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ENERGY TRANSITION

StartSun



Experiences from the StartSun pilot in terraced house in Marttila, Finland

Start-up Package and Sustainability Plan

Tartto | 22.09.2026

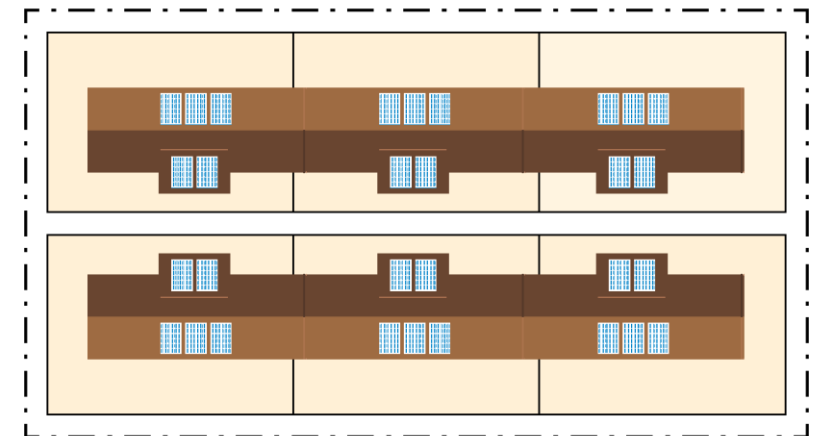
Evilina Vinonen and Riikka Ojala

interreg-baltic.eu/project/startsun

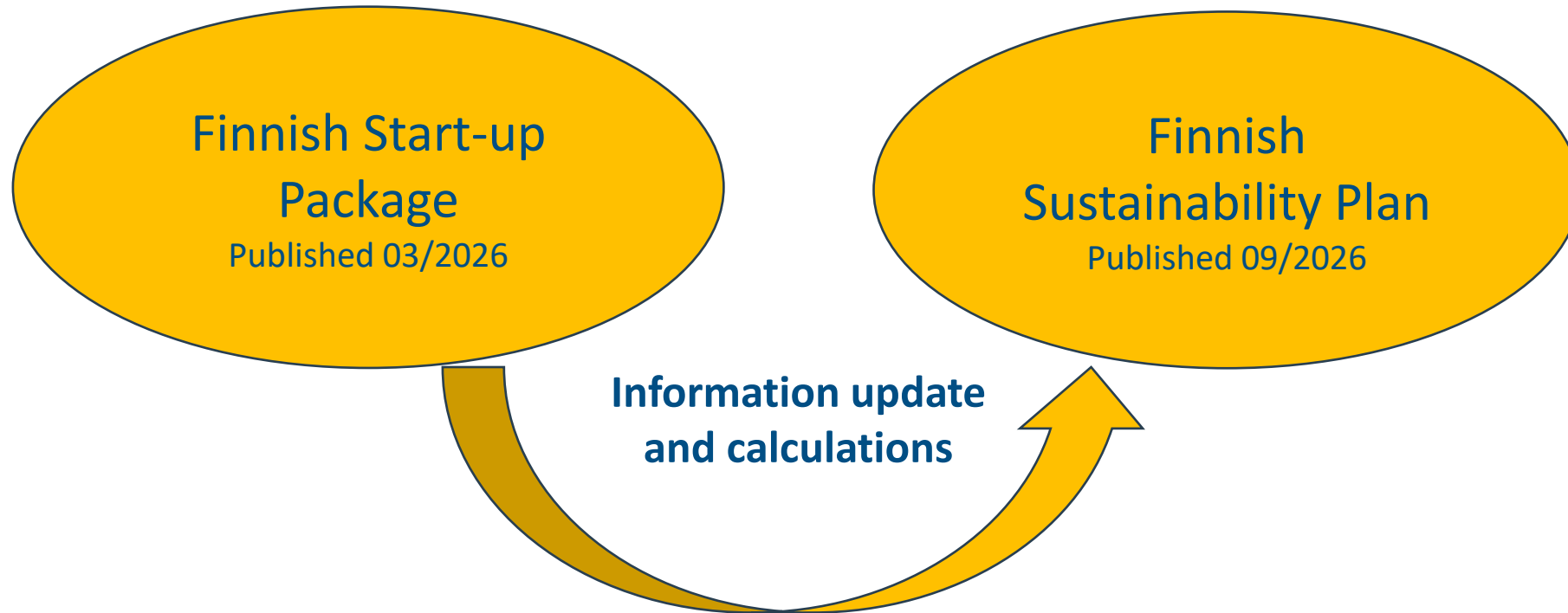


Marttila pilot

Location	Marttila, Southwest Finland
Building type	Terraced house, two buildings and six apartments
Building year	1990s
Heating method	Oil heating until 2025 -> change to air-to-water heat pump
Electricity consumption before modernization	about 3 400 kWh (measured av. from yy 2023-2024)
Oil consumption (before 2025)	10 000 l
Heated area	400 m ² living and 140 m ² storage spaces
Ventilation	Mechanical ventilation
Plot	Municipal leased plot
Housing company	Municipally owned
Electricity distribution company	Caruna Ltd.



