BUILDING A LOCAL ENERGY COMMUNITY

STORY

THINK-E

LOCAL ENERGY COMMUNITIES

Renewable energy directive

Energy market directive

ELECTRICITY TARRIF

Cost reflective

Dump

ELECTRICITY TARRIF

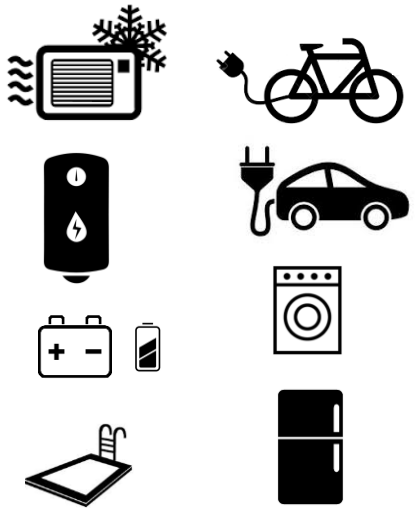
Cost reflective

Dump

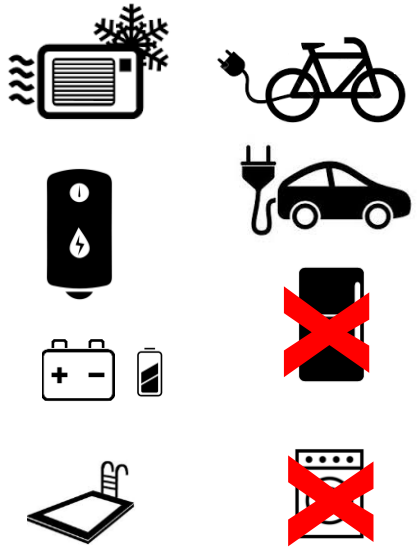
- Energy component
- Distribution components
  - Grid costs
  - Meter rent
  - Subsidies rational energy use
  - Costs related to energy poverty
  - Maintenance for public lighting
  - Obligation to buy up green certificates
  - Reduction of regularly deficit
  - Public contributions CHP
  - Charges and levies
- Transmission components
  - Maintenance and operation of infrastructure
  - Operation of electric system
  - Reserve power and black start
  - Market integration
  - Offshore windturbine connection
  - Green certificates
  - Strategic reserve
  - Subsidies on CHP, RES and rational energy use
  - Contribution on masts and slots
- Federal charges
  - CREG (Commission on regulation on electricity and gas)
  - Denuclearisation
  - Kyoto
  - Protected clients (energy poverty)
  - Heating subsidy
  - Energy contribution
  - Prosumer tariff

