SHREC

Interreg Europe

European Union
European Regional
Development Fund

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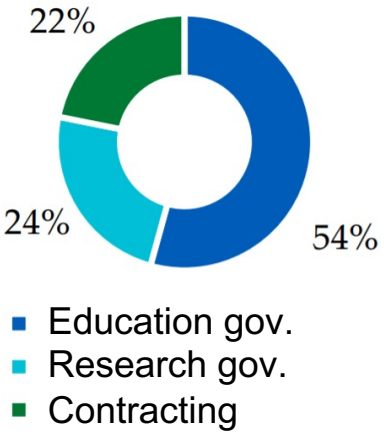
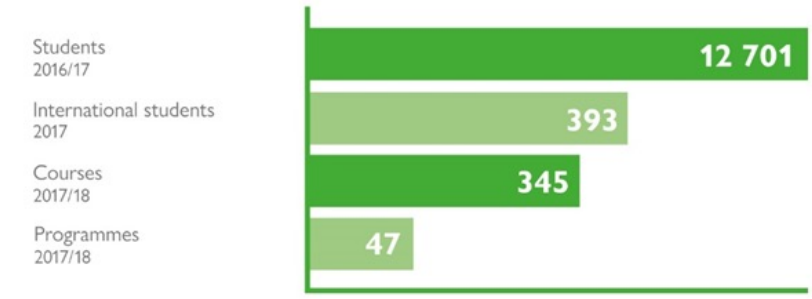
29 October 2020 Groningen

Mid Sweden University





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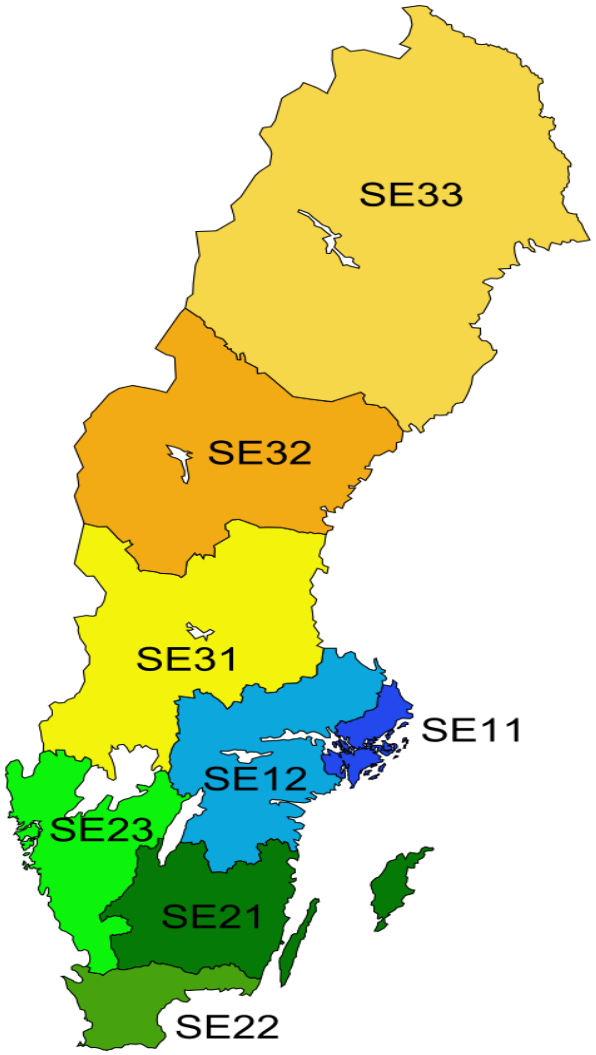
S32 Middle Norrland, Sweden



- 76 709 km2
- 375 000 inhabitants
- 2 Regions Jämtland/Härjedalen and VästerNorrland
- 67% Forest
- Hills and skiing area (in the west)
- The High Coast – a UNESCO World Heritage site (in the east)
- Per capita income is little lower than national average and higher than EU 28 average
- Regional economy based on forestry, natural resources, advanced manufacturing and tourism.

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Middle Norrland Region:

Sweden energy uses 2017

- Industrial sector – Biofuel, and electricity to run processes, 143TWh
- Residential and service sector uses mainly district heat, electricity and biofuels, 146TWh
- Transport sector uses mainly petroleum products such as gasoline, diesel oil, jet fuel but also some electricity and growing share of biofuel. 88TWh
- Total energy use in Sweden is : 378TWh (38GWh per capita)
- Total energy use in our region is : 31TWh (82GWh per capita)
- Total electricity supply in Sweden is 565TWh

- Electricity is produced mainly from hydropower and nuclear power, the past year also wind power.