From Start-up Package to Sustainability Plan



Finnish Start-up Package

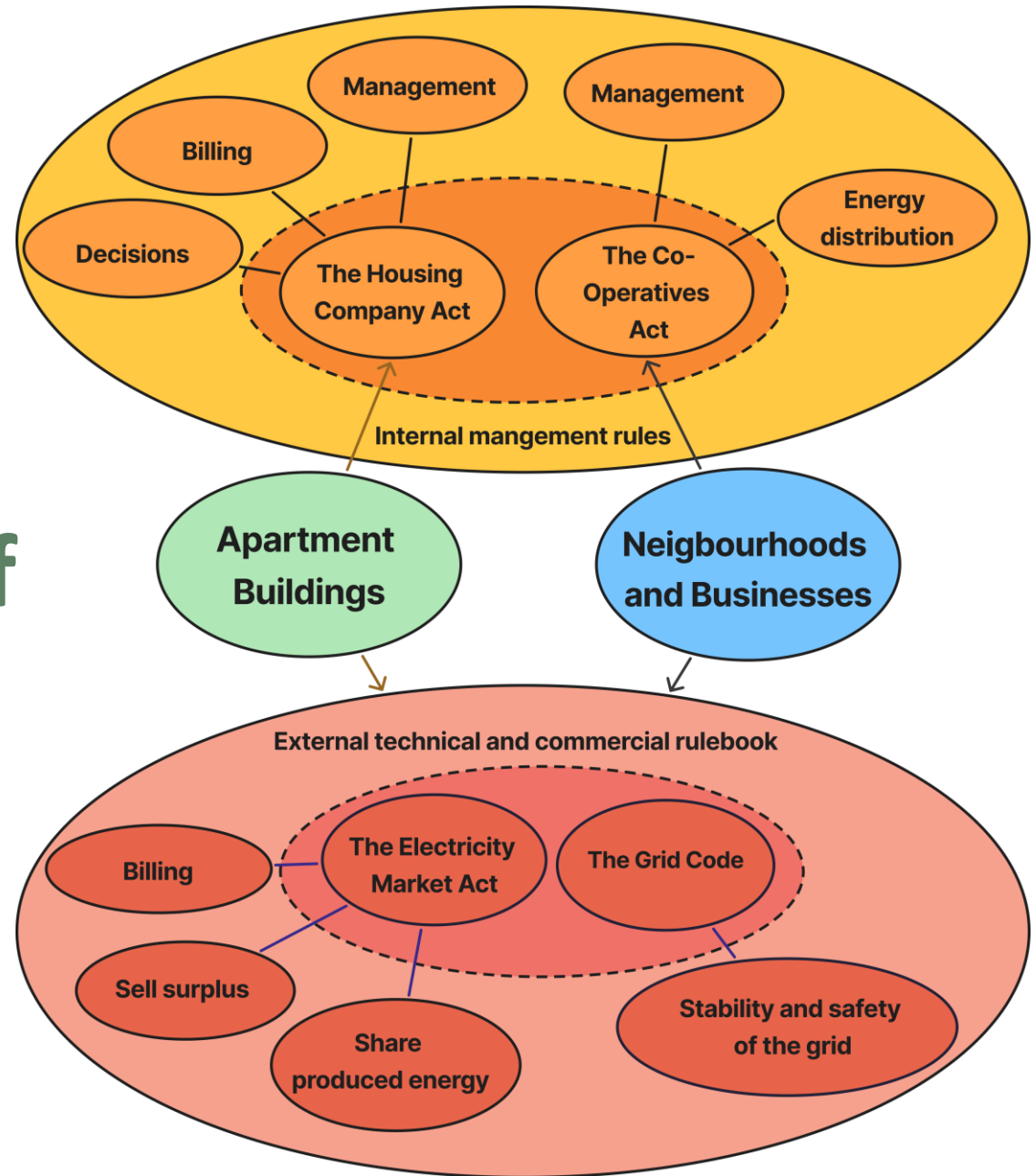
Content

1. What is energy community?
2. First steps in establishing an energy community
3. StartSun pilot: Marttila
4. Decision making and procurement
5. Technical and legislative aspects of energy community
6. Operation and maintenance
7. Dismantling and recycling of the system
8. Practical tips and checklist



