

Energy Efficiency in Small Ports (Sweden)

Teemu Heikkinen
Satakunta University of Applied Sciences
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Basics of energy efficiency

Energy efficiency = Saving energy

With improved energy efficiency:

- *Less energy is consumed for the same need/service* than before and some energy is saved
- *Specific consumption* of energy *decreases* with better energy efficiency (electricity, heat, water or fuel)
- Emissions decrease and natural resources are saved

Key steps to improve energy efficiency:

1. Measure the current use of energy and identify wasters to start with
 2. Plan for both technical and functional improvements,
 3. Implement the solutions,
 4. Verify the change (compare to phase 1 results)
- Simply: Start thinking about your energy consumption

Motivation: Fighting the climate change and Saving money

How much is 1 kWh of energy?

- = 10 W light is on for 100 hours,
- = 10 liters of water from 10°C → 100°C
- = 10 kW sauna stove is on for 6 min

Specific (or nominal) consumption = dividing consumption (kWh, dm³) with explaining factor of some unit

Used for example in comparing of energy or water use in different size buildings. Tells how much energy or water is consumed per floor area or per space volume or per person.

- Heat: kWh/m², kWh/m³
- Water: dm³/m³, dm³/person/day
- Electricity: kWh/m²



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Energy consumption in small ports

Energy audit!
Energiutredning!

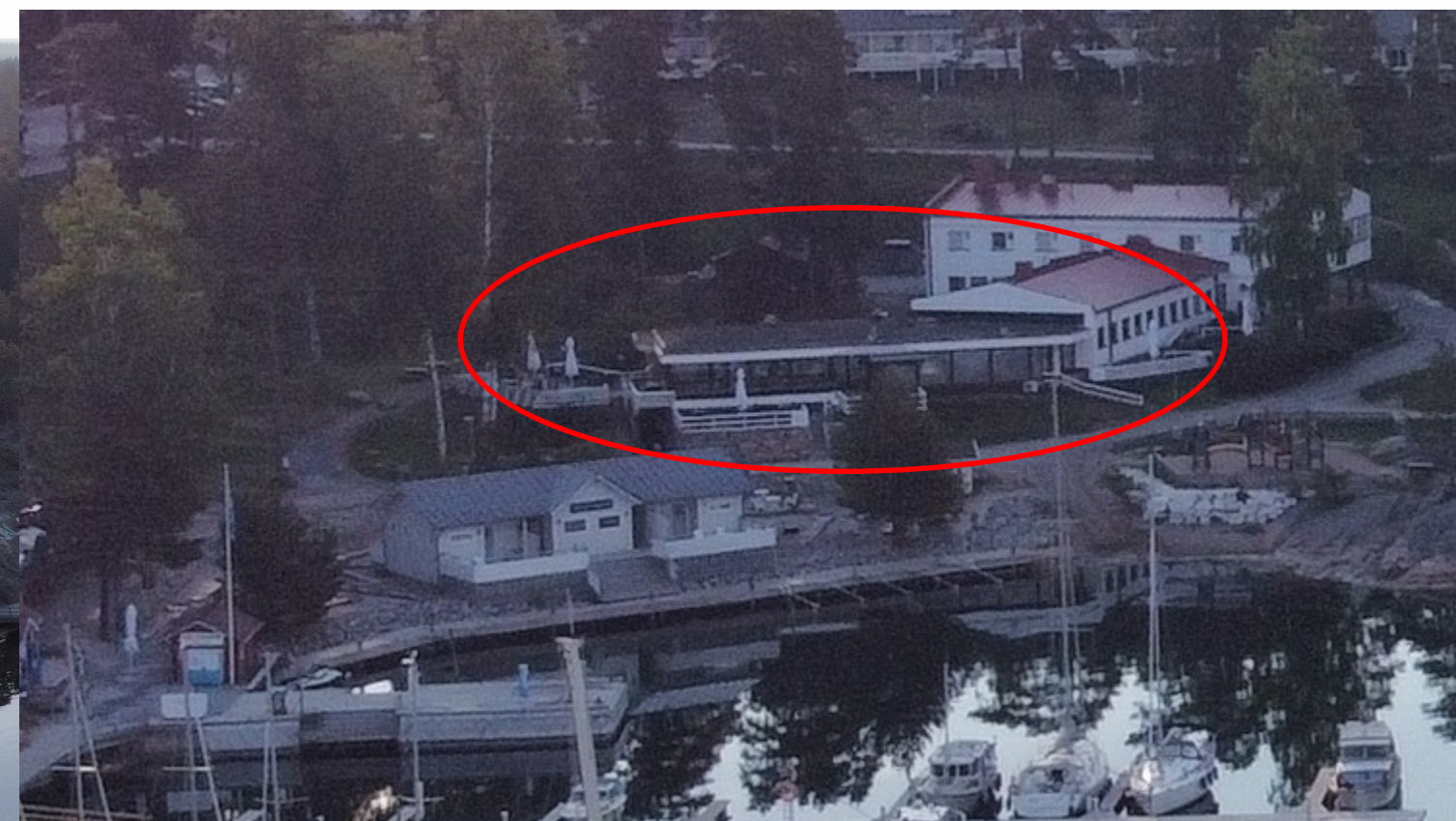
WHERE ENERGY GOES?

