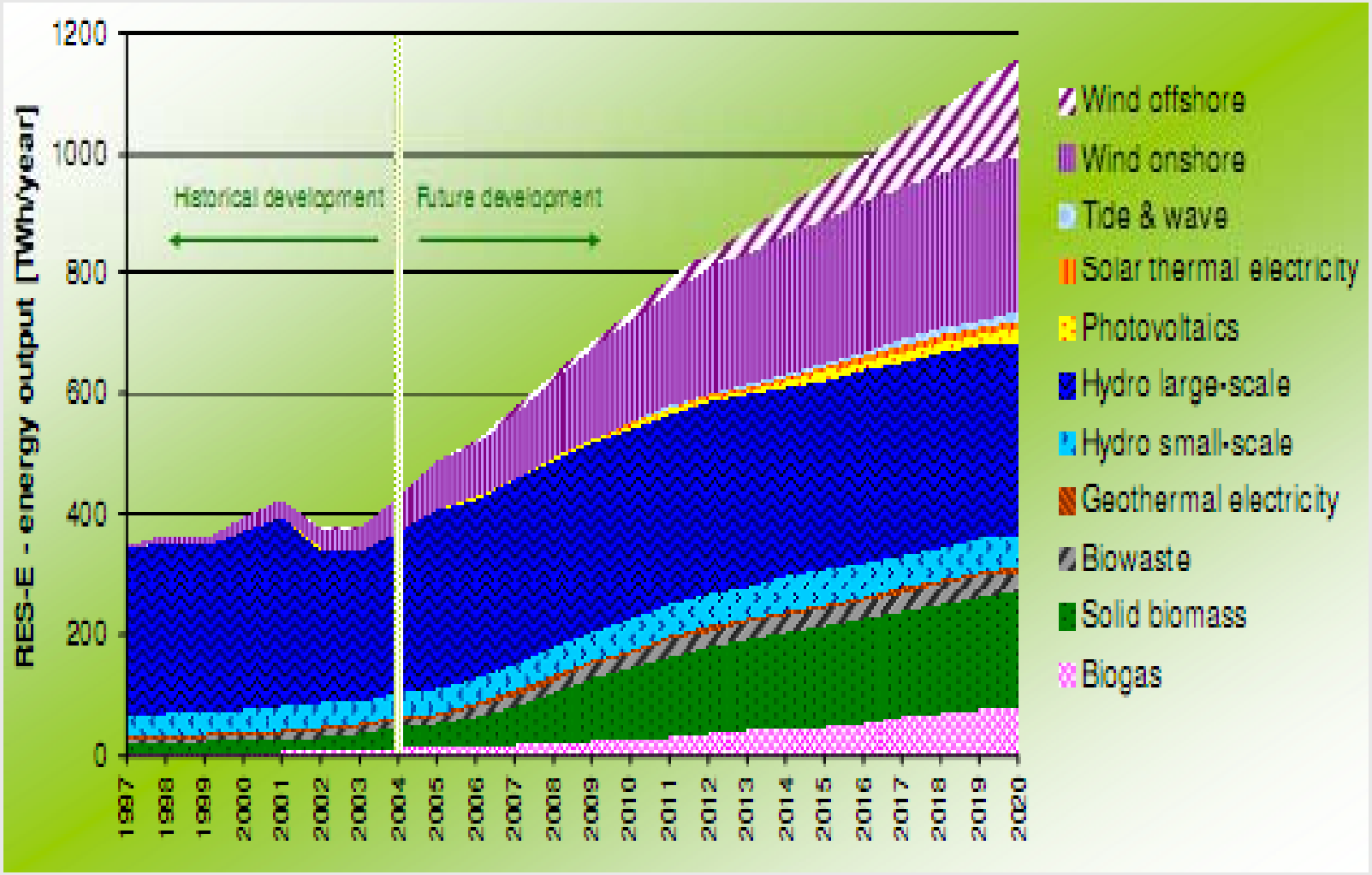
Outline

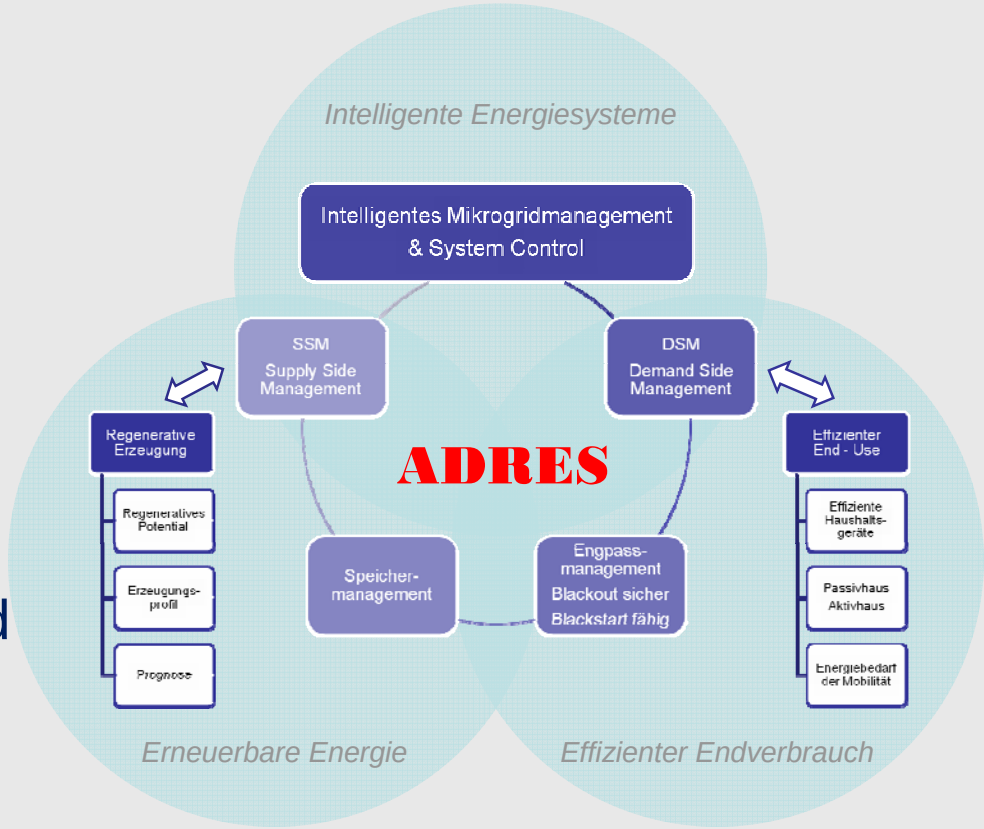
1. Motivation and Goals
2. Methology
3. Data
4. Energy Model specification
5. Results
6. Conclusion



Green-X balanced scenario-EEG-TUWien

- ADRES
