Supply chain risks in the EU's energy technologies

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Background

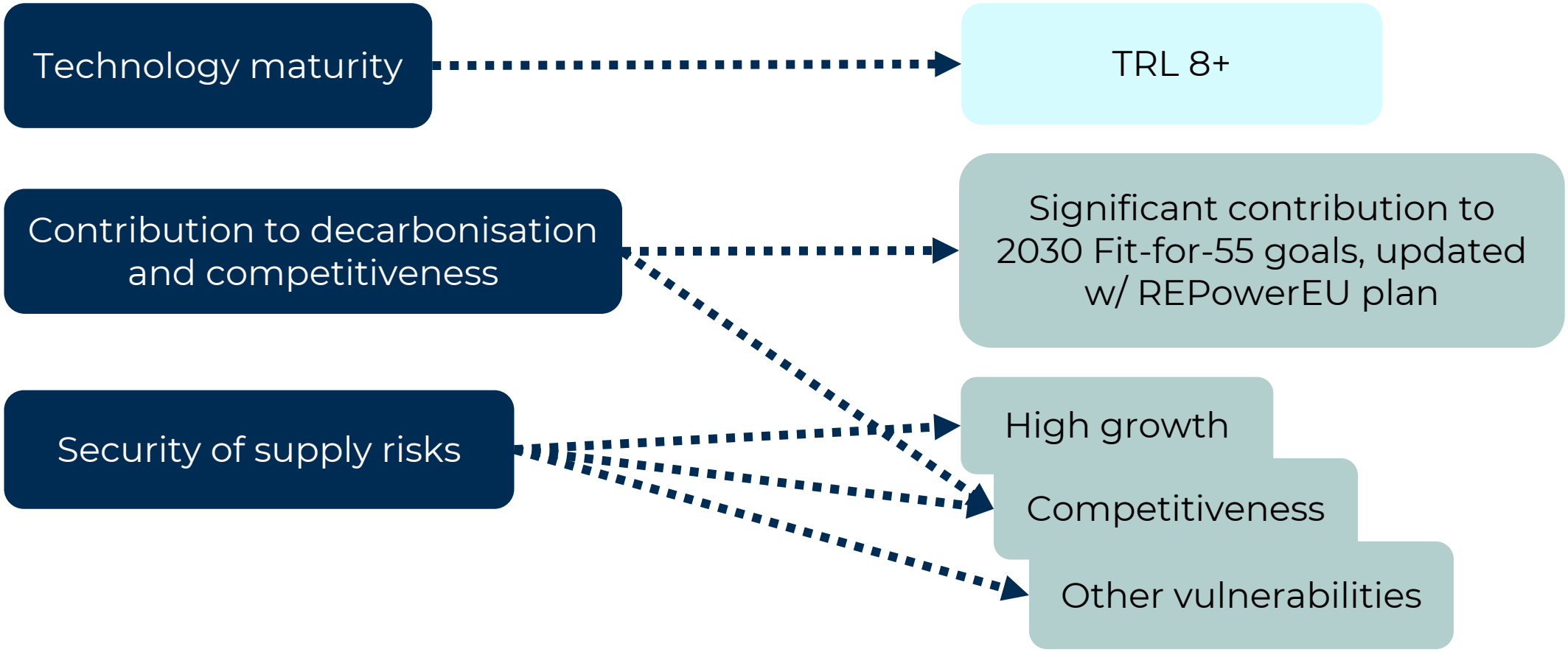
- (proposed) Net Zero Industry Act, focuses on manufacturing of components and devices of strategic energy technologies, up to 2030
- NZIA sets some technologies as strategic:
  - High maturity
  - Contribution to EU decarbonisation and competitiveness
  - Security of supply risks

Strategic net-zero techs:

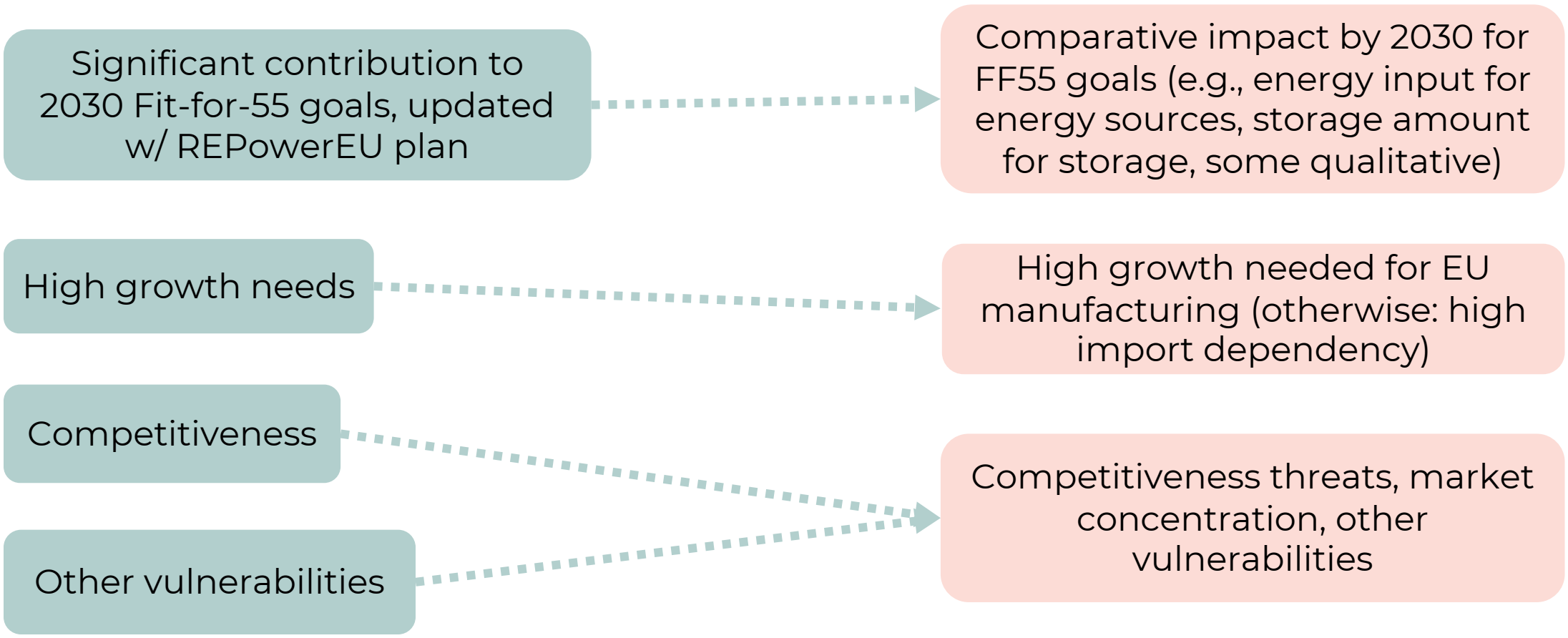
1. Solar photovoltaic and solar thermal
2. Onshore wind and offshore renewables
3. Batteries/storage
4. Heat pumps and geothermal
5. Electrolysers and fuel cells
6. Sustainable biogas/biomethane
7. Carbon capture and storage
8. Grid tech

Strategic technologies

NZIA:



Approach


Significant contribution to 2030 Fit-for-55 goals, updated w/ REPowerEU plan
High growth needs
Competitiveness
Other vulnerabilities
Comparative impact by 2030 for FF55 goals (e.g., energy input for energy sources, storage amount for storage, some qualitative)
High growth needed for EU manufacturing (otherwise: high import dependency)
Competitiveness threats, market concentration, other vulnerabilities

Technology categories

1. Solar photovoltaic and solar thermal
2. Onshore wind and offshore renewables
3. Batteries/storage
4. Heat pumps and geothermal
5. Electrolysers and fuel cells
6. Sustainable biogas/biomethane
7. Carbon capture and storage
8. Grid tech

