EU Heroes

Connecting Communities

Energising Community PV

www.euheroes.eu

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 764805

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JULY WEBINARS

TODAY: Energising Community PV

Find out more about the EU Heroes project HERE:

euheroes.eu **EUHeroes**

Energising Community PV

Part 1: Community Energy Case Studies

This first session will present a range of exemplar projects ranging from the Virtual Power Purchase opportunity arising from the Greek legislative framework; though potential PV building integration opportunities for multi- and single family houses in Lithuania and Poland; a multi-MW, multi-building, multi-location project portfolio from a creative community energy project developer to the supply of power to electrified rail networks by community owned solar PV farms in the UK.

10:30 CEST	Rebecca van LEEUWEN- JONES	Ministerie Van Economische Zaken En Klimaat - RVO (NLD)	EU Heroes Project Coordinator	Welcome & Introduction
	Vitas MACIULIS	Perspektyviniu Technologiju Taikomuju Tyrimu Institutas - Protech (LTU)	Expert	Zero emission multifamily house in Lithuanian Village
	Dimitris KISIKOPOULOS	ELECTRA Energy Social Enterprise (GR)	Vice President	Hyperion Energy Community
	Piotr NOWAKOWSKI	Krajowa Agencja Poszanowania Energii Spolka Akcyjna - KAPE (POL)	Specialist, Research and Projects Dept	PV Integration in Passive Housing
	Dan McCALLUM	Egni Cooperative (UK)	Director	Egni Coop – A Portfolio Approach to Community PV
	Ben FERGUSON	Energy Saving Trust	Development Manager	Riding Sunbeams – Green Valley Lines
11:45 – 12:00	Coffee & Comfort Break			

Overview: Main Results & Impact

Rebecca van Leeuwen

Coordinator, RVO

Online webinar 15th July 2020

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Agenda

- Aim/ Activities
- Partners – The Heroes
- Work Methodology
- Main Results & Impact
- Conclusions

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EU HEROES project

EU routes for High pEnetration of solaR PV into lOcal nEtworkS

Aims

- Enable increased deployment of community PV through new models enabling grid-integration

Activities

- Understand needs of communities and network operators
- Develop new business models
- Pilot those business models

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EU HEROES: Partners

Partners

- Partnership formed through Renewable Energy Working Group of the European Energy Network (EnR)

- RVO – Netherlands
- CRES – Greece
- CREARA – Spain
- DENA – Germany
- PROTECH – Lithuania
- KAPE – Poland
- EST - UK

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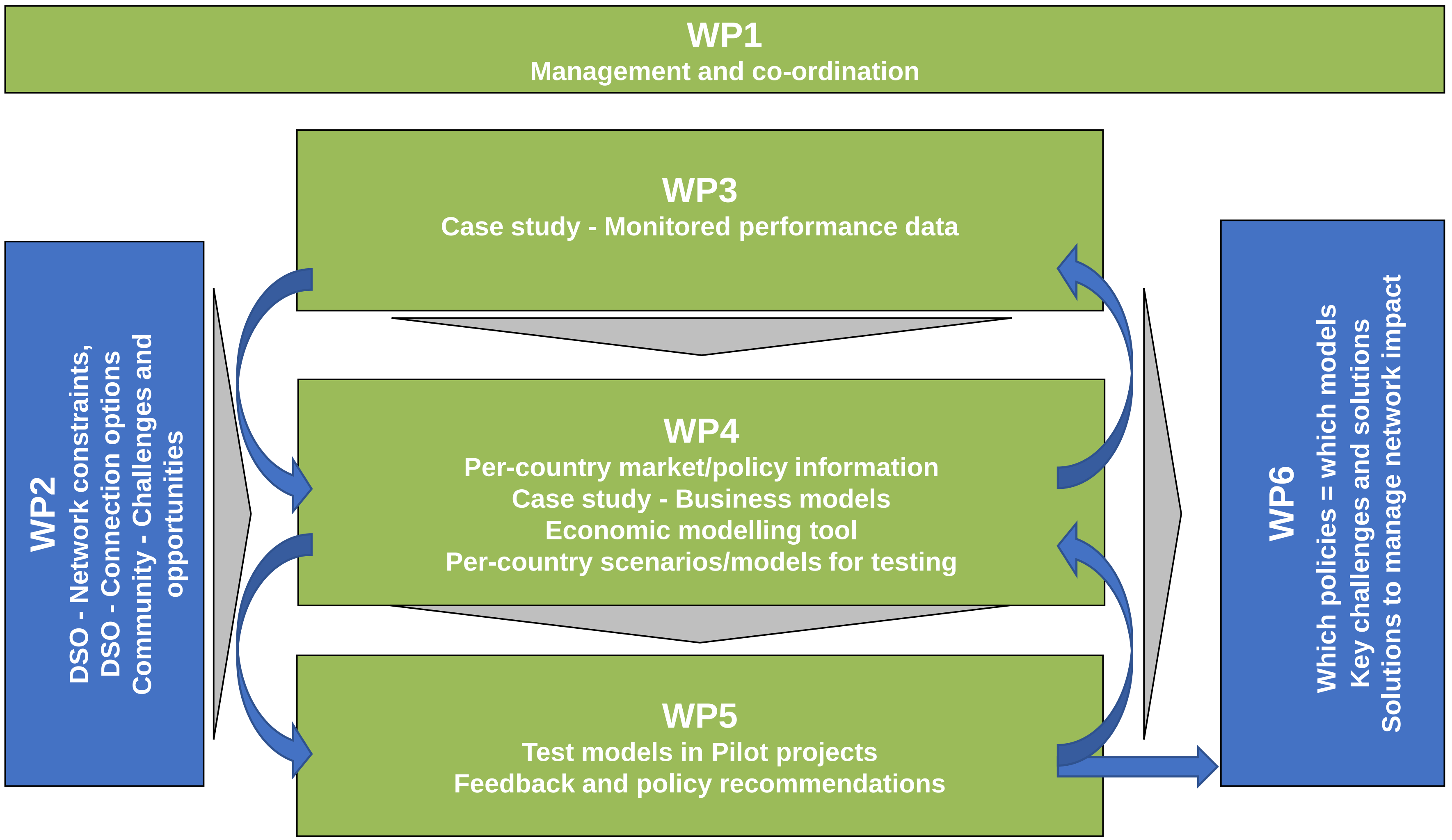
Work Methodology



WP2: Stakeholder Engagement

OBJECTIVES & ACHIEVEMENTS

Description

- Bring together key actors from the energy community and electricity network sectors and engage them in delivering the project objectives
  - Key stakeholder groups
  - Stakeholder engagement plan

Tools

1. **Thematic Workshops**: *local stakeholder exchanges*
2. **Seminars**: *dissemination of results & training*
3. **Bilateral working meetings**: *for in depth discussions and insights*
4. **Telephone meetings** – continuous exchange of info‘

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WP2: Thematic Workshops and their outcomes

Athens, Greece (Grid integration and solar community projects)

- Caps on maximum of renewable energy inst. and grid installation
- High interest loan on financing
- No incentives for micro grids
- Economics of storage

➢ Set up funds or grants for easier and cheaper finance conditions
➢ Provide incentives reducing grid costs (ancillary services, storage)

Madrid, Spain (Royal Decree and impact on self-consumption)

- Royal Decree sets the base for development of self-consumption
  - However: system is complex and collective self-consumption needs to be specified
- General mismatch of information in society

➢ Information campaigns regarding financial support. of PV and self-consumption

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Swansea, UK **(Solar community projects)**

- Lack of professionalized structures
- Access to land and buildings, financially viable projects and organising permits
- Legislation preventing increased deployment of community solar and self-consumption

➢ Communal buildings opening up their roofs for community solar projects
➢ Create framework that enables sites to directly connect to onsite users

Vilnius, Lithuania **(Prosumers in multifamily houses and energy communities)**

- The concept of cooperatives or energy communities is widespread (no political influence)
- Lack of financing mechanisms

➢ Use multi-familiy houses to strengthen the concept of energy communities
➢ Set up financing mechanisms

WP3: PV Case Studies

- 11 PV projects from 6.6kWp to 1.6MWp were analysed, focusing either on operational PV Energy Communities or on PV systems which might be essential ingredient of current or future PV Energy Communities.

*11 **PV** **C**ase **S**tudies (**PV-C.Ss**) from 7 EU countries (from 6.6kWp to 1.6MWp)*

1 *Multifunctional arts-education and entertainment complex*

1 *Hybrid PV community (PVs production is fall under curtailed operation)*

2 *Residential complex PV communities,* ***2*** *Primary schools,*

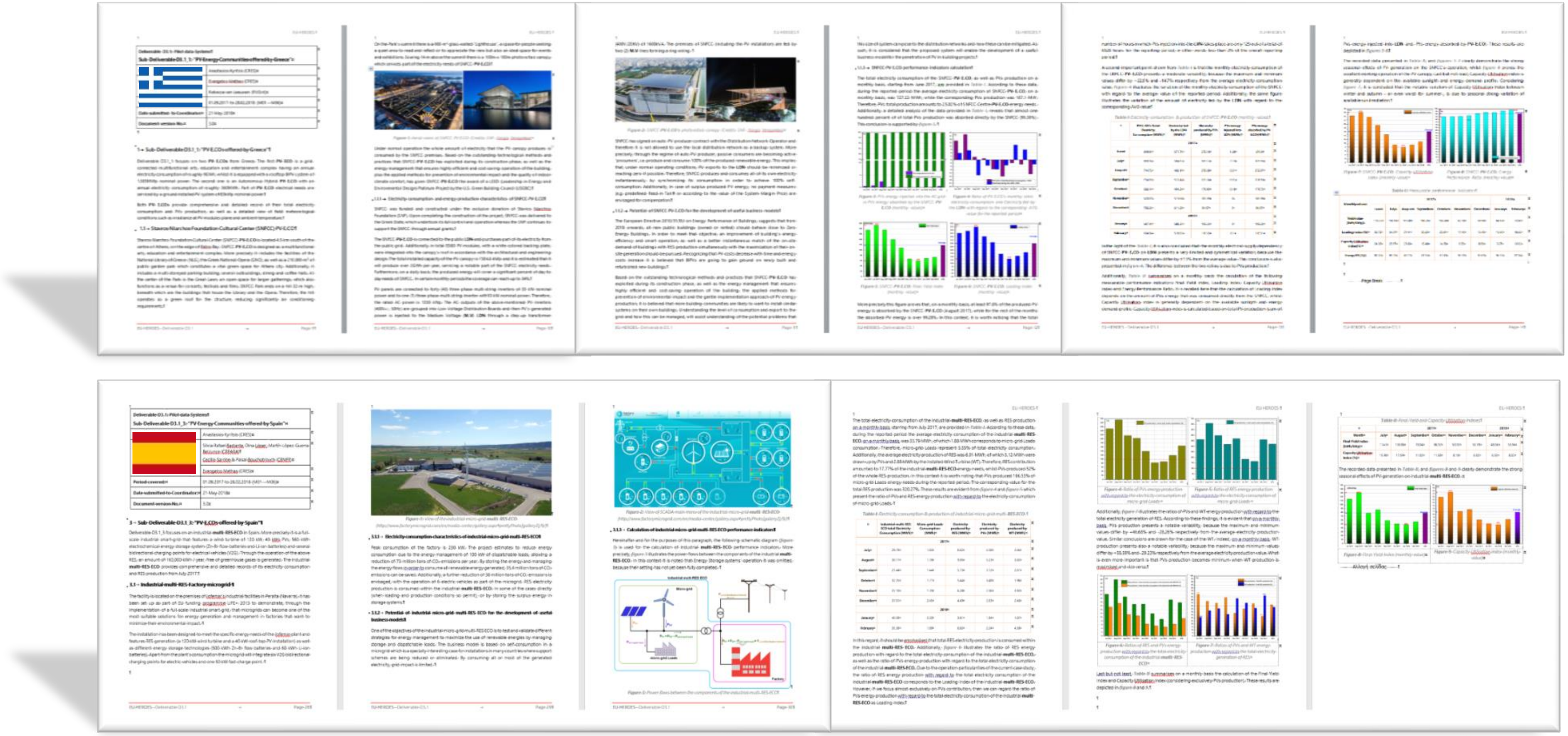
1 *Community enterprise centre,*

1 *Feed-in tariff PV System (considered as virtual energy community)*

1 *Industrial smart-grid installation,* ***1*** *Passive house ,* ***1*** *nZeb house*

WP3: Country Reports

- 7 country reports (for the 11 PV-C.Ss, at least one in every partner's country) was written, giving a detailed technical description of each case study together with characteristic monthly performance data.



WP4: Business Model Adaptation Development & Training

OBJECTIVES & ACHIEVEMENTS

Objectives	Achievements
1 **Provide clear BM description for each case study project, including a country-level context analysis**	**A detailed country report has been developed by each country, covering technical, financial an regulatory aspects in order to deeply describe the national context.**
2 **Integrate technical data into an economical analysis that includes:** • Societal costs (owner/ consumer) • Cost for grid operator	**A financial model has been developed to evaluate different BMs for the case study projects. Additionally to conventional BMs, the tool allows to test more innovative ones, such as the impact of batteries or demand side management.**
3 **Identify and evaluate potential improvements for pilot projects**	**Potential improvements from the BM testing with the financial tool have been identified for each of the case studies, and detecting the optimal BM for community solar projects in each country.**
4 **Provide conclusions on good practices**	*Once the optimal BM in each country has been identified, recommendations will be made in order to overcome the barriers that currently hinder its deployment.*

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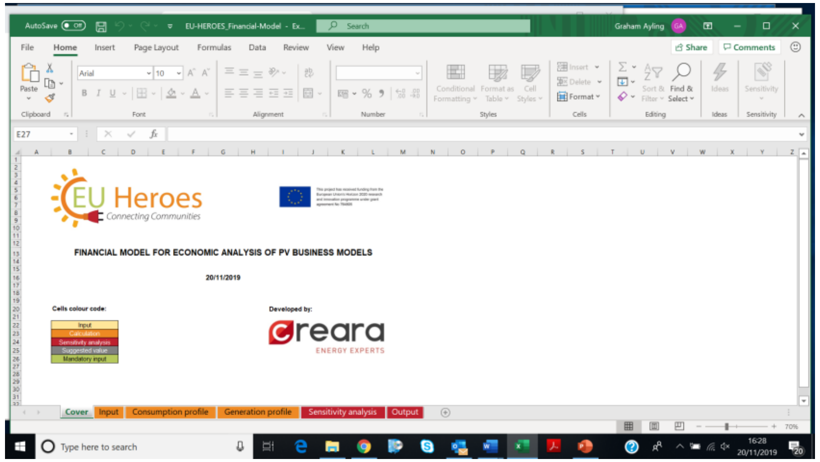
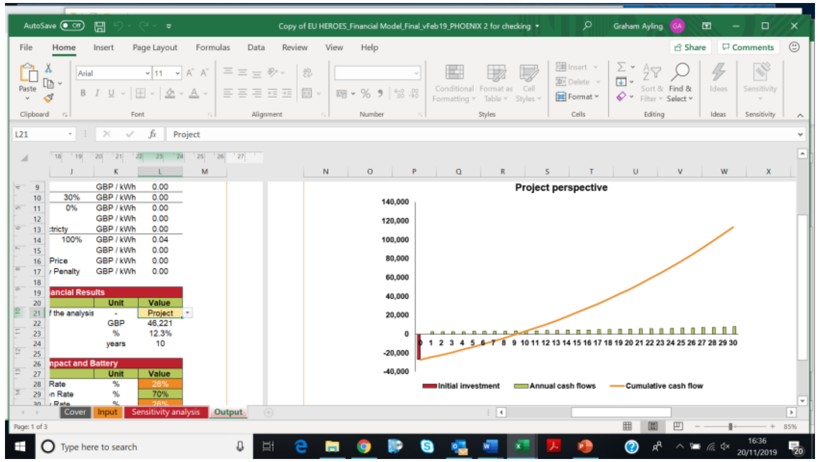
WP4: Community Solar Tool

Tool features

- Aimed at energy communities
- Business modelling
- Can cover community scale
- And include battery storage
- Sensitivity analysis
- Excel-based with user guide
- www.euheroes.com/tool





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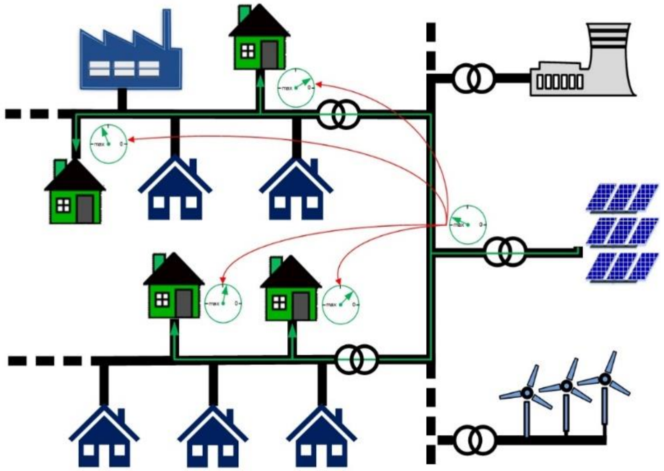
WP5: Tool Piloting & Evaluation

- Demonstrate benefits of the tools developed in the project, to support community project developers & owners

- Adapt model business cases (proposed under WP4) to real community and municipal solar projects



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WP5: The Pilot Projects

1. **Greece:** “Hyperion” - innovative PV energy community project providing distributed ownership of the community solar PV system.
2. **Spain:** Valencia administrative complex with a total area of 35,000 m^2, of which 10,000 m^2 are built, distributed in 6 public buildings.
3. **Poland**: Municipality-owned Public Kindergarten with PVs
4. **Netherlands**: “Groene Mient” social ecological housing project that consists of 33 (private) sustainable homes.
5. **Lithuania:** “Varniai Green House” project for renewable energy based refurbishment of soviet style multifamily house to the modern zero emission entity.