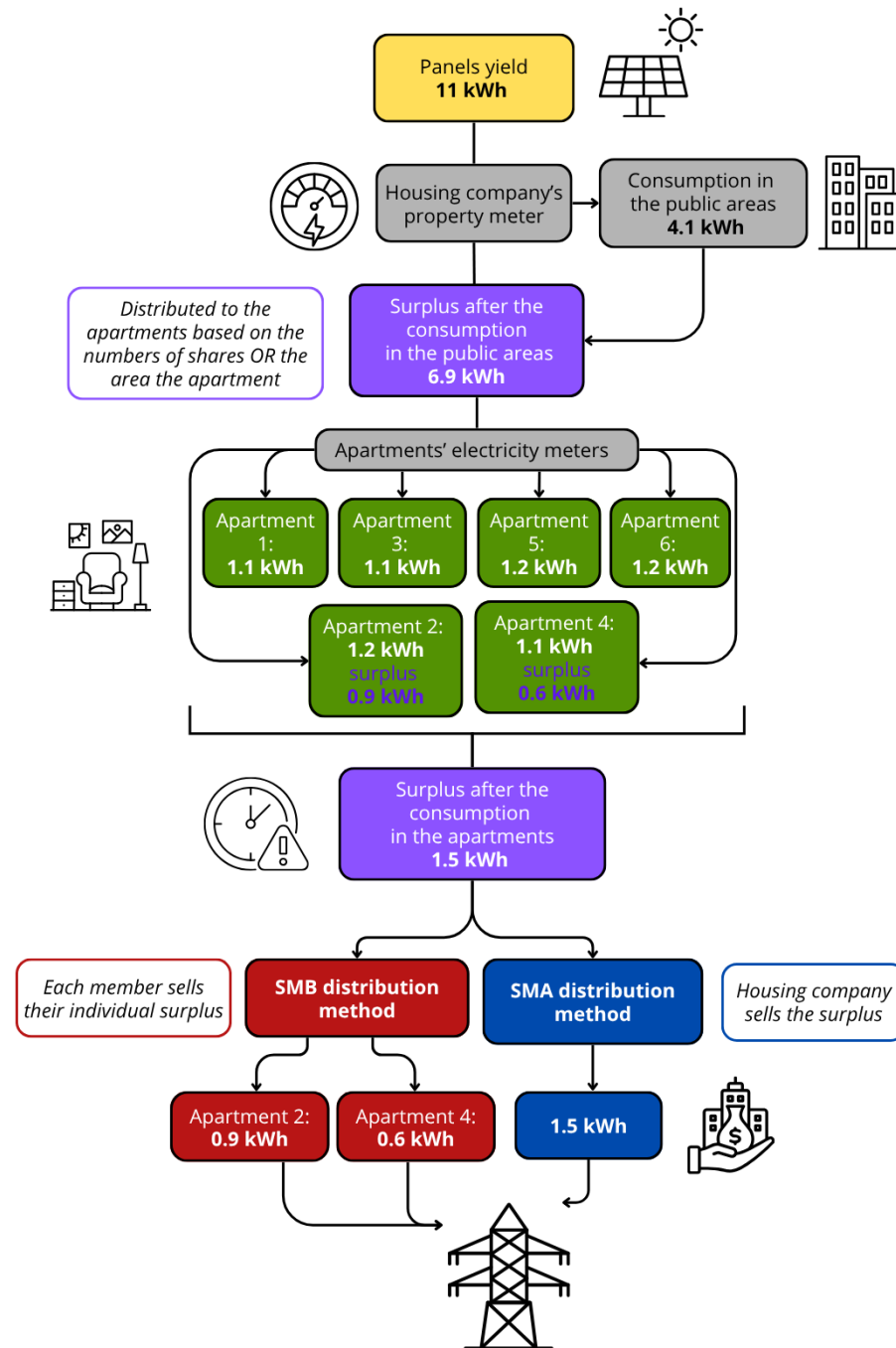
Highlights from the Start-up Package

Technical and legislative aspects of energy community



Surplus distribution method

Credit calculation in Finnish context



Annual costs of electricity distribution for two heating systems and three areas in Finland

Electricity distribution consists of three components

1. Basic fee €/month
2. Distribution fee €/kWh
3. Taxes €/kWh

Vuotuiset sähkönsiirron kustannukset [€/v] kolmen verkkoyhtiön hinnastojen mukaisesti ja kahdelle eri lämmityksen muodolle (IVLP ja öljy)

Perusmaksu Siirtoenergia Vero

1 IVLP, kulutus 25 MWh/v, 3x63 A

Air-to-water heat pump

Helen Sähköverkko (€)



Turku Energia Sähköverkot (€)



Caruna (€)



2 Öljy, s.kulutus 3,5 MWh/v, 3x35 A

Oil heating

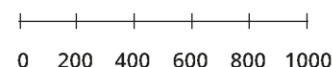
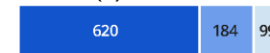
Helen Sähköverkko (€)



