Session D: Battery manufacturing

13:30 – 14:45 (1)

Sector working sessions (parallel sessions)
Session A: Energy Intensive Industries (CCS and CCU)
Session B: Clean tech manufacturing, Renewable energy use and Energy storage use

Coffee Break

15:00 – 16:30 (2)

Sector working sessions (parallel sessions)
Session C: Net Zero Mobility: Aviation, Maritime & Road Transport
Session D: Battery manufacturing

16:30 – 17:00 (3)

Key takeaways from discussions of sectoral sessions

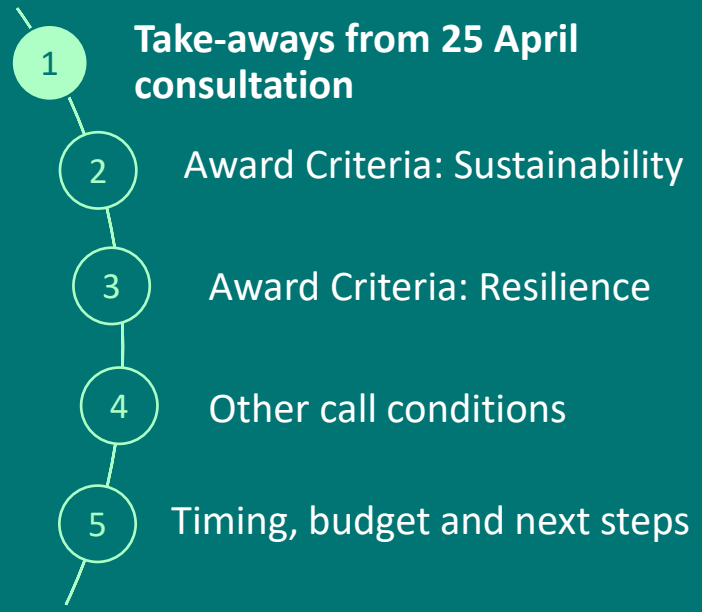
17:00 – 17:15 (4)

Concluding remarks and next steps

European Commission

Take-aways from 25 April consultation

Johanna SCHIELE, Policy Officer, DG CLIMA



European Commission

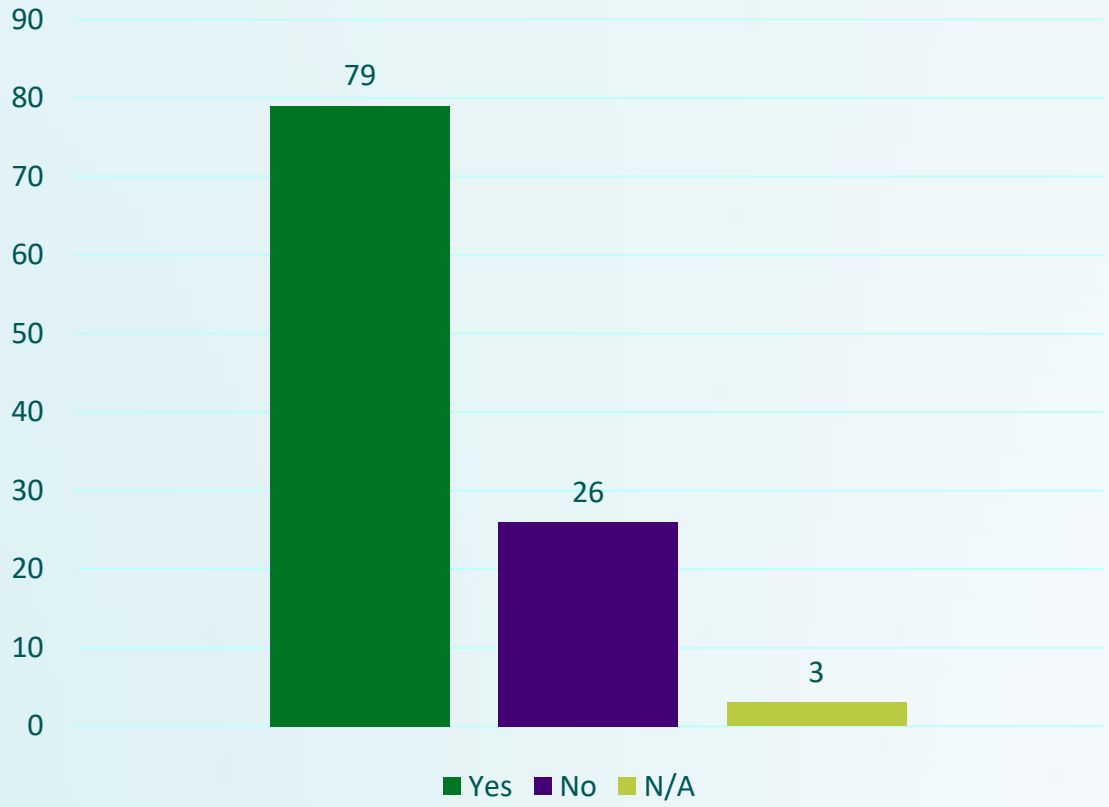
Recap Stakeholder Event 25.4.2024

- **Status quo:** Battery manufacturing supported in general clean-tech manufacturing window.
- **Topic of today's breakout discussion:** EVP Šefčovič made an announcement relating the EU-UK Trade and Cooperation Agreement that the Commission will support manufacturing of the "most sustainable [EV] batteries in Member States" through "a **dedicated instrument** under the Innovation Fund […]" with "up to € three billion for the next three years".
- On 25.4. 2024, DG CLIMA presented an options paper outlining different types of possible funding for this dedicated instrument, and their features.
  - Auction
  - Regular grants
  - Financial instruments in cooperation with EIB

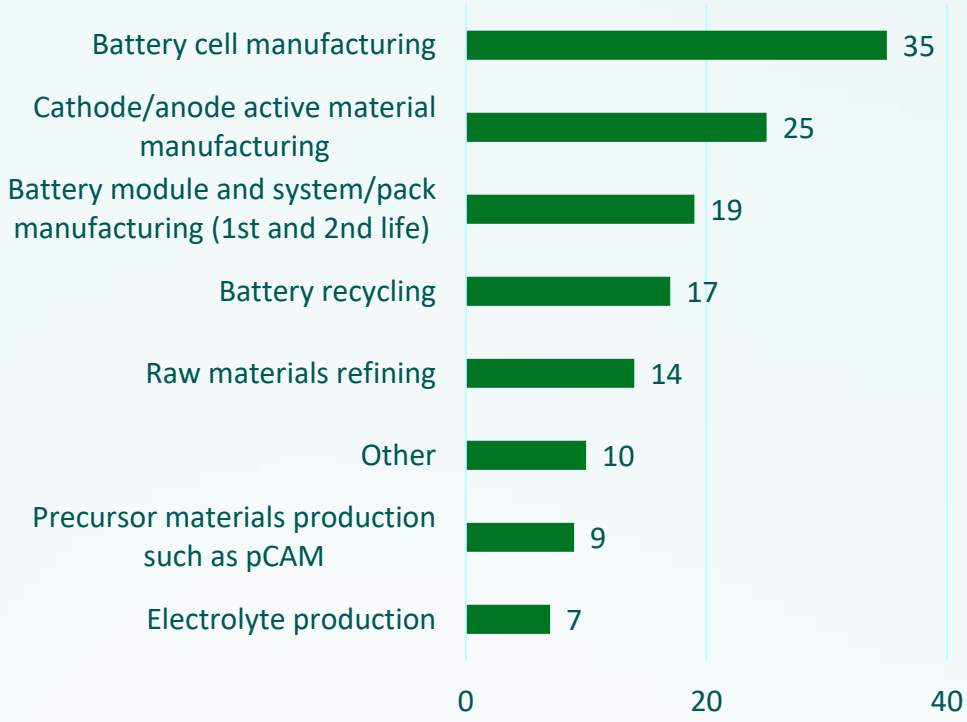
European Commission

A stakeholder survey was answered by 105 participants at and after the April event

Are you currently planning a project in battery manufacturing or along the battery manufacturing supply chain located in Europe?



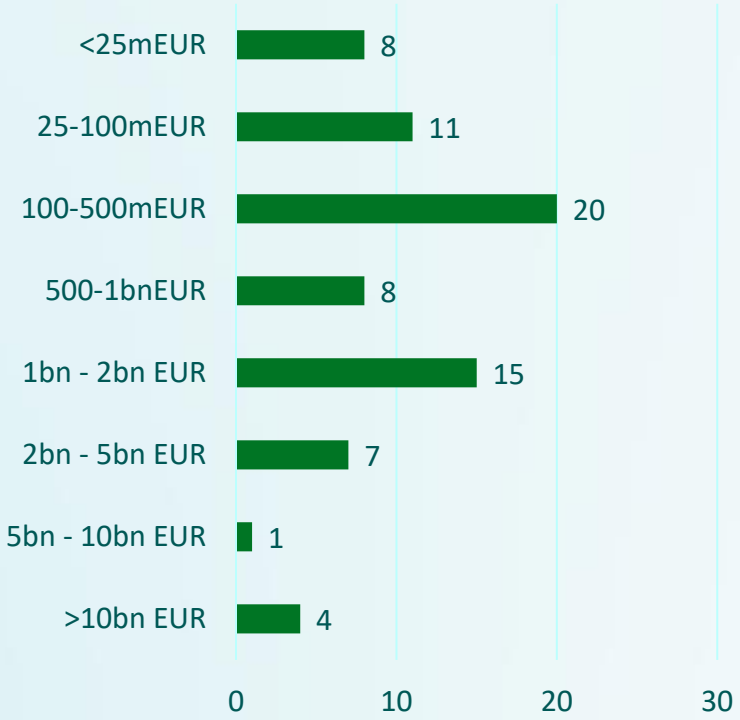
What is your project about (multiple possible)?



European Commission

36% of responding projects expect CAPEX > EUR1bn; 50% expect total project costs of more than EUR 1bn