  - Autonomous
  - Decentralized
  - Regenerative
  - Energy
  - System

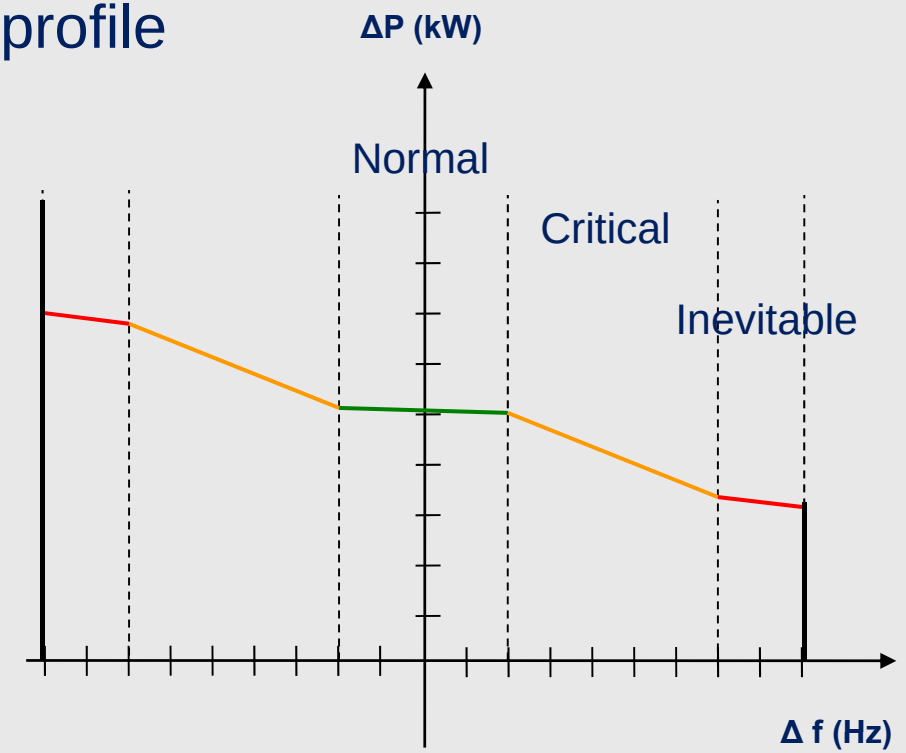
  Smart infarstructure
    - intelligent microgrid
    - Supply-side
    - Demand-side
    - Storage
    - intelligent real time control



