



VIENNA ENERGY FORUM-THE VEF VIRTUAL SERIES

Sustainable Energy and Industry Integration- Session 5



INDUSTRY DECARBONISATION - HARD TO ABATE SECTORS

1. OVERVIEW OF KEYNOTE & PLENARY ADDRESS

The session was opened by Rana Ghoneim of UNIDO. She outlined the importance of reducing emissions in the hard-to-abate sectors, which make up 15 to 20% of global greenhouse gas (GHG) emissions and energy consumption in industry. These sectors are essential to meet our climate goals, and thus should be seen as an important opportunity. However, as these materials are essential for buildings and infrastructure in developing countries, and growing demand for these commodities means highly competitive markets, there is an unwillingness to pay a premium for low carbon steel or cement.

Today's focus is therefore:

- Investment in technologies to make available high-temperature heat.
- How to share information and foster learning – the availability of information on making the transition is important.
- How can the global community collectively create demand for low carbon steel and cement, and what are countries currently doing to support decarbonization?
- Is there an opportunity for procurement commitments to drive the market, and how can the global community work collectively to create markets and demand for low-carbon steel, cement industry?

SETTING THE SCENE PRESENTATION

A scene-setting keynote address were given by: Ms. Rebecca Dell, ClimateWorks Foundation

The keynote address focused on 'Heavy Industry Decarbonization: Steps towards Net-Zero'[1] - with specific emphasis on metals (steel), cement, and chemicals (plastics and fertilizers). Climate-safe heavy industry is possible and affordable with the right investments and approaches, but it is important to first create markets for low-carbon commodities in this space. The underlying logic being one of passing the cost of low-GHG production onto the final consumer. This included:

- **Buy Clean – Public Procurement:** 29% of steel and half of cement goes into civil engineering infrastructure projects - incentivize both best practices and innovation.
- **Clean Product Standards:** applying to both public and private purchasing - critical for material efficiency, especially in building codes.
- **Private Procurement:** Multiple structures - voluntary standards, advance market commitments, and buyers' clubs.

The speaker then considered three levers to support heavy industry decarbonization, this included:

- **Supporting innovation** (*both public and private investment in heavy industry innovation are very low compared to other sectors*): Increase and realign expenditures (many only consider energy efficiency, not the overall environmental performance and other co-benefits; integrate manufacturing, construction, and waste processing). The importance of demonstration at scale.
- **Supporting deployment** (*as more decarbonization options become available, we can support deployment as we have in the power sector*): These tools include: Credit support; Tax credits; Subsidies, including carbon contracts-for-differences; Direct contracting and investment. Also, enabling infrastructure will be critical.
- **Protecting and investing in people** (*approaches will work if we do not have the right people to implement them and if people do not see clear benefits*): Training practitioners throughout the value chain; Targeting underserved communities for investment; emphasizing quality job creation, protecting workers' rights and safety; Properly funding workforce transitions where needed; building informational infrastructure to support markets and policies; Investing in the enforcement of the rules.

The speaker concluded that the technical pathways to reduce emissions vary a lot by industry and by country characteristics - but most include the use of renewable energy, hydrogen or ammonia, carbon-capture, utilization and storage (CCUS), and overarching energy-efficiency. We do not know which pathways (or combination of pathways) will be the most important, so we need to look at what we can do now to allow us to get to near zero by 2050 in the context of uncertainty

[1] See: <https://www.climateworks.org/report/build-clean-industrial-policy-for-climate-and-justice/>

2. SUMMARY OF BREAKOUT DISCUSSIONS

2.1 GLOBAL PERSPECTIVES

Sub-question 1: What policy and actions are available to support IDD and to increase ambition?

We need to first rethink **where** to abate hard-to-abate industries, as there may be a need to move industries to where there is CXCS potential rather than where the resources/demand is. It is important to note that when considering net-zero, efficient distribution could look very different.

Physical pathways are slowly becoming more clear - 3 broad action categories for support: measures to incrementally improve energy-efficiency, technologies that enhance material efficiency, and innovative technologies that dramatically reduce carbon intensity, for example - hydrogen (as feedstock or energy source), carbon capture and storage (CCS) / CDR, direct electrification technologies (e.g. iron ore electrolysis or electrifying cement kilns).