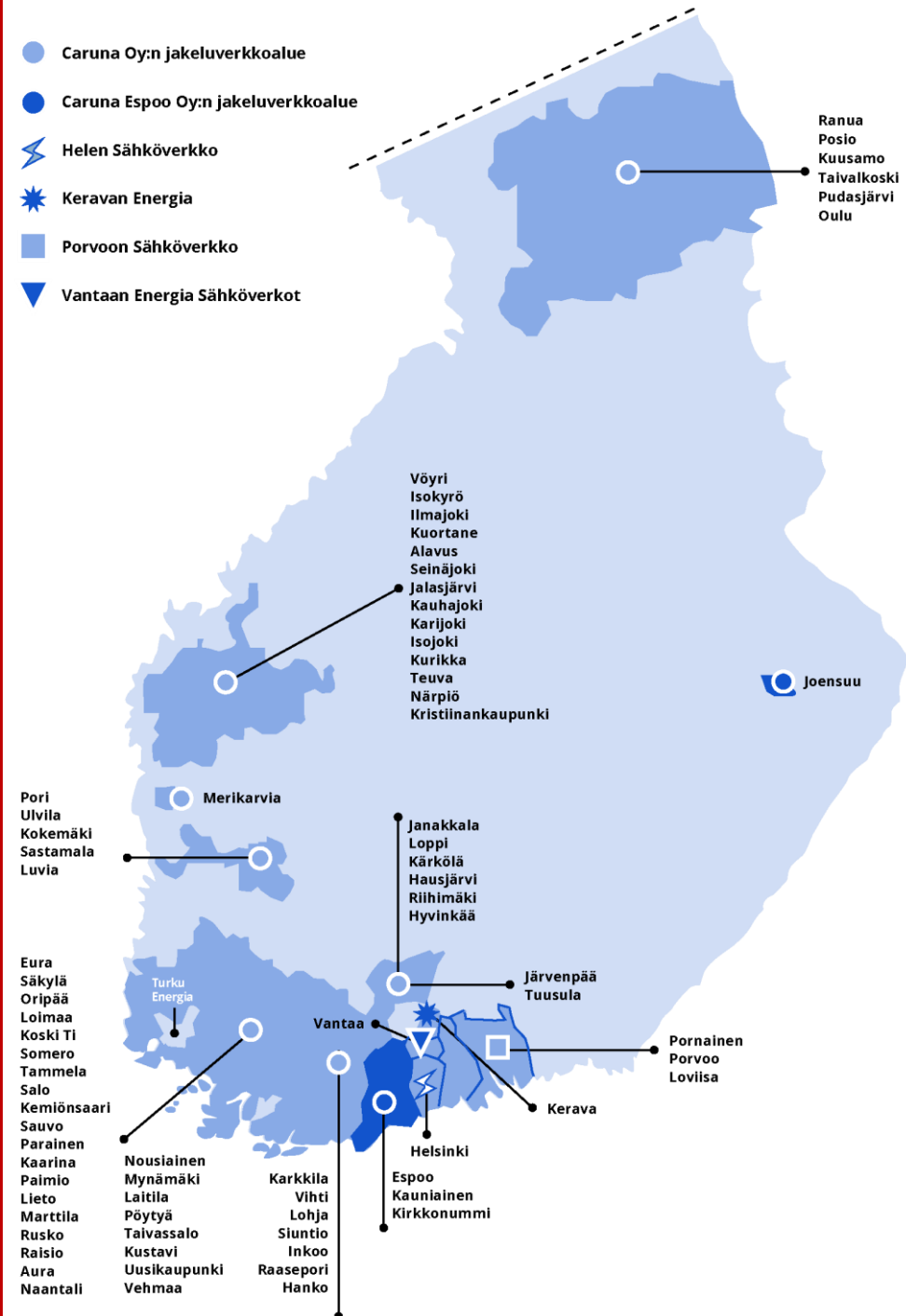
Turku Energia Sähköverkot (€)



Caruna (€)



