



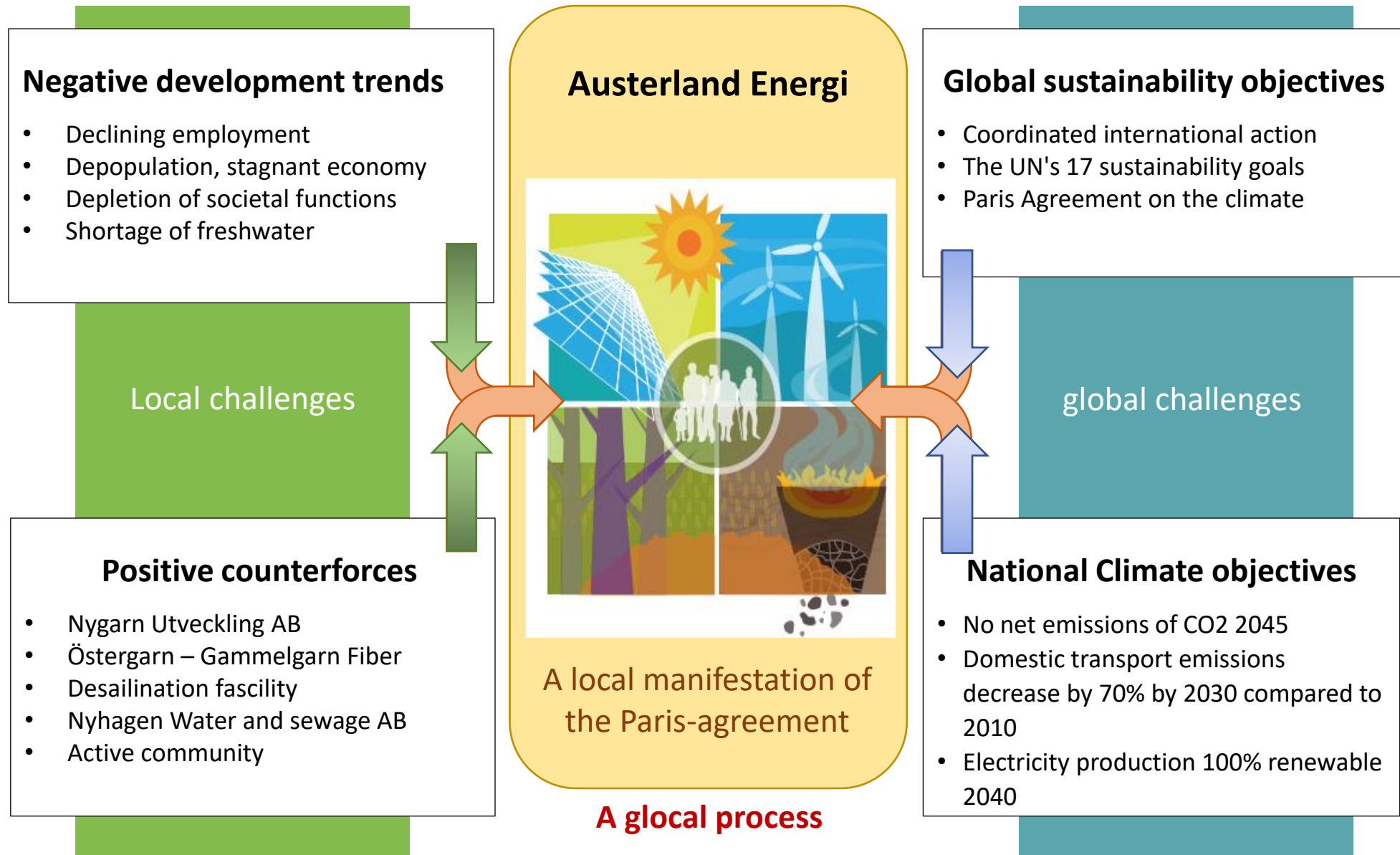
Austerland Energy

- The emergence of a local energy system

Topics

- Background
- Strategies and Models
- Lessons Learnt and results
- Hands-on opportunities we want to realize
- Discussion and collaboration

Energy transition based on the UN's SDG 2030 and Sweden's climate commitments

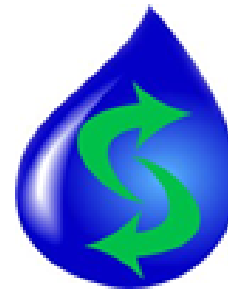


Local networks lay the foundations



Östergarn - Gammelgarn Fiber

A local Fibre Network Owner, organized by the local communities in Östergarn, Gammelgarn and Katthammarsvik as an association



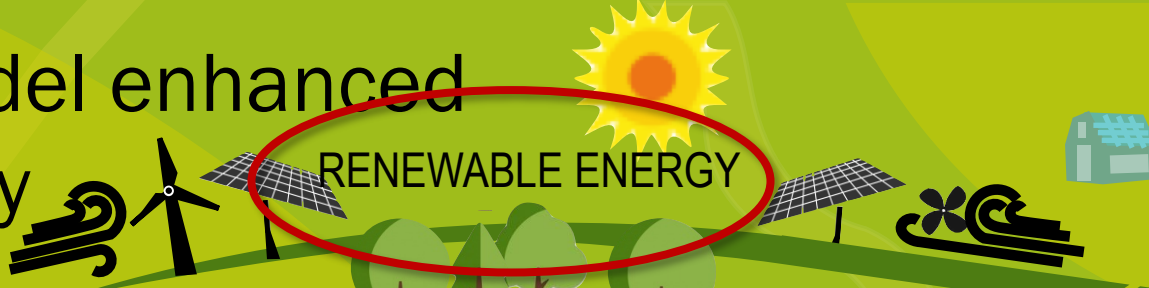
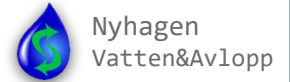
Nyhagen Vatten & Avlopp

A Water & Sewage infrastructure management company, fully owned by Nygarn Utveckling AB. The company built, and operate a system that purify the water and use it as irrigation

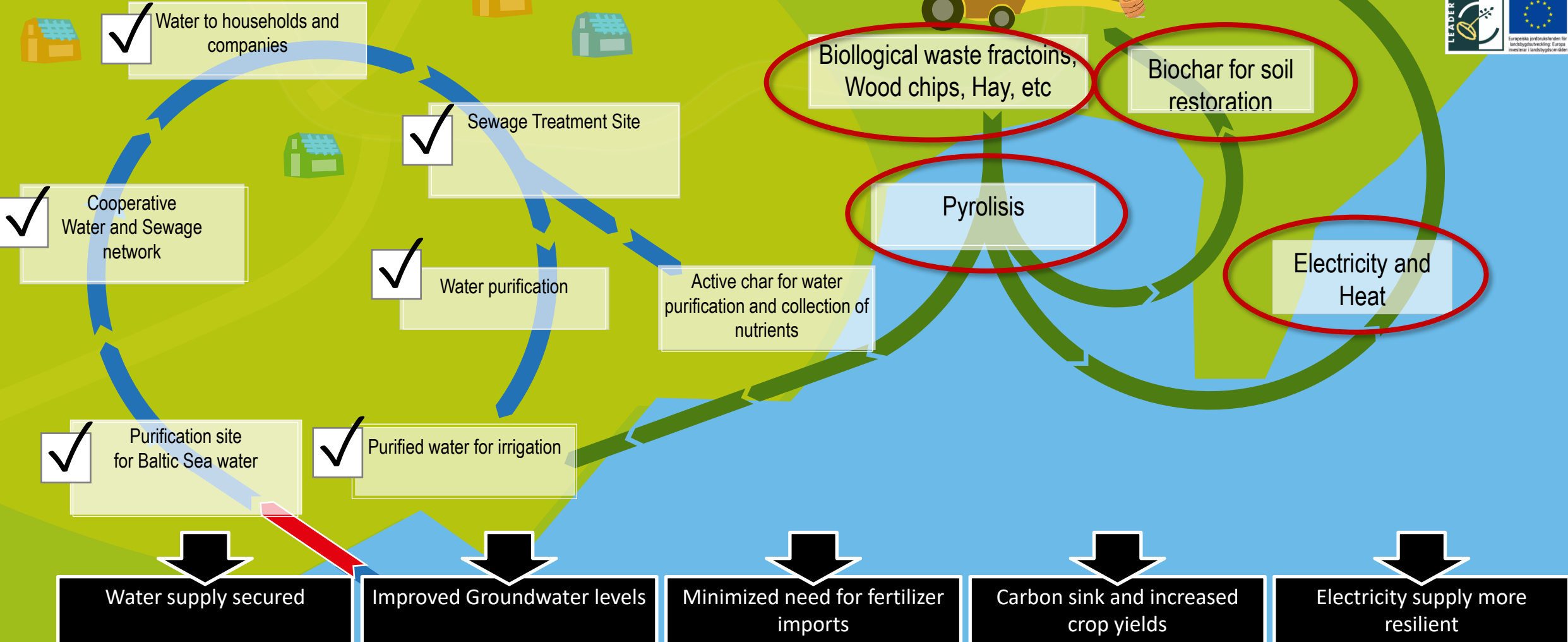
Nygarn utveckling AB (Nygarn Development)

aims to ensure a positive development for Östergarnslandet by being implementers and promoters of development projects. The company has over 125 shareholders.