Exploring technology options in hard-to-abate sectors:

- Aluminium: In this industry, there is cost-competitive renewable energy which is supported by energy storage to support 24/7 power. So, the main question lies with how to cost-effectively replace existing plants. An option here is through **recycling**, as it only requires 5% of energy compared to primary production (expected that this industry will be able to recycle to meet up to 60% of demand).
 - Chemicals: **Replacing feedstock** - e.g. production of ethylene from bio ethylene (such as in India and Brazil). **Advanced recycling** (e.g. feedstock recycling and enhanced collection and sorting).
 - Green hydrogen policy-making space: In some sectors, it would be useful to use strategies that lever incremental technology - e.g. buildings, but in industry these incremental technologies can create lock-in. Hydrogen can be used in lots of applications, but we need to understand that it is **best placed for only a subset of technologies/sectors**. We cannot accept incremental technologies that lock us into technology pathways that prevent us from meeting the net-zero by 2050 goal.
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Challenges for both action and policy:

Availability of Finance:

- Focus first on the higher-margin products, as those more likely to be able to afford the transition (with support)
- The transaction costs associated with using global climate funds are very high - need leveraging capital and to connect capital rather than reroute it like the Global Climate Fund (GCF) has done.

Derisking transformation in production:

- If transformation goes wrong, companies could collapse - the need for risk-sharing as industries require certainty that they will be able to sell higher-cost products (at least for some period of time).

External assistance

- The transition may not be able to happen from the industries themselves - need to make a level playing field (e.g. through a carbon price).

Market reform

- There is a need to engage in aggressive market reforms - e.g. to allow changes in construction practices, etc. to enable a circular economy.
- Need to start think about shutting down facilities once they are paid off (just transition considerations) - target sunset plants.
- e.g. in SA - there is a mothballed DRI plant that is in an excellent solar resource area.
- e.g. cement- make clinker where there is CCS but move the cement to the cement plants.

Technology transfer to developing countries

- Difficult to do, also need to recognise that developing country contexts may be more appropriate to target because of a relatively clean slate (leapfrogging potential).
 - Directing cheaper capital to sites in the developing world to make this a global effort.
 - Importance of balancing how to reward the innovators and also get the intellectual property (IP) into the global setting. This means that you cannot have monopolies over the key technologies, but rather need innovators to license and help integrate into local conditions - then the technology can spread throughout.
 - "Moving" industrial clusters to other geographies will be difficult due to the complexity of linking existing assets to new consumption areas/markets.
 - -There is a need for a mechanism to differentiate green from non-green products before you can incentivise the necessary investments.
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Consumer behaviour

- Directly connect the consumer and the green producer- e.g. through a contract that links across the value chain (such as a contract between a car company, the consumer, and the producer of steel)
- Clear labels and public procurement to drive
- Demand-side focusing: it is possible through smaller product designs, lighter vehicles, lifestyles and behavioural changes (e.g. shared ownership), alternative materials (e.g. wood instead of cement)

Geopolitics & recommendations

- A very difficult challenge - need a form of global governance to ensure that the transition is inclusive and that we work together on a global level
- We need policy instruments such as border tax adjustments to stimulate global efforts
- Governments will be at the heart of overcoming the challenges - at least in the initial stages of setting up the right environment
- Looking at a world that will be higher capital intensity and lower energy intensity - may be a safer world (considering previous wars over energy)

Outcomes from COP26 that would like to be seen: A global carbon tax, companies making public statements that they will prefer green steel, green cement, etc., and green public procurement

2.2 COUNTRY VOICES

Sub-question 1: What actions is your country taking to decarbonize energy intensive industries? What can we learn and share with other countries?

Canada

In the last couple of years, the Canadian government has updated its strategy and the country has been able to strengthen climate discourse, with lots of action in the climate sector.

The foundations for decarbonization have been laid e.g. price on carbon 170\$/tonne by 2030 (they've tried to keep that whilst maintaining competitiveness and avoid carbon leakage). Working on liquid fuel and looking at strategies for hydrogen, carbon capture, and low carbon fuels. Investing in efficiency and the enabling infrastructure. There are still many gaps and hopefully, some global collaborations will help.

Overall they see potential in 1) Promoting demand for low carbon products 2) Procurement policies and buyers clubs 3) Product standards, reporting, benchmarking, etc. 4) Harmonising methodologies 5) Need better data and improve how it is discussed – e.g. in terms of emissions, and embodied carbon. When talking about building emissions also essentially talking about industrial emissions.

India

Effective regulatory environment in India with the energy efficiency ministry under the Minister of Power, with strong regulatory acts, rules and regulations – these started with industry and moved into transport and buildings. Energy efficiency has been the first priority, with cement factories now the best in the world and power plants using new technologies. Fertiliser and petrochemicals are catching up and trying to decarbonise in other industries.

Have learned that industry initially wants support (either technology or financial support) and thus India has developed a trading system. One of the achievements is in energy-intensive industries (PAT scheme[2]), and consumers are excited. Also, India is starting to grow its grid capacity with the target being 450GW by 2030 (on track for 175GW by 2022).

Austria

It is important to look at how to incentivise renewable gas (e.g. producing hydrogen with renewable energy) and how to scale up those industries. Renewable hydrogen in particular is an important part of meeting the Paris Agreement. Need a grid scale-up of renewable hydrogen and renewable gas. How do we do this? We need the policies to do so and to build value chains in a regional sector for this production.

