General Assembly Meeting of FCH JP

Time Wednesday 4th of October 2023, 14:00 - 16:00 (CET)
Place Teams meeting

Persons present: Jari Kiviaho, VTT (chair)
Jessica Vepsäläinen, VTT (secretary)
+ at least 36 participants from other organizations. There was a lot of traffic during the meeting as persons took part in the meeting and left according to their other responsibilities.
Present from EERA: Spyridon Pantelis
Rosita Zilli

1. **Welcome and introduction to the agenda (Jari Kiviaho)**

   - The meeting started at 14.03.
   - Jari welcomed all to the meeting and introduced the agenda for the meeting.

2. **Latest news from EERA (Spyridon Pantelis)**

   - Spyridon presented the latest news from EERA.

3. **EERA Policy Brief on Critical Raw Materials (Rosita Zilli)**

   - Rosita presented The EU policy context and lookahead, what to expect of the upcoming EP elections, latest developments on the key EU files, key international developments and shortly the EERA Policy brief on Critical Raw Materials. Both EERA presentations can be found from Attachment 2.

4. **Candidates for open positions (and possible election): Motivation speech of each candidate (2-3 min per candidate)**

   Candidates:
   - SP3 - "Stack Materials and Design"
     - Alfredo Iranzo, University of Sevilla
     - Marcin Błesznowski, Institute of Power Engineering
   - SP4 - "Systems"
     - Ramon Costa-Castelló, Universitat Polit`ecnica de Catalunya
     - Massimo Santarelli, POLITO
   - SP6 - "Non-electrolytic Hydrogen Production"
     - Gerardo Colón, ICMSE
     - Artur Majewski, University of Birmingham
   - SP7 - "Hydrogen Handling and Storage"
     - Jose Bellosta von Colbe, Hereon

   - The candidates gave short presentations of themselves.
     - Jari presented the motivation speech on behalf of Alfredo Iranzo (SP3), Ramon Costa-Castelló (SP4) and Massimo Santarelli (SP4).
   - In SP3 the situation has changed just before the meeting as both coordinator and sub-coordinator are retiring from FCH JU work. So, both candidates are chosen for SP3.
     - Alfredo Iranzo, University of Sevilla

    - Marcin Błesznowski, Institute of Power Engineering
- A poll was taken to decide the persons for open positions in SP4 and SP6.
- Results of the poll and chosen persons for the open position:
    - SP4: Massimo Santarelli, Polito (71%, 24 responses)
    - SP6: Gerardo Colón, ICMSE (53%, 30 responses)
- In SP7 the person chosen for the position is the only candidate:
    - Jose Bellosta von Colbe, Hereon

The updated Management Board:

Jari Kiviaho (VTT) - chair
Vito Di Noto (Università di Padova) – SP1
Daria Vladikova (BAS) - SP1
Miguel Laguna (CSIC) - SP2
John Irvine (University St. Andrews) - SP2
Alfredo Iranzo (University of Sevilla) - SP3
Marcin Błesznowski (Institute of Power Engineering) - SP3
Vincenzo Mulone (University of Rome) - SP4
Massimo Santarelli (Polito) - SP4
Martin Andersson (Lund University) - SP5
Mathias Gérard (CEA) - SP5
Asuncion Fernandes (CSIC) - SP6
Josemaria Sanchez (CIEMAT) - SP6
Jose Bellosta von Colbe (HZG) - SP7
Marcello Baricco (Università di Torino) - SP7
Secretary: Jessica Vepsäläinen (VTT)

5. **Status up of EERA policy working group (Vito Di Noto & Daria Vladikova)**

    - Vito gave a presentation of the status of the EERA policy working group. Presentation in Attachment 3.

6. **Status of webpages (Jessica Vepsäläinen)**

    - The newly elected SP coordinators will be updated shortly on the pages.
    - Please check the information of your organization and other matters on the EERA JP Fuel Cells & Hydrogen webpage https://www.eera-fch.eu/. If you find any information that needs correcting or want to update the organization information, do not hesitate to contact: jessica.vepsalainen@vtt.fi.

7. **Status of videos (Klaus Taube)**

    - Still many videos missing.
    - Hereon will continue to help with video editing.

8. **Paper of EERA activities (Marcello Baricco)**

    - Marcello presented two options on how to present EERA activities.
    - To reach decision Jari will arrange short MB meeting to make decision.

9. **Short discussion about EERA Exco meeting (Marcello Baricco)**

    - Marcello (Jari) will give an overview of JP-FCH activities and objectives in the EERA ExCo

meeting 18.10.

- All SP coordinators (old and new) are asked to provide two slides.
    - state of play, challenges, and targets
    - DL 16.10. at 8.00 am

10. End of the meeting

- The meeting ended at 16.10.

Attachments

1. Agenda
2. EERA presentations
3. Status up of EERA policy working group.

General Assembly of EERA FCH JP

Time: Wednesday 4th of October 2023, 14:00 - 16:00 (CET)

Place: Teams-meeting

14:00 Welcome and introduction to the agenda (Jari Kiviaho)

14:05 Latest news from EERA (Adel El Gammal → Spyridon Pantelis)

14:20 EERA Policy Brief on Critical Raw Materials (Rosita Zilli)

14:35 Candidates for open positions (and possible election): Motivation speech of each candidates (2-3 min per candidate)

- SP3 - “Stack Materials and Design”
  - ✓ Alfredo Iranzo, University of Sevilla
  - ✓ Marcin Błesznowski, Institute of Power Engineering
- SP4 - “Systems”
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- SP6 - “Non-electrolytic Hydrogen Production”
  - ✓ Gerardo Colón, ICMSE
  - ✓ Artur Majewski, University of Birmingham
- SP7 - “Hydrogen Handling and Storage”
  - ✓ Jose Bellosta von Colbe, Hereon

15:20 Status up of EERA policy working group (Vito Di Noto & Daria Vladikova)

15:35 Status of webpages (Jessica Vepsäläinen)

15:40 Status of videos (Klaus Taube)

15:50 Paper of EERA activities (Marcello Baricco)

16:00 End of the meeting

Attachment 2.

EERA
European Energy Research Alliance
JP Smart Grids



JP FCH General Assembly

4 October 2023 | 14.00 – 16.00 CEST | online

Spyridon Pantelis, Project Manager

Rosita Zilli, Senior Policy Officer

The EERA secretariat

Adel El Gammal
Secretary General
11/2016
BE

Ivan Matejak
Operations Director
12/2018
HR

Luisa Fernandez
Com's Manager
06/2020
AR

Rosita Zilli
Sr. Policy Officer
01/2021
IT

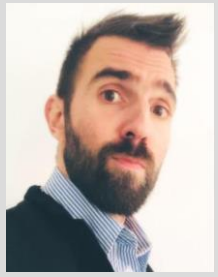
Marianne Lazarovici
Policy and Com's Officer
04/2023
FR

Monica de Juan Gonzalez
Sr. Project Manager
04/2020
ES

Ganna Gladkykh
CET Expert
01/2021
UA

Spyridon Pantelis
Project Manager
02/2022
GR

Open Senior CET Expert



Julien Balsen
JP Wind
04/2022
FR

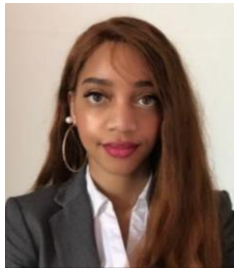
JP Seconded

Martina Campajola
JP PV /J P Hydro
04/2022
IT

JP Seconded

Margherita Menon
JP-E3S / JP-SG
02/2023
IT

JP Seconded



Sandy Ngnidze
Office Manager
05/2022
CM
(sick leave)

Project Intern

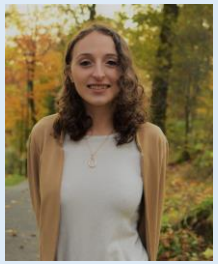
Joining soon

Intern

Pol&Com Intern

Aoife McNulty

Intern



Anita Cornelli
Admin Intern
05/2023
IT

Intern

EERA High Level Policy Conference 2023

- **Brussels, 17 October 2023**

- High Level Policy Conference will focus on **2 key subjects** critical to the CET:
  - Flagship Report 1: "**Energy Demand Reduction**" preparation for SET Plan tender on X-cutting task forces
  - Flagship Report 2: "**Critical Raw Materials**" preparation for SET Plan tender on X-cutting task forces

- At the end, the subject "**Citizen Engagement**" has not been integrated in the conference. However, it subject will continue to be handled by the constituted working group in the view of a future report/event.
  - If you are interested to join this working group, please let us know.

SUPEERA Project

- **Project closed** after 42 months of activity on 30/06/2023
- **Final event at EERA ASM** in Madrid, 14 & 15 June 2023 – main points discussed:
  - Role of the EERA community in the execution of the SET Plan
  - Bridging gap between R&I and market uptake
  - Spreading excellence across the EU (widening process)
- **Latest activities:**
  - Webinar on the EU reform of the electricity market design
  - Policy Briefs on REFuelEU and Critical Raw Materials Act
  - Workshops on widening (LT) and collaboration with industry (IT DE)
- **Recap of all SUPEERA-related policy material and relevant deliverables:**
  - On the EERA website
  - On the dedicated SUPEERA website

Energy storage, Fuel Cells & Hydrogen. Bringing research and industry closer: accelerating innovation and uptake of new technologies.

Date: Tuesday, 10 May 2022
Time: 09:00 - 18:00 CEST
Location: Palazzo della Salute, Via San Francesco 90, 35131 Padova, Italy

The point on the SET Plan (1/2)

- **Nov 2022** - Initially planned publication of the revised SET Plan (Conference on Prague)
- **Nov 2022 – today** → No official feedback; expected date of publication **Oct 2023**
- New SET Plan visual identity template (see next slide)
- **Starting point**: revised SET Plan objective:

The SET Plan will enhance the coordination *and collaboration in research, development, demonstration, with the aim to* ***deploy competitive, sustainable and circular, socially acceptable energy solutions****. This will enable an accelerated high penetration of renewables, as well as ensure a decarbonised and efficient energy use in all sectors of our economy, in line with the EU policy* ***objectives for a resilient, secure, sustainable and affordable energy system.***

Strategic Energy Technology Plan

Entity's name (e.g. IWG Green hydrogen)

[Title of the publication]

[Subtitle]

Date

The point on the SET Plan (2/2)

- **NEW: X-cutting collaboration:** new objective gives more emphasis to cross-cutting issues → bridge the gap between the **lab and the market**; increase the **competitiveness of the EU clean energy industry**; the **value chain approach and circularity principles** to decouple economic growth from resource use; more attention for **citizens needs** including for the most vulnerable ones (fair and just transition).