Circular Resource Model enhanced with Austerland Energy



RENEWABLE ENERGY



Strategies

- Build upon existing networks and local competences
- Concrete visions and practical examples that involve people
- Create a strong reference group
- Search for vital knowledge and competences
- Find partners who can realize



Östergarn -
Gammelgarn
Fiber





Östergarnslandet

Anga, Kräklingbo

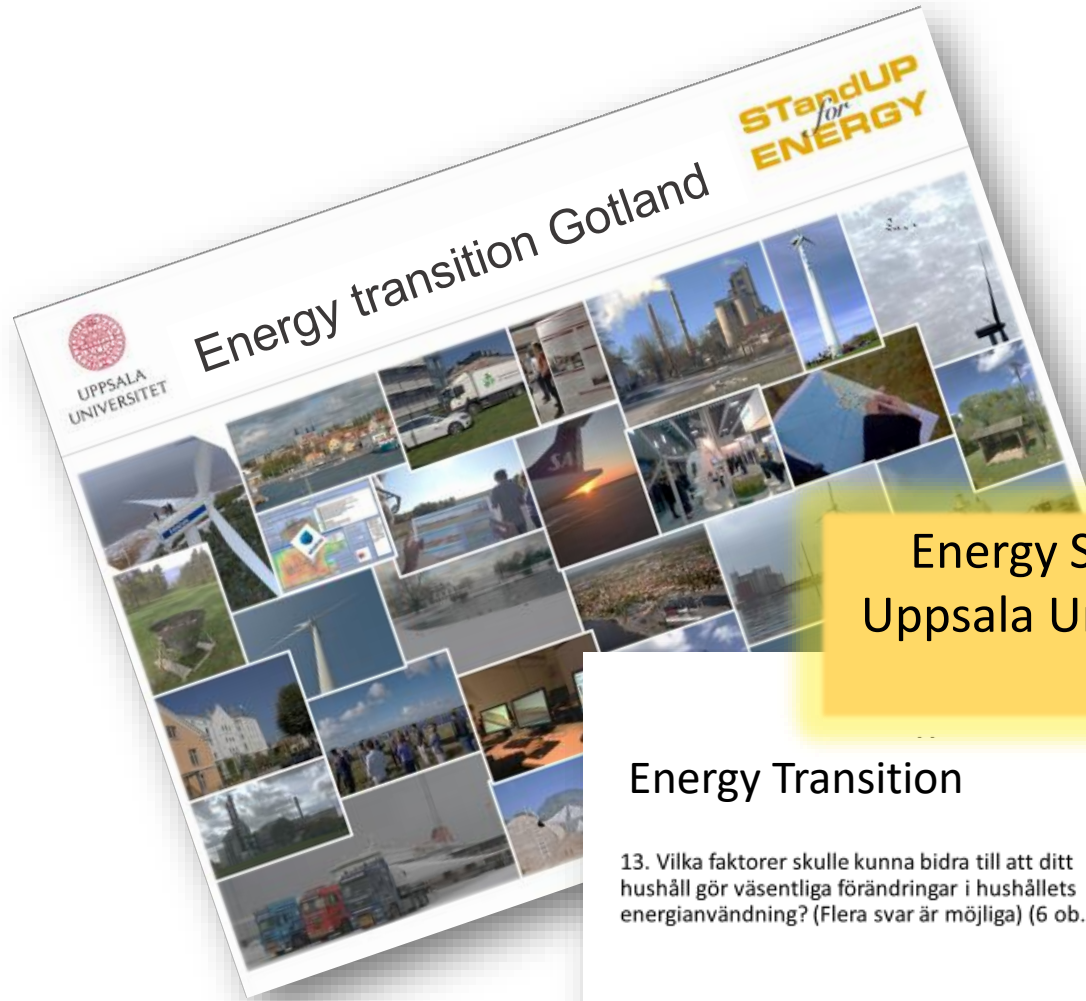
Gammelgarn, Östergarn

142 square kilometres

900 inhabitants

369 households

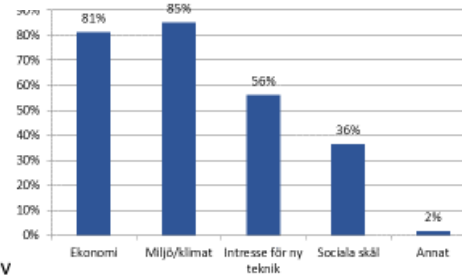
122 Questionnaire Replies



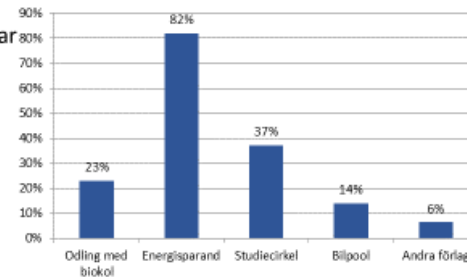
Energy Survey Uppsala University

Energy Transition

13. Vilka faktorer skulle kunna bidra till att ditt hushåll gör väsentliga förändringar i hushållets energianvändning? (Flera svar är möjliga) (6 ob.)



16. Skulle du via Austerland Energi vara intresserad av att delta i någon typ av verksamhet/projekt kring hållbar utveckling och energianvändning? (Flera svar är möjliga) (10 ob.)

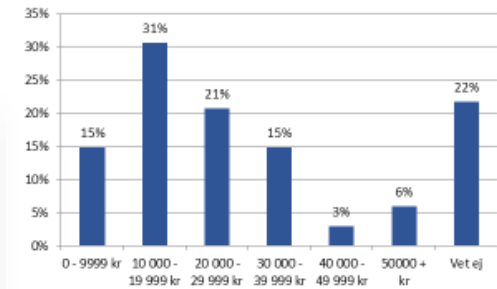


Travel & Transportation

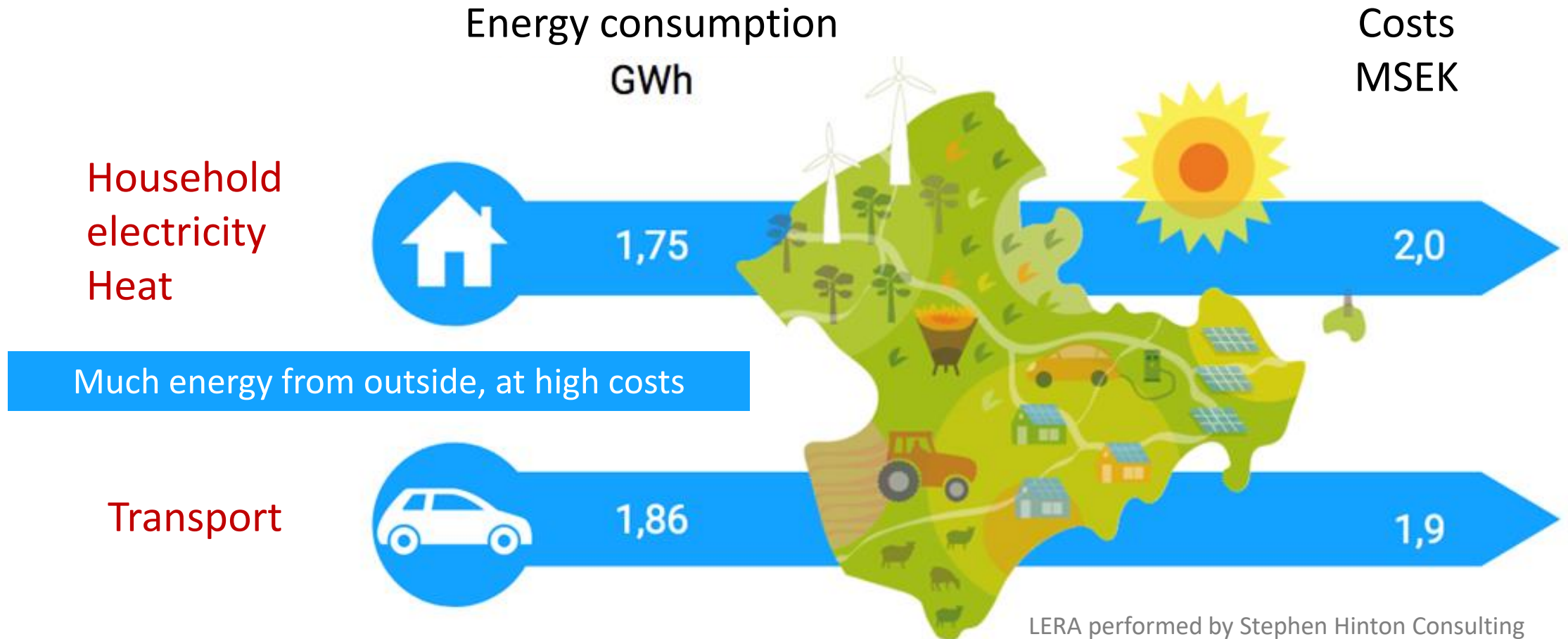
11. Hur långt (mätt i mil) uppskattar du att bilen/bilarna årligen körs?

	Medel	Standardavv.	Spann
Bensin	1319	839	50-4000
Diesel	2010	1667	500-8000
Biogas/bensin	1929	430	1300-2500
Laddhybrid	3175	1744	1500-6000
Elbil	2080	475	1500-2500