Electricity distribution companies in Finland



Notes for the property managers in the Start-up Package

1. Administrative steps for the energy community

- Decision making
- Registration
- Sharing model

2. Electrical technical capabilities

- Main fuse capacity
- Electricity switchboard
- Hybrid inverter

3. Location and safety

- Location of the BESS
- Temperature
- Fire alarm

4. Heat pump and BESS synergy

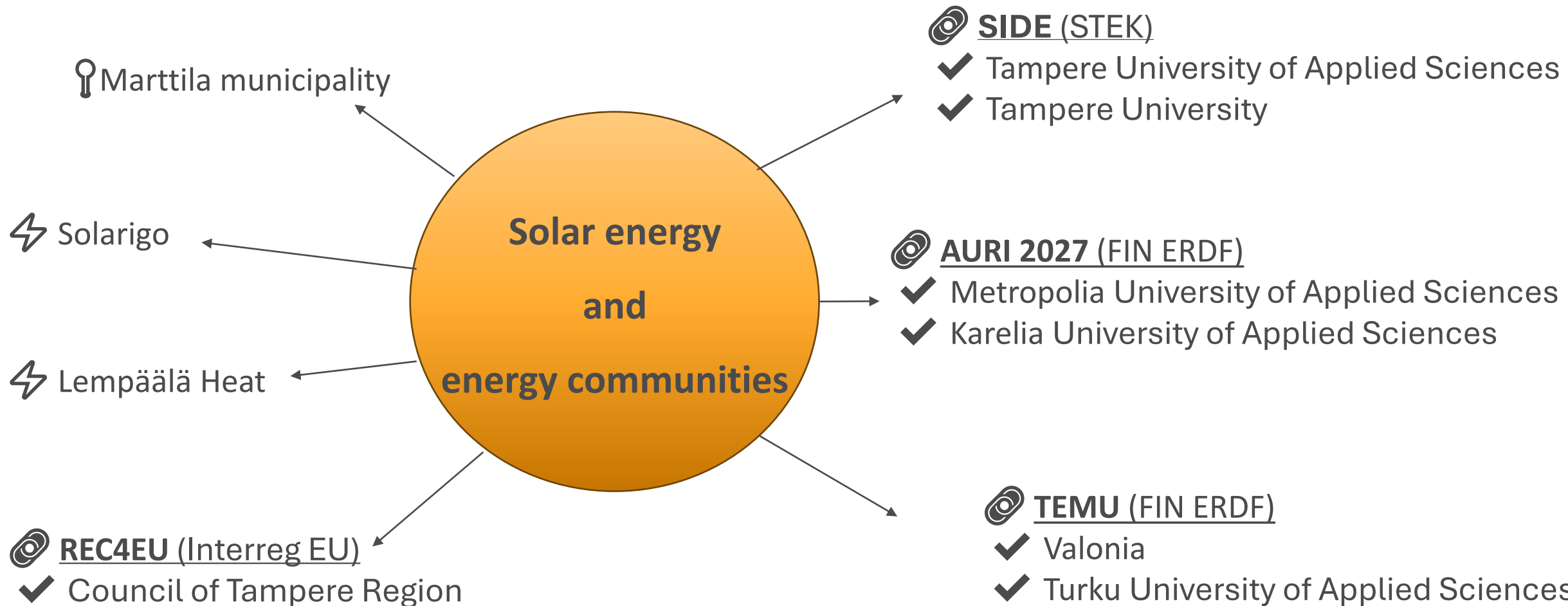
- Priorization
- Spot price control

Lessons learned from Marttila Pilot

	Successes	Challenges
Renewal of heating system	Replacement of old oil burner to sustainable air-to-water heat pump system	Increase in electricity consumption and increase in connection size due to system replacement -> delay in connection to the network and device deployment -> delay in the establishment of an energy community
Solar power system and BESS	Comprehensive and long-term familiarization with the topic in advance (i.e. fire safety)	After replacing the heating system, need for roof repair -> delay in the establishment of an energy community

Validation and Evaluation of the Start-up Package

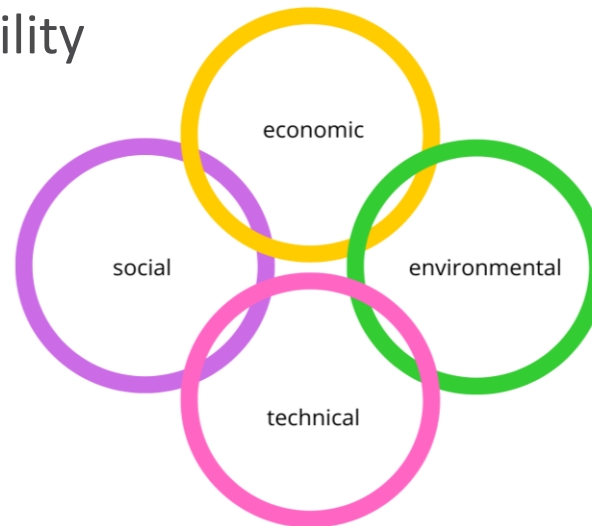
We organized many meetings with the projects and organizations presented in this slide