- **IMPROVING EXISTENT**:
  - Regular revision of IPs according to political priorities
  - Increase countries' participation in the SET Plan
  - Increase public funding through the co-funded energy partnerships, cooperation between existing supporting schemes, national R&I programmes on CET, reinforce international links

IWG on Green Hydrogen and EERA

- ERA Pilot on Green Hydrogen (ERA action 11,1) voluntary - chaired by DE (the German Federal Ministry of Education and Research (BMBF))
- Task Force produced a SRIA (03/2022) with input from 25 MS/ACs, stakeholders from industry, research, politics and civil society
- CSA will continue the work of the Task Force – EERA is leading a consortium proposal for secretariat of H2 IWG (to be submitted by 10 October)
- EERA is now invited to concur and sign the Declaration of Intent and SRIA of the H2 IWG to be constituted (led by DLR)
- Nils A. Røkke (EERA president) is chairman of the Clean Hydrogen Partnership Stakeholder Group

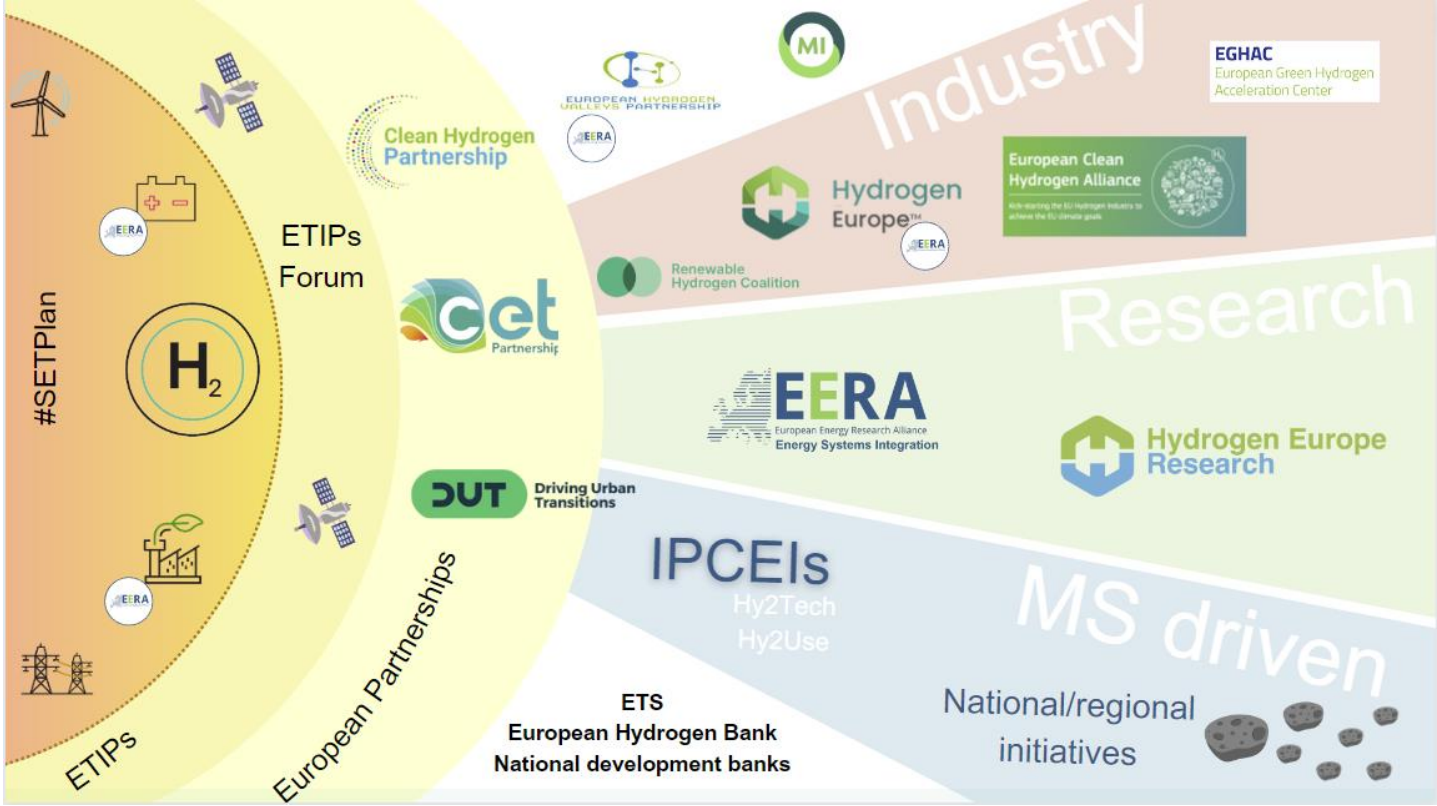
Link to download

- **SRIA - Research priorities**
  - Production (mapping of supply and demand, scaling up of electrolysers, emerging technologies)
  - Transport & Infrastructure (H2 readiness of pipelines, Rail, ship, trucks, integrated modelling)
  - Market Stimulation (H2-specific support measures, viable business models, uniform frameworks conditions)
  - Cross-cutting (regulations & standards, carbon footpring cert., systems analysis, demo activities, education & training)

Other Hydrogen updates

Relaunch of the European Hydrogen Observatory

- open platform providing data and up-to-date information about the entire hydrogen sector.
- focuses on technology and market statistics, socio-economic indicators, policy and regulation, as well as financial support.



European Hydrogen Week

20-24 November 2023 Brussels

Hydrogen Bank

"The first pilot auction, with a budget of €800 million from the ETS Innovation Fund, will take place in November this year during the European Hydrogen Week"

1 EU policy context and lookahead

General Overview

- Entering **the 2nd half of the ES presidency**, to end in Dec 2023. **Followed by BE** (White Semester)
- **European elections approaching** (6-9 June 2024). Co-legislators urged to conclude their work by year-end
- **Main files under the loop**
  - Green Deal Industrial Plan: NZIA, CRMA, EMD
  - Strategic Technologies for Europe Platform (STEP)
  - New public-private research partnerships
  - New Horizon Europe Mission – focus: NEB
  - Proposal on improvement of research careers
- **Challenges on the horizon**
  - What new EP and College of Commissioners?
  - Will the EU Green Deal and green agenda be maintained?
  - Shall focus remain/increase on ST priorities (i.e., implementation challenges)?
  - What impact for Energy Research?

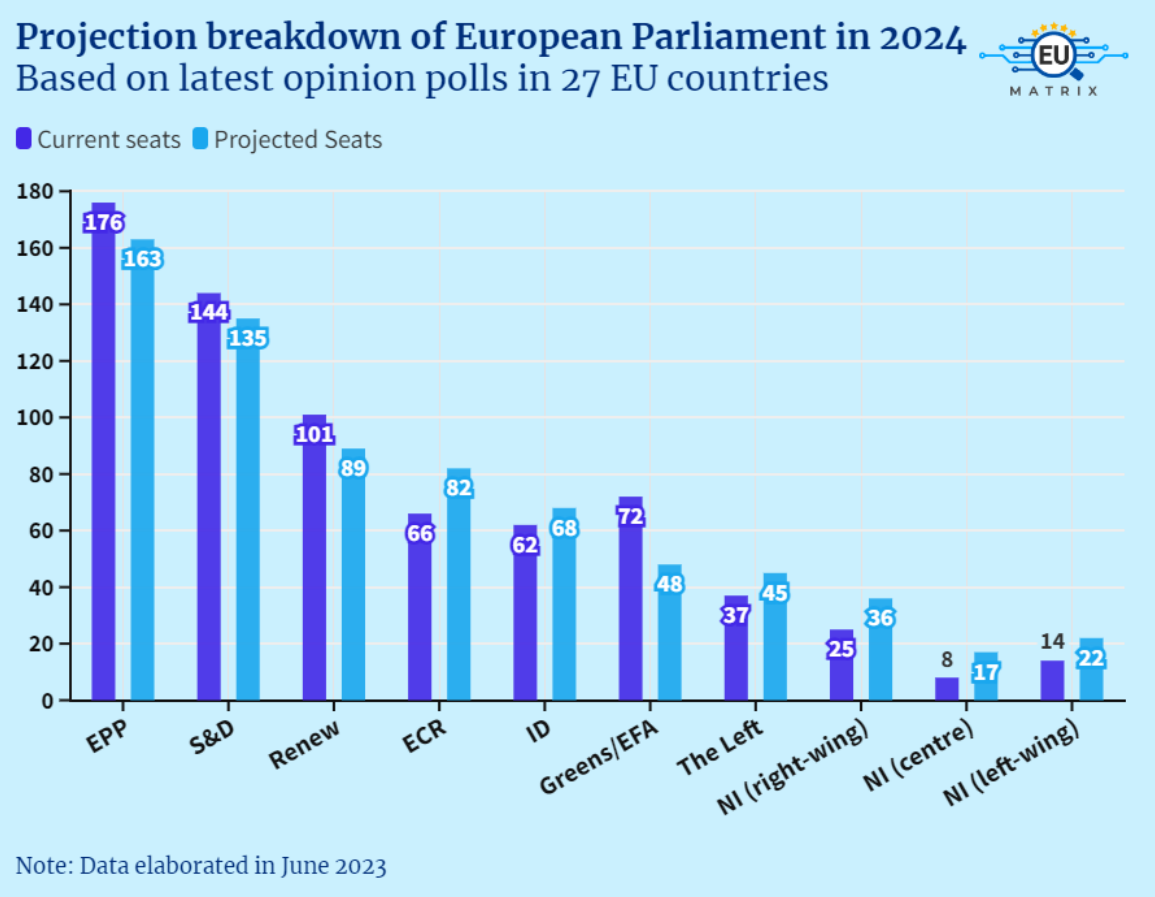
2023 State of the Union address

- **Past achievements**
  - **Joint gas purchases** → no shortages last winter. Price of gas from 300e/MGh to 35. To be **replicated for CRMs and H2**
- **New announcement**
  - **Clean Transition Dialogues** w/ industry
  - Start w/ new "**European Wind Power Package**" → easier funding, permitting
- **Trade and competition**
  - "***The future of our clean tech industry has to be made in Europe***"
  - Launch of **anti-subsidy investigation** into **Chinese EVs**
  - Number of **clean steel factories** in the EU from 0 to 38 in 5 yrs
  - EU attracting more **investment in clean H2** than US and China combined
  - **China's export restrictions on Ga and Ge** → need to strengthen CRM supply chain. Soon 1st meeting of CRMs Club
- **Criticism**
  - No mention of nuclear, updated 2040 GHG emissions targets due by mid-2024, international action & COP28
  - "**Stayed the course**", no additional ambition