10. Hur stor är ditt hushålls samlade årliga kostnad för bränsle till personbilstransporter?

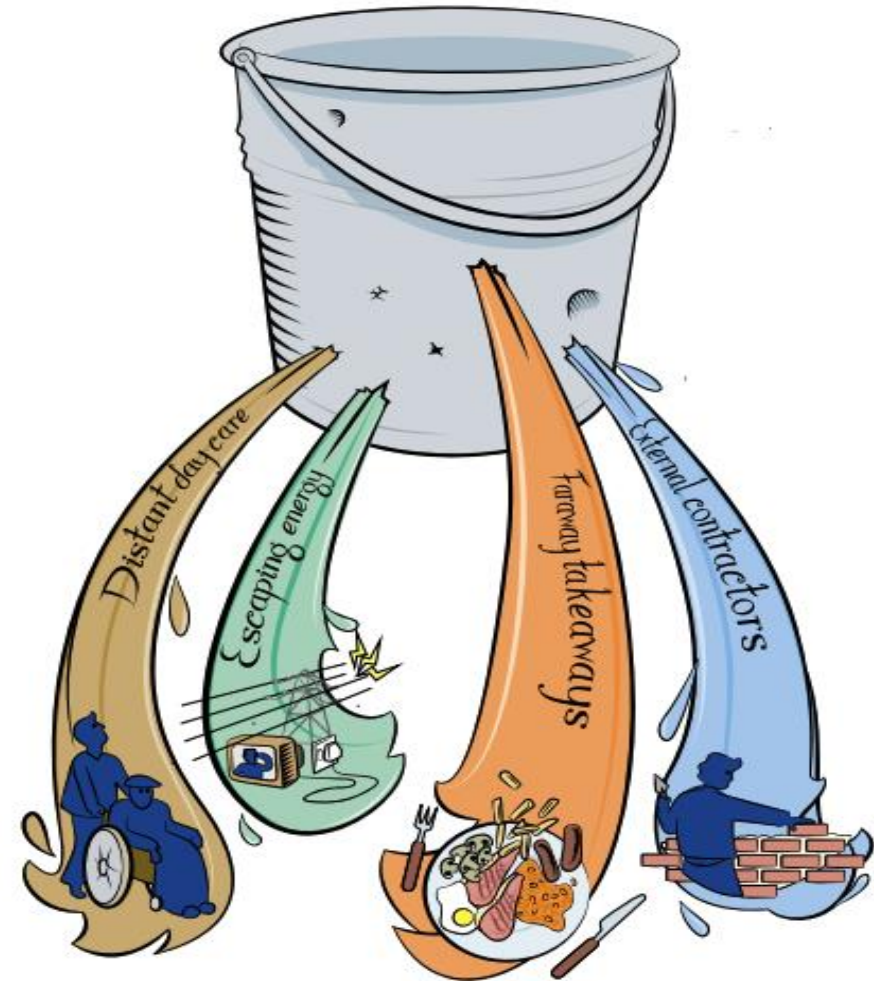


LERA Local Economic resource analysis (122 Households)

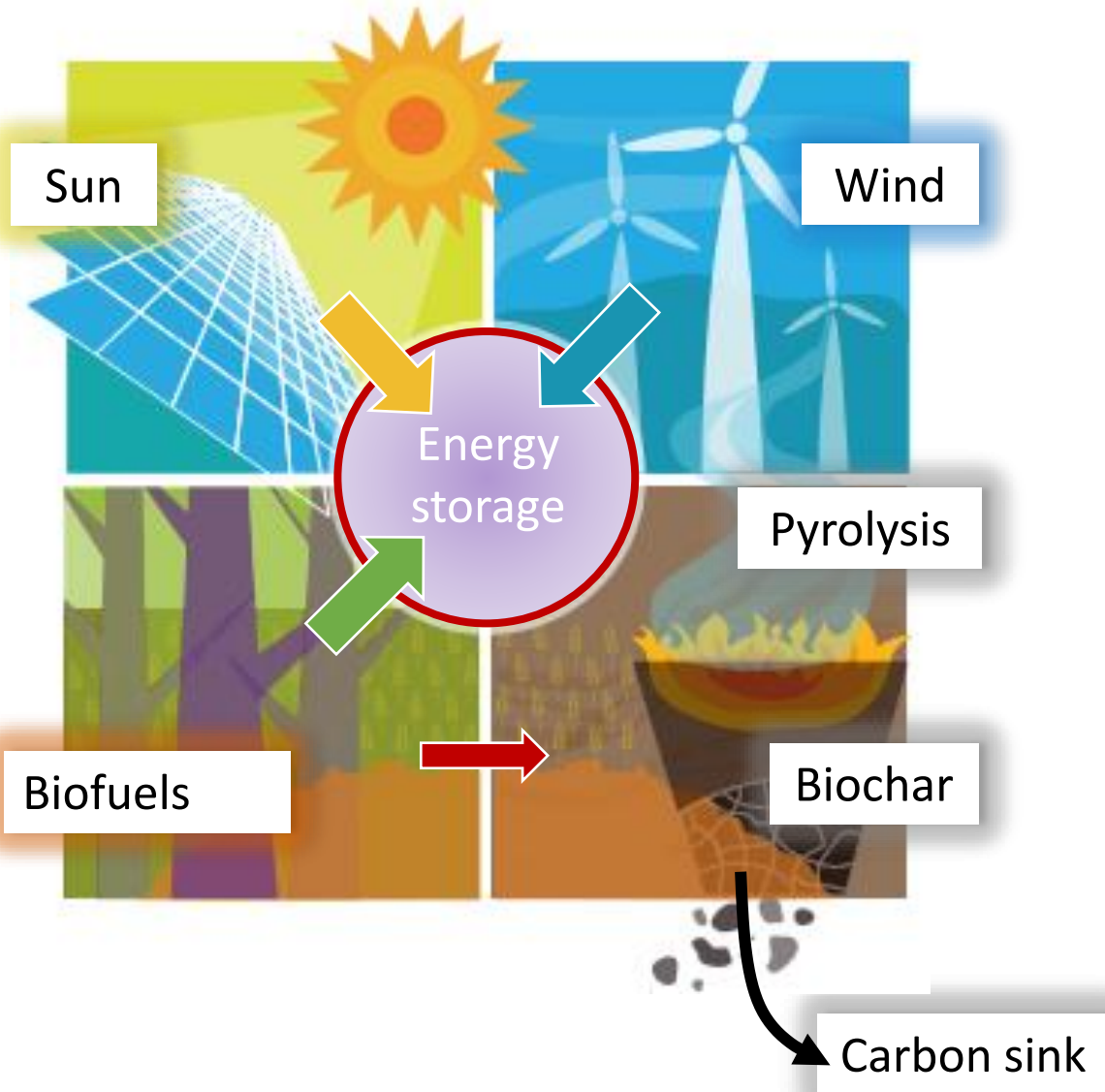


Why is the countryside drained of resources?

Understanding the flow of money and resources



Optimizing the local energy mix



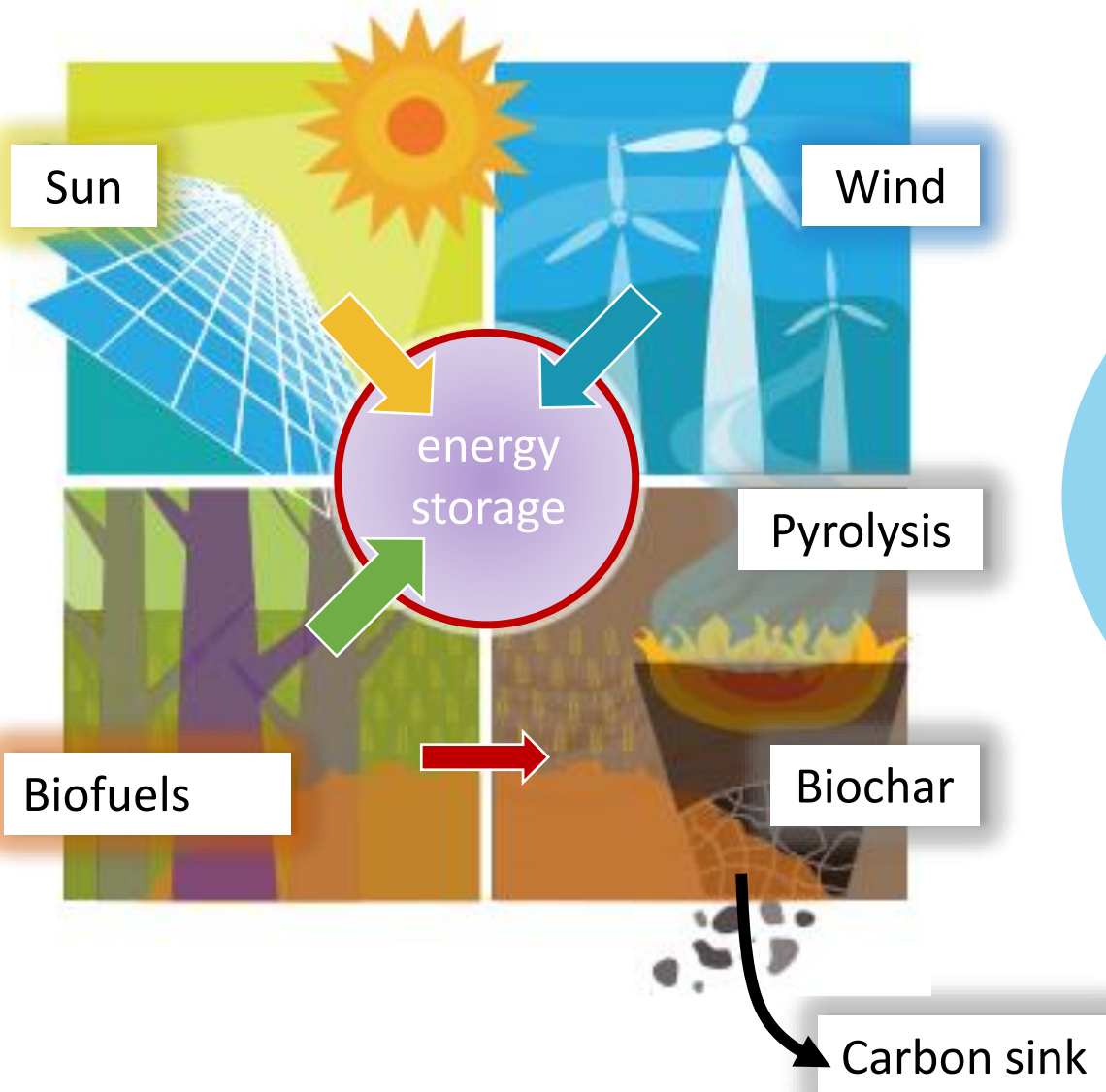
The energy transition creates the conditions for a local "empowerment process"

- The sun shines
- The Wind Blows
- Forests and crops grow

All over Östergarnslandet

"In a fossil-free energy network, Large parts of the energy needs are catered for locally."