Sustainability Plan

Content

1. Economic sustainability
2. Technical sustainability
3. Social sustainability
4. Environmental sustainability



Remarks for Sustainability Plan

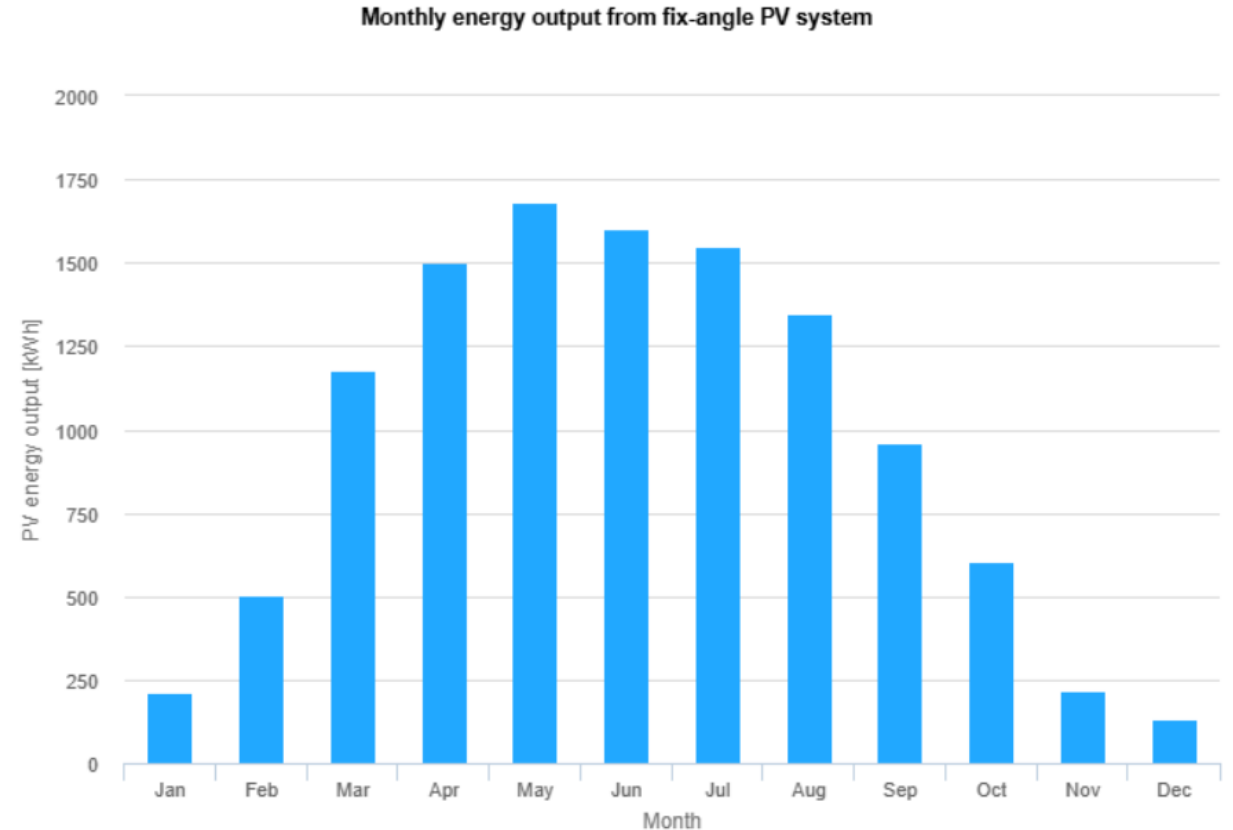
- Acts as a continuum from the Start-Up Package (*Starttipaketti aurinkosähkösähtöyhteisön perustamisesta hallinnointiin*)
- Information in the Sustainability Plan differs in some parts from the information in the Start-Up Package. Information and calculations were updated.
- Economic feasibility and environmental impact evaluations are done by Life Cycle Assessment (LCA) approach for 25 lifespan of the systems.
- In the calculations and information sources are utilized publicly available sources and solar PV calculators/tools ([StartSun](#), [PVGIS](#) ja [FinSolar](#))
- Marttila pilot-specific data is from the property manager (e.g. oil and electricity consumption before heating system modernization).

Highlights from the Sustainability Plan

Economic

- Solar PV system: 12 kWp
- Cost: 12 000 €
- Expected yield: 11 500 kWh/year
- 50 % self-consumption
- Savings are calculated for three different electricity price scenarios
 - 0 %, 3 %, 8 %
- **For 25 years lifespan**
 - LCOE is on 8,3 c/kWh
 - DPBP is 11–12 years

Solar PV production in Marttila during a year (graph from PVGIS)



Technical

- Choosing the system for optimal and safe operation for expected 25-year lifespan
 - Matching electricity consumption with system sizing
 - Yield development during the lifespan
 - Degradation rate of panels (incl. in economic calculations)
 - Commissioning of the system
- Fire safety
- Regular maintenance procedures
- Change of inverter included in technical and economic calculations

Social

- Investing in solar panels for housing companies is not only climate action, but also an economic investment and a tool for **promoting social sustainability**
- Strengthening housing equity and **decreasing energy poverty** in the municipality's housing stock
- If credit calculation is possible, excess electricity can be automatically **credited to residents' electricity bills**.



