LOGREENER

Composing Local Green Energy Transition

Comprehensive Energy Transition Planning at the Local Level – LOGREENER Toolkit for Local Authorities

CEESEU-DIGIT CONFERENCE Pathways to Successful Energy and Climate Planning: Regional Leadership and Innovation in Central and Eastern Europe

Dr. Antun Pfeifer, Prof. Neven Duić

University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture

Hotel Academia, Zagreb, Croatia 07.05.2025.

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Why is planning important?

- Trends toward high electrification and sector coupling
- The need to achieve ambitious renewable energy goals
- Today, different layers of numerous stakeholders
- Choosing priorities
- Holistic planning implies optimal resource utilization
- Supporting sustainable development at the local level
- Overall, be proactive in assessing proposed projects
- Not limited to technical aspects (collaborate, network)

What can the municipality gain from this?

- Increased awareness of opportunities
- Assessment allows determining priorities for critical issues
- Identify opportunities and seek funding
- Utilize innovation financing
- Present planning opportunities and engage community members early
- Create a clear roadmap for potential investors
- Partner with other municipalities and associations
- Raise issues of increased interest at a higher political leve
- Integrate planning into a SECAP (Sustainable Energy and Climate Action Plan)

About LOGREENER

Composing Local Green Energy Transition - LOGREENER

Approved by Monitoring Committee of Interreg Euro MED Programme on 21st November 2023: 2nd Call for proposals - Thematic Projects

- **Project mission:** Promoting green living areas
- **Objective:** improve the capacities of local authorities to plan and deploy sustainable energy transition local plans, creating an optimized and comprehensive toolbook, based in the results of 3 Interreg MED projects: COMPOSE, PRISMI and LOCAL4GREEN

Interreg Mediterranean COMPOSE COMPOSE PLUS

Interreg Mediterranean PRISMI

Interreg Mediterranean LOCAL4GREEN

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2. Ciljane skupine i Partnerstvo

Target group: Local Authorities and key multiplier stakeholders

- **Duration:** 1 January 2024 – 31 March 2026 (27 months)
- Valencian Federation of Municipalities and Provinces, FVMP, Spain

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Toolbox

Composing Local
Green Energy Transition

Find the Right Tools

Enter the area of your interest and get access to:

Sustainable Energy Planning

Step-by-step guidance for planning, implementing, monitoring and evaluating energy transition projects.

Energy Scenario Modelling

Tools and case studies to assess alternative pathways for renewable energy integration

Fiscal Policies for Green Transition

Examples and methodologies of local green taxation incentives.

Clean and Efficient Energy Best Practices

Case studies from successful sustainable energy initiatives.

Capacity Building & Training

Guides, videos, webinars and other resources on how to use the LOGREENER toolkit.

EU Energy & Climate Policies

European policies and strategies shaping the energy transition.

Toolbox

Composing L
Green Energy

Explore Real-World Applications of Renewable Energy Modelling

Modelling Renewable Energy Scenarios is one of the key steps in local energy planning, that enables the evaluation of different renewable energy systems and strategies, tailored to the characteristics of each region. Through scenario modelling, municipalities and stakeholders can assess the feasibility and impacts of different renewable energy integration levels, from minor adjustments to a complete transition to renewable energy sources, balancing supply and demand, and achieving long-term sustainability goals.

Learn more from case studies developed within the PRISMI and PRISMI PLUS projects, co- funded under Interreg MED 2014-2020. These real-world applications showcase how rural and island areas have used energy modelling to assess their transition potential, optimize renewable energy use, and address local challenges.

Get inspired by the experiences and lessons learned from the PRISMI case studies!

Show all   or filter by: Country   Territorial Type   Renewable Energy Technology   Energy Management

Croatia, Rural area, Biomass/ Bioenergy, Solar Energy, Smart Grid & V2G

DEVELOPING A SUSTAINABLE ENERGY FRAMEWORK IN MRKOPALJ, CROATIA

Italy, Insular area, Solar Energy, Wind Energy, Heating & Cooling Technologies, Smart Grid & V2G

MERGING HERITAGE AND ENERGY INNOVATION IN FAVIGNANA, ITALY

To support long-term energy planning in insular areas, an analysis was conducted for the Municipality of Favignana, ...

Cyprus, Insular area, Solar Energy, Wind Energy, Energy Storage Solutions, Smart Grid & V2G

BALANCING NATURE AND SUSTAINABLE ENERGY IN AKAMAS, CYPRUS

Practical guides: +

Other useful links: +

General approach

A common methodology

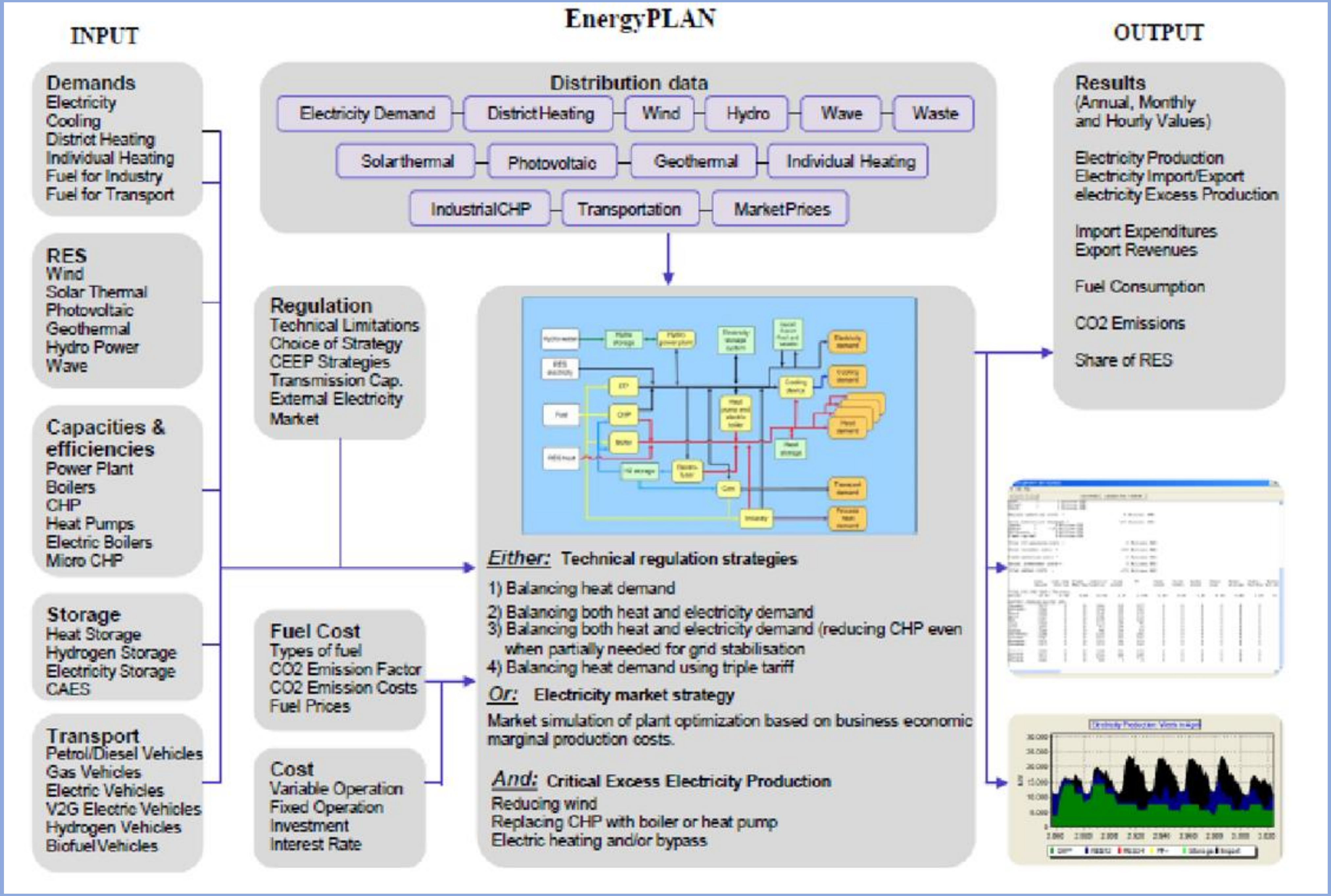
- Assess the potentials
- Acquire the data using available tools

Energy system model

- Pre-process the demand data
- Pre-process the meteorological data for RES production forcast
- Model the referent scenario and future scenarios

Techno-economic assessment

- Schedule the measures and achive optimal performace of the system
- Achive the goals


EnergyPLAN
INPUT
OUTPUT
Demands
Electricity
Cooling
District Heating
Individual Heating
Fuel for Industry
Fuel for Transport
RES
Wind
Solar Thermal
Photovoltaic
Geothermal
Hydro Power
Wave
Capacities & efficiencies
Power Plant
Boilers
CHP
Heat Pumps
Electric Boilers
Micro CHP
Storage
Heat Storage
Hydrogen Storage
Electricity Storage
CAES
Transport
Petrol/Diesel Vehicles
Gas Vehicles
Electric Vehicles
V2G Electric Vehicles
Hydrogen Vehicles
Biofuel Vehicles
Distribution data
Electricity Demand
District Heating
Wind
Hydro
Wave
Waste
Solarthermal
Photovoltaic
Geothermal
Individual Heating
IndustrialCHP
Transportation
MarketPrices
Regulation
Technical Limitations
Choice of Strategy
CEEP Strategies
Transmission Cap.
External Electricity Market
Fuel Cost
Types of fuel
CO2 Emission Factor
CO2 Emission Costs
Fuel Prices
Cost
Variable Operation
Fixed Operation
Investment
Interest Rate
Either: Technical regulation strategies
1) Balancing heat demand
2) Balancing both heat and electricity demand
3) Balancing both heat and electricity demand (reducing CHP even when partially needed for grid stabilisation
4) Balancing heat demand using triple tariff
Or: Electricity market strategy
Market simulation of plant optimization based on business economic marginal production costs.
And: Critical Excess Electricity Production
Reducing wind
Replacing CHP with boiler or heat pump
Electric heating and/or bypass
Results
(Annual, Monthly and Hourly Values)
Electricity Production
Electricity Import/Export
electricity Excess Production
Import Expenditures
Export Revenues
Fuel Consumption
CO2 Emissions
Share of RES

1 RES potential assessment and data gathering

RES potential assessment and data gathering

A common methodology has been developed to identify the most promising Renewable Energy Sources (RES) that should be exploited and how to collect the necessary data for an appropriate Energy plan.