2

Upcoming EP elections: what to expect

Projected changes in European Parliament seat distribution (May 2023 polls)



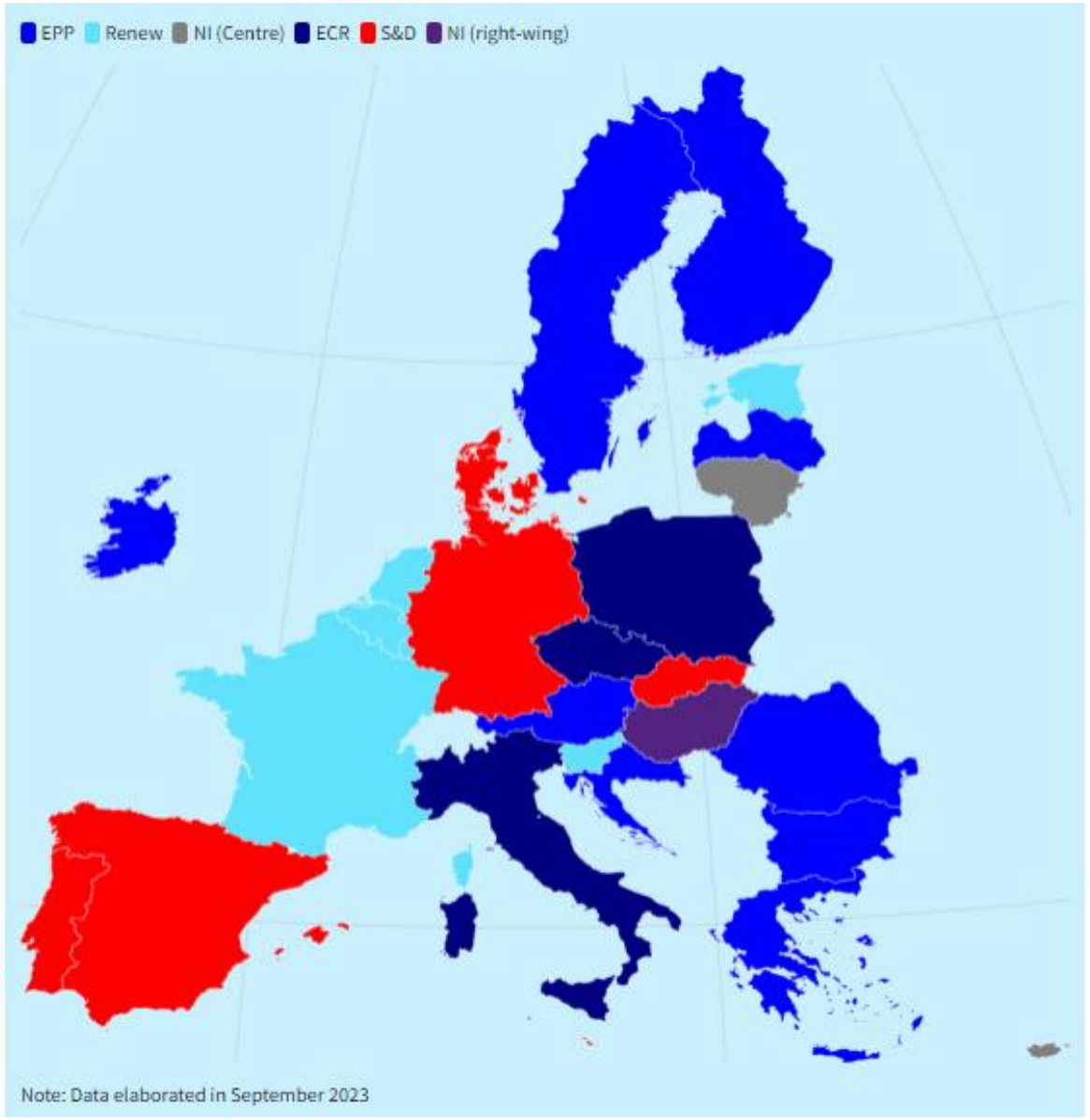
- Opinion polls in **EU27** in **May 2023**
- Predicted **seat losses**:
  - EPP: 163 seats → -13 from current 176
  - S&D: 135 seats → - 9 from current 144
  - Renew Group: 89 seats → -12 from current 101
  - Greens/EFA: 48 seats → - 24 from current 72
- Predicted **seat gains**:
  - ECR: 82 seats → + 16 from current 66
  - The Left: 45 seats → +8 from current 37
  - Significant gains among non-attached members, especially right-wing.
- NB: **15 additional seats** between 12 countries (Sept 23) → 705 to 720:
  - Two additional seats for France, Spain, Netherlands
  - One each for Austria, Denmark, Belgium, Poland, Finland, Slovakia, Ireland, Slovenia, and Latvia

Shifting European Parliament dynamics

- Continuation of the **downward trend in centrist group** vote shares (EPP, S&D, Renew) since 2009.
- EPP and S&D together would represent just over 40% of seats, with **all centrist groups needed for a majority** (55%).
- EP's **political spectrum likely shifting further to the right** due to Conservative (ECR) and right-wing unaffiliated MEPs.

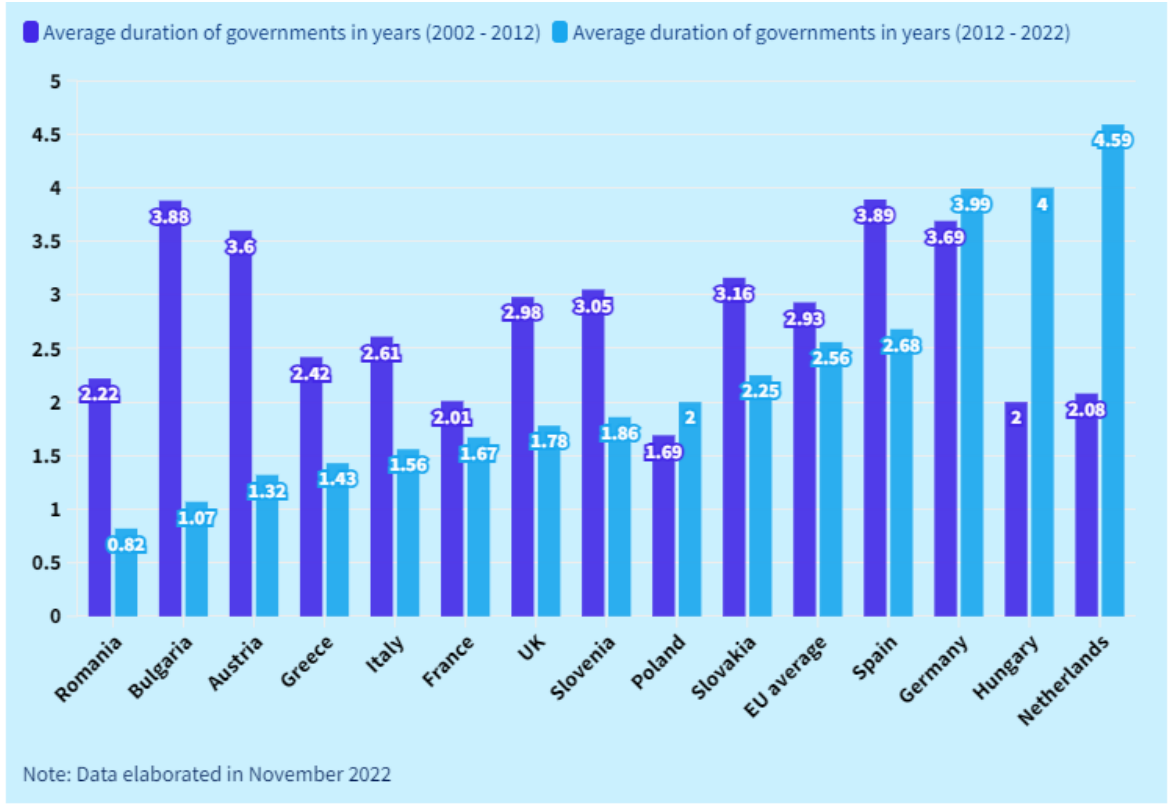
Projections for Council's composition in July 2024 (September 2023 data)

- **Majority of conservative to right-wing** government reps.
- **Seven member states with social democrat-led governments**: Germany, Denmark, Portugal, Slovakia, Spain, Malta, and possibly Luxembourg.
- **Five member states with liberal governments**: France, Belgium, the Netherlands, Slovenia, and Estonia.
- As for the EP, **majorities in the Council are expected to become less clear** post-2024 elections.



Governments across Europe increasingly unstable

- **Council's future political instability** akin to the European Parliament.
- **Decreasing government term lengths** in EU member states over 20 years.
- Average government term: 2.93 years (2002-2012) vs. 2.56 years (2012-2022).
- Lowest terms: Romania (0.82 years), Bulgaria (1.07 years), Austria (1.32 years).
- Highest terms: Netherlands (4.59 years), Hungary (4 years), Germany (3.99 years).