(NB. For Germany & the UK currently identifying most appropriate pilots)

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W5: Conclusions

- Model is applicable to wide variety of situations;
- Simple enough to understand;
- Provides insights to existing configuration;
- Provides possibilities to analyse impact of infrastructure; configuration modification as well as impact on business case outcomes.

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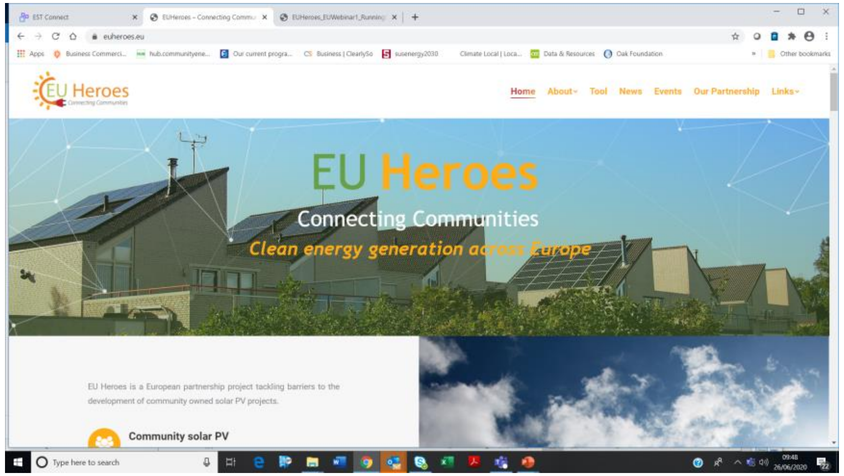
WP6: Dissemination and Communication

- Website and social media
- Articles and presentations
- National-level dissemination webinars
- EU dissemination webinars
    - Today
    - 8th July
    - 1st July
- Twitter: @euheroes
- LinkedIn group: EU HEROES



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Impact

- **Strategic Impact –** Closely following Article 22 of the RES Directive – provide recommendations for effective implementation
- **Market Impact and Socio-economic impact –** smooth transition from subsidised deployment to market conditions. Acceleration & empowerment of citizen engagement with renewable energy and decarbonisation of the EU economy;
- **Energy and Environmental Impact –** contributed to increase in share of renewable energy in EU energy mix and reduced CO_2 emissions;
- **Shortened the (expensive) learning curve** for making this energy transition in society possible – valuable exchange of info'.

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Conclusions

- Could it be that:
  - there are ***"No More Heroes?"***
  - "***We don't need another Hero?" or do we?***

- Or could it be that:
  - With the right legislation in place;
  - With a level/ equal playing field
  - With increased public acceptance

- ***We could (all) be Heroes***'

and contribute to a cleaner, greener & brighter future

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ZERO – EMISSION MULTIFAMILY HOUSE IN RURAL AREA OF LITHUANIA

15/07/2020

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Zero-emission multifamily house

INTRODUCTION

- **THERE ARE PLANTY OF OLD MULTIFAMILY BUILDINGS IN EUROPE**
- **ENERGY SUPPLY OF MANY OF THEM IS FAR AWAY FROM POSSIBILITIES OF XXI CENTURY**
- **LAST TECHNICAL AND ECONOMICAL ACHIEVEMENTS OPENS NEW AMASSING POSSIBILITIES FOR MODERNIZATION OF ENERGY SUPPLY OF SUCH BUILDINGS**
- **RESEARCH MADE DURING EU HEROES PROJECT SHOWS REAL POSSIBILITIES TO REACH ZERRO EMMISION OF SUCH BUILDINGS**

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Zero-emission multifamily house

BASIS FOR THE DEVELOPMENT OF ZERO – EMISSION BUILDINGS

- **FLEXIBLE NET- METERING** AND PROSUMERS SYSTEM IN THE COUNTRY
- **EFFECTIVE** GEOTHERMAL AND AEROTHERMAL **HEAT PUMPS**
- DISSEMINATION OF GREEN IDEAS IN THE SOCIETY
- COMMUNAL THINKING OF HOUSEHOLDS

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Zero-emission multifamily house

FLEXIBILITY OF NET-METERING SYSTEM

- POWER LIMIT FOR PROSUMING – **500 kW !**
- PLACES OF PV PRODUCING AND CONSUMING **CAN BE DIFFERENT:**

  producing in the remote area – consuming in another part
- CONSUMERS HAVE OPPORTUNITY TO ACQUIRE **PART OF BIG PV STATION** AND USE GREEN ELECTRICITY IN THEIR HOUSEHOLDS

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Zero-emission multifamily house

PILOT PROJECT IN SMALL TOWN VARNIAI

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Zero-emission multifamily house

GENERAL CHARACTERISTICS OF THE PROJECT

- TOTAL AREA OF THE HOUSE – **1040 sq. m.**
- NUMBER OF APARTMENTS IN THE HOUSE – **20**

Annual energy consumption, kWh/year	Before project	After project
ELECTRICITY CONSUMPTION	**24 000**	**79 000***
HEAT (for heating and hot water) CONSUMPTION	**364 000**	**165 000 ****

* Increased because of electricity supply of heat pump
** decrease because of house insulation

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Zero-emission multifamily house

ENERGY CHARACTERISTICS OF THE PROJECT

Parameter	Value
PV system size	79 kW
Specific system yield	1000 kWh/kW
Specific system cost	900 Eur/kW
Direct consumption rate	30%
Net-metering rate	70%
Electricity tariff (direct consumption)	0,15 Eur/kWh
Net-metering credits rate	0,05 Eur/kWh
Heat pump size	40 kW
Heat cost before project –	0,06 Eur/kWh

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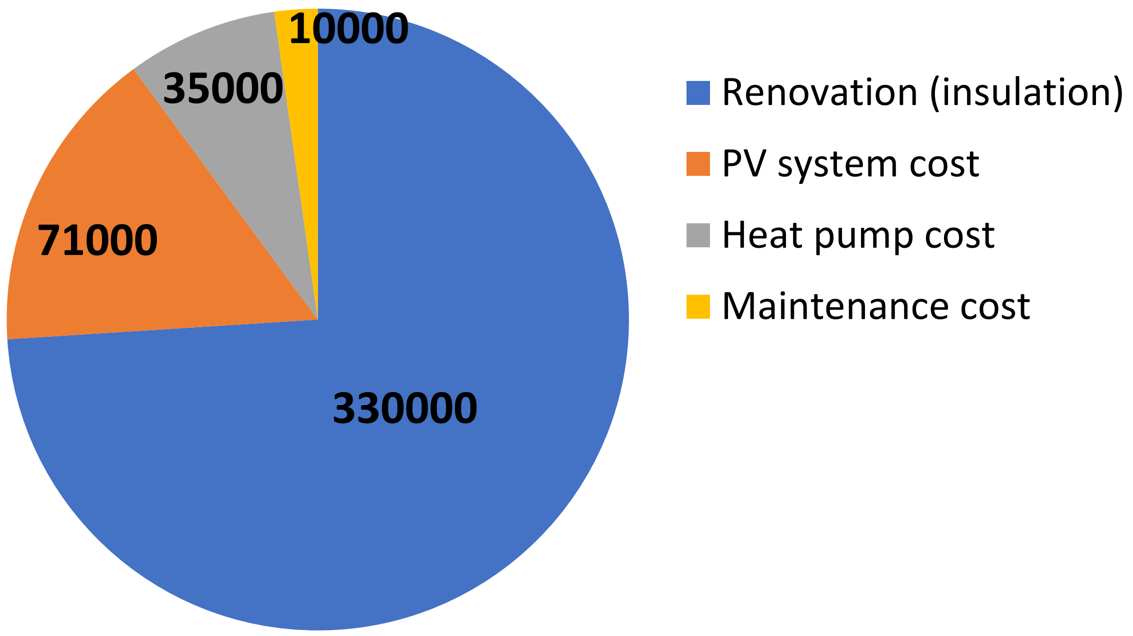
Zero-emission multifamily house

FUNDING SCHEME

Total – 446 000 Eur



SUPPORT SCHEME

- Subsidy for renovation – **30 %**
- Subsidy for energy modernization – **60%**

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Zero-emission multifamily house

ESTIMATED RESULTS OF EXPERIMENT

- **ENERGY EXPENDITURES** OF AVERAGE HOUSEHOLD:
  - before modernization – **106 Eur/month**
  - after modernization – **71 Eur/month**
- **INVESTMENTS** OF AVERAGE HOUSEHOLD TOTAL – **22 300 Eur**
- **SUPPORT:**
  - for renovation – **5 000 Eur**
  - for energy modernization – **3 500 Eur**
- **LOAN** – **13 800 Eur**
- **PAYBACK PERIOD:**
  - renovation – **16 years**
  - energy modernization – **5 years**

CO_2 emissions by house – **90 t/year**

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Zero-emission multifamily house

OBSTACLES

- COMPLEX PROJECTS COMBINING SOLAR ENERGY WITH HEAT PUMPS ARE RATHER COMPLICATED FROM TECHNICAL AND ECONOMICAL POINTS OF VIEW. THEREFORE, IT IS NOT EASY TO EXPLAIN ITS ADVANTAGES FOR ORIDINARY HOUSEHOLDS – PARTICIPANTS OF THE PROJECTS

- ELECTRICAL AND HEAT COMPANIES ARE NOT PREPARED FOR THE WORK TOGETHER AS INTEGRATORS. THEREFORE, IT IS NOT EASY TO FIND SOLUTIONS SUITABLE FOR ALL PARTIES OF THE PROJECTS

- LEGISLATION AND TECHNICAL REQUIREMENTS ARE NOT PREPARED ENOUGH FOR SUCH INTEGRATION. THEREFORE, IT REQUIRES MUCH MORE EFFORT AND GOOD WILL FROM PUBLIC AUTHORITIES AND MUNICIPALITIES TO REDUCE OBSTACLES FOR SUCH INNOVATIVE PROJECTS

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Conclusions

&

- VARNIAI EXPERIMENT AND COMBINING SOLAR ENERGY TOGETHER WITH THERMAL ENERGY SHOWED VERY HIGH ECONOMICAL AND TECHNICAL EFFECTIVENESS FOR ENERGY SUPPLY OF BUILDINGS
- PROJECT SHOWED THAT CREATING ENERGY COMMUNITIES TO SUPPLY GROUPS OF BUILDINGS CAN BE EVEN MORE EFFECTIVE
- EXPECTED PROJECT DEVELOPMENT – OPENING COUNTRY PROGRAM FOR CREATION OF ZERO-EMISSION DISTRICT HEATING SYSTEMS APPLIED FOR SMALL TOWNS

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ELECTRA ENERGY.

Social enterprise

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ΚΑΛΟ

ΕΛΕΤΑΕΝ

ΕΚΠΑΙΔΕΥΤΙΚΗ ΠΛΑΤΦΟΡΜΑ ΚΑΛΟ

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cooperative enterprises build a better world

coop

Who we are

We work for the development of ENERGY DEMOCRACY in Greece

ELECTRA ENERGY.

- *Raise awareness*
- *Capacity building*
- *Advocacy*
- *Consulting*
- *Project Development*

Who we are

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HYPERION
SOLAR COMMUNITY

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ELECTRA ENERGY.

Dimitris Kitsikopoulos

The context

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Directive RED II
(2018 / Clean energy package)

Law 4513/2018
(Energy communities)

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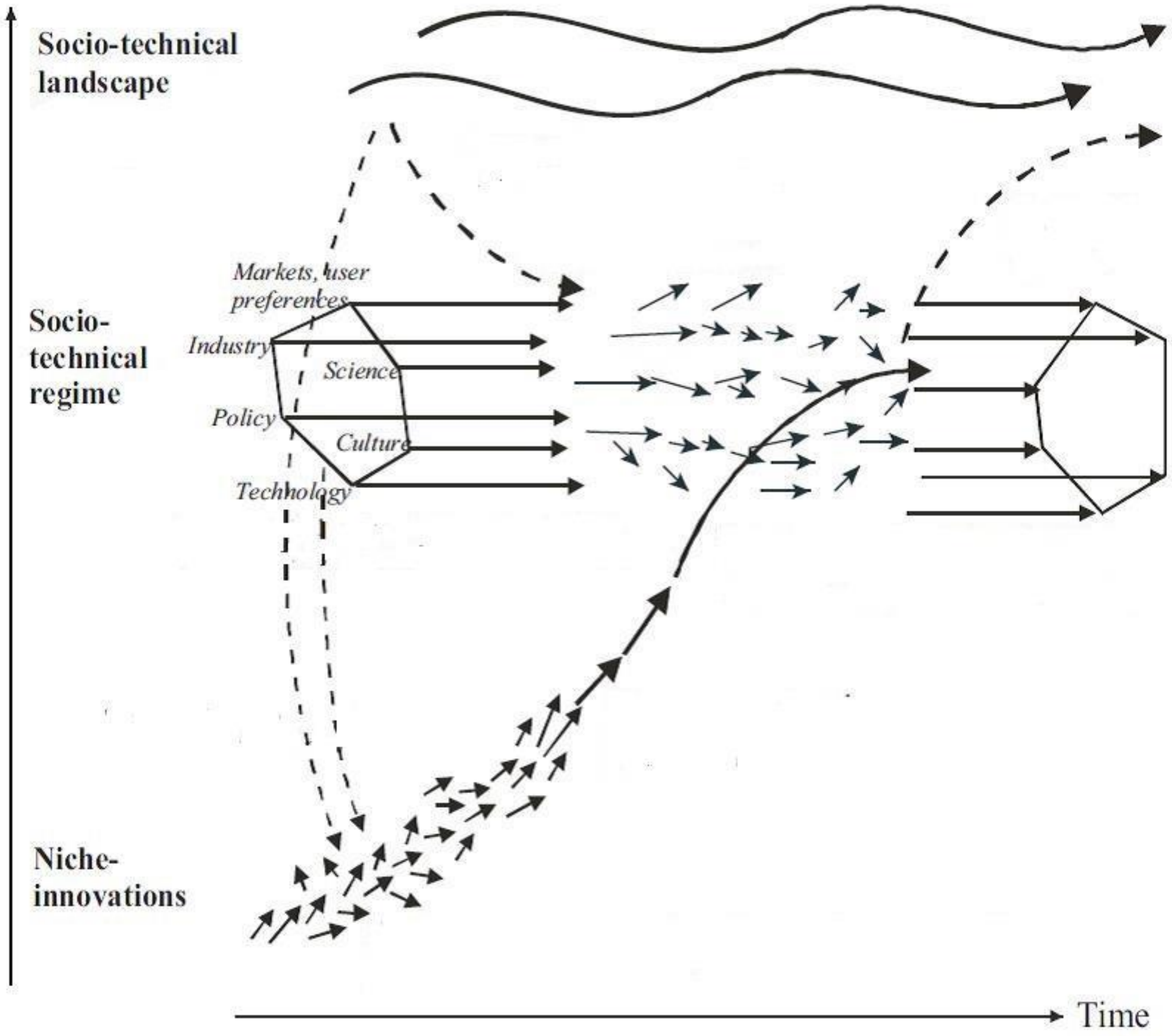
Structuring Community Energy



