REINVENT – PROJECT NR 730053

Critical drivers workshop report

Deliverable 1.5

2017-05-31

Introduction and summary

As the Paris Agreement comes into force and national governments resolve to progress towards a low- or zero-carbon economy, many sectors of the economy are finding themselves in the spotlight of climate policy. Resource-intensive industries – such as steel, plastic, paper and meat and dairy production – must now adapt to life in a net zero-carbon emissions world. The question then is how these industries can move towards a zero-carbon world.

The workshop brought together leading researchers and organisations to confront this challenge and explore how industries are taking action. What innovations are taking place? What barriers are being found? What is needed to ensure that industries can both contribute to the economy and also play their part in the low-carbon transition? Understanding how action is taking place 'on the ground' is vital for the future development of a low-carbon economy in Europe.

One important aspect is the development of reliable decarbonised energy systems for new decarbonised industrial processes to co-evolve with. A recurring theme was the interconnectedness between sectors and actors in value chains and that decarbonisation implies changes in these value chains. The idea of a refrigerator adapted to veganism, constructed with fossil-free materials and powered by green electricity connects all our sectors and actors ranging from primary production to end consumer. New value chains imply new partnerships. With decarbonised energy we need to shift the attention from the use-phase of products to the embodied energy and emissions.

Not surprisingly then, another important theme was cooperation – between actors, companies, countries, internationally etc. and in different areas, e.g. energy, research and innovation, policy experimentation, etc. Capital intensity and long lifetime of assets requires long-term thinking about change processes. Sometimes other regulations and permitting procedures stand in the way of green investments and policy coordination is therefore important. Europe needs a more mission oriented policy approach (for research, system innovation and industry) in order to achieve deep decarbonisation.

Cooperation also relates to who the agents of change are (consumers, industry, finance, regulators, politicians, etc.). For example, a lot of consumption we engage in is rooted in unsustainable systems of production and the power of consumers more limited than we like to think. Investors are generally conservative but in the context of decarbonisation, for investors to look at the past for guidance about the future is like driving a car through the rear view mirror. A challenge in this context is also that investors do not like investments that depend on government policy for their viability since it implies political risk. Mission-

driven cooperation and risk-sharing across sectors as well as between actors will be important.

Context

The REINVENT workshop took place in Utrecht on 17 May 2017 (1pm - 4pm) and involved participants and partners of the project, as well as the members of the Advisory Board. The workshop was led by Lars J. Nilsson (project coordinator, ULUND) and Harriet Bulkeley (leader of work package 1, UDUR).

The following researchers were present at the workshop:

1. Lars J. Nilsson (Lund University)
2. Harriet Bulkeley (Durham University)
3. Johannes Stripple (Lund University)
4. Katja Pietzner (Wuppertal Institute)
5. Agni Kalfagianni (Utrecht University)
6. Stefan Lechtenböhmer (Wuppertal Institute)
7. Ernst Worrell (Utrecht University)
8. Andries Hof (PBL)
9. Monica Keaney (Lund University)
10. Teis Hansen (Lund University)
11. Valentin Vogl (Lund University)
12. Bregje Van Veelen (Durham University)
13. Mariësse van Sluisveld (PBL)

The following guests participated:

1. Mia Lafontaine (FrieslandCampina, the Netherlands)
2. Karl Edsjö (Electrolux, Sweden)
3. Eva Blixt (Swedish Steel Association, Sweden)
4. Stanley Santos (Tata Steel, the Netherlands)
5. Ruud Meliste (Port of Rotterdam, the Netherlands)
6. Mark Sanders (Sustainable Finance Lab, the Netherlands)
7. Maria Loloni (Climate-KIC, Germany)
8. Annita Westerbroek (Dutch Paper Industry, the Netherlands)

Including the Advisory Board:

9. Alexandra Landsberg (Environmental Ministry, Germany)

10. Bert Merz (ECF, the Netherlands)
11. Nils Hannerz (IKEM/CEFIC, Sweden)

Concept and process

There is a growing attention towards the need for decarbonisation within the key sectors of material production, e.g. paper, plastic and steel, as well as in the food sector, notably meat and dairy. The overall objective of REINVENT is to help Europe achieve its long-term climate policy objectives through exploring pathways and policy options for supporting decarbonisation in these resource-intensive industries. For fostering decarbonisation and carbon-free futures within these sectors it is interesting to explore existing innovations, potentials for circularity and governance models that could be the catalysts for such futures. This workshop aimed to start this important discussion and explore critical drivers and barriers together with a number of invited stakeholders.