- End-use management
  - Load follows generation
  - Flexible and dynamic load profile

What we need???

  - Load profile component



Normalized load droop curve

2- Methodology

- Traditional load profile
  - Prognostigating the total load consumption
- Principle
  - Electricity need is derived from customer‘s demand
- ADRES load profile
  - bottom-up Algorithm
  - Detailed load profile is needed
  - Individual load profile for each household
  - Total load profile obtained from sum of individual load profile
- Requirement
  - User behavior information
  - Distribution of household appliances

Lead to individual household load profile

- Electrical devices mixture
- Switching probablity of each device
- Considering different family type

Total load profile of settlement

- Sum of all individual household load profile

3- Data

- Survey
- Measurement

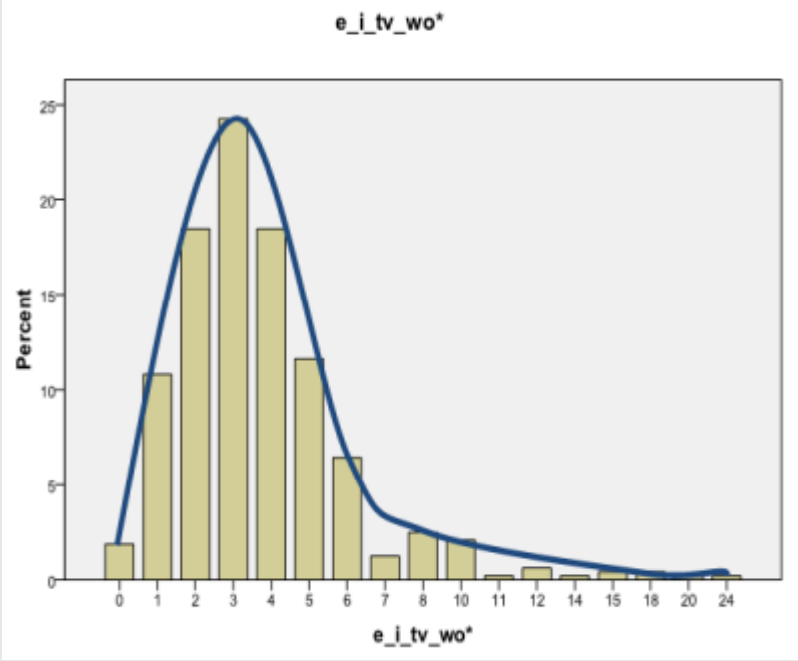
- **Survey**
  - Household demographic
  - Building surface area and location
  - Number and age of household appliances
  - Usage duration of white goods
  - Regularity of using household devices

Family type according to occupancy function

Family type	Job	%
single	full time	5
	part time	1
	Retired	8
Couple	full time	8
	part time	0
	Retired	30
family	2 full time + children without retired member	12
	1 full time +children	24
	family with retired member	11