New EU 2024 political landscape: what's in for climate & energy files?

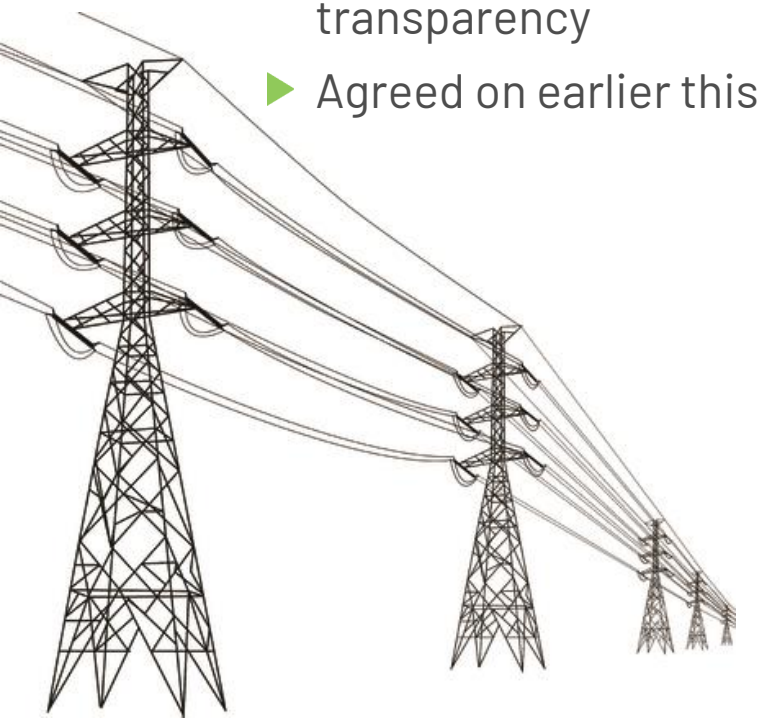
- Future political spectrum anticipated to **move away from** alignment with the von der Leyen Commission's flagship **Green Deal.**
- Upcoming term likely to shift **primary focus from climate and energy policy formulation to policy implementation**.
- **Climate neutrality commitments likely to be upheld**, but EU leaders expected to initiate a **gradual softening of climate pledges.**
- **Industrial regulation** likely to favor a **more market-oriented approach.**

3

Key EU files: latest developments

GDIP – Reform of the Electricity Market Design (EMD)

- EC proposal in March 23 to better protect vulnerable consumers, support non-fossil flexible resources, stabilise prices over the LT
- Finalisation expected by end of the year/beginning 2024
- **Regulation on Wholesale Energy Market Integrity and Transparency** (REMIT)
  - Aim: improve EU's protection against market manipulation through better monitoring and transparency
  - Agreed on earlier this summer. Handled separately from rest of the EMD reform.



- **Rest of the file → EP voted on its position but divided** (only 366 MEPs in favour) **/ Council still working towards its negotiating mandate**
- Controversies on **scope of PPAs** and **CfD**, **capacity mechanisms**, **support to existing nuclear plants**.

GDIP – Critical Raw Materials Act

- 07/09/23 → Approved ITRE Report:
  - Increases the **EU's processing capacity from**

    40% to at least 50% of the EU's annual SRM consumption
  - **Strategic partnerships in emerging markets** to contribute

    to **develop up to 20% of the EU's new processing capacity**
  - Strong objectives of **development and deployment of substitute to raw materials +** increasing the share of **secondary raw materials**
  - Increased recycling capacities → EU to **recycle at least 45% of each SRM contained in the EU's waste**
  - Previous **recycling benchmark** relative to the EU's total consumption of each raw material → now **relative to how much ends up in waste**
- 20/09/23 → First trilogue took place

GDIP – Net Zero Industry Act (NZIA)

- **EP Position**
  - Rapporteur Christian Ehler's (EPP, DE) amendments focus on **funding**, **streamlining the definition of net-zero technologies**, **expanding the scope of the proposal** and reintroducing the concept of **Net-Zero Industry Valleys**
  - **Compromise list of strategic technologies** to benefit from easier and faster permitting and funding now includes: **renewable energy technologies**, **nuclear fission and fusion technologies**, **energy storage**, **carbon capture and storage (CCS), hydrogen transport infrastructure**, and **electrolysers**, a. o.
  - Many EP committees recently delivered their opinions → Controversies ongoing on the final list of strategic technologies (nuclear, biogas, biomethane, CCS)
  - Vote in ITRE Committee (responsible for the file) on 25 October
- Council of the EU plans position for 7 December

Main R&I files (1/2)

Strategic Technologies for Europe Platform (STEP)

- **Proposal** to support European leadership on critical technologies, now within Council and EP
- €10 billion the EC is asking MS to divert from other priorities to top-up the budget of the European Innovation Council
- If secured, significant boost to the Accelerator programme, aimed at supporting start-ups and SMEs to develop and scale up to new markets or disrupt existing ones

New public-private research partnerships

- Before summer, the EC gave MS a **list of ten new partnerships** to set up under HEU, pooling European, national and private funding → Of interest to EERA : Innovative Materials for EU / Raw Materials for the Green and Digital Transition /Social Transformations and Resilience / Solar Photovoltaics
- If approved by MS, the new PPP would add to the current portfolio of 49 joint research programmes as of 2025

Main R&I files (2/2)

New Horizon Europe Mission focused on the New European Bauhaus

- July 23 → EC proposal for a new Horizon Europe Mission focused on the New European Bauhaus
- So far funded through HEU, the New Bauhaus is not comprised in any EU programme → this new Mission – the sixth in the Horizon portfolio – would give it clear focus

Proposal on improvement of research careers

- EC plan proposed in July 23 to improve working conditions for researchers
- Non-binding three-pronged approach:
  - More effective monitoring of research careers through an observatory
  - Updated charter for researchers
  - Competence framework of seven areas researchers are expected to develop skills in.

Main EU Institutional changes – EU Commission

Frans Timmermans

- **Resigned as Executive VP** on 22 August to run for prime minister in Dutch elections
- **VP Maroš Šefčovič** took up his functions over the Green Deal
- EC President UvdL then decided for the climate portfolio to be run by an **EU Climate Commissioner**
- She nominated **Wopke Hoekstra** (EPP), to be grilled by MEPs during the week of 9 October

Mariya Gabriel

- **Resigned** on 15 May to become Deputy Prime Minister and Foreign Affairs Minister of Bulgaria
- Officially replaced by **Iliana Ivanova** as Commissioner for Innovation, Research, Culture, Education and Youth on 12 September

Margrethe Vestager

- **Withdrew temporarily** while **she runs for the EIB Presidency**, on 5 Sept
- Competition policy attributed to Commissioner for Justice **Dider Reynders**
- Responsibility for 'A Europe Fit for the digital age' to Vice-President **Vera Jourová**.

Horizon Europe – Latest news

UK regains access to Horizon Europe research programme

- **7 September:** EC and the UK reached an agreement on its association with the EU's Horizon and Copernicus programmes
- UK researchers able to participate in projects from the **2024 WPs onwards**
- **End of a lengthy negotiation process after Brexit**. Two-year-long delay resulting from the Northern Ireland dispute and concerns about the exact conditions of the UK's re-accession.
- Deal seems to favour the EU: the UK will be reimbursed if it contributes 16% more than it receives, but it will have to reimburse the Commission if it receives 8% more than it contributes.

4

Key international developments

The road to COP 28

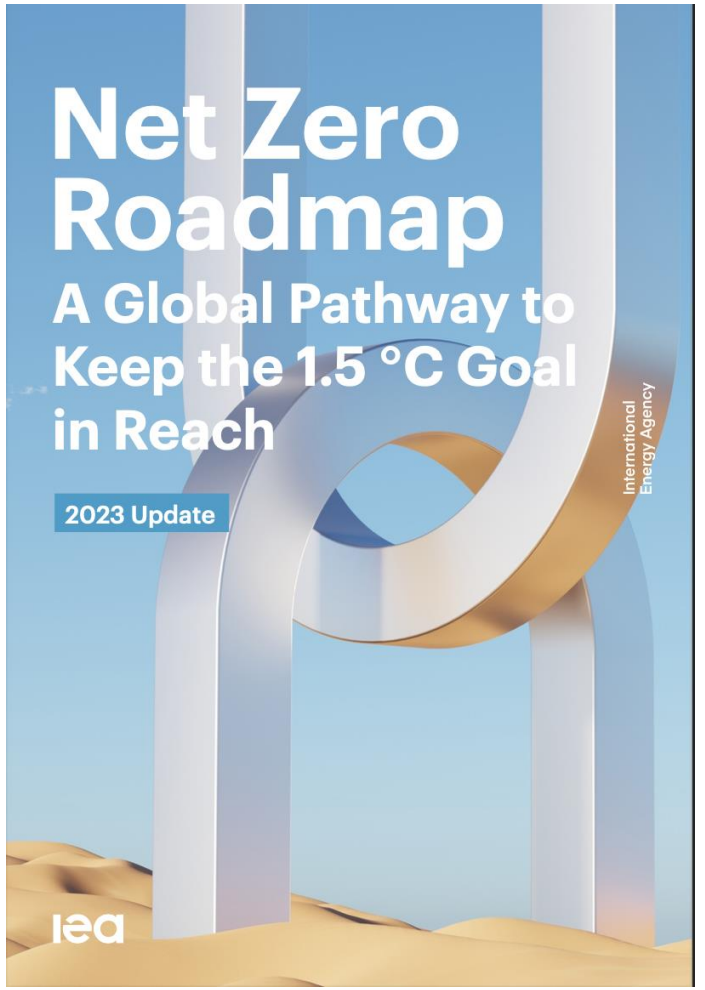
- 30 Nov - 12 Dec 2023, Expo City Dubai. Official website here
- 20 Sept 2023: UN Climate Ambition Summit to kick-start action – UAE, US, China not invited
- EU had previously signaled **intention to bring GHG emissions from -55% to -57% by 2030 during COP27**, recent preparations for COP 28 appear to omit any reference to this specific objective.
- **EU draft position for 'global phase-out' of unabated** (= those burned without CO2 capture technology) **FFs** and an **early peak in consumption in the near term**
- COP27 → proposal to phase out CO2-emitting FFs backed by 80+ countries but oil and gas-rich nations opposed it
- **EERA bid to participate in two events at COP28** in partnership with the European Commission on **demand reduction** and **CRMs**

IEA latest reports

Tracking Clean Energy Progress report

- Assessment of recent developments for over **50 components** of the energy system critical for clean energy transitions
- **New energy economy emerging at a faster pace** than expected, particularly on **solar PV and EVs**
- However, **achieving net-zero emissions by 2050 requires urgent and accelerated change** across most components of the energy system

Net Zero Roadmap 2023



- First published in 2021, outlines global pathway to be on track with the 1.5˚C goal
- Ramping up **renewables**, improving **energy efficiency**, reducing **methane emissions**, and increasing **electrification** will bring **over 80% of emissions reductions** needed by 2030.
- Tripling global installed renewable energy capacity to 11,000 gigawatts by 2030 will achieve the largest emissions reductions.