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The first VIRTUAL NET-METERING Energy Community in Athens

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-*PV*
- *Virtual Net Metering*
- *Attica + Central Greece*
- *180kw (PHASE 1)*

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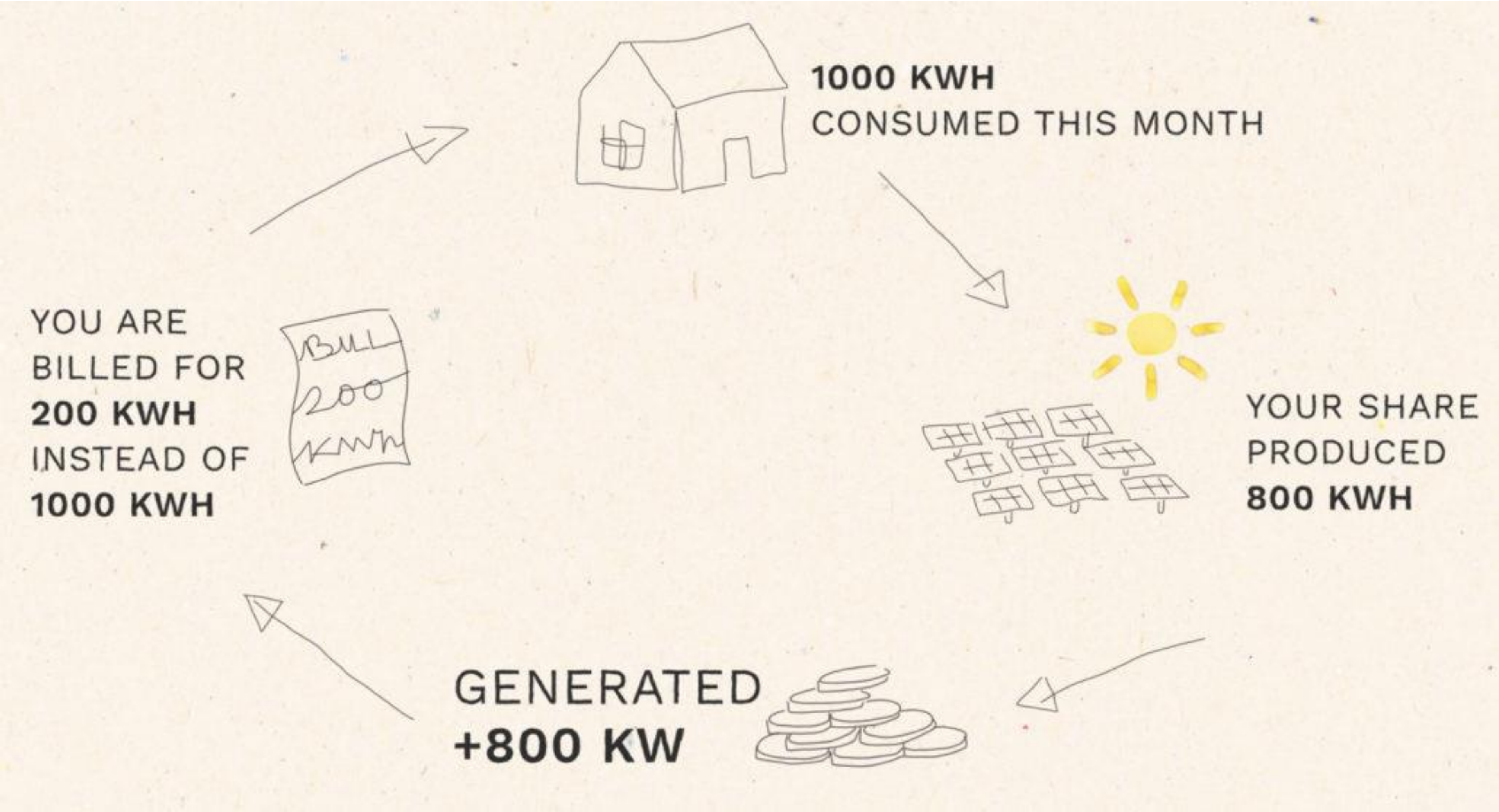

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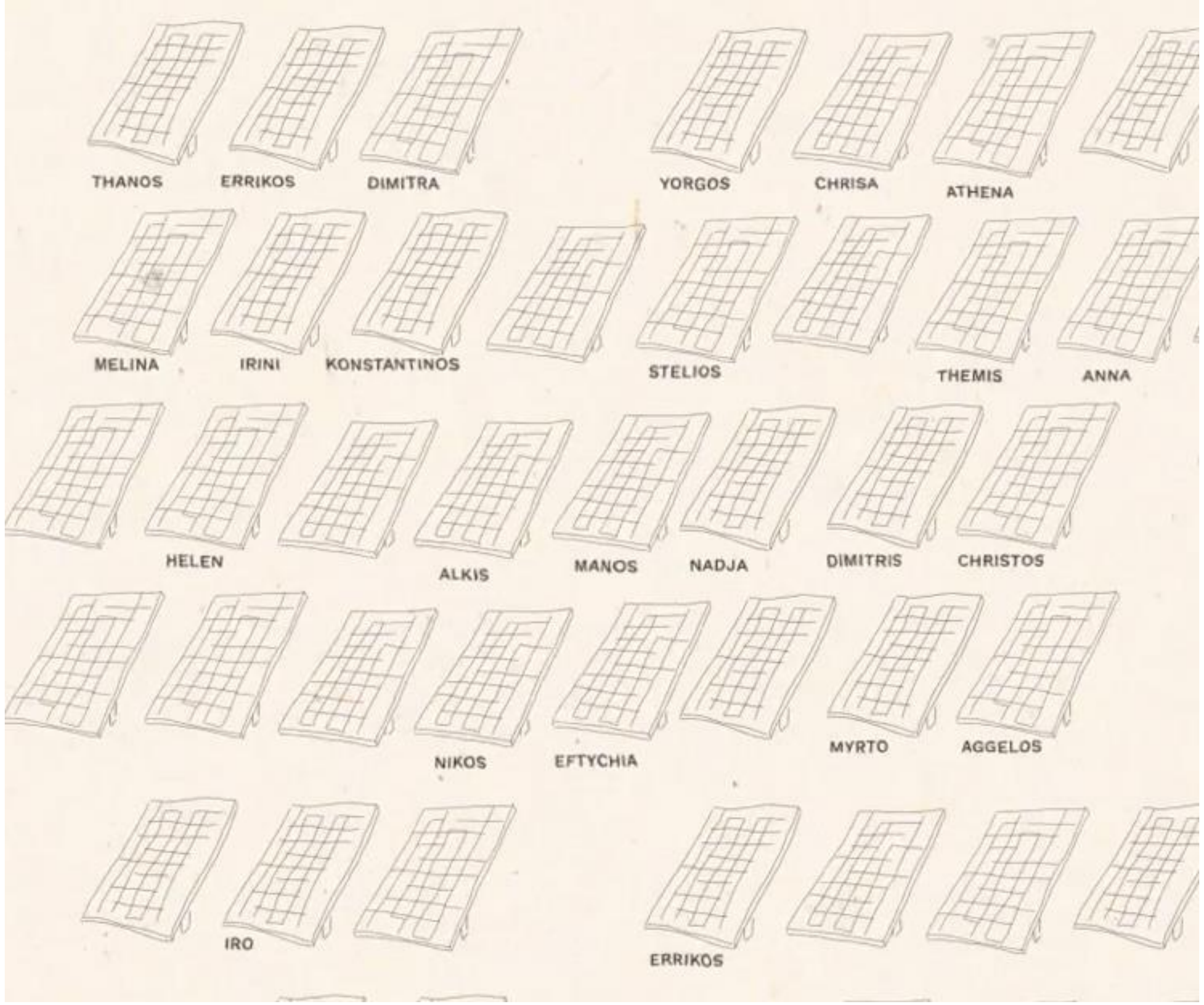

45 Households
&
small businesses

Project targets:
- CLEAN & AFFORDABLE ENERGY: Provide clean and affordable electricity to members
- ENERGY EFFICIENCY: Provide energy efficiency and energy saving solutions to members
- REPLICATE: Learning, expertise, and capacity building in order for the project to be succesfully replicated in other places and locations across Greece, the Balkans, and Europe
- RAISE AWARENESS: Raise awareness by developing a best practice. Disseminate and share information, data, and expertise
- ENERGY POVERTY: Develop and test solutions and models to tackle and mitigate energy poverty in urban areas

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Technical and economic analysis of PV installation integrated with the passive single-family building

Piotr Nowakowski & Ryszard Wnuk

The Polish National Energy Conservation Agency (KAPE)

Online webinar 15th July 2020

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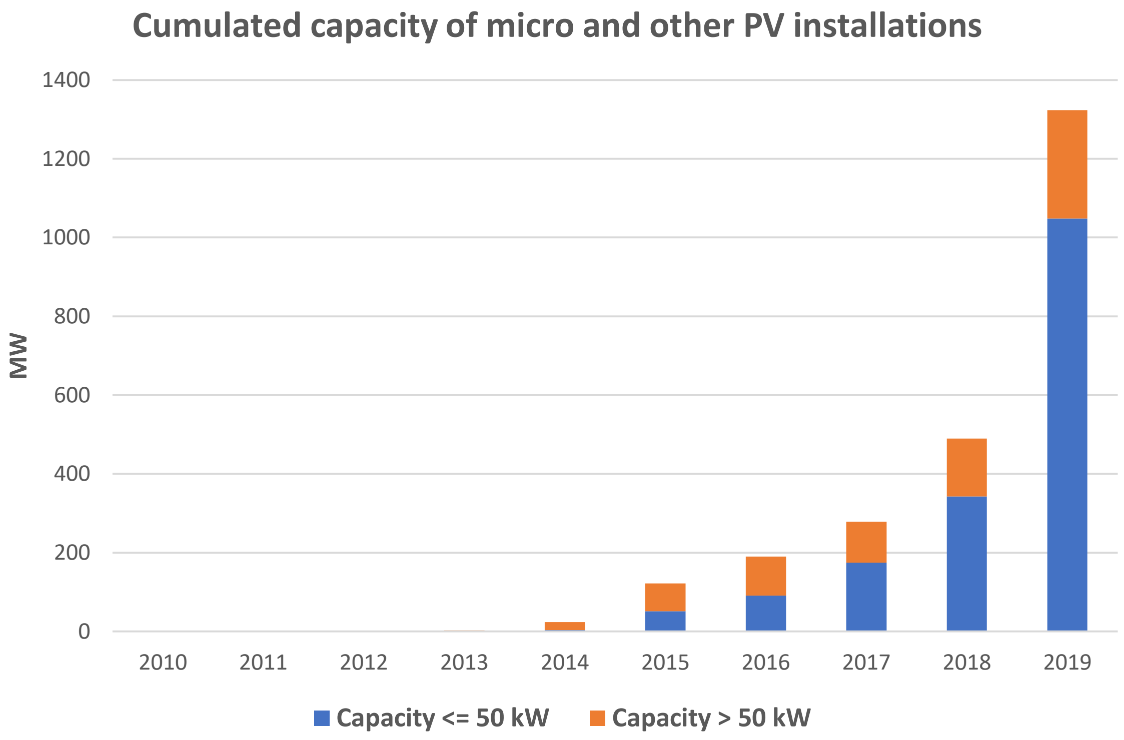
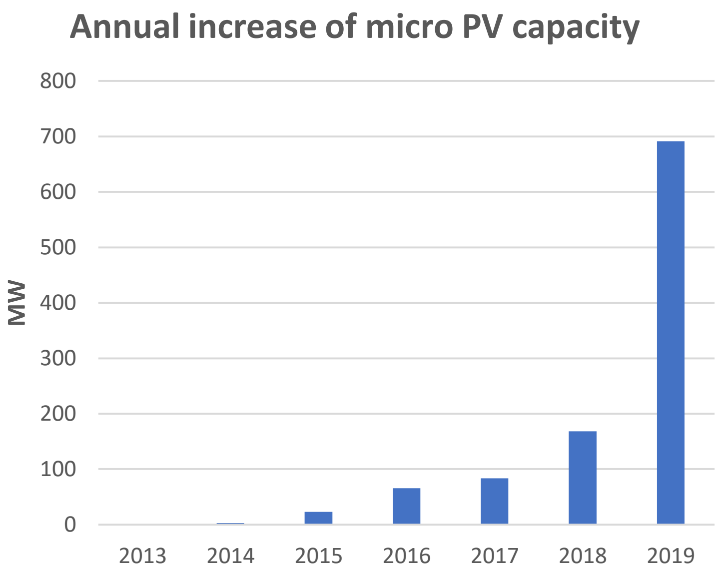
Polish PV sector in numbers

Key figures:

- Total installed capacity at present: 2109 MW
- Average capacity of installed micro PV installations: 6,5 kW_p
- Share of micro PV in total domestic energy consumption: 0,57% (end of 2019)
- Share of micro PV capacity in the Polish Power System: 2,21% (end of 2019)





Model PV installation

The PV system:

- on-grid PV installation with total capacity of 9,75 kW_p
- PV modules - 39 x Selfa PV SV60P.4-250W_p
- Inverter - 1 x Sunny Tripower 9000TL
- Azimuth angle – 13°
- Inclination angle – 40°
- Total cost – 12 000 EUR

The single-family building:

- Floor area – 204 m^2
- Passive standard– 12,6 kWh/m^2/rok
- The only energy carrier– electricity
- Air/water heat pump
- Mechanical ventilation with heat recovery
- Simple shape of the building and the uniform roof surface – no shading elements (no chimneys, bay windows, etc.);
- North-south orientation of the roof
- Maintained correct distance from all other shading objects (tall trees, buildings)

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Monitoring of PV system operation

Monitoring of basic parameters since October 2016:

- Total energy consumption;
- PV system generation;
- Electricity fed into the grid;
- Electricity delivered from the grid;
- Energy self-consumed.

Extension for additional parameters measured on-site since August 2018:

- Ambient temperature;
- PV modules temperature;
- Irradiation.