In this section:

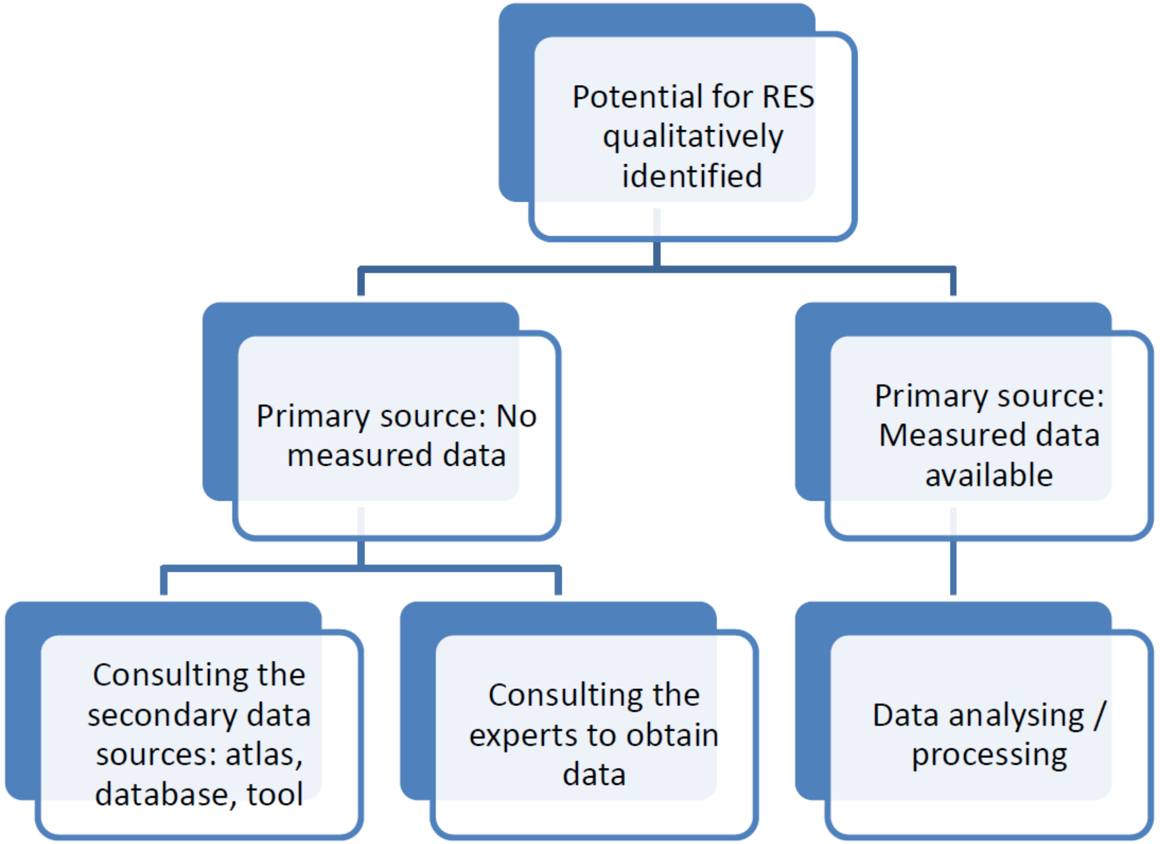
1. **Identification of local needs**: used to qualitatively and quantitatively describe energy demands at the study location.
2. **Determine the key available resources**: the key available resources are identified. This resources will be taken into account for the next step: collection of available data.
3. **Determine the availability of data for the key resources and the collection of data**: available data for the key resources is collected to allow for future assessment of the technical potential of the given resource.
4. **Assess the potential of RES according to the collected and mapped data**: using the collected data and standard engineering methods for the technical energy potential assessment, the technical potential of each RES is calculated. Such information is used for creation of scenarios of low carbon sustainable development.

RES potential assessment and data gathering

To successfully plan the energy system of isolated areas both qualitative and quantitative approaches are necessary.

- **Qualitative** approaches aim to determine which sources and kinds of demand exist in the system and which technologies can be used to satisfy the demand with given resources.
- **Quantitative** approaches describe the exact amounts of resources and demand.

In order to successfully identifying and collecting the data, there are various sources that can be used that we will see in the rest of the presentation.



RES potential assessment and data gathering - Qualitative methods

Qualitative methods are used to describe the availability of resources and demands as first step towards the planning of energy system in a geographic area.

Step 1 - mapping the needs: The level of need of commodities has to be defined locally

Step 2 - mapping the local resources: The resources are locally available (renewable) ones but also imported ones

Resource	Level	Code			
Local primary energy					
Wind	Low, Medium or High	**Wind**	WindL	WindM	WindH
Solar	Low, Medium or High	**Solar**	SolarL	SolarM	SolarH
Hydro (height)	Low, Medium or High	**Hydro**	HydroL	HydroM	HydroH
Biomass	Low, Medium or High	**Biom**	BiomL	BiomM	BiomH
Geothermal	Low, Medium or High	**Geoth**	GeothL	GeothM	GeothH
Energy import infrastructure					
Grid connection	None, Weak, Strong	**Grid**	GridN	GridW	GridS
Natural gas pipeline	No, Yes	**NGpl**	NGplN		NGplY
LNG terminal	No, Yes	**LNGt**	LNGtN		LNGtY
Oil terminal/refinery	No, Yes	**OilR**	OilRN		OilRY
Oil derivatives terminal	No, Yes	**OilD**	OilDN		OilDY
Water					
Precipitation	Low, Medium or High	**H2OP**	H2OPL	H2OPM	H2OPH
Ground water	Low, Medium or High	**H2OG**	H2OGL	H2OGM	H2OGH
Water pipeline	No, Yes	**Aqua**	AquaN		AquaY
Sea water	No, Yes	**H2OS**	H2OSN		H2OSY

RES potential assessment and data gathering - Qualitative methods

The next steps deal with the identification of relevant technologies and solutions for the future energy systems. These steps will be analysed in more details in the next presentation about the design and analysis of scenarios.

Step 3 – identifying appropriate technologies and devising scenarios:

- Local, renewable, energy sources will be given priority (due to security of supply reasons) depending on the qualitative resource assessment
- Technologies will have to be assessed from both a local and global environmental and regulatory point of views.
- Also, social viability of technologies should be pondered.

Step 4 – modelling and analysis of scenarios: What should be decided in this qualitative step is the approach and the idea to build the scenarios.

In PRISMI we have decided to analyse 3 scenarios:

- Business As Usual – BAU (or Low-RES)
- RES
- High-RES

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RES potential assessment and data gathering – Quantitative methods

Once the technologies have been identified, the resources and needs have also been identified, it is time to collect all the useful data that will be used for a detailed analysis of the energy system and for the final energy strategy planning.

Primary sources of data

Primary sources of data include measurement data and data from meteorological stations located at the location in question. Data quality: The measurement data should be collected over a period of at least 1 to 3 years to ensure that seasonal fluctuations are taken into account by the comparison with long-term data.

Secondary sources of data

Various atlases, national sources of data and data interpolated by the use of some tools are considered to be secondary sources of data. Various secondary sources are described in the next slides.

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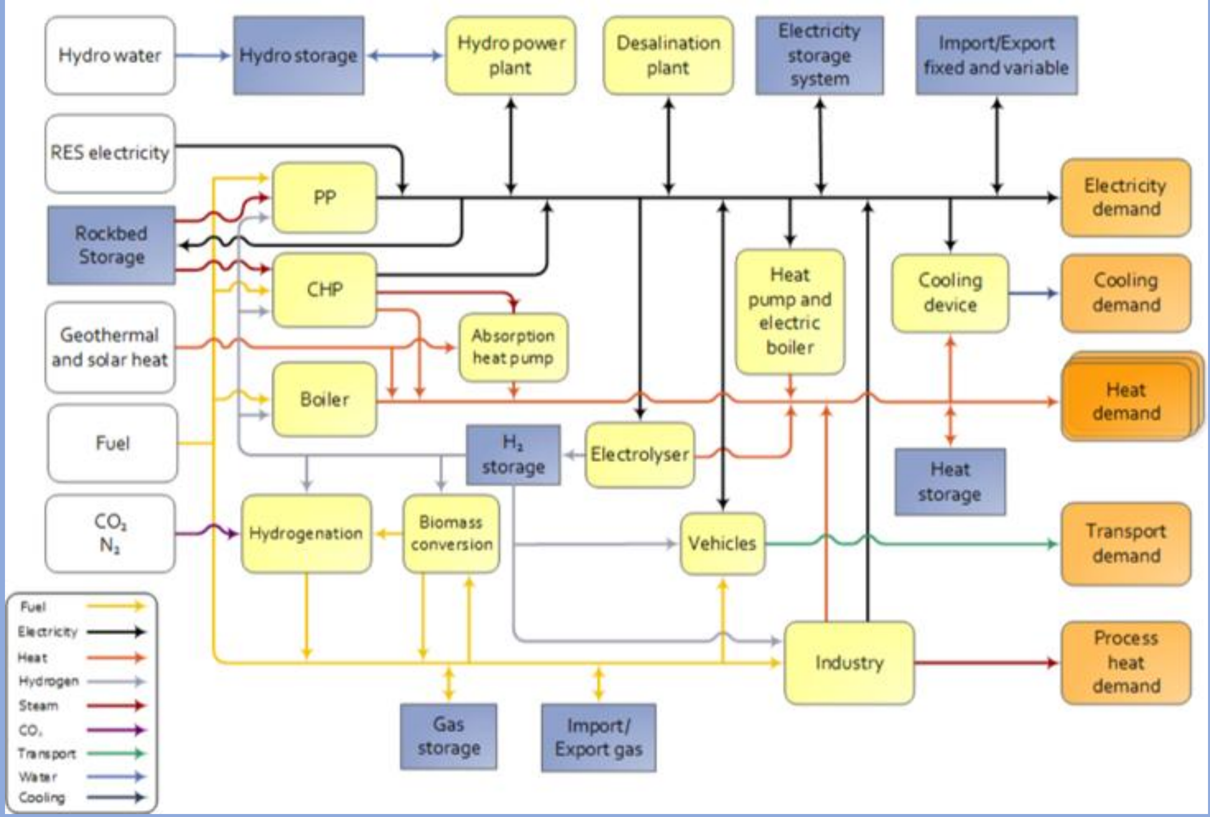
2 Chapter **Energy planning scenario analysis**

Method: energy system model in EnergyPLAN

Simulation of the hourly energy system operation for inputed configuration



Data needed: demand of each fuel for different demand sectors, fuel prices, power plants and storage technologies installed capacities, capacity for industrial and energy transformations, costs of maintenance and investments.

Variable sources are modelled using historical data and are being verified through "base" scenario – taking into account known data for some previous year.

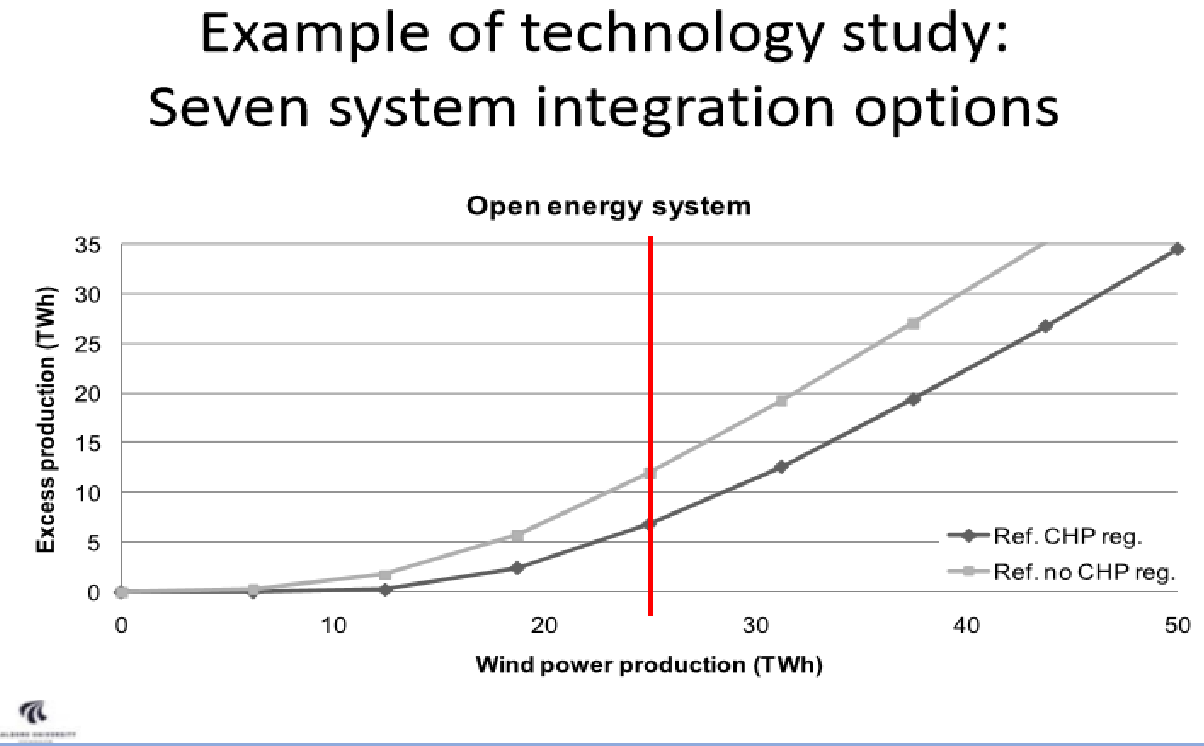
Outputs: hourly energy balance, total cost, CO_2 emissions, import/export of electricity and *critical excess electricity production*

