IDRIC Policy Roundtable: Industrial Electrification

Summary of Discussion

March 2023

Overview

On 7 February 2023, IDRIC convened a policy roundtable on industrial decarbonization in Birmingham to obtain a clearer picture of the financial and non-financial barriers for electrification and with this to begin a discussion about potentials solutions.

Participants started this process by exploring some specific barriers, followed by general options for these that could be addressed in a way that would allow both industrial investors and capital providers to make the necessary investment decisions at the scale needed, in the timescales necessary for Net Zero, and at an affordable cost of capital.

This summary captures the main insights from the roundtable discussion. It does not necessarily reflect the view of all participants, nor constitute official IDRIC recommendations. This document aims to form the basis for further policy discussion and development and therefore should be considered part of an ongoing conversation.

Note: The roundtable predated the UK Government proposals of further exemptions to energy policy costs for energy intensive industries (British Industries Supercharger, 23rd February), which will be consulted on in due course. Where relevant, notes have been added to this document.

Content

Introduction

In order to meet Net Zero targets, energy intensive industries (EIIs) will need to switch away from fossil fuels to alternatives like hydrogen and electricity. However, while technically feasible solutions are available or in development for many industries, both hydrogen and electricity are economically unattractive to investors at present. Both fuels are currently more expensive and offer no market benefits as customers are not willing to pay more for the same product produced through more expensive but less carbon intensive processes.

For hydrogen this has been recognised in policy and a specific hydrogen business model developed to subsidise the production of hydrogen to make it more comparable with the main counterfactual fuel, natural gas.

However, despite electricity being more than three times the cost of natural gas to industrial users, no such financial support is being offered to encourage and enable the transition to electricity. Significant non-financial barriers also stand in the way of the necessary investment in industrial electrification.

Moreover, support for hydrogen fuel switching and other decarbonisation options such as CCUS have focused on developing supply and supporting infrastructure within industrial clusters. As a consequence, industrial sites not located within these discrete geographical regions, which collectively make up 50% of UK industrial emissions, have restricted access to these technologies, often leaving electrification as the only feasible option.

It is therefore vital that steps are taken to improve the investment case for industrial electrification, particularly for dispersed sites, to ensure that industrial emission reduction targets are achieved, but also to ensure the competitiveness of UK industrial sectors relative to international competitors who do not face equivalent costs, receive greater policy support and therefore represent more attractive prospects for low-carbon investment.

Barriers to industrial electrification

The discussion highlighted a range of barriers to industrial electrification, from energy costs to policy and regulatory risks, delays in network connections and infrastructure as well as the progression of R&D activities in electrification in some sectors.

Financial Barriers

Energy costs are a central barrier to investment in industrial electrification. Due to the price and energy use differentials between gas and electricity, electrifying energy intensive processes (as an alternative to current production methods, e.g. with natural gas) would increase overall energy costs on the order of 3-5x, depending on sector and process efficiency. Moreover, some EIIs are unable to hedge over periods longer than 6 months, which increases their exposure to wholesale energy price volatility. EIIs tend to be low-margin businesses with high energy costs as a proportion of their overall costs, and in which increased production costs as a consequence of fuel switching or electrifying cannot easily be passed on to consumers.

As a general principle, competitive electricity prices are a necessary, but not sufficient factor to incentivise the electrification of industrial processes in the UK. In the context of industrial electricity prices, competitiveness has two aspects:

- The need to balance price differentials between electricity and counterfactual fuels to incentivise the use of electrification of processes.

- The competitiveness of electricity prices paid by industrial consumers compared with those faced by international competitors, many of whom receive significant exemptions, subsidy and support compared to UK industry.

The electricity price paid by UK industry is composed of three main components:

- **The wholesale price.** This may often be comparable with that paid in other countries as the technology costs faced are similar and, for European competitors, wholesale electricity is increasingly traded across interconnectors, potentially reducing wholesale price differentials further. However, there are also some international examples where the wholesale price for generation is fixed at a low level for industrial consumers, e.g. nuclear output in France is priced at €42/MWh.

  Despite gas generation making up 40% of electricity production, gas generators usually wholesale electricity prices due to current market design, which sets the wholesale price for all generators at the level of the most expensive producer running. To address this, the Government is looking into potential modifications of the wholesale electricity market through the Review of Electricity Market Arrangements (REMA). Industry stakeholders reported that they are aware that this includes considerations about locational pricing which will introduce charges to encourage industrial relocation to areas of greater concentration of electricity networks and/or generation. Concerns were expressed that this incentive conflicts with the reality that many industrial sites are located where they are due to other critical geospatial considerations, such as the local availability of essential raw materials. Other participants highlighted the need to properly consider carbon externalities as part of frameworks for setting the price of gas.

