Paris Energy Club Spring Meeting

Thursday 16 March 2023

Summary of discussion

The Paris Energy Club gathered on March 16 and discussed 3 topical issues relating to global energy transition. The discussion which took place during the first session of the meeting tackled the way energy companies are managing their transition to net zero. Session 2 of the meeting looked at human resources in the wake of the energy transition, with the participation of young recruits and students invited to share their views on the issue. Role of nuclear energy in the reducing carbon emissions and achieving net zero target was the central topic of session 3.

Session 1: How are energy companies approaching the transition to net zero?

As the need to address global warming is becoming a pressing issue, energy corporations recognize that failing to address climate change would both undermine trust with their stakeholders - from employees to investors - and compromise their ability to deliver sustained outcomes. Decarbonization of a company's operations and, crucially, of its supply chain, is on the top of the list of actions, as for most companies such operations make up 65% to 95% of their carbon impact.

Global business is one of the fastest, most effective agents of change in the world. The history of the last century shows that market systems can rapidly innovate, reduce costs and create opportunities. The challenge is to ensure the world uses that engine to deliver the change needed for a net zero future. That is a responsibility for policy makers who set the rules which define how markets work, but it is also an imperative for investors, employees, consumers and management to recognise the urgency of the challenge and get it done.

The first session of the meeting discussed the way companies are transforming themselves in order to achieve their net zero strategies. Magnitude of transformation varies among companies; some energy companies are still heavily engaged in hydrocarbons while others have already achieved a full transformation moving away from oil and gas activities to become renewable focused (Orsted which used to be an oil and gas company is now an offshore wind company).

One consequence of such transformation is that main actors are converging to become power companies. The portfolio of technology solutions adopted by each player does have an impact on the structure of its investments in low carbon activities. There is no general principle or ideal portfolio of technology solutions today and every company is defining its own strategy and assets. As an example, ExxonMobil has been strong for years in developing carbon capture solutions, as well as the third generation of biofuels, but not very much in other renewable solutions compared to Total, BP, Shell, and the like.

The net zero perspective by 2050 requires massive changes for energy companies as they must fulfil multiple objectives simultaneously. In addition to the pressure of meeting expectations of investors and the public, energy companies must consider customers' expectations, their awareness of GHG emissions and their own footprints. By doing so, such companies are investing in solutions and products that are potentially less profitable and riskier than before. Definition of net zero targets and their evolution over time is only a first

step for energy companies as they need also to understand the kind of market they will have to address, a moving target by nature, and select technological options among large decarbonisation solutions available while mitigating risks.

Succeeding such energy transition requires sound strategic alliances, as even large companies do not have all the capabilities, skills and technologies required for their journey towards net zero.

The strategic plan to achieve net zero requires the implementation of a transformation plan along with a reorganisation of operations. As energy transition brings new businesses, innovative solutions, new technologies, etc., there is also a need to develop new competencies. Meanwhile, the investment strategy must be adjusted accordingly to meet capital and financial performance targets, which is a key element for attracting and retaining investors.

On the regulatory front, energy companies need to consider number of elements such as carbon taxes, carbon markets functioning, carbon certification, etc.). In addition, companies face the "execution gap" when setting their net zero objectives, i.e., adjust their projects and their execution, divest away from selected oil, gas and/or coal assets to redirect investment towards greener assets.

In their quest of net zero, Scope 3 is the most challenging part for oil and gas companies since the most significant quantity of emissions will come from end-users and consumers of oil and gas products.

While working at achieving their net zero ambitions, energy companies still need to maintain long-term profitability, to target sustainability accelerants (for example, carbon intensity of products) to mitigate risks and monitor market shares and value.