Household appliances category

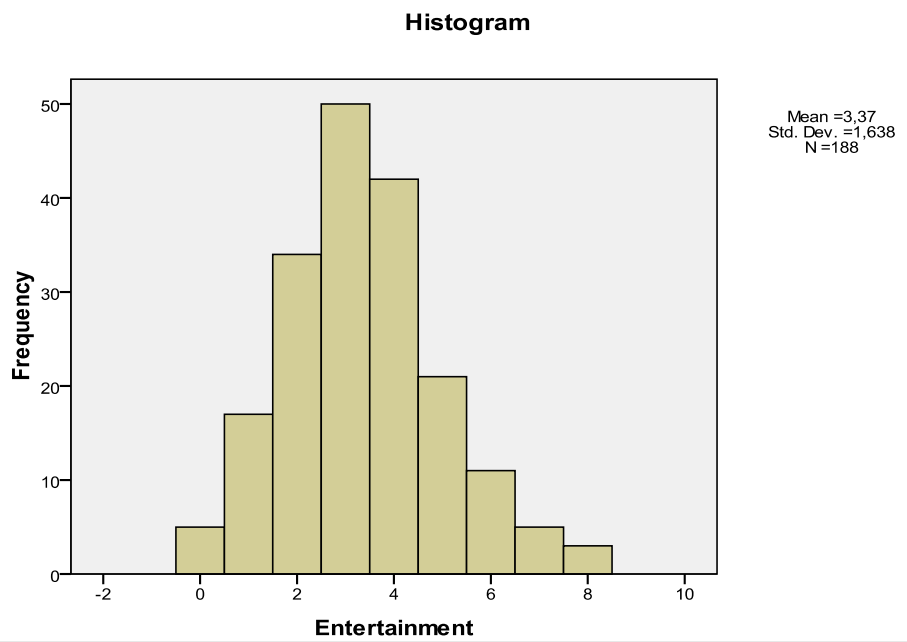
Entertainment	Communication	Office	Kitchen	Others
Beamer	Answering	PC	Coffee machine	Vacuum
Sat/DVB	Coreless Tel.	Laptop	Water boiler	Iron
Recorder		Fax	Toaster	Sew machine
DVD player		Scanner	Grill	Heating
Play station		Printer	Mixer	Moisture
HiFi		Hardware		Hair dryer
				Toothbrush



Probability function of TV operation hours in single family type

Household devices category

- Entertainment
- Communication
- Office
- Kitchen
- Others



3- Data

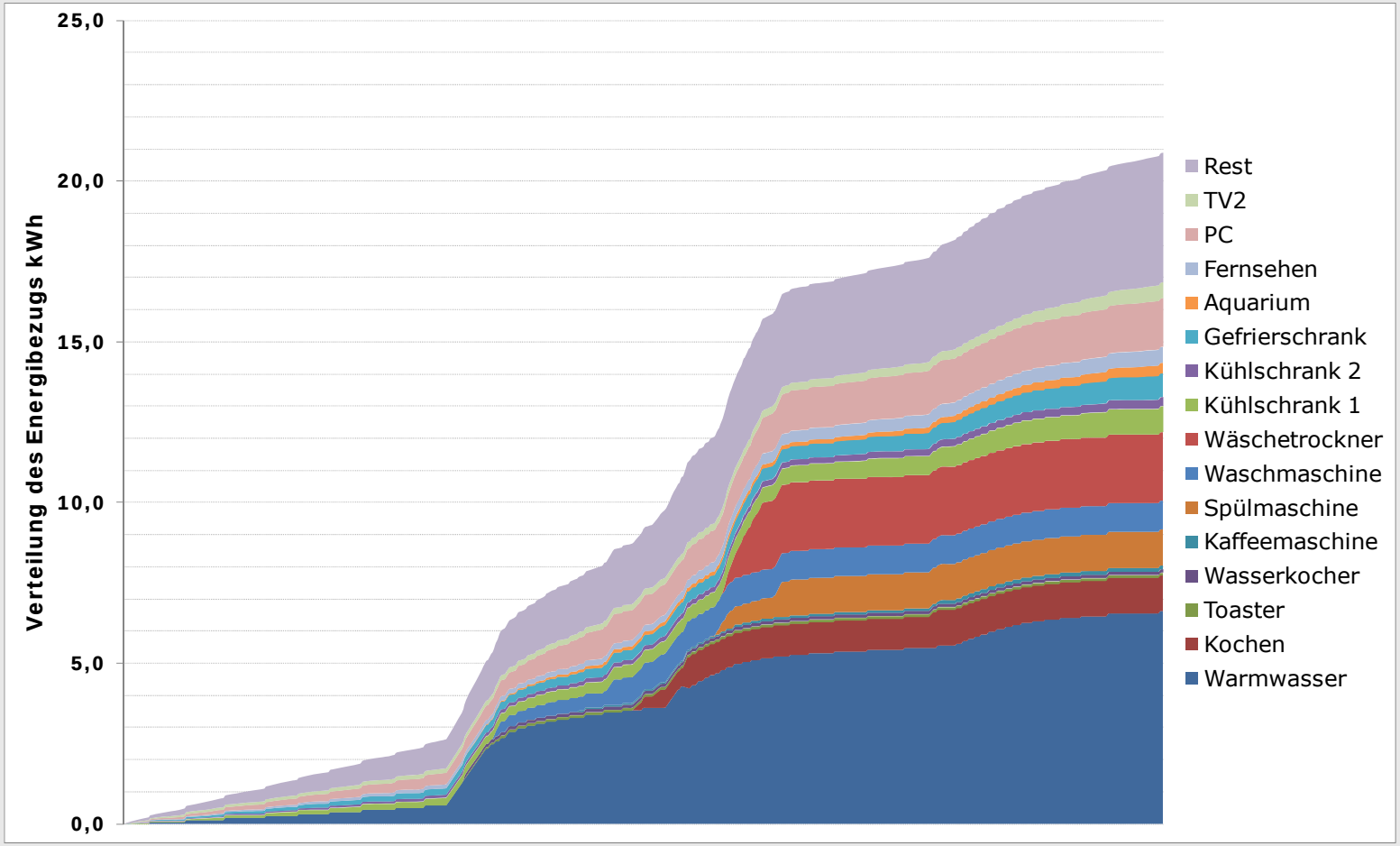
- Survey
- Measurement
- **Measurement**
  - 15 min. Total consumption for one year