. *(https://www.energimyndigheten.se/en/news/2019/energy-in-Sweden*

Middle Norrland

Thematic objective 4 — Supporting the shift towards a low-carbon economy in all sectors 2014-2021:

Total Budget: 8,7M€ + co financing 50% = 17,4M€

Today's project: 6,4 M€ in 14 projects, 5 prestudies from 2015-2017. 8 projects ongoing.

Mid Sweden University 2 projects ,

- **ECOSYS: -energy effective processes, (9,8M€) (20210131)**
- **Biogas from biomethanation of syngas, (8,6M€) (20201231)**

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EcoSYS

Eco-effective processes and systems

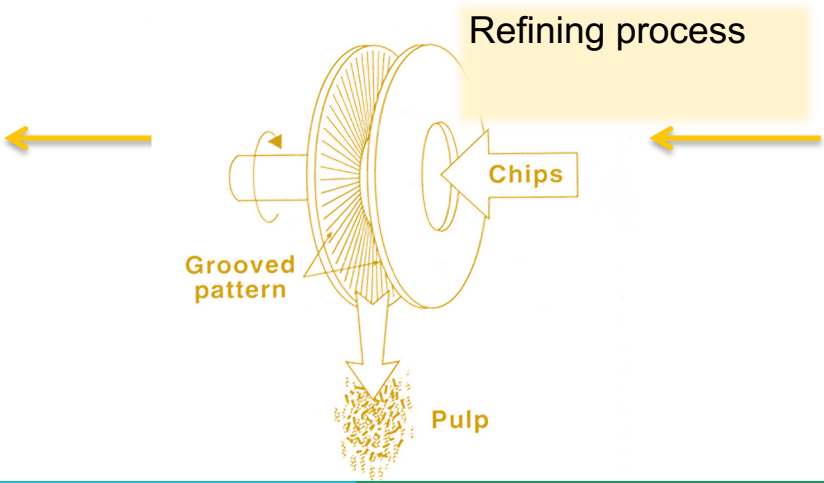
Birgitta Engberg, Associate professor,
FSCN - Mid Sweden University

EUROPEISKA UNIONEN
Europeiska regionala utvecklingsfonden
Region Västernorrland
KK-stiftelsen

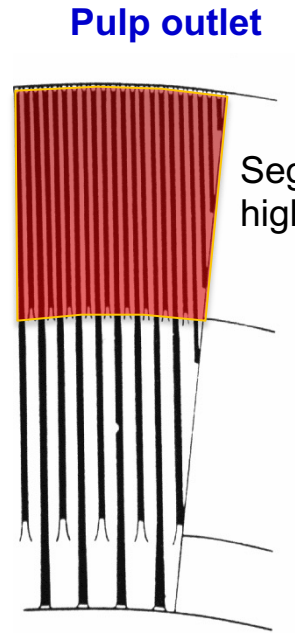
Main objective
– increase electric energy efficiency in the mechanical pulping process!

Mechanical Pulp – High yield pulp

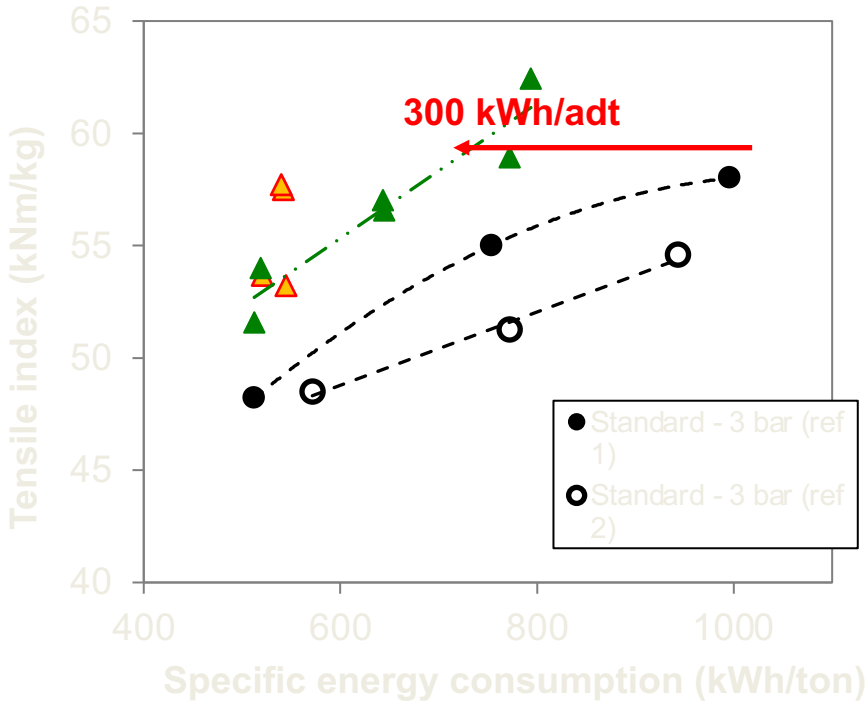
- ✓ **High raw material yield ~ 97% - Resource efficient process!**
  (1 ton of wood – almost 1 ton of fiber based product)
- ✓ **Products are reusable and recyclable**
  - ➢ However, high use of electric energy in the refining process…