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Assessment of the PV system' functioning

Performance indicators for PV installations:

- **Final energy consumption;**
- **PV generation;**
- **Self-Consumption Index;**
- **Capacity Utilisation Index;**
- **Productivity Index;**
- **Self-Sufficiency Index;**
- **Share of energy fed into the grid in total energy produced.**

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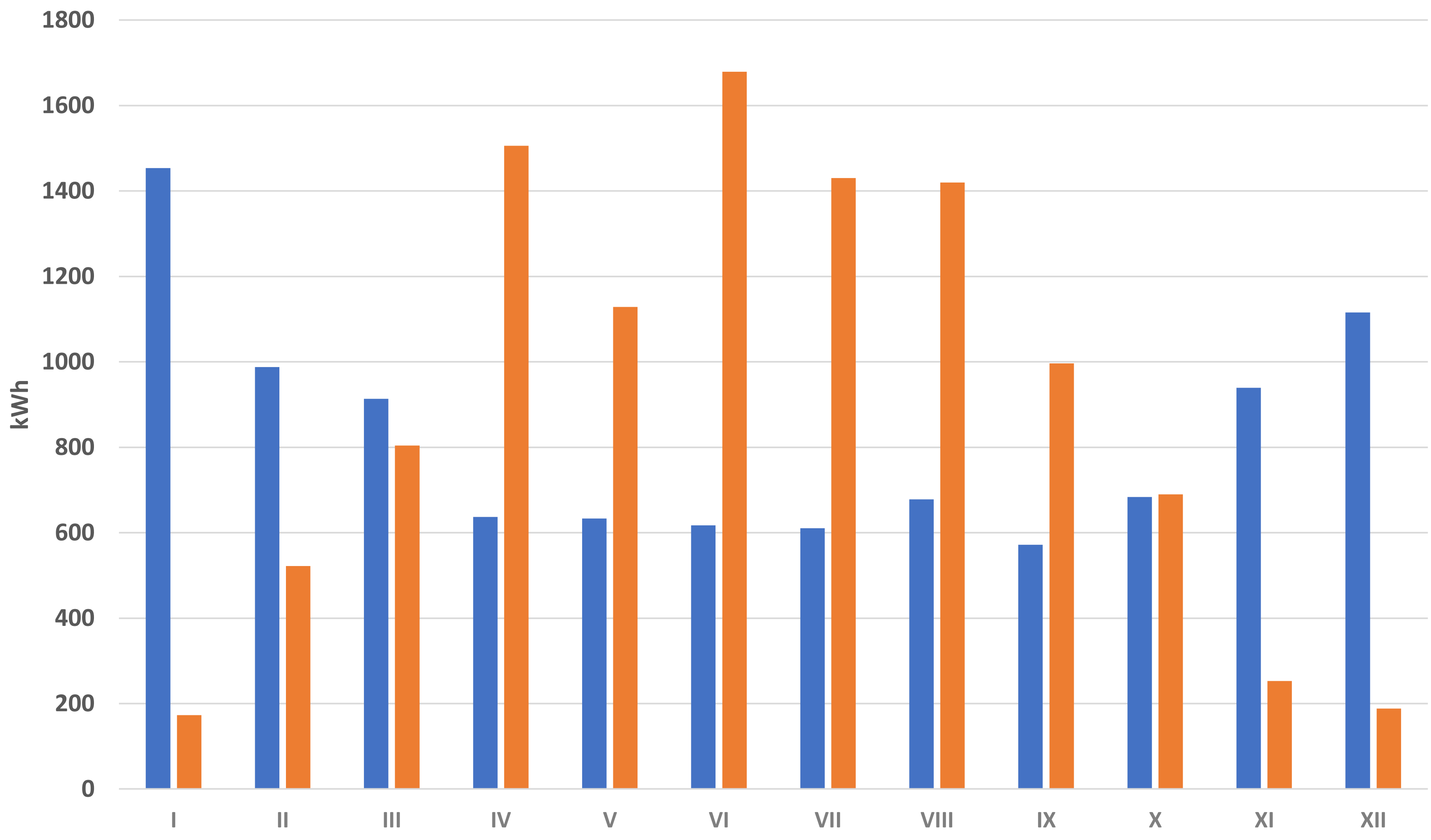
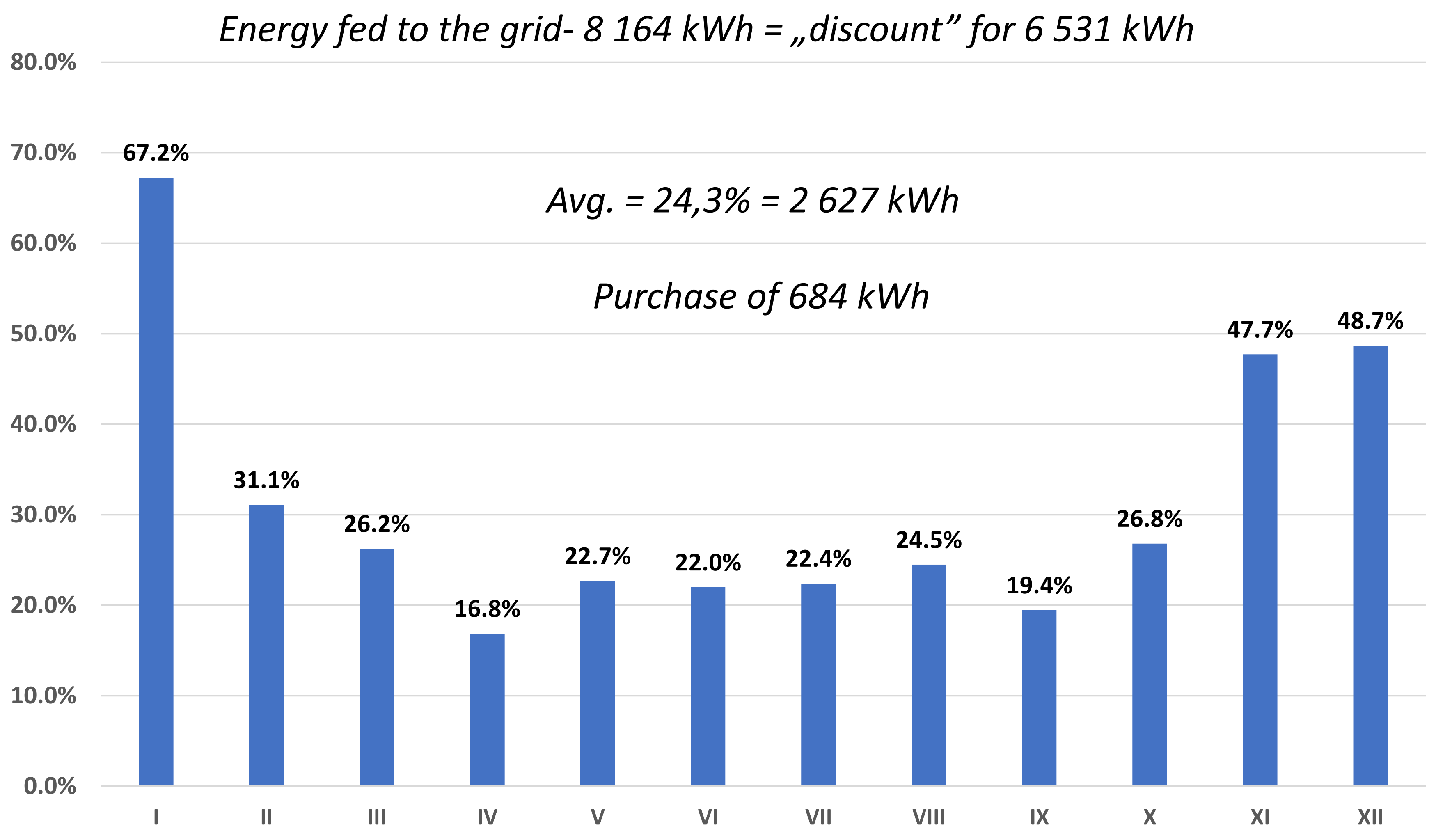
Energy consumption and PV production



Total energy generated in 2019: 10 790 kWh

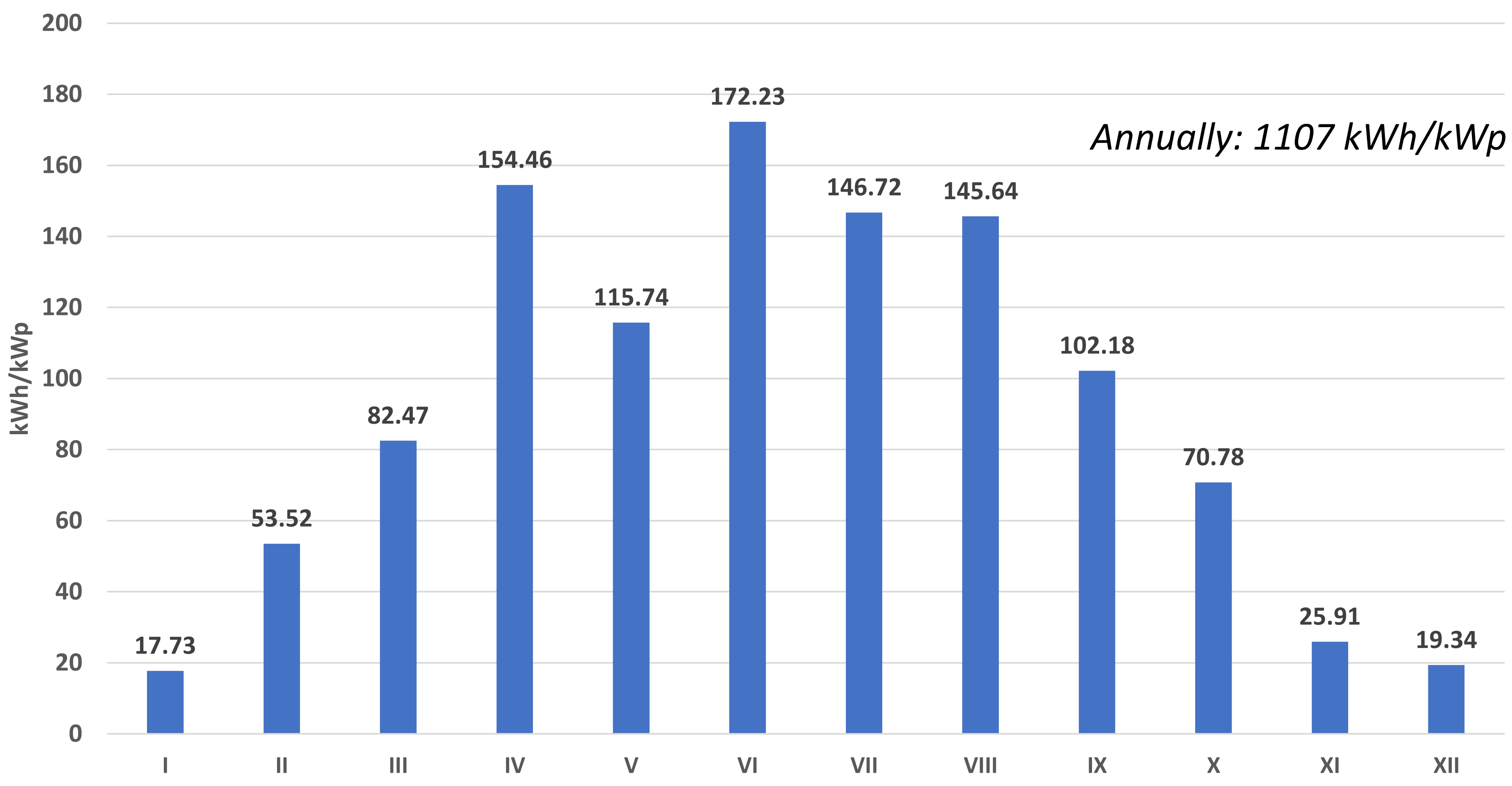
Total energy consumption in 2019: 9 842 kWh

Self-Consumption Index



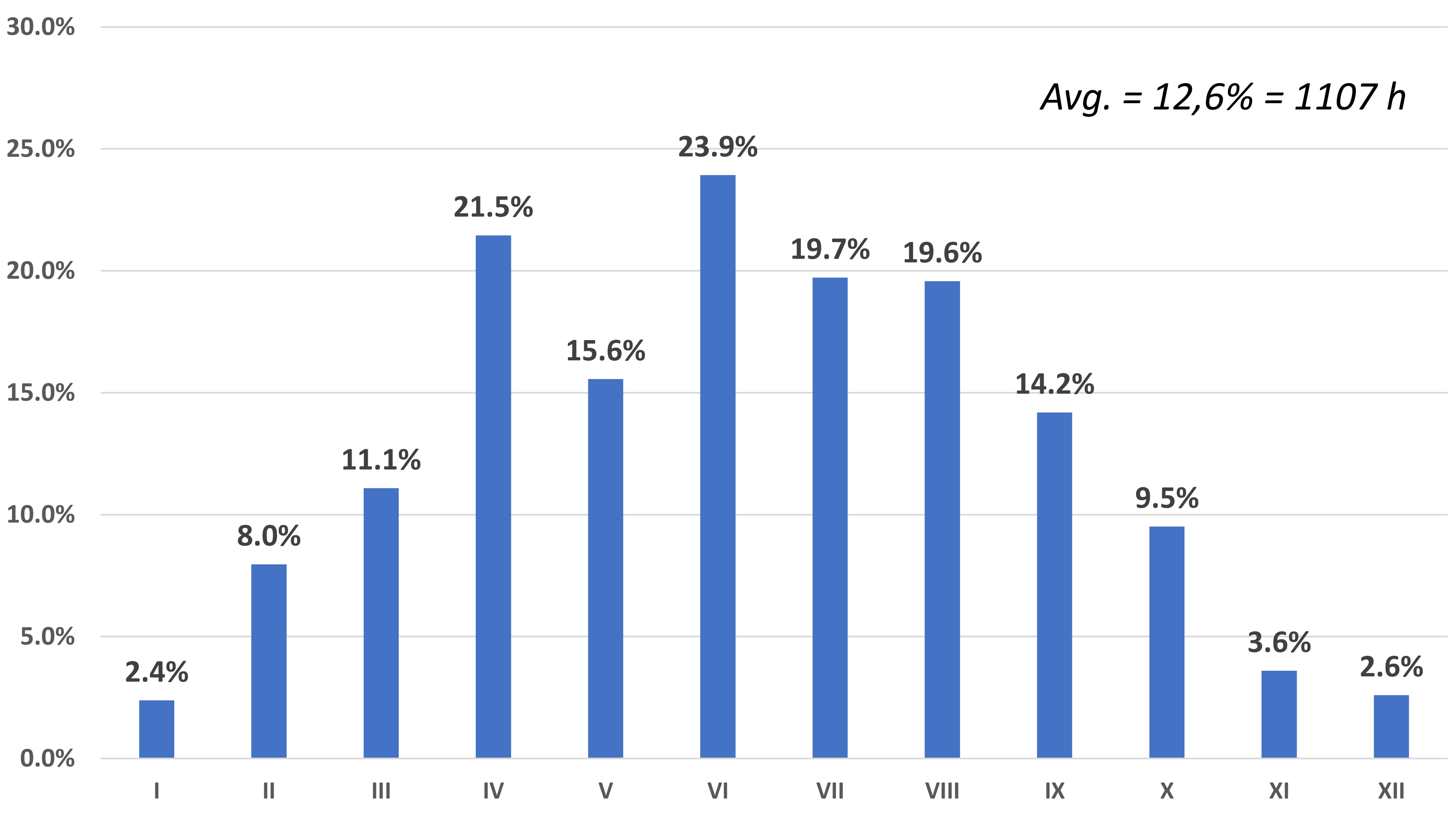
$$\text{SCI} = \frac{\text{PV energy generated and directly consumed (kWh)}}{\text{energy generated by the PV system (kWh)}}$$