When setting their net zero strategy, energy companies tend to adopt a four-step approach:

1) First, an initial assessment is needed to understand the baseline.
2) Second, companies try to benchmark best practices, and learn from others with the objective of replicating successes of other companies.
3) Third, companies develop their own net zero strategy, define the framework for emission reductions, identify emission reduction levers, consider local conditions and regulations, etc. Due to the number of uncertainties surrounding such path, most energy companies develop scenarios to accommodate changes (technology, consumers behaviour, regulation, markets, etc.).
4) Ultimately, companies define an implementation roadmap, with detailed list of actions leading to transformation and reorganisation.

Playing with assets and suppliers is used to manage energy portfolio. Divesting some assets helps reducing CO2 emissions, selection of suppliers with the best carbon footprint is also used to reduce Scope 3 emissions, an approach that is already used in the automotive industry where car makers require from their suppliers to put lifecycle analysis in place to reduce the carbon footprint of their end-products.

Companies look also at ways to reduce emissions from their own operations such as energy efficiency measures, switching power sources, use of renewable power, abatement with CCUS applications, etc.

As a conclusion, the net zero strategy and approach by companies occurs in a highly uncertain world. Energy companies are taking a multi-faceted approach to the transition to net zero, with some convergence in companies' strategies, among which the fact that the net

zero strategy is a top-down approach[1]. Such approach is different from the one used in the past, as decisions in oil and gas were more of bottom-up nature where discovery of new oil and gas reserves precedes their development and production.

But there are also differences in the speed of implementation with some companies already accelerating their transformation taking risks and aiming at capturing market share as early as possible, while other players announced their intention to accelerate in the next decade and are watching market development with the intention to catch up later.

One essential element that all players (energy companies, financial markets, investors, etc.) are watching is the monitoring and reporting standards used to track paths towards net zero. Such monitoring and reporting standards are important in understanding and benchmarking net zero strategies and means of carbon reductions implemented by energy companies.

As it was the case in the past for financial reporting, it is expected that CO2 abatement reporting will be broader covering ESG, environment, social and governance. The US Securities and Exchange Commission announced last year its willingness to requires Scope 1, 2 and even 3 reporting by large US corporates. The pressure is also coming from private initiatives such as the GHG Protocol or the Science-Based Targets Initiative. Energy companies are already developing reporting standards, preparing for the time when direct financial pressure to report will materialize.

One participant indicated that announcing a net zero roadmap is not sufficient; such roadmap need to be credible. Carbon emissions reductions should not be limited to CO2 emissions reduction by selling parts of business or assets to other companies.

The same participant stressed on the need to favour the most efficient solutions in terms of CO2 reduction funding. Some measures such as energy saving certificates can help some industries but may be very inefficient for others. Therefore, policies need to shape the right tools that target and serve the most efficient projects first, keeping regulations and energy efficiency policies stable over time.

Another participant indicated that NOCs strategies need to be watched carefully given their contribution to global emissions (the 20 largest NOCs account for half of the projected upstream emissions considering only Scope 1 and 2 from 2021 to 2030). For the time being, NOCs are lagging behind and have avoided decarbonisation scrutiny that their peers the international oil companies have experienced in the last few years.

Regulation is also adding to the overall complexity, with either insufficient regulation or sometimes regulation that is unintelligible or impossible to apply.

Energy transition is exchanging working capital for fixed assets. Given the present structure of renewable energy market, investors are not able to recover capital, posing a real issue at a time when interest rates are rising.

Recent geopolitical development and the Russia-Ukraine war have placed energy security as top priority, even higher than net zero or decarbonisation objectives according to one participant, such development is blurring companies' strategies towards net zero.

One participant expressed concerns about the categorisation in terms of scope 1, 2 and 3, which he believes is not entirely logical.

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[1] The will to achieve net zero by 2040 or 2050 is expressed by the CEO, with this decision cascading to the teams who will struggle to find solutions to reach this net zero goal.

Another participant thought that the meeting discussion was very Eurocentric while Europe represents 7% of the world's population and a bit of world energy. According to him, the whole CO2 issue is essentially European, more than American or Japanese. The rest of the world is much more concerned about local and regional pollution, less about global warming.

