

SHREC:

Scaling up renewable energy production in Mellersta Norrland:

Consumers should be involved in the clean energy transition, and they should benefit from it^{1 2 3 4}

*SHREC² is a European initiative where eight regions in eight countries (Holland, France, Italy, Lithuania, Romania, Slovakia, Sweden) are working to accelerate the transition to a climate-neutral (or climate-positive) economy through the transition to renewable energy. From Sweden's side, **Mellersta Norrland** participates in SHREC. Mid Sweden University coordinates Sweden's efforts.*

By looking at how different countries invest and organise to shift from fossil to fossil-free, renewable energy while discussing policy learning, it helps mobilise actors in the countries involved, ensure that new initiatives can be launched and contribute to the overall global, EU and national climate goals.

This is a basis for discussion with various stakeholders (stakeholders) in Mellersta Norrland, organisations that are or want to be involved in innovation and production of renewable energy; civil society organisations, public organisations, businesses, academia and politics. The energy issue has many important dimensions, not least resource efficiency and circular economy. Here has been chosen to focus on renewable energy. The document concerns only a fraction of the interesting development in Jämtland/Härjedalen and Västernorrland, the recommendation is to find statistics and analyses in the rich flora of reports that are continuously published. See also annex with a selection of ongoing projects in the region.

Intro – regional climate objectives fully in line with national frameworks and global climate agreements

The Paris Agreement is a global climate agreement that entered into force in 2016.³ Sweden advocates ambitious implementation of the Paris Agreement and contributes in several ways to achieving the goals, b.a. Sweden has nationally and regionally set climate goals. The long-term climate target means that Sweden will not have net greenhouse gas emissions to the atmosphere by 2045 and the vision is that Sweden will become the first fossil-free welfare country.

Within the EU, a political agreement was reached on 21 April 2021⁴ setting the objective of a climate-neutral EU by 2050 and a collective net greenhouse gas reduction target of at least 55 % by 2030 compared to 1990. The EU's commitment to a new Green Deal, the European Green New Deal, also states that the EU should not emit any greenhouse gases by 2050. An important element of the European Green Deal is that *“consumers should be involved in the clean energy transition, and they should benefit from it”*.^{5 6 7}

The county administrative boards in Jämtland County and Västernorrland County have developed energy and climate strategies for the two counties in cooperation with the respective region; 2030 *Jämtland LÄN ENERGY AND Climate Strategy 2020-2030* ⁶ and *Energy and Climate Strategy for Västernorrland 2020-2030*⁷. The strategies point the work forward to contribute to Sweden's national energy and climate goals, *inspire regional actors to collaborate*, identify focus areas and aspects with extra high priority and can serve as a basis for future action plans and projects. Important national and regional targets include maintaining high production of renewable energy in Mellersta Norrland, fossil fuel-free transport and machinery, forests as a resource for a strong and long-term bioeconomy and that this should be matched by the development of a stable electricity

1 Quotes from the EU's New Green Deal; “The European New Green Deal”; [resource.html \(europa.eu\)](https://resource.html(europa.eu))

2 www.interregeurope.eu/SHREC

3 For more information, see the Swedish Environmental Protection Agency; [Paris Agreement – Environmental Protection Agency \(Naturvardsverket.se\)](https://Paris Agreement – Environmental Protection Agency (Naturvardsverket.se))

4 [A European Climate Law: Council and Parliament reach provisional agreement – Consilium \(europa.eu\)](https://A European Climate Law: Council and Parliament reach provisional agreement – Consilium (europa.eu))

5 Communication FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS, The European Green Deal, Brussels 2019; [resource.html \(europa.eu\)](https://resource.html(europa.eu))

6 Fossil fuel free 2030 Jämtland County Energy and Climate Strategy 2020-2030

7 Västernorrland County Administrative Board | Energy and climate strategy for Västernorrland 2020-2030

grid.

In Sweden, discussions and plans on fossil-free industrial processes and transition to renewable energy take more and more place. Most experts agree that electricity production in Sweden needs to increase significantly, some say at least double (140 TWh to 280 TWh), while WSP 8 estimates that at least 215 TWh by 2045 will be needed for a good conversion. Many interesting initiatives are underway, but is there any dimension that has untapped potential?

Existing statistics and comparisons with other countries within the SHREC cooperation⁹ show that Sweden, and especially Mellersta Norrland, is very advanced when it comes to renewable energy production. Interesting and mobilising civil society for the climate transition, both as customers/consumers and producers, is an important part of the SHREC and a recurrent ambition in global as well as EU strategies. It is an area where Sweden does not seem to be as active as compared to several of the other¹⁰ participating countries, but where SHREC Sweden considers that Mellersta Norrland is a region that has great potential to take new approaches in terms of taking an active part in climate action, developing learning about people's participation and participation to drive the implementation of this transition.¹¹

Dynamics Mellersta Norrland

Two regions with very different industrial structures

The energy system in Mellersta Norrland is based on indigenous renewable energy carriers such as water, biomass, wind and solar.