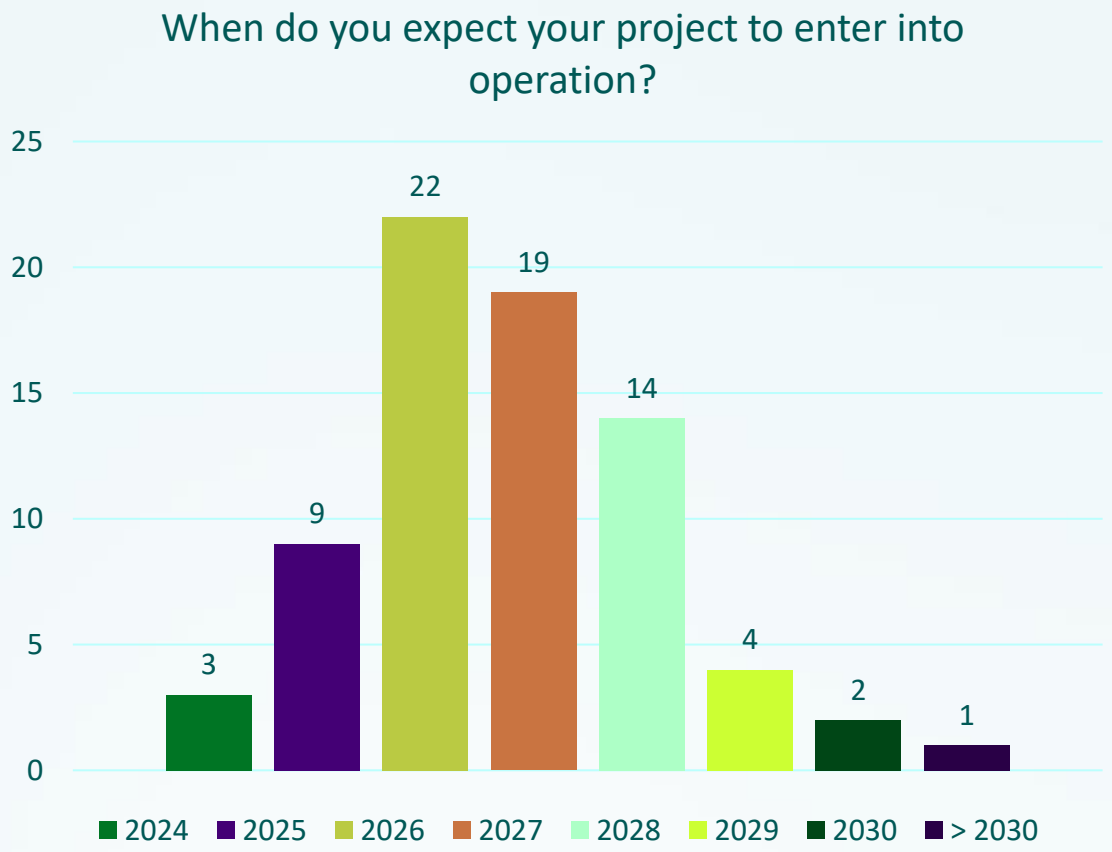
Estimated project CAPEX



Estimated total project costs over 10 years

European Commission

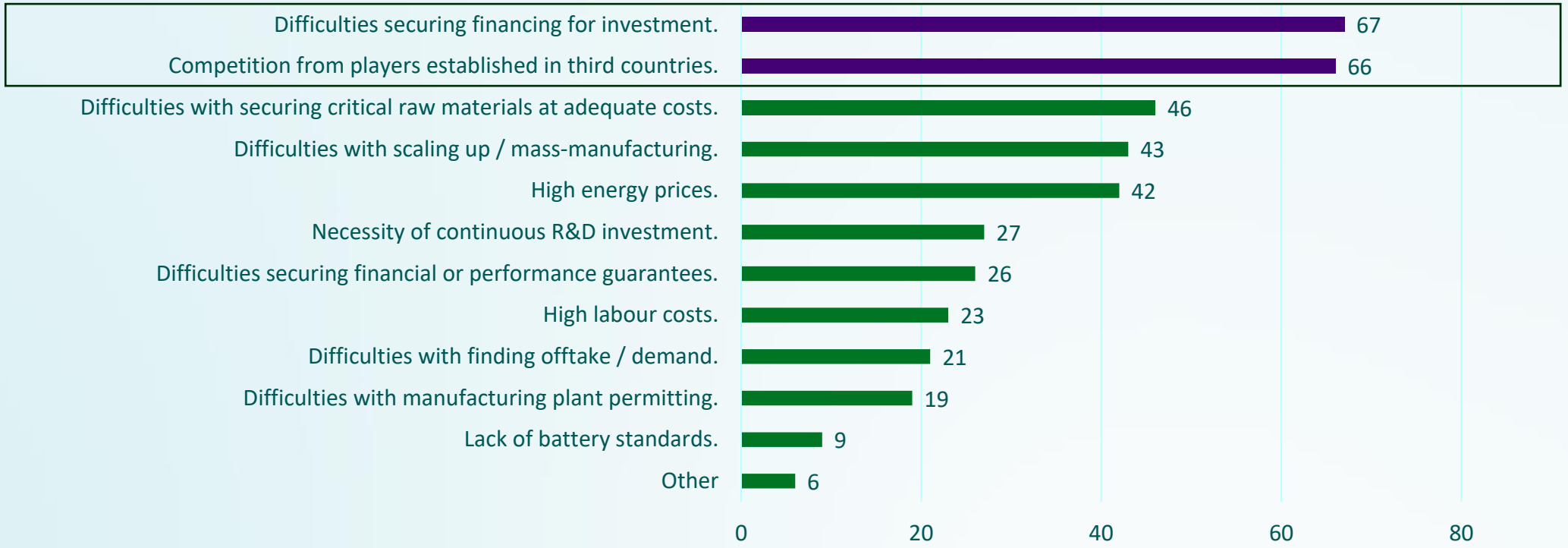
Most projects are pre-start of works, with a majority expecting EiO possible before 2028



European Commission

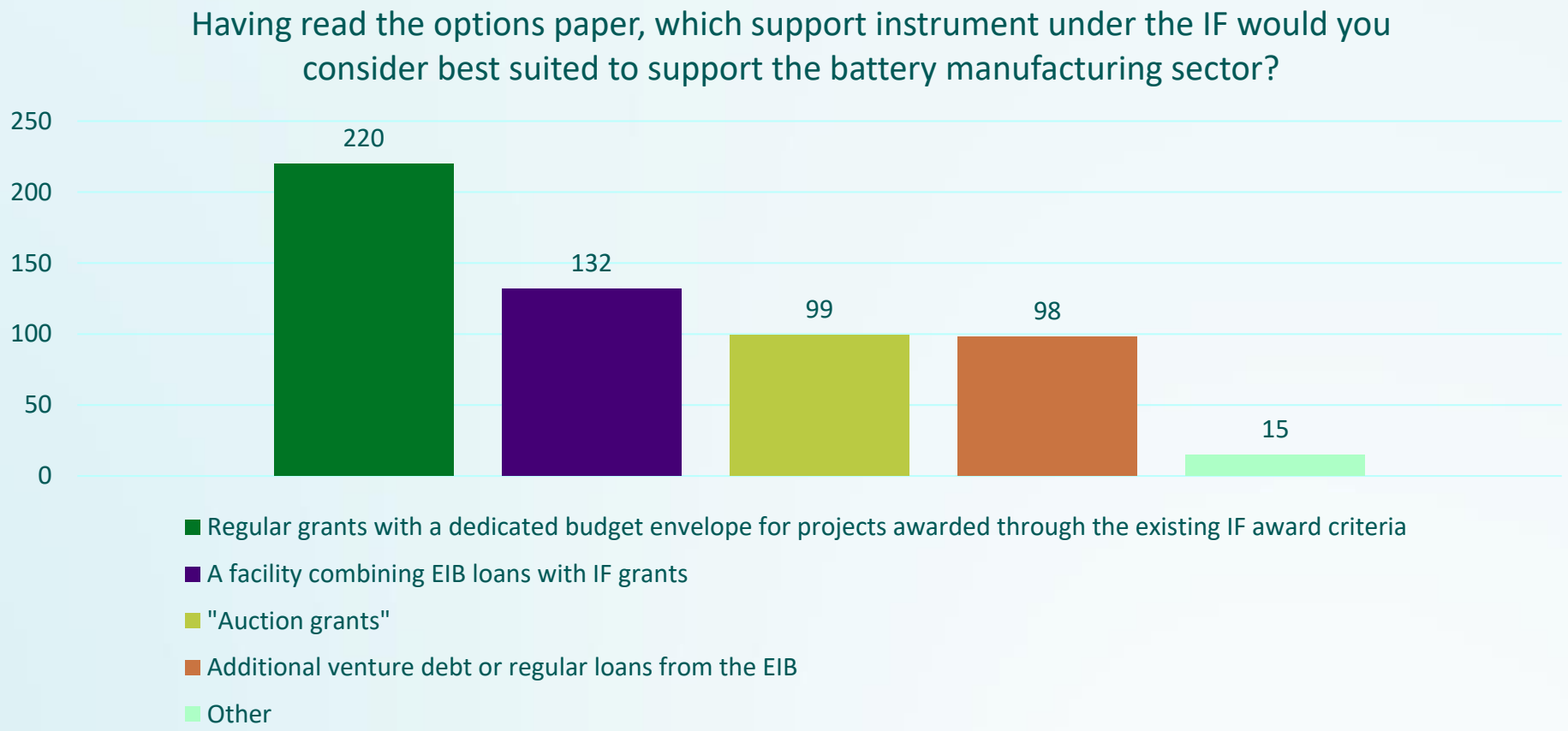
Securing financing and competition from third countries are top-two challenges for EU manufacturers

Where do you see the key challenges for battery manufacturers in Europe?



European Commission

Most survey participants expressed a preference for regular IF grants



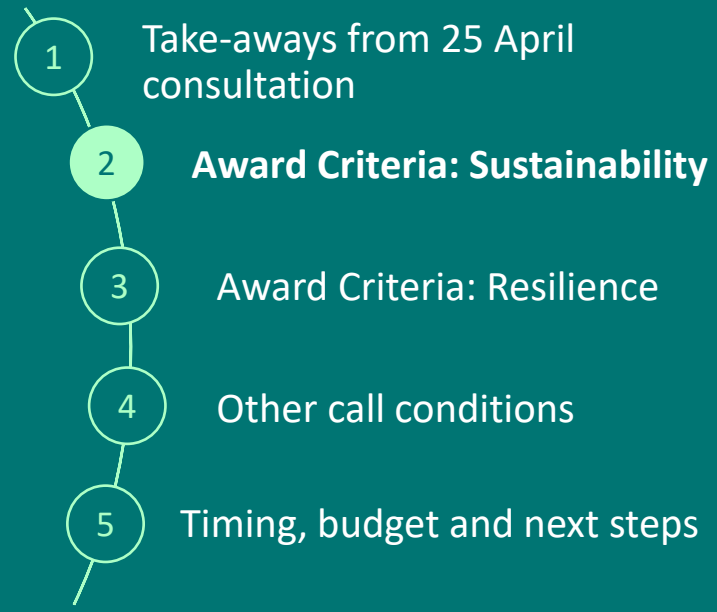
European Commission

Key take-aways for CLIMA consideration

- Overall preference for financing features of:
  - IF regular grants such as pre-EiO financing and cumulation with other public support.
  - Combination of IF funds with lending instruments.

- Roll-out **speed** is key, there is a decent project pipeline.
- No clear-cut answer on whether support should tackle the whole value chain just cell manufacturing. In which direction is the pull factor stronger?
- Clear need for adjustment to GHG methodology to capture manufacturing footprint.

Sustainability & GHG methodology



Johannes Eckstein, Fraunhofer ISI, Senior Researcher

European Commission

A suitable methodology within the IF for batteries

- The GHG emission calculation depends on the sector under the IF
  - *Energy Storage* and *Energy Intensive Industries* are potentially suitable
  - A completely new method means more time and administrative burden

- Battery manufacturing as *Component Manufacturing* for *Energy Storage*
  - Batteries have been supported following this approach up to now
  - However, production emissions are only marginally considered here as bonus points

- Battery manufacturing under *Energy Intensive Industries (EII)*
  - Allows to consider the whole lifecycle, including production/manufacturing process
  - The concept has been successfully applied to many different other sectors

➢ **Today's discussion**
  - **Moving away from component manufacturing, which covers only the use phase, to an approach that covers also production**
  - **Defining a suitable reference scenario**
  - **Production steps to consider in the GHG methodology for battery manufacturing need to be defined**

Scope of GHG emissions

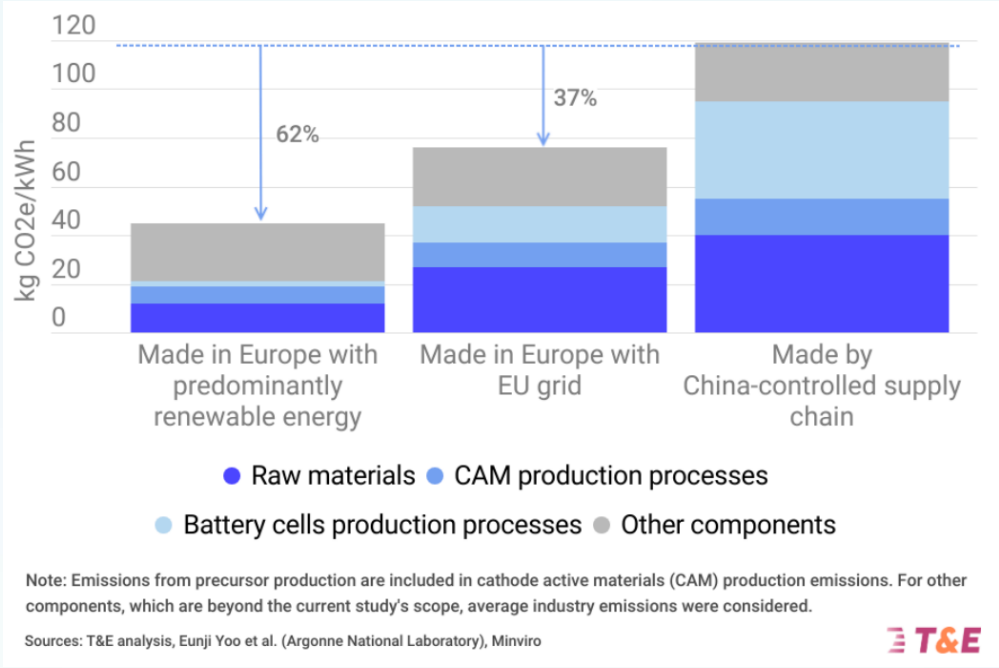
- Substantial savings can be achieved depending on the production process.
- The source of electricity in the manufacturing process is an important lever.

- Depending on the (LCA) approach taken, different parts of the lifecycle need to be considered
  - inputs to cell manufacturing
  - production
  - distribution?
  - use phase
  - end-of-life?

- Scope of the “supply chain“ and “production“ needs to be defined consistently with IF regulation.

- IF methods require the definition of emission savings by using a reference scenario. This needs to be defined.