Example 1: Improved refining efficiency in Mill A



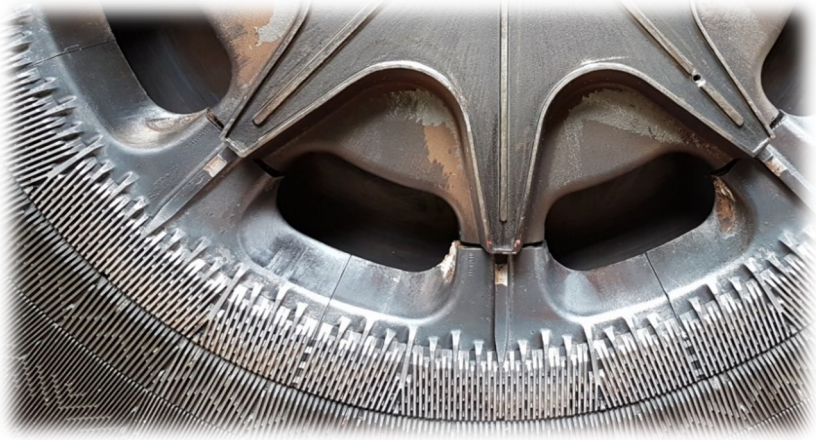
Improved refining efficiency by 30% or approx. 300 kWh/ton of produced pulp!



Applied part – cooperation with partner companies

Example 2: Improved refiner feeding in Mill B

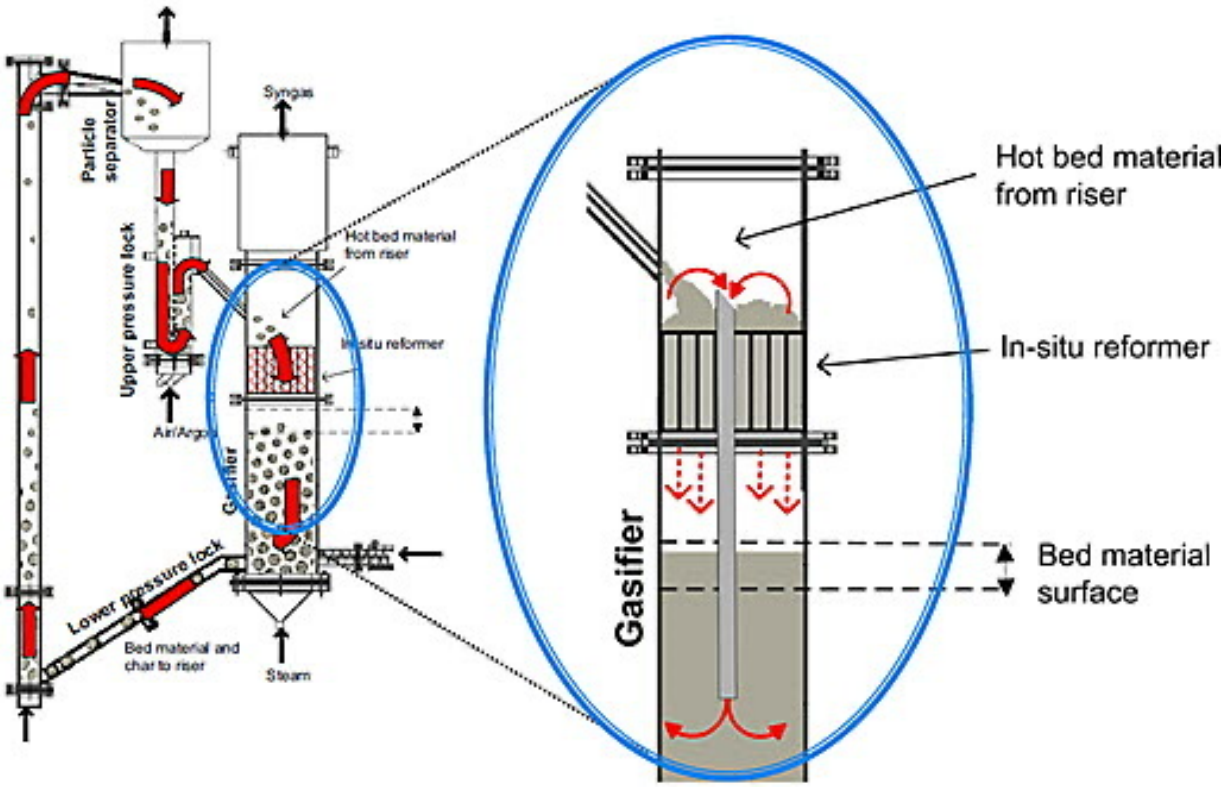
New center-plate design to prevent steam from flowing backwards and to push chips forwards.