The event was organised as an open-space workshop where the topics for break-out group discussions are not determined beforehand. The key idea was to put the workshop guests in the driver's seat through addressing what they perceive as important issues. To engage everyone into discussion, the participants were divided into small groups consisting of researchers and guests, with a researcher-rapporteur assigned to each group. Participants were split into groups according to their particular interests. Notably, these were thematic rather than sectoral groups, so as to avoid sectoral silos and stimulate cross-sectoral dialogues.

To generate themes for discussion, the participants were asked to write down post-it notes with suggestions of important themes to look at with the 2030 and 2050 decarbonisation goals in mind. Based on these notes, four initial themes for discussion were identified: 1) Fuelling the transition; 2) What makes innovations fly; 3) Policy conditions and governance initiatives and 4) Consumption issues – who are the consumers? The participants split into groups based on the theme of their interest, which resulted in four groups consisting of five to seven people. The discussion in groups took place for half an hour, and then new themes generated within these discussions and with the help of the post-it notes resulted in new groups being formed: 5) Investment practices and how to change them; and 6) Cross-sectoral integration and global competitiveness. 'Fuelling the transition' theme remained since the previous round of discussions. Again, the participants split into groups and the discussions took place for half an hour.

The overall discussion was noted by each group's rapporteurs, and the guests shared their reflections during the wrap-up session of the workshop. These are reported in the rest of this document.

Highlights

The following points were generated during the workshop. Please note that these points present a summary of the overall discussion that took place and do not represent the standpoint of REINVENT.

1. Fuelling the transition

- How rapidly will the 100 % decarbonised and perhaps fully renewable energy system develop and how can industry co-evolve through electrification or shifting to power-to-gas fuels?
- There are basically three different routes for decarbonised steel production: virgin material (hydrogen reduction), recycling (electric arc furnaces), and CCS (carbon capture and storage of fossil-based processes). Concerning recycling, improving scrap quality will be slow and better sorting or collection of scrap materials is needed.
- Ideally we will see power-to-heat before 2030 and power-to-hydrogen after 2030. Long-term solutions for steel are hydrogen (for reduction of iron ore) or electrification together with improved materials efficiency. In the transitioning phase, carbon lean processes with CCS/CCU will be important.
- Support is needed from the rest of society for ensuring a robust 24/7/365 electricity supply. CCS is not seen as a good solution due to a lack of carbon dioxide storage options. The high renewable energy potential speaks in favour of this option. Replacing oil is key, a major challenge will be to transform electricity to forms you need: power-to-products (heat or hydrogen). Steady supply of electricity is needed. Offshore wind plays a key role. A hub for offshore wind is necessary. Conversion and storage of electricity is also needed.
- Partnerships between the energy sector, steel and mining are important. New value chains will be created. The whole energy infrastructure needs to be overhauled. And a broader thinking than just individual sectors is required. Research is needed in energy systems and electricity storage. Carbon-free electricity is utterly most important. We need clearance on next steps and agreement with companies and we need to think about which material that might be best for society, if not steel, then use alternative materials.

2. What makes innovations fly

- Longer and more complex investment and financing schemes are needed for decarbonisation. There is often a general payback expectance within five years of

investments made by companies, something that is not enough in this case. Business models and ownership models need to change (e.g. leasing a paper mill instead of owning it could be considered).

