

## EXECUTIVE SUMMARY

# The Nordic Battery Value Chain

- Step 2: The feasibility of a joint Nordic value proposition to attract investments and partnerships within the battery value chain

An assignment from the Swedish Energy Agency

Delivered by Business Sweden

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# This report is a second step in the overall ambition to evaluate a joint Nordic approach to strengthen the emerging battery industry in the Nordic region

<b>Background</b>	<ul style="list-style-type: none"> <li>In, December 2020, the Swedish Energy Agency and Business Sweden joined forces to evaluate how to support the emerging Nordic Battery Ecosystem</li> <li>The overall goal is to support the development of a sustainable, circular, profitable and competitive Nordic battery industry</li> <li>The reports focuses on the Nordic countries who have set, or with ambitions to set, national strategies for the establishment of a battery industry.</li> <li>This is the second report launched during 2021</li> </ul>
<b>Objective of the report</b>	<ul style="list-style-type: none"> <li>To understand the gaps that need to be filled in order to build up a competitive battery industry in the Nordic region</li> <li>To understand the feasibility of a joint Nordic value proposition for attracting foreign direct investments and partnerships</li> </ul>
<b>Methodology</b>	<ul style="list-style-type: none"> <li>The report is based on <ul style="list-style-type: none"> <li>In-depth interviews with leading players within all parts of the value chain in Sweden, Finland and Norway</li> <li>Market research for a comparative analysis of competing regions within Europe</li> </ul> </li> </ul>
<b>Appreciation</b>	<ul style="list-style-type: none"> <li>Our gratitude to all interviewees as well as to Business Finland and Innovation Norway for dialogue and support</li> </ul>
<b>Next steps</b>	<ul style="list-style-type: none"> <li>To discuss the report findings with the Nordic industry</li> </ul>

Interviewees from Sweden, Finland and Norway*	
 <p>The logos of the interviewees are arranged in a grid-like fashion. The logos include: VATTENFALL, Aalto University (A!), RISE, dafo, Työ- ja elinkeinoministeriö (Swedish Ministry of Employment and the Economy), InnoEnergy, MORROW, FREYR (Renewable energy storage), Graphmatech, northvolt, Hydro, Elkem, LKAB, EYDE CLUSTER (NCE EYDE Norwegian Center of Expertise Sustainable Process Industry), NIKKELVERK (A GLENCORE COMPANY), hydrovolt, HITACHI, corvus energy, STENA RECYCLING, fortum, ABB, CARGOTEC, BIL Sweden, Battery Norway, BatteriRetur, Metso:Outotec, and BEYONDER.</p>	

\*Excluding additional interviewees wishing to stay confidential

# There is a great potential for the Nordic countries to develop a strong position in the rising European battery market – but the window of opportunity is narrowing