However, green electricity may be limited to the technical potential at a regional level – can supply be secured for hard-to-abate sectors? More generally, which segments of value chains/industry should be supplied with renewable gasses?

A clear roadmap is being developed for objective key areas - an idea is a quota system so that gas suppliers have to have a certain amount of renewable gasses/hydrogen, in their portfolios.

Big need for cross-border and transnational cooperation.

[2] See: <https://www.iea.org/policies/1780-perform-achieve-trade-pat-scheme>

United Kingdom

In the UK the net-zero target has gotten industry going, with a recent announcement of a new NDC target (68% of 1990 emissions by 2030). They are working with UNIDO on NDCs and involved in the the 3% club^[3]. Additionally, they want to kick start the hydrogen economy (5GW of hydrogen by 2030), hence the net-zero hydrogen fund – for R&D.

Technologies include: CCS – investing \$1Billion for 4 industrial clusters (up to 10Gt CCS). The technology exists, but the economics don't always make sense – hence the introduction of the industrial energy transformation fund. Looking to turbocharge Mission Innovation for the iron and steel industries.

G7 working on net-zero transitions, globally – need coordination. Hoping on developing countries to target industrial decarbonisation and thus the UK are working with the World Bank on R&D for industrial decarbonization in developing countries.

South Africa

There has been a rapid change in hard-to-abate sectors – globally 5 years ago no one knew what to do with them. In 2020, the hard-to-abate sectors in South Africa decided on a low emission development strategy for net-zero by 2050. And in 2021 a new NDC in South Africa. The government is currently forming sector emission targets, so as of yet there are no numbers next to the targets.

Country context: 40% unemployment, and 50% below poverty line before COVID-19. Emission-intensive sectors historically hit the environment and inequality. We can talk about technology but if there is no mention of inequality or employment, it won't get traction i.e. Microeconomic (jobs, etc.) and macroeconomic (-trade) focused.

Technological modelling shows that South Africa can maintain intensive industries, decarbonise them, and keep them contributing to the economy. However, South Africa has not yet gotten to the stage where big industries are doing anything.

Iron & Steel: central to this is the indigenous iron ore supply, good solar power resources, and transmission lines. This industry in South Africa can generate 5 Mega tonnes – the global supply is 1800 Mega tonnes. So we're drowning in global value chains, meaning countries with small economies and small productive sectors cannot do it alone as they will fail in the wind of international protectionism (eg. Chinese dumping of iron & steel on the market). Demand for these products is on the increase throughout developing countries, and everything cannot be imported – South Africa needs to build the local value chain industry, and note here that affordability for decarbonisation depends on country context.

[3] <https://eeglobalalliance.org/three-percent-club>
<http://mission-innovation.net/our-members/united-kingdom/>

Sub-question 2: What are gaps that we need to work collectively on as a global community to decarbonize the energy intensive industries?

Where are the coordination priorities?

- Related standards and benchmarks.
- Innovation; lots still need to happen with regards to technical and market innovation. Mission Innovation about to renewed (links to COP).
- Value Chain perspective.
- If we want to promote hydrogen, it needs to be at an affordable price. Need assurance in a broader ecosystem.
- Jobs/social agenda.
- Industry focus areas are very different. In steel, we need global sector decarbonisation, but this is not the same everywhere. Don't necessarily need the whole world in all industries but rather a 'carbon club' with key players – would include certifications, standards, trade rules, access to finance, and technology.

Investment agenda

Draw finance into the bankable projects, the most decarbonisation, by renewables, portfolio standards and do not just give subsidies. Rather a market that needs satisfying, which also decreases the chances for corruption. 'Give people markets to satisfy'.

Takeaways:

- Eager to build some of the mechanisms that link together opportunities.
 - Country-level actions could support around definitions and standards, for the content of steel/cement of materials. Coordination is needed for these standards.
 - Think about specific technologies and hydrogen etc. (eligibility for how and where we invest in projects).
 - A database of projects that could be investable, as a way of bringing investment in.
 - Also to think about where and how to connect the materials information and lifecycle.
 - It is very clear that there is a social and economic shift, but will require a level of engagement – opportunities for job training, etc.
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2.3 ENABLERS FOR PROGRESS

Sub-question 1: What is needed at the global, sectoral and technological level, to create a global market for low carbon commodities like iron and steel and cement?

Due to long lead times and high capital costs, there is an incentive to do the cheap transitions now and keep the more expensive ones for later, however it is in the best interest to invest in common and shared infrastructure – economies of scale.

Cannot go demand as usual – need to recycle steel and concrete – an opportunity we cannot afford to miss as the developing countries grow. Need to increase recycling of concrete and cement, and how to re-use secondary steel.