- Incentives are needed for companies to make investments towards decarbonisation. It is difficult to strike the right balance. A Catch-22 might happen with the 'right' projects not being funded: If it is 'feasible' for the company to do anyway, it does not get a subsidy; if it does not get a subsidy, the project does not get realised.
- How does policy promote the creation of innovation and decarbonisation champions, or empower them to be more active and forward thinking? The leadership process has not been 'designed' and there is a need for people who really believe in decarbonisation and have the power and the mandate to do something. Many people are discouraged by hurdles, particularly legislation or permitting procedures which takes years to overcome.
- How to break through traditional processes? The four sectors considered in REINVENT are very capital-intensive and are hence unlikely to do it on their own. Someone else needs to take the lead on making it happen. Encouraging information and knowledge sharing is important.

3. Policy and governance: Conditions and the initiatives that might support transitions

- International competition is a key condition that needs to be taken into account and policy instruments are important to address this. A single country in Europe is simply too small to implement a policy that would drive a change and not face potential outsourcing. European cooperation would therefore create a competitive advantage, but the question is what kind of cooperation is needed?
- How to achieve 'energy cooperation'? There are huge demands for energy, so the creation of a European Energy Union makes intuitive sense. This require however new types of infrastructure to decarbonise electricity use in different ways. There is currently not a strong industry push towards such a strategy (but electrification is a big issue for all industry players, these are national governments that create barriers).
- What are the 'landscape factor' that are of importance?
    - The drop in oil prices. EU leaders have not come up with a way to address international competition on these issues (e.g. fossil feedstock used for chemicals is not in the ETS).
    - Agriculture: It is very difficult to change or touch agricultural policy. CAP review, but they are not looking into inter-sectoral connections. We need to look across sectors (When there is a dialogue with farmers it is a nice dialogue. The problem is the big food processing industry). Future scope may include lab meat and grass protein refining.

- Small initiatives are needed, e.g. on bioplastics. But it is too big to handle for marginal or small actors, so governmental intervention is necessary. Big change has to come from close collaboration between industry and governments. Real breakthroughs are currently under-valued and under-supported. Investments in the whole chain in order to create a level playing field (Mazzucato).
- Compare with electricity: Electricity (with successful innovation in renewable technologies) is a protected market in contrast to the other sectors. China took up the challenge to produce the solar panels. Energy is one of the most important issues to solve (how do you transfer geothermal energy across the continent?).
- Policy and governance needs 'leadership'. The prevailing 'the market has to do it' attitude is not going to work. For plastics you have to avoid fossil carbon ending up in the environment; it has to come back as an input (but the price is 1 billion EUR; now it is simply too cheap to throw away).
- Possible changes in perceptions on the materials? Steel is quite successful, but not plastic.
- SDGs are not likely to drive change; it is just a frame but not much in specific terms.
- Big change with big governments: States often support the losing companies. A common innovation policy; create a market (just having a technology is not enough). (We need a Manhattan project! E.g. basic research on algae, there are not many small algae projects; there is no large scale strategy/mission to create innovation towards a fully zero-carbon Europe. In Europe we lack an approach of identifying a mission and the research needed to support this mission.
- Leakage problem: ETS charges emissions when they are being produced; better to charge consumption; feed-in-tariffs for green plastics?
- Lack of standards; no standards for materials being recycled. Without standards it is difficult to charge a premium.
- If radical innovation to renewable fuels is done, energy demand will increase dramatically. Agreement between industry and government to not reduce electricity generation will be necessary or else transition will not happen.
- Clarity on how emissions are treated: ETS money does not go back to develop technology and to investments although this was promised.
- No common vision really needed? There are already (complex) Sustainable Development Goals (SDGs). It is more important that governments take Paris Agreement and SDGs seriously. Stability and point of direction is very important. If poverty is reduced, steel and food production will increase. Industry needs help from governments. Governments should look at 2025/2030 to now support the next steps for industry in order to reach 2050 terms.
- No agreement of who the agents of change are: consumers and regulations versus industry itself. Level-playing field argument for industry not being an agent of change. But in NL and Sweden, CEOs are agents of change. Governments should stimulate starting new projects (public-private R&D), i.e. not only rules and

regulations, but large infrastructure and industry projects should also be stimulated by governments (e.g. heat grid instead of gas grid).