Results with new center-plate:

- Possible to increase production from 12 – 20 ton/day
- Increased process stability – approx. half of the power variations
- **Improved process efficiency by 30% or approx. 400 kWh/ton of produced pulp!**

Biogas from biomethanation of syngas



- The biogas **market** is limited by the amount of available organic waste.
- <u>Possible solution</u>: Utilize other biomass sources that can be gasified into syngas and then synthesized into bio-SNG (Subsitute Natural Gas).

Enviromental and energy policy for Landstinget Västernorrland

Contribute to sustainable development by:

- active and continuous work with improvements in environmental care and reduced energy consumption.
- using renewable energy sources in a sustainable way and reducing our use of resources by streamlining our efficiency.
- preventing pollution by purchasing strategies; purchasing and ordering goods and services that give a small environmental and energy impact.
- carefully following environmental legislation and preparing for future requirements.
- engaging all employees in environmental work.
- working actively to increase the understanding of the relation between public health and the environment.
- exercising regional political responsibility for a good environment and energy efficiency, and engage actively in cooperation with other organizations and stake holders.

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Focus of projects today and tomorrow

- **Transportations – infrastructure for electrical chargers,**
- **Energy effective companies, develop SME introduce new technology**
- **Multistore apartments- change behavior and usages of energy, introduce sensor technology and measurements .**
- **Biofuel development**
- **Energy effectiveness in processes industry**
- Lithium -ION Batteries
- Green – Energy - Jet fuel from the forest
- Sustainable energy – storage from the forest
- Cellulose replace plastics in future materials
- Measurement and follow up Internet of Things

TIE - Transforming the Industrial Ecosystem

- Exploit the competitive advantages of the region
- Choose opportunities from a global perspective
- Use information technology as a key enabler
- Adapt to changing markets
- Supply competence and skills
- Profile the most exciting future opportunities

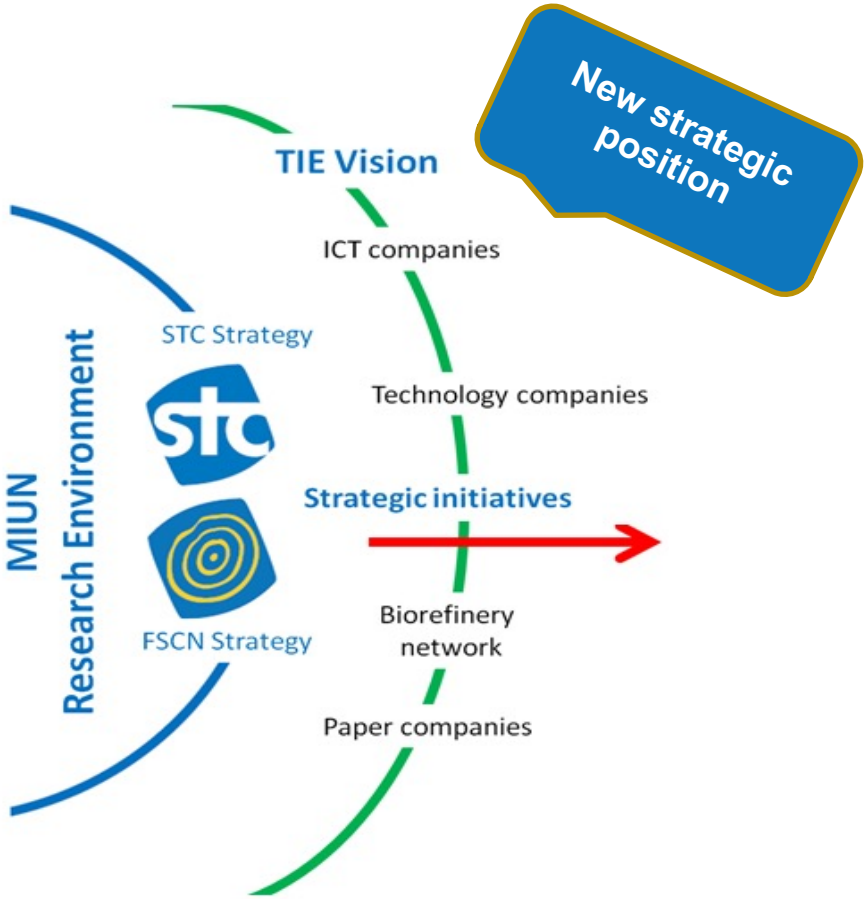
Research Environment with a mission and vision to support