  Goal : season effect, occupancy function
  - Second base using „energiemessensor“ room automation Möller
    - 40 household
    - 10 individual measuring sensor for each household
    - 10 day in winter and summer

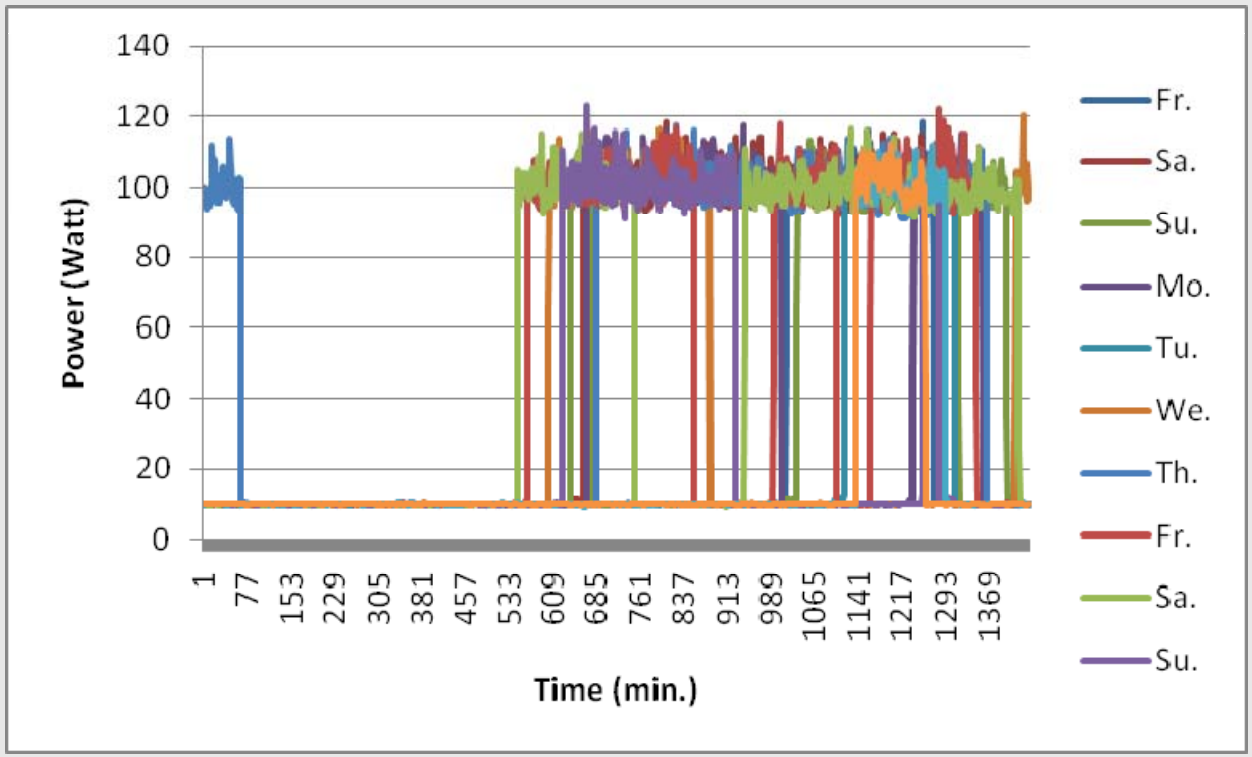