- **Network charges**. As a consequence of Ofgem's targeted charging review, network costs faced by industrial consumers currently are significantly higher (£20-30 per MWh) compared to the average of the last 5-6 years (approx. £10 per MWh). Moreover, European competitors generally do not face these costs due to exemptions and government support, particularly those in Germany and France. Participants suggested that Ofgem's historic focus on balancing network charges away from domestic consumers has come at the expense of industrial decarbonisation and competitiveness.

- **Policy costs**. Similarly, policy costs including renewable levies, taxes and supplier obligations are significant contributors to high UK industrial electricity prices. This includes the Carbon Price Support mechanism, a UK only tax on electricity generation which was added to the carbon price under the EU ETS to drive the move away from coal generation, and which is passed through to industrial consumers through energy bills. A switch which is now largely complete, raising the question of its continued necessity. As with network charges, international competitors are exempt from, or do not face equivalent policy costs.

Combined, network charges and policy costs make up 95% of the electricity price differential between UK and EU industrial consumers. Removing this differential would reduce the price of electricity paid by industry which would also lower the price differential to natural gas, incentivising electrification and protecting UK industrial competitiveness.

Disparities in Policy Support

As well as on-going costs related to the price of electricity or carbon taxes, the UK sectors do not receive the same support in up-front capital costs. For example, industrial competitors in Europe have received government capital support in the order of €1-2Bn, while the USA offers investment incentives through subsidy, tax breaks or other means which can reduce the effective capital costs of investment.

Given the disparity in support for energy costs and capex available to UK industry relative to international competitors, investment leakage to sites in other countries has been a major issue in recent decades. For example, it was noted that non-EU imports of glass products have increased from 38% to 65% in the past 10 years.

It was noted that, in addition to disparities in support provided internationally, domestic disparities exist. For example, it was highlighted that many small-medium sized sites, such as the majority of the ceramics industry, do not qualify for EII support schemes despite being classed as energy intensive operations as the electro-intensity calculation used in the UK-only 'business-level' test favours larger industrial consumers.

Participants also highlighted the disparity in support between industrial clusters, which have been the focus of support for alternative decarbonisation options including hydrogen and CCUS, and dispersed industrial sites for whom such technologies will not be readily available in the short-term and for whom process electrification may be the only viable decarbonisation pathway. This will also impact competitiveness between companies located in industrial cluster areas vs. dispersed sites.

Further Investment Barriers

Policy and regulatory risk

Inconsistency and unpredictability of policy support is a fundamental barrier to investment in technology transitions. Government has a key role to play in unlocking investment by setting a long-term commitment to policy direction, and providing structures to guarantee return on investment.

However, the track record on decarbonisation and energy policy of most UK governments in recent decades has been characterised by unpredictability and lack of clarity, as well as stop-start policy initiatives and U-turns. Not only are policy and regulatory risks to investment difficult to assess, but there is very little that investors alone can do to manage them, even if there were clarity about them.

Similarly, when support mechanisms are too complicated for investors to understand and where the allocation of funding is unclear, intermittent or regularly questioned by politicians, then investment will not be forthcoming.

It was noted that for longer-term investments, investors will be looking to whether there are sufficient mechanisms to 'grandfather' their returns in case important factors change in a way that could not have been foreseen at the time a financial investment decision was made.

The above should be considered in the design of financial support structures for electrification.

Network connections and infrastructure

Further to financial and economic barriers to investment in industrial electrification, issues around the availability and readiness of supporting infrastructure were reflected strongly in discussions.

Investment in industrial electrification cannot take place if there is uncertainty about the availability of grid infrastructure. A 'chicken and egg' scenario therefore often develops where it is impossible for industry to secure investment funding without an electricity connection agreement for the delivery of the network required to support their investment within a reasonable timescale. However, unless industry signs up to a connection agreement, Ofgem will not allow funding for the network investment to proceed because it is deemed 'ahead of need' or simply uneconomic. Further to this, participants highlighted a need to reform the rules that govern the queue system for new grid connections, to ensure that new connections, storage and generation can be connected at the speed needed. Although it was noted that this is the subject of ongoing work by Ofgem.