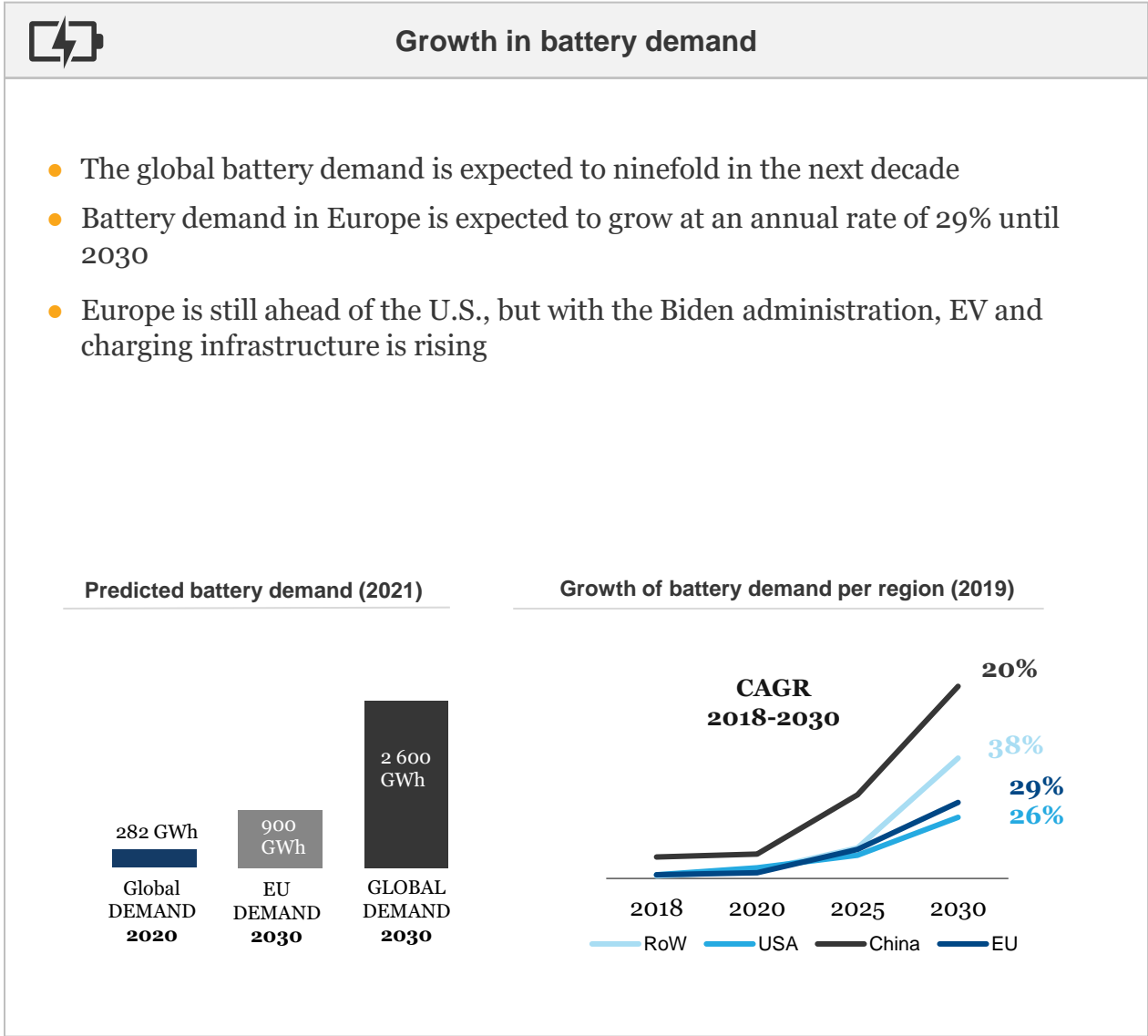
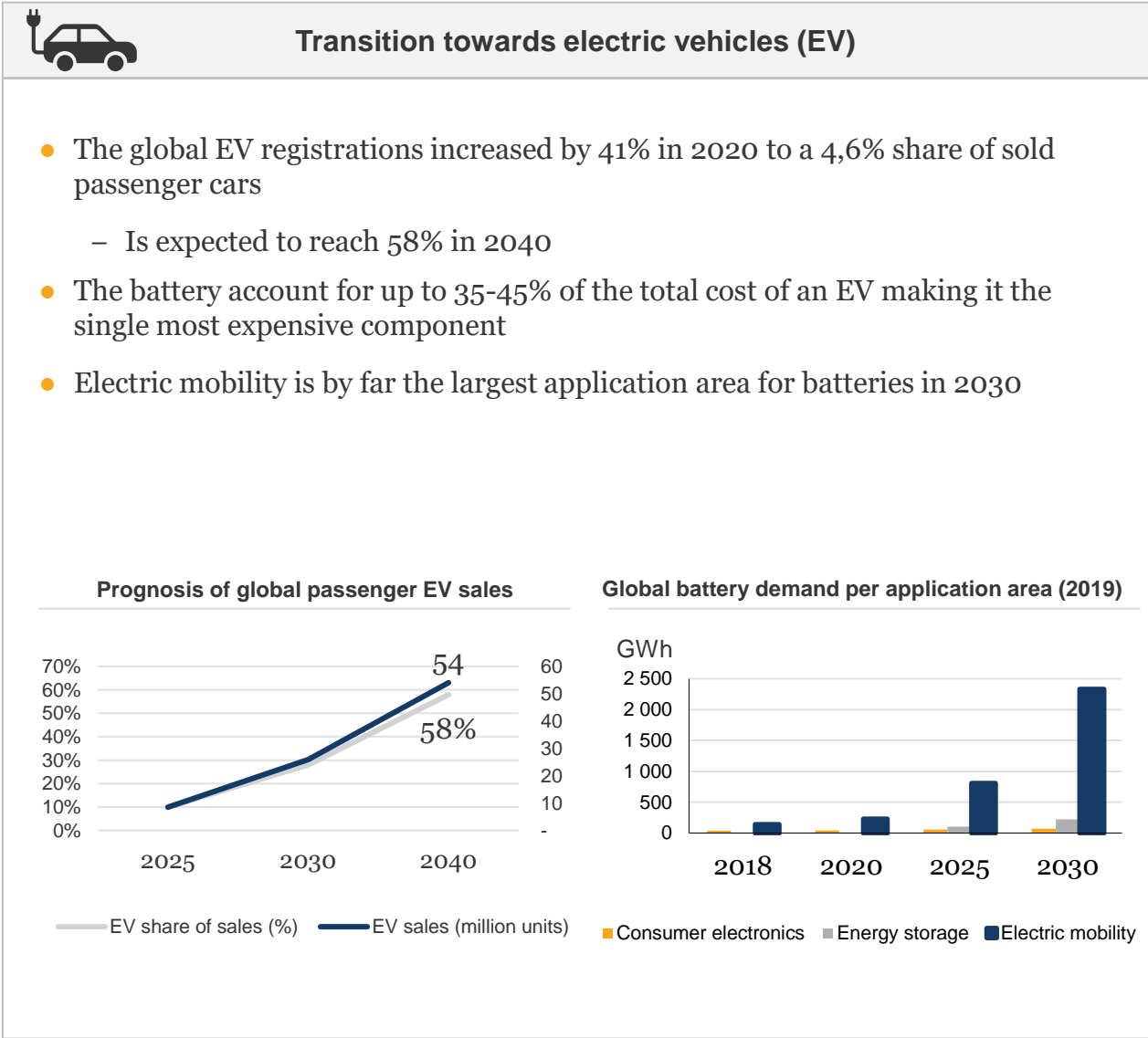
European battery industry is developing fast	<ul style="list-style-type: none"><li>• Electric vehicles drive and accelerating growth of European battery market</li><li>• Vast investments into Europe bring competence and capital</li><li>• Ongoing race among emerging European battery hubs to secure investments</li><li>• Heavy EU investments for an EU clean energy transition towards carbon neutrality by 2050</li></ul>
The Nordic region has a favorable momentum	<ul style="list-style-type: none"><li>• The battery industry is being developed throughout the region</li><li>• The Nordic countries have complementary strengths in every step of the battery value chain</li><li>• The region has advantages in clean, affordable energy and a strong manufacturing industry</li></ul>
Some gaps need to be filled to build a competitive industry	<ul style="list-style-type: none"><li>• There is an overall need to speed up the development and strengthen market position</li><li>• Competence and critical components are required</li><li>• Foreign direct investments are needed to fill the gaps</li></ul>
By joining forces, the region can take a strong position	<ul style="list-style-type: none"><li>• The region needs to move fast in order to take a stronger position</li><li>• Joint promotion activities to get attention is desired by the industry</li><li>• A joint value proposition would improve the attractiveness towards foreign investors</li></ul>

