

BotH₂nia



EVENT · EVENT · EVENT

BotH₂nia goes Kokkola 16.3.2022

This is a presentation given at the event BothH₂nia goes Kokkola on 16.3.2022.

BothH₂nia is a network of operators interested in hydrogen. The objective of the network is to create a Nordic hydrogen cluster around the Baltic Sea, beginning with the Bothnian Bay. BothH₂nia strengthens the position of the north in the European hydrogen industry!

BothH₂nia invites all businesses, research institutes, investors, municipalities and cities to roll up their sleeves for a greener future.

Please notice that the presentation has been modified to comply with the Accessibility Directive. In case for need the original material, please contact Minna Näsman (minna.nasman@both2nia.com).



Hycamite TCD Technologies Ltd.

HySpot- Project

03/2022

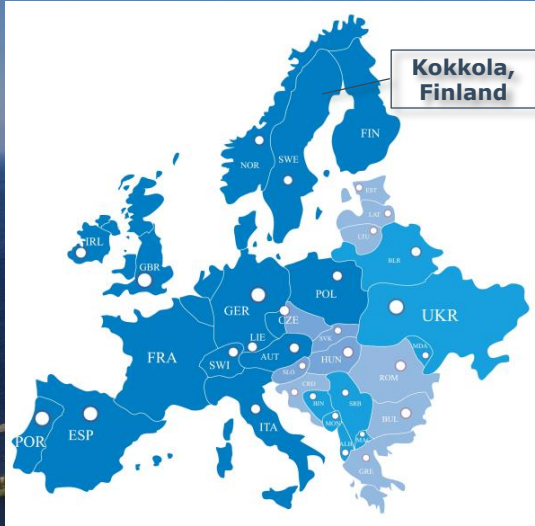
Hycamite TCD Technologies Oy

- Production of clean hydrogen and solid, high-value carbon by thermo-catalytic conversion of (bio)methane
- Deep-tech, roots in UniOulu research (prof. Ulla Lassi)
- Established 2020, next phase: industrial demonstration site to Kokkola starting next year



LOCATION

Location of Hycamite industrial pilot at Kokkola Industrial Park (KIP) Northern Europe ´s largest ecosystem of inorganic chemical



Hycamite has signed an agreement with KIP Infra Oy about renting an 1.3 + 0.5 ha area for the industrial scale demonstration site.





Laura Rahikka
Founder and CEO



- **Company established 2020**
- Personnel: 17
- Location: **Kokkola, Finland**
- Status: Growing fast **from pilot scale to industrial scale** (TRL 6)

Jussi Kukkula
Project Manager



Demo-plant project

- Management of the industrial scale pilot plant project

Henrik Romar
R&D Director



Technology

- Technology dev.
- New product development
- Application know-how

Susanna Rönqvist
CFO



Finance

- Finance, financial admin
- Stakeholders

Niina Grönqvist
Founder and Commercial Director



Commercial

- Business dev. of hydrogen and carbon products

Matti Malkamäki
Founder and Chairman



Board, Ecosystem

- Investor relations, financing
- Ecosystem development

Board of Directors, Advisors and participation



Board of Directors and Advisors



Matti Malkamäki, Founder and Chairman

- Serial entrepreneur and founder of deep tech startups, incl. Greenenvironment Oy, Aurelia Turbines Oy, Aument Power Oy
- European Clean Hydrogen Alliance Roundtable member
- Member of the steering group; National Hydrogen cluster, Finland & BotH2nia



Martti Hintikka

- 20 years experience in early stage and growth business. VC investment director in 200+ cases, incl. Ecolan, BookIT, Futurice, etc.