    Goal

    probability function of using individual appliances

Load duration curve for sample household



Operational hours of TV in sample household



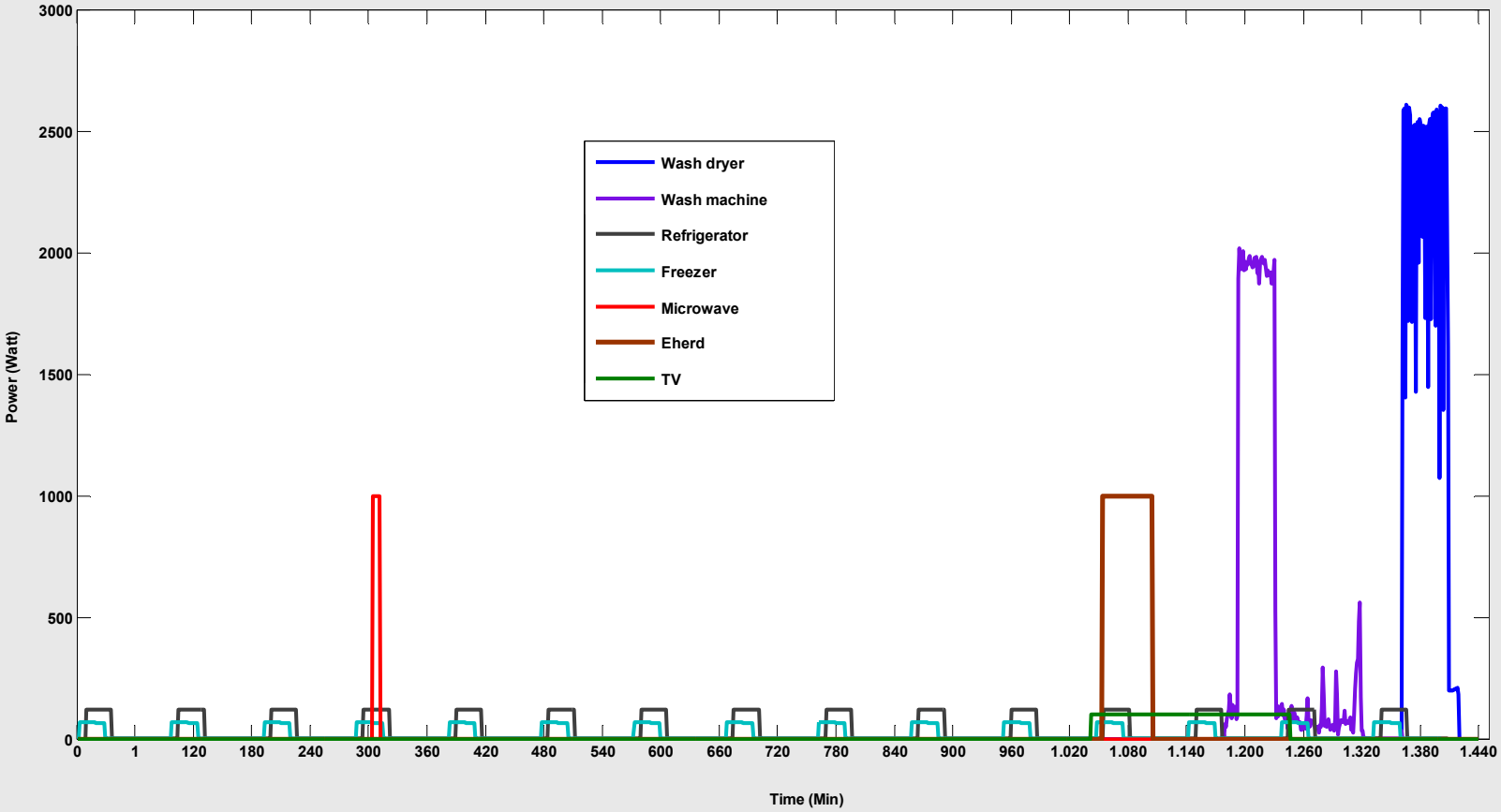
4- Model specification