“ The value chain needs to become circular [...] and **batteries need to be obtained close by**. You do not want to be under China's restrictions. Covid has proved that the supply chain must be European. ”  
[Finnish company]

“ Nordic batteries have **the chance to become the Rolls-Royce of batteries**. We have the preconditions for high quality sustainable batteries and integration with digital services. ”  
[Norwegian company]

“ We need to take decisions and invest now **in order to take this position for sustainability at all**. It takes 3-4 years to establish a battery cell factory, and 10 years to set up mining. **We need to act NOW.** ”  
[Swedish company]

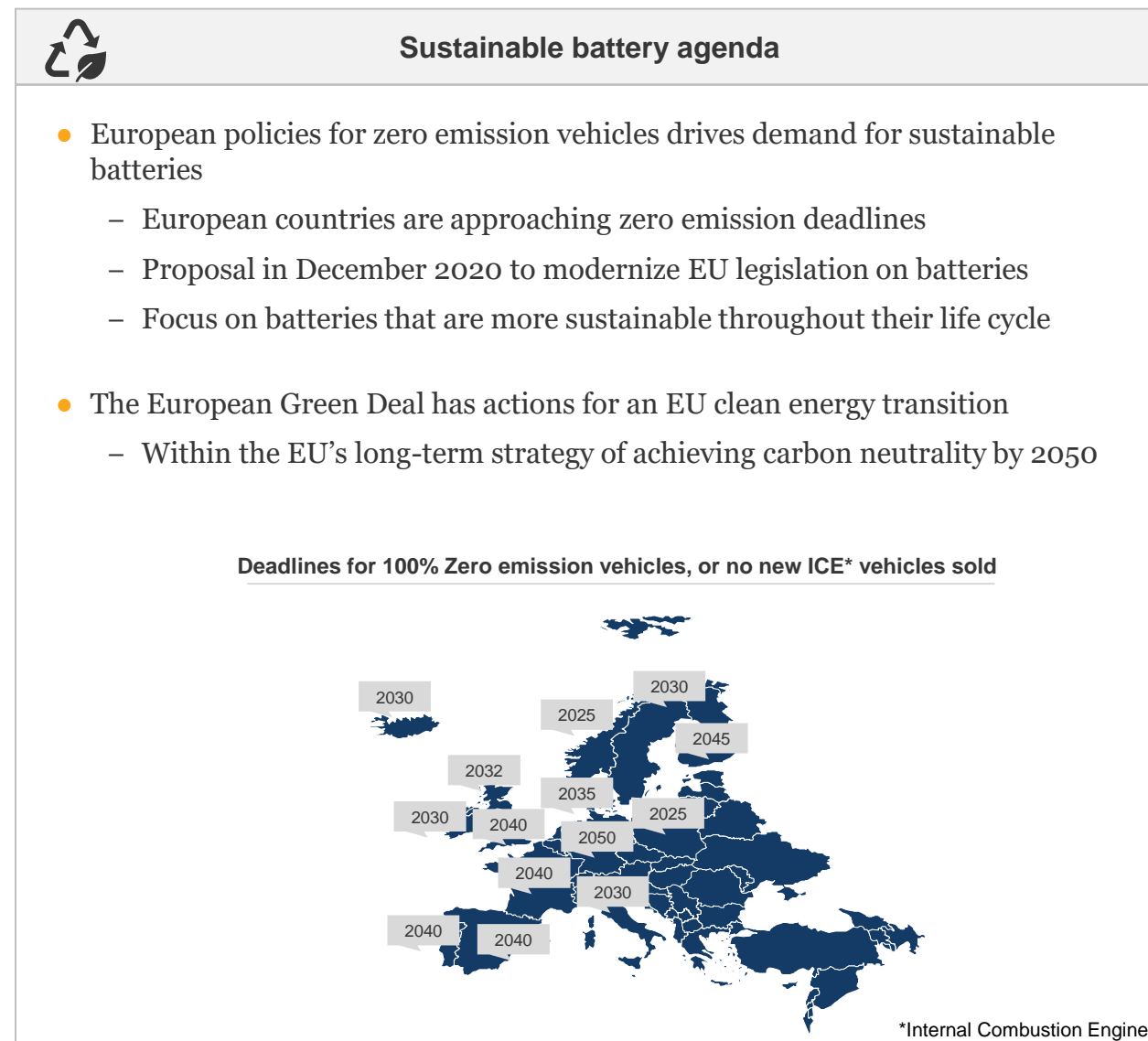
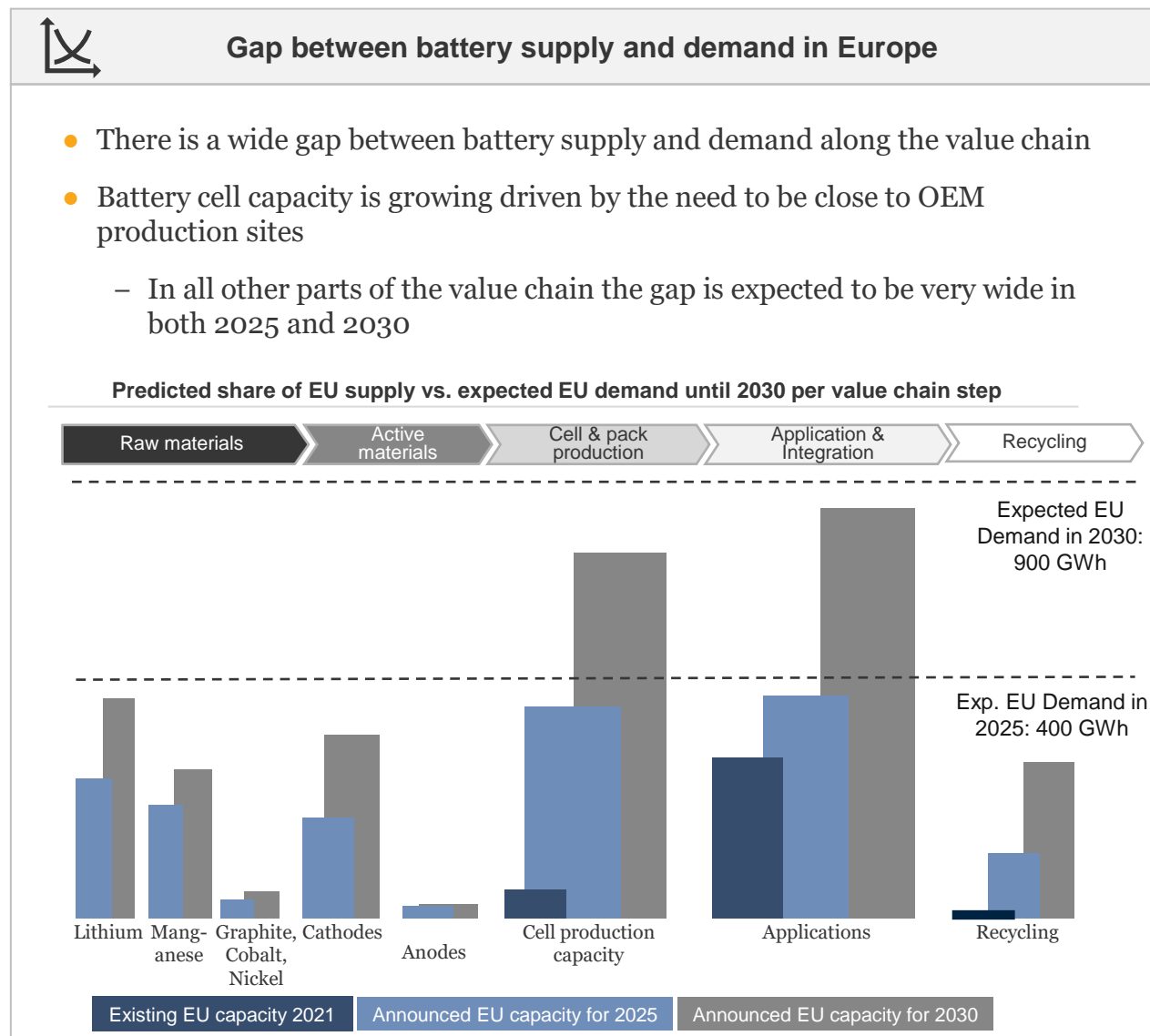
# The transition towards electrical vehicles will accelerate the demand for batteries in Europe in the next decade