Mellersta Norrland includes two regions; Region Jämtland/Härjedalen and Region Västernorrland. Jämtland/Härjedalen covers about 12 % of Sweden's surface area, but has only 1.5 % of the population (approximately 132 000). Västernorrland has about 5.3 % of Sweden's area with 2.3 % (approximately 245 000) of the population. The two regions have a relatively different history. In 1905, when Sweden's union with Norway ended, Jämtland and Härjedalen were separated from a long time very close association with Norway, and became the only fully landlocked region in Sweden. By the beginning of the 20th century, just over 40 % of all land in Jämtland had been purchased by the forest companies that supplied their sawmills along the northern coast with timber from the forests of Åland. Very little was invested in Jämtland. In 1906, the Riksdag prohibited such acquisitions by the Norwegian Prohibition Act. At this time when almost all of Sweden began to industrialise, no mills were established and few industries in Jämtland. One reason was also that the strong people's movement that had grown up in Jämtland, did not at all want to see the country industrialised and Jämtland became a raw material producer.¹² In retrospect, it can be said that Jämtland went directly from an agricultural community to a service community. In today's statistics on entrepreneurship and start-ups, Jämtland has the second highest figures for entrepreneurship (small enterprises) and third highest for start-ups¹³.

Region Västernorrland has a long history of industrial activities, mainly through the forest industry with many sawmills. Sweden's first major industrial area arose when hundreds of steam saws were built along the coast of Mellannorrland, the first of which started in Tunadal in 1849¹⁴. In the latter part of the 19th century, the sawmill epoch meant that Västernorrland had a faster population development than the rest of the country. The industries which currently have a high level of specialisation and at the same time employ a large number of employed workers are insurance, telecommunications, the manufacture of paper and paper products, the manufacture of chemicals, the manufacture of other means of transport and forestry. Forests and digitalisation are two areas of strength for Västernorrland, which were also discussed within the framework of the National Innovation Council autumn 2020¹⁵. Today's statistics show that Västernorrland has few enterprises and small business start-ups, while the median wages are high¹⁶.

Central Norrland is an extremely important energy and electricity producer

Västernorrland's total energy consumption amounted to almost 25 TWh in 2017. Of these, the industrial sector accounted for over 70 % and the transport sector accounted for 13 %. The largest energy carriers for the industrial sector in the county

8 WSP report "Deficiencies, decisions and balances in the electricity system", 2021

9 SHREC, Regional Analysis on Policies for the Transition to Low Carbon Energy, October 2020

10 SHREC, Regional Analysis on Policies for the Transition to Low Carbon Energy, October 2020

11 See for example Regional Development Plans, Region Västernorrland, Region Jämtland/Härjedalen

12 http://sv.wikipedia.org/jamtlands_samtidshistoria

13 Economic facts 2020

14 M.Nylinder, H.Fryk, Timmer, Swedish University of Agricultural Sciences, Uppsala 2011

15 Government Offices, Article from the City Council Committee, 8 October 2020

16 Ekonomifakta.se

are electricity, liquor and biofuel, which together account for about 90 per cent. In 2017, electricity production in the county amounted to approximately 13 TWh and electricity consumption amounted to about 9 TWh, which means that Västernorrland exported just over 4 TWh (equivalent to 2015 6 TWh). The electricity production in the county consisted of 85 % hydro power, seven percent of wind power, seven percent of industrial counter-pressure, and the remaining one per cent from solar cells and combined heat and power plants. In recent years, a strong expansion of wind power has taken place in the county, which has contributed to Västernorrland County having the third most wind power capacity in Sweden.

Jämtland County has few energy-intensive industries and comparatively small population. This means a relatively low energy consumption. At the same time, large amounts of renewable electricity are produced mainly from hydro, wind and biomass and a small part of solar power. Only one-third of the electrical energy produced is used in the county and a large part is exported today. This makes Jämtland County the nationally leading exporter of renewable electricity. Energy consumption in 2017 was barely 5 TWh and 12.7 TWh of electricity was exported. It also opens up opportunities for the establishment of electricity-intensive industries in the county. Hydropower accounted for about 88 % of electricity generation and wind power for around 11 %¹⁷.



source: <https://lagetilanet.regionjh.se/>

Central Norrland, through its differences, but at the same time many common values, has a strong inherent dynamic. How can it be highlighted constructively in order to take renewable energy and electricity production into additional value creation in this region?