Optimizing the local energymix

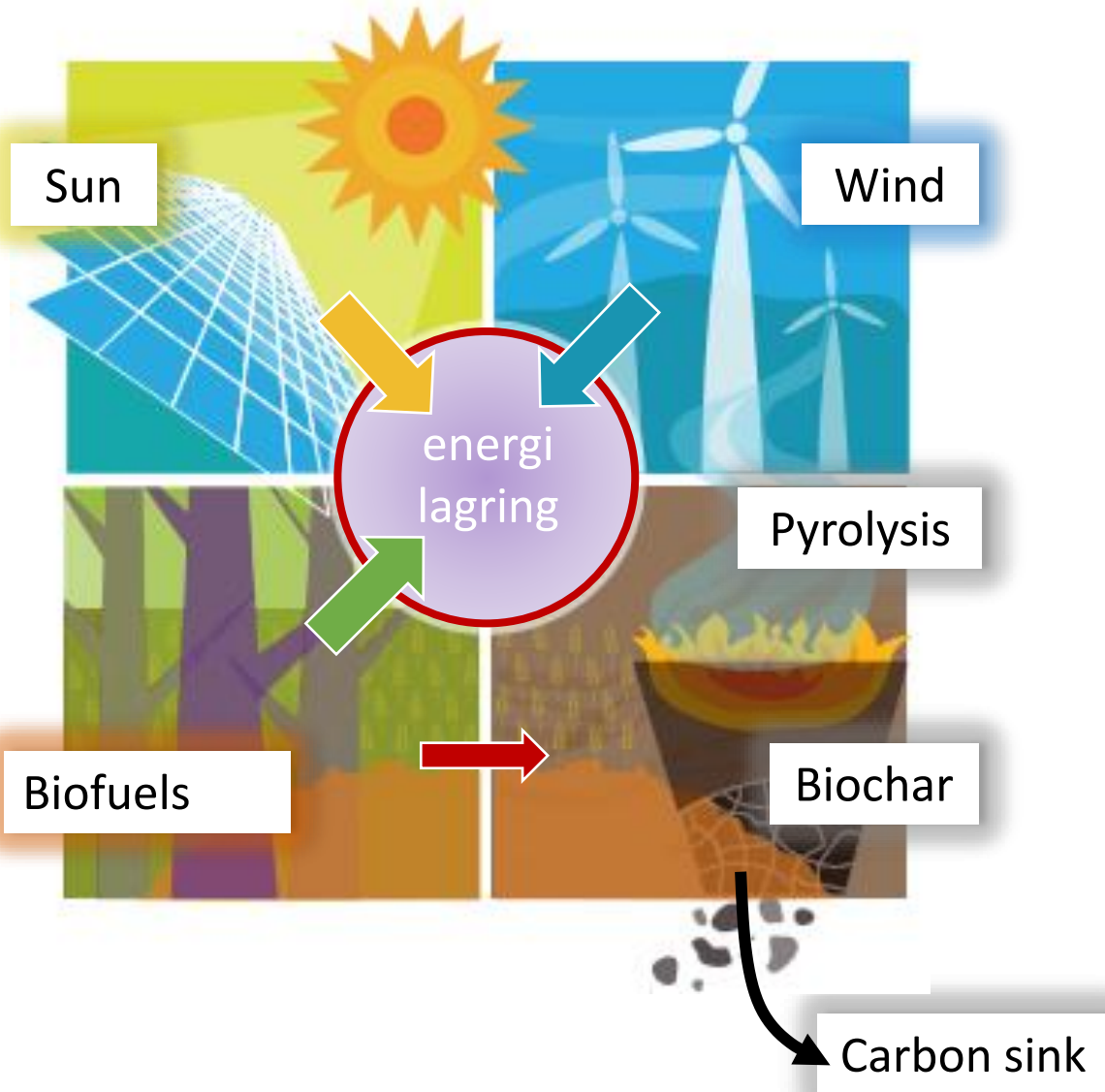


Empowerment

- power to local people

*A development process where people get **ownership** over personal, socio-economic and environmental factors affecting their everyday life and existence*

Optimizing the local energymix



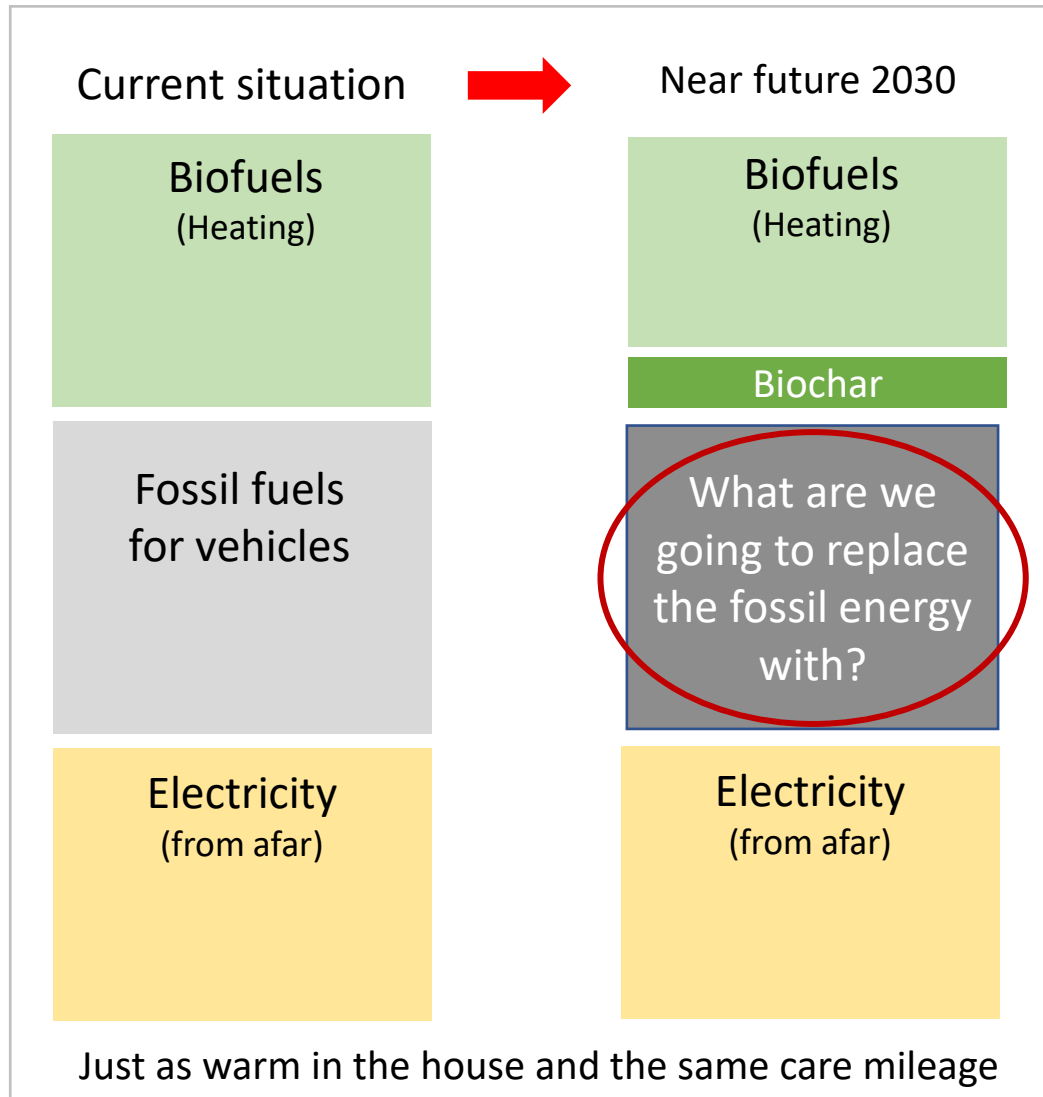
Smart energy transition

Biochar to Earth and climate
Fossil Free heating and driving

- **The overall objective** – the climate benefit
- **The local objective** – favoring households and rural areas
- Make use of local resources
- Cost- and energy-efficient
- Convenient, feasible

SUSTAINABLE DEVELOPMENT

Energy transition Scenario (MWh)



Energy transition Scenario

(survey 122 Households)

Current situation
(MWh)

Biobränslen

551 MWh

Fossil fuels for
vehicles

(52%)

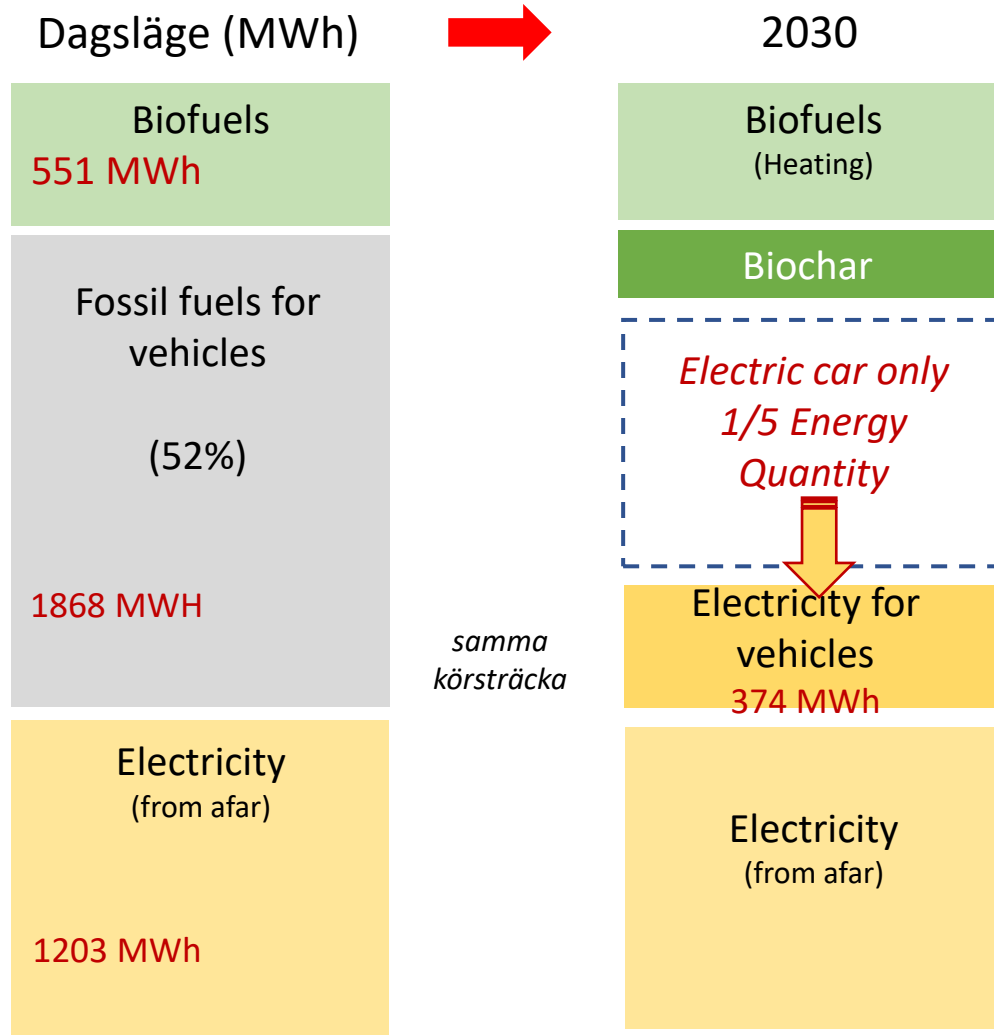
1868 MWh

Electricity
(from afar)