1. Solar photovoltaics
2. Solar thermal
3. Onshore and offshore wind
4. Ocean energy tech
5. Batteries
6. Other storage
7. Heat pumps
8. Geothermal energy
9. H2 Electrolysers and fuel cells
10. Sustainable biogas/biomethane
11. CCUS
12. Grid tech

+ secondary techs

Table 1

Tech	High Contribution to EU FF55 goals in 2030	High Growth Rate for manufacturing, import dependency	Competitiveness threats, market concentration, and other vulnerabilities	Aggregate Score
Solar photovoltaic systems	5	5	5	15
Wind (onshore & offshore)	5	4	4	13
Batteries (storage and E-mobility)	5	5	3	13
Heat pumps	5	3	4	12
Carbon capture storage and utilisation	4	5	3	12
H2 Electrolysers and Fuel cells	3	4	4	11
Grid technologies	4	2	4	10
Offshore renewable techs (wave and tidal)	1	5	3	9
Other storage tech (incl. thermal storage)	3	3	2	8
Solar thermal systems	2	2	3	7
Sustainable biogas/biomethane techs	3	3	1	7
Geothermal energy systems	1	2	3	6

Table 2

Tech	High Contribution to EU FF55 goals in 2030	High Growth Rate for manufacturing, import dependency	Competitiveness threats, market concentration	Aggregate Score
Ener. System-related Ener. Eff. Measures	4	2	2	8
Nuclear fission	2	2	2	6
RFNBOs (excl. H2)	2	2	3	7
Bio-liquids (incl. Adv. Biofuels)	2	2	2	6
Solid Bioenergy	3	1	2	6
Hydropower (& pumped hydro storage)	2	1	2	5

Analysis of grid technologies

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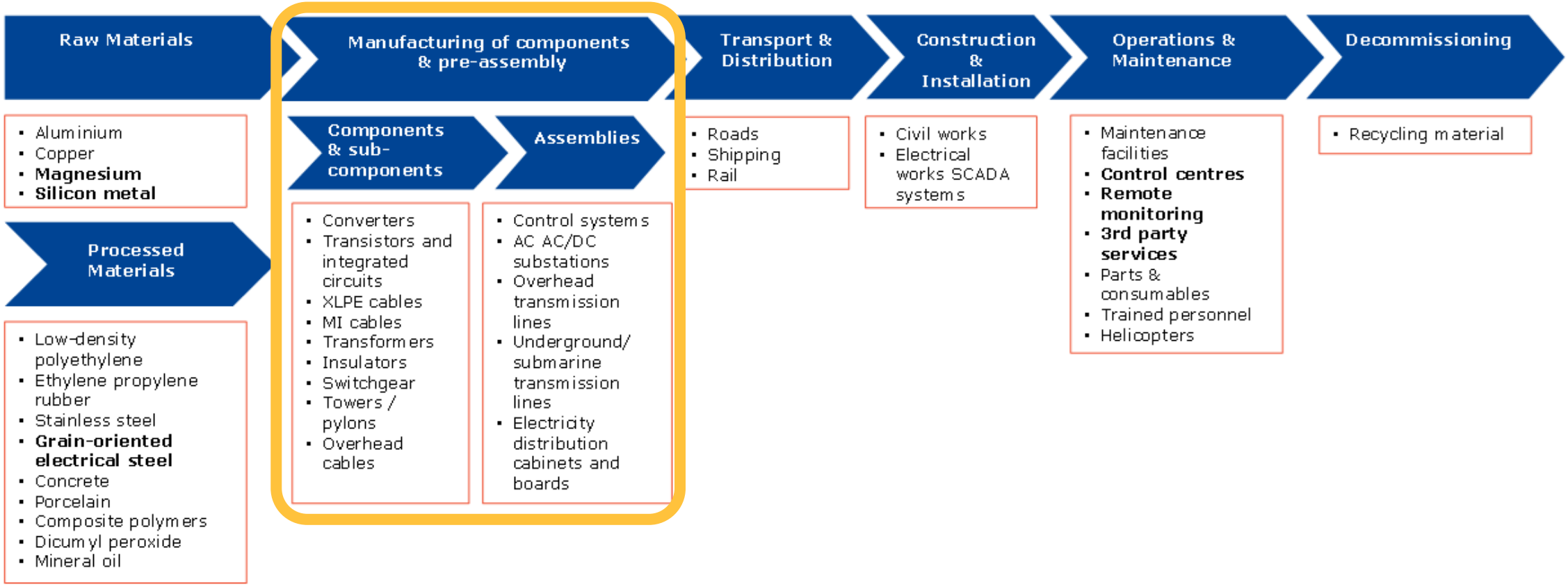
Grid technologies