EFFECTIVE FLEXIBILITY

Flexible



Relevant



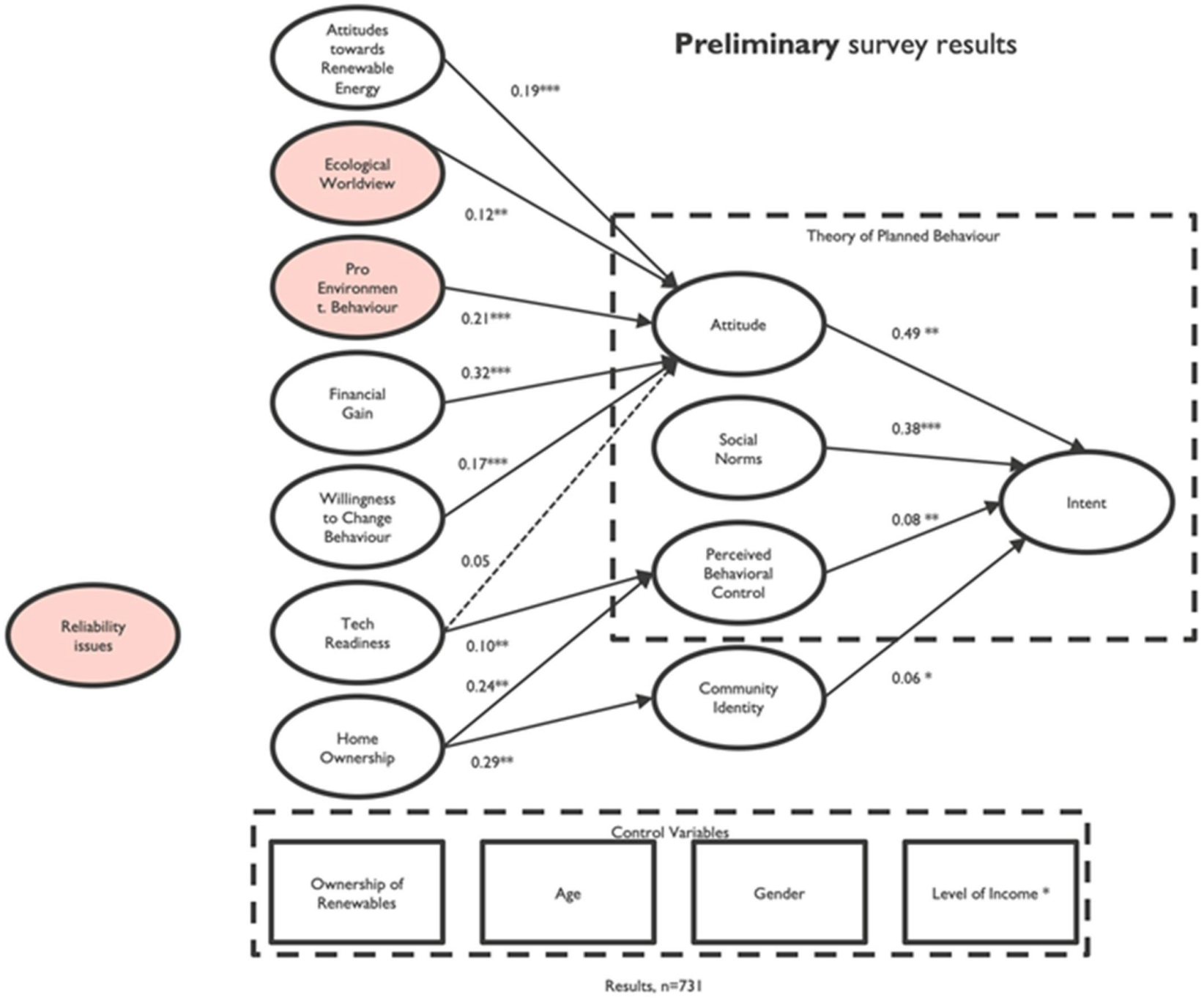
AGGREGATION

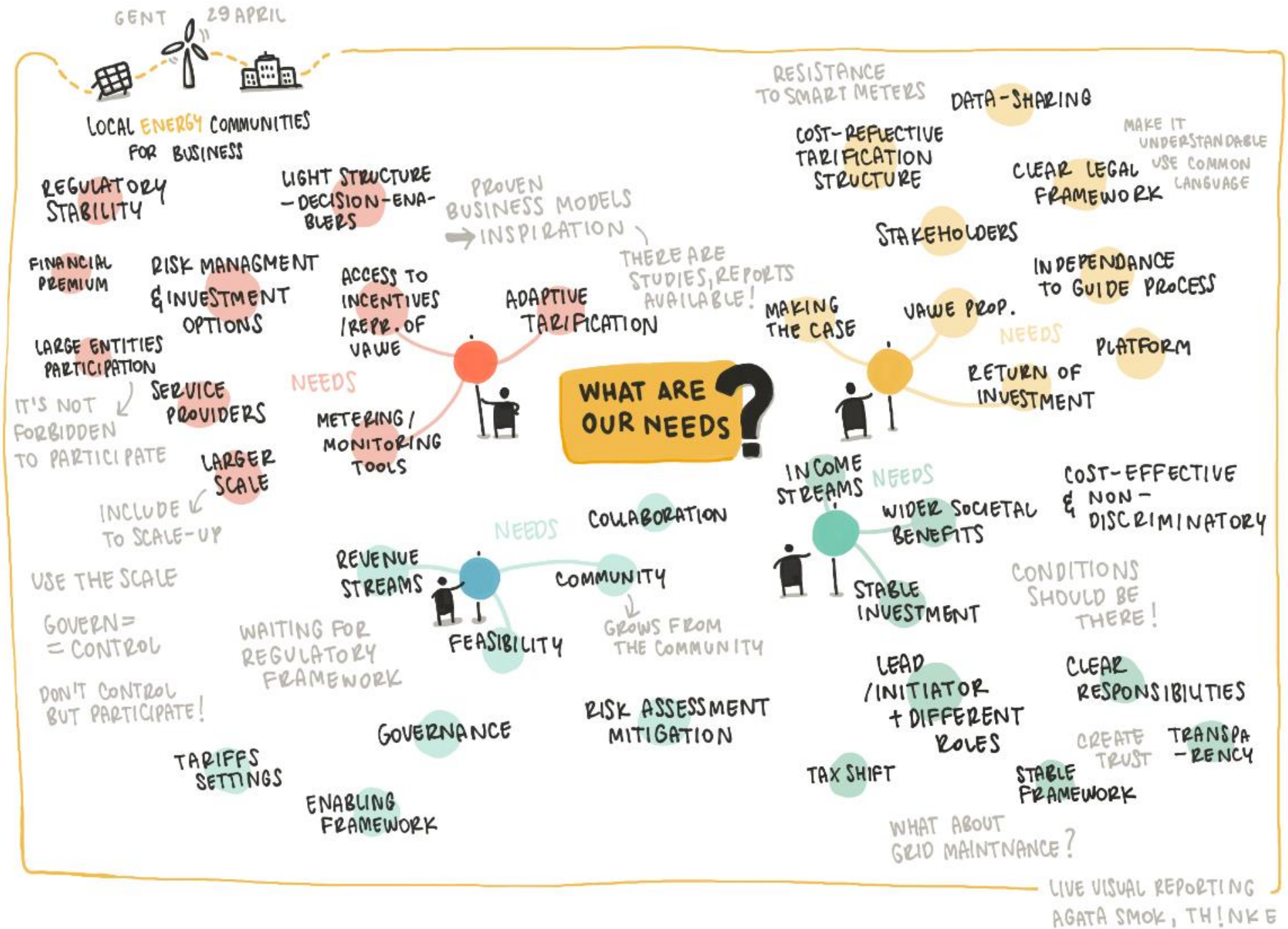
Market development

Value

DRI

Non m


Preliminary survey results
Attitudes towards Renewable Energy
Ecological Worldview
Pro Environmen t. Behaviour
Financial Gain
Willingness to Change Behaviour
Tech Readiness
Home Ownership
0.19***
0.12**
0.21***
0.32***
0.17***
0.05
0.10**
0.24**
0.29**
Theory of Planned Behaviour
Attitude
Social Norms
Perceived Behavioral Control
Community Identity
Intent
0.49 **
0.38***
0.08 **
0.06 *
Reliability issues
Control Variables
Ownership of Renewables
Age
Gender
Level of Income *
Results, n=731


GENT
29 APRIL
LOCAL ENERGY COMMUNITIES FOR BUSINESS
WHAT ARE OUR NEEDS?
NEEDS
REGULATORY STABILITY
LIGHT STRUCTURE - DECISION-ENABLERS
PROVEN BUSINESS MODELS → INSPIRATION
THERE ARE STUDIES, REPORTS AVAILABLE!
FINANCIAL PREMIUM
RISK MANAGMENT & INVESTMENT OPTIONS
ACCESS TO INCENTIVES /REPR. OF VALUE
ADAPTIVE TARIFICATION
METERING / MONITORING TOOLS
LARGE ENTITIES PARTICIPATION
IT'S NOT FORBIDDEN TO PARTICIPATE