Juhani Pitkäkoski

- Overall management, former CEO of YIT and Caverion, former CoB of Fennovoima, CoB of Destia; change management; construction, projects; service B to B, Russia, digitalized services, M&A



Aleksi Lumijärvi

- Climate finance expert, 20+ years of global experience in renewable energy and climate-related markets and finance: Pöyry, Aalto Capital, Greenstream Network, IRENA, Nordic Development Fund



Anni Siltanen

- Chemical Industry Federation Chief Advisor, public relations and regulations executive in European chemical industries, business mentor



Ulla Lassi, Prof., Ph.D. (Tech), Technical advisor

- University of Oulu. Professor of Applied Chemistry since 1.1.2006 (Kokkola University Consortium Chydenius).
- Since 2015, Head of Research unit of Sustainable chemistry at the University of Oulu

Hycamite connections to European H₂ ecosystems

- Invited ECH2A Roundtable memberships

- Clean Hydrogen production
- Clean Hydrogen in the Energy sector

European Clean
Hydrogen Alliance



- Invited member of European Clean Hydrogen Economy Roundtable hosted by Commissioner Mariya Gabriel and Head of Unit for Hydrogen, Ms. Helene Chraye

- Only start-up in the roundtable
- Only Finnish participant in the roundtable

- National Hydrogen Cluster

- Company member
- Member of the steering group

H₂cluster
FINLAND

- BotH₂nia industrial hydrogen ecosystem

- Company member
- Member of the steering group

BotH₂nia

- Company member of WEC Finland

- Active participation in the social media

- LinkedIn articles
- Twitter

**WORLD
ENERGY
COUNCIL** | FINLAND

Sustainable Carbon as a secondary product supplementing the sales



PRODUCTS

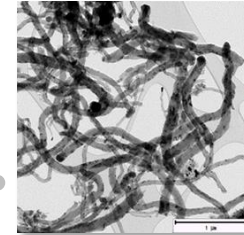
Carbon nanotubes (CNT)

Carbon nanofibers (CNF)

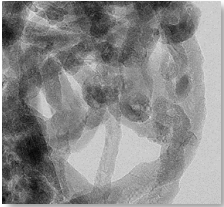
Amorphous carbon → activated carbon

Graphite

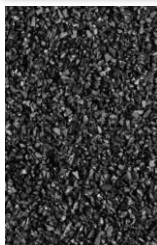
CNT, CNF



Graphite



Activated carbon



- ▶ Battery industry
- ▶ Lightweight materials for automotive and aerospace industry

- ▶ Battery industry
- ▶ Electric vehicles (supercapacitors)
- ▶ Catalysts



- ▶ Water treatment
- ▶ Pharmaceutical purification
- ▶ Industrial applications





Hydrogen use opportunities and business potential in Kokkola and more broadly in Central Ostrobothnia

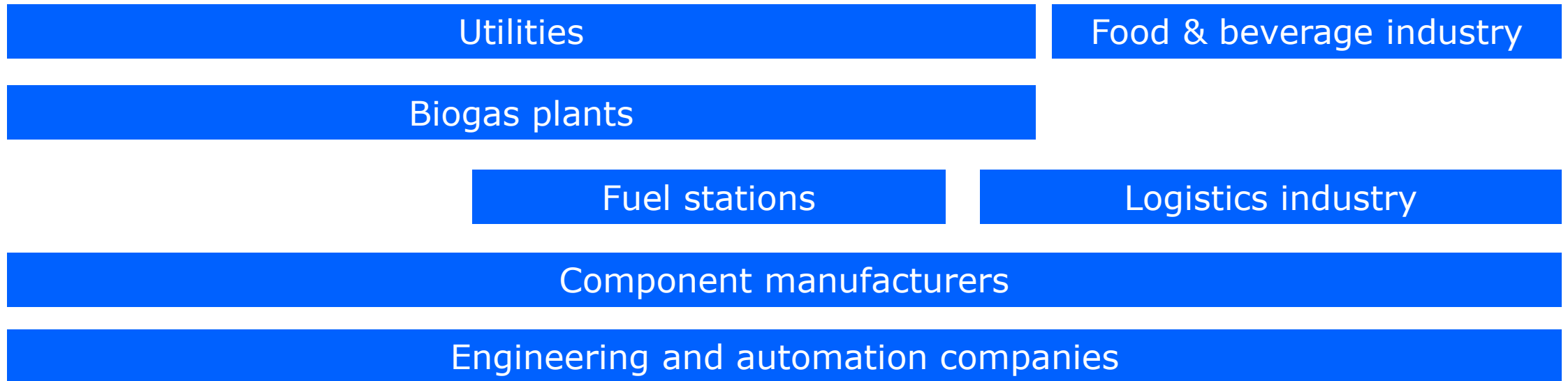
03/2022



This project aims to map and describe the following points in Kokkola and the wider Central Ostrobothnia area:

- Hydrogen production potential
 - Hydrogen value network
 - Hydrogen use possibilities
 - Hydrogen business possibilities
 - Possibilities of producing hydrogen from biogas
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- This project was carried out via webropol questionnaire
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- The questionnaire was sent to approximately 200 people. About 10% responded and a further 10 respondents were interviewed

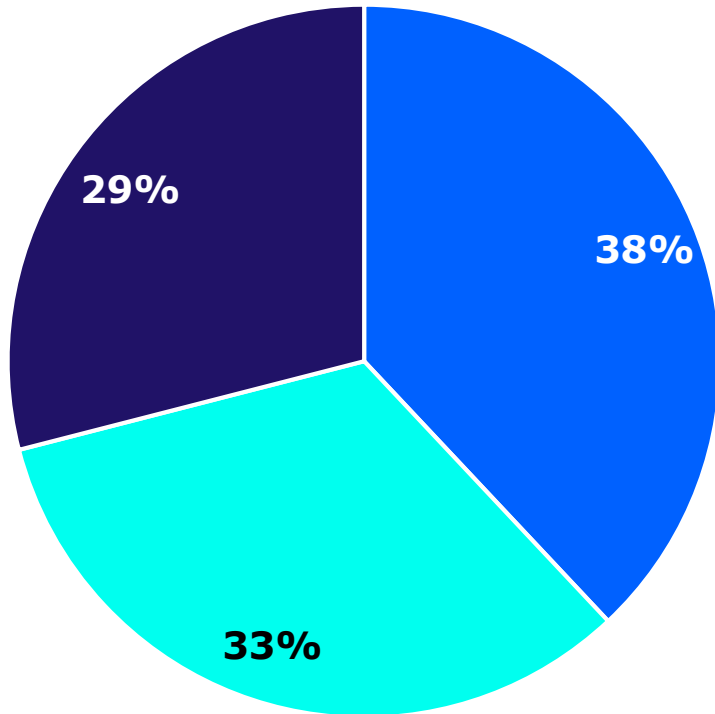
Results – hydrogen economy value chain in the area



Results – development of a hydrogen economy in the area

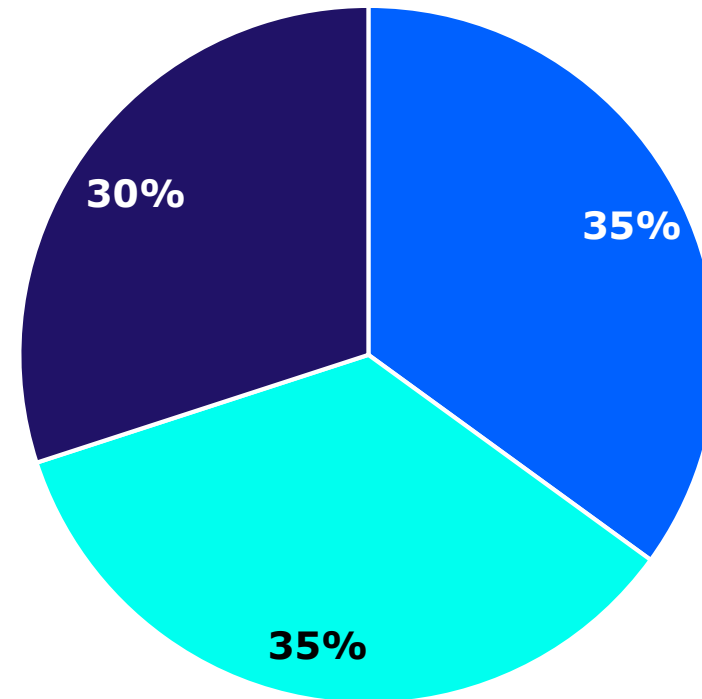


Is your company directly or indirectly involved in business activities related to the hydrogen economy?



■ Yes ■ No ■ I don't know but I am interested

If no, does the company have any strategic plans to be involved (directly or indirectly) in business activities related to the hydrogen economy?