- Traditional infrastructure (converters, transistors and ICs, transformers, cables, insulators, towers/pylons, etc.)
- Smart grid infrastructure
  - Smart meters (Advanced metering infrastructure): including both meters and comms/databasing infrastructure
  - Smart EV charging: power electronics and switches for charging, SCADA, etc.
  - Home energy management systems (HEMS): building automation and control systems

Traditional infrastructure



*Note: vulnerable elements found highlighted in **bold**.*

Source: Trinomics (2021), Study on the resilience of critical supply chains for energy security and clean energy transition during and after the COVID-19 crisis

HEMS

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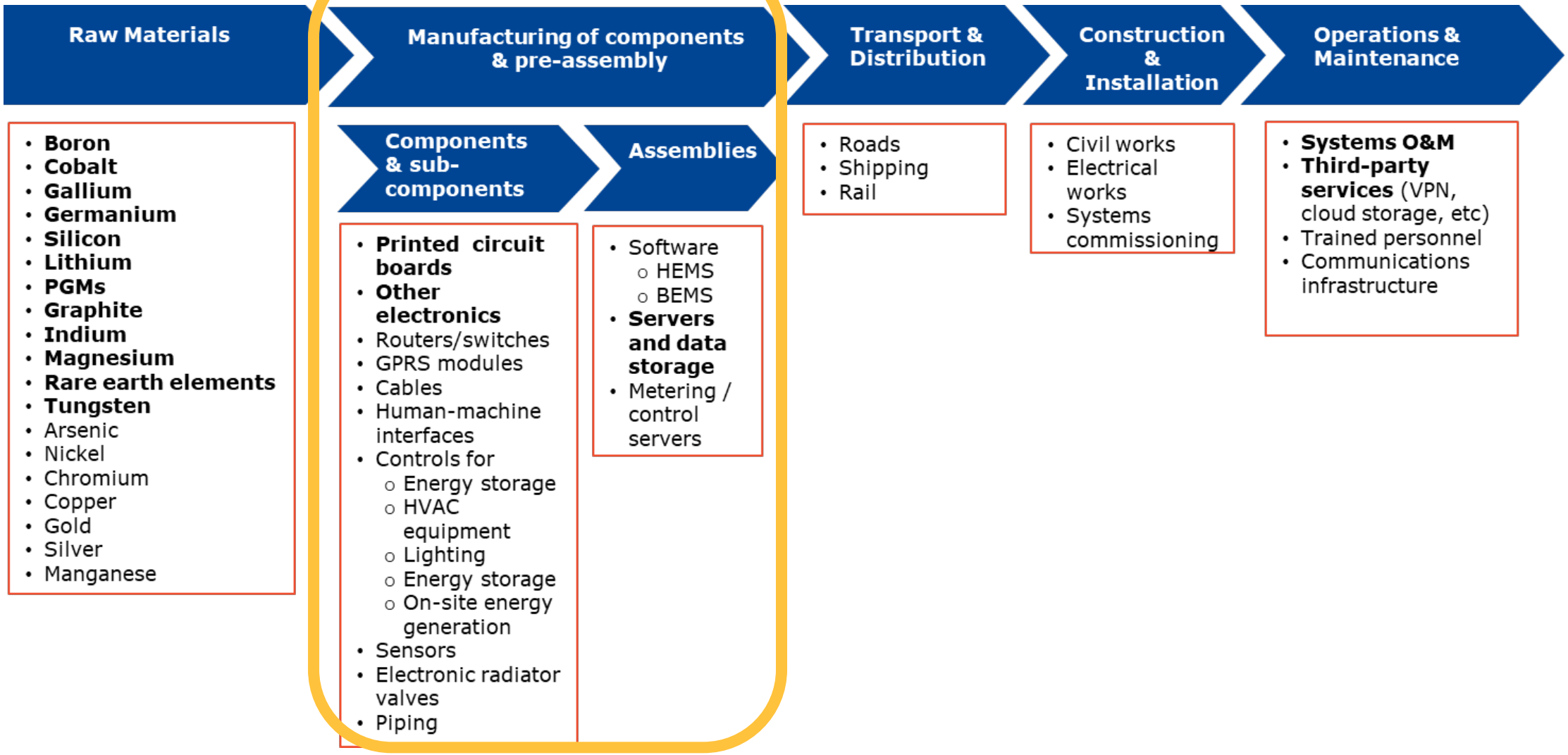