- End-use bottom-up energy model using Matlab

Problems :

- Lack of data
- Incomplete measurement
- Without considering the season effect and day type

5- Result



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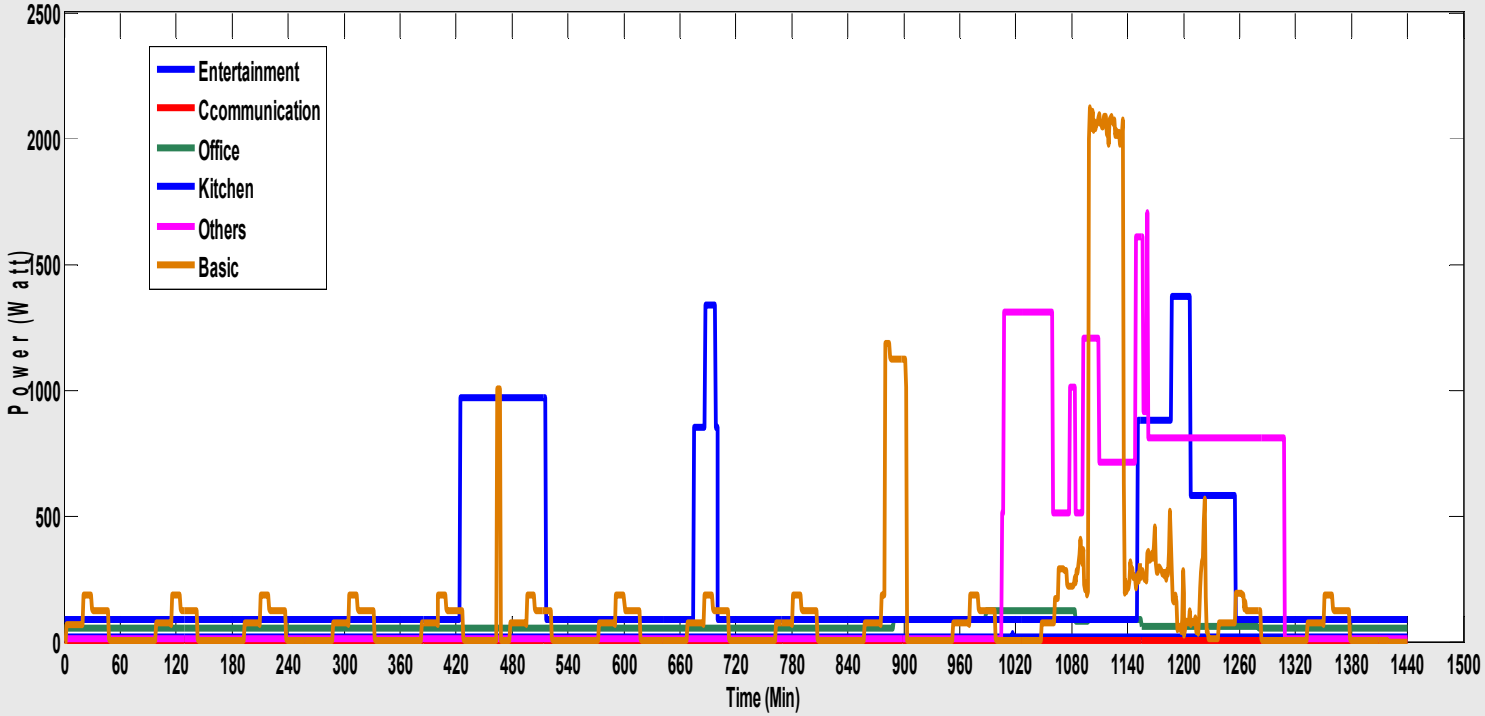