Sectoral demand and supply

- Infrastructure collaboration and coordinated rollout of technologies such as CCUS
- More Roadmaps for sectors – consistency in long-term goals.
- Demand creation through various initiatives e.g. steel zero initiative (supply chain push to have a decarbonized chain all along, with responsible steel standards).
- High emission coalitions of key players (supply sides). Once you have that commitment you can get alignment on roadmap and agreements to meet key milestones – including with financiers, governments, and policymakers. Making product measures a reality – standards etc.

Technological Level

- R&D to bring costs down

Global Level

- Need to get around the clash between emerging and developed countries targets ie. Setting long-term targets that trickle down to local, national, and firm-level.
- Policy certainty so firms are more prone to make costly investments with confidence.
- Long-term planning to decrease costs of lock-ins.
- Funding challenges, developing countries spend less on R&D so this reduces their capacity to create and adopt.

Stakeholder Support

- Enhanced societal dialogue to support ambitious climate policy development through empowerment and coordination of national stakeholders.
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Supply Chain Approach:

- There is a difference in cost margins between upstream (commodity element) and downstream.
- For upstream (e.g. cement, steel), the profit margin versus the cost of abatement per tonne of carbon is small, whereas downstream (e.g. automotive, construction) the profit margin versus the cost of abatement per tonne of carbon is very large.
- So, a key part of the answer lies in creating the link through the supply chains mobilizing those who have a large profit margin to help and drive the decarbonisation of the upstream emitters.
- See this report[4] on these global supply chains and associated emissions between major markets. This can help us identify the key countries to engage in. Additionally, The report highlights the substantial impact companies can have when taking a supply chain angle at their emissions: We all know we need to do more—taking a supply chain view can be a game-changer for global climate action.
- Especially for end-consumer companies, emissions in the supply chain (Scope 3 upstream) are much higher compared to emissions in operations (Scopes 1+2). So, net-zero supply chains would hardly increase end-consumer costs.
- About 40% of emissions (in the World Economic Forum (WEF) 8 focus value chains) can be abated at <€10 per ton of CO₂. In fact, net-zero products would only increase by 1-4% if everybody joins forces along the supply chain.
- *“Every CEO should pursue our 9 actions toward net-zero supply chains”* – WEF

The final stage of the 30-year road map (2040 to 2050) to net-zero will likely be expensive. The good news is if we take a supply chain approach the first 40% can be achieved for less than €10 a tonne of CO₂e (this would include circular economy, energy efficiency, etc.). The next 40% would cost €10 to 100 per tonne CO₂e and the final 20% above €100 per tonne. So, everything doesn't need to be done at once, we can start with niche markets where people will pay, then grow them over time.

Sub-question 2: How do these needs and gaps vary across different economies?

[4] See: <https://www.weforum.org/reports/net-zero-challenge-the-supply-chain-opportunity>

IDDRI's "Deep Decarbonization Pathways in Emerging economies"[5] project highlights the main challenges encountered in the implementation and review of mitigation targets and policies and processes – in Brazil, India, Indonesia, China, and South Africa.

The **geographic concentration** of these industries is very important. Even in medium-sized countries, there are often only one or two very large facilities in these industries. This means that the transition issues for the local economy, national strategy, and workforce vary across different economies, but are acutely important **in both emerging and advanced economies.**

The feasibility of technologies differs from country to country, and from the developing country perspective is a larger barrier. The top-down visions are there (especially the private sector and stakeholders in both public and private sectors), but more is needed at the local level. For example, heavy investment in technology (e.g. CCUS) is not so feasible in India (everything at a demonstration stage as of yet). Government and industry need to work together so that financing these technologies does not break the economy of the country.

Standards and certifications need to be integrated into the system so that the market is effective across different countries.

Need a **level playing field** from one economy to the next, especially in the steel industry.

Sub-question 2: How do these needs and gaps vary across different economies?

Government

- **Push policies** – research, demonstration, enabling infrastructure.
- Public finance to **de-risk investments.**
- **Public procurement**
- Should be involved in partnerships to fund R&D and support
- **Supportive frameworks** (e.g. IPPs, enabling environment to support innovation)
- **An open narrative** about policies, performance standards, incentives, etc. Need to make this a topic of conversation.
- **Circular economy** – collaboration by the government for full chain involvement

[5] See: <https://www.iddri.org/en/project/deep-decarbonization-pathways-emerging-economies>

Private sector

- Investing in low-carbon tech (competitive first-mover advantage)
- Fast-moving businesses can push the government to put policy measures in place
- Demand creation through supply chains (on the supply chain topic, see "Industrial Supply Chains Decarbonization in Southeast Asia".[6])
- The financial sector also has a key role to support investments.

Public and private partnerships are especially important in sending signals to industry and consumers, as well as in developing countries

[6] See: <https://www.globalefficiencyintel.com/industrial-supply-chains-decarbonization-in-southeast-asia>