# There is a wide gap between current production capacity and future demand

## - EU regulations for a green battery life cycle are setting the market conditions



# Europe is mobilizing to build up competitive battery value chains – the arena is expected to be set within 3-4 years

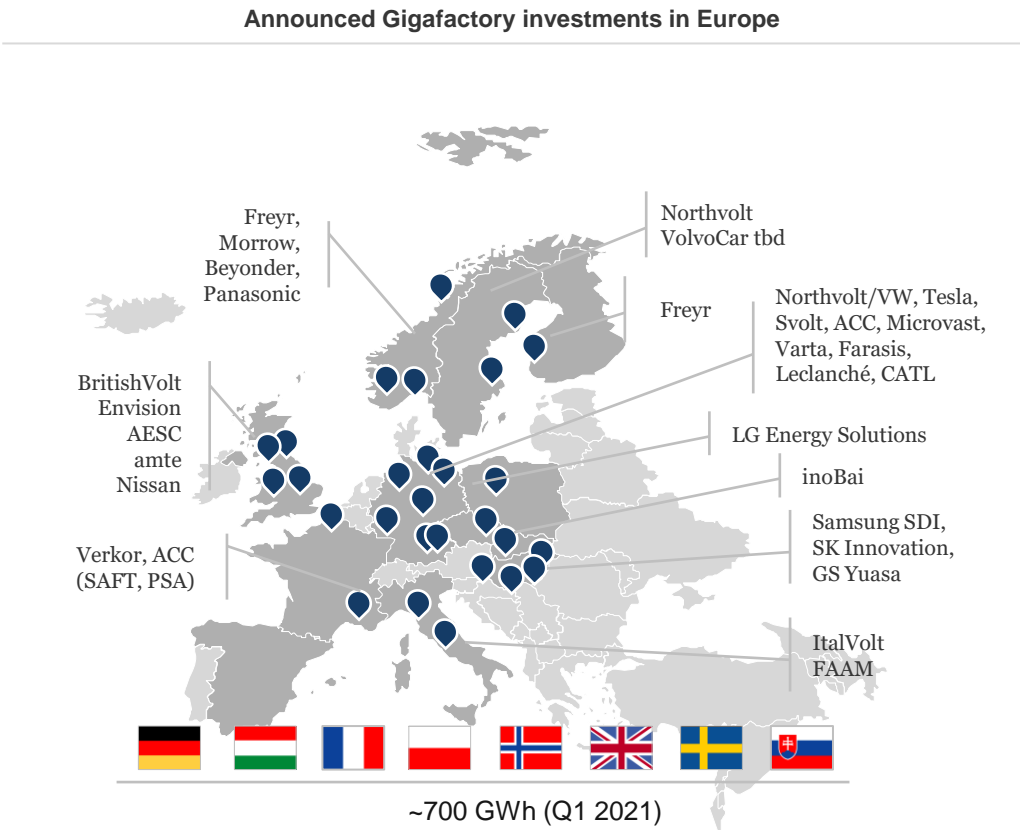


## European battery production build-up

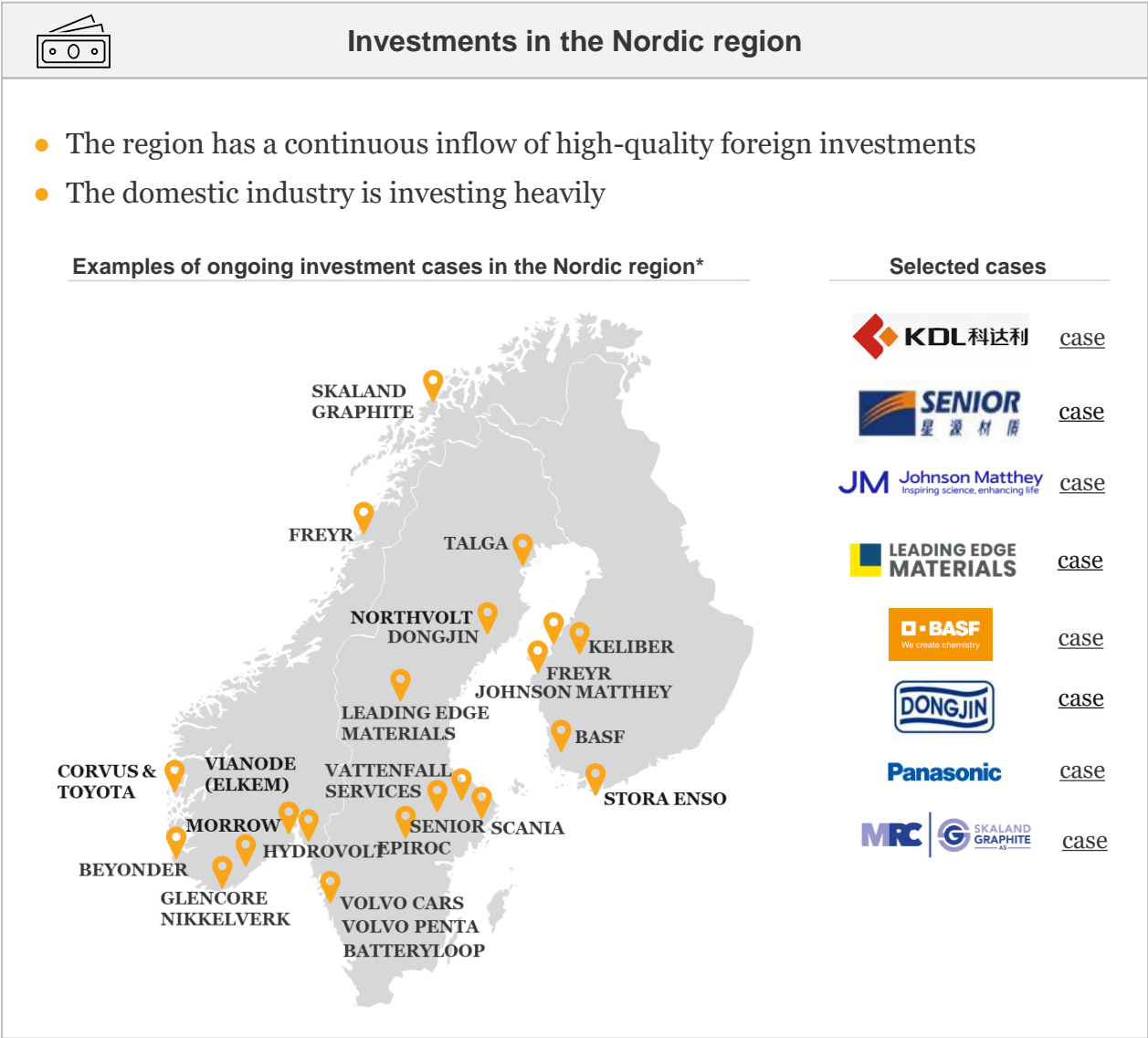
