Workshop

Co-organised by EC-JRC and IEA-EGRD

Improving the resilience of the complete clean energy supply chains – from raw materials to advanced materials, manufacturing and end-of-life

12-13 December 2023

JRC premises, Petten, The Netherlands

The energy transition, which is taking place globally in order to achieve the Paris 1.5 degrees target, is bringing a shift of paradigm for our energy system: the main focus is shifting from the *fuel* to the *technology*, the *manufacturing* of components for the clean energy technologies, and the *materials*. That's why it is said that **the energy transition is a materials transition**.

But, clean energy materials, such as *lithium*, *graphite*, *manganese*, *nickel* and *cobalt* for our batteries, *rare earth metals* for our wind turbines generators and electric vehicle motors, etc, are scarce and sometimes heavily concentrated in few countries and regions, creating dependencies and increasing the risk of disruption of the relevant supply chains, putting the progress of the whole energy transition into risk. Against this background, the governments have come up with measures and policy initiatives, such as the Critical Raw Materials Act in the EU and the Inflation Reduction Act in the US, as well as the Critical Materials Strategies in many countries (EU, US, Australia, Japan, etc).

Both the International Energy Agency (IEA) and the European Commission's Joint Research Centre (EC-JRC), have analysed the materials demand and supply bottlenecks of the clean energy technologies' value chains and have offered **landmark reports** [1, 2] that underpin with robust scientific evidence the debate and support the needs of policy-makers and decision-makers internationally. At the same time, it became clear that, in addition to policy, administrative and regulatory measures, **research and innovation can and must play a central role in strengthening the resilience of the clean energy supply chains**. This Workshop aims exactly at examining the role of Research and Innovation in the clean energy materials and supply chains, debating issues where policy-making requires robust scientific evidence and support, and offering solutions for improving the resilience of the complete supply chains – from raw and refined materials, to their processing, manufacturing of components, assemblies and systems, till their end-of-life and recycling.

The Workshop is organised jointly by the International Energy Agency's Expert Group on Research and Development (IEA-EGRD) and the European Commission's Joint Research Centre (EC-JRC), and it is hosted by the Directorate for Energy, Mobility and Climate of the JRC in its premises in Petten, the Netherlands. It will bring together renowned experts from across the globe dealing with the clean energy materials and supply chains. Its **objective** is twofold:

[1] IEA, 2022 – "The Role of Critical Minerals in Clean Energy Transitions"; IEA, 2023 – "Energy Technology Perspectives 2023"

[2] EC-JRC, 2023 – "Supply chain analysis and material demand forecast in strategic technologies and sectors in the EU – A foresight study"; Also, reports and knowledge in RMIS: https://rmis.jrc.ec.europa.eu/

- to provide a better understanding of the state-of-the-art solutions available for managing and increasing the resilience of the clean energy materials supply chains
- to define the R&I needs for addressing the policy challenges related to the clean energy supply chains, and assess ways towards fulfilling them.

When it comes to **policy challenges**, four issues can be distinguished:

1. Which are our future needs in clean energy materials and how can we diversify their sourcing? Can demand-side management play a key role in striking the right balance between materials demand and supply?
2. How can we secure the energy transition by increasing the resilience of the supply chains and mitigating the disruption risk?
3. How can we ensure sustainability and address the ESG challenges along the whole value chain, and how can R&I help resolving the challenges of circularity and increase its role in materials supply?
4. What innovative and advanced materials do we need in order to substitute expensive and not easily accessible strategic materials in the clean energy technologies' value chains?

Consequently, the Workshop is divided in four **Sessions**, each one addressing the relevant challenge:

I. Materials challenges in the clean energy transition
II. Modelling and analysis of supply chains, Resilience, and Mitigation of disruption risk
III. Sustainability, ESG and Circularity - Challenges and Innovation in recycling, and
IV. New Innovative and Advanced materials for Substitution of CRMs

Each Session consists of three-four expert presentations followed by a discussion. Wrap up for the first day and conclusions at the end of the second day will report the conclusions of the Workshop.

Practical information

The Workshop will be hybrid. It will be a two half-day event, starting at 14.00 on 12/12 and concluding at 13.00 on 13/12.