SERVICE PROVIDERS
LARGER SCALE
INCLUDE TO SCALE-UP
USE THE SCALE
GOVERN = = CONTROL
DON'T CONTROL BUT PARTICIPATE!
TARIFFS SETTINGS
GOVERNANCE
ENABLING FRAMEWORK
RESISTANCE TO SMART METERS
DATA-SHARING
COST-REFLECTIVE TARIFICATION STRUCTURE
MAKE IT UNDERSTANDABLE
USE COMMON LANGUAGE
CLEAR LEGAL FRAMEWORK
STAKEHOLDERS
INDEPENDANCE TO GUIDE PROCESS
MAKING THE CASE
VALUE PROP.
NEEDS
PLATFORM
RETURN OF INVESTMENT
INCOME STREAMS
NEEDS
COST-EFFECTIVE & NON-DISCRIMINATORY
WIDER SOCIETAL BENEFITS
STABLE INVESTMENT
CONDITIONS SHOULD BE THERE!
NEEDS
COLLABORATION
REVENUE STREAMS
COMMUNITY
GROWS FROM THE COMMUNITY
FEASIBILITY
WAITING FOR REGULATORY FRAMEWORK
RISK ASSESSMENT MITIGATION
LEAD /INITIATOR + DIFFERENT ROLES
CLEAR RESPONSIBILITIES
CREATE TRUST
TRANSPA-RENCY
TAX SHIFT
STABLE FRAMEWORK
WHAT ABOUT GRID MAINTNANCE?
LIVE VISUAL REPORTING
AGATA SMOK, THINKE

LOCAL ENERGY COMMUNITIES

TH!NK E & OPHEMSTRAAT

THINK-E

TH!NK E

Unique Living Lab

- Battery Lab (Lead Acid/Lithium/Ni-Fe)
- Thermal Lab (VC/PVT/HP/SEASONAL/GEO)
- Electric Vehicles & Chargers (Tesla Model X – BMW i3)
- Smart Appliances