It was noted that every decarbonisation scenario will require increased use of electrification, in addition to the grid developments required to support the deployment hydrogen and CCUS, which should be recognised as the basis for some certainty of need on the part of Ofgem. Participants also highlighted the importance of a proper understanding of where responsibilities lie for grid development, as procurement orders must be made 5-10 years in advance of new developments.

Current connection offers for electricity distribution and transmission networks may be for delivery in up to ten years. In some other cases, a clear commitment to facilitating a new grid connection, even with a long-stop date, may not be forthcoming because the connection is dependent on other, deeper reinforcements elsewhere in the network, which must be justified and financed separately.

Participants also highlighted the issue of crowding of other infrastructure (e.g. pipes, cables) under roads, which will become more pronounced as other sectors, e.g. domestic heating, also create demand new and enhanced electricity supply.

Time delays, costs and uncertainties associated with obtaining planning permission as well as other consents and permits often represent significant barriers to investment. Participants reported that local planning authorities often do not have a sufficient understanding of how local energy systems must be developed due to insufficient resourcing, training and skills. In addition to this, it was notes that DNOs currently do not give sufficient focus to industrial electrification, relative to the electrification of domestic heat and transport.

Security of electricity supply

For some industrial processes, continuous electricity supply is critical as having to stop and restart can be very costly and can cause physical damage to infrastructure (such as to kilns from uncontrolled cooling) and further costs from the resultant loss of production and revenues. Operators of industrial plant have generally been able to avoid this through access to reliable and predictable gas supplies. Commonly this has been through natural gas which

has a robust supply chain, technical and geographical diversity, and existing large-scale storage.

Increasingly electricity will be produced from a mix of intermittent and inflexible generation technologies (renewables and nuclear respectively). Without comparable options for large scale/long term electricity storage, participants highlighted that it is currently unclear how this imbalance between patterns of availability and consumption can be managed in the event of large-scale electrification. This is compounded by inadequate plans to increase grid capacity (it was noted that currently about six times as much energy is moved using gas networks rather than electricity), long lead times for connecting new electricity storage, and a shortage of necessary contractors to undertake the work – "everyone is working on HS2".

Supply chain and skills

The need to ensure the quantity and quality of skills are available to support industrial decarbonisation was clear. Participants noted that the requirement for skills extends beyond specialist skills, to a general lack of availability of contractors for digging and construction, due to competition for limited workforce between large scale infrastructure projects.

[Issues around skills and workforce provision for industrial decarbonisation are being researched elsewhere within IDRICs programme of activities and will be reported separately in greater detail.]

The lack of adequate supply chains was also highlighted as a barrier. Participants noted that there are few companies who may have a history of working with equipment such as industrial heat pumps, which undermines industrial confidence to invest in such technologies. It was suggested that increased support for demonstration for industrial heat pumps could increase confidence.

Technological risk

While electrification is a technically feasible option for many sectors, for example steel and glass, this is not true of all EIIs. Even for those sectors with existing technologically feasible options for electrification, further R&D is needed to increase the scale of operational production, improve efficiency and reduce the cost differential with gas-powered operations. There is also a reluctance for investors to risk adopting first-of-a-kind technologies, many preferring to invest in proven technologies.

Participants highlighted the lack of dedicated, sector-specific R&D support in the UK compared with EU countries. Recent UK R&D support has been targeted towards hydrogen and CCUS technologies, with no equivalent support for electrification. Furthermore, the Government and regulator's approach to funding allocation for R&D and deployment has been targeted towards clusters and heavily focused on competition. This discourages collaboration and makes timely access to the results of such work difficult, especially for dispersed industrial players.

A better allocation and use of the resources, both for industry and policymakers, could be made by encouraging greater collaboration and encompassing technology experience sharing.

Lack of advocacy for industrial electrification

A widely held view among participants was that the case for industrial electrification, and awareness of the issues limiting investment in electrification, are not sufficiently appreciated amongst policymakers. Comparisons were drawn with the successful advocacy for hydrogen and CCUS, which have subsequently received significantly more policy attention relative to electrification.

Discussion of interventions

Risk management

The discussions clearly highlighted the need for policy clarity and predictability to encourage positive investment decisions for electrification. While lowering of the cost of capital is an important goal, investments may not go ahead if risks are unclear or seen as unmanageable at the point at which investment decisions are made, even if the proposition is otherwise potentially attractive. Transparent, predictable and durable regulation is critical to delivering capital.