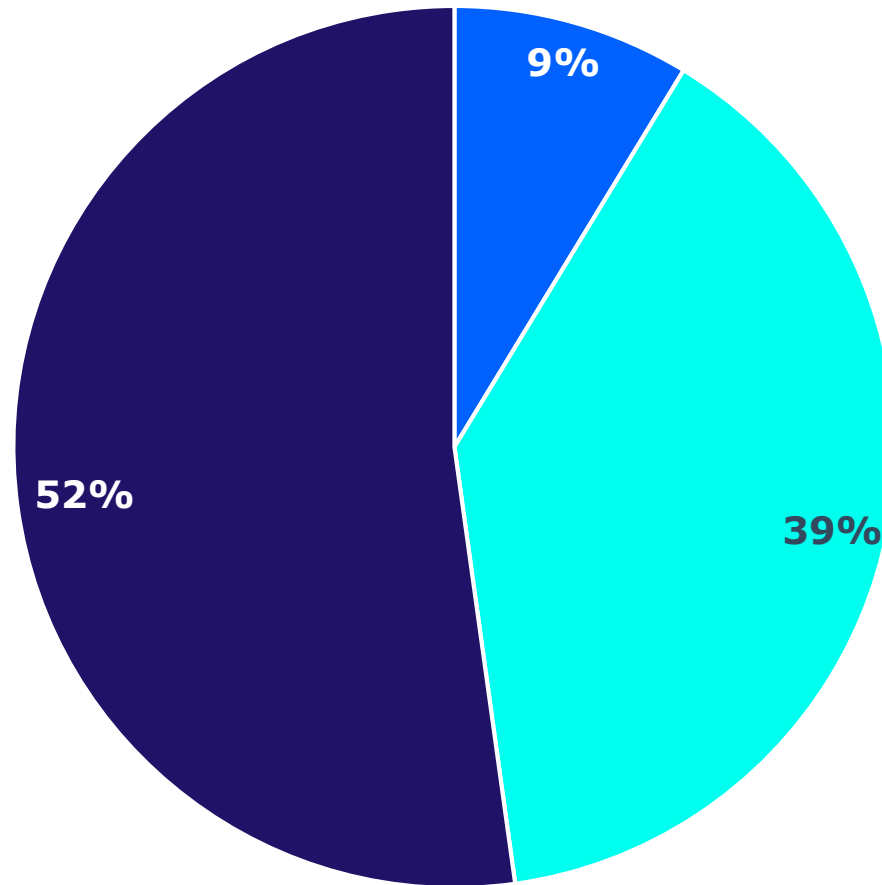


■ Yes ■ No ■ I don't know

Results – hydrogen as an energy source



Would your company be interested in using low carbon hydrogen as a main source of energy?



■ Yes ■ No ■ I don't know

Results – prospects for the development of the hydrogen economy in Kokkola and Central Ostrobothnia