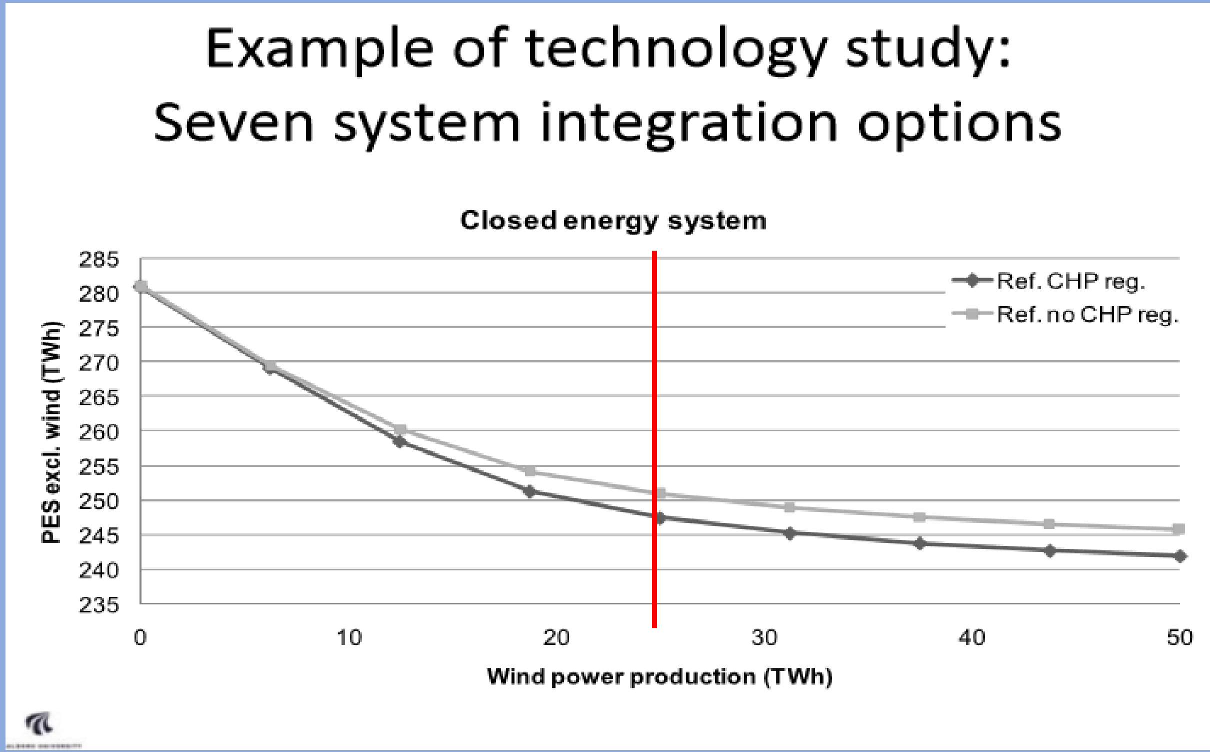
Developed by: Prof. Henrik Lund, Aalborg University, Denmark
http://people.plan.aau.dk/~lund/

Principal energy system's development scenarios

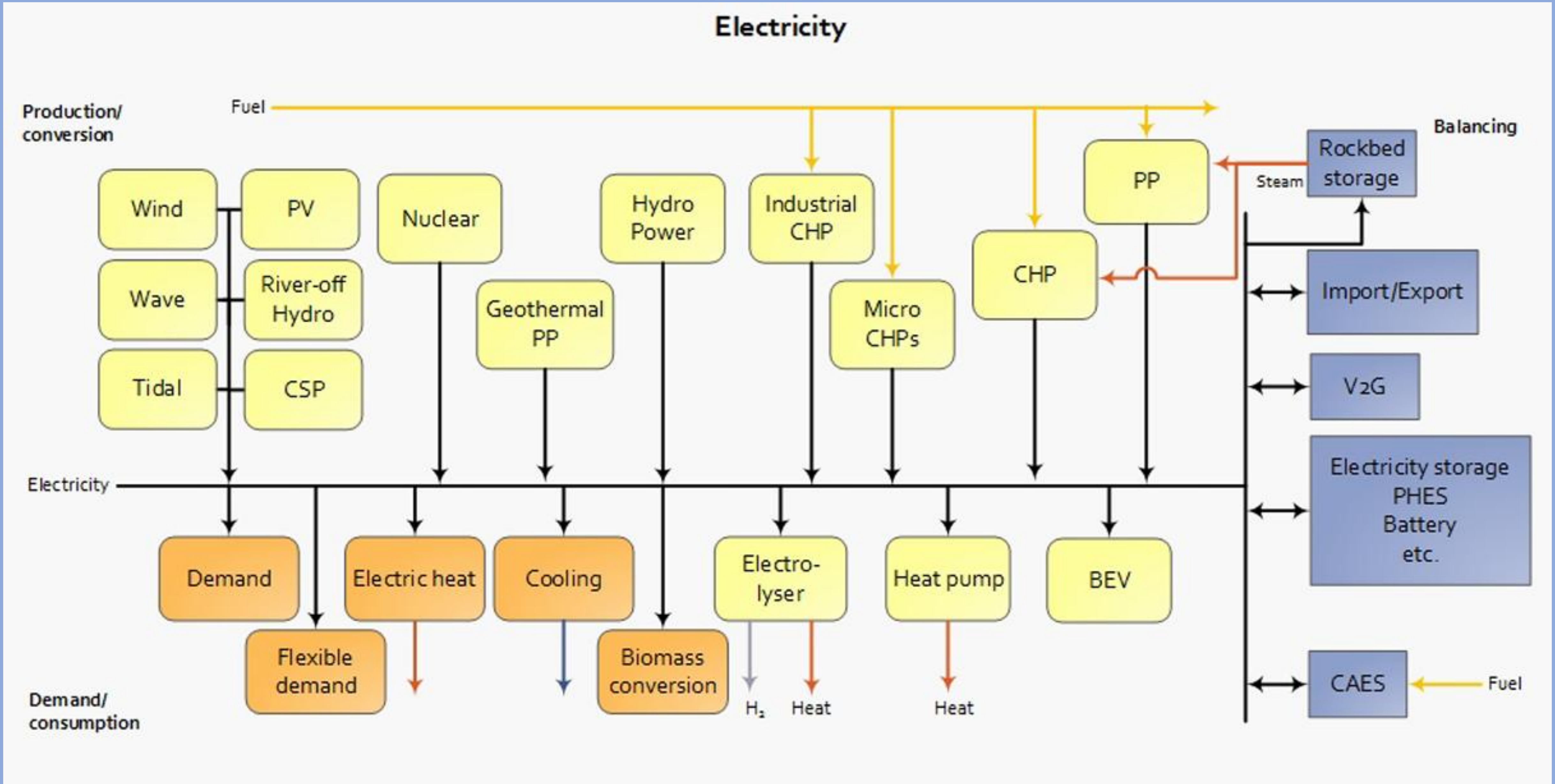
- **BAU scenario (LowRES)**: without any additional investment in RES apart from some estimated private investments as a consequence of technological development
- **RES scenario**: investment in RES is locally supported for easy-to-implement projects and does not offer the full decarbonization
- **HighRES** scenario: investments in RES cover all available potential to achieve 100% RES energy system

How energy system responds to renewables?