As discussed in the previous section, uncertainty around the availability of grid connections in a reasonable time, as well as policy and regulatory risks are central barriers to investment in electrification. These can prove challenging to assess and manage, in particular when allocation of public funding is unclear, intermittent or risks being withdrawn by subsequent governments. Having a source of funding that is clear and bankable is therefore crucial for investment decisions. For longer-term investments and managing risks related to long-life assets, exemptions from future regulation for existing investments, or 'grandfathering', might be needed to help protect investments from unforeseen changes.

Mechanisms for financing energy policy costs, such as levies or taxes should be carefully chosen and their implications considered, for example investor confidence or distributional impacts. Funding through taxation also requires the support of the Treasury whereas levies lie in the remit of DESNZ and may be more viable for use in the short term. Participants noted that current state aid limits, as defined in the Trade and Cooperation Agreement, would not present an obstacle to UK Government support for EIIs, due to the high level of subsidy competitors in EU countries already receive.

Overcoming financial barriers

The roundtable discussed a range of measures to mitigate uncompetitive electricity prices for industrial users and provide incentives and support for current gas-users to switch to electricity.

CfDs

Providing clarity and predictability for investments in renewable energy generation was the main objective of Contracts for Difference (CfDs) which replaced previous obligations and

incentives, which were often complicated and vulnerable to future government changes. Using private law contracts combined with a credible counterparty, CfDs offer investors not only revenue stabilisation, but also confidence that funding mechanisms will not be changed by future governments, thus securing the expected return on investment. This design makes risks predicable and manageable, which led investors to support significant scales of investment at a lower cost of capital. However, it was noted that CfDs for renewables took many years to design and implement. Any equivalent mechanism to support electrification could therefore replicate this clarity and predictability, but may take years to develop.

Green Power Pools

Participants discussed Green Power Pools as a potential mechanism for providing low-cost energy to energy-intensive industries. Bundling of contracts for renewable energy generators supported by CfDs would enable them to sell electricity at an average price of renewable CfD generation, rather than at marginal costs. In principle, policymakers could choose to make these contracts directly available to industrial consumers, thereby insulating them from the effects of gas price volatility.

Exemptions from policy and network costs

In addition to bringing down wholesale costs of electricity, participants also emphasised the importance of reducing policy and network costs to create a level playing field in energy costs compared to international competitors as well as between sectors. Proposals discussed included:

- Extending existing exemptions from policy and network charges currently granted to some energy-intensive industries to all energy-intensive companies in the listed eligible sectors in order to reduce disparities between UK and EU producers. It was suggested that this could be achieved by removing the current 'UK only' business level test for the exemption scheme for Energy Intensive Industries.
- Exempting electro-intensive industries from network charges, similar to Germany and France, where electro-intensive industries is exempt from 80-90% of these charges.
- Increasing the current exemption of EIIs from the renewable levies from 85% to 100%, as currently done in several European countries.
- Increasing exemptions from the capacity market levy to 100%.
- Removal of the UK-only the Carbon Price Support, as discussed above.

It was indicated that these exemptions would cumulatively remove about 95% of the (pre-war) price differential between UK compared to Germany and France. This research also suggests that the distributional impacts of shifting some of these costs away from industry would not substantially increase bills for households. Spreading the costs of exempting the steel industry from policy costs and network charges over 24m UK households adds only around 34p per year to annual household bills. Exempting all EIIs could add approximately £1.85 per year, although this would increase with increasing electricity use.

Note: on 23rd February, the government announced 'British Industry Supercharger' which would exempt energy intensive firms from certain costs arising from renewable energy obligations such as the Feed in Tariff, Contracts for Difference and the Renewables Obligation, as well as GB Capacity Market costs. The government is also exploring reductions on network charges.

The delivery mechanisms and timelines for the measures will be consulted on in the Spring, with an expectation that they'll be rolled out from Spring 2024 onwards.

Rewarding demand flexibility

Rewarding industry for demand side reduction and flexibility could reduce costs and provide wider system benefits. Some industries, such as steel, produce in batches and therefore have some flexibility in aligning production processes more closely with patterns of generation/cost. Demand side reduction and making use of industrial energy flexibility could therefore be used to balance intermittency in electricity generation more efficiently, further supported by technological innovations (e.g. batteries and boilers that can switch between gas and electricity). Other countries such as France have introduced financial rewards for demand side flexibility. However, it was noted that some industries continuous production processes and are unable to access demand-side mechanisms.