A recent study (T&E) discusses GHG emissions of battery production



T&E, 2024, Fig. 25: https://te-cdn.ams3.digitaloceanspaces.com/files/An-industrial-blueprint-for-batteries-in-Europe-How-Europe-can-successfully-build-a-sustainable-battery-value-chain.pdf

European Commission

The reference scenario: EII – Transport fuel substitute

The EII methodology considers all phases of product life

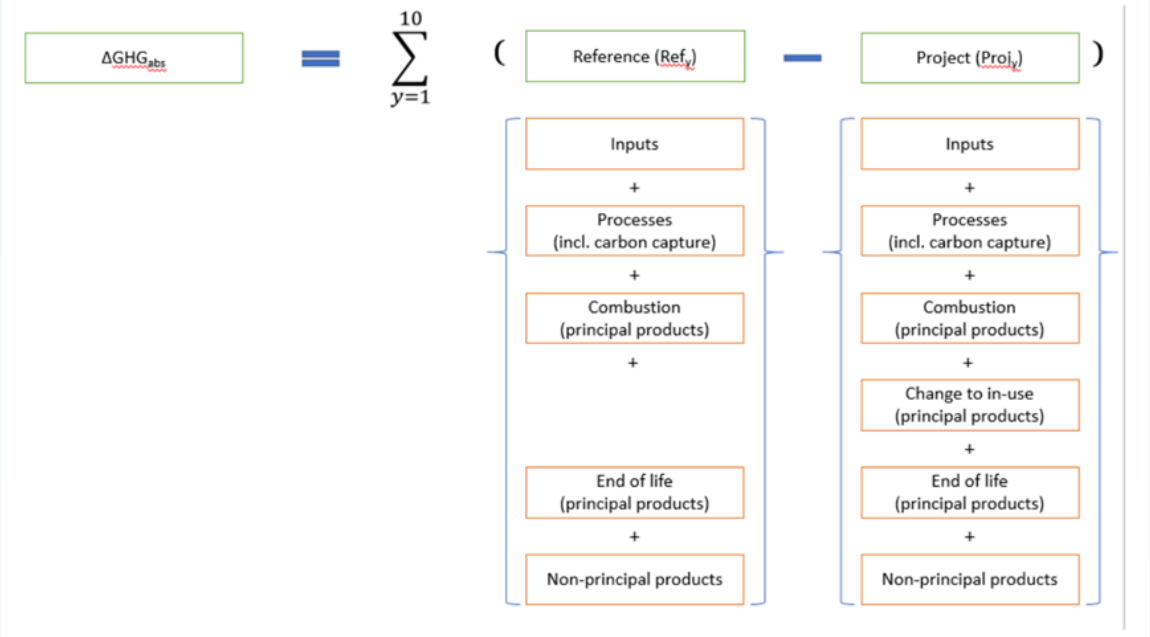
- The EII methodology provides a reference scenario for *Transport Fuel Substitutes*
- This will be used as reference scenario, drawing on elements of Energy Storage

Transport fuel substitute as reference scenario

- Has so far been used for the production of hydrogen or RFNBOs
- It uses diesel fuel as reference and includes production emissions of diesel

- **Assumptions:**
  - Batteries of projects are used in BEVs, Energy Storage provides toolset and assumptions
  - Energy efficiency gains in BEV versus ICE vehicles is considered as in Energy Storage
- Emissions during production of batteries are higher than production of diesel, but much lower in use phase

The EII methodology considers all phases of product life



European Commission

Setting the reference scenario: Transport fuel substitute

Constructing the reference scenario – Using the IF toolbox

The reference scenario: taken from EII

- Emission Factor EF_Diesel = 80.4 g_CO2e/MJ
- This includes “processes” i.e. the production of the fuel
- Underlying assumption: Batteries are used in BEV

Assumptions taken from Energy Storage methodology:

- 0.684 MJ/km (corresp. 19 kWh/100km) for BEV
- Energy efficiency ratio: BEVs are 3 times more efficient than diesel ICE.
- 14,300 km per year per BEV

In addition:

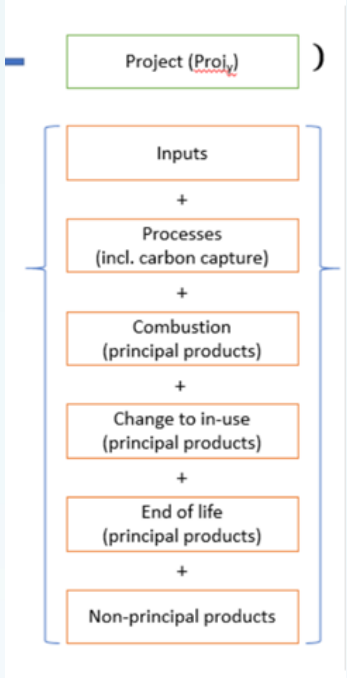
- 100 kWh battery in BEV as assumption for all projects
- Allows calculating the number of BEVs supplied by storage capacity produced and then construct a reference scenario
- This is different to the current cost factor approach used in manufacture of components

Implications for the project scenario

- The use phase needs to be considered for comparability with the reference scenario
- Production phase is essential, but which steps to consider needs to be defined

Proposal to abandon zero electricity emission factor assumption:

- 0 g_CO2e/kWh (like EII approach) will ignore important sources of emissions in production and BEV use.
- 176 g_CO2e/kWh (2030 forward looking) allows assessing project emissions and is therefore proposed.



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Reference scenario: Giga factory example

Example case: Reference scenario for a Giga factory

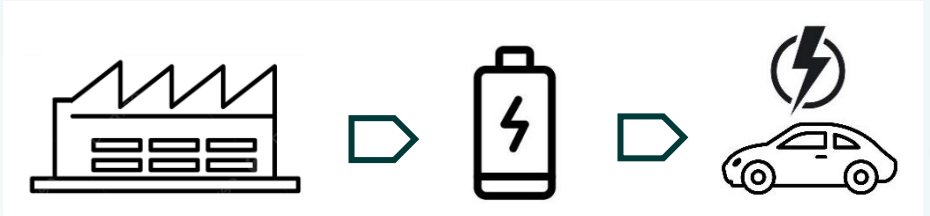
- 10 GWh per year production output
- This supplies 100,000 BEV per year
- per assumption of 100kWh per BEV

- Over a period of 10 years: BEVs and savings of use phase in this period are considered
  - Production of year 1 for 10 years, of year 2 for 9 years, etc.

- Assumptions for use phase as for Energy Storage
- using the emission factor of diesel (incl. production) of EII

➢ <u>Total of 13 Mt_CO2e as reference for the giga factory project</u>

- This includes “processes” i.e. the production of the fuel
- and the use phase
- production and use over 10 years



10 GWh p.a. produced

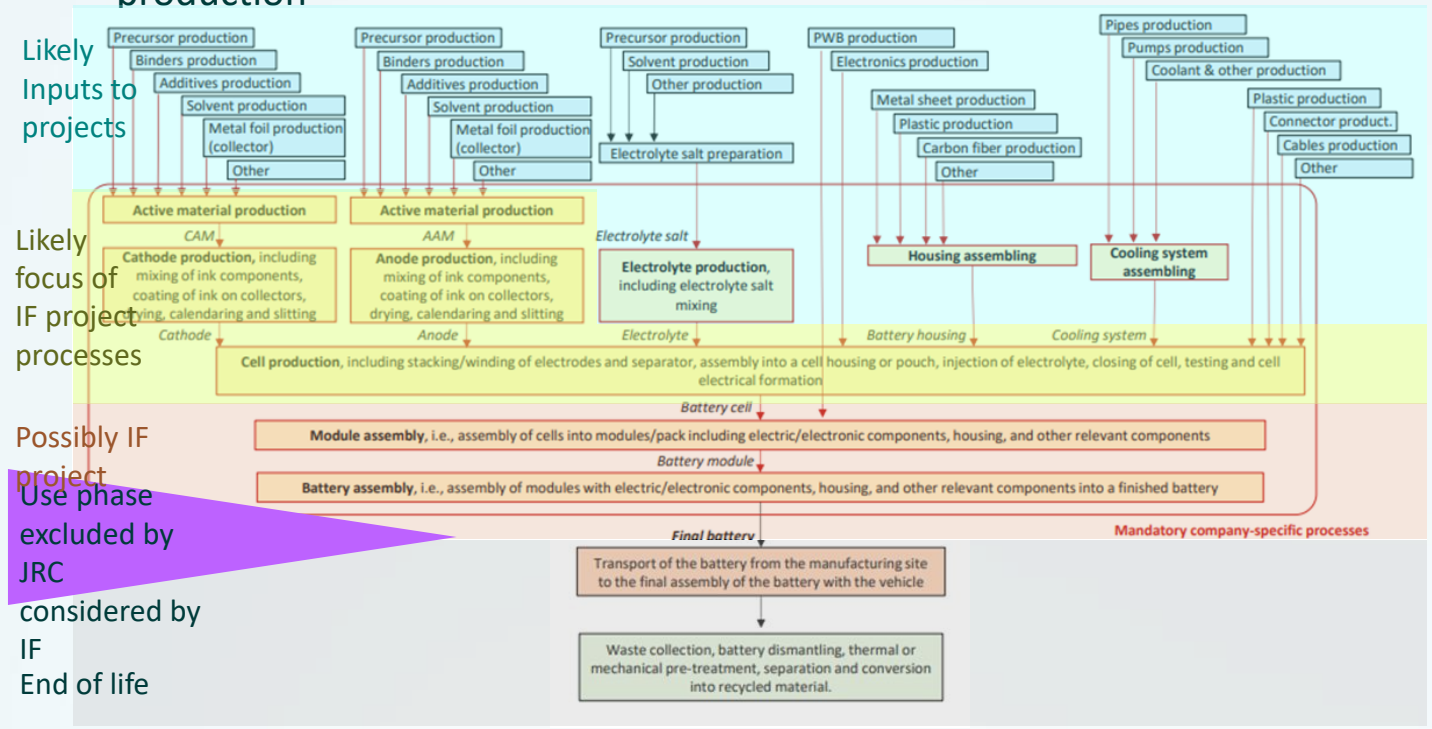
100 kWh battery capacity per BEV assumed

14,300 km p.a. technical assumptions on energy demand and efficiency gain

The project scenario

- JRC approach provides guidance on elements to consider for emissions of projects
- Use phase is explicitly excluded by JRC while IF will include it
- EII approach requires to consider all parts of the life cycle: Inputs, Processes, Use phase, end of life (and non-principal products)
- JRC categories can be mapped onto IF EII
- However, not all steps of the life cycle are under control of projects.

JRC has proposed a method to determine GHG emissions of battery production



https://eplca.jrc.ec.europa.eu/permalink/battery/GRB-CBF_CarbonFootprintRules-EV_June_2023.pdf

European Commission

Project scenario: Giga factory example: only EV use

Using the previous example of a giga factory producing 10 GWh p.a., equivalent to 100k BEV over 10 years

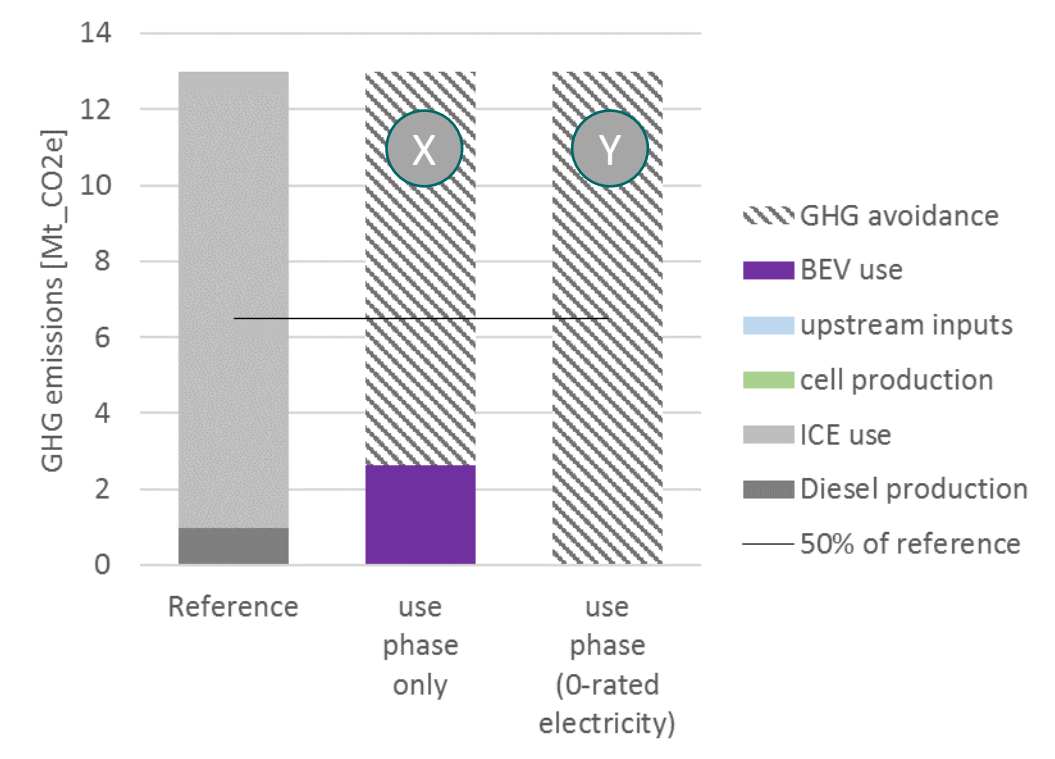
X

Considering only EV use phase

- no production is considered
- all projects will be ranked equally
- no differentiation is possible

Y

- if no electricity emissions are considered, project GHG avoidance will be strongly overestimated!