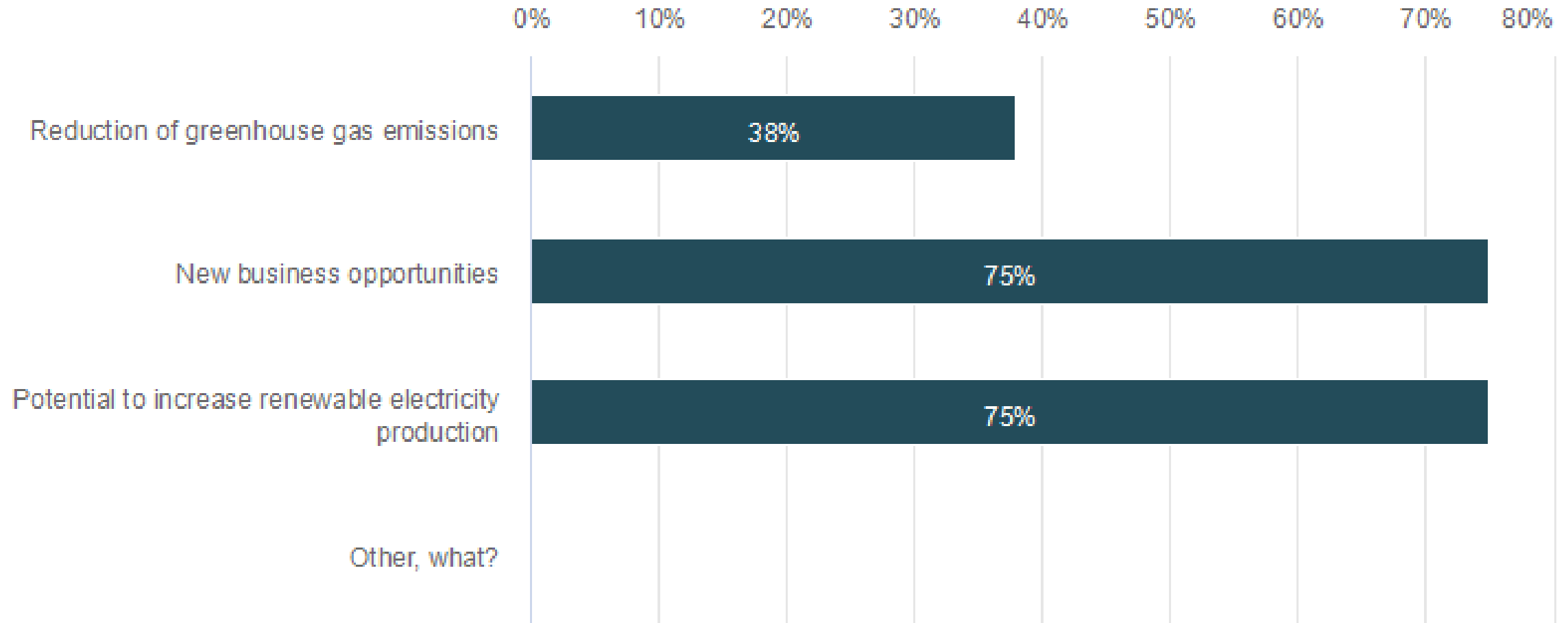
Within 2 years

- First test and R&D projects
- Feasibility and market studies
- Hydrogen vehicle tests abroad
- Second biogas plant
- Small test facility
- Providing coating services where needed
- The equipment under construction will produce biochar, hydrogen and carbon monoxide from wood chips. Methane is also obtained from carbon monoxide and hydrogen. Carbon monoxide, if desired, hydrogen and carbon dioxide