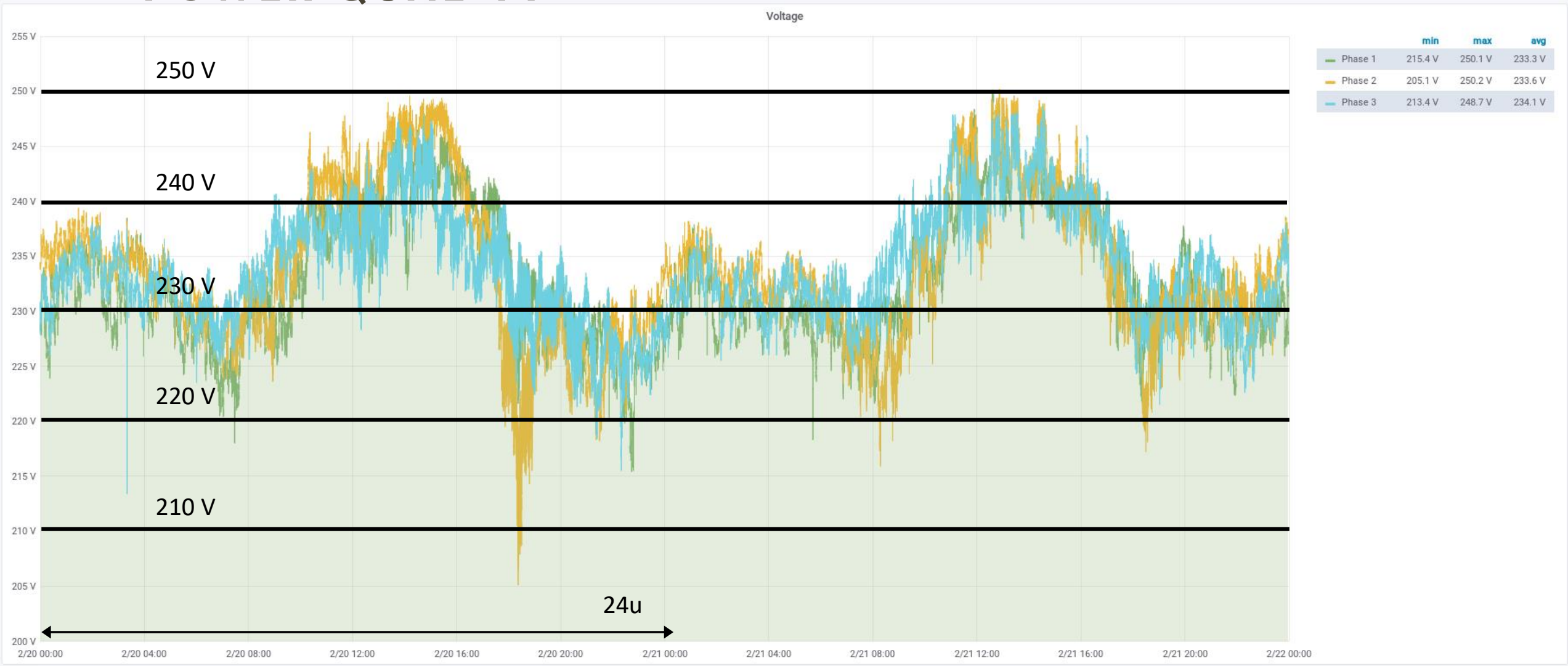





LOCAL ENERGY COMMUNITIES
LEC TRANSITION

THINK-E

POWER QUALITY



OPHEMSTRAAT – OUD-HEVERLEE

Energy Production

- Photovoltaics (Solar ~60 kW)
- Fuel Cell (Gas to Electricity 1kW)

Energy Storage

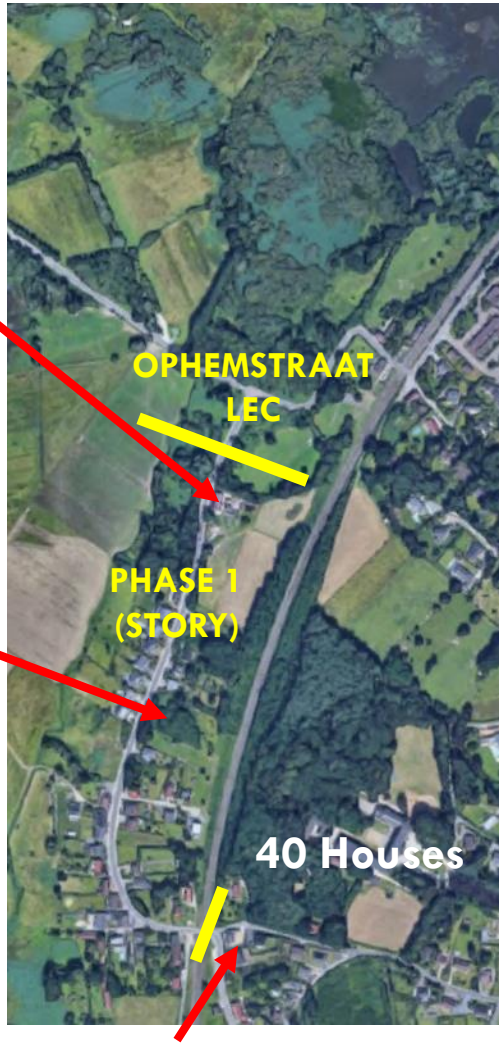
- Living Lab – Battery Lab (14kW/50kWh Li-FePO4)
- Neighborhood Battery (90kW/90kWh Lithium-Ion)

Flexible Devices

- EV's & Chargers (6 Full Electric & 1 Hybrid ~400kWh)
- Heat Pumps
- Electric boilers

LIVING LAB

NEIGHBOURHOOD BATTERY



SUBSTATION

COMMUNICATION CHALLENGES

Communication = Essential in the LEC = Coordinated Energy transfers

- New Houses = Isolation = no GSM/3G/4G/LTE inside
- WiFi doesn't penetrate the building / basement
- Frequent Internet Connection Dropouts

Pay for use of the neighbor's internet connection?

Data & Energy Cost of Data Transfer?

Load Availability (EV gone during the day)?