Assumptions: EU27 average electricity mix 2030; total of 45 kg_CO2e/kWh for battery production; 12 kg_CO2e/kWh for battery cell production; zero scrap; electricity only (no natural gas), see e.g. https://www.sciencedirect.com/science/article/pii/S0921344922004402

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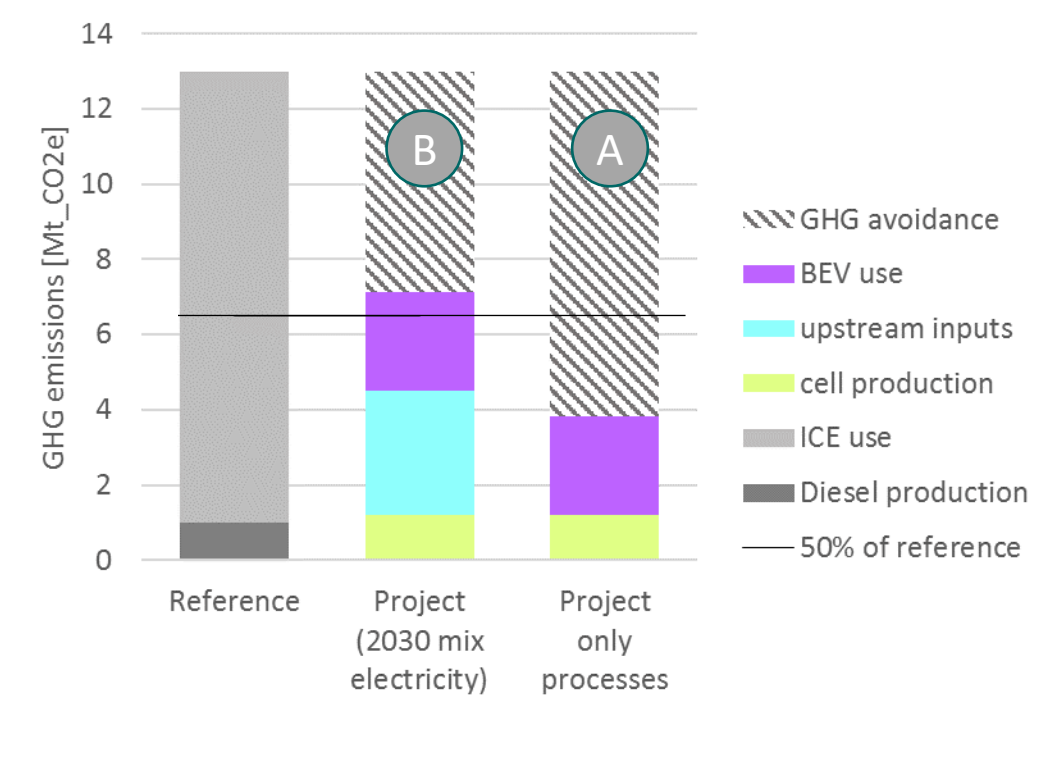
Project scenario: Giga factory example: full project

Using the previous example of a giga factory producing 10 GWh p.a., equivalent to 100k BEV over 10 years

A Considering only processes of cell production as project plus EV use phase
- projects will be able to show differences in production phase
- simple to monitor
- important part of GHG balance is neglected
- excludes possibility for component manufacturers to participate

B In addition: Considering upstream inputs
- GHG balance becomes more complete, closer to LCA
- More difficult for production steps to be assessed at the time of the application and monitored



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Project scenario: Projects differ in production steps

How do we consider that projects cover different parts of the production chain?

Option 1: **all are equal**	**Option 2:** **standards provided**	**Option 3:** **use cost shares**
Assume all projects cover the same production steps (cell production) using similar inputs. Only assess cell production.	Give standard emission values for all production steps, allow deviation upon proof by projects.	Rescale reference emissions based on production steps covered by projects and (predefined) shares of battery costs of production steps. Steps and shares to select for projects.
• simple in assessment at the time of application • no difficulties in monitoring • excludes projects addressing only part of the value chain, which can apply under a different topic	• ensures comparability between projects that cover only part of the production chain • requires assessment and monitoring if projects deviate from standard values • implicitly constructs a battery production reference. Default values need to be set while they may vary across battery types and over time.	• Is consistent to the “component manufacturing” approach of the IF • ensures comparability between projects • steps and shares may need to be predefined, will be questionable and may change over time • Cost shares are an imperfect estimator for GHG emission shares

Slido Poll (Multiple choice)

1. What is your project about?
2. Is the basic assumption of rescaling produced storage capacity to a number of BEV a suitable simplification?
3. Can we assume that emissions of inputs upstream of cell production are monitored?
4. How should we consider differences in production step coverage by different projects?
5. Is it a valid approach to apply a non-zero emission factor for the electricity used, also for the production steps?

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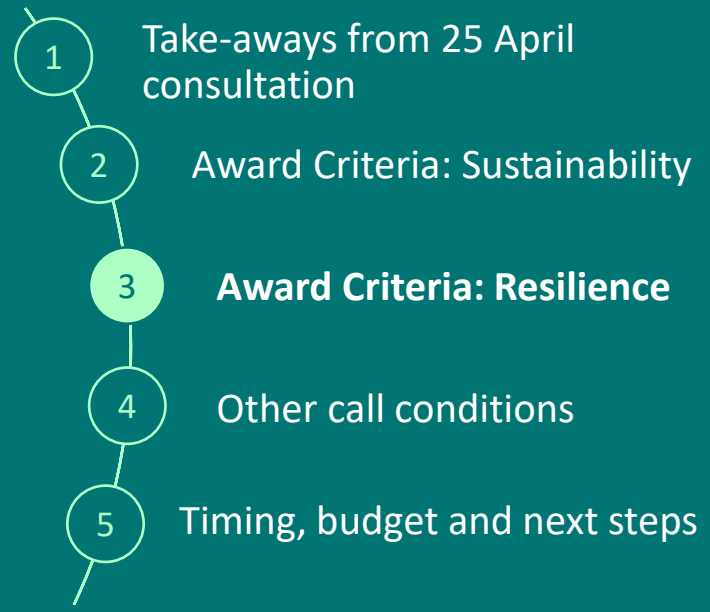
Resilience



Ewelina Daniel, DG CLIMA, Policy Officer - C.2 - Low Carbon Solutions (II): Research & Low Carbon Technology Deployment

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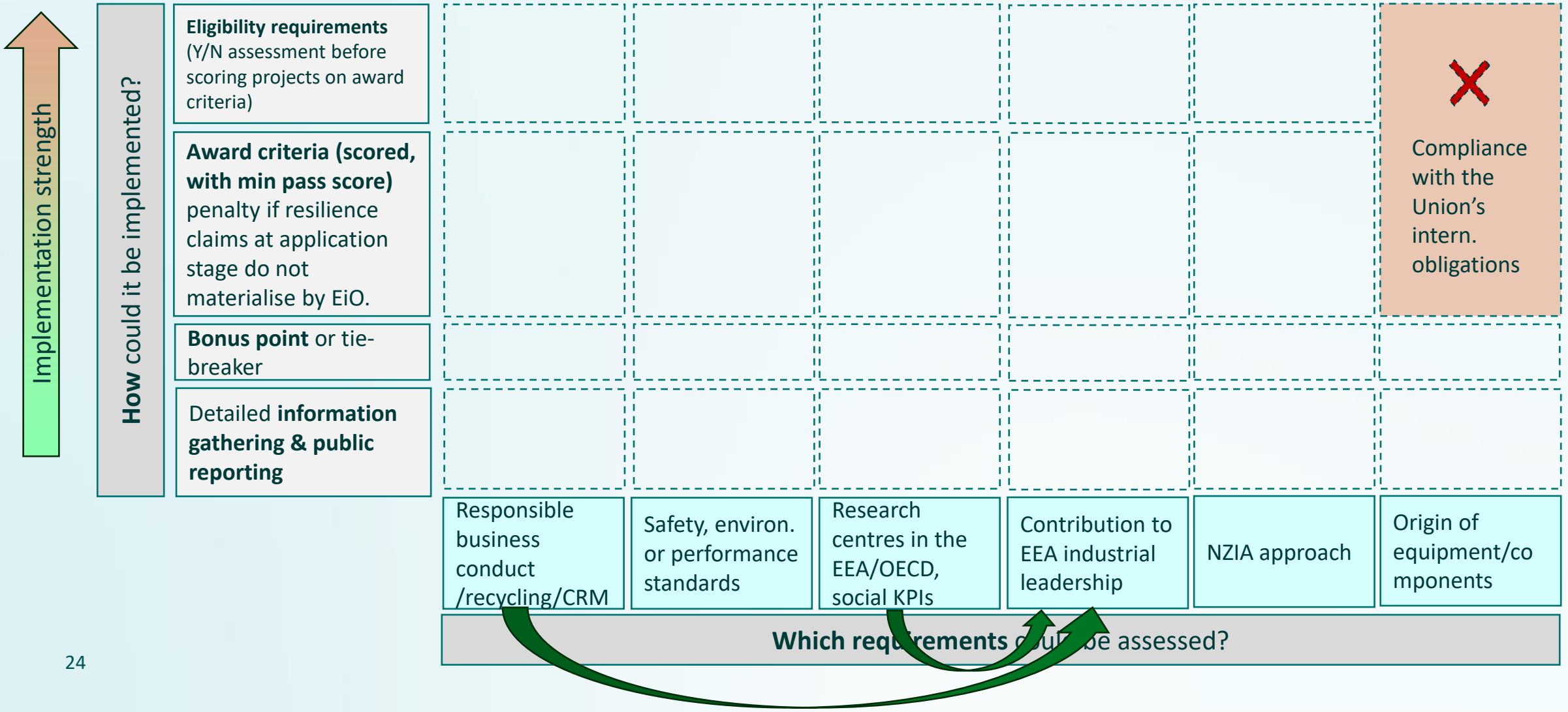
Resilience: rationale

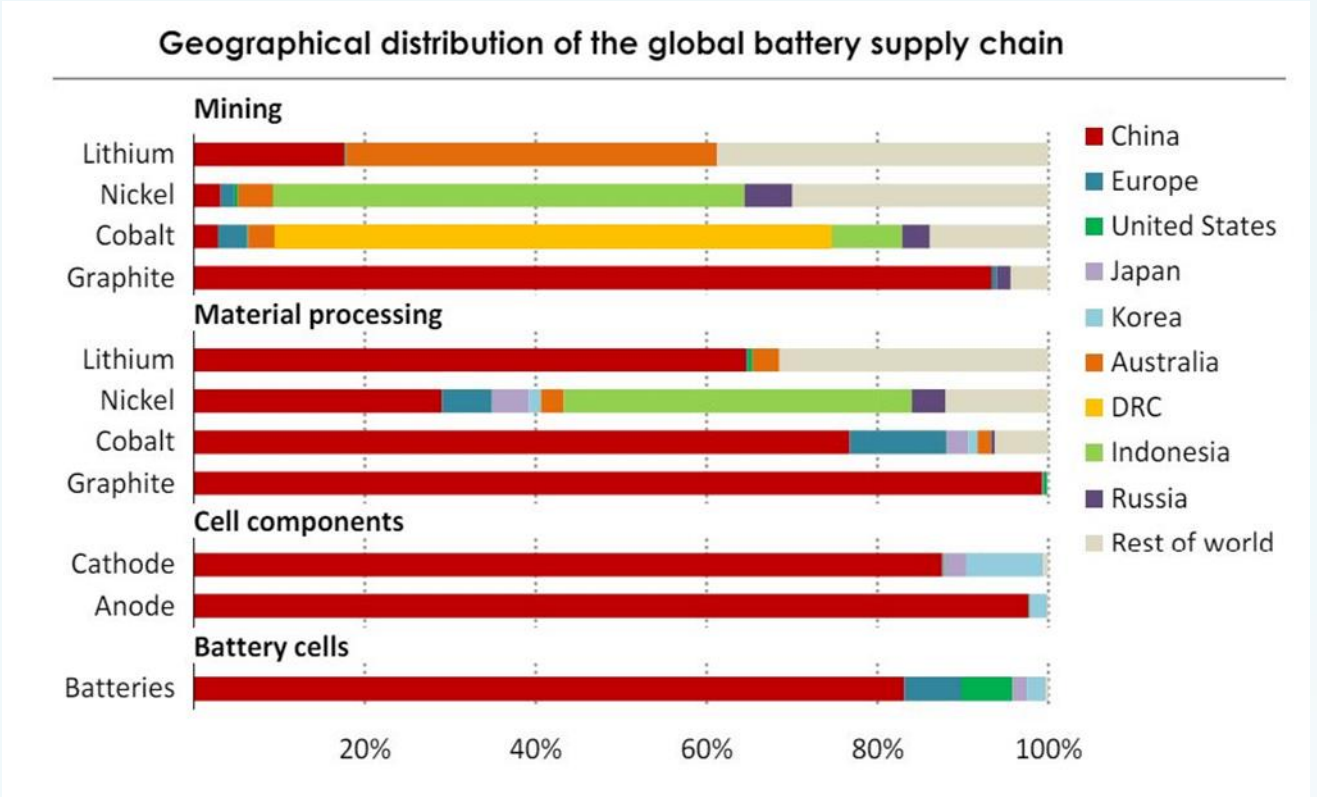
- Announcement of EVP Šefčovič: *This new instrument will provide support (…) of the most sustainable batteries creating important spill-over effects on the entire value chain, including its upstream segment.*
- Key priority for the EU, in line with Open Strategic Autonomy of the EU, RRF, NZIA and STEP Regulation.
- Since ETS Directive revision, “resilience” criterion has been added to the IF “regular” calls for proposals.
- Competitiveness of EU battery industry is challenged (lower production costs and subsidies in third countries for local manufacturers, global value chain is dominated by China, EU’s share in global investments dropped).
- Number of possible “resilience” requirements and number of ways to implement them in a “regular” call for proposals.
- The scope on battery cells is combined with strong resilience requirements to have a pull effect on the value chain.