Next EERA and external events

EERA events

- **EERA JP Coordinators meeting**
  - 16 October, Brussels, Belgium
- **EERA High-Level Policy Conference: "Researching energy pathways to a resilient and net-zero society"**
  - 17 October, Brussels, Belgium

External events

- **SET Plan Conference**
  - 13 and 14 November, Barcelona, Spain
- **UN Climate Change Conference (COP28)**
  - 30 November – 12 December, Dubai, UAE

EERA
European Energy Research Alliance



POLICY ANALYSIS

Securing sustainable critical raw material supply for clean energy in Europe

Context overview and role of research and innovation in solar PV, wind, hydrogen, batteries, and power electronics

Objectives

1. **Expand and enhance the knowledge base** of the clean energy research community on Critical Raw Materials (CRMs) by:
   - Providing **insights and analysis** on their importance for the Clean Energy Transition (CET)
   - Identifying **geopolitical risks and supply chain vulnerabilities** associated with CRM sourcing and processing
   - Examining the relevant EU **legislative and policy background** related to CRMs
   - Analysing **international cooperation and trade** aspects in CRM sourcing and processing
   - Identifying **research priorities** for optimising CRM sourcing and processing
   - Delving into the specificities of five selected technologies: **solar PV, wind, hydrogen, batteries and power electronics**

2. Develop a **set of policy recommendations** to achieve a sustainable and secure supply of CRMs in the clean energy sector.

3. Create a **comprehensive yet concise document** valuable for the **EERA community**, **EU and national policymakers, industry players** and other interested stakeholders, e.g. **NGOs, think tanks** etc.

Report structure

PART I

Importance, risks and policy context for CRMs in Europe's Energy transition

- Definition and importance of CRM for the CET in Europe
- Geopolitical risks and supply chain vulnerabilities
- General, social, environmental and ethical considerations linked to CRM sourcing and processing
- EU legislative and policy background (particular focus on the CRMA)
- International cooperation and trade

PART II

Circular economy, substitution and alternative materials: Focus on the relevance of CRMs for selected technologies

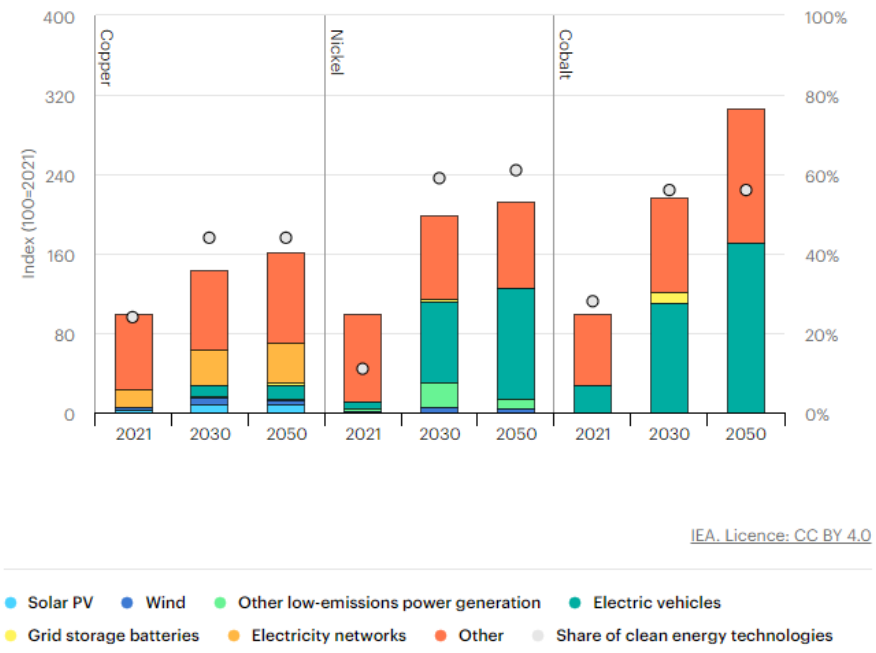
- Definition of key concepts
- Focus on five pivotal technologies: solar PV, wind, hydrogen, batteries and power electronics

PART III

Policy Recommendations for achieving a sustainable and secure supply of CRMs in the European clean energy sector

- General Recommendations
- Specific recommendations for the selected technologies

I. Importance, risks and policy context for CRMs in Europe's Energy transition (1/2)



Total demand for selected minerals by end-use in the Net-Zero Scenario, 2021-2050 (source: IEA)

- Transition to "**net-zero age**" particularly **materials-intensive → CRMs key to several low carbon technologies**, e.g. solar PV, wind turbines, batteries, electrolysers, power electronics
- **Lithium**, **graphite**, **cobalt**, **nickel**, **platinum** group metals projected to experience the **fastest growth BUT** unpredictable nature of **disruptive innovation → substitution**, **efficiency improvement**, **design optimisation**, **new materials**
- **Supply of CRMs generally more concentrated** than that of fossil fuels → greater risk to market stability
- Significant levels of **concentration during extraction,** much **higher** during **processing**
- **Europe highly reliant on a few countries** for CRMs sourcing & processing→ supply chain **vulnerability** (esp. **China**).

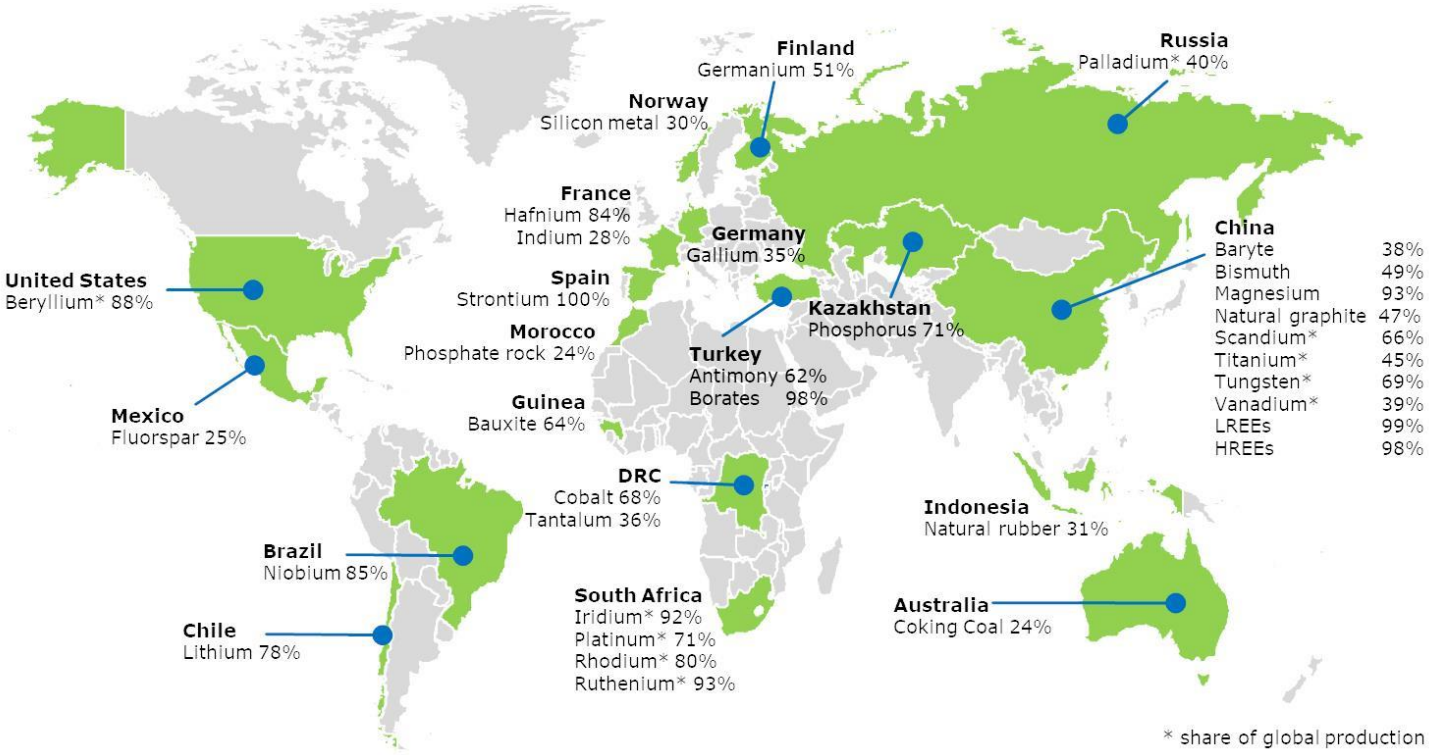
I. Importance, risks and policy context for CRMs in Europe's Energy transition (2/2)

- **Supply-side risks** → negative **environmental, health, ethical and social impacts**, potentially impeding production-scaling efforts and exposing CRM users to reputational risks

- **EC Critical Raw Materials Act** → 16/03/23, aimed at enhancing the functioning of EU single market to **ensure EU's access to a secure and sustainable supply of CRMs**