4. Consumption issues

- The 'consumer society' generates unsustainable outcomes. An important question is whether consumers are willing to pay for low-carbon sustainability. There is currently a trend towards organic and healthy food. However, this has also become a market niche, so the question is how do you make the sustainable consumption options the norm. How could the consumer be 'educated' to do the 'right choices'? There is the need to nurture/nudge a different kind of consumer, new forms of consumption.
- However, a lot of consumption we engage in is rooted in unsustainable systems of production. There are no easy ways out, with the options available being to produce less, produce differently, produce with a different quality or to convert the production practices to be more sustainable (e.g. meat and dairy farmers converting to vegetable production).
- When it comes to policy, for consumption based on differentiation, there is a space for companies to develop new kinds of products, while for consumption based on price, there is not much that companies/retailers can do, so policy can intervene through 'standards' etc.
- The interface between food and appliances becomes interesting in discussing consumption. For example, how would 'low carbon eating' change the way appliances look like? How could a low carbon fridge look like? The design of the fridge came from the need to preserve certain stuff, and if that changes how would the appliance change? A prototype for a 'vegan' fridge could be developed, where there is no space for meat, or milk bottles, but vegetables and salads, for example, are preserved well.

5. Investment practices and how to change them

- Financing and investment may seem trivial at a first glance. We think that if there are profits to be made, someone will invest. However, it is not as simple as that.
- Finance is very biased towards status quo and risk management is always backward looking. We now face the opposite, i.e. a need for major changes and looking at future risks. Status quo is always easier than change for investors but it is like driving a fast car through the rear view mirror.
- Investment bubbles must be avoided, e.g. there was a green technology investment bubble some years ago.
- Corporate governance and leadership is important, as well as understanding how and when companies reorient strategically.

- If the business model (and thus financing) depends on the government (e.g. through a specific policy) that is a big negative for investors since it implies political risk.
- Investment culture is persistent but we are starting to see changes in accounting for climate change and fossil-fuel risks through reducing exposure to vulnerable sectors, fossil fuel assets and fossil-fuel dependent sectors.
- Investors often look for good teams and good people and not only for good ideas. Good ideas with bad teams often do not fly.

6. Cross-sectoral integration and global competitiveness

- Radical changes in downstream industries and markets may completely change the demand for the core industries that are the focus of REINVENT.
- Labelling systems should also take into consideration the energy and emissions embedded in products, not just from their use phase.
- Rather than introduce a carbon tax on the production of goods, we should tax the use of goods. This would take care of the problem of displacing production, since imported goods would be taxed in the same way and people would not need to go across the border to buy steel.
- Business model innovation may be very important – if producers have incentives to produce goods that are durable and energy efficient, then this may have a significant impact.

Reflections

From the guests

During the reflections session it was stressed that decarbonisation can only happen if different players act together. For this, new coalitions and partnerships on an international level, across sectors, value chains and governments are needed. The importance of showing and pushing forward good examples of decarbonisation was also brought up, so that it can be shown that decarbonisation is possible. Finally, it was expressed that the guests would be interested in learning about the opportunities and problems on the routes towards decarbonisation, in order to be able to make better decisions. The expectation from the guests was that REINVENT could contribute to the European agenda on industrial development.

From REINVENT

Overall, this has proved to be a fruitful workshop that fulfilled the aims set out for it; providing stakeholder perspectives on the drivers, dynamics and implications for decarbonisation in energy and emissions intensive sectors. A broad spectrum of themes has been discussed, with different ideas gathered within each. This gives an important input for

REINVENT participants to think from and to develop the research within the project. The workshop showed that there is a strong interest in the emerging issue of decarbonising these sectors and a great openness on the part of stakeholders to engage constructively with REINVENT and the topic of decarbonisation.