How could resilience requirements be assessed in a “regular” call of proposals?



NZIA approach

- NZIA now adopted but DAs (notably on resilience) have to be prepared (expected in 9 months), customs codes will have to be developed.
- NZIA provides possibility of discriminatory measures against trading partners, if overreliance or risk of it can be proven.
- Art 20 approach could be applied in EU funding instruments (EU calls just like national auctions provide subsidies).
- We don't have complete data but on e.g. Li-on chemistry cells we can observe that 80% of import come from China.
- Discussions still ongoing if this is sufficient data but **would exclusion of Chinese components be in the interest of EU-based producers?**



Source: IEA (2024), Batteries and Secure Energy Transitions, IEA, Paris https://www.iea.org/reports/batteries-and-secure-energy-transitions, Licence: CC BY 4.0

Batteries and Secure Energy Transitions – Analysis - IEA

Measures possibly favouring EEA/OECD manufacturers

- Responsible business conduct / CSR requirements
  - Beyond the existing legislation (e.g. CSR Directive, Supply Chain Due Diligence Directive)
  - Existing codes like: International RBC Agreement for the Renewable Energy Sector (signed in 2023) : https://www.imvoconvenanten.nl/en/renewable-energy or OECD Guidelines for Multinational Enterprises on Responsible Business Conduct
  - Certification or self-declaration?
- Recycling strategy
- CRM intensity
- Social KPIs (trainings, job creation)
- Research centres in the EEA/OECD
  - Precise definition of research centre
- Standards
  - Are there battery standards beyond the existing legislation (i.e. what will be required under the Battery Regulation)
  - Can trade partners catch up quickly?

Should such requirements be eligibility conditions, should they be a stand-alone or part of a broader award criterion?

Contribution to Europe's industrial leadership and competitiveness

- **Standard approach** under other EU funding programmes
- **In the call text**:

  1) Call objectives: (amongst others) to support European industrial leadership and competitiveness in the batteries sector.

  2) Award criterion (scored): Contribution to Europe's industrial leadership and competitiveness:

  Projects could demonstrate: supporting European battery value chain, resilience of the supply chains, development of new technology, creating new IP rights, partnerships with European research bodies, recycling or other strategy helping to reduce dependency on critical raw materials, contribution to new industrial ecosystems (e.g. clusters) or other positive spillover effects, jobs created, trainings or other actions to develop know-how in Europe.

  In practice: project would fail if it cannot demonstrate any contribution. **Min pass score** established (link to STEP seals). Project with value chain outside Europe can still pass this criterion.

  3) Mandatory reporting on origin of components + report at the end of monitoring period on fulfilment of the claims in the application (grant reduction/claw-back possible).

Foreign Subsidy Regulation

- FSR is already in force and can be triggered, amongst others, ex officio by DG COMP upon the complaint received.
- Concretely, if link can be made between the abnormally low grant request and the fact that project developer purchased equipment from a supplier that received foreign financial contribution, complaint could be made to DG COMP.
- DG COMP does not investigate all complaints.
- In practice “tick the box” question will be asked if the intended suppliers receive foreign contributions (whether it’s subsidies or on market terms).
- Complementary to this, TDI instruments are in place.
- This is not a new requirement but a reminder of the existing legislation.

Open discussion Slido

1. Which is the preferred way forward (some requirements are stackable)?
2. Would exclusion of Chinese components be in the interest of EU-based producers?
3. Should requirements on business conduct/standards/CRM/recycling/research centres be eligibility conditions, should they be a stand-alone award criteria or part of a broader award criterion?
4. Is there any other aspect missing in “Contribution to Europe’s industrial leadership, competitiveness and resilience?”
5. Any other alternative approach to suggest?

Slido polls

1. What aspects should be addressed under “Contribution to EEA industrial leadership” award criterion?
2. Would exclusion of Chinese components be in the interest of EU-based producers?

European Commission

Other call conditions

Johanna Schiele, DG CLIMA, Policy Officer - C.2 - Low Carbon Solutions (II): Research & Low Carbon Technology Deployment

European Commission

What about the scope of the instrument?

- Most likely, EV cell manufacturing.
- Rest of the value chain would remain eligible in the general manufacturing of components topic.
- Possible additional financial instrument through EIB or promotional banks for strengthening of the upstream value chain.

In the battery regulation [3(1)14] EV batteries are defined as follows:

"'electric vehicle battery' means a battery that is specifically designed to provide electric power for traction in hybrid or electric vehicles of category L as provided for in Regulation (EU) No 168/2013, that weighs more than 25 kg, or a battery that is specifically designed to provide electric power for traction in hybrid or electric vehicles of categories M, N or O as provided for in Regulation (EU) 2018/858"

What about project timing and disbursement schedule?

Stakeholder feedback: Need for speed

- Suggested time to financial close: 1 year
- Suggested time to Entry into Operation: 3 years
- Under “project maturity”, among other factors, we will assess the project’s ability to credibly reach those deadlines will be assessed.

Stakeholder feedback: Pre-financing and flexible disbursement schedule

- Projects can receive up to 40% of payments before financial close if well justified / needed.
- Project can receive up to 90% of payments for milestones before Entry into Operation if well justified.
- 60% of payments have to be linked to actual GHG emissions reduced.

What about the Degree of Innovation criterion?

- Stakeholder survey results make clear that scaling-up and **mass-manufacturing** of existing battery technologies to reach economies of scale is a key problem.
- Challenges in scale-up such as:
  - low error tolerance around sensitive chemistries
  - substantial investment needs in infrastructure and equipment
  - skilled labour and supply chain management
  - maintaining quality control and efficiency.
- => Projects do not have to be first-of-their-kind with regards to technology to compete on Degree of Innovation
- => Innovation reduced use of raw materials, recycling/circular economy etc. will be considered

What about the Start of Works requirement?

What is the Start of Works requirement?

- "Start of works" refers to the **first firm commitment** that makes an investment **irreversible.**[1]
- IF projects must normally be pre-Start-of works to guarantee an **incentive effect** of the subsidy.

What is the issue?

- Many battery manufacturing projects are modular investments, with production lines financed, built and de-risked … one by one
- This creates a grey zone of project expansions under "Start of Works"

Suggested solution:

- Allow for smart definition of project boundaries, where additional production lines can be treated as new projects.
- If there is a modular production ramp-up, it would have to be argued that FID for capacity expansion was not reached prior to application.

Audience question: would it be a burden to prove that a financial decision for a new manufacturing line within an existing project has not yet been taken?

1) The buying of land and preparatory works such as obtaining permits and conducting preliminary feasibility studies are not considered as start of works. The initiation of grid connection processes does not count as start of works either.

European Commission

Next steps

Stefanie Hiesinger, DG CLIMA, Head of Unit - C.2 - Low Carbon Solutions (II): Research & Low Carbon Technology Deployment

European Commission

Timing, budget, next steps

- **Timing:** Ambition to move as fast to roll-out as possible.

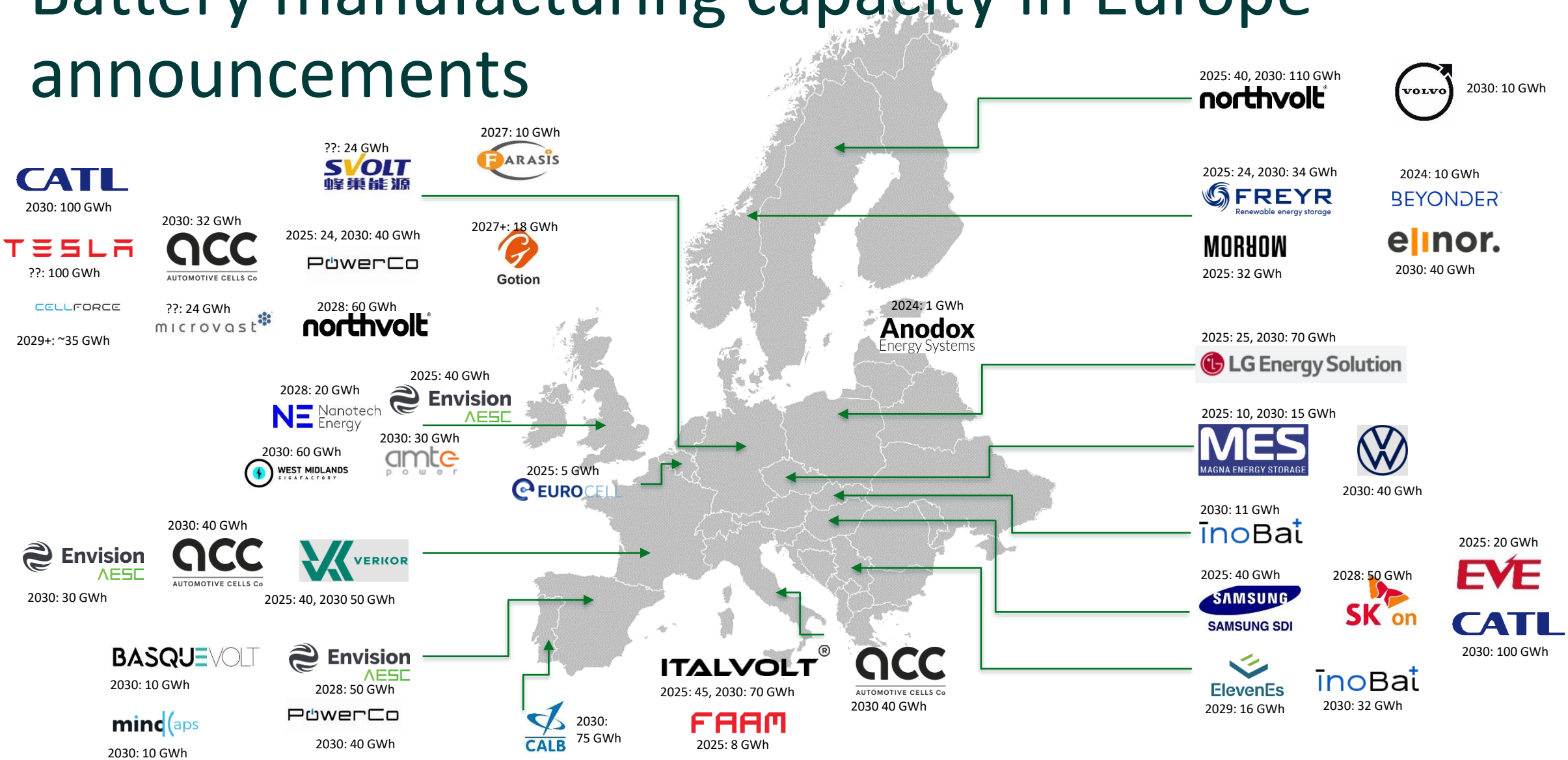
- **Budget:** EUR 1bn for first round, with potential additional EUR 200mn (with expected leverage effect, e.g. in InvestEU: 14x)