Support for Capex and R&D

While for some sectors such as steel, electrification is already a mature technology, for many industrial sectors including existing steel plants, competitive electricity prices are necessary but not sufficient to enable investments in electrification. Additional funding will be needed to support technological developments, retrofitting plants and develop confidence in electrification technologies and their supply chains.

Participants voiced concern that capex support for electrification is currently limited and not on par with support provided for other decarbonisation routes, for example for CCS, where business models include capex loans. It was suggested, that as a short-term measure, capex support for electrification should be increased, while in the longer term, mechanisms like a unified CfD for carbon savings could create a level playing field for different abatement routes.

In addition, suggestions for improving accessibility of funding included consolidating different funding pots across activities and introducing rolling applications for major funds like IETF and SIETF to allow better alignment of application windows with business cycles.

A major concern among participants was that, apart from the CCUS business models, government match funding for energy efficiency or electrification is due to end, which is creating a considerable gap with competitors. Participants strongly urged continuing capex support for industrial decarbonisation through a successor to the IETF, in line with recommendations of the Net Zero Review. It was also suggested that revenue from UK-ETS should be more clearly earmarked to fund industrial decarbonisation measures, similar to the practice in other European countries.

Bridging the innovation gap with European competitors also requires more government funding for research, development and demonstration. In addition, participants suggested measures to build confidence in using new technologies, with targeted support for disseminating evidence and case studies of successful technology deployment, as well as for demonstrating and integrating new technologies into production processes in UK companies.

Market creation and carbon leakage

In addition to bringing the price of electricity down, demand-side measures will be important to create a market for low carbon products, such as product standards and green public

procurement. Furthermore, measures such as Carbon Border Adjustment Mechanisms (CBAM) should be considered to address carbon leakage to countries without or only voluntary carbon taxes.

Investing in network connections

In addition to overcoming financial barriers to investments in industrial electrification, action is needed to provide more certainty for investors that electricity connections and local capacity requirements will be available for sites within reasonable timelines. As discussed with the section on barriers, participants strongly urged greater action on anticipatory network investment and reducing time delays, costs and uncertainties associated with obtaining planning permission as well as other consents and permits. A separate IDRIC policy roundtable on planning, consenting and permitting for industrial decarbonisation will be convened to explore this in more detail.

Participants also discussed the potential of private wires and power purchase agreements (PPAs) as a potential means for overcoming barriers related to grid connections and network charges for some industrial sites. While there are some advantages, including the avoidance of some policy and network costs, and that there is already a CfD in place for private wires which could be amended, this was not considered a viable basis for an electrification strategy for EIIs. Importantly, private wires and PPAs can affect overall competitiveness, as they are usually agreed over long periods (e.g. 15 years) over which price differentials to market prices can increase. Participants noted that even with the use of private wires or onsite generation, connection to the main grid is still required for reliability and security of supply, along with the relevant network charges. Furthermore, it was also highlighted that Ofgem are trying to limit the use of private wires.

A strategy group involving government, Ofgem, electricity generators and industrial users should be convened to map out where supporting infrastructure is needed as a priority for industrial electrification, which could then inform National Planning Frameworks and Regulated Price Controls. A similar successful exercise was carried out for electricity generation with the Electricity Networks Strategy Group in 2009[1] (and updated in 2012[2]).

Place-based approaches and collaboration

A strong theme emerging from the discussion was the need for coordinated, place-based approaches to network development and other supporting infrastructure (including technical but also social and economic infrastructure). Necessary network changes need to be mapped

1 http://www.geni.org/globalenergy/library/technical-articles/transmission/uk/our-electricity-transmission-network/1696-01-ensg_vision2020.pdf
2 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/48275/4264-ensg-summary.pdf

not only at the transmission level, but also capture local (distribution) and cross-sector requirements. Place-based approaches could also support risk management by spreading the costs and risks across members of a cluster or virtual cluster. Confederations of industries could decarbonise together by sharing an electrical connection and could be given priority in the queue for new grid connections. Place-based collaborations could also support governments in developing policy taking into account needs and options of local industry, and balancing risk. It should be acknowledged however that commercial collaborations of this nature could be complex and may be difficult to implement.

Building an adequate supply chain and ensure the quantity and quality of skills are available to support industrial decarbonisation was noted on many occasions. It was highlighted that there could be substantial economic and employment benefits for the UK if sufficient focus were given to building local supply chains.