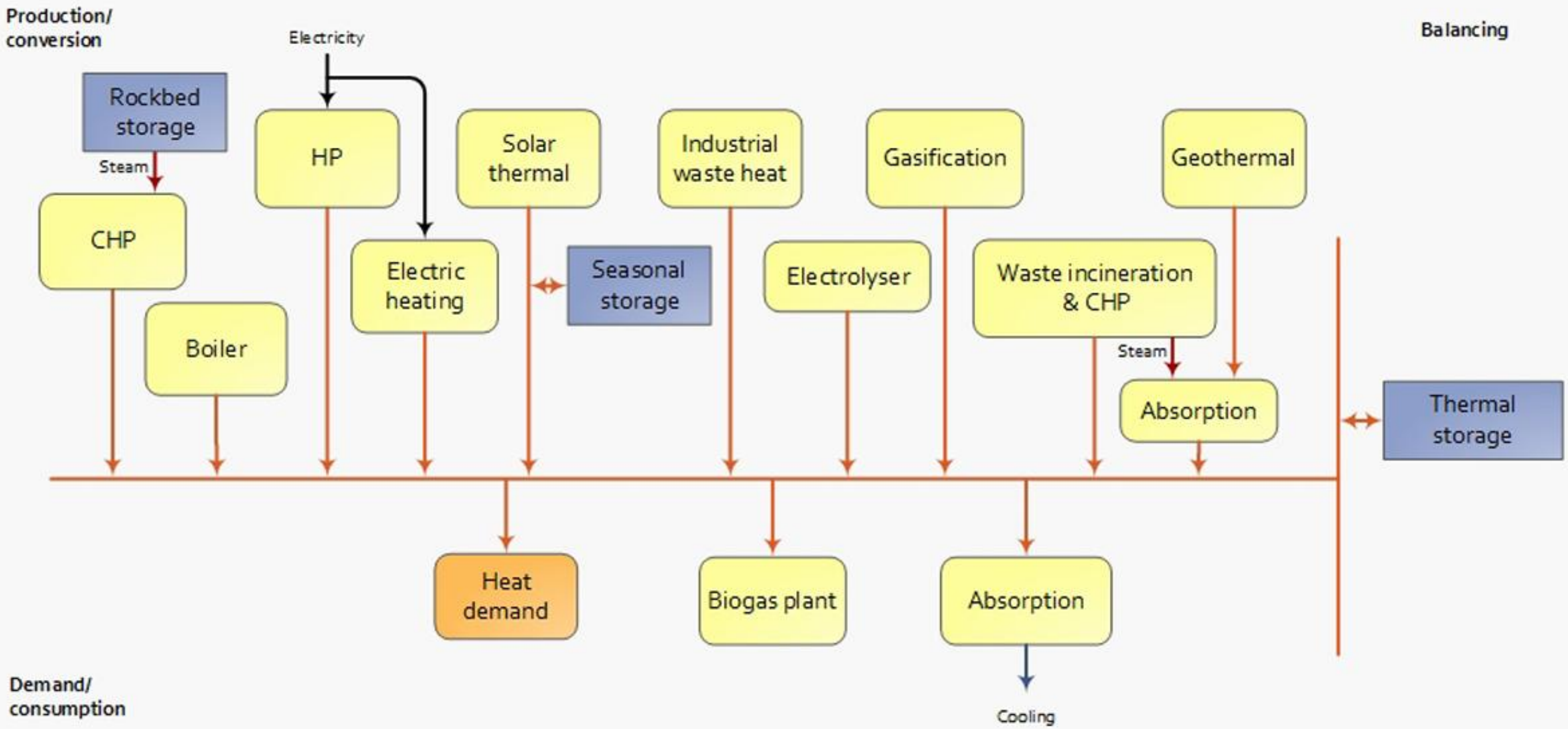




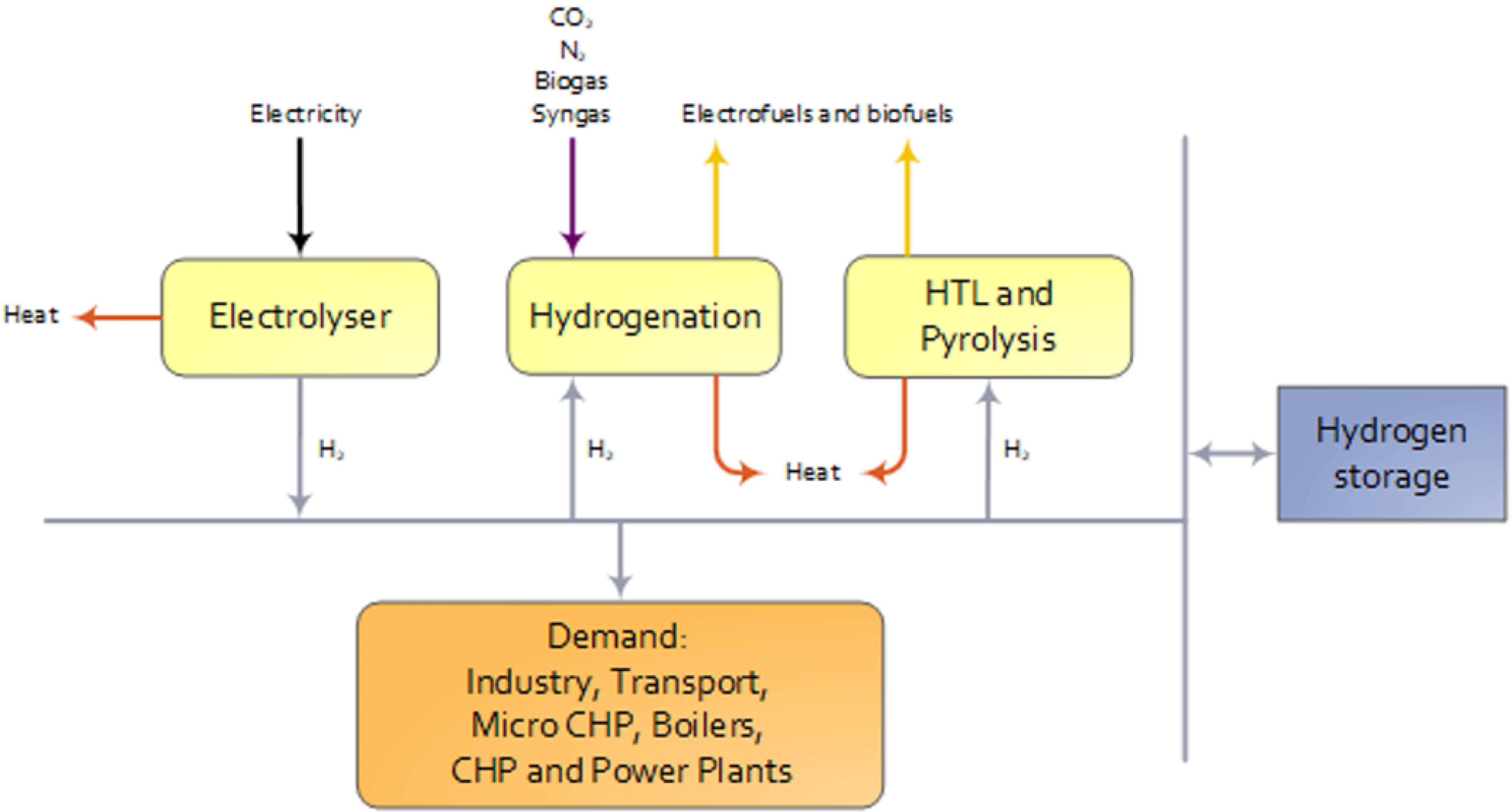
(B. V. Mathiesen, 2017)


Electricity
Production/ conversion
Fuel
Balancing
Wind
PV
Wave
River-off Hydro
Tidal
CSP
Nuclear
Geothermal PP
Hydro Power
Industrial CHP
Micro CHPs
CHP
PP
Steam
Rockbed storage
Import/Export
V2G
Electricity storage
PHES
Battery
etc.
CAES
Fuel
Electricity
Demand
Flexible demand
Electric heat
Cooling
Biomass conversion
Electro-lyser
Heat pump
BEV
H_2
Heat
Heat
Demand/ consumption

District heating

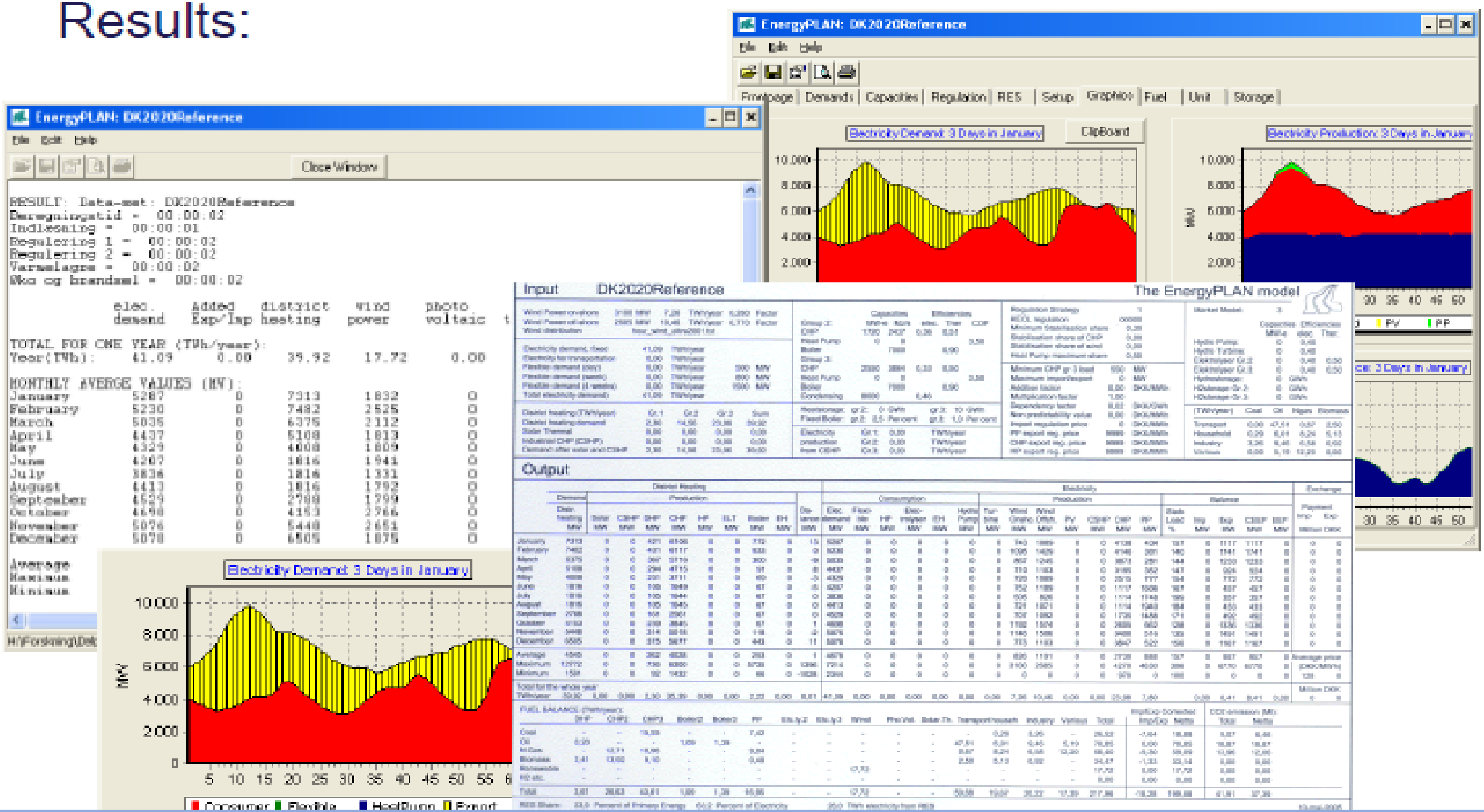


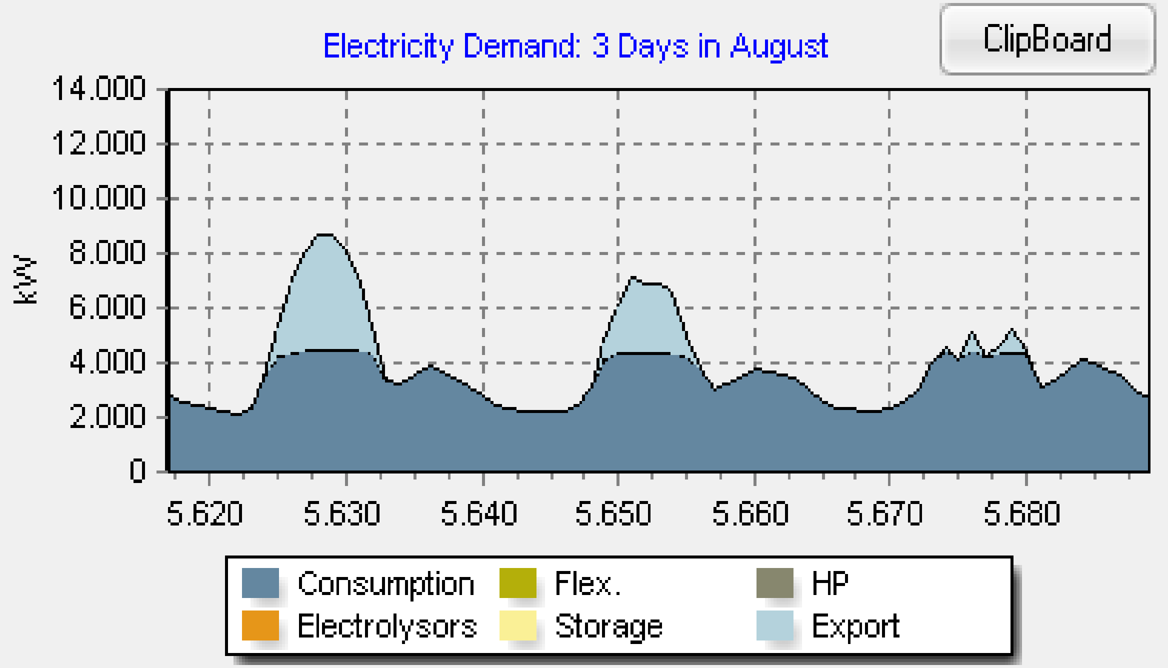
Hydrogen

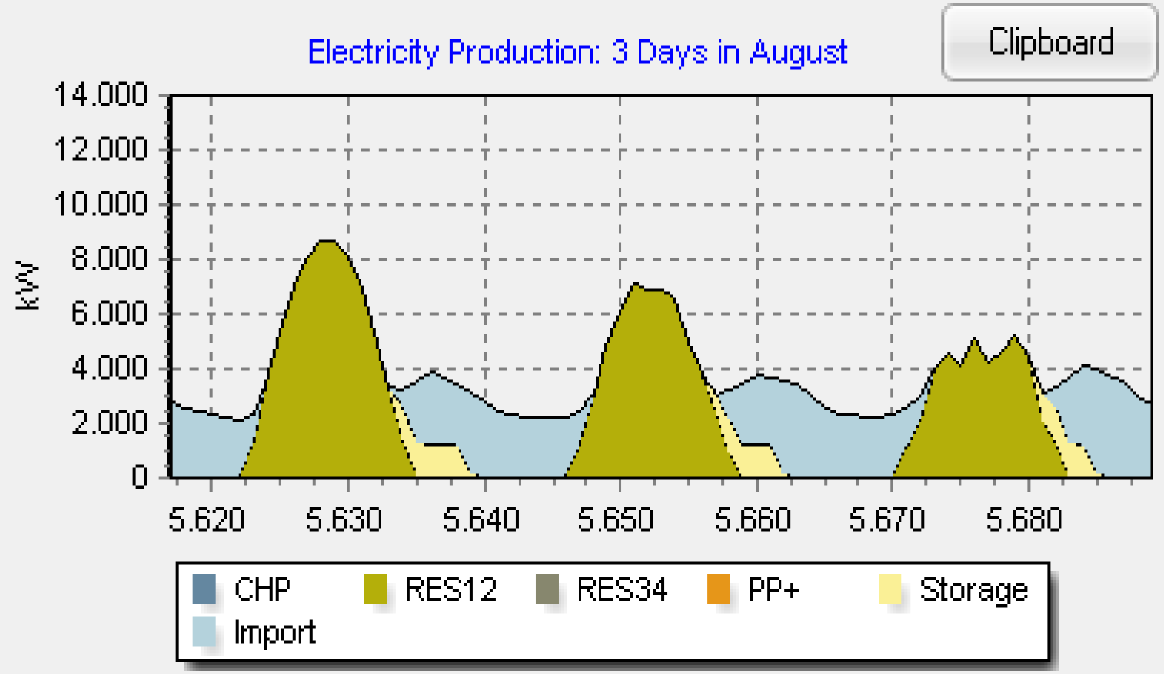


Electricity
CO_2
N_2
Biogas
Syngas
Electrofuels and biofuels
Heat
Electrolyser
Hydrogenation
HTL and Pyrolysis
H_2
H_2
Heat
H_2
Hydrogen storage
Demand:
Industry, Transport,
Micro CHP, Boilers,
CHP and Power Plants