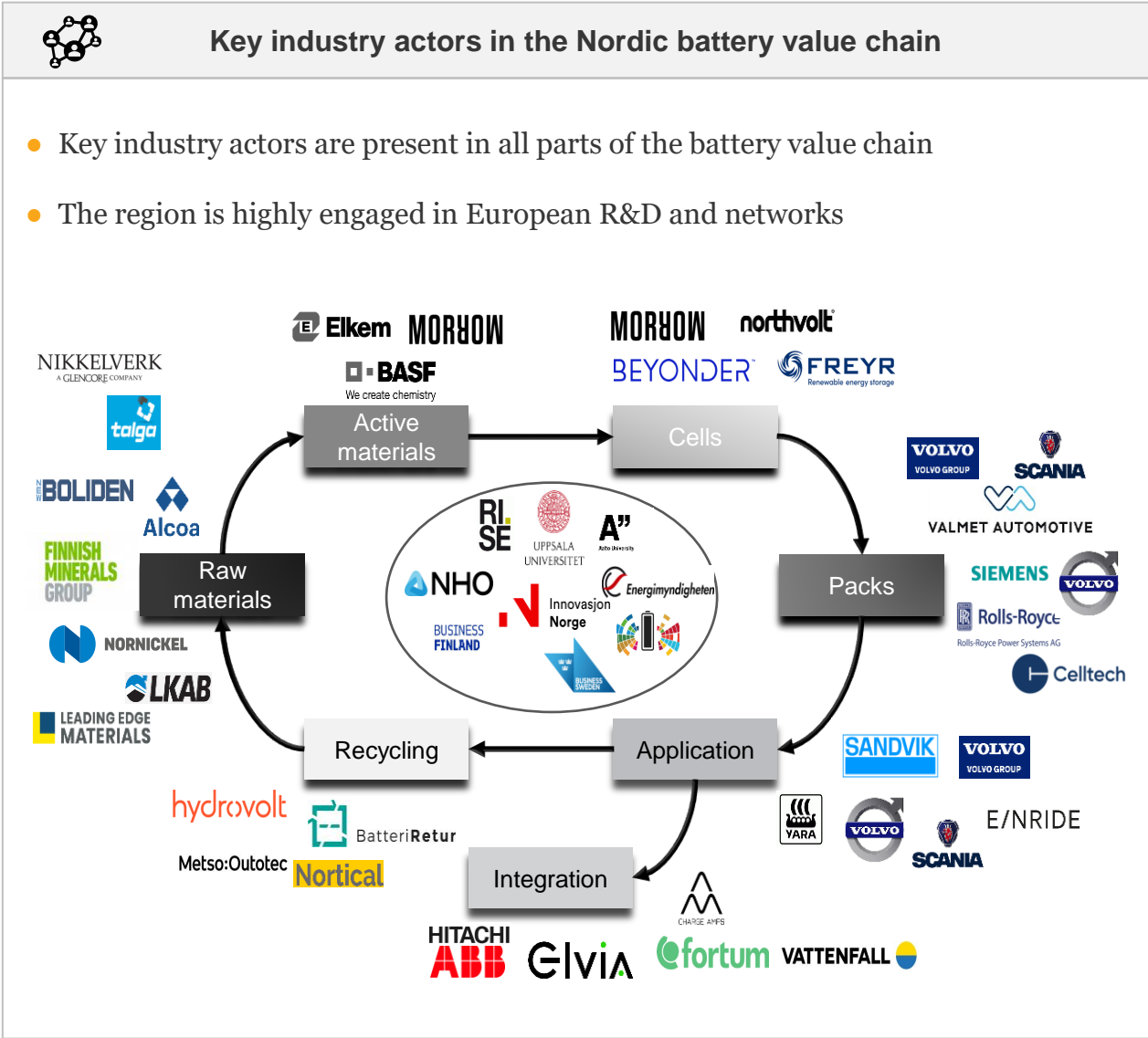
- Proximity of strategic components are crucial for European OEMs
  - Today, China, South Korea, Japan and Taiwan represent about 80-95% of the global battery production capacity
- The European share of the global battery production is expected to grow from 6% in 2020 to 16% in 2030
- Investments are happening at high speed – primarily by Asian and North American industry actors