Productivity Index



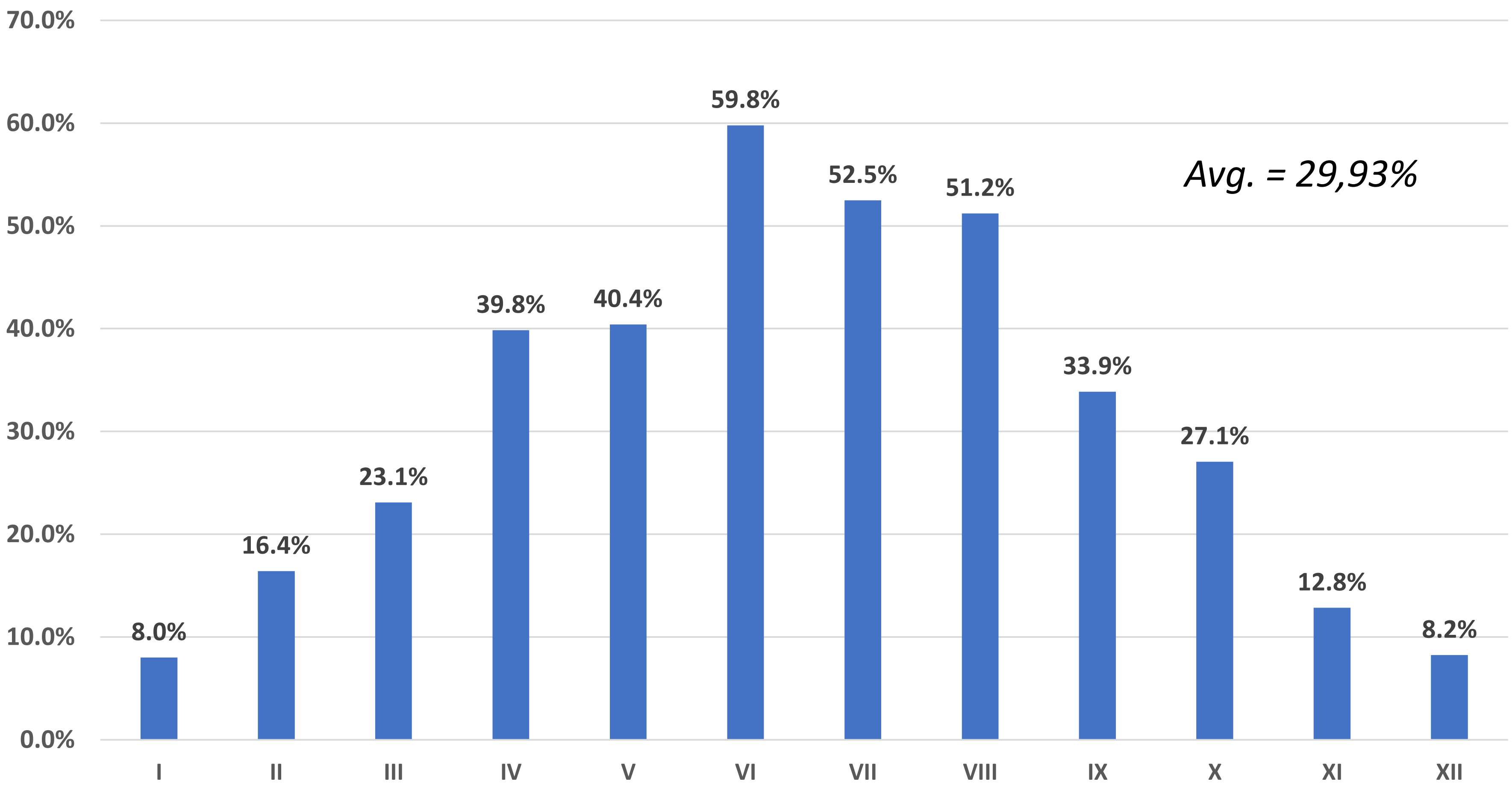
$$\mathrm{PI} = \frac{\text{total energy production(kWh)}}{\text{nominal installed capacity}(\mathrm{kW}_p)}$$

Capacity Utilisation Index



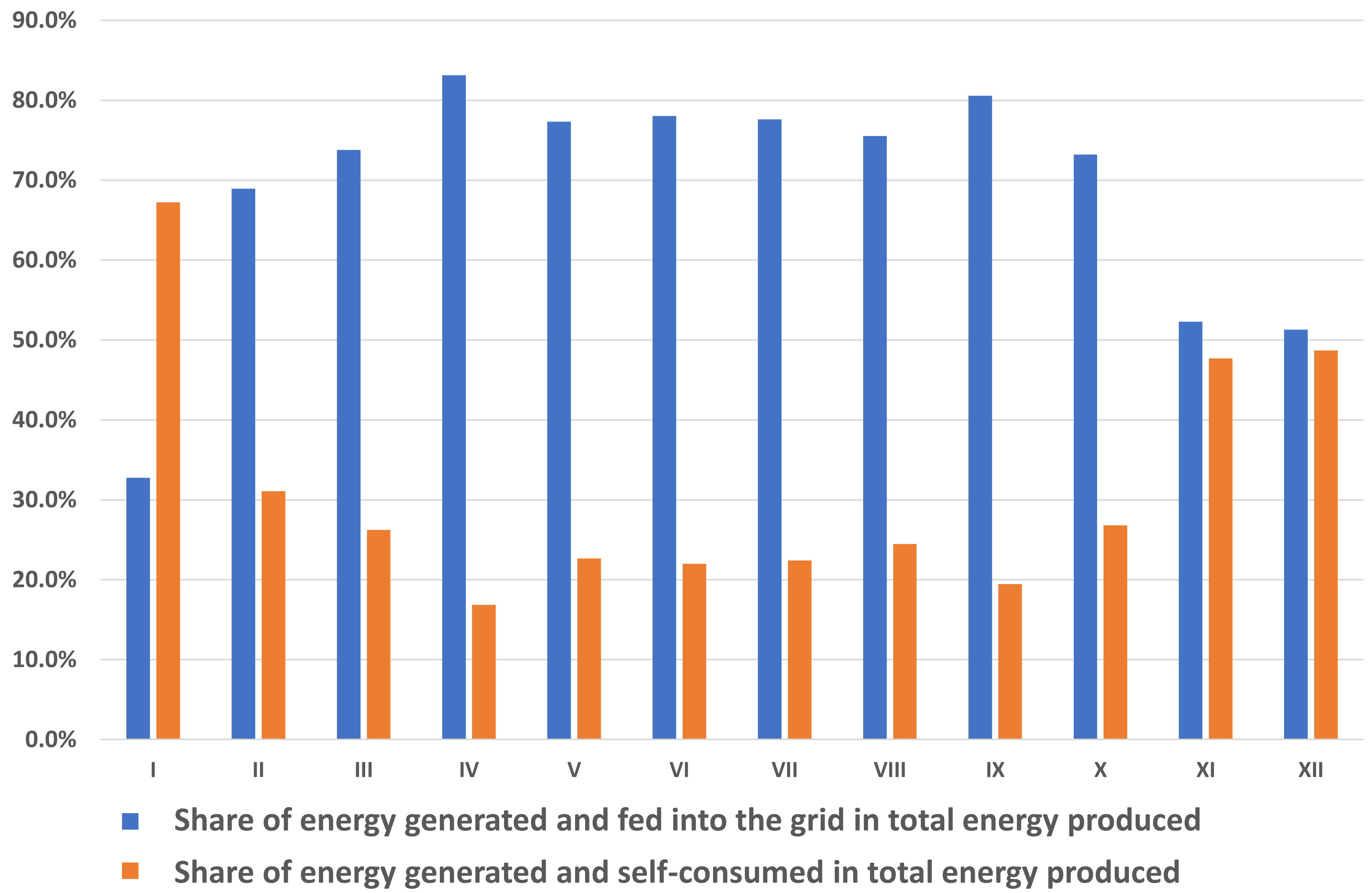
$$\mathrm{CUI} = \frac{\text{energy generated by the PV system (kWh)}}{\text{energy produced over a specified period of time in operation with nominal power (kWh)}}$$

Self-Sufficiency Index



$$SSI = \frac{\text{self} - \text{consumption (kWh)}}{\text{total energy demand (kWh)}}$$

The shares of energy fed into the grid and energy directly used in total energy produced



Technical assessment of the PV system' operation

Conclusions:

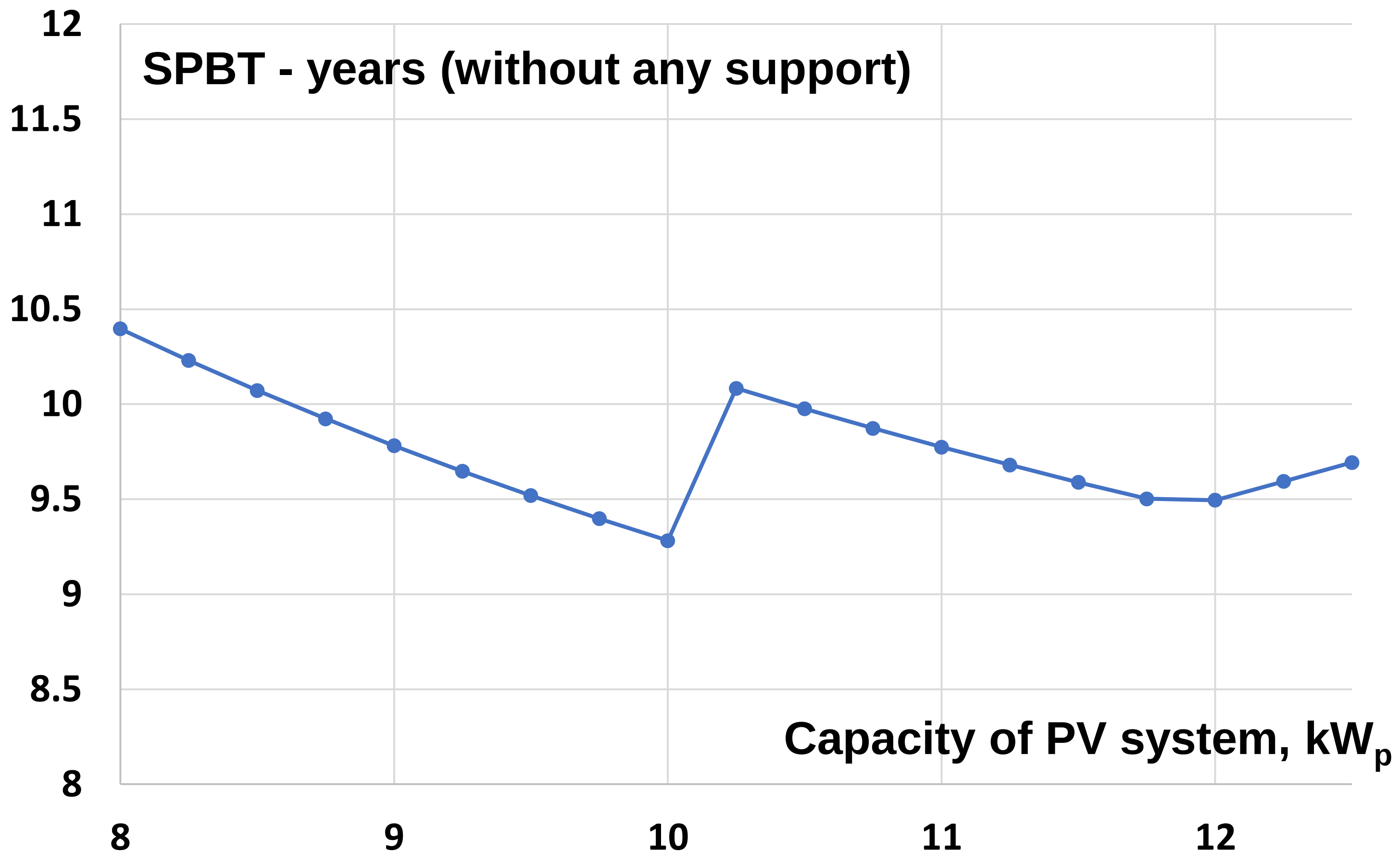
- High efficiency of PV system;
- High quality components and reliable execution of the installation;
- Relatively high solar irradiation values in 2019 – 1280 kWh/ m^2 rok;
- Productivity - 1107h - exceptionally favorable conditions (azimuth, tilt angle, no shading);
- Relatively high self-consumption rate;
- Annual balancing - correct design of PV capacity (appropriate estimation of total electricity demand);
- Validity of using the net-metering support scheme is undeniable.

A photovoltaic installation with properly design capacity, operating within net-metering scheme can provide 100% energy independence of the building, understood as no need of electricity purchase.

Profitability of PV installation

Annual electricity demand: 9 842kWh. Investment cost: 1250 EUR/kW_p (2016).

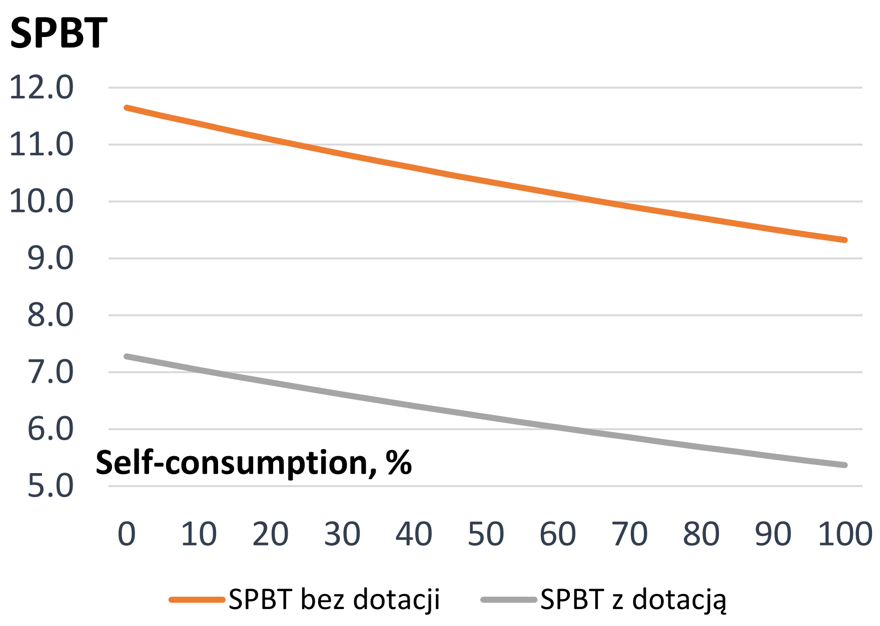
Self-consumption: 2627 kWh. Electricity price: 0,15 EUR/kWh.



Profitability of PV installation

$$P = \frac{\frac{E_z}{o + a - o \cdot a}}{H \cdot \eta_{inst.}} \cdot STC \quad [\mathrm{kW_p}]$$

E_z	-	Annual electricity demand [kWh];
o	-	Discount ratio;
a	-	Self-consumption, share of energy self-consumed in total energy produced;
H	-	Annual irradiation on surface of PV modules [kWh];
η_{ins}	-	Efficiency of PV installation = 0,87, (1 – losses), Based on data from the monitoring system;
STC	-	*Standard Test Conditions* (1 kW/m²).



If the self-consumption coefficient a^* is defined as a share of energy from the PV system directly used for energy demand, the formula for determining the capacity of the installation is as follows:

$$P = \frac{E_w}{H \cdot \eta_{inst.}} \cdot STC = \frac{E_z \cdot \left(a^* + \frac{1 - a^*}{o}\right)}{H \cdot \eta_{inst.}} \cdot STC \quad [\mathrm{kW_p}]$$

Programmes and instruments supporting the development of photovoltaics in buildings in Poland

My Electricity

- ✓ Programme to be implemented between 2019 and 2025 with €235 million budget
- ✓ Beneficiaries – individuals generating electricity in a micro installation for their own needs
- ✓ Grant funding of up to 50% of eligible costs
- ✓ Eligible costs include: purchase, assembly and start-up of the installation
- ✓ Installed capacity ranging from 2 to 10 kW, up to 5000 PLN

Thermo-modernisation tax relief

- ✓ Beneficiaries: owners or co-owners of single-family buildings
- ✓ Deduction from the tax base up to 100% of expenses incurred up to PLN 53 000
- ✓ Expenditure related to the implementation of thermo-modernization projects – construction materials and devices + assembly