Forest as a resource – over time – hundreds of units rationalised to scale

At the beginning of the 20th century, the forest was the dominant source of energy in Sweden's energy supply. Most of the wood went to households, to fuel and operation of steam engines and to charcoal for the ironworks.

Rationalisation in forestry and in the forest industry has progressed fast, in 1970 there were 899 sawmills, all of which produced more than 1,000 cubic metres of sawn product. In 2019, this figure was 151.18 Over the same period, production has increased by 35 %. In 1951-1989, the number of paper and pulp mills decreased from 135 to 70, while the number of enterprises fell from just over 80 to 20 through closures and mergers. Most pulp mills that are now in operation have a long history and to survive they have grown into very large units.¹⁹ The number of employees in forestry and the forest industry has also fallen drastically and many heavy, harsh and damaged jobs have disappeared.

Just under 50 % of the forest land area is owned by individual private forest owners in Mellersta Norrland. The forests of limited companies are mostly owned by forest industry companies. During the 19th century, a large number of forest companies were formed, which mainly bought peasant-owned forest land in Northern Sweden. By mergers during the 20th century, the number of forest companies has been gradually reduced to only a few, but large companies²⁰. The same development can be seen in the case of forest owners' organisations. In the 1960s and 1970s, many small local associations merged into regional associations. Today there are few forest owners' associations in Sweden; the three largest are Södra, Mellanskog and Norra Skog.

In the 1930s, more and more households began to move from wood to other alternatives and at the beginning of the 1970s wood was mainly used as fuel by rural households with their own access to forests. The very strong expansion of nuclear

¹⁷ CABs, Energy statistics for 18 counties and associated municipalities for 2017

¹⁸ M. Nylinder, H. Fryk, Timmer, Swedish University of Agricultural Sciences, SLU 2011

¹⁹ M.Nylinder, H.Fryk, Massaved, Swedish University of Agricultural Sciences, SLU 2015

²⁰ Agriculture and forestry in Sweden since 1900, Sweden's National Atlas 2011

power in the 1980s made electric heating an attractive alternative.

Gradually, sawmills moved from steam to electric power, the by-products went to the pulp and record industry. During the last three decades of the 20th century, energy production from the by-products of sawmills increased sharply, partly in the sawmill industry itself but, above all, in the district heating sector.

The increase was partly due to the competitive advantages that biofuels gained from the CO2 emissions from fossil fuels introduced in the early 1990s.²¹

In 2019, the Government appointed a *Forest Report (SOU 2020:73)* — “Strengthening property rights, flexible forms of protection and nature conservation in forests” presented in November 2020. More than 180 referral bodies may speak before a decision is taken. In spring 2021, lobbying and intense debate, for example in Dagens Nyheter, have been ongoing. There are major differences of opinion on how the forest should be managed and used. A hot topic has been about the use of forest biomass for energy purposes. Overall, it can be concluded that the values and importance of forests in the transition to a fossil-free economy are very high. Even today, bioenergy, in terms of total energy use, has the greatest importance of all energy carriers.²² Without a doubt, however, the investigation and the criticism and debate about forests will mean that more values than just timber will become increasingly important in future forest management. Central Norrland, with great emphasis on Forest as a resource in its regional strategies, has a key role to play in demonstrating how different values can be generated without conflict with, for example, biodiversity and forests as a carbon sink.

Biofuels are vehicle fuels produced from renewable biomass. The development of biofuels is currently taking place very quickly, and the number of feedstocks that can be used is increasing. All biofuels sold in Sweden must be sustainable in accordance with the Act on Sustainability Criteria for Biofuels and Bioliquids (2010:598).

The magazine Bioenergi has produced an updated summary of biofuel production plants in the Nordic region. A3a6-4861766c217d _Several of the existing and planned installations are located in Mellersta Norrland. The region has been one of the pioneers in biorefinery and biofuel production from forest raw materials, e.g. through the innovation environment “The Biorefinery of the Future”, Processum in Örnsköldsvik, see picture below²³.



Water as a resource – Invaluable force with conflicting objectives

There are about 2000 hydropower plants in Sweden, of which more than 200 are larger power plants, which together account for 98 % of hydropower production. The Swedish hydropower produces between 61-78 TWh per year and is extremely important for Sweden, as it can be quickly adapted to how electricity demand increases or decreases. Power plants in northern Sweden account for 80 % of hydropower production in Sweden. Ångermanälven with Faxälven and Fjällsjöälven (and others) and Indalsälven have many hydropower facilities and are of great importance for Sweden’s energy supply.

