

# CONCLUSIONS FROM THE POWER- TO-GAS INTEGRATION BUSINESS CASE STUDIES

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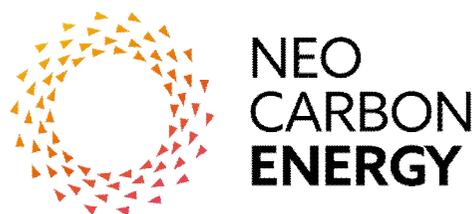
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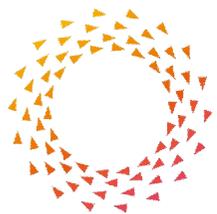
# Introduction

- The focus was in sectors that would have high global impact and significant relevance to Finnish industry.
- Additionally systemic analyses have been conducted to chosen P2X cases through streamlined LCA.
  - How is society and politics shaping the world view to enable P2X technologies
- Lessons learned



# Sectors for specific case studies

1. pulp and paper mill (kraft)
2. combined heat & power (CHP)
3. wastewater treatment (WWT)
4. steel mill (BF + BOF route)
5. oil refinery (SMR)



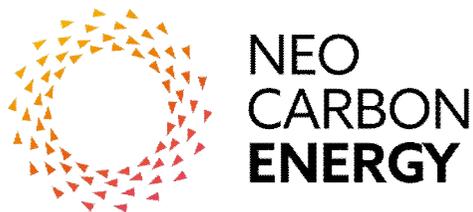
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# Limitations to approach

- WP3 did not assume significant technology cost reductions but concentrated on possible profitable cases now.
- Several profitable cases were found but no further development was done due to need to “find the pot of gold at the end of the rainbow”

# Commercialization of P2X

- Industry-integrated P2X technologies are close to profitable commercial project appearance in near-future business conditions.
- The main precondition is very low price of electricity
- The most potential applications are determined by the utilisation possibilities of the side-streams from P2X processes.



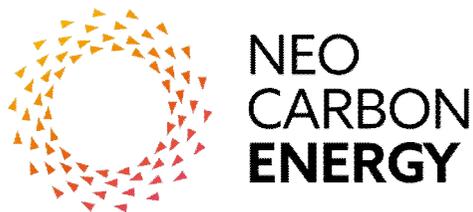
# Most promising areas

- Especially attractive sites for P2X integration are CHP plants and wastewater treatment plants, where heat can be utilised.
- Additionally there are rather good integration opportunities within pulp mills, steel industry and in ammonia production.
- The challenge of P2X is not about technology and control but about incentives and who is responsible for this needed operation.



# Profitability of transforming investments

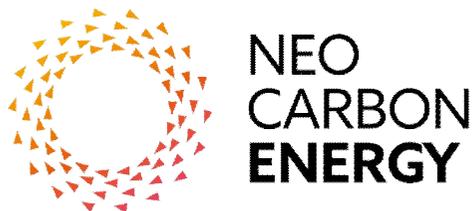
- It seems that new, transforming investments require short payback or IRR >> 10% (>20% ?)
- Reluctance to invest first is high
- Belief in estimations of future business environment are low
- Ecosystem for P2X is currently poor



There is still need to find bold first users.

# Paying for storage

- Electricity networks with high variable renewable share need to use storage to balance production and use
- For financing P2X projects the way storage is financed is essential.
- P2X will compete with battery storage and smart demand management.



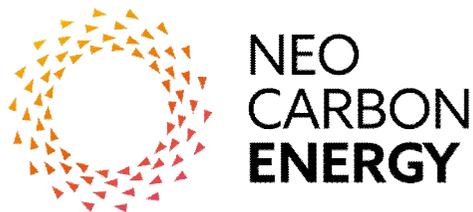
There is currently no stakeholder that takes responsibility and cost for storage.

# Demand for P2P storage

- Grows fast depending on penetration of VRE
- Storage demand in the 2030 horizon will depend on country-specific characteristics, in particular on the level of interconnectivity.
- Estimation for Finland is 4 – 10 GW.

# Enabling prosumers

- New technologies are revolutionizing the potential role of energy consumers, and indeed could create a whole new class of ‘prosumers’.
- They can offer localized generation of renewables, and deliver flexibility.
- Industrial consumers could also make money from smart scheduling.



There is currently no vision how this potential can be enabled or used.

# Power to SNG

- P2SNG has vast theoretical potential if the paying capability for carbon-neutral gas would be improved through more ambitious support mechanism.
- The paying capability seems to be the best in transportation sector
- P2X integration are CHP plants and wastewater treatment plants