Clean Air Programme

- ✓ Funding in the form of preferencial loan up to 100% of eligible costs

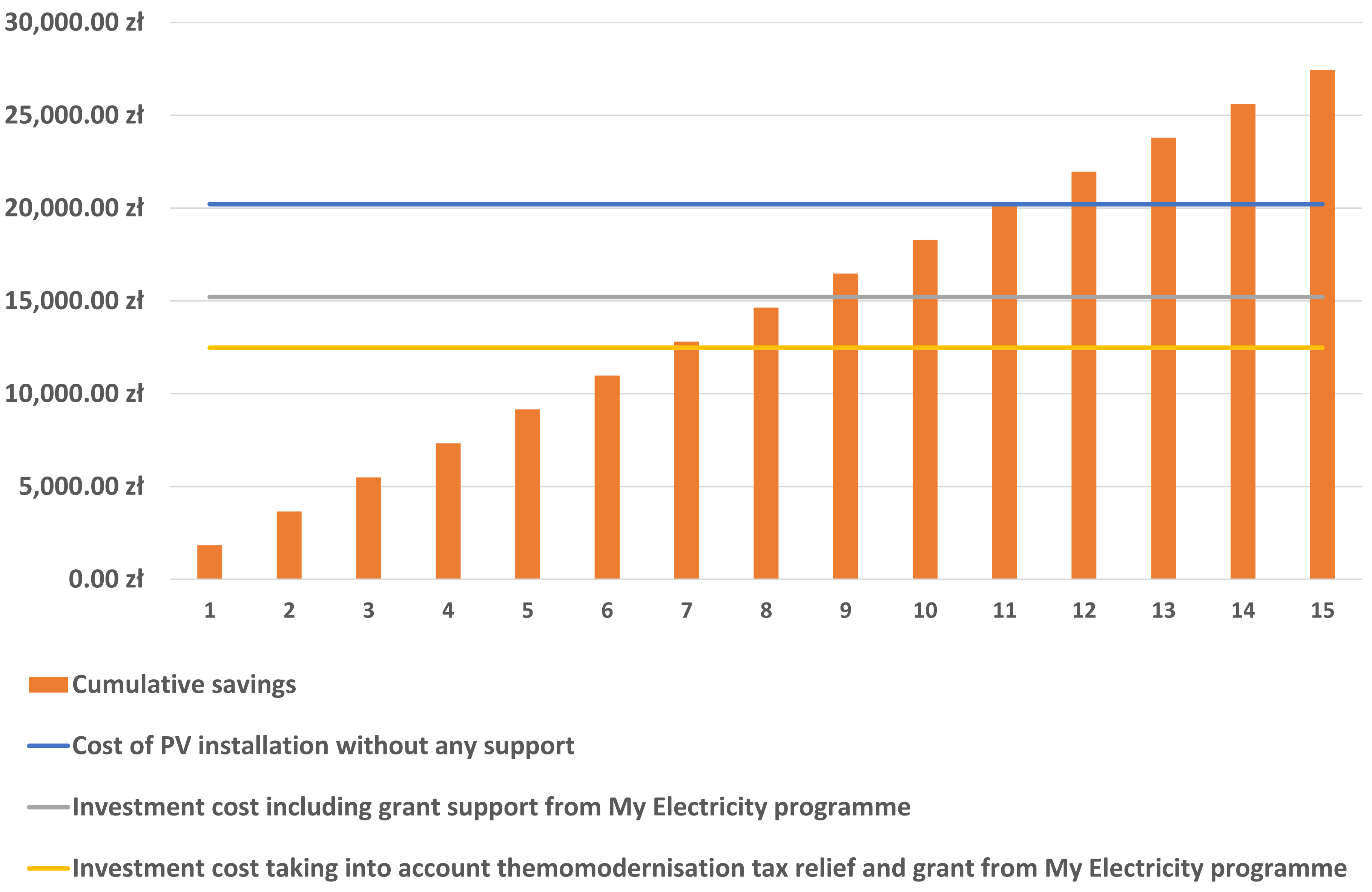
Impact of support programmes and financial instruments on profitability of PV investments

Profitability of a 4 kW PV system fully covering electricity demand of a typical single-family house

Assumptions:

- Annual energy demand - 3000 kWh;
- Solar irradiation – 1028 kWh/m^2, data provided by Ministry of Investments and Development;
- Total loses – 12%;
- Annual energy yield– 3618 kWh;
- Self-consumption – 15%;
- Energy fed into the grid– 3060 kWh;
- Unit cost of installation– 5000 zł/kW$_p$;
- Electricity price – 0,617 zł/kWh (0,14 EUR/kWh).

Impact of support programmes and financial instruments on profitability of PV investments



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For further info'

http//www.euheroes.eu

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EU Heroes

Egni

Egni Co-op is a community organisation which funds and manages rooftop PV installations in Wales.

- Set up by Awel Aman Tawe (AAT), a community energy charity which has been operating for 20 years.
- Set up Awel Coop, 4.7MW wind farm. Started in 1998 - commissioned in Jan 2017. It's a long story…www.awel.coop. But wind farm key to Egni expansion
- Grants/contracts (£100k) also very helpful to reduce risk
- Prime drivers are tackling climate change and engaging people in energy.

Gwasanaeth Ynni Energy Service

Green Vibrant Enterprising Accessible Regenerate Neath Port Talbot

Cronfa Amaethyddol Ewrop ar gyfer Datblygu Gwledig: Ewrop yn Buddsoddi mewn Ardaloedd Gwledig
European Agricultural Fund for Rural Development: Europe Investing in Rural Areas
Llywodraeth Cymru Welsh Government

Cronfa Gymunedol Fferm Wynt PEN Y CYMOEDD Wind Farm Community Fund CIC

Cymunedau Cynaliadwy Cymru Sustainable Communities Wales

Egni / Awel Aman Tawe

Current Status

- Ysgol Gwaun Cae Gurwen 16kw installed in 2004 – largest project of type in Wales at time
- Now 2.4MW on roofs throughout Wales – schools, businesses, community centres.
- Aiming for 500kw - 1MW before Sept 2020
- Model helped by FiT with up to 1MW extra subsidy free
- Ongoing Share Offer has raised £1.8m @ 4% & £2.1m secured from Dev Bank of Wales @ 5%

EGNI COOP

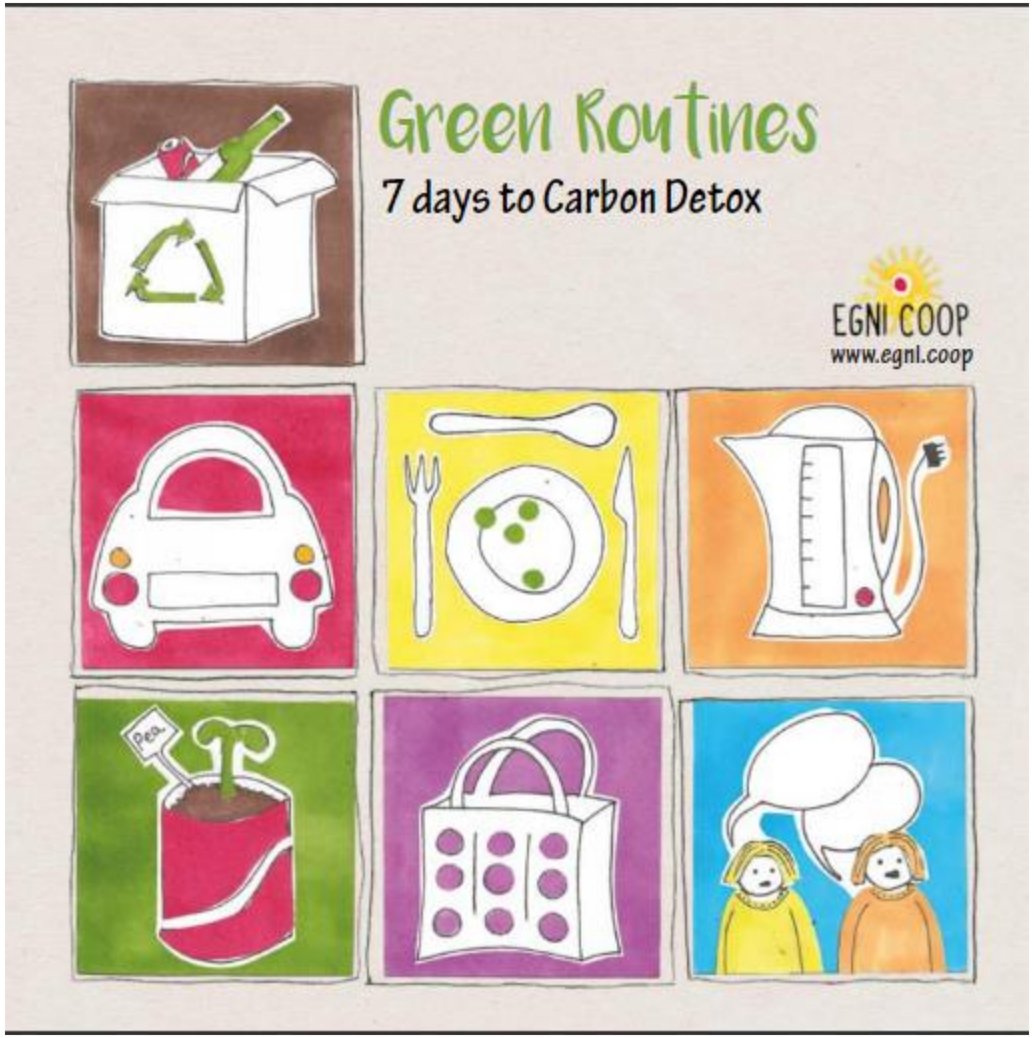
Egni: Challenges

- New staff – massive change but tempting to do too much
- Procurement
- Capacity within Local Authorities
- Leases
- FiT deadline, and then,…Covid19

EGNI CO-OP

Egni: Education

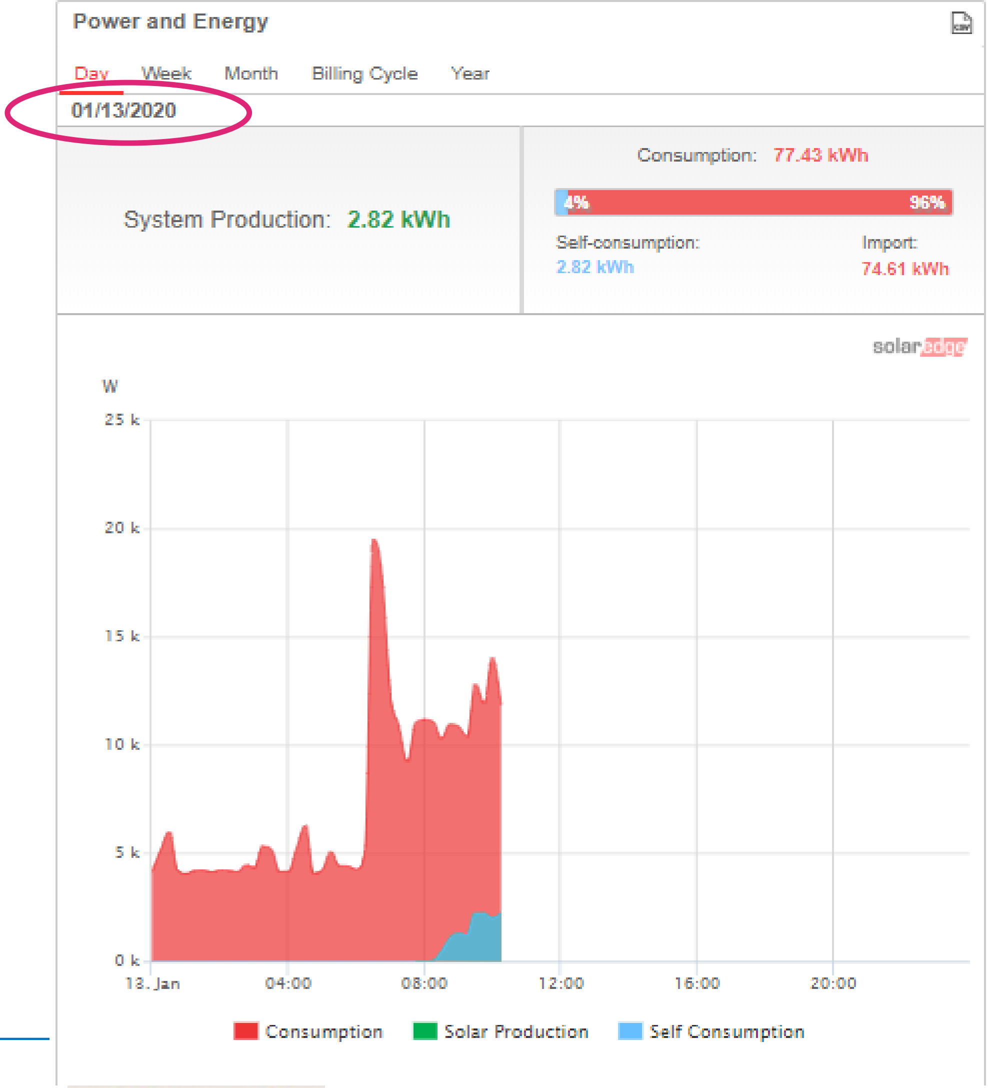
- Energy Data platform for schools
- Resources to enable schools to integrate data from the installation into lessons. Will be free to all and online.
- Includes Green Routines and short audios of interviews with people in Wales and how they live / cut their carbons
- Aiming to secure funds for an Education Officer to visit schools / support teachers
- £500 of shares in Egni to all schools – link to coop entrepreneurship & climate change
- We're part of a two-year EU project to support co-op entrepreneurship in schools
- Free visits to our wind farm (including coach travel)
- Open book about our costs, income and generation data, increasing learning opportunities


Green Routines
7 days to Carbon Detox
EGNI COOP
www.egni.coop
Pea

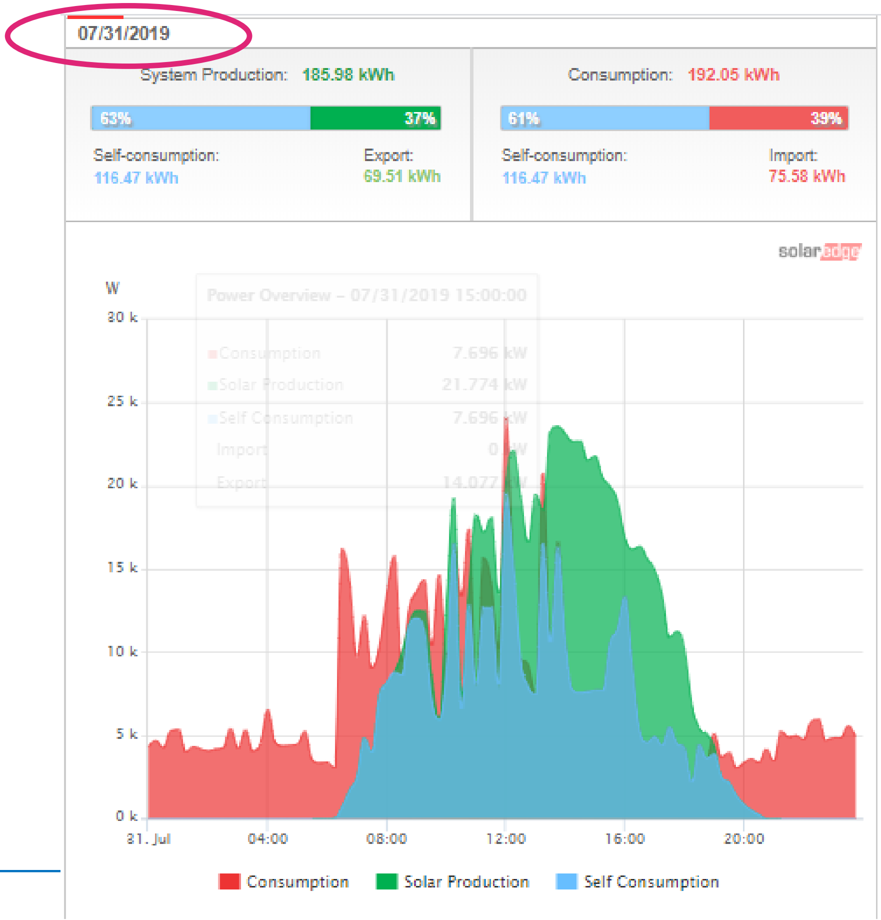
EGNI CO-OP

Web portal

See the solar panels' generation, your onsite consumption of grid electricity and how much solar energy you're using onsite – straight from the roof!