Transformation of the Industrial Ecosystem

Joint vision for STC and FSCN Centres

- **Competence – strong research environment**
- **Content – strategic research program**
- **Coproduction – strong culture**

→ Research Environment for Transformative Technologies



Strategic Framework

[1] Analysts and consultants call on businesses to create more value through innovation, yet most companies have been optimized to provide greater efficiency, not greater innovation. As a result, any innovation-driven strategy will likely falter unless we fundamentally *reframe our strategic thinking*.

[1] In particular, we must *regrind our lenses to monitor the periphery*, that is, the edges, of our business. At these edges lie our richest opportunities for value creation and our strongest protection against value destruction.

[1] Hagel and Brown, The only sustainable edge; why business strategy depends on productive friction and dynamic specialization, Boston (Mass.): Harvard Business School, cop. 2005

Projects together with stakeholders

Three major projects

- **Drive**
- **Smart**
- **Milo**

- **12 M€ over three years**

- Clusters
  - Processum – Biorefinery of the future
  - Bron Innovation (digitalisation)
- Local Authorities: beneficiary of funds
- Swedish energy agency
- Tillväxtverket - Managing authority
- Regional partnership of politicans
- Region of Jämtland/ Härjedalen and Västernorrland
- Industrial Associations, SCA

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Research project - Drive

SMART

Smarta system och tjänster

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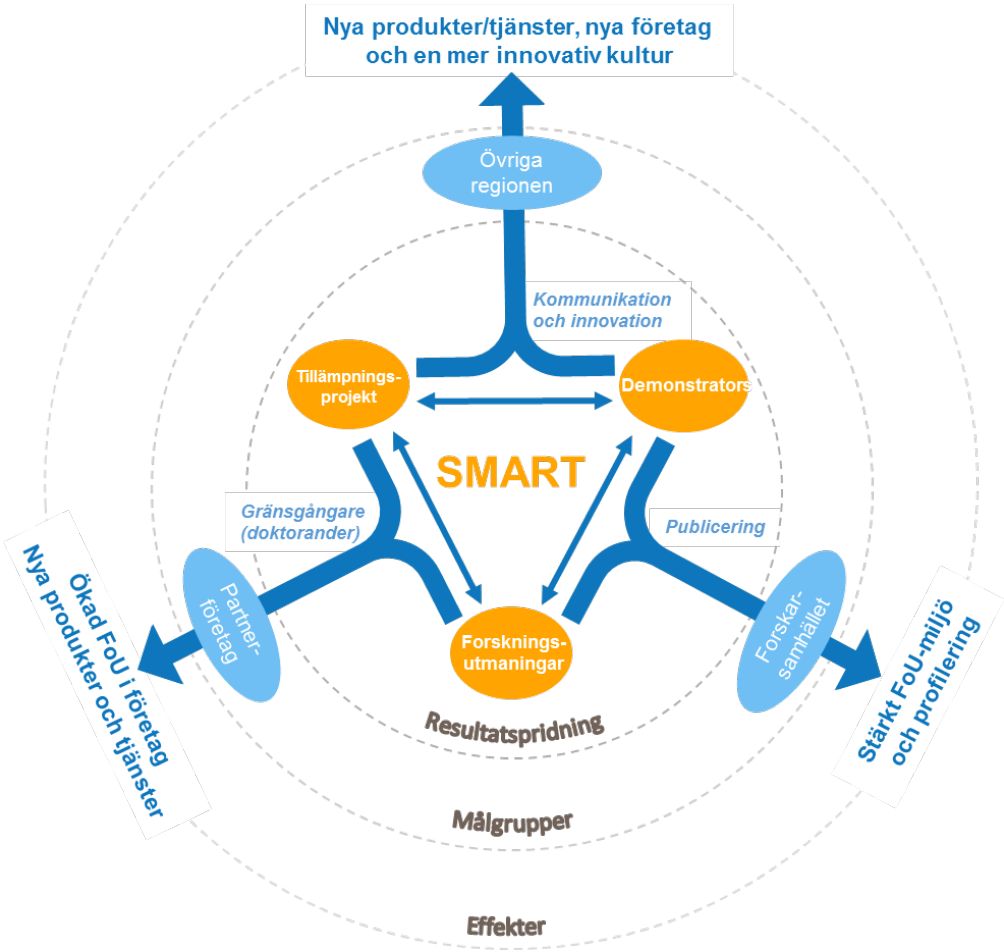
Internet of Things (IoT) for smart industry