- Electricity for boats (visitors/home port users)
e.g.: 15 boats (5A x 230V) x 5h \approx 86 kWh
- Mechanical ventilation of buildings – round the year, if installed
- Space heating – especially in winter, if there are spaces in need for heating (vs not heated)
- Cooling/air conditioning – especially in summer
For example air source heat pumps
- Lighting (indoors/outdoor areas/piers)
- Refrigeration equipment
- Saunas, electricity/wood heated stove
E.g. 10kW sauna stove + sauna ON for 4h/day = 40 kWh/day
- Heating of washing water
E.g. 5min shower, water of 37 °C (flow of 12 l/min) \approx 2,2 kWh/shower
- Household appliances (cooking, laundry, ...)
- Air leakages, unadjusted or broken building service equipment

HOW TO SAVE ENERGY?

- Education of boaters, Pay-per-use, own el. production
- Automation, need based ventilation using moisture/CO₂ sensors
- Lowering room temperatures, automation, utilizing passive solar energy, better insulation
- Sunshades/eaves, own solar power → heat pumps (avoid excess cooling)
- Leds, automation: motion or presence detectors, light sensitive switch → switch off/dimming
- Energy efficient fridges and freezers, well ventilated place for them, own solar power plant
- Well insulated sauna, avoid idle heating
- Avoid overheating, adjust water flow, nozzles, automation, own ST plant, restrict shower time
- Use energy efficient household appliances
- Find/fix/block the leaks, adjust/repair/maintain building service equipment regularly

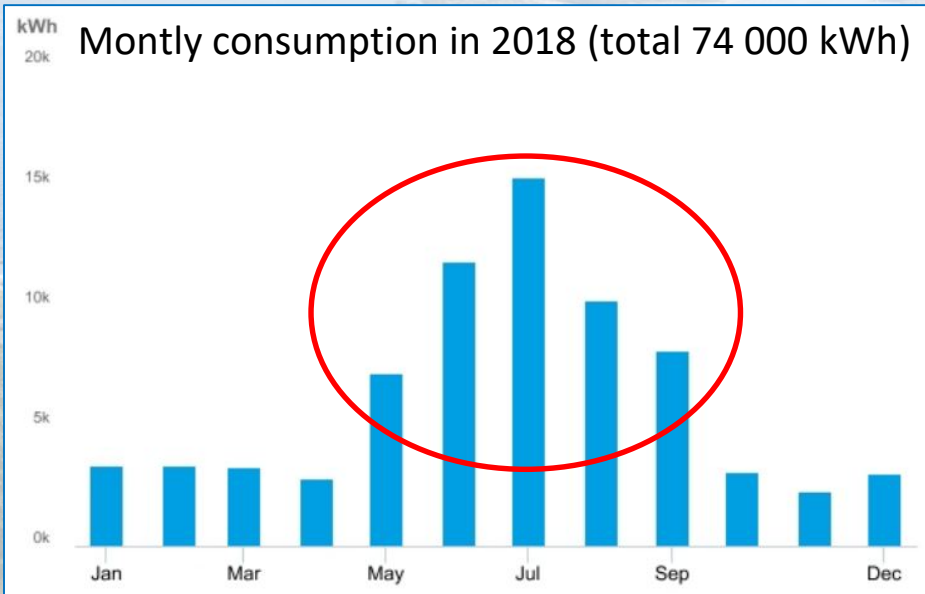
PV production - consumption match in a small port (1/3)