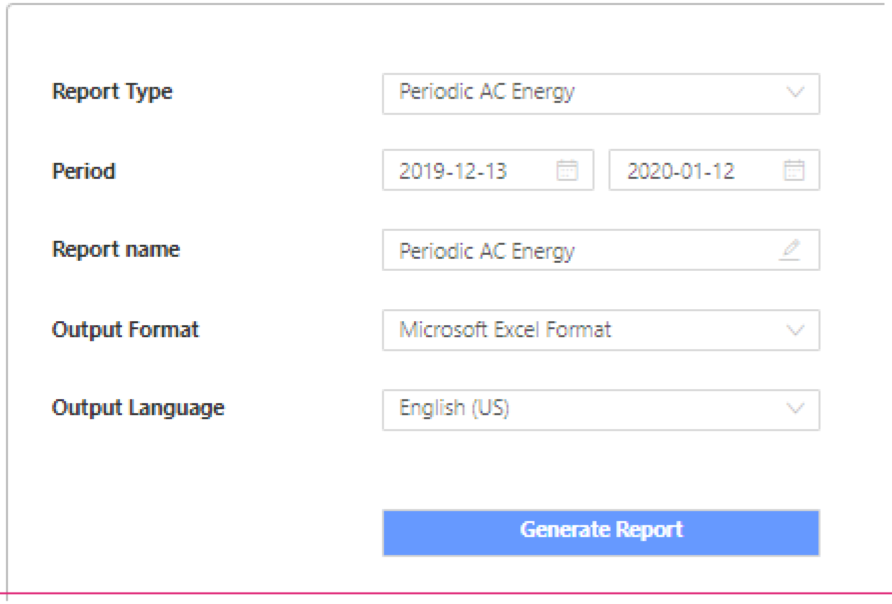


Compare today with with a summer day

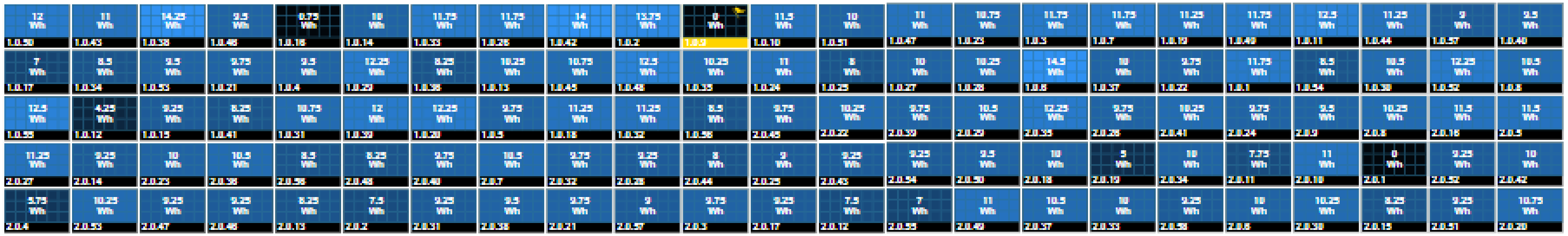


Web portal

Generate reports on the installation



See data from every panel on the roof. Can you see any which are not performing well? What's wrong with them and what should we do?



EGNI CO-OP

Egni: What Next

- Install as much as possible

Issues will be:

- Lockdown
- O&M / Billing of existing sites
- Install cost
- PPA prices
- Council capacity
- Availability of panels etc

EGNI CO-OP

Egni: Beyond FiT

- Procurement & Public Sector capacity. Partnership needed based on values
- Subsidy free solar – will 20% electricity cost reduction work? Will need high onsite use so community buildings hard without grant
- Links to other coops to reduce costs eg Big Solar Coop. Joint procurement of panels?

EGNI CO-OP

Diolch/Thanks! Egni Coop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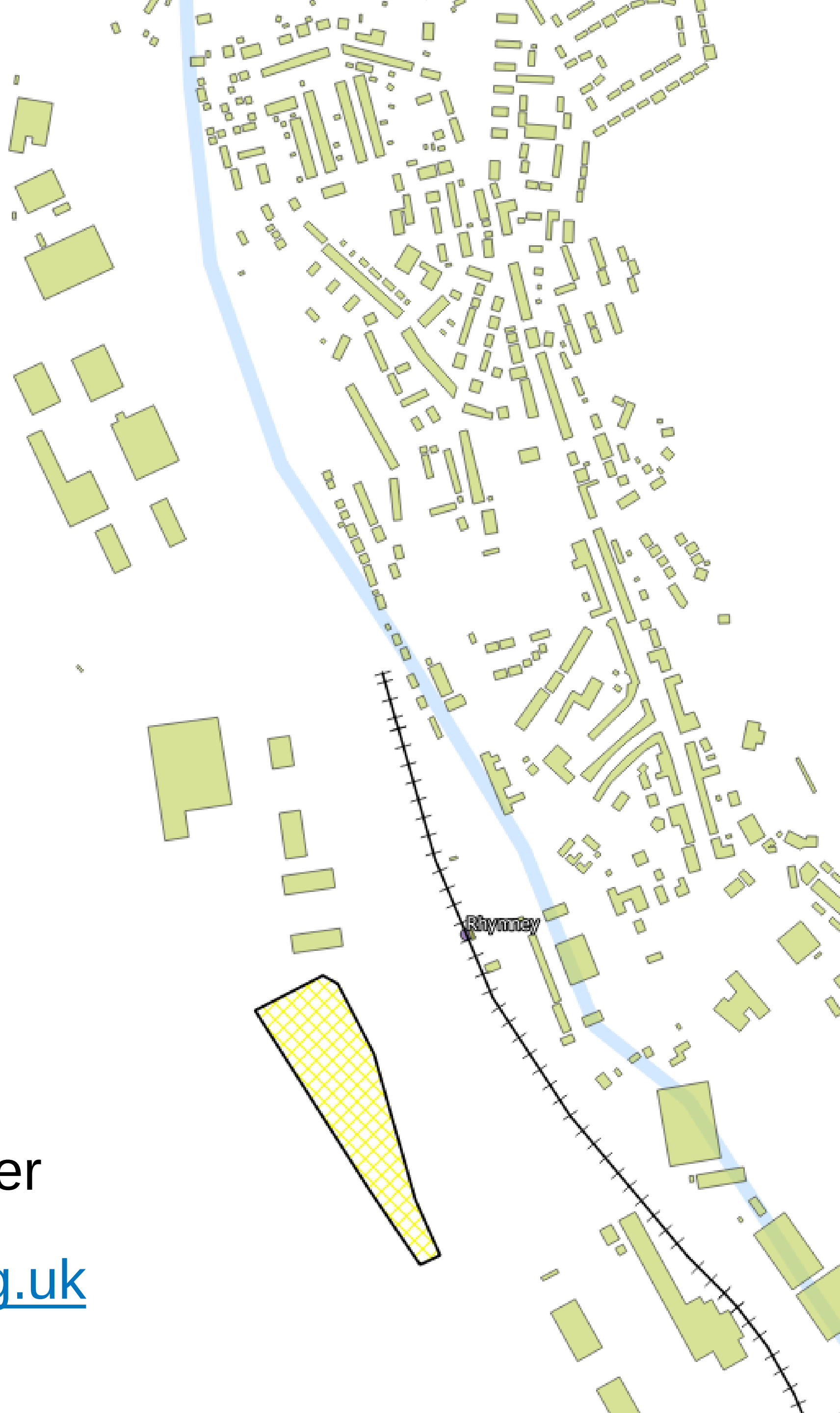
Green Valley Lines

Connecting local renewable generation to rail traction networks

Ben Ferguson

Development Manager

Ben.Ferguson@est.org.uk



Green Valley Lines –

Project Partners

RSSB A Better, Safer Railway

UKRI Innovate UK

NetworkRail

TRAFNIDIAETH CYMRU
TRANSPORT FOR WALES

RIDING SUNBEAMS

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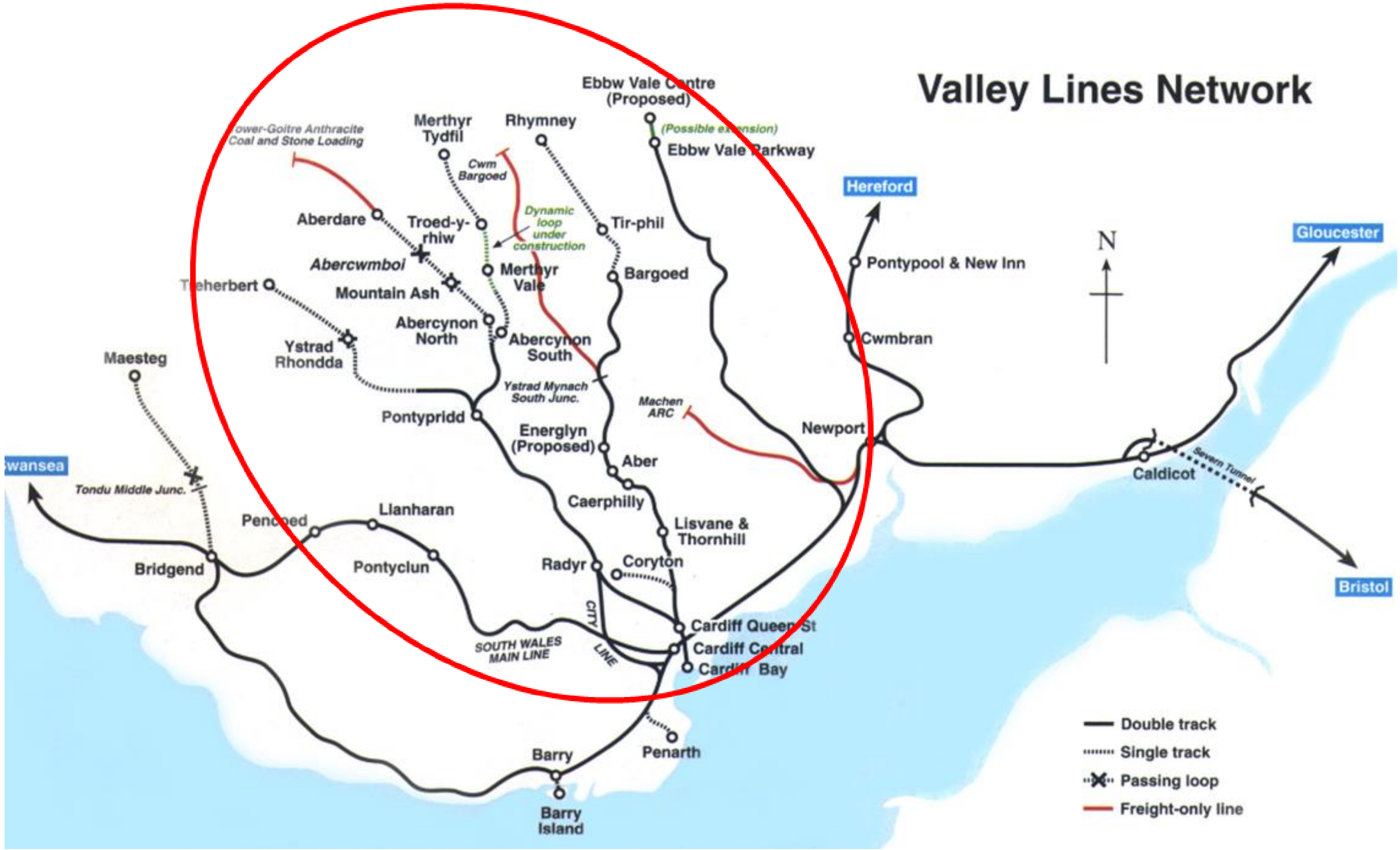
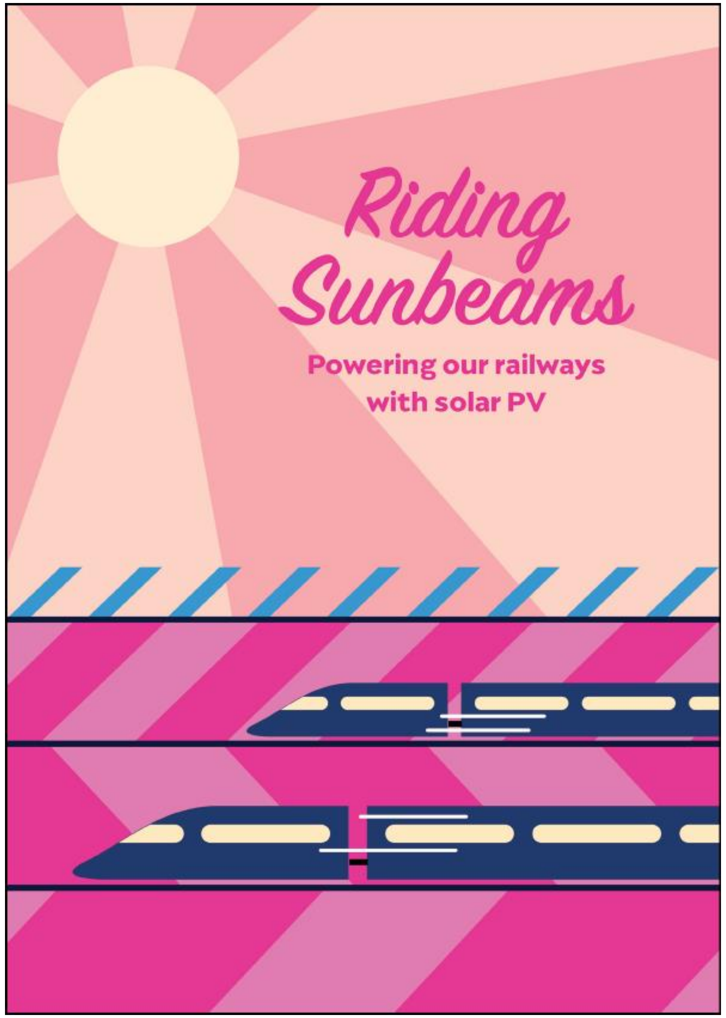
RICARDO Ricardo Energy & Environment





Green Valley Lines

Project Context

REPOWER Balcombe:

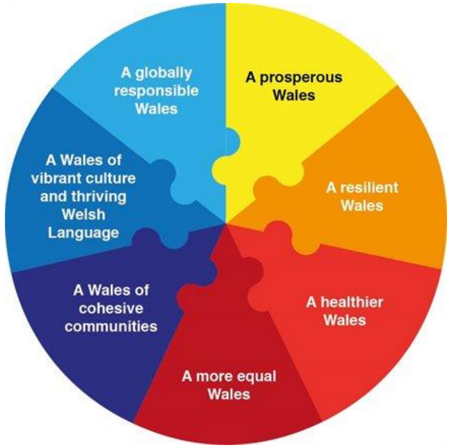
- ”We don’t want fracking, now we can’t afford the grid connection for solar pv”
- Can we connect to the railway?”

10:10:

- “No-one in the world is doing this?!”
- Funding won from Innovate UK
- Imperial College, Community Energy South, Turbo Power systems
- Identified community sites, and technological barriers and solutions to powering low voltage dc and high voltage ac rail traction demand
- Led to “First Light” 100kW test connection at Aldershot Station

https://www.ridingsunbeams.org/ourwork/firstlight

Green Valley Lines – useful drivers for a new route to market:



POLICY:

- Wellbeing of Future Generations (Wales) Act 2015
- Welsh Government Renewable Energy and local generation and ownership targets
- Emerging adoption of Climate Crisis Declarations
- Carbon pricing?

Transport for Wales:

100%
renewable energy on Core Valleys Lines by 2023

50%
of renewable energy generated in Wales by 2025

Over £7 million
spend for renewable technology

UK Rail Industry:

- Response to UK Minister for Rail's challenge to the industry to remove "all diesel only trains off the track by 2040"
- "each key constituent of the industry eg Network Rail, TOC, FOC, ROSCO etc, should publish a long-term plan to achieve interim and long-term targets towards rail decarbonisation in support of net zero carbon by 2050. These will be reviewed, monitored and regulated by a central body"

QUESTION:

"In a new electrification project, might co-design of the traction network with local supply of renewable power generation contribute to financial viability?