Results:


EnergyPLAN: DK2020Reference
File Edit Help
Frontpage Demands Capacities Regulation RES Setup Graphics Fuel Unit Storage
Electricity Demand: 3 Days in January
ClipBoard
Electricity Production: 3 Days in January
10.000
8.000
6.000
4.000
2.000
MW
PV
PP
Close Window
RESULT: Data-set: DK2020Reference
Beregningstid = 00:00:02
Indlesning = 00:00:01
Regulering 1 = 00:00:02
Regulering 2 = 00:00:02
Varmelagre = 00:00:02
Øko og brændsel = 00:00:02
elec. demand
Added Exp/Imp
district heating
wind power
photo voltaic
TOTAL FOR ONE YEAR (TWh/year):
Year(TWh): 41.09 0.00 39.92 17.72 0.00
MONTHLY AVERGE VALUES (MW):
January 5287 0 7313 1832 0
February 5230 0 7482 2525 0
March 5035 0 6375 2112 0
April 4437 0 5108 1813 0
May 4329 0 4008 1809 0
June 4207 0 1816 1941 0
July 3836 0 1816 1331 0
August 4413 0 1816 1792 0
September 4529 0 2708 1799 0
October 4698 0 4153 2766 0
November 5076 0 5448 2651 0
December 5078 0 6505 1875 0
Average
Maximum
Minimum
Input DK2020Reference
The EnergyPLAN model
Output
Electricity Demand: 3 Days in January
10.000
8.000
6.000
4.000
2.000
0
MW
5 10 15 20 25 30 35 40 45 50 55
Consumer Flexible HeatPump Export





Electricity

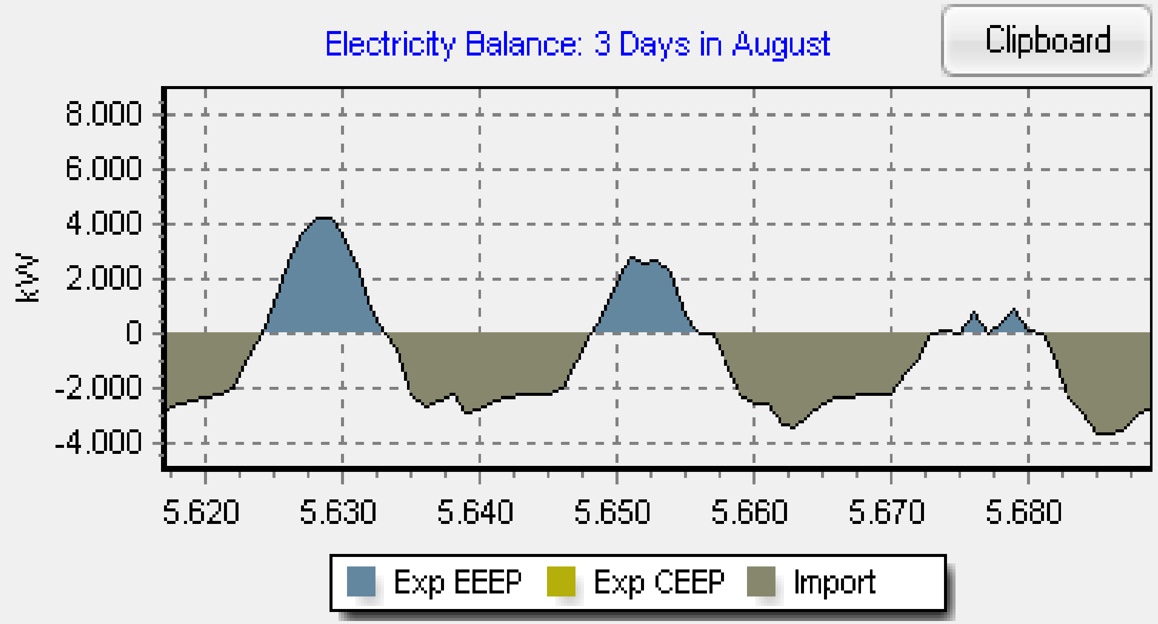
3 Days

Back

Forward

Color --> Monocrome

Done!



CHP: CHP in group 2 and 3 + industrial CHP, micro CHP and CHP-Waste

Making results demonstration most user-friendly

2025	RES share in PES	Import
LowRES	44,20%	55,80%
RES	75,00%	25,00%
HighRES	84,50%	15,50%

LowRES		
RES prod.	6,84	GWh/year
Solar	6,84	GWh/year
Wind	0	GWh/year
Tidal and Wave	0	GWh/year
Hydro	0	GWh/year

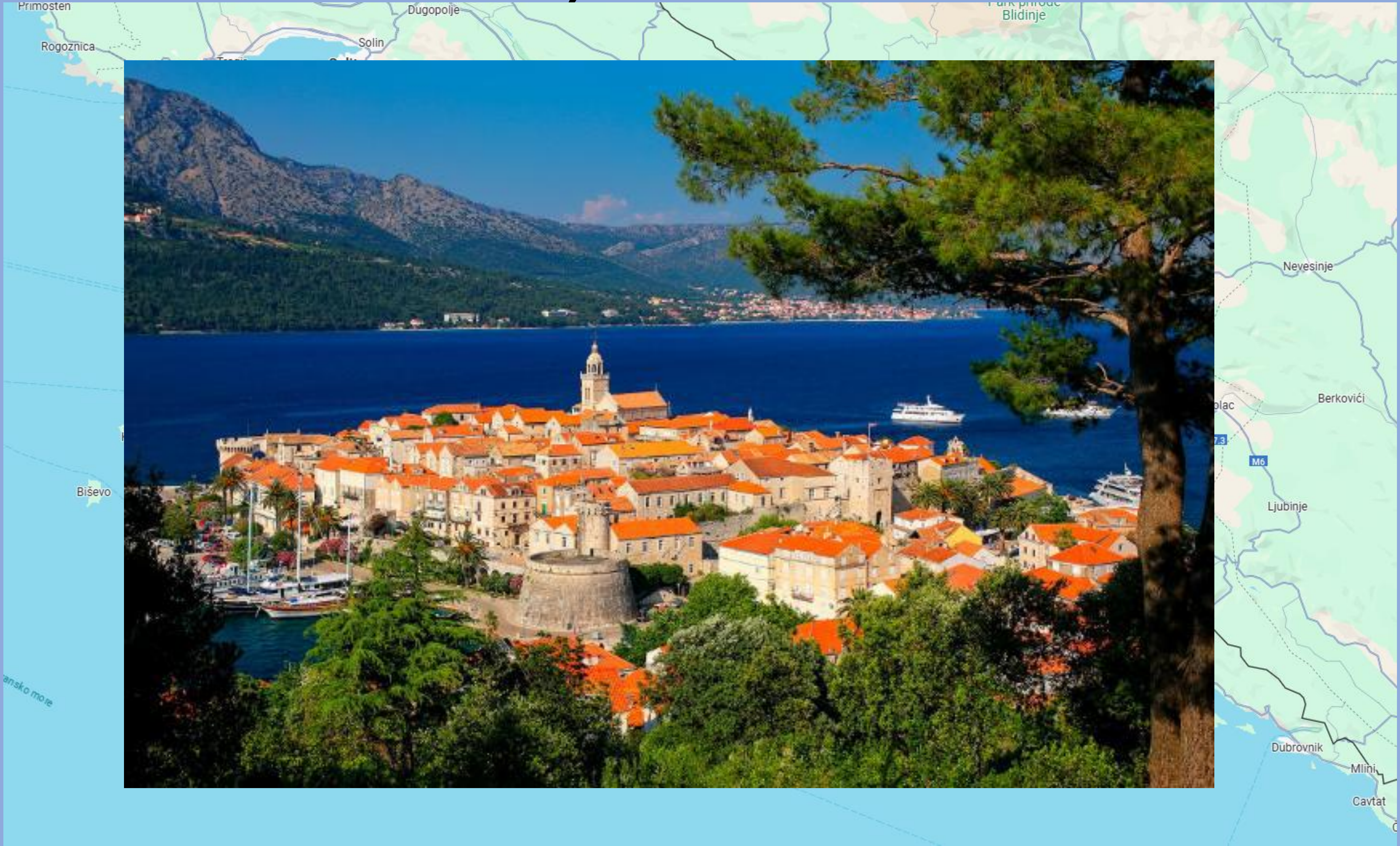
RES		
RES prod.	66,46	GWh/year
Solar	66,46	GWh/year
Wind	0	GWh/year
Tidal and Wave	0	GWh/year
Hydro	0	GWh/year

HighRES		
RES prod.	100,4	GWh/year
Solar	66,46	GWh/year
Wind	33,89	GWh/year
Tidal and Wave	0	GWh/year
Hydro	0	GWh/year

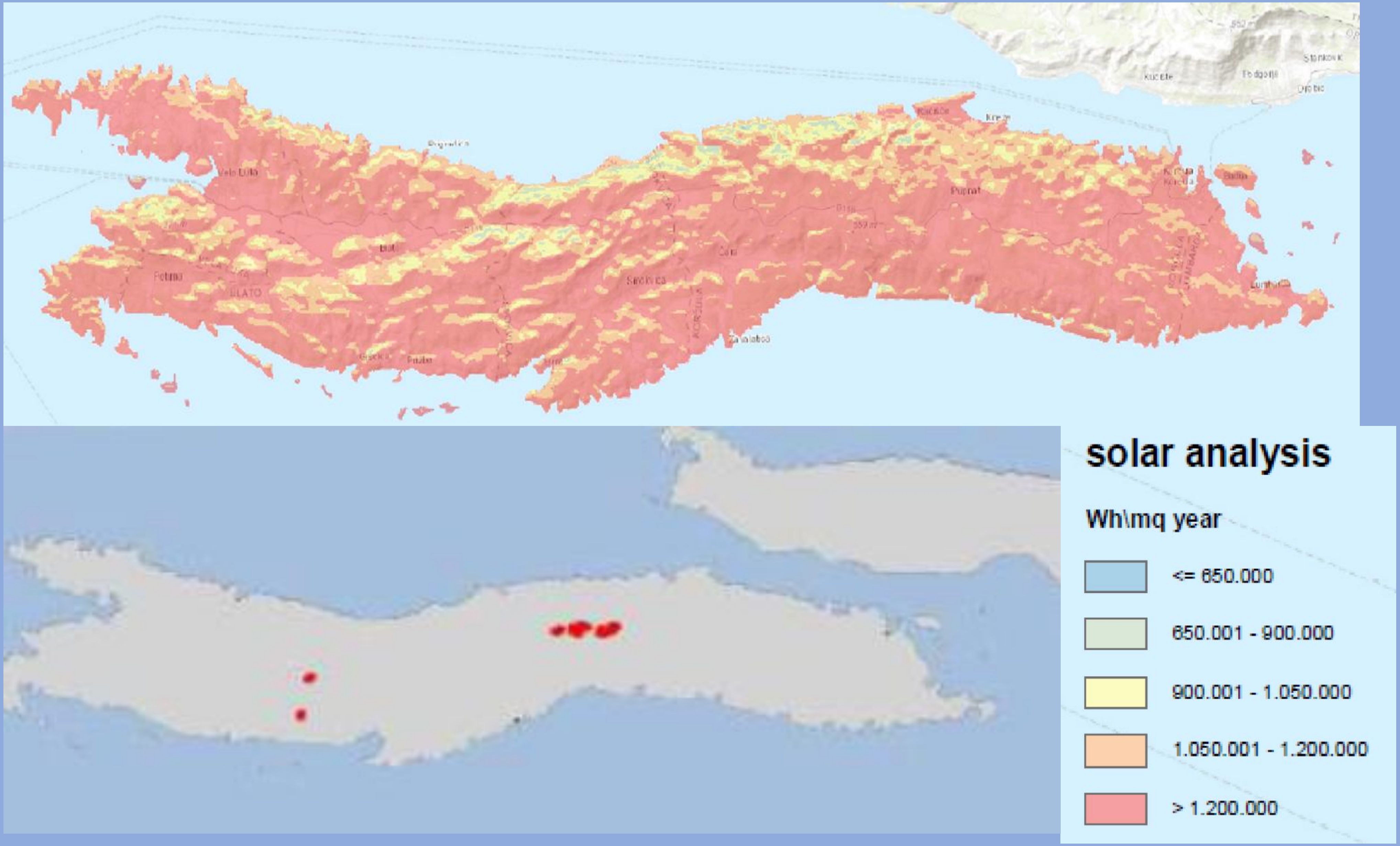
Scenario	GHG Emissions [kt]
Base yea	17,004
LowRES	7,158
RES	7,158
HighRES	5,57