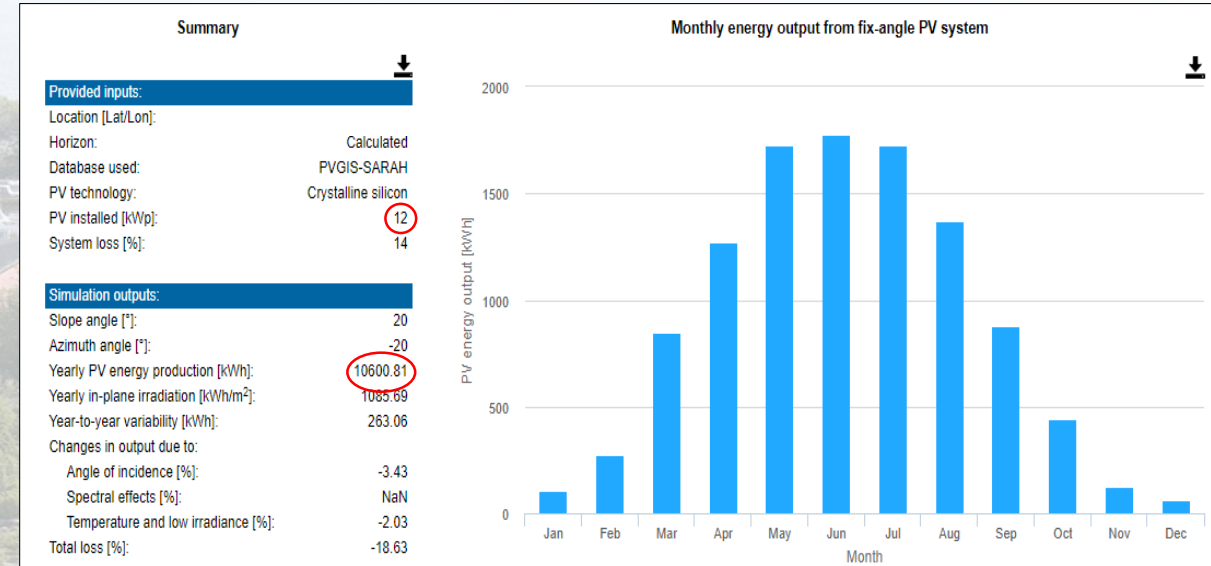
Airisto Marina
Pargas, Finland
- 110 guest berths

Picture by Matias Toivola

PV production - consumption match in a small port (2/3)



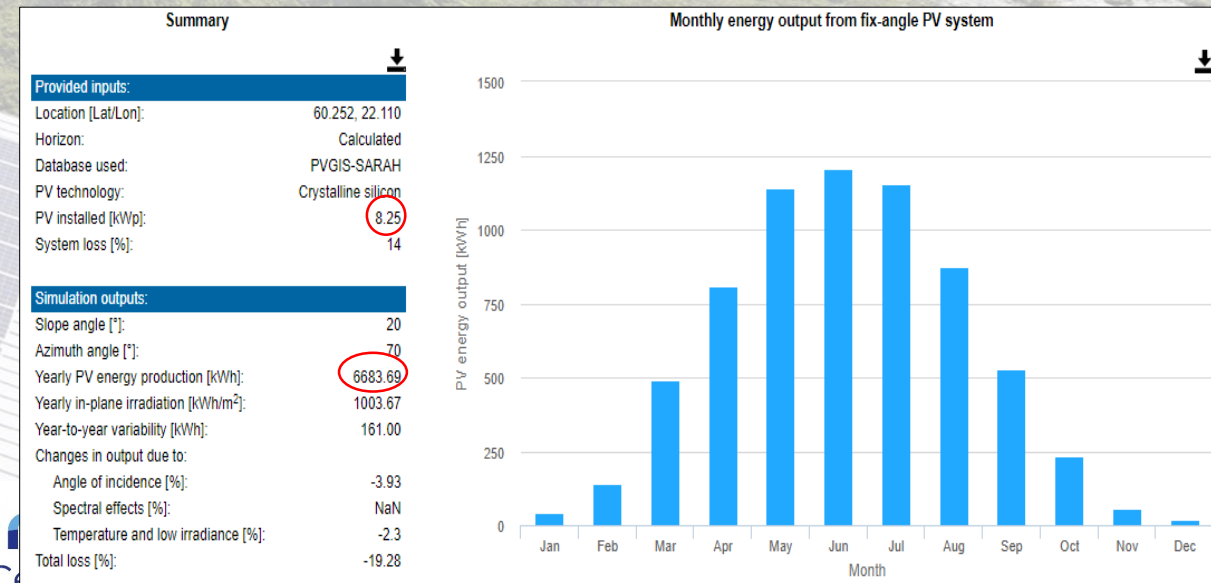
All material are from final thesis of Mr Vesa Tammilehto (SAMK)