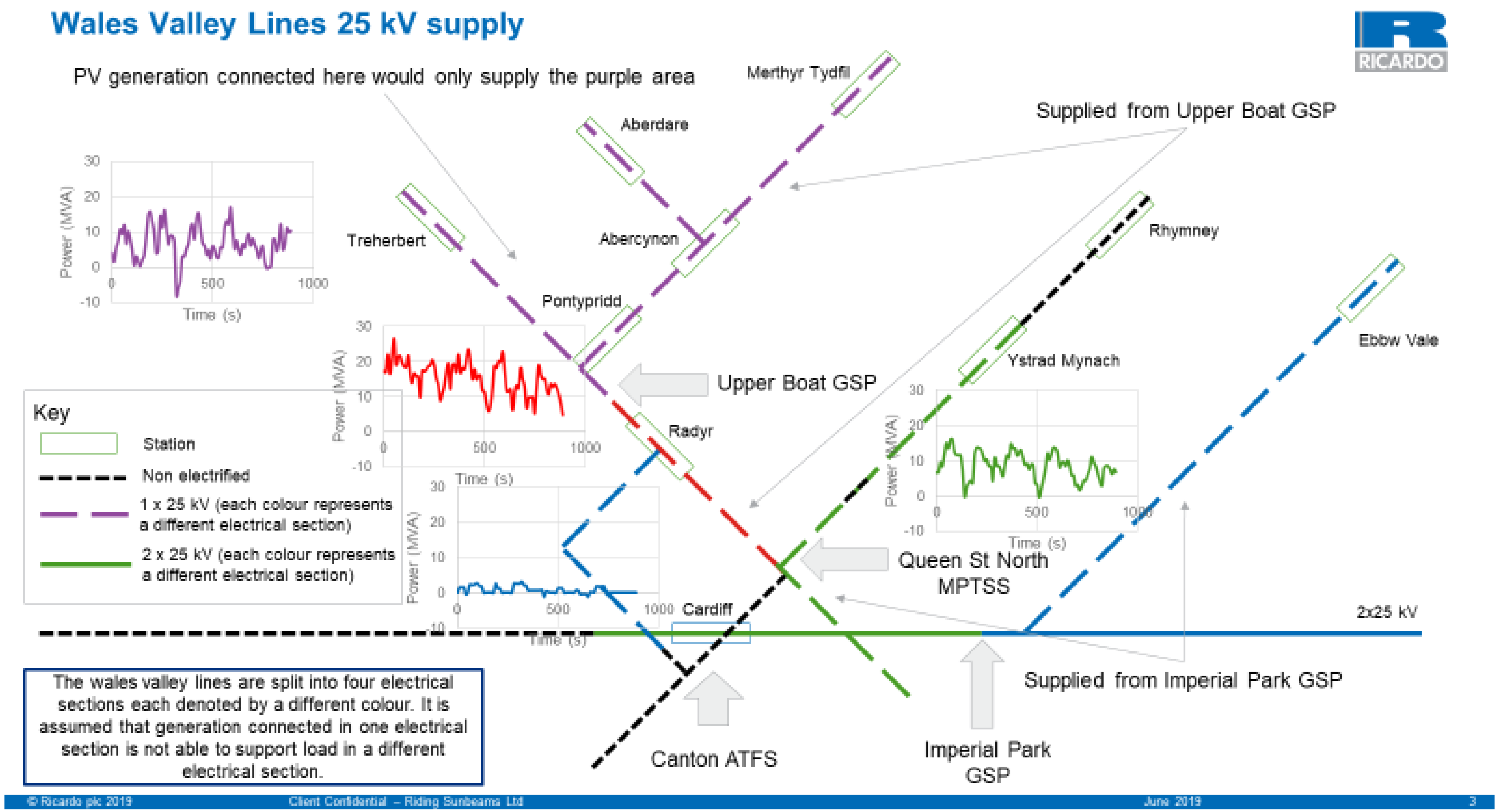
Green Valley Lines – Project Scope:

TASKS:

- Detailed interface design
- Load profiling and matching
- Resource mapping
- Lineside storage analysis
- Financial modelling and sensitivity testing

OUTPUTS:

- South Wales Metro Design Recommendations
- Generic guidance on integrating renewable supply to AC rail traction
- Public Summary report
- Portfolio of potential sites (solar pv and wind)



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What actually happened?

Challenges…	… and responses
TfW engineers had fixed the Grid Supply Points before our project started…	…but it turned out we could build new connection gantries anywhere on the line at a bearable cost (approx. £100,000)
We could obtain converters on the market – but with a higher spec than we needed, at a greater cost than was viable…	…so 'next step' funding is being sought to design a purpose made convertor technology that delivers a viable price point – which we determined in our financial sensitivity tests
Battery storage was prohibitively expensive….	…so we modelled for a modest spill to grid, and recommend that the rail network license is extended to allow export via the grid supply point
The topography adjacent to 'valley' lines is often unsuitable for solar pv or wind…	…but we worked our assumptions on costs for private wire and found plenty of solar sites within 1km of trackside, and wind sites within 2km of trackside
We found we could generate more than enough power to supply the traction demand…	…but without battery storage, the key limiting factor is in fact the ~10MW ac maximum line capacity on the rail ac system

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Setting the hurdles

Solar PV Generation:			TAM North			TAM South and Rhymney			Ebbw Vale			Radyr		
		Convertor Price Point	80.00	£150	£250	£80	£150	£250	£80	£150	£250	£80	£150	£250
Project Characteristics at 8p/kWh	minimum viable capacity	MW	7	8	9	7	7	8	6	7	8	7	7	8
	Yield net of maintenance curtailment	kWh per annum	7,506,344	8,578,678	9,651,013	7,506,344	7,506,344	8,578,678	6,477,134	7,551,183	8,624,956	7,506,344	7,506,344	8,578,678
	Traction demand met	%	16.93%	19.06%	21.08%	5.61%	5.61%	6.41%	48.93%	50.89%	52.48%	46.06%	46.06%	48.07%
	Greenhouse Gas displaced (CO2e)	metric ton	796	1,003	1,243	31	31	36	5,376	6,267	7,159	6,230	6,230	7,120
	CO2 value per annum	nominal £10/metric ton	£7,963	£10,026	£12,432	£315	£315	£360	£53,760	£62,675	£71,587	£62,303	£62,303	£71,203
	Power exported through GSP	KwH	6,546,965	7,370,772	8,153,170	7,468,411	7,468,411	8,535,327	5,122,494	6,142,360	7,172,046	5,681,464	5,681,464	6,674,449
	Traction power to Metro lines	KwH	959,378	1,207,906	1,497,843	37,932	37,932	43,351	1,354,640	1,408,823	1,452,909	1,824,880	1,824,880	1,904,230
Project Characteristics at 10p/kWh	minimum viable capacity	MW	5	5	6	5	5	6	5	5	5	5	5	6
	Yield net of maintenance curtailment	kWh per annum	5,361,674	5,361,674	6,434,009	5,361,674	5,361,674	6,434,009	5,402,539	5,402,539	5,402,539	5,361,674	5,361,674	6,434,009
	Traction demand met	%	12.40%	12.40%	14.70%	4.01%	4.01%	4.81%	46.40%	46.40%	46.40%	40.44%	40.44%	43.60%
	Greenhouse Gas displaced (CO2e)	metric ton	470	470	621	22	22	27	4,484	4,484	4,484	4,450	4,450	5,340
	CO2 value per annum	nominal £10/metric ton	£4,698	£4,698	£6,214	£225	£225	£270	£44,841	£44,841	£44,841	£44,502	£44,502	£53,402
	Power exported through GSP	KwH	4,795,659	4,795,659	5,685,317	5,334,579	5,334,579	6,401,495	4,117,986	4,117,986	4,117,986	5,361,674	5,361,674	6,434,009
	Traction power to Metro lines	KwH	566,015	566,015	748,691	27,094	27,094	32,513	1,284,553	1,284,553	1,284,553	3,759,690	3,759,690	4,706,848

What would be the smallest viable site (in whole MW)?

- At 3 converter cost points
- On a lifetime, RPI linked ppa at 8 or 10 p/kWh
- Meeting a minimum IRR of 5% & DSCR of 1.2%

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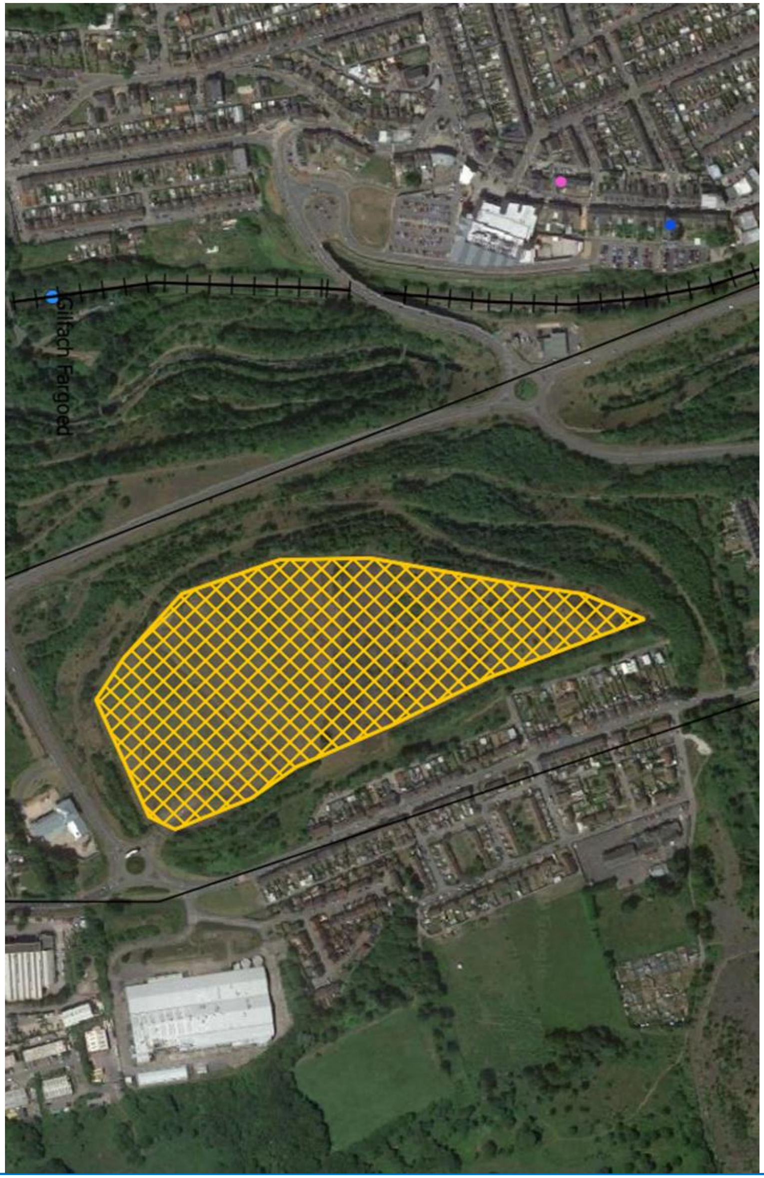
Defining the potential

Sites viable at 8p/kWh			Renewable Capacity		line section capacity & limit			illustrative deployment			traction contribution		
utilisation section	line section	site name	max generation capacity MW solar	max generation capacity MW wind	max MW solar capacity by line section	max MW wind capacity by line section	max line section injection capacity MW	wind deployed	solar deployed	total MW deployed	% traction demand met by wind deployed	% traction demand met by solar deployed	total % traction demand met
TAM North	Merthyr	Merthyr wind 1		6	8	6	10	6		6	28.48		153.67
		Merthyr Solar 2	8										
	Treherbert	Treherbert Wind 1		6	18	24	10	10		10			
		Treherbert Wind 2		6									
		Treherbert Wind 3		6									
		Treherbert Wind 4		6									
		Treherbert solar 1	18									22.99	
	Upper Boat GSP/ Porth/ Abercynon	Treherbert solar 2	7.5		7.5	10	20	10	7	17		16.93	
		Treherbert Wind 5		6							48.95		
		Pontypridd wind 1		4							36.32		
TAM South	Caerphilly/ Rhymney	Rhymney solar 2	11		11	12	20	12	8	20		6.41	25.29
		Rhymney Wind 1		6							9.53		
		Rhymney Wind 2		6							9.35		
Ebbw Vale & Radyr	Ebbw Vale	Ebbw Wind 1		6	41	6	10	4	6		71.6		120.53
		Ebbw Solar 1	12									48.93	
		Ebbw Solar 2	9										
		Ebbw Solar 3	20										
	Radyr	NO SITES	NO SITES	NO SITES	NO SITES	NO SITES	NO SITES	NO SITES	NO SITES	NO SITES	NO SITES	NO SITES	NO SITES

Projects identified were shortlisted to meet the financial benchmarks

Conditions to be met:



- The rail electrical network license must be altered to allow for surplus to be exported onto the grid under standard power purchase agreements (could also be sleeved PPAs back to rail operators)
- A design specification to produce suitable convertor technology within the £80-£250 per kW price point must be achieved (versus existing over-specified convertors at around £1,000 per kW)
- For battery storage to be cost effective, prices will need to come down further

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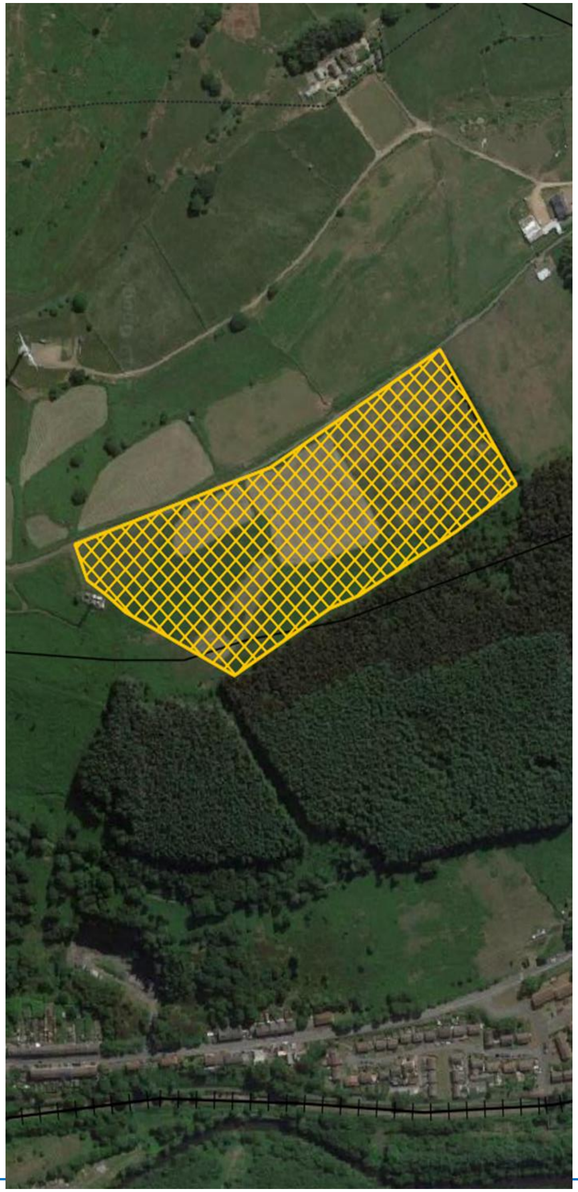
Outcomes:

- A technically capable engineering solution for injecting renewable power generation directly to ac rail networks, whether in new or retrofit scenarios
- Some regulatory and market barriers to deploying this solution have been defined
- We have demonstrated that solving the barriers is worthwhile and will unlock a meaningful route to market for new renewable power generation while avoiding the need for traditional grid connection and associated infrastructure costs
- We have provided a benchmark and methodology for identifying the correct scale and type of generation projects to connect
- We can, under corrected conditions, meet the Transport for Wales decarbonisation objective for 2025 AND offer a long-term low-cost price of energy to the operator (@ 8p/kWh linked to RPI for 20- 30 years)



Next steps

- Funding application submitted to UKRI for convertor development
- Further refinement of the potential to blend generation technologies and maximise the total capacity connected to any 10MW ac line section
- Riding Sunbeams CIC intend to develop the renewable energy sites with support from the Welsh Government Energy Service – and when constructed, 51% ownership to be made available to local communities

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Thank you – questions?

Further info available soon at:
https://www.ridingsunbeams.org/ourwork/greenvalleylines


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Energising Community PV

Part 2: Building on the Momentum

During the second session the EU Heroes team will be presenting their perspectives on the short, medium and longer-term opportunities for PV community projects in their respective countries, as well as more broadly across the EU as a whole.

12:00 CEST	The EU Heroes Project Team	**ROUNDTABLE** • *What do you think are the key opportunities for community PV in 2020?* • *What is your vision for community PV in 2030?* • *How do energy communities get from 2020 to your vision of 2030?*
	Rebecca van LEEUWEN- JONES, Graham AYLING, Otto BERNSEN - EU Heroes Project Team	**Summary & Wash-up**
13:00 CEST	Webinar Close	


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Energised Communities Envisioned

- What do you think are the key opportunities for community PV in 2020?
- What is your vision for community PV in 2030?
- How do energy communities get from 2020 to your vision of 2030?

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All presentations available for download from the EU Heroes Website:

euheroes.eu

Let's keep the conversation going:

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