Picture: StartSun material bank

Environmental and Economic impact of Energy system's modernization

Before	consumption/year	unit conversion GWh	emission factor (tCO ₂ /GWh)	Emissions, tCO ₂ /year	Costs, €/year
light fuel oil (l)	10000	0,1	242,0	24,20	15000
purchased electricity (kWh)	3215	0,003	45,0	0,14	463
Total				24,34	15463
After	consumption/year	unit conversion GWh	emission factor (tCO ₂ /GWh)	Emissions, tCO ₂ /year	Costs, €/year
purchased electricity for the housing company (does not include AWHP consumption)	2800	0,0028	45,0	0,13	380
AWHP	20000	0,020	12,9	0,26	2712
residents' purchased electricity (total of 6 apartments)	12000	0,012	45,0	0,54	1627
housing company's own electricity production	11500	0,0	0,0	0,00	
electricity for the housing companys own use (50 %)	5750	0,0	0,0	0,00	0,0
Distribution of excess electricity production to shareholders/residents per property (assumption: 50 kWh/month in a total of 6 apartments over 7 months)	2100	0,0	0,0	0,00	
electricity sales to the grid	3650	0,0	0,0	0,00	146
Total				0,92	4573
Emission reductions and cost savings after energy system change				23,42	10890

Conclusions and considerations of Sustainability Plan: Impact of the Replaced Heating System on Solar PV Integration

Oil-heated properties:

Technical Solution: Phasing out oil boilers and installing air-to-water / ground-source heat pump system connected to the existing hydronic distribution network.

Solar PV Integration: Heat pumps shift heating and domestic hot water (DHW) production to electricity. This increases site-level electricity demand during the solar generation season (March–October) through DHW production. Solar PV generation feeds directly into the heat pump, significantly boosting the self-consumption rate and directly reducing grid electricity purchases.

Key Benefit: Completely eliminates dependence on heating oil and safeguards the housing company against impending price spikes driven by the upcoming EU ETS2.

Direct Electric-heated properties

Technical Solution: Implementing a decentralized energyefficiency retrofit by installing apartment-specific air-to-airheat pumps to offset direct electric radiator loads. DHWcontinues to be heated via individual electric water heaters.

Solar PV Integration: AAHPs reduce overall space heatingelectricity consumption. Peak solar production in summeraligns perfectly with the cooling load of AAHPs and thebaseline demand of DHW boilers. Generation from theshared solar PV plant is distributed to residents using energycommunity regulatory mechanisms (e.g., virtual net metering/ compensation calculation).

Key Benefit: A low-barrier, cost-effective solution providingimmediate reductions in residents' electricity bills.

Conclusions and considerations of Sustainability Plan: Synergy of the Triple-Bottom-Line Impact

Combining heating system modernization with solar PV creates powerful synergies across three dimensions of sustainability:

- **Technical Sustainability:** Heat pumps absorb surplus solar power for DHW production and space cooling exactly when solar irradiance peaks, avoiding grid feed-in issues.
- **Economic Sustainability:** Feeding excess solar power back into the grid yields low returns due to the loss of grid tariff and electricity tax savings. Maximizing local self-consumption optimizes avoided grid transmission fees and taxes, accelerating the payback period.
- **Environmental Sustainability:** Eliminating fossil fuel oil permanently removes local direct CO₂ emissions. The additional electricity required by heat pumps from spring to autumn is largely supplied emission-free by the on-site solar PV facility.

Thank you!



We hope that these outcomes can be utilized by other relevant housing companies/municipalities in Finland

Contacts

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ENERGY TRANSITION



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