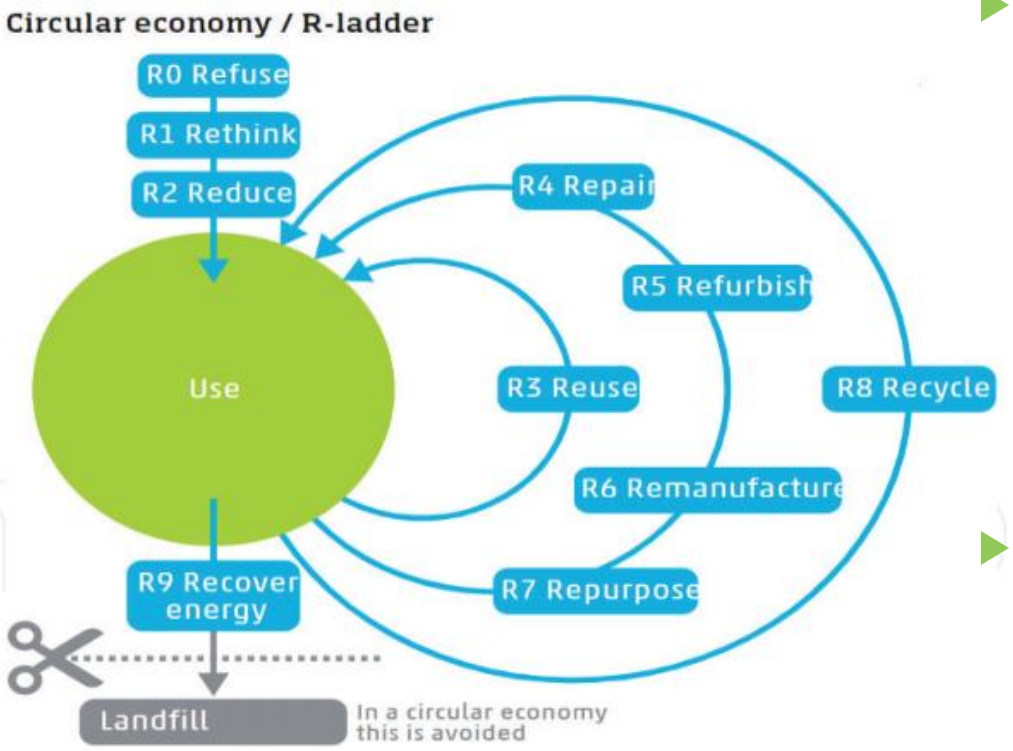
- Persisting **knowledge gaps at EU level reg. vulnerabilities within CRM supply chains** → insufficient coordination to monitor, manage the risks, address potential disruptions in CRMs supply

- EU's strategy for **international engagement → free trade agreements**, « **Critical Raw Materials Club** », « **Global Gateway** » strategy



Biggest supplier countries of CRMs to the EU (source: European Commission report on the 2020 criticality assessment)

II. Circular economy, substitution and alternative materials: Focus on the relevance of CRMs for selected technologies (1/3)

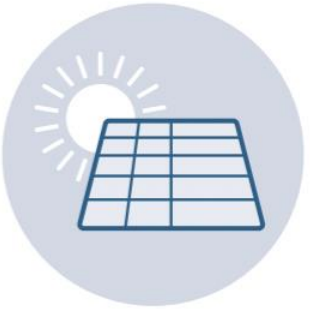


R-ladder of circularity strategies (source: The Netherlands Environmental Assessment Agency)

- **Circular economy**
  - Concept born as response to linear "take-make-use-dispose" model, to transition towards a regenerative growth model operating within planetary resource boundaries
  - Evolution of the concept →the **R-ladder**: hierarchical framework guiding the managing of products throughout their life cycle
  - Approach to ideally **inform policymaking in all relevant areas**, although current analysis centred mostly on **recycling** (more immediate practicality)
- **Substitution & alternative materials**
  - Replacement of CRMs with **more abundant and environmentally sustainable alternatives**
  - Offers opportunities to **re-evaluate entire product systems** → enhanced sustainability
  - **Strategic approach** to strengthen domestic supply chains, diversify sourcing, enhance resource efficiency

II. Circular economy, substitution and alternative materials: Focus on the relevance of CRMs for selected technologies (2/3)

Solar PV



- PV module production to increase **X 5-10** over the next 10 yrs to achieve climate neutrality by 2050
- Key CRMs: **silver, bismuth, silicon, Indium**.
- **Consumption limits** established for silver, bismuth and indium to reduce usage and encourage substitution

Wind

- Set to become Europe's primary source of electricity (**up to 50%** of all power consumed in EU by 2050)
- Materials reliance**: rare earths, nickel, manganese, copper and aluminium** but also secondary materials, e.g. ferrous scrap, glass fibre and carbon fibre
- Key challenges: reduce **reliance on REEs** in generator technologies, addressing **air gap** behaviour and developing innovative **cooling** methods

II. Circular economy, substitution and alternative materials: Focus on the relevance of CRMs for selected technologies (3/3)

Hydrogen

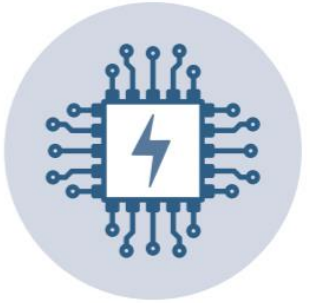
- **Proton exchange membrane electrolyser (PEMEL)** → most promising technology (e.g. high hydrogen purity, low footprint, compact design).
- Efforts centred on **reduction of platinum group metals** usage (platinum used in the cathode and iridium in the anode). As complete elimination is hard to reach → drastic advances in the **mass activity** of PGM- type electrocatalysts can help

Batteries

- Net-Zero Scenario: **35-fold** expansion in installed grid-scale battery storage capacity between 2022 and 2030
- CRMs used : **lithium, nickel, cobalt, graphite and vanadium** → reduction in usage is essential
- Simultaneously → need to **explore new battery chemistries** (e.g. sodium-ion) and focus on **direct recycling** of electrode materials

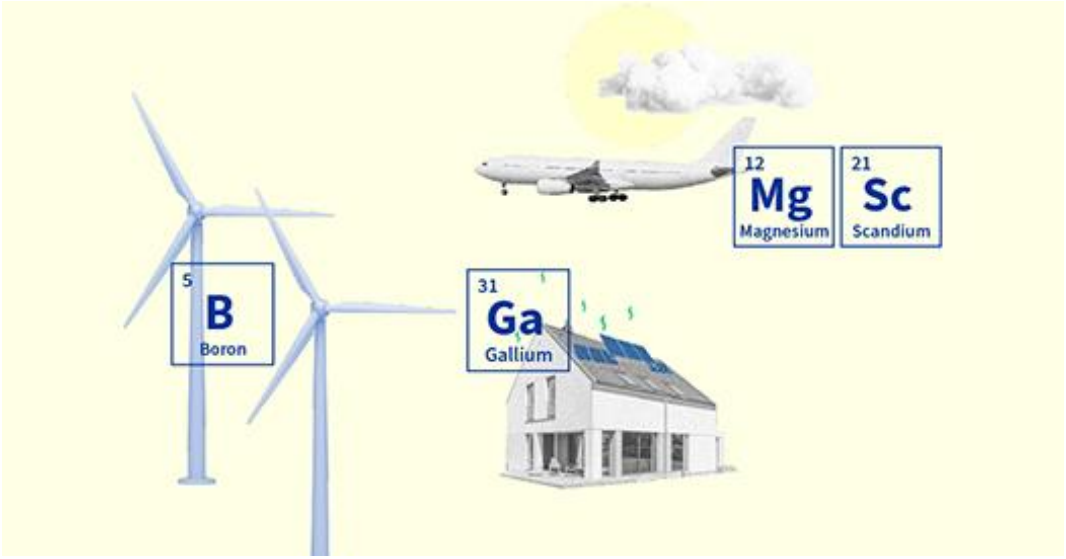
Power electronics

- CRMs primarily concentrated in **power semiconductors**, in the components required to cool them and in passive components for filtering currents and voltages
- To reduce losses in systems and improve resource efficiency → increased utilisation of **wide bandgap** semiconductors, **superconducting** power cables and components; expansion of **direct current** grids at high voltages



III. General recommendations (1 / 2)

- Promote a **circular economy** approach to critical raw materials
  - Promote a circular economy approach for sustainable CRM use and device longevity
  - Encourage the substitution of CRMs with alternatives where feasible
  - Strengthen the role of R&I in circularity
  - Develop recycling knowledge, infrastructure, technologies and processes



- Scale up investment in **research, innovation and technology deployment** across all TRLs
  - Immediately boost R&I investment
  - Establish a coordinated EU CRM supply chain monitoring body
  - Introduce societal readiness early in the innovation process

III. General recommendations (2/2)

- Ensure a **fair supply chain** at global, national, regional and local levels
  - Promote diversification of CRM supply
  - Foster workforce skill development
  - Upscale domestic mining in alignment with the objectives outlined in the EU Critical Raw Materials Act
- Establish effective **economic mechanisms** to ensure Europe's competitiveness
  - Establish compensation mechanisms for CRM trade
  - Secure equitable treatment for European CRM value chains globally
- Strategically increase **international collaboration**
  - Strengthen global partnerships for CRM supply resilience
  - Implement an international database on CRMs

III. Specific recommendations for the selected technologies (1/2)

- **Solar PV**
  - In Europe, invest exclusively in solar PV production technologies aligned with the 2050 climate neutrality objectives
  - Prioritise R&D for full PV module recyclability

- **Wind**
  - Ensure comprehensive access to CRMs for the European wind industry
  - Invest in recycling of permanent magnets

- **Hydrogen**
  - **Reduce dependence on platinum group metals (PGMs).** Foster research initiatives aimed at decreasing reliance on PGMs, particularly platinum and iridium, within hydrogen-related technologies. Prioritise efforts to enhance the mass activity of platinum and iridium to reduce their usage in technologies such as PEMEL
  - **Encourage research into the development and implementation of alkaline cells.** Promoting a shift towards alkaline exchange water electrolysis (AEWE) and alkaline exchange fuel cells (AEFCs) would lessen reliance on PGMs and enable the EU to explore promising technologies, such as layered double hydroxide catalysts (e.g. nickel-based). Additionally, encourage research into the production of suitably stable anionic polymers, followed by their implementation and optimisation.