- **Next steps:**
- Final internal deliberations around scope, separate call or topic in upcoming call and call design.
  - Finalisation of updated GHG methodology and resilience criteria.
  - Finalisation of call text.
  - InfoDay to explain call conditions to prospective applicants.
  - Call launch

Back-up slides

European Commission

Battery manufacturing capacity in Europe - announcements

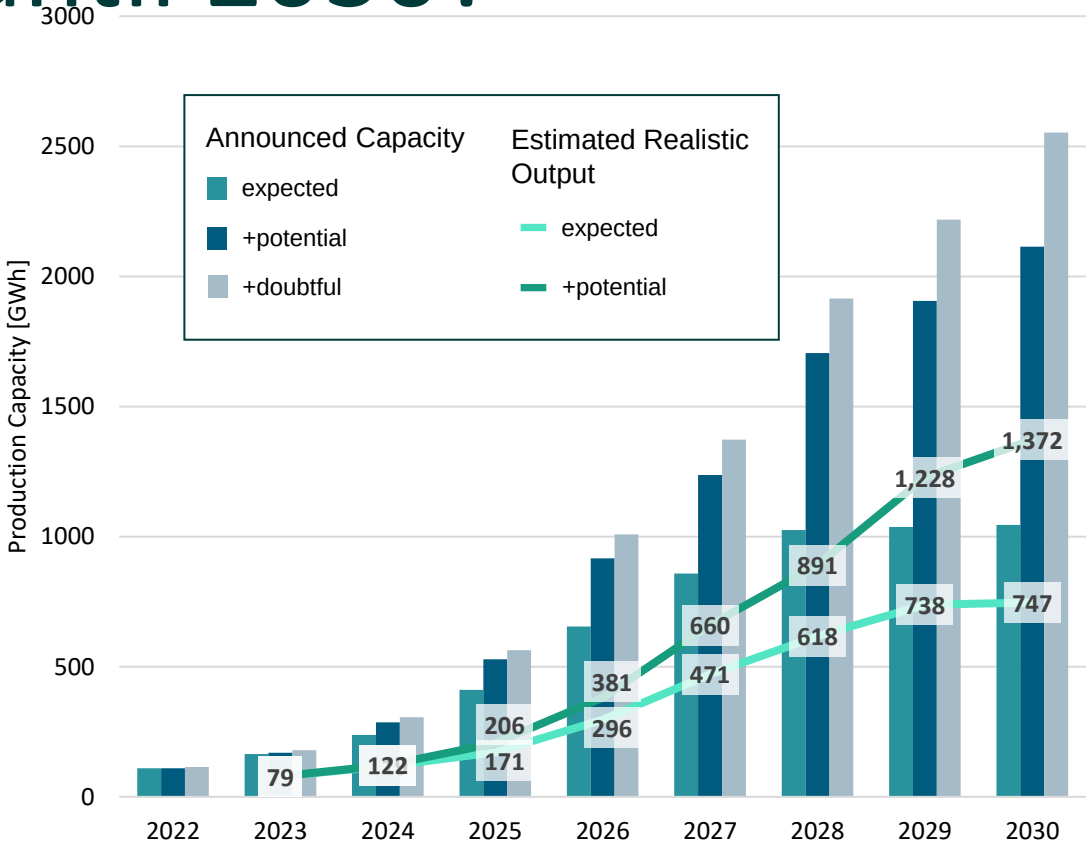


No claim to completeness, status 2023

What is the expected ramp-up of battery cell manufacturing in the EU until 2030?

- **Estimates from Fraunhofer ISI Database**
  - Scope: EU incl. UK, Norway and Serbia
  - Based on public announcements for maximum capacity of cell manufacturing
  - Three categories determine the likelihood of realisation: expected, potential, doubtful depending on the source of information
  - Expert assessment of production delays and production control for estimation of output in two scenarios: expected and potential
  - Analysis indicates that cumulative cell production output of 1 TWh in 2030 seems possible

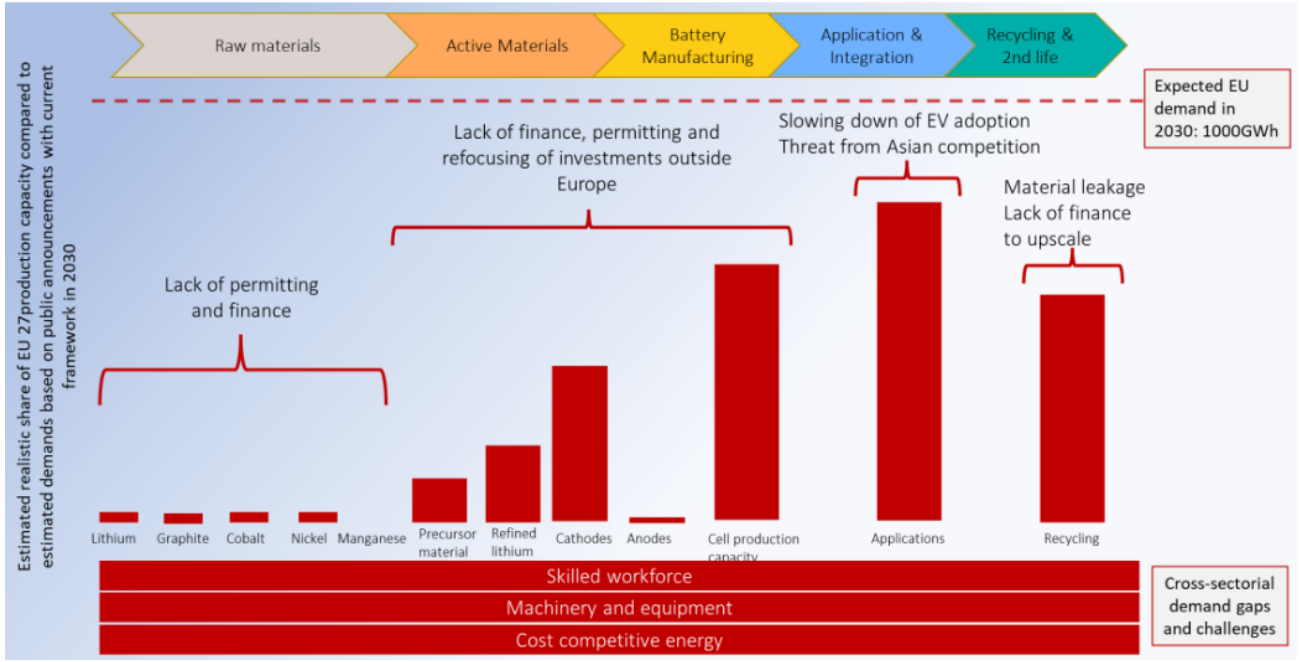
- **What are potential risks to those new capacities actually being realized?**



Source: Fraunhofer ISI Cell Production Database - based on public announcements of cell manufacturers, and additional "market intelligence"

Are capacity gaps emerging in the supply chain upstream of manufacturing in the EU?

- **Zooming into the battery value chain**
  - Large gaps between EU domestic production and demand anticipated in
    - Raw materials
    - Anodes
    - Precursor material
  - Heterogeneous contractual situation (long-term, short-term) for material supply and dependencies on raw materials
  - Strong cost competition e.g. from Asia with more vertical integration of material supply, processing and manufacturing, subsidies in non-EU countries



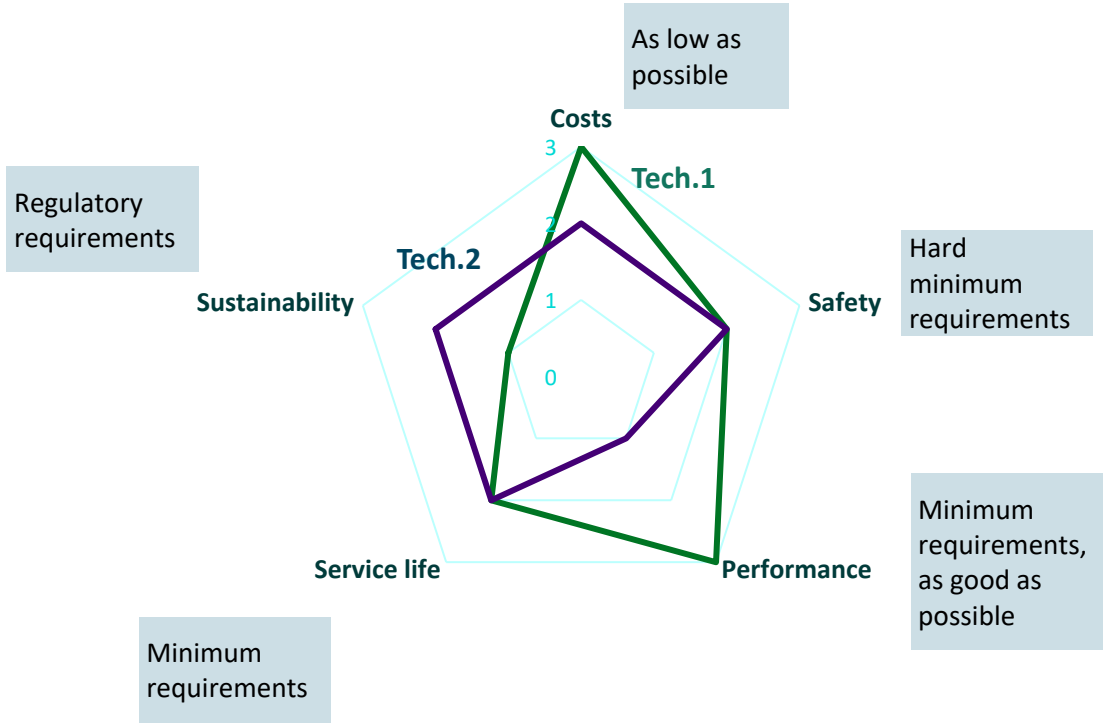
- Source: InnoEnergy & European Battery Alliance

Which focus should be set for battery support within the Innovation Fund?

- **Battery cells are heterogeneous - Diverse application requirements determine cell technology**
  - Safety (Mobile or stationary application? Shock and vibration? People close to the battery?)
  - Performance (Energy density, fast charging, low/high temperature operation)
  - Service life (High duty application, standby application, service life of application, ...)
  - Sustainability (carbon footprint of cell production or supply chain, recyclability, input material)

➢ **To what extent should battery support be tailored to specific application and sustainability requirements?**

Schematic assessment of cell technologies



- Source: own illustration.

Where will different cell technologies be produced globally?

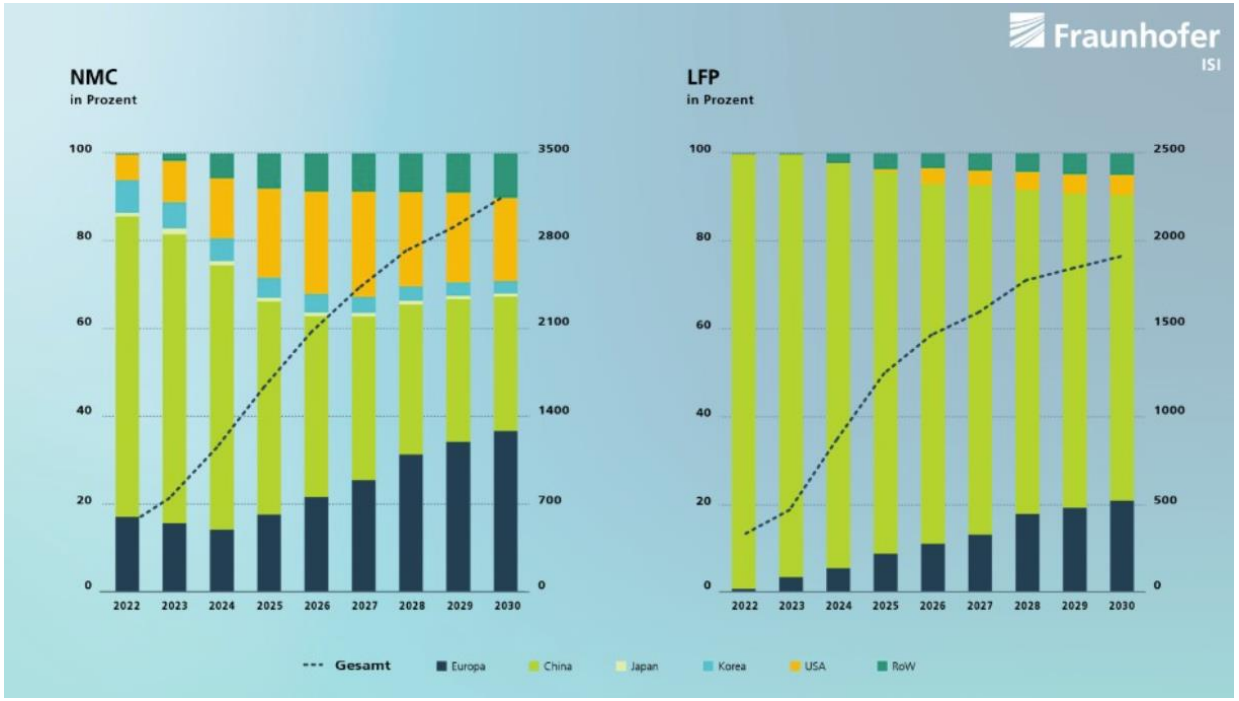
- Despite R&D efforts on cell chemistry, two technologies are expected to dominate the battery market:

– NMC - Lithium-Nickel-Mangan-Cobalt-Oxide ➔ higher energy density, more expensive, contains cobalt

– LFP - **Lithium Iron Phosphate** ➔ lower energy density, less expensive, less critical raw-material intensive

  - ➢ Regional differences in the predominance of certain cathode materials:
    - ➢ Europe: Cell production focused on NMC
    - ➢ China: Cell production shifting to LFP for majority of vehicle segments
  - ➢ Additional innovative technologies to be considered?