Bloomberg NEF ranking (panned capacity)						
	Sweden	Finland	France	Germany	Hungary	Poland
BNEF ranking 2020	10	8	8	4	12	12
Raw mat.	22	11	17	17	22	22
Cell & component	13	13	13	6	6	5
Environment	3	5	1	12	8	11
Regulations	1	3	9	2	14	13
Demand	8	13	5	2	15	14

\*Excl Norway, the index is based on activities in 2020 only

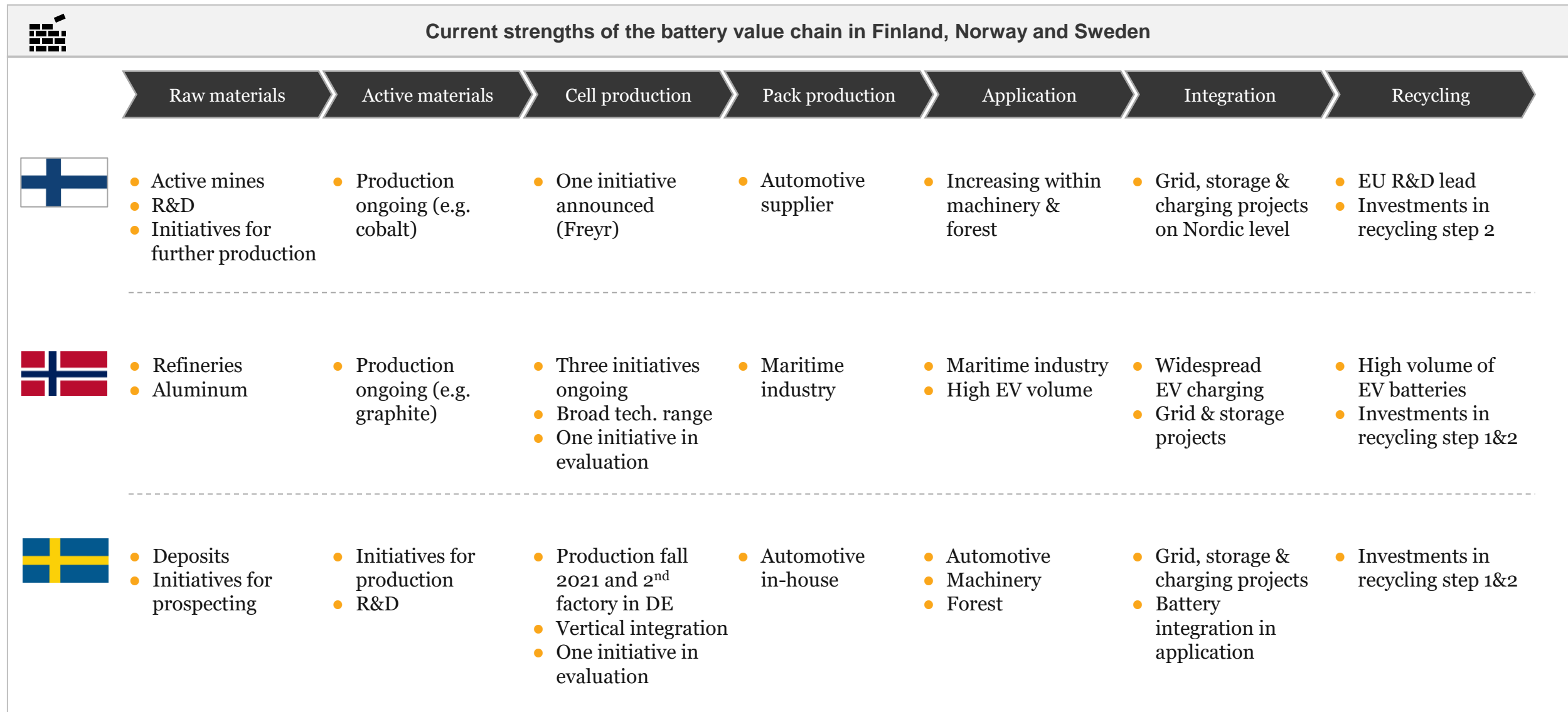


# The Nordic region has a favorable momentum with key actors in all parts of the value chain and a continuous inflow of foreign investments