Participants highlighted the potential benefit of learning from cluster solutions to develop dispersed solutions for electrification, which would allow creating similar synergies while addressing specific technical needs, as well as resource and skills challenges of dispersed sites. Mini-clusters could emerge around larger, dispersed emitters (e.g. cement) which are location bound due to the availability of raw materials. As current government support for industry clusters is ending, it should be considered how knowledge and experience form the current cluster program can be captured and shared going forward.

Participants also noted that place-based approaches (including industrial clusters) can exacerbate disparities between regions or between members of the same industry sector with different access to decarbonisation options depending on their location. There are also notable differences in the capacity to engage with each other and with governments and funding bodies. Concerns were voiced that if the competitive approach underpinning the current industry cluster model was to be chosen for supporting mini-clusters, this could exacerbate disparities further.

It was clear from discussion that both sectorial and place-based approaches have a role to play, and that allocation of funding for R&D should support collaboration and (timely) sharing of knowledge, especially to dispersed industrial players.

Conclusion and next steps

Electrification is among the critical routes to industrial decarbonisation. For many processes, sites and sectors electrification represents the most effective route, while for others it may even constitute the only feasible route at present.

While industrial electrification may seem like a straightforward option due to the ubiquity of electricity supply, industrial sites looking to switch from fossil fuels to electricity face numerous financial and non-financial barriers to investment in electricity technologies for their operations. Barriers discussed in this roundtable included:

- Financial barriers
  - Electricity wholesale prices, network charges, and policy costs
  - Disparities in policy support (compared to international competitors as well as disparities between industry sectors).
- Further Investment barriers
  - Policy and regulatory risk
  - Network connections and infrastructure
  - Security of energy supply
  - Supply chain and skills
  - Technology and R&D

Despite its importance, industrial electrification and the barriers involved currently do not receive equivalent policy attention compared to alternative decarbonisation routes such as hydrogen and CCS.

Participants highlighted the need for timely policy action to ensure all industrial sites and sectors can decarbonise in time to meet the UK's net zero targets while maintaining industrial competitiveness. Industry representatives in particular highlighted the critical role of clarity and predictability of policy support in helping to manage investment risk.

Potential solutions discussed included measures to reduce electricity costs for energy intensive industries (arising from wholesale prices, indirect policy and network costs), Capex support, measures to reward demand flexibility while ensuring certainty of supply, support for R&D, market creation and prevention of carbon leakage.

Furthermore, the discussion stressed the urgent need to invest in, and speed up planning and consenting processes for, expansion and capacity improvements to critical grid infrastructure. Finally, the potential for place-based approaches and cross-sector collaboration were explored, which highlighted the particular role of electrification as a critical route to decarbonisation for remote and dispersed industrial sites.

A key consideration for the implementation of any policy-driven solution will be associated timelines. Measures requiring new primary legislation can take years to come into law, and will have to compete for parliamentary time. Given the short time available to decarbonise, a two-stage approach may be necessary, one which makes use of existing powers (e.g. for grants and subsidies) as shorter-term measures while other alternative support measures are

developed (e.g. CfDs which take longer to develop and will need primary legislation). Where primary legislation is currently already in the process of being passed, the Government should consider using it as a vehicle to introduce high-level enabling powers which would allow measures to be developed in secondary legislation sooner. Since these can give quite wide-ranging powers, the use of suitable safeguards, such as sunset clauses should be considered.

Arising from this discussion, a summary table of the potential policy measures discussed, as well as their associated risks, considerations and drawbacks can be found HERE. Please note that this is work in progress and the subject of ongoing development.

IDRIC will take this discussion forward and continue fostering dialogue with policy makers, industry and academia, in particular on:

- The strengths and weaknesses of various policy measures addressing barriers to electrification across industrial sites and sectors.
- The characteristics and barriers for electrification in specific energy intensive industry sectors.

For further details and to be part of this conversation, please contact the IDRIC Policy Team at policy@idric.org

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Aldersgate Group

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BEIS/DESNZ, Industrial Electrification

British Ceramic Confederation

British Glass

Buglass Energy Advisory Limited

Chemical Industries Association

Climate Change Committee

Confederation of Paper Industries

Energy Intensive Users Group

Frontier Economics

Green Alliance

IDRIC

Low Carbon Contracts Company

Mineral Products Association

National Infrastructure Commission

Providence Policy

Scottish Government, Industrial Decarbonisation

UK Steel

University of Birmingham

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Welsh Government, Industry Decarbonisation, Energy and Steel