Source: Trinomics (2021), Study on the resilience of critical supply chains for energy security and clean energy transition during and after the COVID-19 crisis

1: EU Demand

- **High growth rate** in Europe
  - Transmission grid expansions: €135b in ~43000km (ENTSO-E TYNDP 2022)
  - HVDC lines: 18% CAGR to 28000km in Europe by 2030 (IEA 2023, Energy technology perspectives)
  - Smart grid tech: rapidly expanding across EU: expecting to have 10-30% CAGRs in coming years! (COM (2022) 643)
- Overall, EU demand for this tech is rated to be **high** (4 points)

2: EU manufacturing growth

- Traditional infrastructure
  - Very good manufacturing base in EU (actually a net exporter in many key components)
  - However: ongoing delays by primary suppliers.
- Smart grid infrastructure
  - EU maintains **high manufacturing output** (about 1/5 of global production) for many components (PLCs, power electronics, embedded electronics, sensors, etc.)
  - Potential for scaling manufacturing is high, but **some dependencies exist** on other sources for some components
- Overall, **low** rating for EU manufacturing growth

3: Competitiveness (I/II)

- Traditional grid infrastructure
  - **EU position is historically strong** and remains so (Eurostat 2021 PRODCOM data)
  - **EU remains dependent on external sources for a few key components**.
    - Example: many multi-terminal HVDC systems (used in offshore grids) come from Chinese manufacturers
    - Example 2: large transformers (over 500 kVA) are being imported.
  - **High market concentration for some components**: 3 manufacturers make over 50% of EEA's (higher-voltage) power cables!
- Smart grid infrastructure
  - **Strong competitive position for EU** in many components, but **import dependencies for some critical components** (e.g., semiconductors, microprocessors, servers, electronic boards). US suppliers have good position globally for end-devices.
  - **Market concentration was high but is decreasing**. In a few cases, there is geographic concentration: semiconductors in East Asia (but some plans to tackle that as well by EC and US gov).

3: Competitiveness (II/II)

- Other vulnerabilities
  - Dependence on semi-conductor supply chain.
  - Software requirements and regulations.
  - Smart grid tech is often nascent tech with little standardisation.

- Overall, **high** rating (4 points) for this indicator

Conclusions

- Solar PV, Wind, Batteries remain the main critical techs
- Other strategic techs due to recent policies (e.g., heat pumps, hydrogen tech, CCS)
- Some tech of medium strategic importance for various reasons
- Secondary tech is less strategic (except building insulation material)
- Changes might appear when looking at a longer time window
- More info: full report on EU publications website

★★★★★ Rate this publication

Supply chain risks in the EU's clean energy technologies

This study focuses on the clean energy technologies (CET) defined as strategic in the proposed Net Zero Industry Act (NZIA) and considers their strategic importance. The study looks at each technology chosen in the NZIA (and other less strategic but relevant technologies) and uses desk research and expert input to

View more

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