Entertainment
Ccommunication
Office
Kitchen
Others
Basic
Power (Watt)
Time (Min)
0
500
1000
1500
2000
2500
0 60 120 180 240 300 360 420 480 540 600 660 720 780 840 900 960 1020 1080 1140 1200 1260 1320 1380 1440 1500

Pros and cons

- ✓ Assessing the load profile with efficient new technology appliances
- ✓ Studynig the energy saving potential of necessary load dropping
- ✓ Studying the effect of user behavior on load profile
- ✓ Simulation of energy balance in ADRES

- ✓ Lots of detail data is required

6- Conclusion

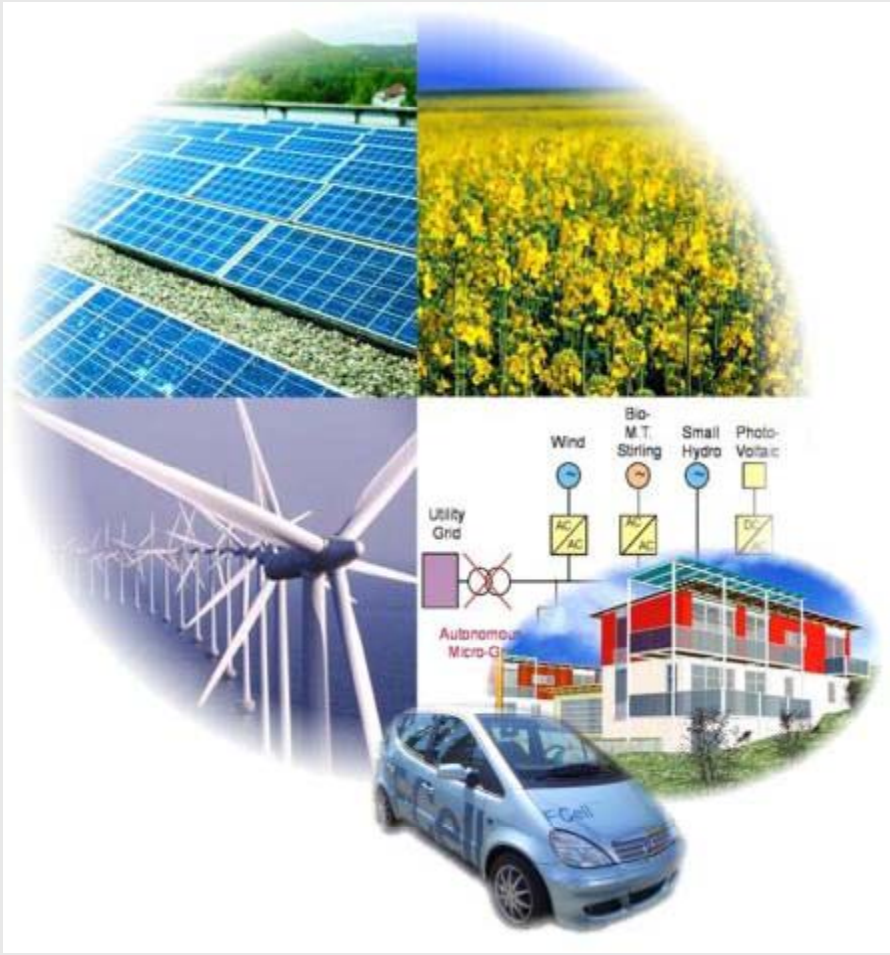
- Future power system needs new infrastructure
- Smart grid, smart meters and smart appliances
- Individual household load profile modling is more essential compare with traditional model
- ADRES will demonstrate an intelligent settelment assuming having new structure

Forschungsprogramm

ENERGIE DER ZUKUNFT

Gefördrt aus Mitteln des Klima- und Energiefonds

Verantwortliche Ministerien



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Thank for your attention

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