➢ **What types of battery cells are expected to lead cell production in Europe and how should the EU position itself on technologies?**



- Source: Fraunhofer ISI Cell Production Database - based on public announcements of cell manufacturers, and additional "market intelligence"

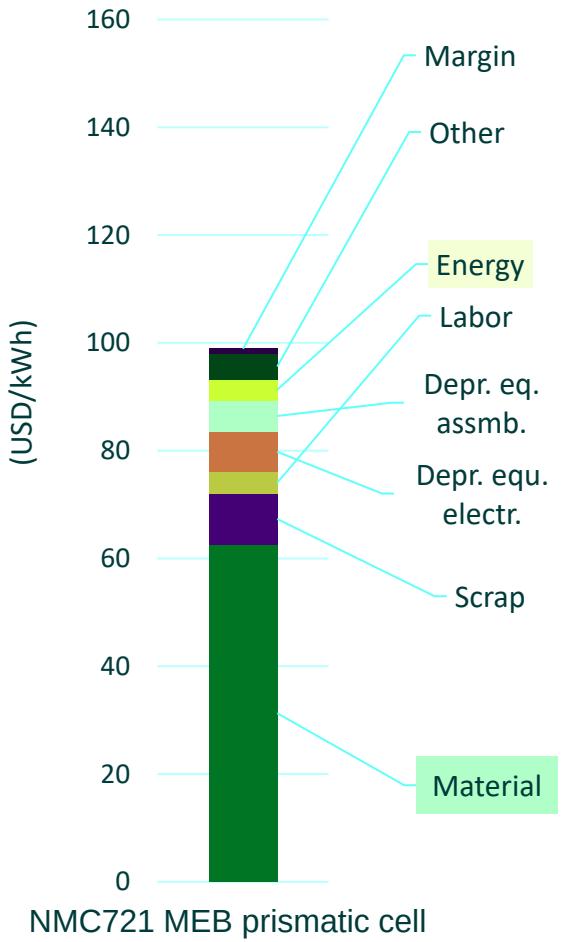
Material cost determine the largest cost share of battery cell manufacturing

Cell technology determines material and manufacturing costs

- Costs depend on technology (i.e. NMC vs. LFP) and performance
- Supply conditions and dependencies on raw material costs vary among manufacturers depending on the terms of contract
- Fluctuating raw material costs limit the validity of a reference price for a particular technology
- No uniform reference price for materials

➔ **With only few exceptions, there is no international market price for "battery cells"**

- **How can the level of support be anticipated?**



NMC721 MEB prismatic cell

Margin (→ price)
- high USP

vs.
- commodity

Location
- Energy cost
- Labor cost

Scale
- Supply conditions
- Depreciation cost
- R&D cost

Scrap
- Process control
- Process experience
- Size of the cells

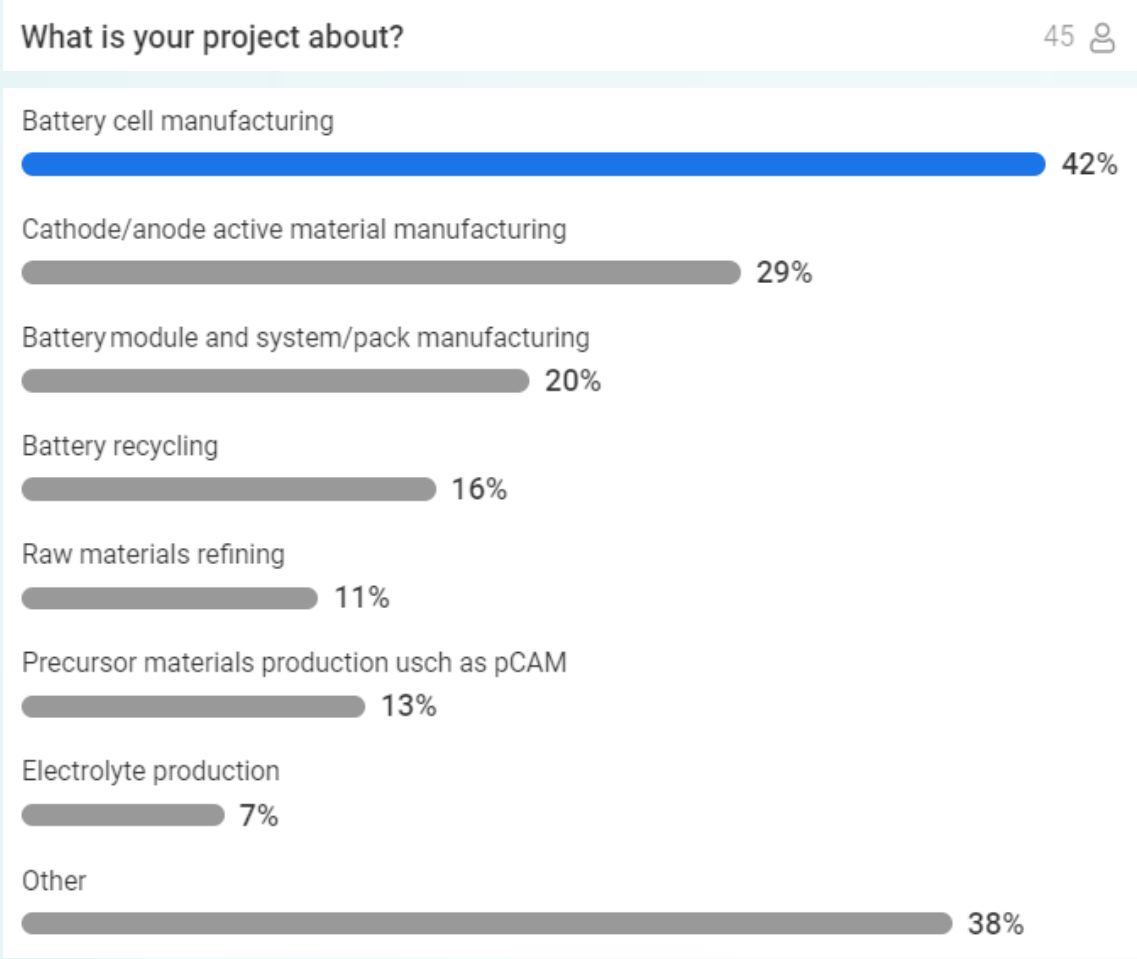
Technology / materials
- Raw material costs
- Safety features, stability, electrolyte, separators, ...

- Source: Data from Fraunhofer ISI, in Q1 2024

Slido Poll Results

1

What is your project about?



European Commission

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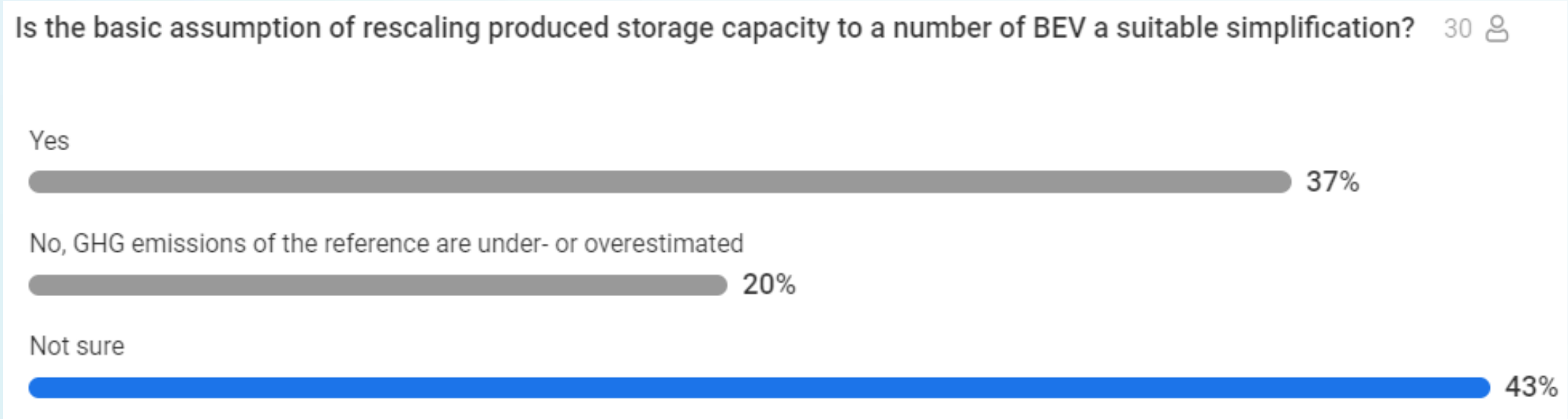
2 Is the basic assumption of rescaling produced storage capacity to a number of BEV a suitable simplification?



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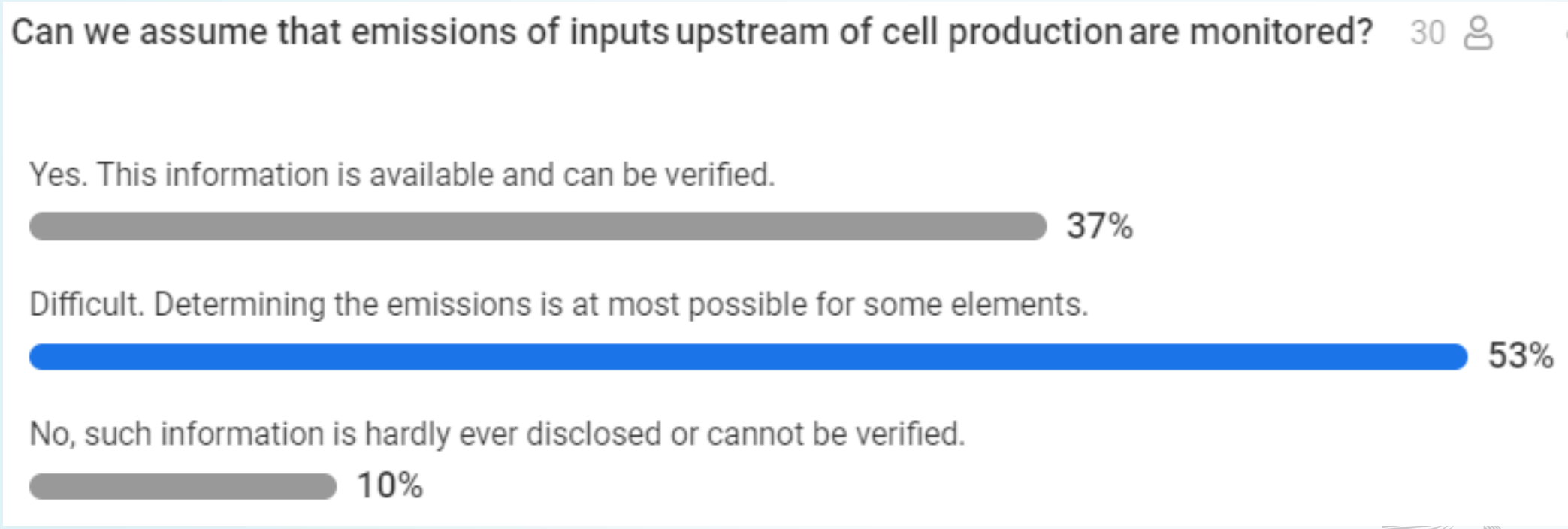
3 Can we assume that emissions of inputs upstream of cell production are monitored?