The history of hydropower is long. Used to drive both mills and saws using running water. The expansion of hydropower in Sweden started already in the late 19th century. In 1894 Sweden’s first commercial power company, Hissmofors AB, Indalsälven was formed. In 1918-1961 most of the hydropower was built out using the 1918 Water Act. The Swedish basic industry; the forest, ore and hydropower, developed strongly in these years. ²⁴

21 Agriculture and forestry I

22 See picture Energy balance 2018, Swedish Energy Agency

23 See Jonas Joelsson, presentation SHREC November 2020, “Processum, The biorefinery innovation hub”, Rise/Processum

24 <https://historia.vattenfall.se>

Heat pumps (geothermal energy) and hydrogen

Heat pump technology has had a major impact on the Swedish heating market and, by extension, on the electricity system and the energy system in general. In 2019, 1.2 million single-family houses (60 %) used a heat pump.³⁰

Hydrogen is an energy source that is increasingly important for the sustainable energy system. Many countries now hope that green hydrogen will be developed into an option that will make a big difference to the chances of meeting the set renewable energy targets. Hydrogen itself is not a primary energy source but can act as an energy carrier or energy storage medium for energy from, for example, renewable energy sources. This allows the energy from hydrogen to be saved and used when needed. The Swedish Energy Agency is tasked with developing a proposal for a comprehensive strategy for the role of hydrogen in the Swedish energy system. The government initiative “Fossil Free Sweden” has already developed a hydrogen strategy to identify the issues and challenges that require national coordination.³¹ The strategy will facilitate the transition to fossil freedom. The Swedish Energy Agency’s mandate shall be reported to the Government Offices on 31 July 2021.

Biofuel Region, which works in Västernorrland, but also in Jämtland and Västerbotten, has investigated the possibilities for hydrogen in the region. In the region of Norra Mellansverige, an interesting initiative, “Mid Sweden Hydrogen Valley”, is underway, a suitable collaboration partner for Mellersta Norrland. See further [2019— Regional-conditions-for-infrastructure-for-electric and renewable-propellants-in-Västernorrland.pdf \(biofuelregion.se\)](#) and [Central Sweden gather around hydrogen – Region Gävleborg \(regiongavleborg.se\)](#).

See annex on Vätgas in Mellersta Norrland; Östersund – Jämkraft *Electricity Marketplaces and Smart Grids*

The Swedish electricity market was liberalised in 1996. In Sweden today we have a very lively debate about the electricity market and the entire electricity system. In the WSP’s report “Deficiencies, decisions and balance in the electricity system”³², WSP’s report “Regional electricity grid analysis” for Västernorrland³³ as well as among others, energy companies and the Swedish Energy Agency, there is good evidence to learn more about energy, the electricity system and the electricity market. See also the Consumers’ Electricity Market Agency and the Electricity Market Inspectorate; [Energy market operators | Ei.se](#) — Energy Market Inspectorate to get a picture of the players in this market.

Electricity in the North has developed “Strategy for open electricity networks – collaboration between a private individual and electricity network supplier”. Electricity in the north is a network of 17 independent local electricity grid companies in southern/central Norrland and Dalarna that together strive for collaboration, societal benefits, skills and economies of scale. [Elinorr – electricity network companies in Norrland – Elinorr](#).

At the same time, various initiatives are under way around the world to develop an energy market and a future decentralised and democratic electricity system. Energy Web is a network and member organisation that will harness the potential of digital technologies in this context. The aim is to enable all energy assets owned by all customers to participate in any energy market. Read more about this at <https://energyweb.org>.

Build momentum and contribute to the climate and energy transition

The vision is that Sweden will become the first fossil-free welfare country, what special role does Mellersta Norrland want to take in that work? Strategies and ongoing initiatives in the region show that there are strong drivers to be active in this transition. The dynamism between small-scale and large-scale entrepreneur-driven enterprises and large energy-intensive industries is valuable in this context. Building on the European Green Deal, that “*consumers should be involved in the clean energy transition and should benefit from it*”³⁴, something unique and exciting can emerge.