3 Examples

The island of Korčula, Croatia



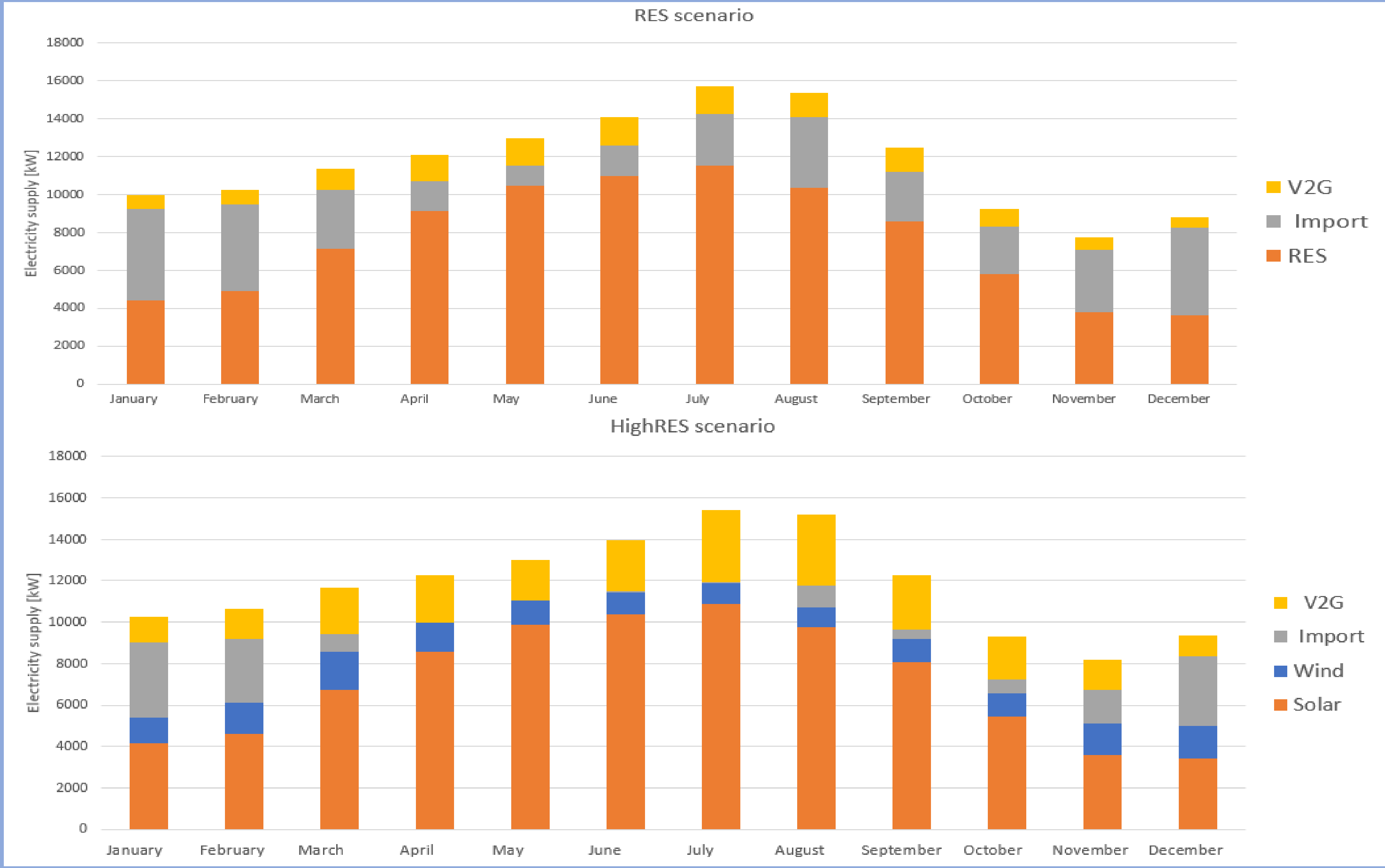
Solar potential on the island of Korčula



Basic inputs for modelling

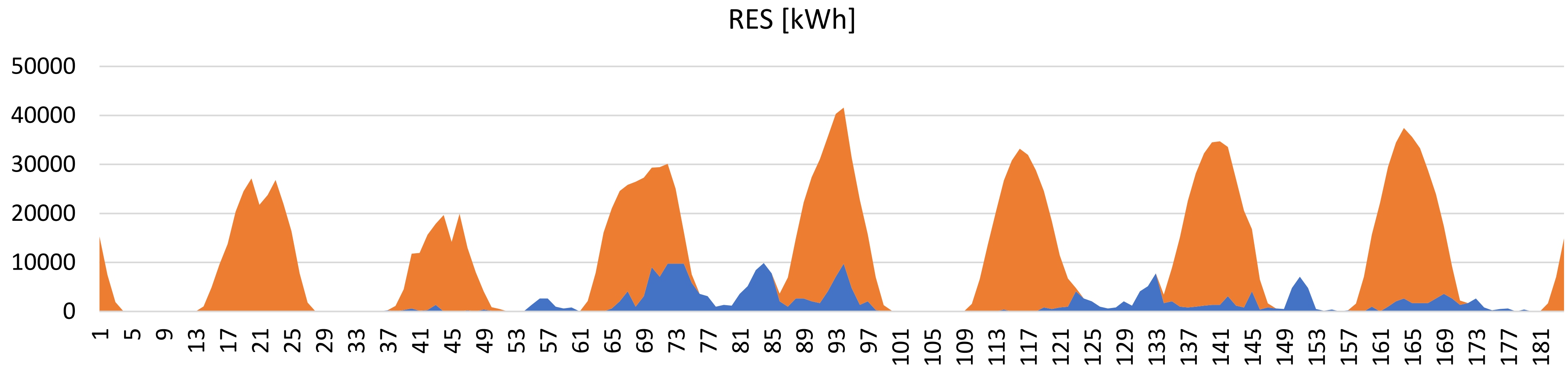
Korčula 2030	LowRES	RES	HighRES
PV [MW]	4.59	44.59	42.05
Wind [MW]	0	0	10
EV [no. of vehicles]	0	1849	5222
EV connection [MW]	0	9.892	38.642
EV demand [GWh]	0	7.975	12.533
EV battery [MWh]	0	72.11	203.658
Electricity demand [GWh]	64.17	65.17	69.77

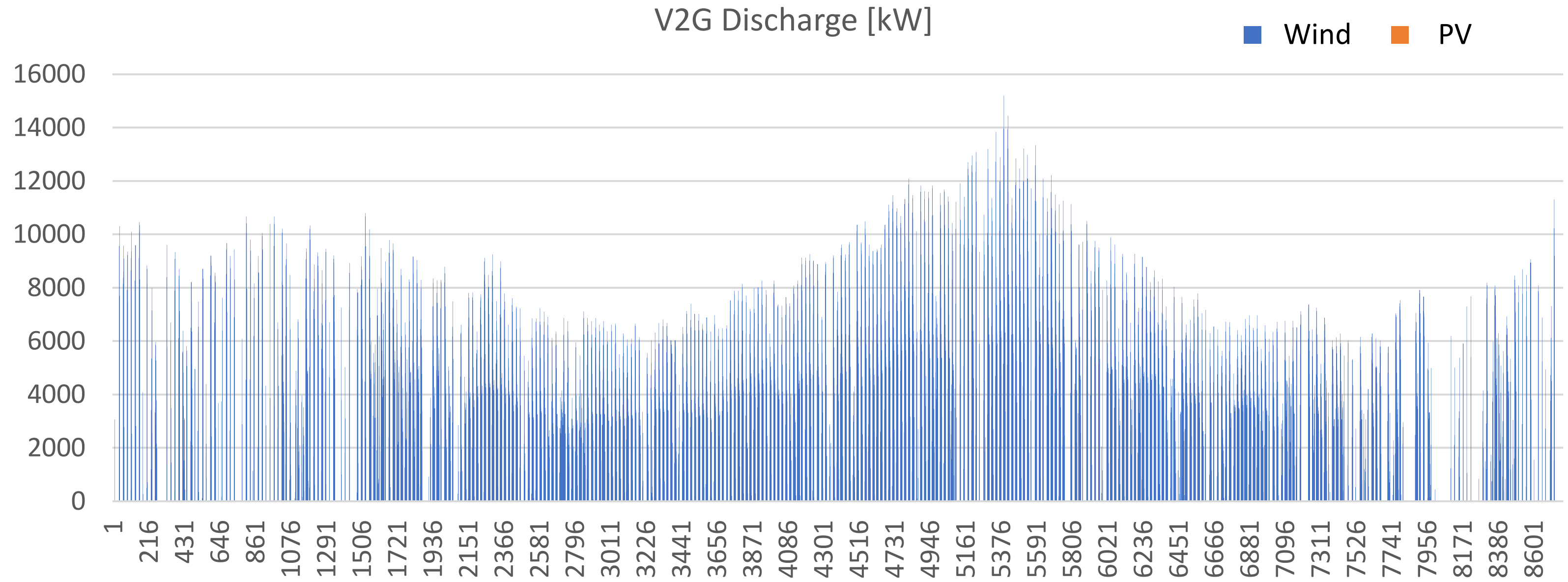
Results: Korčula



Results: Korčula

Hourly production from RES in a characteristic week for HighRES scenario on Korčula:





Results: Korčula

LowRES			RES			HighRES		
RES prod.	6.84	GWh/year	**RES prod.**	66.46	GWh/year	RES prod.	73.97	GWh/year
Solar	6.84	GWh/year	**Solar**	66.46	GWh/year	Solar	62.67	GWh/year
Wind	0	GWh/year	**Wind**	0	GWh/year	Wind	11.3	GWh/year
Tidal and Wave	0	GWh/year	**Tidal and Wave**	0	GWh/year	Tidal and Wave	0	GWh/year
Hydro	0	GWh/year	**Hydro**	0	GWh/year	Hydro	0	GWh/year
Solar thermal	8	GWh/year	**Solar thermal**	8	GWh/year	Solar thermal	8.83	GWh/year