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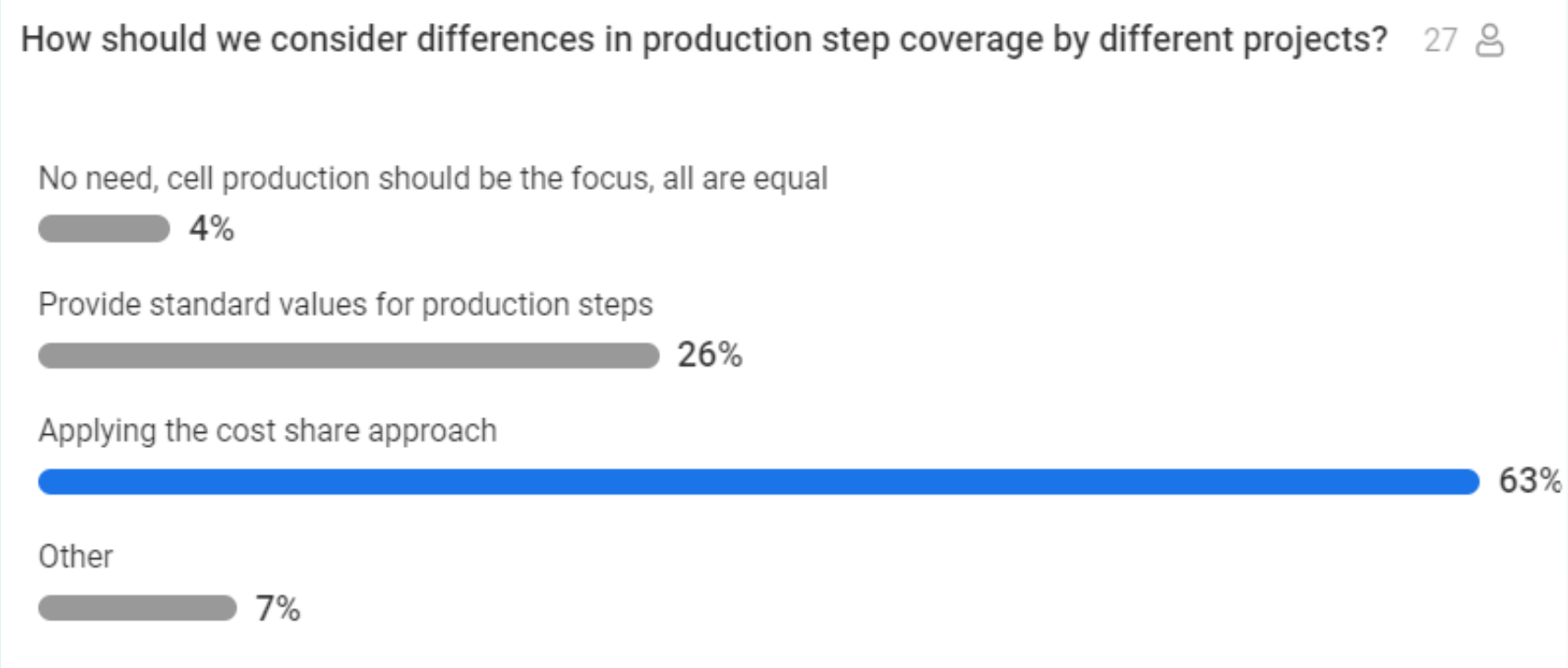
4

How should we consider differences in production step coverage by different projects?



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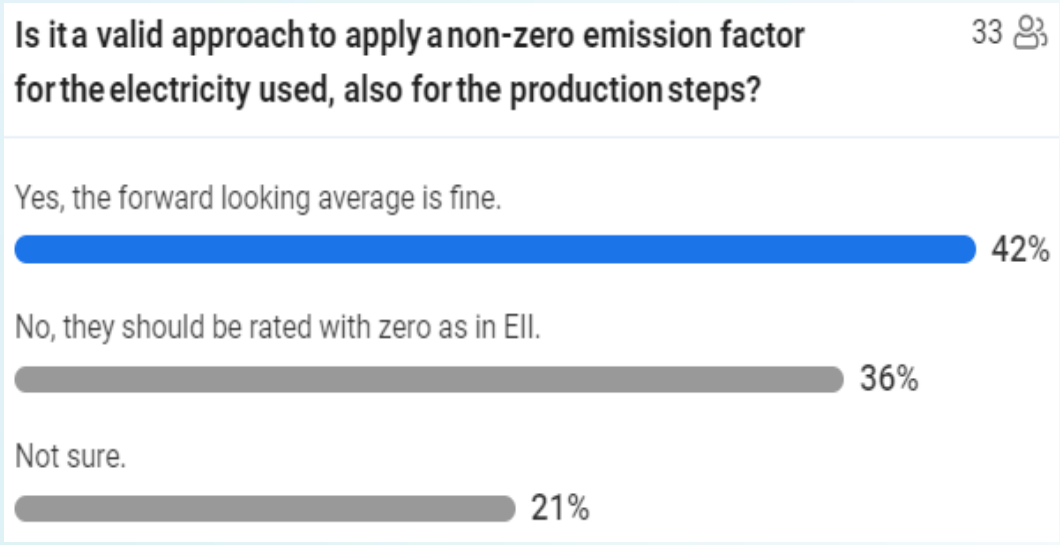
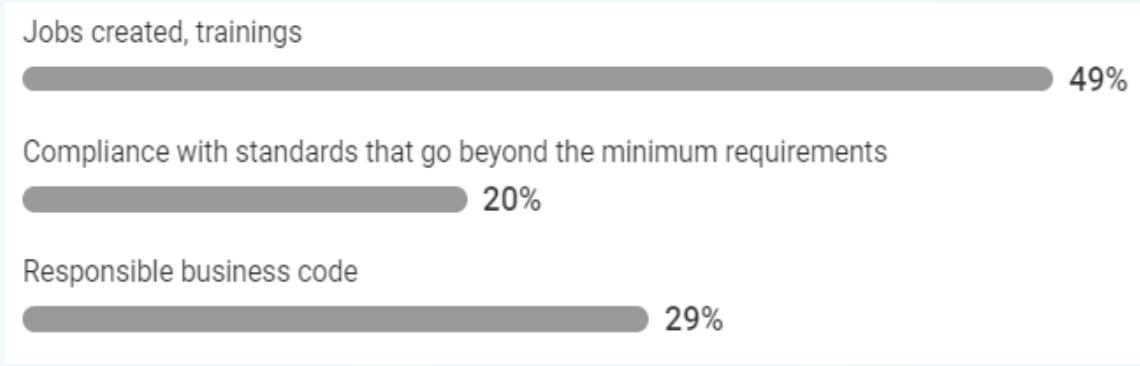
5

Is it a valid approach to apply a non-zero emission factor for the electricity used, also for the production steps?





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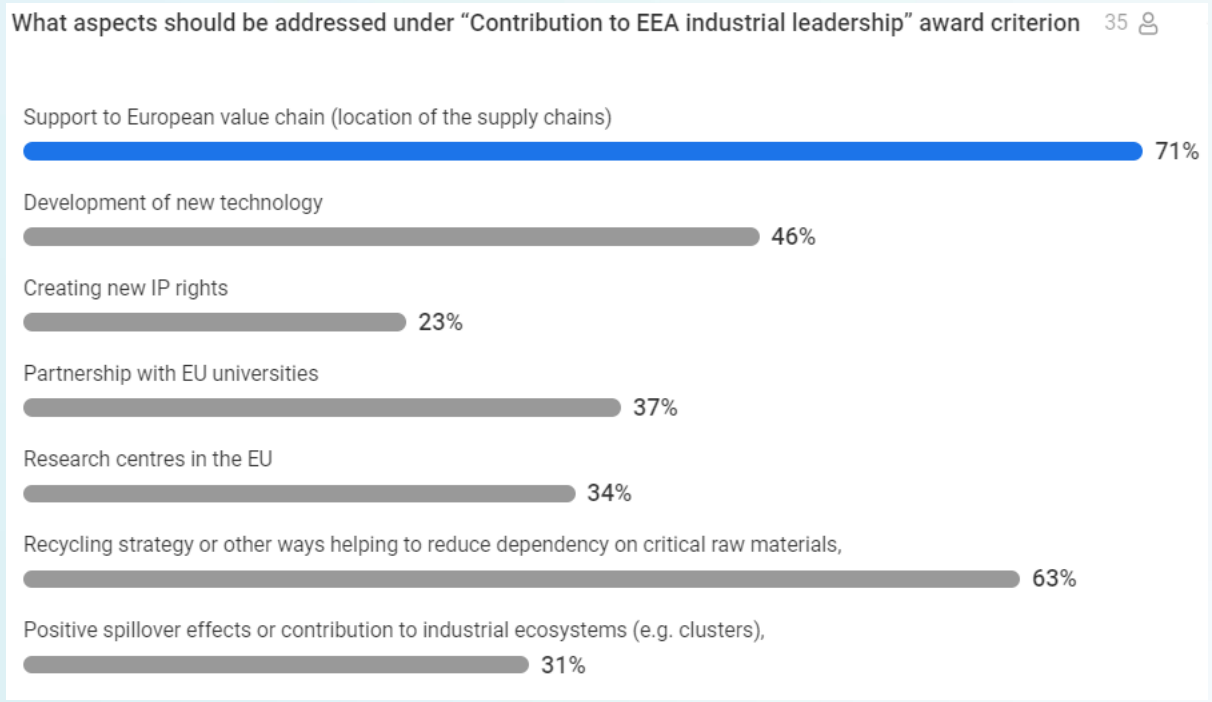
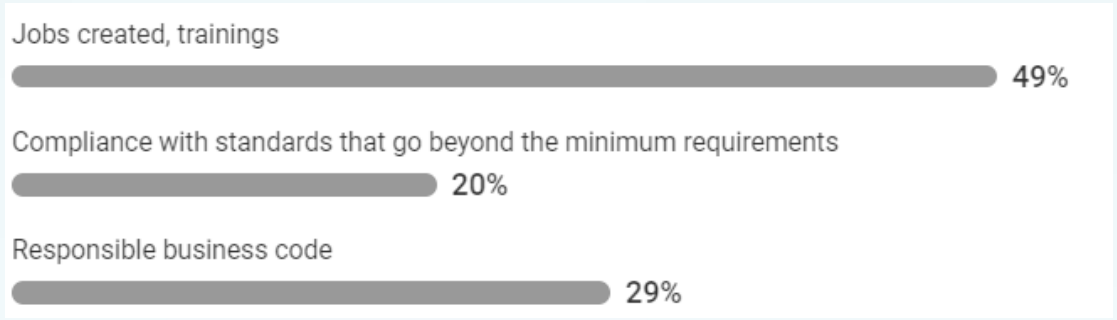
6

What aspects should be addressed under “Contribution to EEA industrial leadership” award criterion?





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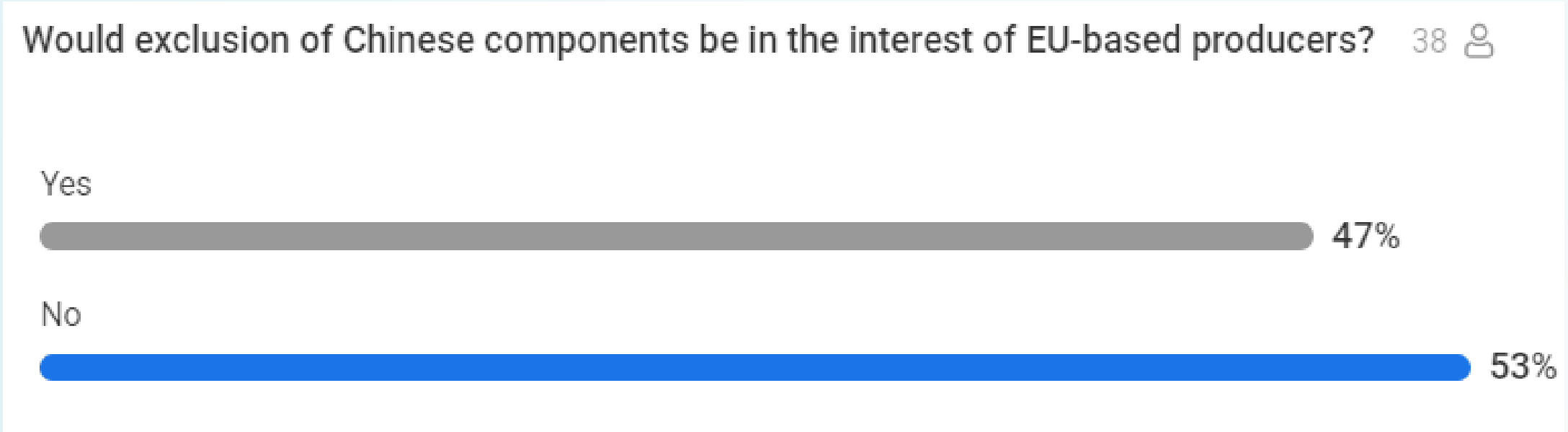
7

Would exclusion of Chinese components be in the interest of EU-based producers?



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