INTEROPERABILITY

Car does not talk to charger

ABB doesn't talk to ABB

THEORY ≠PRACTICE

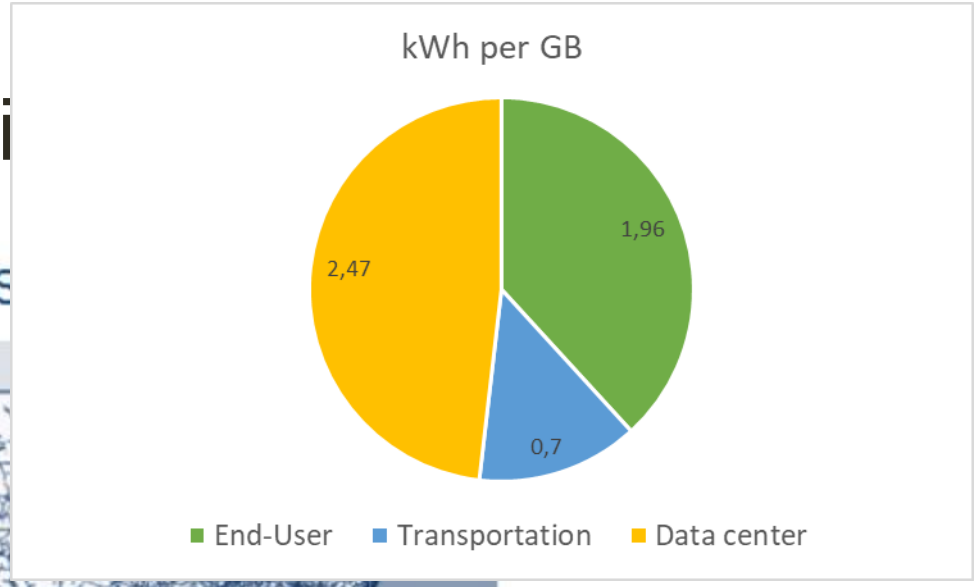
THINK-E

Model predictive control

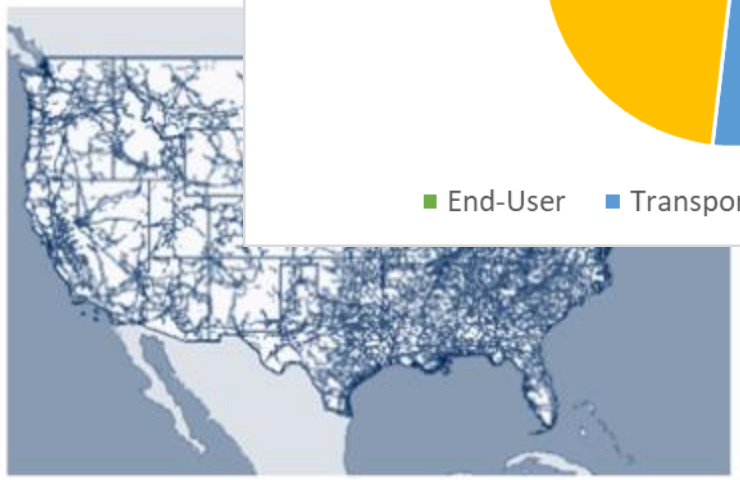
Start from simple and robust,
the rest can be done later.