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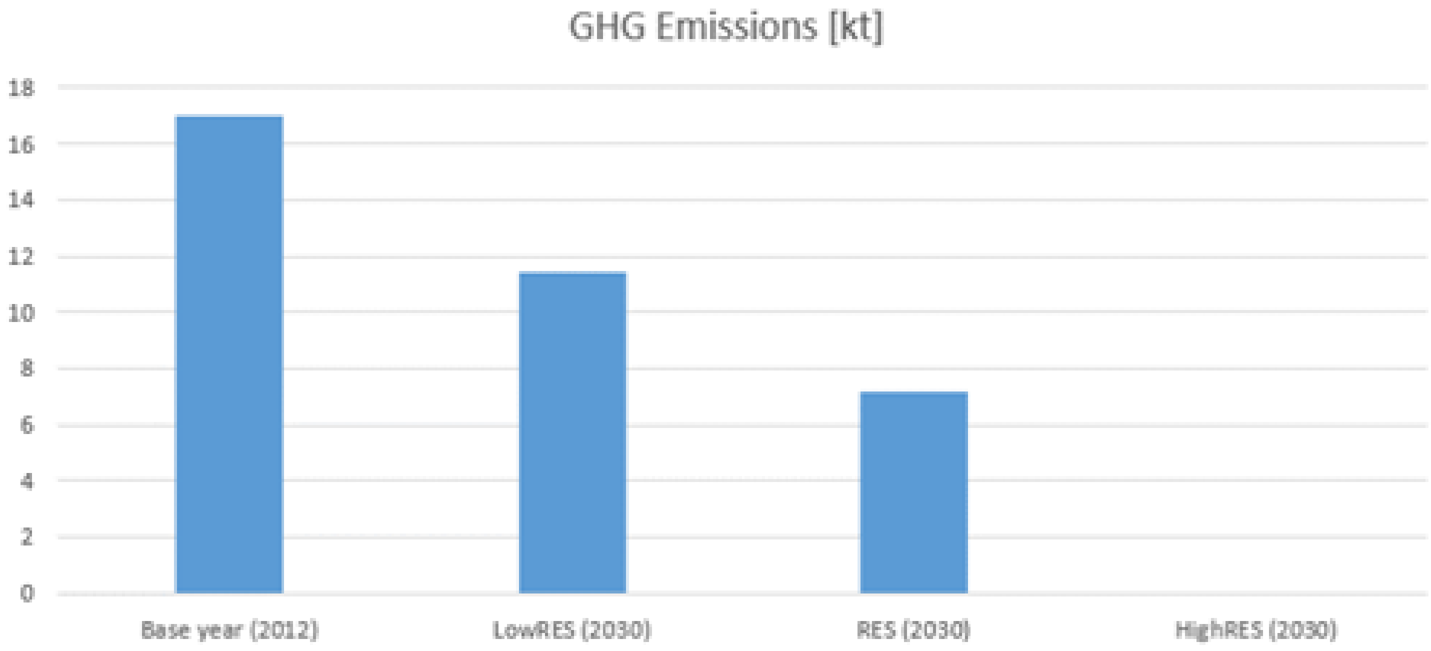
Results: Korčula, socio-economic analysis and emissions



Number of full-time equivalent jobs per scenarios of development of the energy system on the island of Korčula

2030	LowRES	RES	HighRES
Engineering	17	164	167
O&M	1	11	13
Instalation	12	116	122

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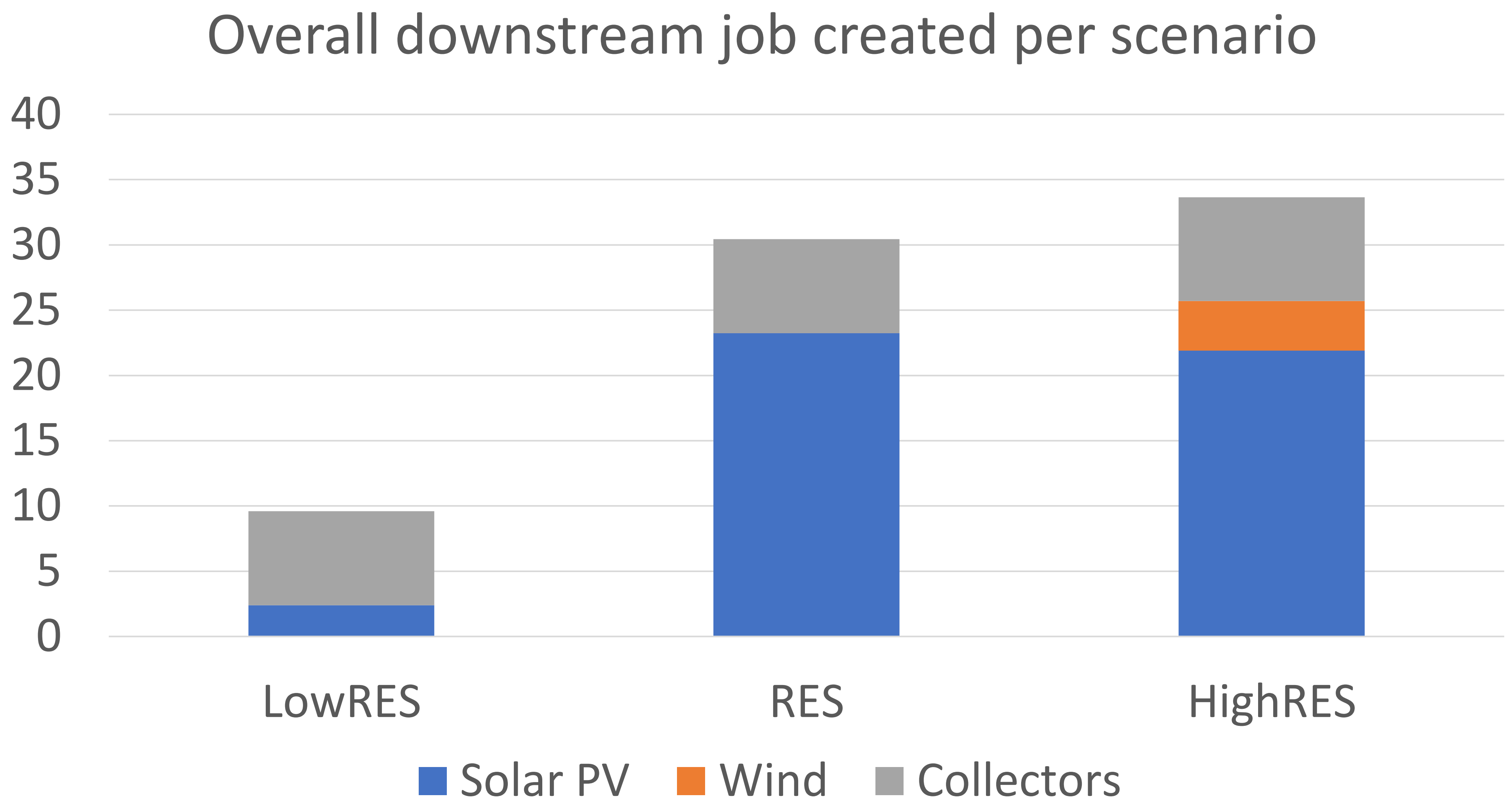
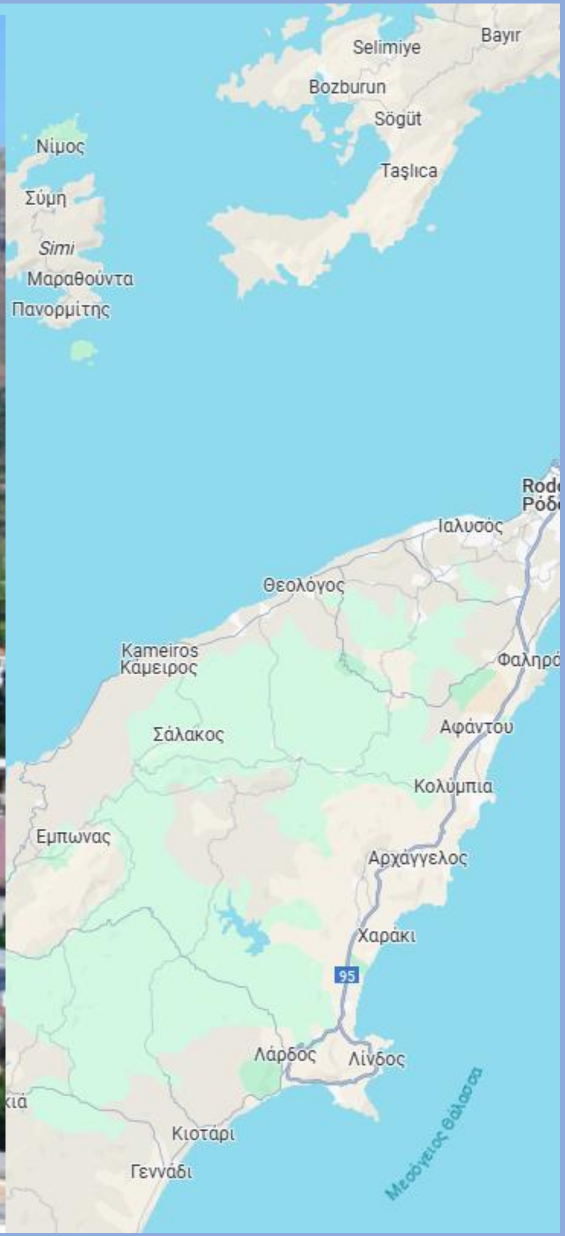
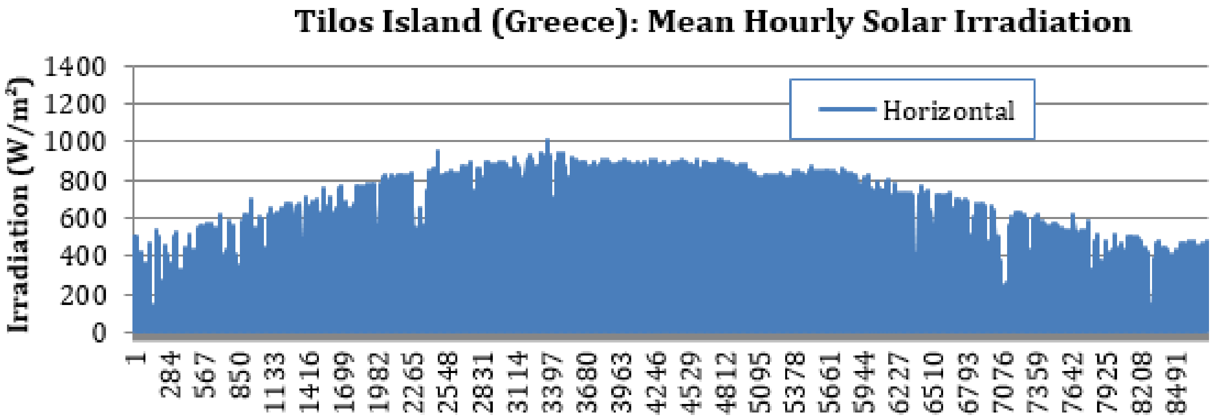
New, green jobs for the whole year

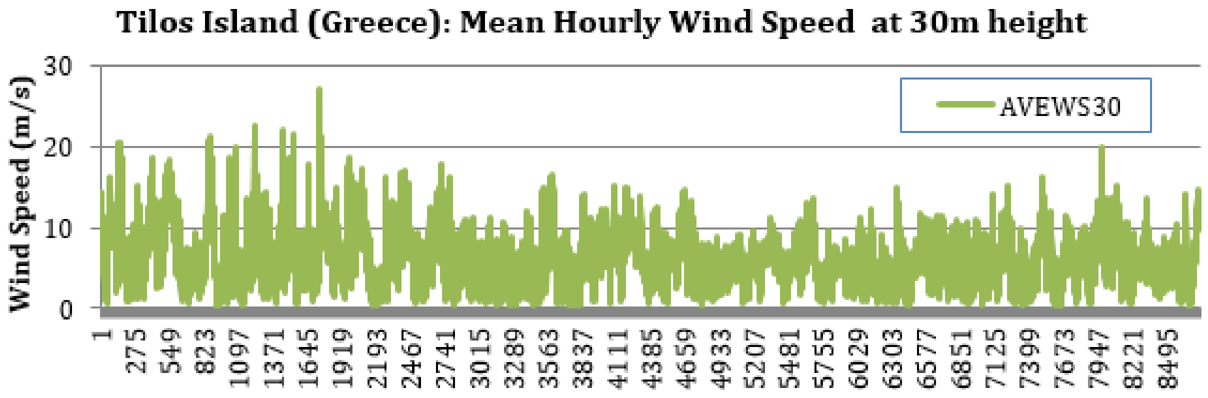


The island of Tilos



Basic input data





	LowRES	RES	HighRES
PV [kW]	160	160	1000
Wind [kW]	0	810	810
EV [no. of vehicles]	0	100	0
EV charging rate/car [kW]	0	11	0
Storage Capacity[MWh]	0	2.88	2.88
Autonomy [%]	9%	70%	87%

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Results

Table 4 RES sources contributions

LowRES			RES			HighRES		
RES prod.	0.27	GWh/year	RES prod.	2.29	GWh/year	RES prod.	2.69	GWh/year
Solar	0.27	GWh/year	Solar	0.27	GWh/year	Solar	1.31	GWh/year
Wind	0	GWh/year	Wind	2.02	GWh/year	Wind	1.38	GWh/year

Following these amounts of generated energy, Figure 4 represents the RES share in electricity production.

