Source: Bedenik and Hecher, 2012

The energy transition: An integrative analysis

Assignement

Modelling domestic load flexibility

06.5.2020

Goals

1. You are asked to develop your own model for assessing the potential of residential Demand side Management programs.

2. Through the exercise, you will
   a. Understand the challenges related to load and flexibility modeling
   b. Use your creativity to design your heuristics for modeling load flexibility
   c. Understand the importance of survey design for calibrating your model
   d. Assess the potential impact of Demand Side Management programs at residential level

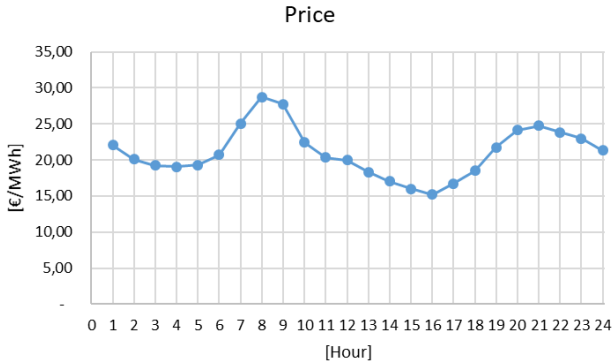
Instructions

1. Select a domestic device of your interest from the following list: dish washer, washing machine or electric vehicle[1].
2. Develop a survey and collect at least 10 responses to complete the following tasks:
   a. Model the daily load curve of the selected device for two representative days: weekday and weekend.
   c. Develop your heuristic model of flexibility. Try to model users' inconvenience caused by load rescheduling. Here some potential approaches:
      - Set a maximum delay or anticipation time for which users could accept the load shift.
      - Remuneration system - put a price on delay or anticipation time
      - Mix the two previous options
      - Include other variables other than just delay or anticipation time
   d. Calibrate your heuristic model of flexibility based on the results of your survey.

1. modelling electric vehicles is more challenging with respect to washing machines and dish washers.

Instructions

3. Once the model is calibrate, evaluate the yearly potential economic saving for a single households based on the following electricity price curve. Assume it is constant over the entire year.



Hours	(hour)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Price	(€/MWh)	22,03	20,12	19,22	19,04	19,32	20,73	25,05	28,71	27,78	22,44	20,34	19,95	18,30	17,02	16,02	15,18	16,74	18,53	21,75	24,14	24,74	23,84	22,99

4. Try to assess what could be the impact at national level. Explain the assumptions behind your reasoning.

https://www.epexspot.com/en/market-data?market_area=CH&trading_date=2020-05-05&delivery_date=2020-05-06&underlying_year=&modality=Auction&sub_modality=DayAhead&product=60&data_mode=table&period=

Instructions

5. Comment the challenges you faced and the results you have obtained. Are they in line with your expectations?

Deliverables:

- a word/pdf document with the description of the methodology used for point 2 and the answer to points 3,4 and 5. Please include also the survey you developed.
- Optional: the excel or the script used for your model

You can use excel, Matlab, Python or any other programming tool for developing your model.

Try to use your creativity both for developing your heuristic and collecting the data for its calibration.

Pay particular attention to the assumptions behind your model.

Logistic and deadlines

1. In case of questions, contact Matteo by email. matteo.barsanti@epfl.ch

2. Deadline to submit assignment: 19.05.2020, 6pm - send by email to: Claudia.binder@epfl.ch, matteo.barsanti@epfl.ch