Deadline for online registration will be no later than December 6th. Please register here to participate. Your email address will be then added to the EC's environment (tenant) on TEAMS in order to assure your access to the authentication in the guest portal. Please read the instructions about joining the EC M365 Environment and accessing the virtual room (available on the registration site). The TEAMS link to the virtual room will be shared with you a few days prior to the event.

Clean energy supply chains

Petten, 12-13 December 2023

Agenda

	Day 1 - Tuesday, 12 December 2023	
14.00	**Opening of the meeting and Welcome to the JRC**	**Piotr Szymanski, Director JRC C**
14.10-14.30	**Introduction – purpose of the Workshop**	**Birte Holst Jørgensen, Chair of IEA-EGRD** **Vangelis Tzimas, HoU JRC.C7**
14.30-15.50	**I. Materials challenges in clean energy transition** **Chair:** Vangelis Tzimas	
	Madalina Ivanica, EC-DG GROW: "The EU Critical Raw Materials Act and the Net-Zero Industry Act" (20') Kathryn Peretti, Department of Energy, USA (20') Peter Levi, IEA: "Clean energy technology supply chains" (20') **Discussion may include:** Challenges of supply of materials and components for the green transition; Foresight of Supply and demand; Bottlenecks and dependencies in supply; Manufacturing bottlenecks; Demand mitigation actions through behavioural change.	
15.50-16.10	***Coffee break***	
16.10-17.40	**II. Modelling and analysis of supply chains, Resilience, and Mitigation of disruption risk** **Chair:** Johannes Tambornino	
	Michalis Christou, Samuel Carrara, EC-JRC.C7: "Supply chain analysis and materials demand forecast in strategic technologies and sectors in the EU" (20') Martin Beermann, Joanneum Research: "Results of IEA TCP HEV Task 40 - Critical Raw Materials for Electric Vehicles" (20') Tilmann Vahle, Systemiq: "Principles and Collaboration for Global Sustainability in Battery Recycling" (20') David Pennington, EC.JRC.D3: "Foresight of materials supply" (8') **Discussion may include:** Resilience of supply chains and strategic autonomy; Stress-tests and Risk Mitigation measures; Preparedness and early warning; Role of secondary raw materials to strengthening resilience of supply chains; R&I needs for increasing resilience of the clean energy supply chains	
17.40-17.55	**Wrap-up of the 1st day**	
18.00	***Closing of the 1st day***	

	Day 2 - Wednesday, 13 December 2023
9.00-10.20	**III. Sustainability, ESG and Circularity - Challenges and Innovation in recycling** **Chair:** Herbert Greisberger
	Reinhold Lang, Johannes Kepler University: "Navigating towards an 'all-circular' Plastics & Carbon Economy - CO2 as 'renewable' feedstock and 'new' industrial commodity" (20') Alexandra Hegarty, IEA: "Creating sustainable and responsible critical mineral supply chains - guidance for policy makers" (20') Fabrice Mathieux, EC-JRC.D3: "Circularity and sustainability as a means to build resilient and responsible value chains: the example of batteries" (20') **Discussion may include:** Sustainability of clean energy materials supply; environmental, sustainability and governance (ESG) standards along the complete value chains; circularity opportunities and challenges; how to reduce, re-use and recycle; R&I needs for recycling
10.20-10.40	***Coffee break***
10.40-12.00	**IV. New Innovative and Advanced materials for Substitution of CRMs** **Chair:** Atsushi Kurosawa
	Pekka Pohjanne, Materials for new energy technologies, VTT (20') Gavin Harper, Birmingham University (20') Kumar Sadayappan, Office of Energy Research and Development, Canada: "Alternate materials and technologies for sustainable energy applications" (20') **Discussion may include:** Substitution needs, requirements and prioritisation; new innovative and advanced materials, R&I needs
12.00-12.45	**Discussion: Research needs for the clean energy supply chains** (Moderator: Birte Holst Jørgensen)
12.45-13.00	**Summary and conclusions from the Workshop** (Birte Holst Jørgensen and Vangelis Tzimas)
13.00	**Closing of the Workshop**