III. Specific recommendations for the selected technologies (2/2)

- **Batteries**
  - Promote circular energy storage
  - Prioritise silicon-rich anodes in EV batteries
  - Accelerate adoption of lithium metal all-solid-state batteries
  - Promote repurposing over recycling
  - Enhance European battery production sustainability

- **Power electronics**
  - Promote wide-bandgap semiconductor integration
  - Embrace direct current (DC) transmission
  - Develop and integrate superconducting components into systems

EERA
European Energy Research Alliance
Fuel Cells and Hydrogen

Thank you

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Attachment 3.

EERA
European Energy Research Alliance

Status of EERA policy working group

Vito Di Noto, UNIPD

General Assembly of EERA FCH JP – 4 October 2023

Outline of the topics

- EERA Annual Strategy Meeting (Madrid, 14-15 June 2023) – Updates on SET-Plan: **Implementation Working Group on Hydrogen**
- Spanish Presidency of the EU Council – Priorities: **Fit for 55 – Gas and Hydrogen package**
- **Renewable Energy Directive (RED):** Negotiation and Approval
- Green Deal Industrial Plan: **The Net Zero Industry Act**
- **European Hydrogen Bank**

SET-Plan: Implementation Working Group on Hydrogen

Revised SET Plan objective

The SET Plan will enhance the coordination *and collaboration in research, development, demonstration, with the aim to* ***deploy competitive, sustainable and circular, socially acceptable energy solutions****. This will enable an accelerated high penetration of renewables, as well as ensure a decarbonised and efficient energy use in all sectors of our economy, in line with the EU policy* ***objectives for a resilient, secure, sustainable and affordable energy system.***

- **Nov 2022** – **Initially planned publication** of the revised SET Plan (Conference on Prague)
- **Nov 2022 – today** → No official feedback; **expected date of publication Oct 2023**

NEW: Implementation Working Group on Hydrogen. Sponsored by **DE**, building on the Pilot action on green hydrogen within the new ERA (European Research Area) and the SRIA (Strategic Research and Innovation Agenda) published in March 2022.
8 countries have already expressed their interest: Austria, Bulgaria, Finland, Germany, Greece, Italy, Portugal, Slovakia

SET-Plan: Implementation Working Group on Hydrogen

- **Coordinates** the work on hydrogen **previously split** between different IWGs of the SET Plan, ensuring mutual coordination on an ongoing basis **among national and regional hydrogen R&I programs**.

- Bottom-up approach and more ownership by member states and associated countries, **which also means more financial and political commitment**.

- It aims at maximizing cooperation and synergies among member states and associated countries, **and avoid inconsistencies, duplications, and fragmentation of measures**.

- Supports **the development of hydrogen technologies,** fosters **collaboration and coordination within the SET Plan countries** to ensure their active involvement.

- Additional support actions (*e.g.*, HE CSA) are underway **to further define its mission**, supporting the preparation of the Implementation Plan (IP) on hydrogen and ensuring synergies with other SET Plan IWGs, domains and objectives.

Other activities:

- **Robust outreach approaches,** development of assessments of risks, design and implementation of solutions, societal engagement actions to span across the EU and Associated Countries.
- **Dissemination and networking activities with other existing ETIPs and IWGs** (*e.g.*, joint workshops, thematic conferences, webinar series, regular exchanges, etc.).

Hydrogen in the EU – the foundations

EU's hydrogen strategy and **REPowerEU plan** → a comprehensive framework **to support the uptake of renewable and low-carbon hydrogen** to help **decarbonise** the EU in a cost-effective way and **reduce its dependence** on imported fossil fuels.

- In 2022, H_2 accounted for **less than 2% of Europe's energy consumption**; used to **produce chemical products** (*e.g.*, plastics and fertilizers). **96% of this H_2 was produced with natural gas**.
- By 2030, the European Commission has proposed **to produce 10 million tonnes of renewable H_2 and to import 10 million tonnes**.

The priority for the EU is **to develop renewable H_2**.

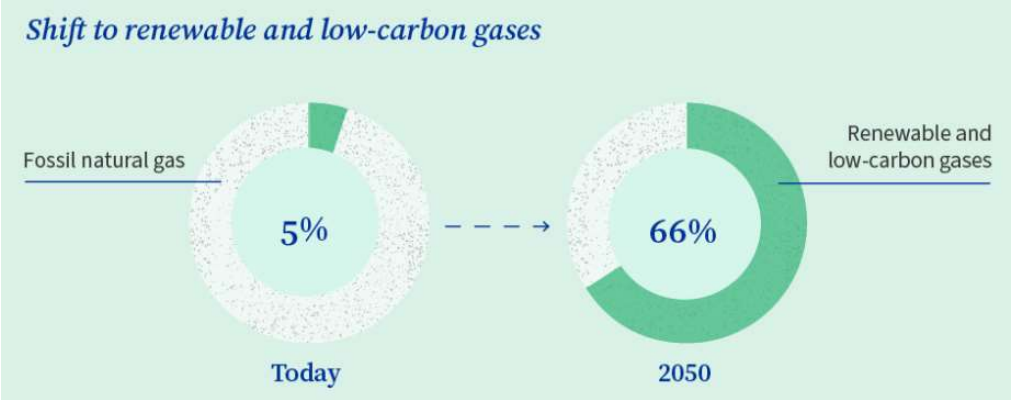
The "**Fit-for-55 package**" (July 2021) → legislative proposals that **translate the European hydrogen strategy** into **concrete European hydrogen policy framework**.

The recovery plan **NextGenerationEU** has been made available to EU countries **to invest in hydrogen projects across the value chain.**

"Fit-for-55 package" sets targets for the uptake of renewable hydrogen in industry and transport by 2030.

Fit for 55 – Gas and Hydrogen package

High Priority for the Spanish Presidency of the EU Council

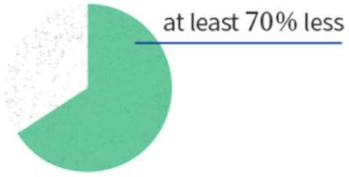


Renewable and low-carbon gases are gaseous fuels with a **lower carbon footprint** than fossil fuels.

Renewable gases can be produced from:

organic sources
- biogas
- biomethane

non-biological renewable sources (using electricity)
- renewable hydrogen
- synthetic methane



Low-carbon gases are not produced from renewable energy sources but they produce **at least 70% less greenhouse gas emissions** than fossil natural gas across their full lifecycle.

Using renewable and low-carbon gases reduces the greenhouse gas emissions released into the atmosphere.

decarbonising the gas sector

achieving climate goals

Renewable and low-carbon gases

↓

fewer greenhouse gas emissions

↓

climate goals within reach

Fit for 55 – Gas and Hydrogen package

Areas of action

1. Creating a market for hydrogen

- competitive EU market and dedicated infrastructure for hydrogen
- creation of European Network of Network Operators for Hydrogen
- facilitated trade with non-EU countries

EU hydrogen goals for 2030:

40 gigawatts of renewable hydrogen electrolyser capacity

10 million tonnes of renewable hydrogen

2. Integrating renewable and low-carbon gases into the gas grid

- facilitating access to the existing gas grid, including by removing cross-border tariffs
- certification system and common terminology
- rules on and monitoring of quality of gas, including for blending

→ **2049** as the maximum end date for long-term fossil gas contracts

3. Engaging and protecting consumers

- simpler ways to change energy provider
- more transparent billing information
- access to smart meters

4. Increasing security of supply and cooperation

- integrated planning for electricity, gas and hydrogen networks
- certification of storage system operators
- strengthened solidarity arrangements between EU countries, to deal with crisis situations

Fit-for-55 package: Hydrogen delegated acts (20 June 2023)

Provide EU definition of renewable H_2 to ensure that **hydrogen is produced from renewable energy sources** and **achieves 70% emissions savings**.

A methodology for renewable fuels of non-biological origin

Conditions when **hydrogen, hydrogen-based fuels, or other energy carriers** can **be considered as renewable fuels of non-biological origin (RFNBO).**

- **H_2 production** goes hand in hand with **new renewable electricity generation capacities**.
- **H_2 is produced when and where renewable electricity is available.** Avoid that **the demand for renewable electricity** used for H_2 production is incentivizing **more fossil electricity generation**

A minimum threshold for greenhouse gas emissions savings of recycled carbon fuels

Provides a methodology for calculating life-cycle GHG emissions for RFNBOs.

Certification of renewable H_2, **producers will be able to rely on a well-established system of certification by third parties.**

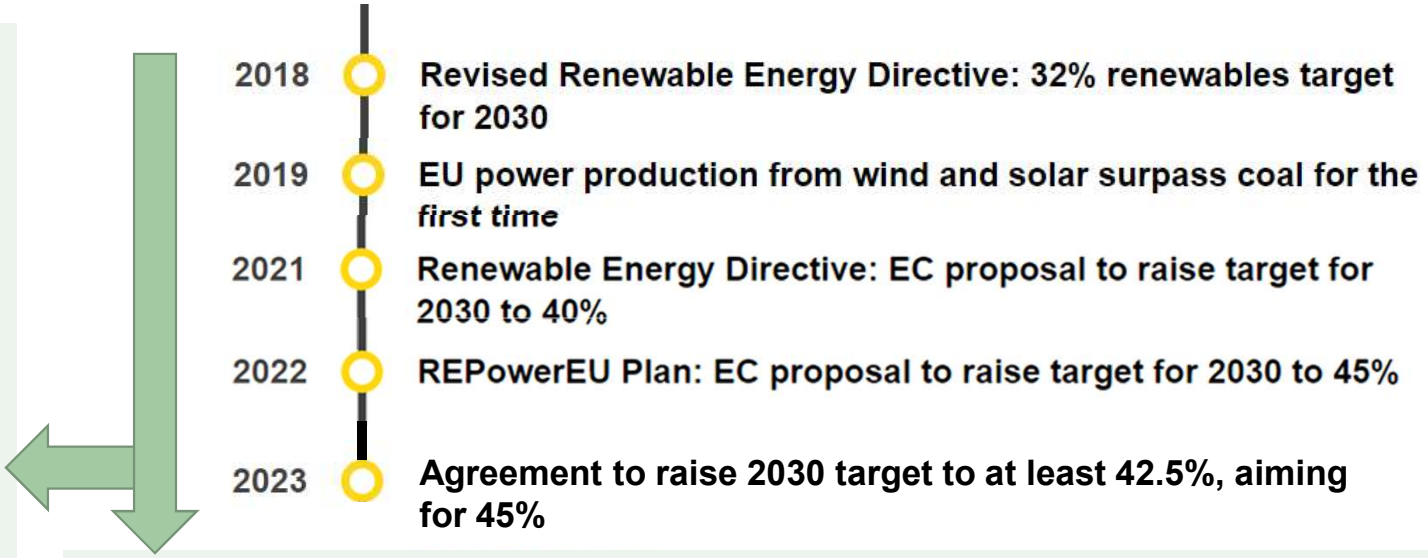
The Renewable Energy Directive

The Renewable Energy Directive is the legal framework for the development of clean energy across all sectors of the EU economy, supporting cooperation between EU countries towards this goal.