1203 MWh

Energy transition Scenario

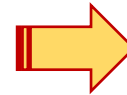
(survey 122 Households)



Just as warm in the house and the same mileage with the car

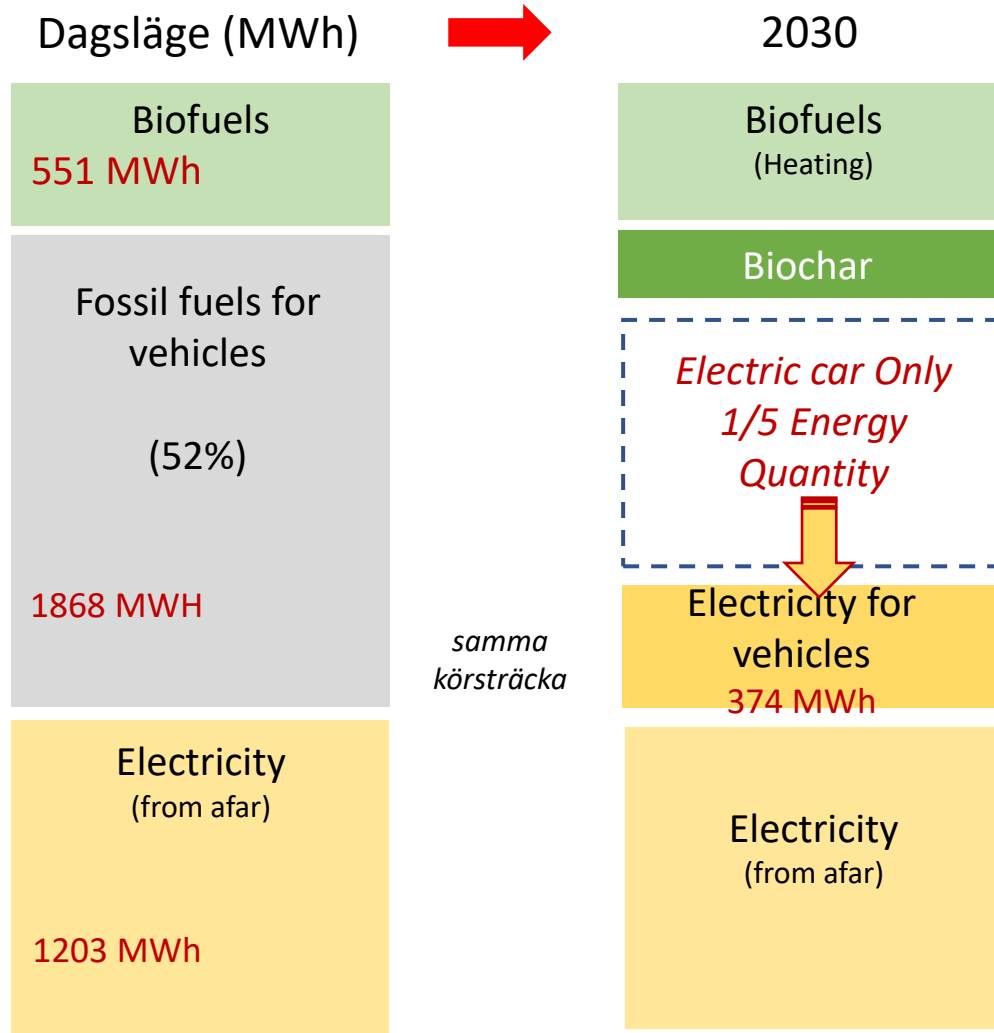
In order to produce 1MWh of electricity/year on Gotland, approximately 7 m² solar panels are required.

= 22m² solar panels/household/car
= 13 Solar panels/Car



Energy transition Scenario

(survey 122 Households)



Just as warm in the house and the same mileage with the car

Costs

New Nissan Fossil car
20.000 km/Year
10 years
Service

Resale value 2030?

Costs

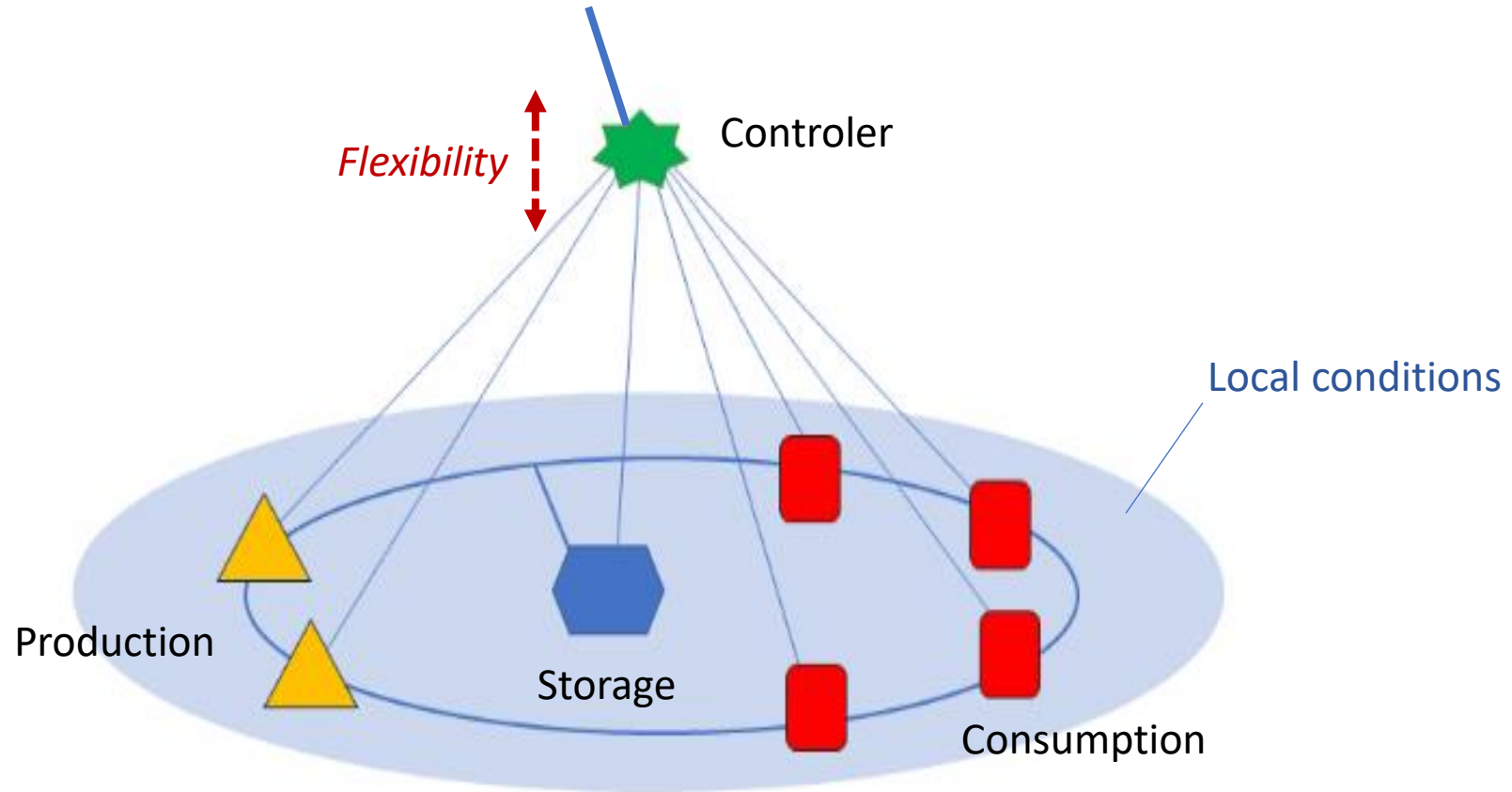
New Nissan Electric car
20.000 km/Year
10 years
Service

Resale value 2030?