Designed system

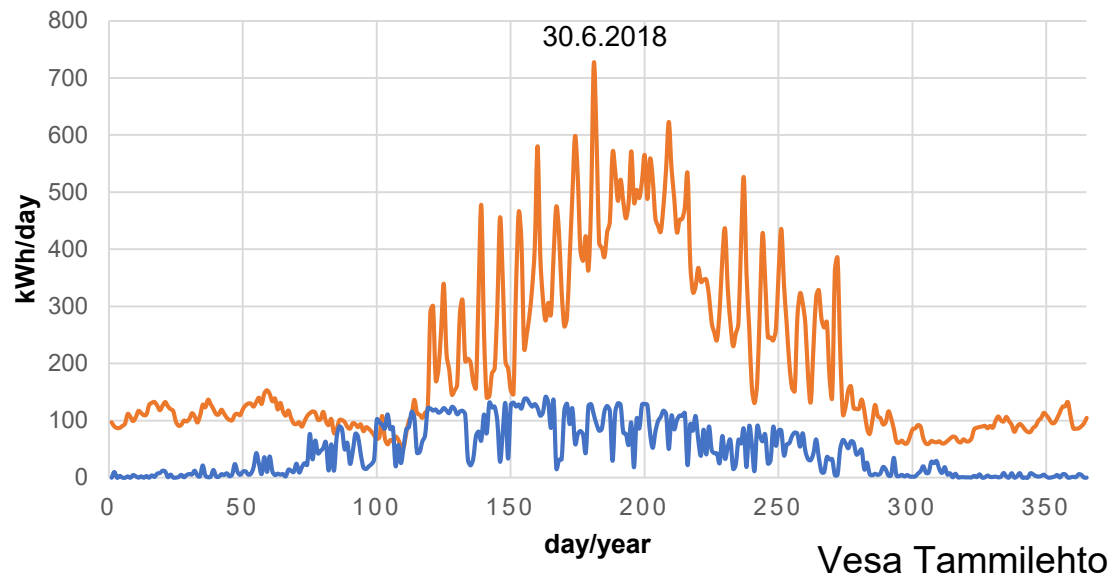
- 54 x 375Wp = **20.25 kWp**
- 32 to southeast (-20°)
 - 22 to southwest (+70°)
 - Annual production estimate **17.3 MWh**

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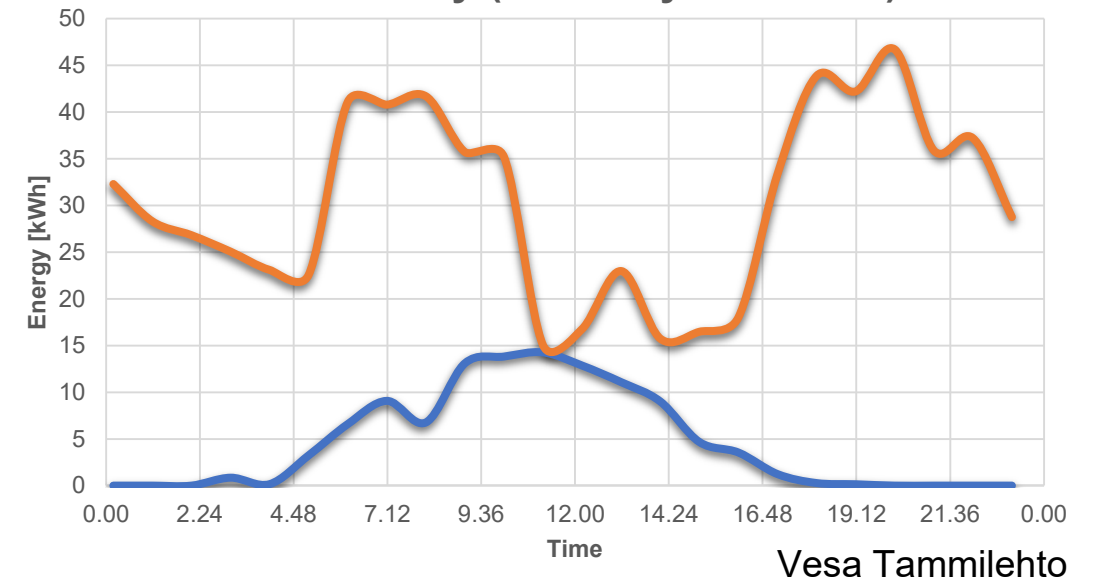


PV production - consumption match in a small port (3/3)

DAILY MATCH IN YEAR 2018



Match of a day (Saturday 30.6.2018)



- Self-consumption percentage ~82%
- This is already excellent compared e.g. to domestic houses where 50% is already difficult to reach.
- If PV production share would be bigger there would be more excess production during mid day. How to optimize? Maybe boost the hot water boilers/tanks or preheat saunas for new quests?



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CB PortMate energy efficiency investments





Tack så mycket! Thank you!

Teemu Heikkinen
Project Researcher
CBSmallPorts/
Satakunta University of Applied Sciences
<https://sub.samk.fi/projects/cb-small-ports/>
teemu.heikkinen@samk.fi



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