\*Foreign and domestic investments  
Source: Business Sweden interviews and analysis, Business Sweden report “the Nordic battery value chain” January 2021, company homepages


# Finland, Norway and Sweden have complementary strengths in every step of the battery value chain



Source: Business Sweden interviews and analysis




# The Nordic region has the basis for a cost efficient and sustainable battery industry

	Industry prerequisites for operational expenses in the Nordic region	
Green and affordable energy	<ul style="list-style-type: none"> <li>• High share of renewable energy in the energy mix</li> <li>• Among the lowest energy prices in Europe with a low carbon footprint</li> </ul>	<p>“ The battery industry is <b>extremely competitive</b>, global and driven by regulations. All clients throughout the value chain have a focus on price and regulations. The Nordics <b>offers preconditions for efficient OPEX to a high level of sustainability.</b> ”</p> <p>[Swedish company]</p>
Stable energy supply and cold climate	<ul style="list-style-type: none"> <li>• Robust grid network with great redundancy and integrated electricity markets</li> <li>• Six months cold climate reducing the need for cooling</li> </ul>	
Productive workforce	<ul style="list-style-type: none"> <li>• Deep knowledge in industrial processes, manufacturing and focus on R&amp;D</li> <li>• Educated population and high productivity</li> </ul>	
Connected logistics	<ul style="list-style-type: none"> <li>• Well-connected with regional and continental industries</li> <li>• Geographical distance reduced by digital communication and efficient logistics</li> </ul>	<p>“ The Nordic <b>cold climate is an attractive add-on</b> for the energy mix and low electricity costs. ”</p> <p>[Finnish company]</p>
Position for sustainability	<ul style="list-style-type: none"> <li>• High national demands and level of investments in sustainable production processes</li> <li>• Production site in the Nordics create positive brand awareness for sustainability</li> </ul>	
Supply of materials	<ul style="list-style-type: none"> <li>• Rich deposits of raw material for batteries</li> <li>• High sustainability of produced battery materials</li> </ul>	<p>“ The Nordics offer clean energy, sourcing of raw materials and a strong industry converting the materials to end-products. All of this is sustainable and at low energy prices. <b>This makes the Nordics unbeatable!</b> ”</p> <p>[Norwegian company]</p>

Source: Business Sweden interviews, initial analysis of statistics comparing markets in Europe

# The industry highlight engagements in setting EU regulations, as well as to reduce risk and attract FDI to strengthen the value chain

Highlighted industry needs to successful build-up a strong battery industry				
	Market prerequisites	<b>Regulations for sustainability</b> <ul style="list-style-type: none"> <li>Supportive EU regulatory for batteries and battery waste demanding full life cycle sustainability</li> </ul>	<b>Competence lift</b> <ul style="list-style-type: none"> <li>Investments in R&amp;D initiatives</li> <li>Education on all levels to reduce the competence gap long term</li> </ul>	<b>Access to raw materials</b> <ul style="list-style-type: none"> <li>Transparency and speed in national regulations and processes for mining</li> <li>Public debate on options for responsible mining</li> </ul>
	Value chain supply & demand	<b>Lowered first-mover risk</b> <ul style="list-style-type: none"> <li>Capital, grants and guarantees to reduce first mover risks</li> <li>Clear incentives for FDI</li> </ul>	<b>Connected ecosystem</b> <ul style="list-style-type: none"> <li>Alliances with OEMs for orders and future innovations</li> <li>Collaboration between regional leaders and digital innovators</li> </ul>	<b>Investments in infrastructure</b> <ul style="list-style-type: none"> <li>Charging infrastructure</li> <li>Improvements in energy supply, storage and digital grids</li> </ul>
<div> <div> <p>“<b>Regulations on EU level are crucial for the future market requirements. We can not miss such an opportunity, so we need to be engaged in the process.</b>”</p> <p>[Finnish company]</p> </div> <div> <p>“We have a good storyline regarding a green battery value chain, <b>but our voices have not been heard</b> – marketing efforts are needed.”</p> <p>[Swedish company]</p> </div> <div> <p>“If the Nordic position for sustainability was more known, we might <b>finally be able to get paid for all the investments we have done</b> to have high quality along the full production line.”</p> <p>[Norwegian company]</p> </div> </div>				

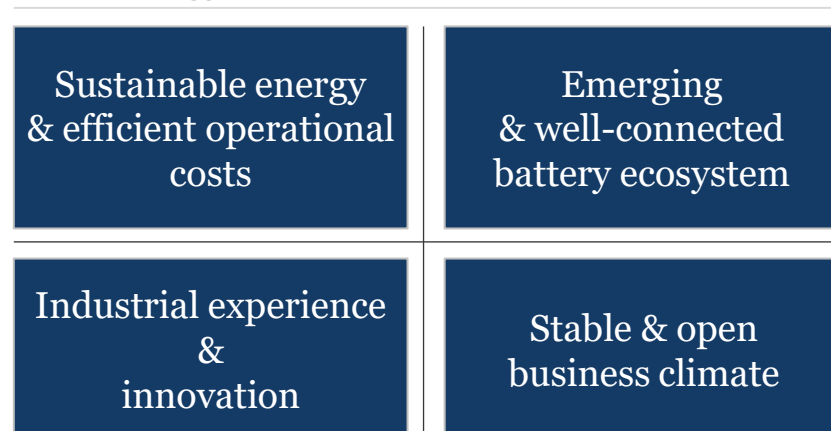
# A jointly developed value proposition would improve the attractiveness towards foreign investors