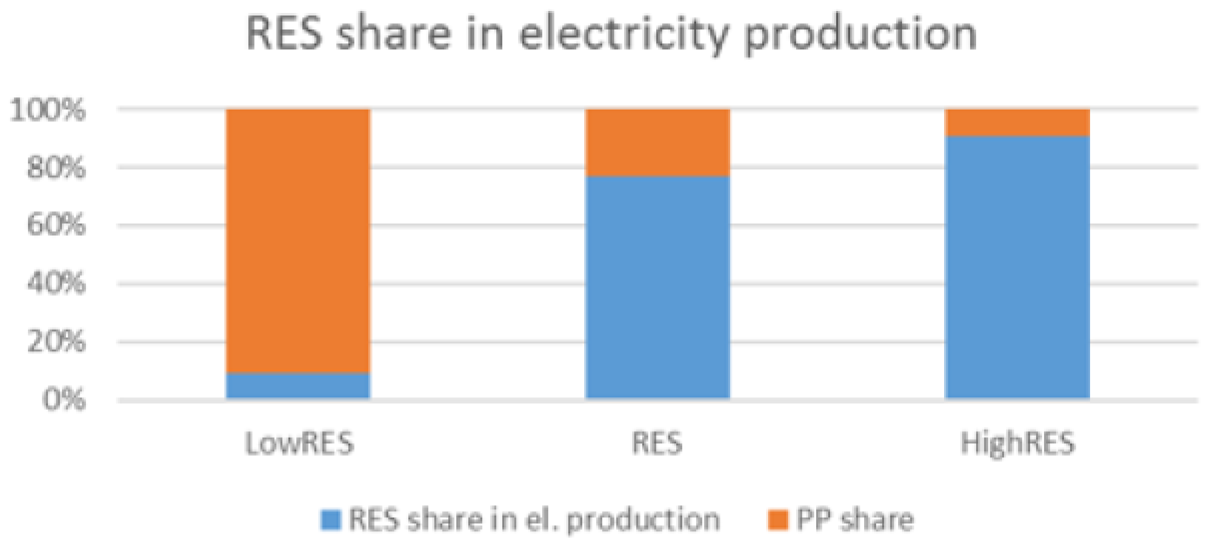
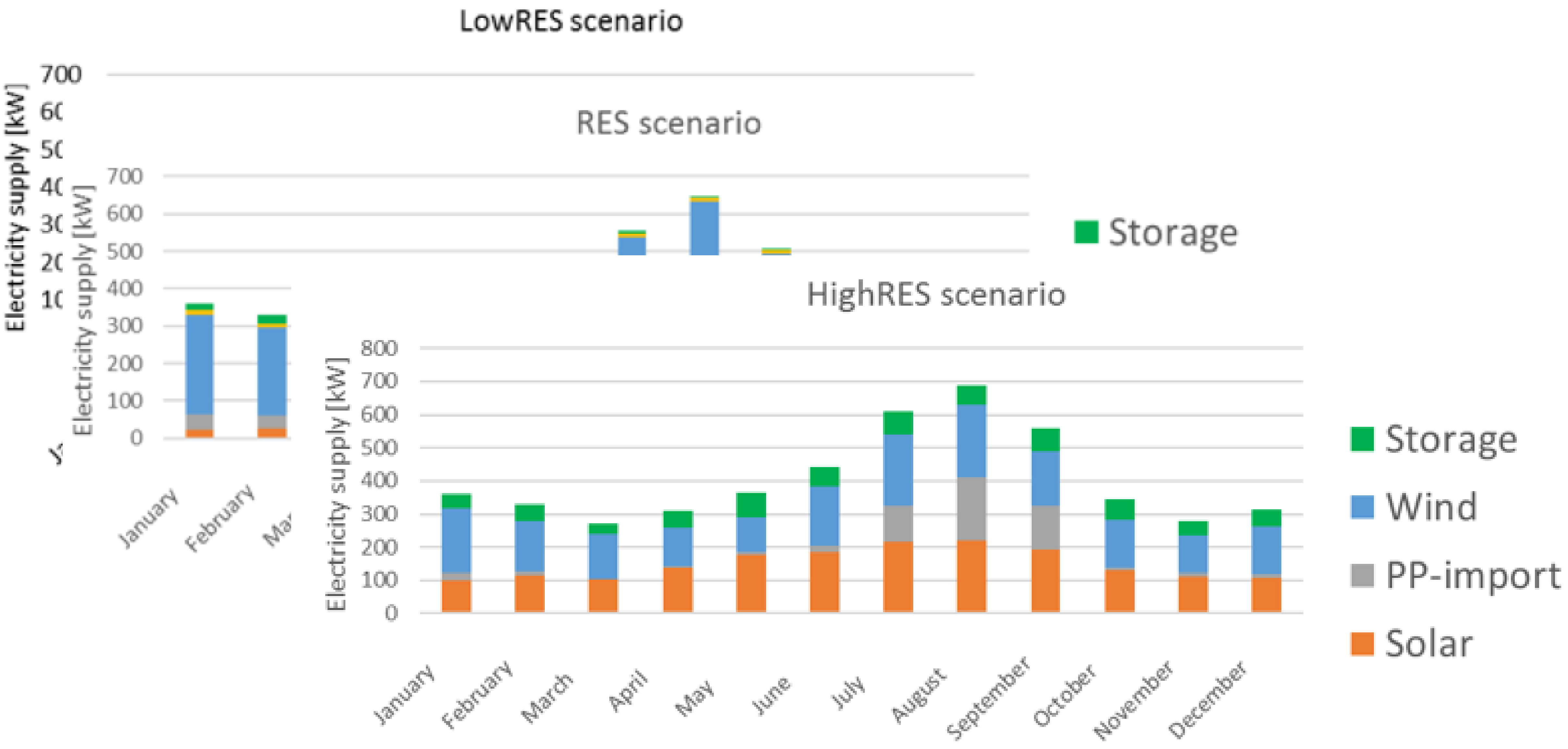
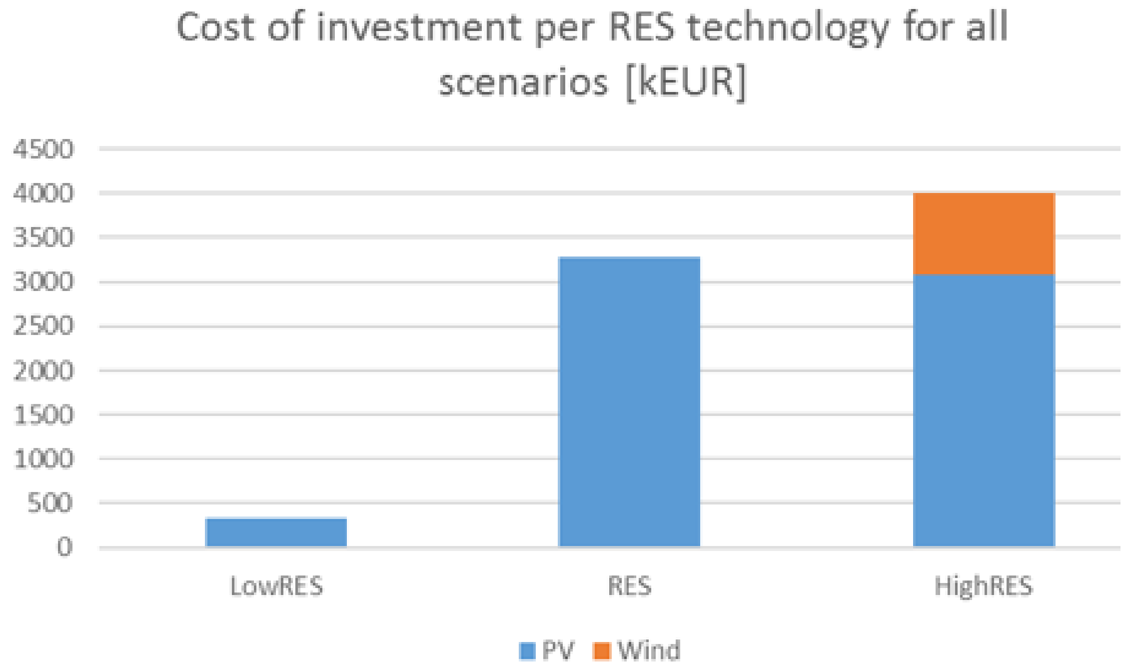


Figure 4 RES share in electricity production

Results


LowRES scenario
RES scenario
HighRES scenario
Electricity supply [kW]
Storage
Wind
PP-import
Solar
800
700
600
500
400
300
200
100
0
January
February
March
April
May
June
July
August
September
October
November
December

Results



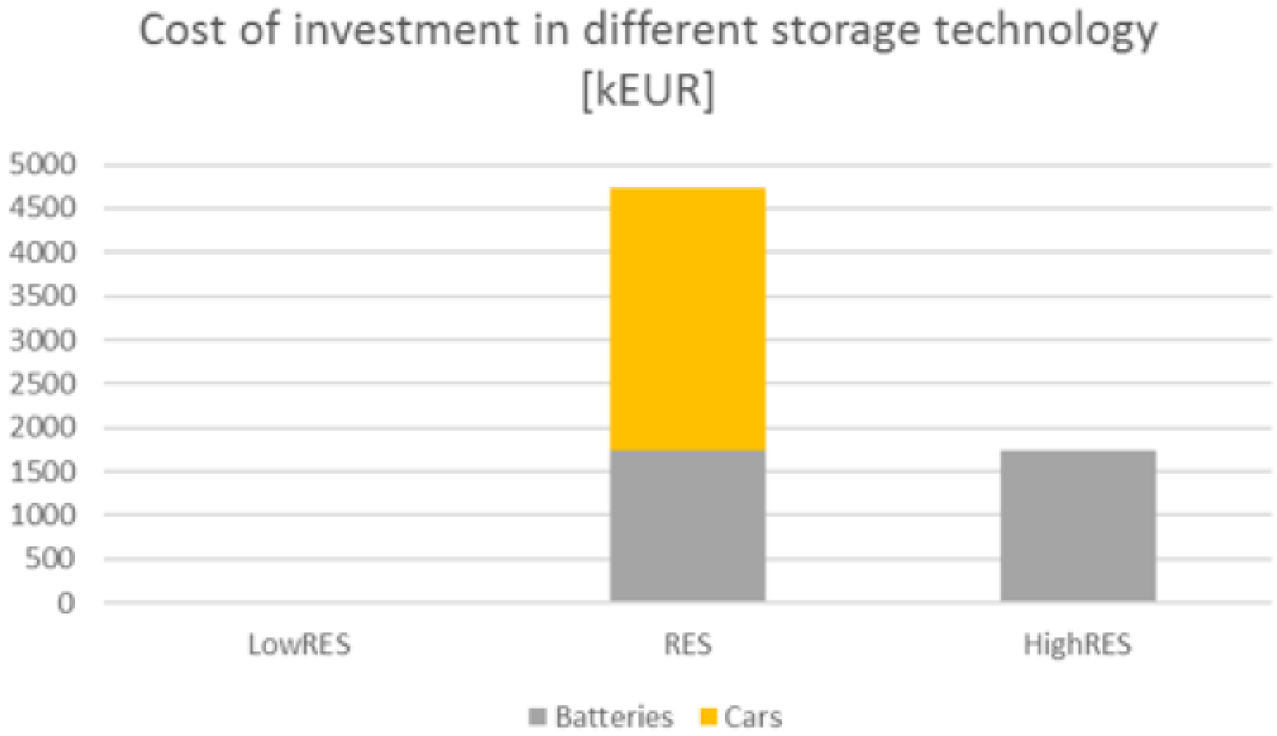


Table 6 Number of full time equivalent jobs per scenarios of development of the energy system on the island of Tilos

2030	LowRES	RES	HighRES
Engineering	4	7	12
O&M	1	1	3
Instalation	4	7	17

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Thank you!

Dr. Antun Pfeifer

Postdoctoral researcher / Senior Assistant

antun.pfeifer@fsb.unizg.hr