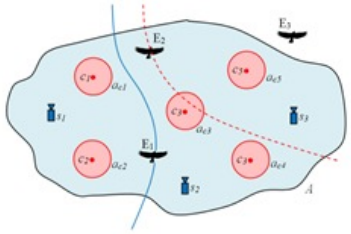
Example :

Imaging IoT in wind mill parks

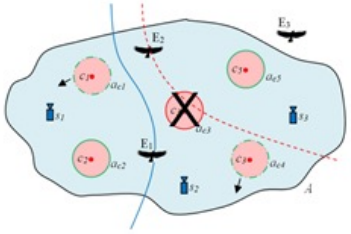


MiLo – Environment in the control loop

Monitoring of birds and wild life around wind mill parks

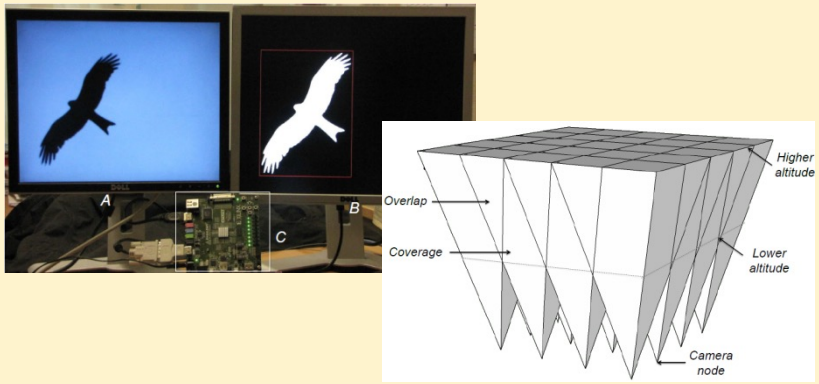


Interaction with planned or existing sites



Proposal for conflict avoidance

- Detection & Localization of eagles



Wind turbine icing detection

Liquid Water Content and Droplet Sizing Shadowgraph Measuring System for Wind Turbine Icing Detection, Rydblom et al, IEEE Sensors Journal, Vol. 16, No. 8, pp. 2714-2725, APR 15 2016

Field Study of LWC and MVD Using the Droplet Imaging Instrument, S Rydblom et al, IEEE Trans. on Instrumentation and Measurement, Vol. 68, No. 2, pp. 614-622, FEB 2019

Stakeholders to be involved in SHREC

- **Clusters**
  - Processum – Biorefinery of the future
  - Bron Innovation (digitalisation)
- **Local Authorities: beneficiary of funds**
- **Swedish energy agency**
- **Tillväxtverket - Managing authority**
- **Regional partnership of politicans**
- **Region of Jämtland/ Härjedalen and Västernorrland**
- **Industrial Associations, SCA**

Influence decision making process, drive the innovation in regional energy field

Benefits from SHREC

- **Increase the Middle Norrland region and Mid Sweden university capacity and knowledge:** improve the **policy instruments** from the governance point of view
- Improve the **effectiveness of the use of funds**
- Introduce **innovative approaches and develop research activities together with key stakeholders .**
- Develop **smart energy societies, challenge countryside/ cities**
- Involve **energy consumers** as active players in planning activities
- Get a good **network in Europe of future partners** in research and policy development projects.

Knowledge exchange: learn from other region's best practices

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Thank you!

Hans-Erik Nilsson
Karin Nygård Skalman
Åsa Yderfält

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Questions welcome