SOME DATA ON DATA

- 6 MB of data per day
- MPC integration: 960 exchanges wi
  daily

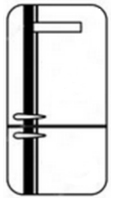


US Internet Topography



THINK-E

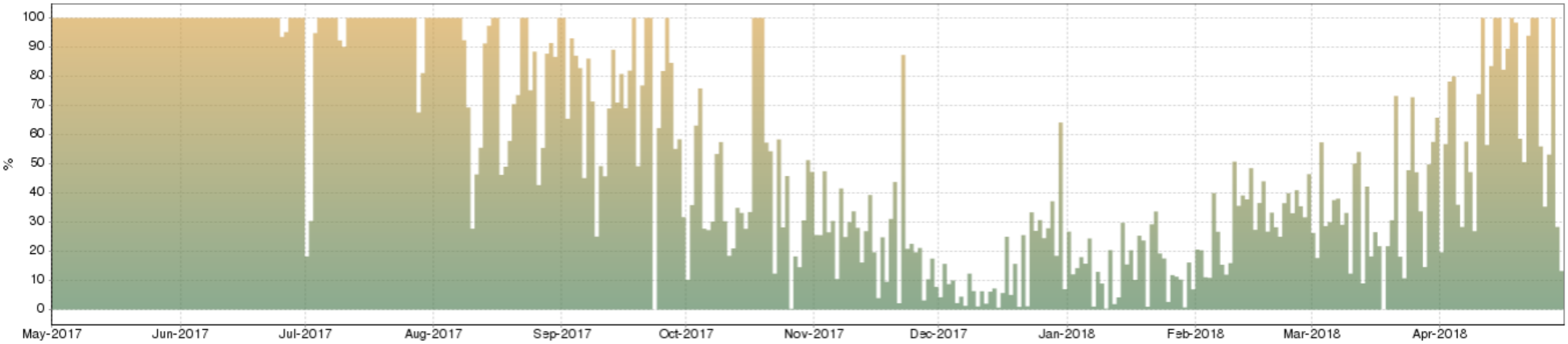
357 kWh

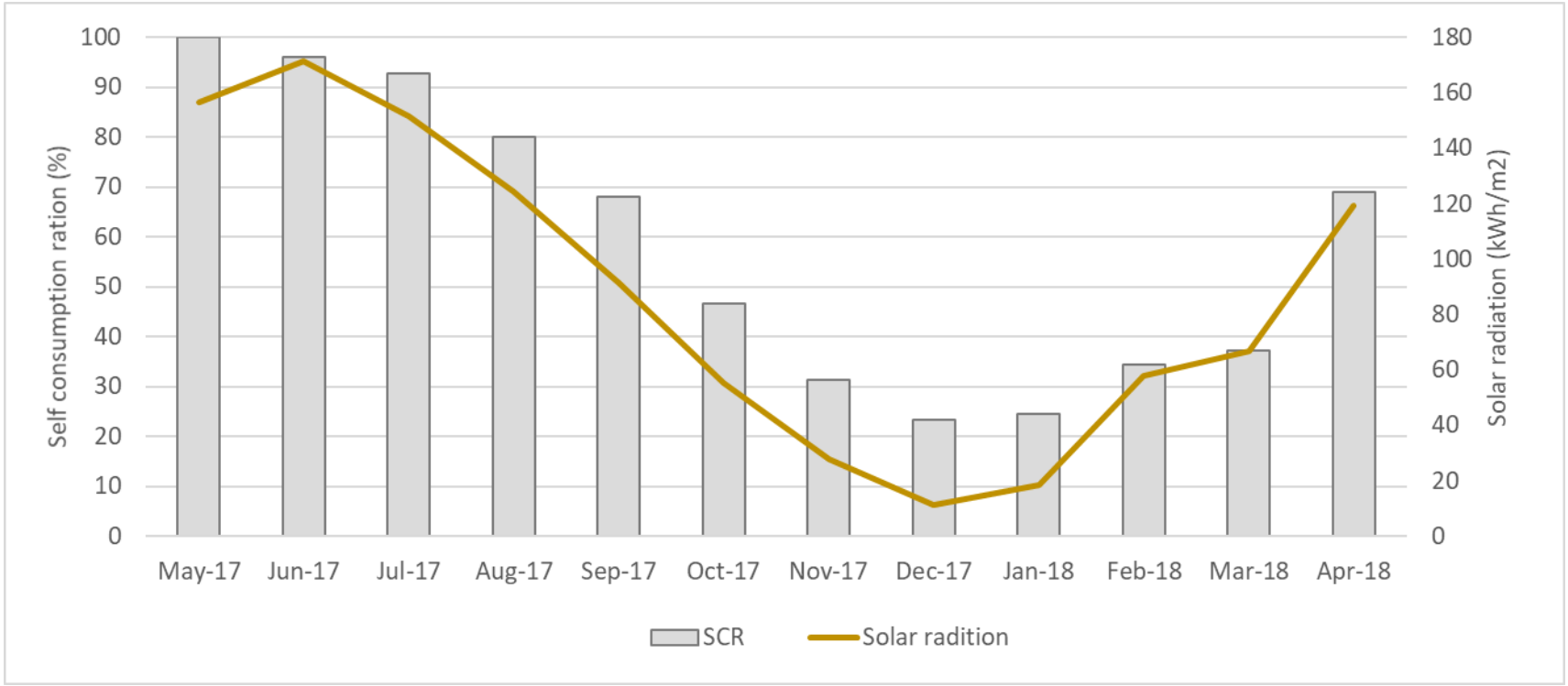


426 kWh

445 kWh

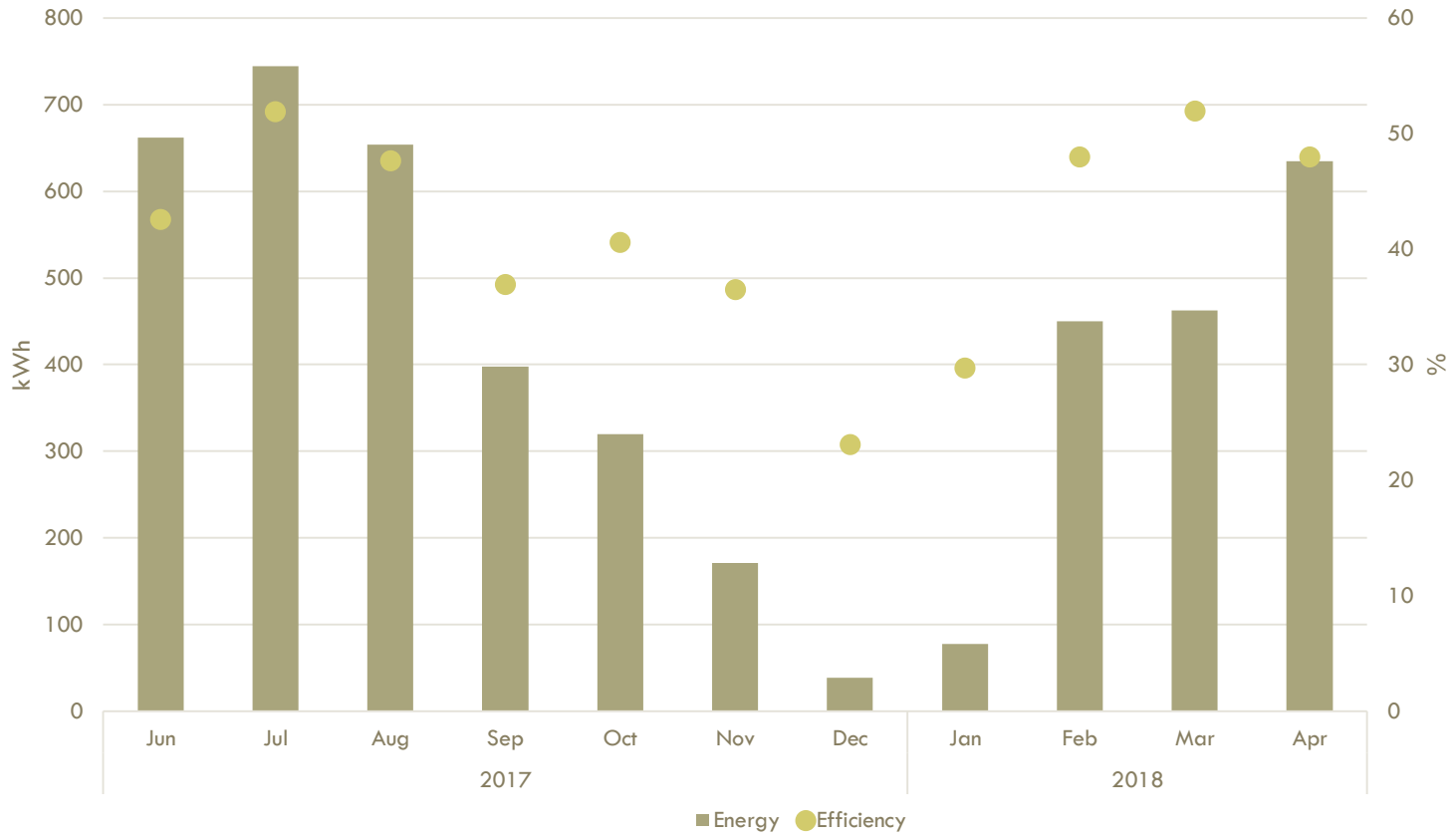
5550 kWh

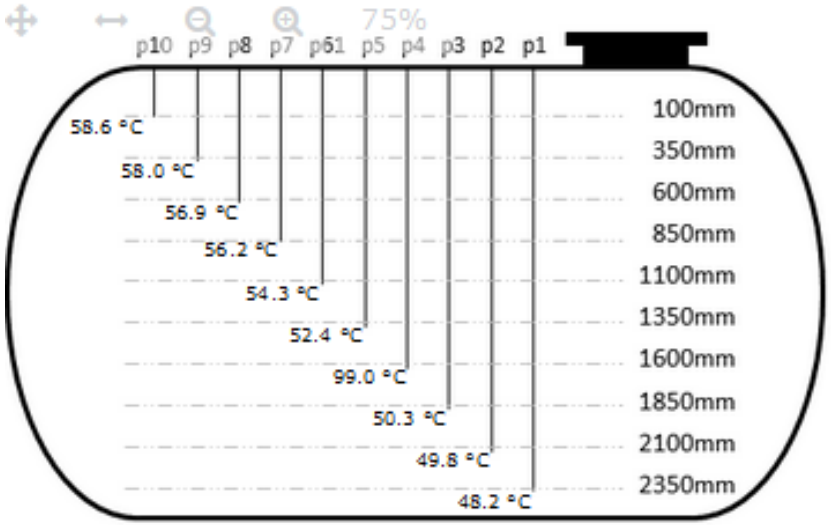

100
90
80
70
60
50
40
30
20
10
0
%
May-2017
Jun-2017
Jul-2017
Aug-2017
Sep-2017
Oct-2017
Nov-2017
Dec-2017
Jan-2018
Feb-2018
Mar-2018
Apr-2018


100
90
80
70
60
50
40
30
20
10
0
Self consumption ration (%)
180
160
140
120
100
80
60
40
20
0
Solar radiation (kWh/m2)
May-17
Jun-17
Jul-17
Aug-17
Sep-17
Oct-17
Nov-17
Dec-17
Jan-18
Feb-18
Mar-18
Apr-18
SCR
Solar radition