The share of renewable energy sources in EU energy consumption
has increased from 12.5% in 2010 to 21.8% in 2021

Binding target: 42.5% of renewable energy sources by 2030 + 2.5% voluntary

- **Faster approval procedures** for deploying renewables (no more than 12 to 24 months)
- **Transport:** Greater share of biofuels and renewable fuels to reach a 14,5% reduction of GHG emissions



Approved in the European Parliament on 12 September with 470 votes. EU Council should also approve it soon, and then the law will be published in the Official Journal, with about 7 years to reach the targets it sets.

The Renewable Energy Directive

- **Provisional agreement** on 30.03.23.
- **FR**'s last-minute support withdrawal → **blocking minority with pro-nuclear countries.**
- **FR** successfully advocated for **a 20% decrease in green H_2 target for industrial use for countries with low fossil H_2 share**, favoring nuclear countries.
- To strike the final deal, **FR requested exclusion of certain ammonia production plants** from the calculation of the green H_2 target for industry.
- **Agreement on 16.06.23** → Non-binding recital **excludes H_2 for ammonia production** from industry's total consumption, limited to a few existing plants. **EC recognizes nuclear power's role in achieving climate neutrality by 2050**.
- Adopted in **EP ITRE Committee** (Committee on Industry, Research and Energy) **on 28 June**.
- Final approval in **EP Plenary (12 September 2023).**

EU is attracting more **investment in clean H_2** than US and China combined

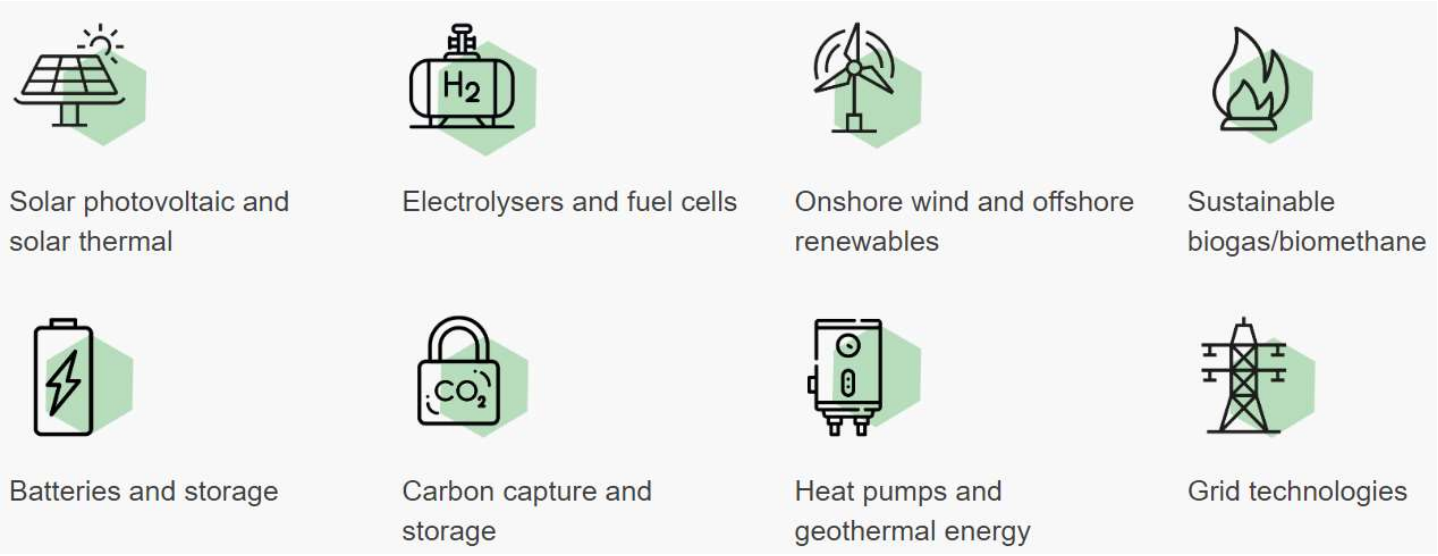
Green Deal Industrial Plan: The Net Zero Industry Act

The Net-Zero Industry Act is an initiative stemming from the Green Deal Industrial Plan which aims to scale up the manufacturing capacity of clean technologies in the EU, that support the clean energy transition and release extremely low, zero or negative greenhouse gas emissions when they operate.

Aim: EU's overall strategic net-zero technologies manufacturing capacity **approaches or reaches at least 40% of annual deployment needs by 2030**.

The Act also **simplifies the regulatory framework for the manufacturing of these technologies**. This will help **increase the competitiveness of the net-zero technology industry** in Europe

Key Technologies



Green Deal Industrial Plan: The Net Zero Industry Act

- Draft report presented by **EP** (European Parliament) Rapporteur Christian Ehler (EPP).
  - ✓ **Remove distinction between *"net zero technologies"* and *"strategic net zero technologies"*** in the EC's proposal. Open future regulation to all technologies compatible with EU green taxonomy.
  - ✓ Bring back **Hydrogen Valleys**, integrated ecosystems combining multiple H_2 applications.
- Doubts remain regarding funding of NZIA (**Net Zero Industry Act**). **Will 25% of EU's carbon market revenues be sufficient** for the outlined ambitions?
- Next steps in EP:
  - ✓ Vote on compromise amendments in ITRE Committee (Committee on Industry, Research and Energy) on 12 October.
  - ✓ Agreement on NZIA during plenary session in November.
- Council examining first presidency partial proposal: **inclusion of all mature nuclear technologies** in the regulation.
- Negotiations to start on 11 July.

European Hydrogen Bank

EU public support measure to kickstart the hydrogen economy - Auction system to fund renewable hydrogen projects

REPowerEU's objectives: producing 10 million tonnes of domestic renewable H_2 by 2030, + 10 million tonnes of imports

Hydrogen Bank:

- Announced in March, along with the Net Zero Industry Act
- First pilot auction in autumn 2023
- Provide a **fixed premium for renewable hydrogen production**, total budget of €800 million

FR wants to extend the scope to low-carbon (i.e. nuclear hydrogen)

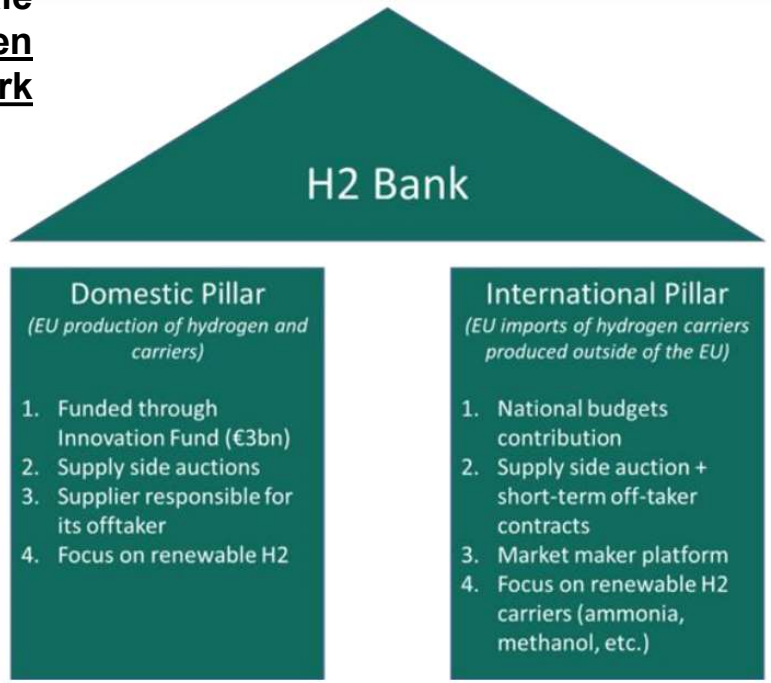
EP INI – report by MEP Robert Hajšel:

- importance enabling the production of H_2 on all EU territory (geographical balance)
- Consider other criteria **besides price**, e.g. sustainability, job creation

European Hydrogen Bank

The **upscaling of the H_2 technologies** and **the development of large-scale projects face several market and regulatory risks**. Therefore, **the hydrogen sector needs concrete public support and a coherent regulatory framework** until it can achieve full-scale competitiveness in the global market.

The creation of a Hydrogen Bank will act as a major funding scheme to ramp up the hydrogen value chain. It will be a market-making tool supporting both the domestic production and consumption of renewable and low-carbon hydrogen and the import of hydrogen and its derivatives, **helping to achieve European targets for decarbonisation**



EP INI – The Committee on Industry, Research and Energy (ITRE) has been referred to produce an own-initiative repot (INI) on the European Hydrogen Bank. MEP Robert Hajšel is the rapporteur

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Thank you very much for your kind attention!