Photovoltaic system
Loans
Amortization

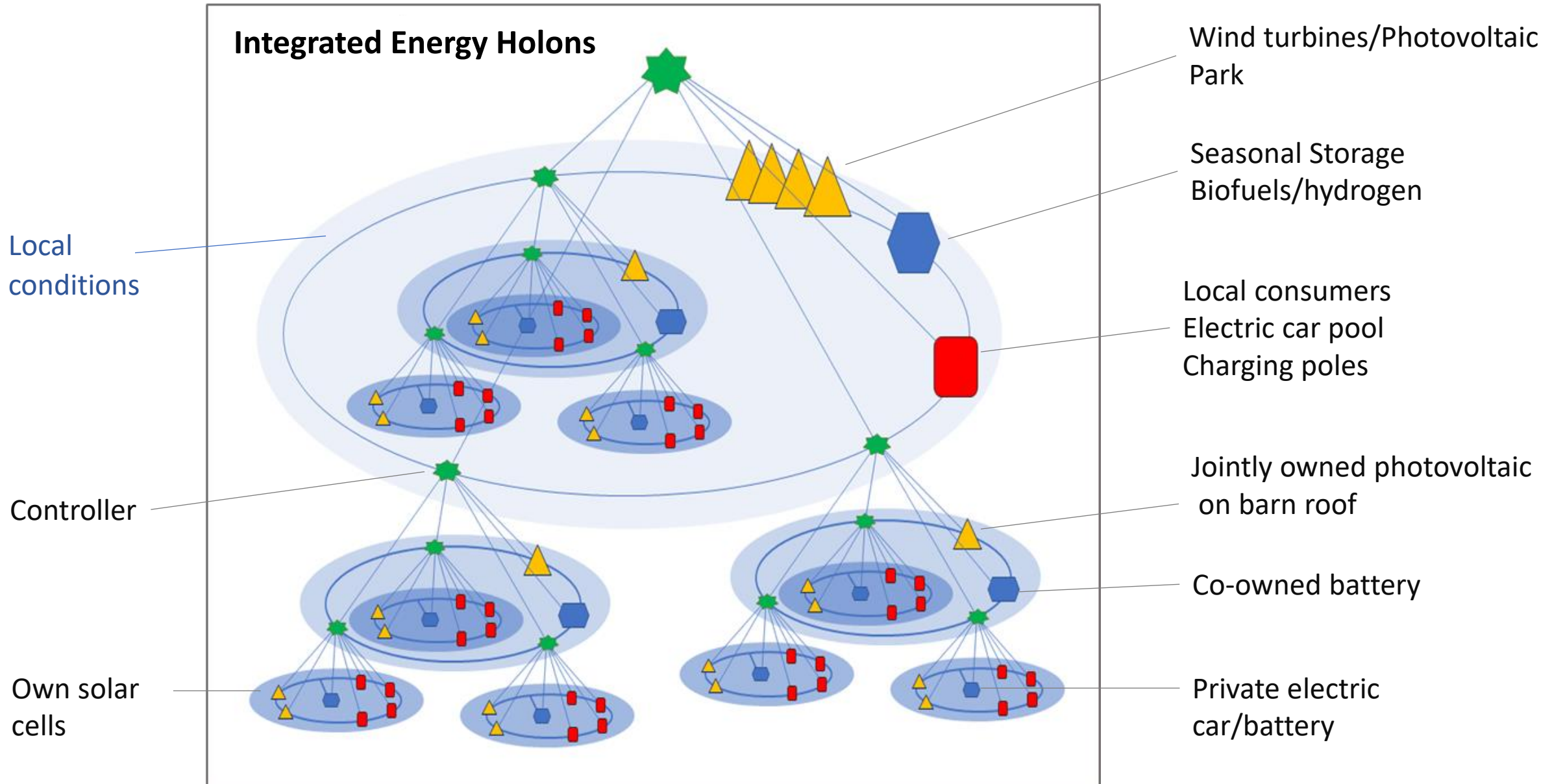
Components in a prosumer household

Models

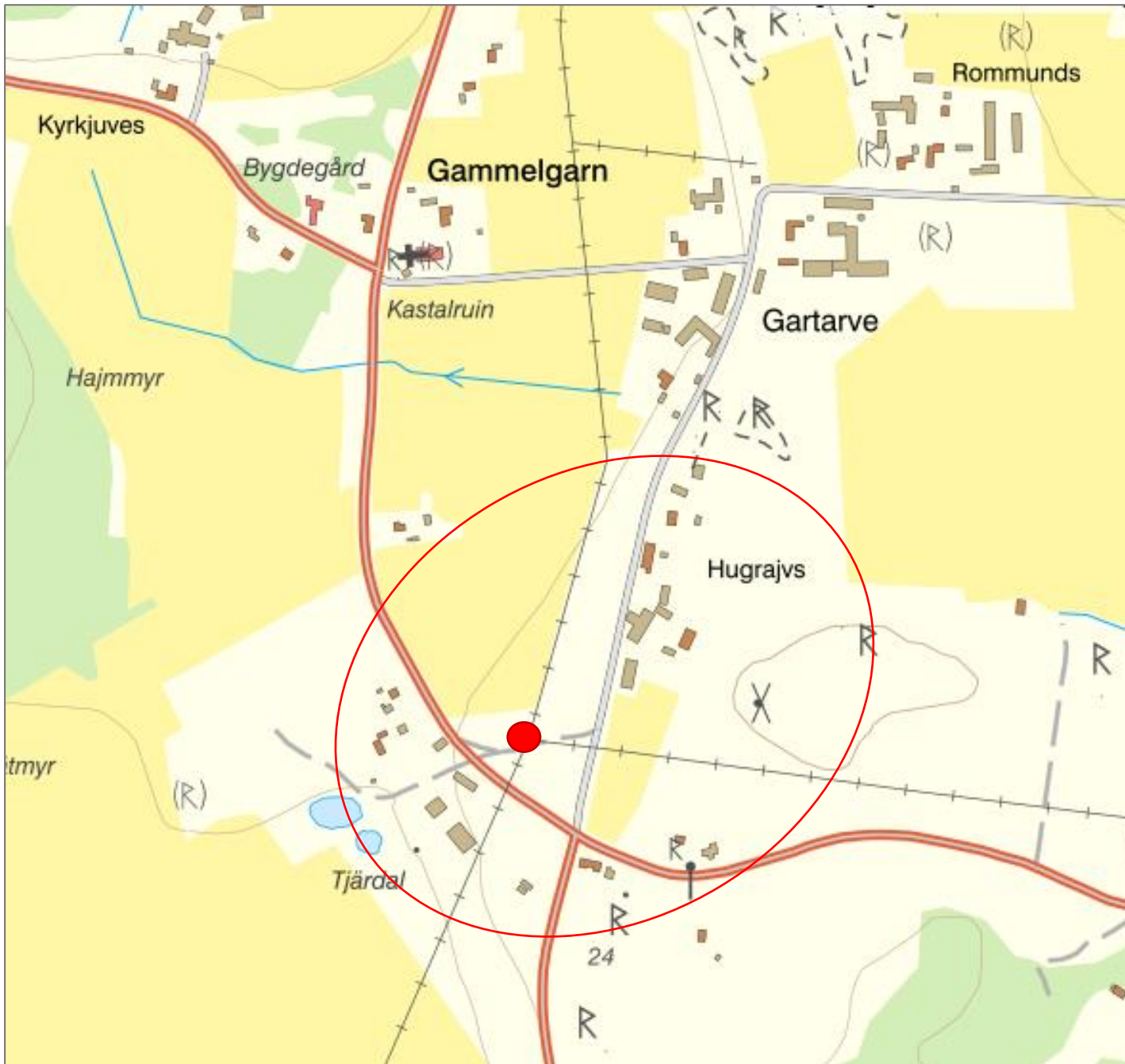


A robust energy-holon also functions during shorter interruptions in the main power supply

Robust Local Energy Network



Hugrajvs



- 11 households in cooperation
- Own and/or common solar cells/batteries
- Local power network with controllers
- Opportunities to mutually "buy and sell power"
- Robust, local energy network that can withstand 1 week of regional power outages in "low-consumption mode"

The Church Village



- New construction and integration of schoolhouse and church
- Heating with a common biofuel/bio-carbon Boiler
- Hot water Culvert system, large accumulator tank for energy storage
- Solar cells and smart local energy network, electric car pool
- Robust system that can withstand 1 week of regional power outages in "low-power"



Biomacon modell XL



Based on the figures we have received, our recommendation for calculated heating system is to operate the heating station with a biomass boiler with a heat output of 90-130kW and a biofuel boiler with a power of 120-160kW, these together should be able to regulate between 90-270kW.



KWB modell Powerfire

Of the products available on the market today, this could, for example, consist of a bio-carbon boiler from Biomacon model XL that produces 24, 1kg of biochar per hour and has a heat output of 80-160kW and which is combined with a biofuel boiler from the KWB model Powerfire 150kW, Alternatively Multifire 120kW, both of which can incinerate both chips and pellets.