## A suggested Nordic value proposition...

- As the Nordic countries share similarities and offer comparative strengths, a combined value proposition would strengthen each country
- The value proposition is aimed to attract foreign direct investments as well as strategic partnerships with OEMs and R&D centers
- The suggested Nordic value proposition centers around four pillars:

### Suggested Nordic value proposition for batteries



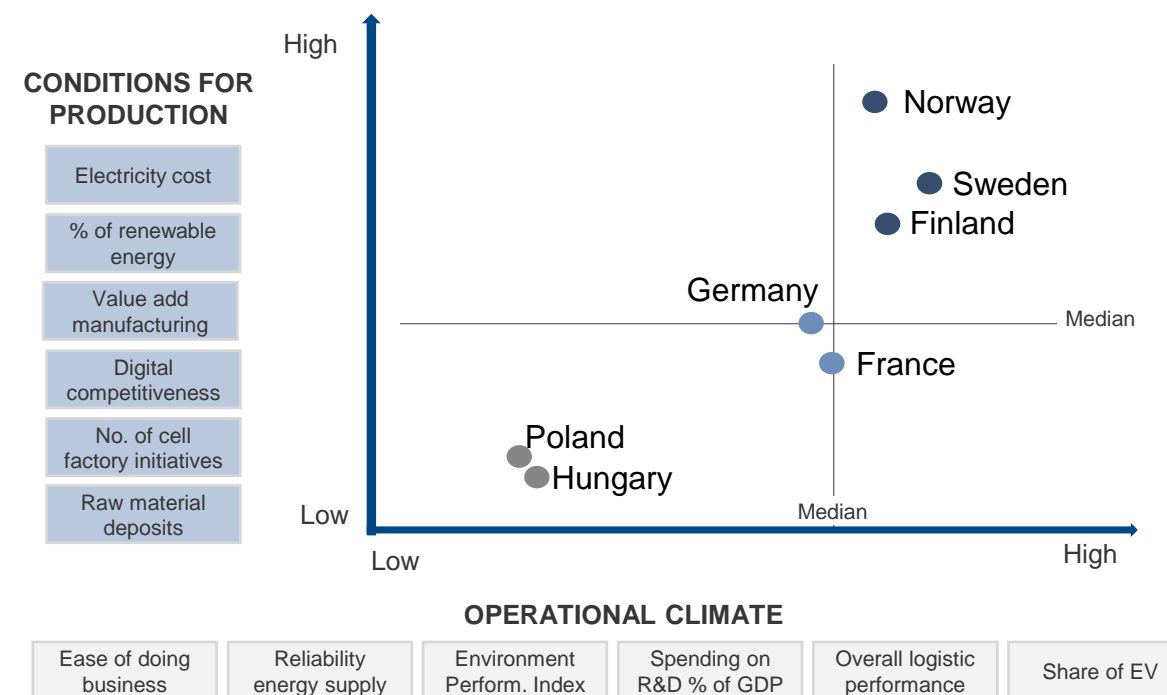
“We must have a **clear, to the point narrative** highlighting our strengths for sustainability, profitability and strong industry tradition”  
[Norwegian company]



## ...is strong compared to other European investment destinations

- An initial European comparison indicates a strong Nordic position\*
  - Deeper analysis over time with future estimates needed

### Business Sweden's Market Selection Analysis of the suggested value proposition



\*Based on latest data available for one specific year. Parameters weighted. Comparison only among stated countries.

Source: Business Sweden interviews and analysis, Business Sweden Market Selection Analysis

# By joining forces, the Nordics can accelerate the development of a strong position in the rising European battery market

	Recommended actions to accelerate the Nordic battery industry	
<b>Develop a joint Nordic value proposition to attract FDI</b>	<ul style="list-style-type: none"> <li>• Develop a joint Nordic value proposition to attract foreign direct investments for experience, competence and competitiveness</li> <li>• Manage potential collaboration barriers by securing speed and efficiency, and focus on business value</li> </ul>	
<b>Positioning and creation of global alliances</b>	<ul style="list-style-type: none"> <li>• Take a global position with a strong common sustainability and profitability narrative</li> <li>• Initiate joint marketing activities, e.g setting up alliances and enabling networking platforms</li> </ul>	
<b>Extend Nordic collaboration</b>	<ul style="list-style-type: none"> <li>• Set up a Nordic communication platform for exchange of experiences and recruitment needs</li> <li>• Collaborate as joint Nordic R&amp;D test centers</li> <li>• Develop a common agenda for long-term competency development at all levels</li> </ul>	
<b>Acknowledge the impact of upcoming EU regulations</b>	<ul style="list-style-type: none"> <li>• Create awareness of the importance of the ongoing developments of the EU regulations on Nordic governmental level                             <ul style="list-style-type: none"> <li>– Including regulations on the battery life cycle, battery waste and transportation of battery materials</li> </ul> </li> </ul>	

“**For example: recycling is still an open field**, more so than other value chain steps, where the Nordic countries have preconditions for high value add. **Regulations will set the conditions.**”

[Finnish company]

“**Together in the Nordics we could lift the level of R&D substantially.** We need test centers like the ones in the UK and Germany.”

[Norwegian company]

“**We need vast investments throughout the entire value chain.** Foreign investments and competence are decisive as we accelerate our own capabilities and technology.”

[Swedish company]





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