Above, we have seen the traditional development of mergers and closures to create larger, more efficient units. In the history of the region there are also clear drivers for value creation through co-production, where consumers are involved in the transition to renewable energy. Forest owners’ associations, LRFs, village development groups and households are examples of both commercial and social cooperative initiatives. The conditions for new value—³⁴ ³⁵creating systems, where

30 [New statistics on the use of energy in single-family buildings, multi-dwelling buildings and premises \(Energy Agency.se\)](#)

31 <https://fossilfrittssverige.se/wp-content/uploads/2021/01/Vatgasstrategi-for-fossilfri-konkurrenskraft-1.pdf>

32 [Electrical system-sa-can-equation-ga-i-hop WSP2021.pdf](#)

33 WSP Sverige AB, Regional Electricity Network Analysis Region Västernorrland, March 2021

34 New EU Green Deal; [A European Green Deal | European Commission \(europa.eu\)](#)

35 R.Ramirez, U. Mannervik, Strategy for a networked world, University of Oxford, UK, Imperial College Press, 2016. See also M.Mazzucato “Mission Economy A Moonshot Guide to Changing Capitalism”, IIPP, University College of London 2021

small and large producers of energy carriers, electricity producers, consumers and other relevant actors work together should be very good in Mellersta Norrland. What kind of organizational arrangements support such co-creation? Co-production in value-creating systems replaces the logic of traditional view of value creation in value chains and networked³⁶. It requires the strategic ability to invite, interest and mobilise others to develop common value creation, collaboration and learning based on trust, common interests and fundamental values of justice and justice³⁷.

SHREC programme group in Sweden estimates that Mellersta Norrland has great potential to build value through co-production and new value-creating systems. It is also in line with the EU's emphasis, in its description of the strategy to implement the UN 2030 Agenda, that it must be done through a holistic approach³⁸. The starting point is that affected people create a common vision and goals for collaboration, based on an understanding and in line with the wider context (larger system). In an image, the European Commission describes what is called "Whole-of-Government approach"³⁹.

By developing a good innovative design for value creation, which highlights the common and mobilises the necessary actors, implementation will be shared between the various collaborative actors. At the same time, links must be created with regional, national and global innovation environments and partners. Here, existing clusters and innovation environments in the region will be important and hopefully a complex and differentiated network will emerge. Central Norrland has been at an advanced stage when it comes to IT and digitalisation, it is also apparent when the National Innovation Council met Västernorrland in⁴⁰ autumn 2020, and this is of course also a good and important prerequisite for co-creation in networks.

The innovative design will have built-in learning and policy development for system development and upscaling. A connected policy learning on testbeds or pilot projects should contribute to system development by studying the policy and institutional changes needed, as well as support and incentives. The offer to the outside world from Mellersta Norrland can be *a network organisation that works well for the transition to the fossil-free welfare society*.

Some proposals – networking, system innovation and possible initiatives

In order to achieve the goals of the Paris Agreement and the Swedish vision of a fossil-free welfare society in 2045, we need to think in system perspectives and system innovation. The new values and new ways of working that emerge need to be supported by new policies, new types of infrastructure and production systems that promote innovation. For it to work, new business models involving new value constellations, target groups and collaborative actors will emerge. The result can be the development of completely new technologies, products or processes. Here are some possible initiatives to discuss:

- * Testbeds or pilots for co-creating energy production and bioeconomy with design to be scaled up through networking from local initiatives to regional, national, EU and global. Follow-up research and support through network knowledge and policy development – MIUN.
 - Biomass/biofuel – biofuels/biogas
 - Wind power
 - Solar power (solar, solar heat)
 - Hydrogen
- * "Energy communities" – collaboration in villages to become "prosumers" in interaction with network owners and electricity distributors
- * A learning pilot – Transition to a fossil-free economy in a municipality – bioeconomy with holistic approach and with support and innovation work backed up by innovation environments in Mellersta Norrland, nationally, Nordic, EU and globally. Policy learning at different levels energy policy and contributing to system innovation
- * Business models for a value-creating system by many different actors
- * A limited concrete example from Mellersta Norrland to fossil-free Sweden – how to work with renewable and fossil-free – working machines
- * Further development of the "Nordic Green Belt" based on renewable energy

36 R.Ramirez, U. Mannervik, Strategy for a networked world, University of Oxford, UK, Imperial College Press, 2016

37 See research on networks, e.g. L.Svensson, EJakobsson, C.Åberg, the power of development in networks About learning between companies, Santerus publishing house

38 [EU holistic approach to sustainable development | European Commission \(europa.eu\)](#)

39 [EU holistic approach to sustainable development | European Commission \(europa.eu\)](#)

40 [Forest and digitalisation – two areas of strength in Västernorrland – Regeringen.se \(Government Offices/riegeringen.se\)](#)

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_____ Picture: Nordic Green Belt, Jämtland and Västernorrland counties and Trøndelagfylke in Norway; [Nordic Green Belt](#) —
[Interreg Sweden-Norway \(interreg-sweden-norge.com\)](#)

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ANNEX: See separate annex – information and examples of interesting activities that can inspire action and develop further.