570 kg/day for 300 days = 170 tonnes Biochar/year



Biomacon model XL



KWB model Powerfire



Business Case

Investment
Depreciation
Fuel

Energy value
Product value

Climate Klivet
Carbon Dioxide
bonus



570 kg/day for 300 days = 170 ton biochar/year

Price: 2.000 SEK/tonnes of Biochar = 340.000 SEK + the value of soil enhancement

Price: 20 SEK/kg = 20.000 SEK/tonnes = 3.4 mSEK

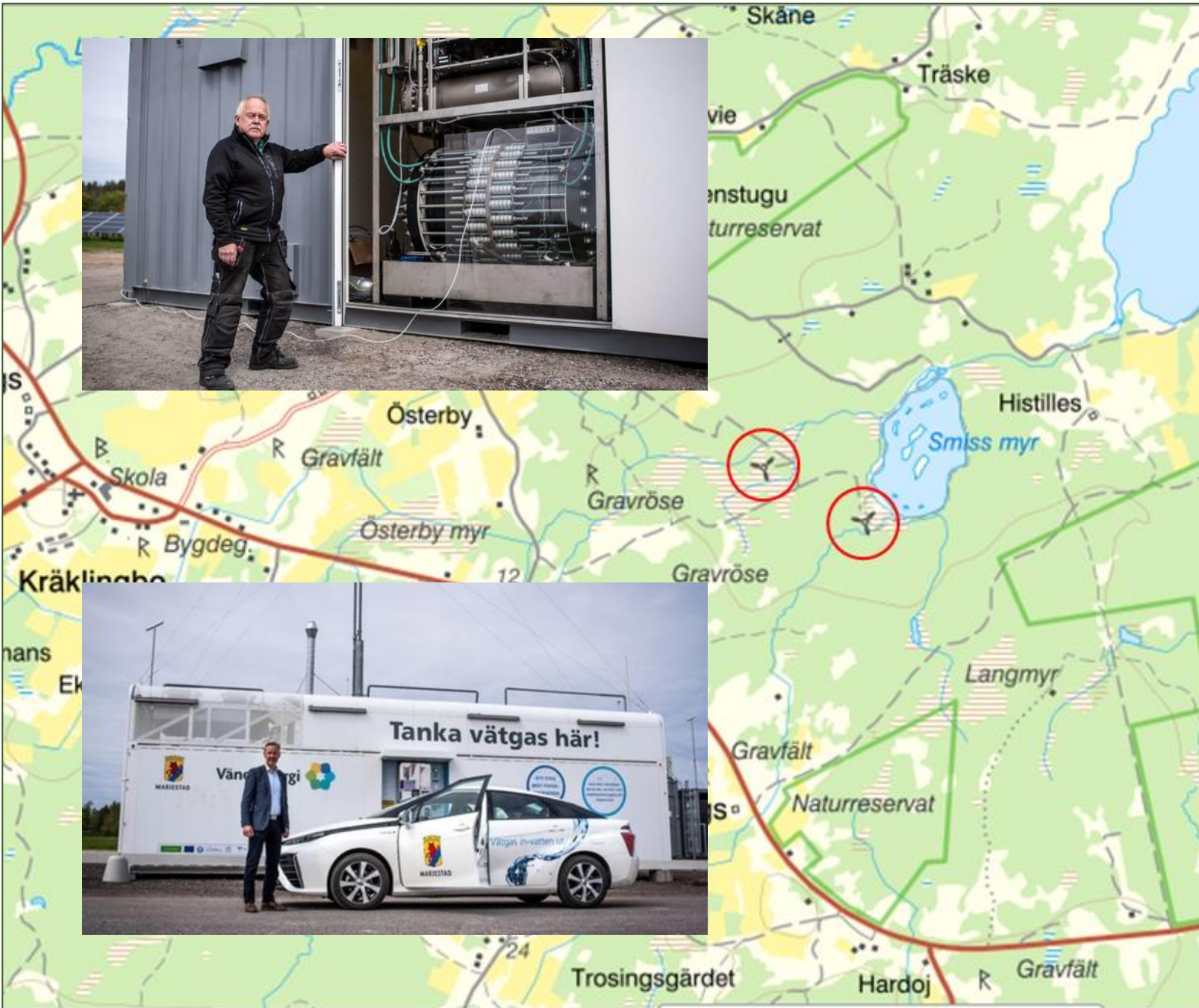
Skags Farm



- Large solar electricity plant around irrigation pond or in the free land
- Electrical energy for the farm's economy buildings for the warehousing of vegetables and root crops
- Possibilities for shorter energy storage in batteries or as hydrogen
- Shareholding in summer housing

Smiss

- Larger co-owned photovoltaic system adjacent to existing wind turbines
- Weekly and seasonal storage of energy in the form of hydrogen
- Producer of oxygen to industries and hospitals
- Can in crisis mode supply the entire Östergarnslandet with electricity

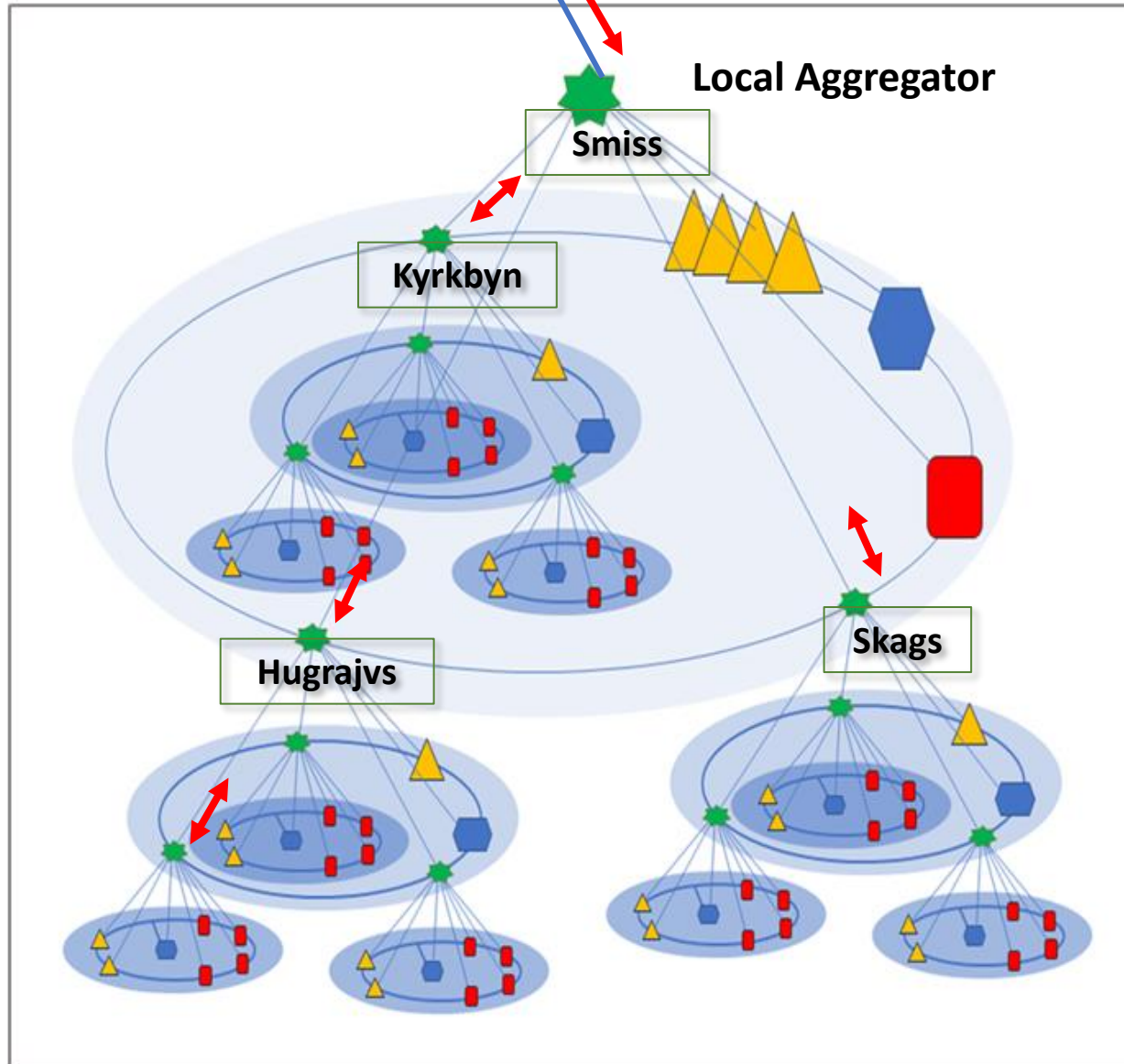


**Digital innovation forum
Amsterdam 2017**

Distributed energy generation with its occasional **inverse power flows**, new **storage capabilities**, new digital **prosumers** with their smart meters and other **intelligent devices**, together with the need for operating closer to the design limits are radically modifying the conditions under which distribution grids operate impacting their reliability and efficiency.

This radical change in the way of generating, transporting, distributing, and consuming energy creates many challenges that affect the entire business model around electricity.

Francesco Gennaro | ST Microelectronics
Eloy Ortega Gonzalez | Indra Sistemas



Smiss

Wind power, larger photovoltaic system, hydrogen storage

Church Village

Sammankoppling
Between existing and new production
(biofuels/biochar/
Solar cells

Skags farm

Photovoltaic plant for the economy buildings on irrigation pond/free land, shareholding

Hugrajvs

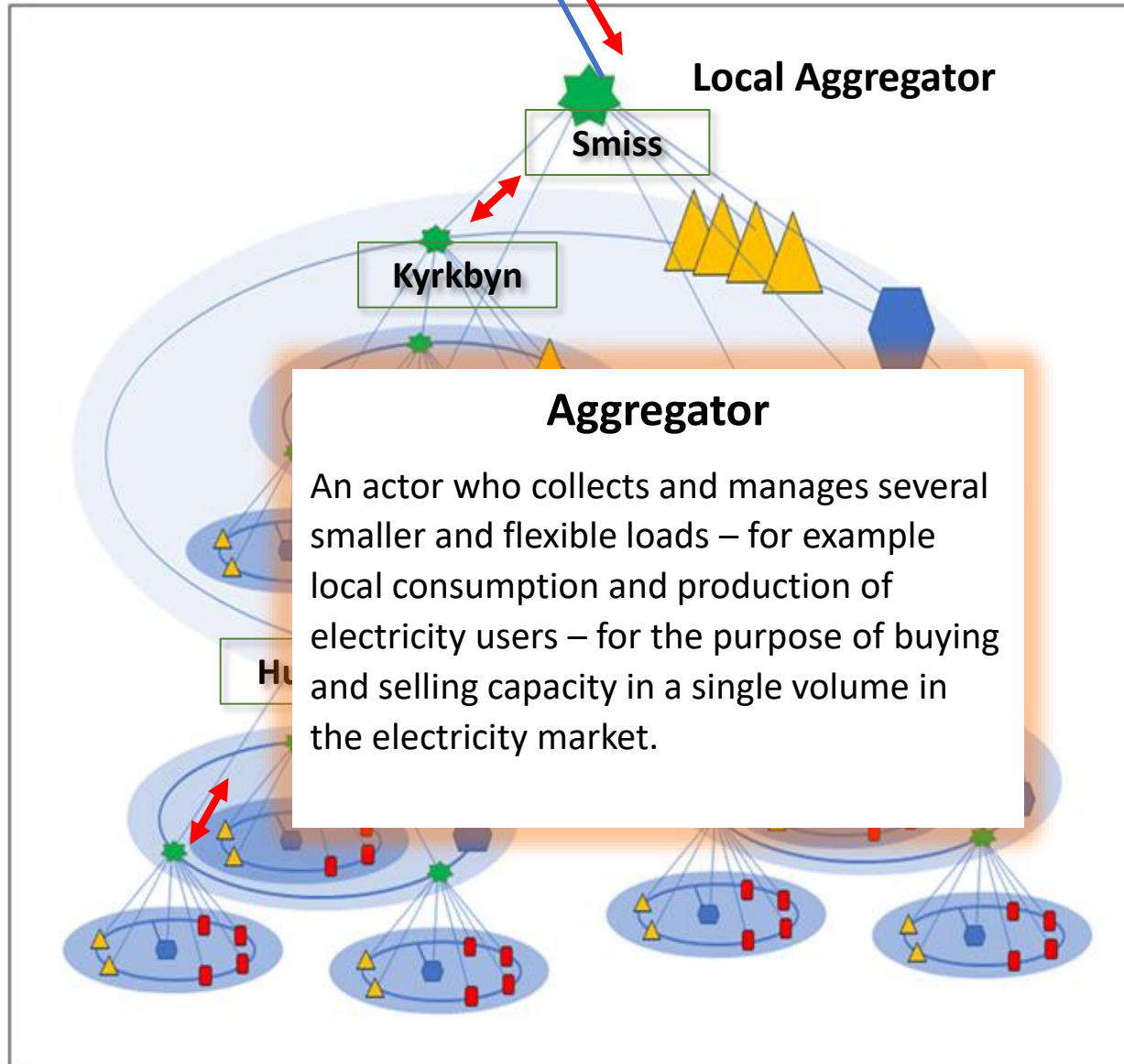
Energy networks between existing neighbouring houses (Biofuels/photovoltaics)