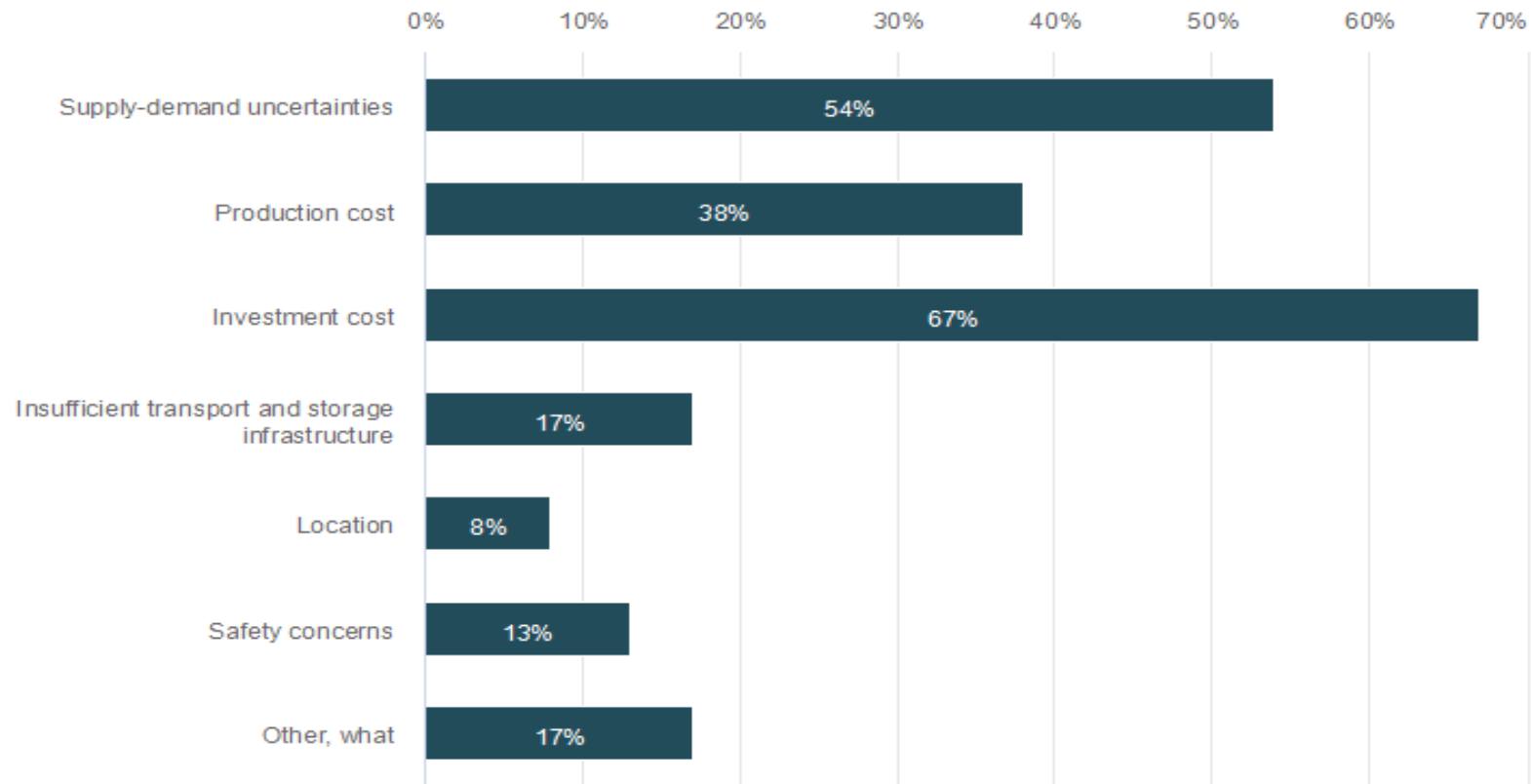
Within 10 years

- Part of the products will be hydrogen fueled
- Utilisation of waste heat from H₂ production
- Strengthen know-how in hydrogen processes
- Third biogas plant
- Annual production of 10-20 kt H₂
- Consideration of using alternative technologies and other production processes

Results - potential



Results - challenges



Other, what?

Price of hydrogen and how it may increase services prices

Use of electricity in the production equipment

High energy consumption compared to battery powered vehicles and expensive maintenance costs

Production – is production technology complete?

Results – Biomethane potential in the area



- Several biogas plants and new projects are currently planned in Central Ostrobothnia.
- Future opportunities in hydrogen production:
 - In-situ methanation
 - The LNG terminal in the KIP area could have biomethane from the area's farms to be fed into the KIP gas network
 - Thermocatalytic production of hydrogen and solid carbon from biomethane (so-called turquoise hydrogen)



Picture: Jepua Biogas Ltd.

SWOT analysis



Strengths

- Local availability and potential of renewable energy production, e.g. wind and biogas
- Strong interest and willingness to develop local hydrogen economy



Weaknesses

- High production cost of green hydrogen
- High investment cost
- Safety concerns



Opportunities

- New business opportunities
- Potential of greenhouse gas emission reductions
- Synergy opportunities



Threats

- Supply-demand uncertainties
- Insufficient transport and storage infrastructure
- Lack of hydrogen refuelling stations
- Unclear regulatory framework



Next steps



Q3-Q4/2022



Set up an info campaign to raise awareness of the local business potential and synergy opportunities for SMEs in different sectors, such as power generation, transportation, heating supply and industrial processes.

2023



Conduct a comprehensive study to identify potential, necessary measures and requirements for local hydrogen economy development along the value chain including production, storage, distribution and end use.

Q1-Q2/ 2024



Prepare a regional hydrogen roadmap for 2024-2030 structuring the approaches, investment needs and timelines identified in the study and pointing out the role hydrogen can play in reaching the emission reduction goals.





Contact us



Maija Mäkinen
Project Coordinator
maija.makinen@hycamite.com



Laura Rahikka
CEO
laura.rahikka@hycamite.com



Fiona Mwacharo
Business Analyst
fiona.mwacharo@hycamite.com



Natascha Skog
HR-manager
natascha.skog@hycamite.com



Karoliina Alakotila
Office Manager
karoliina.alakotila@hycamite.com