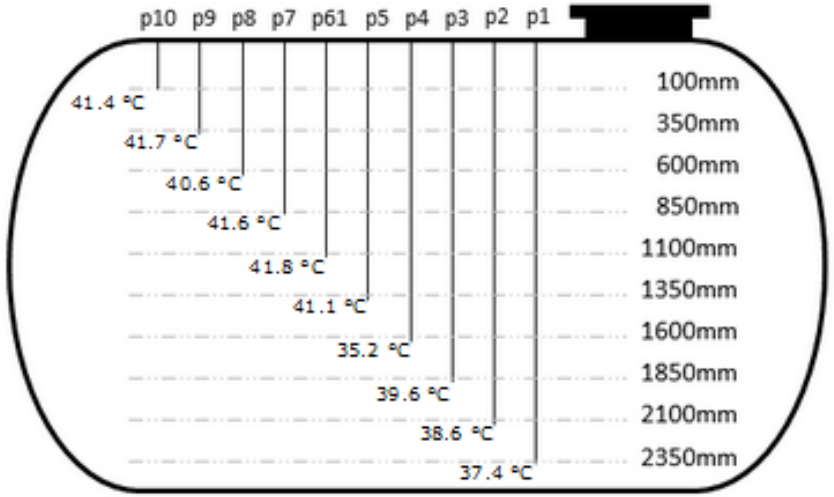
VACUUM SOLAR COLLECTORS

Energy production and efficiency

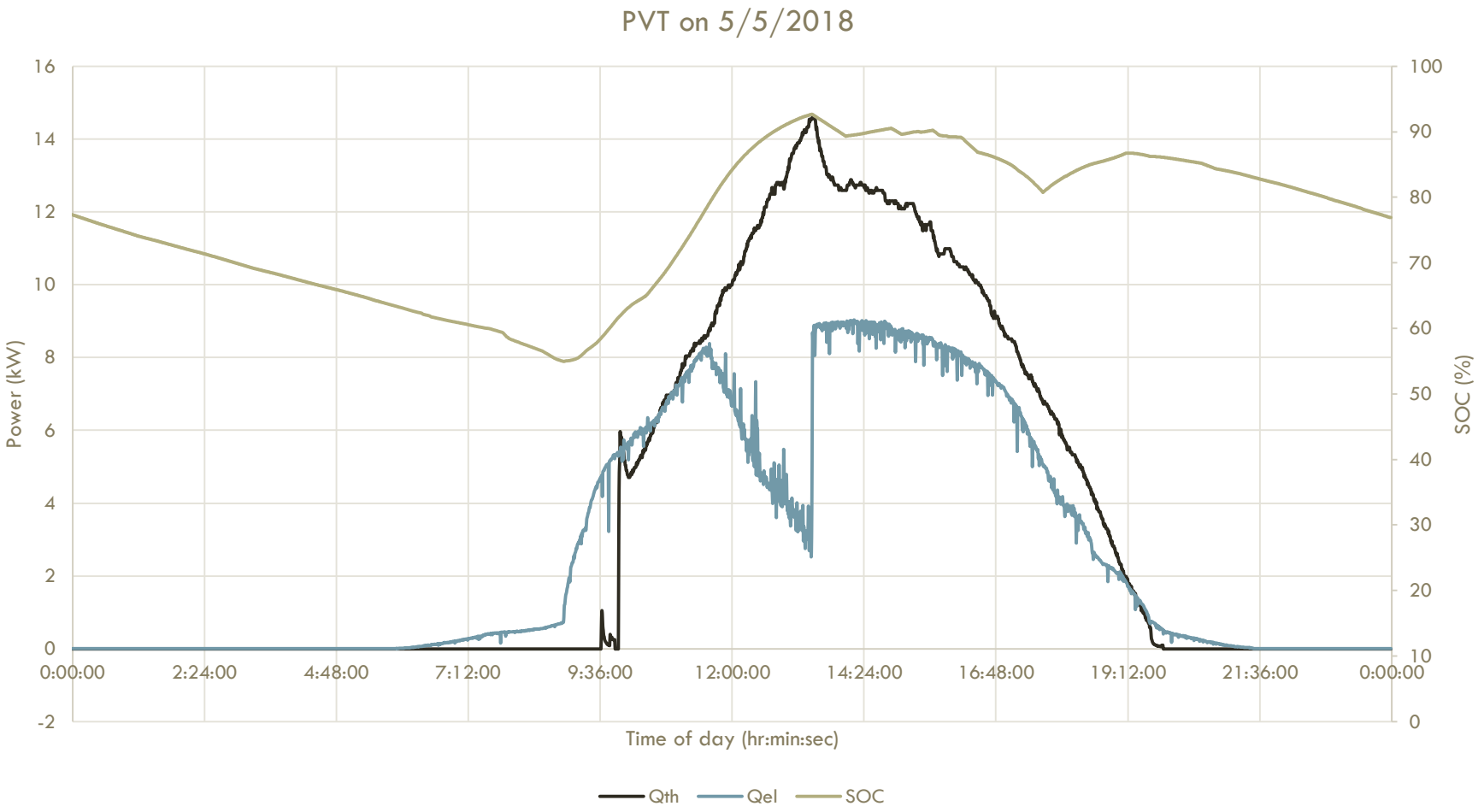




Storage tank 1 (west)



Storage tank 2 (east)


PVT on 5/5/2018
Power (kW)
SOC (%)
16
14
12
10
8
6
4
2
0
-2
100
90
80
70
60
50
40
30
20
10
0
0:00:00
2:24:00
4:48:00
7:12:00
9:36:00
12:00:00
14:24:00
16:48:00
19:12:00
21:36:00
0:00:00
Time of day (hr:min:sec)
Qth
Qel
SOC

	Solar radiation			
ΔT_{25} (K)	>1000W/m²	≈1000W/m²	>800W/m²	>600W/m²
5	**203**	**102**	**86**	**20**
10	**455**	**254**	**223**	**91**
15	**708**	**406**	**359**	**161**
20	**961**	**558**	**495**	**232**
25	**1213**	**710**	**632**	**302**

Net extra yield for PVT set-up (W_{el})

QUESTIONS?

STORY

THINK-E

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 646426