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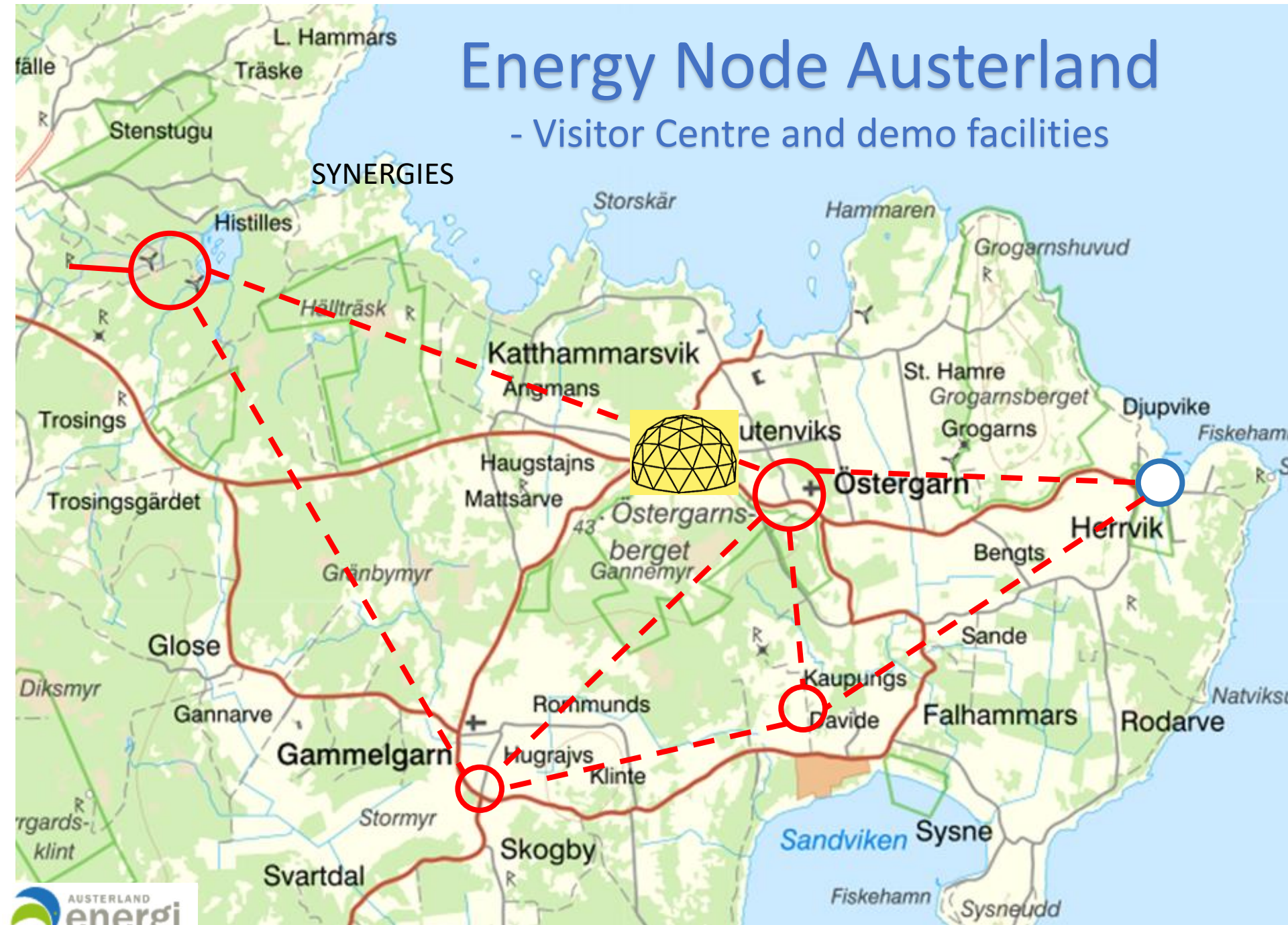
Photovoltaic plant for the economy buildings on irrigation pond/free land, shareholding

Hugrajvs

Energy networks between existing neighbouring houses (Biofuels/photovoltaics)

Energy Node Austerland

- Visitor Centre and demo facilities



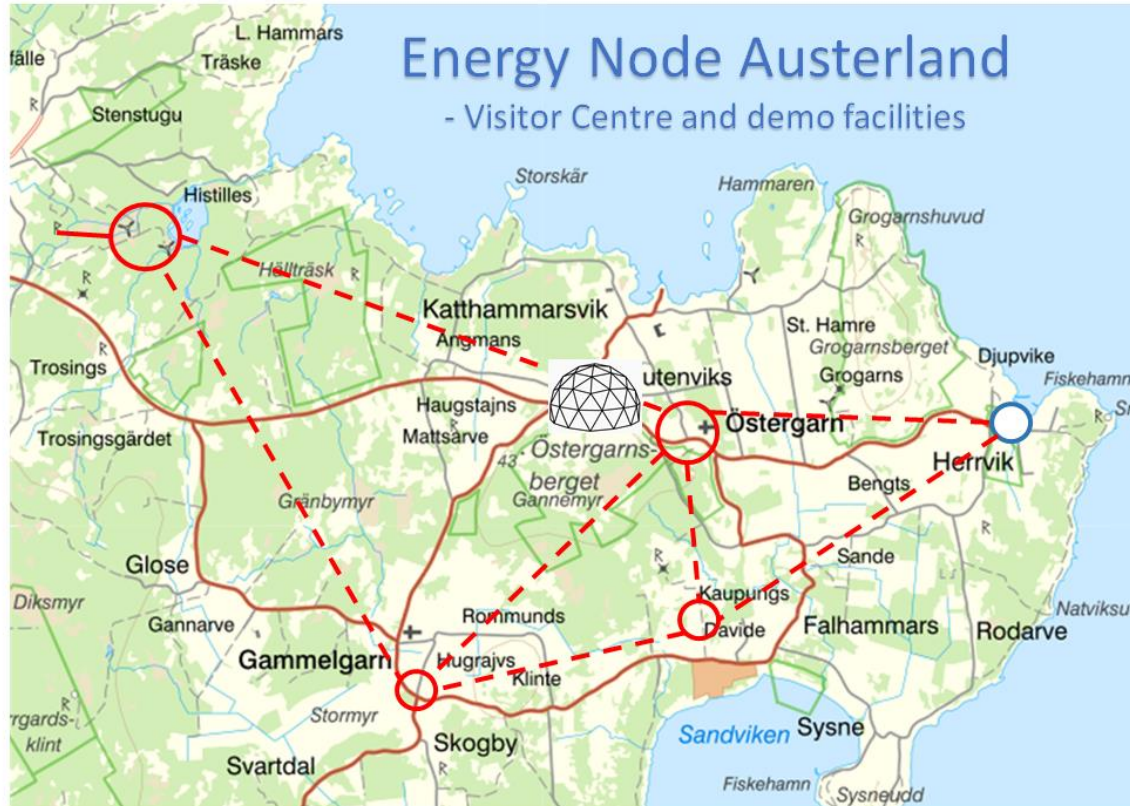
- Robust Energy network with an optimum energy mix of wind, solar and biofuels
- Energy storage Short/long time (batteries, hydrogen)
- Car pool, charging poles for electric cars
- New forms of cooperation, tariffs, regulations
- Integrated Bio-coal production
- Biochar as carbon sink and soil enhancement
- Solar powered Desalination Plant
- Purified Wastewater for irrigation
- Climate benefits through emission reduction and carbon sinks

Austerland Visitors ' Centre



Simple, innovative and inspiring

- Showcasing strategies for the implementation process
- Describes the robust system
- Explains the technology and demonstrates the synergies
- Allows participants to make simulations and own energy and cost calculations
- Attracts technology developers, researchers and students



Energy Node Austerland

- Visitor Centre and demo facilities

- Robust Energy network with an optimum energy mix of wind, solar and biofuels
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Visitors' Centre Austerland

A location that:

- Describes the robust system
- Explains the technology and synergies
- Allows participants to make simulations and own energy and cost calculations
- Attract technology developers, researchers and students

And where groups of interested people can make study visits in the neighborhood to see all this also in reality.

Austerland Energy – A model for inspiration and hands-on roadmap for an energy transition that utilizes genuine local empowerment in a process that benefits the climate as well as the local community.