One participant indicated that the conditions under which the IEA's net zero scenario is clearly unrealistic as the IEA clearly stated that achieving goals of such scenario requires an unprecedented level of international cooperation including all governments, companies, etc. which is not happening according to the same participant.

For years, IEA has been indicating that energy investment is insufficient and that such pattern will create problems down the road. The same IEA noted later that achieving net zero scenario targets requires stopping investment in fossil fuels.

The huge push for clean energy investment is not only motivated by achieving net zero but also because of re-emergence of energy security concerns since Russia-Ukraine war started about a year ago. According to one participant, India's ambitious hydrogen strategy is for energy security reasons (less exposure to volatile fossil fuel prices) not for net zero. In many countries, the push for clean energy has another motive: building industry capabilities locally. India for example aims at becoming the largest producer of electrolysers in the world. China is also pushing hydrogen and other clean technologies to serve industrial policy targets, jobs creation, energy security, etc.

One participant said that if the world fails to achieve net zero by 2050, 2060 or 2070, average temperature rises will be significantly higher, a situation that underlines the need for higher investment in climate adaptation.

Session 2: Human capital management in the energy transition era

As the global energy mix is rapidly changing towards an increasing share of renewables, traditional energy sectors will experience declining job opportunities. In parallel, ongoing energy transitions and decarbonisation efforts are poised to bring profound shifts in the sector's employment, including massive new opportunities for job creation in clean energy. In most cases, this will require the development of both new programmes of education, certification and vocational training along with targeted upskilling or reskilling programmes for the existing workforce. Several governments, companies and industry organisations, among other stakeholders, are already developing robust educational and skills training programmes to meet the challenges of the workforce transition.

At the same time, young graduates' approach to work conditions has changed, particularly in developed world. Young generation of workers tends to change positions and employers more often than older one. When applying for jobs, such segment puts also more emphasis on work environment and organization, as well as the hiring company societal and environmental values.

Session 2 discussed the formation of human capital, its management and the way in which energy enterprises can attract and retain human capital, a factor that is crucial as the energy transition is developing. At its start, energy transition logically focused on technology, but it is now time to pay attention to the human capital that will achieve and lead the transition.

Bodies dedicated to lifelong training are acting as fast followers, which is a clear difference with educational bodies. Training on hydrocarbons related skills are still considered with a specific focus on gas, seen as transition fuel. As the industry is digitalizing, there is a call by employers to cover technologies and methods linked to intelligent factories

to optimize industrial processes and to conduct preventive maintenance rather than curated maintenance. Climate change and energy transition are the third axis of expansion in the training domain.

One of the main challenges in the future is to adapt and accompany the existing workforce which means enlarging existing knowledge and competencies by adjacency. The second main challenge is 'Attract & Retain' which means attract not only fresh graduates but also experience mid-career staff using certification of competencies as an incentive. The third challenge that training entities face is 'Maintain & Assure' staff dedicated to fields of competency related to hydrocarbons as the energy industry will still have to meet oil and gas demand for the latter for some time.

Today, there is a lack of volume for vocational training. Large oil and gas projects are limited and most of them are still in their initial stages leading to reduced activity of professional trainings.

One of the main challenges for training institutions in the coming 20 years is the timing of the competency handover between oil and gas and energy transition technologies, which is uncertain (in 5, 10, 15 or 20 years from now?).

According to one participant, energy companies find it difficult to attract young recruits, when such companies have been (or still) involved in "oil & gas" business unless the renewable energy segment of their activities is significant and growing, though wages and salaries are still important attractiveness factors for hiring companies.

One participant underlined the importance for young graduates to know that they are going to be involved in a project that has impacts on the ongoing energy transition.

The participants also discussed the mobility of graduates from one employer to the other. One (young) participant indicated that for him, as young employee who graduated recently, he plans to work for different companies to gain in competencies and diversity of enterprises' cultures.

Job description was put forward by another participant as a particularly important factor for a job announcement. Such description needs to be precise and detailed enough to provide a clear idea of what the position is about (content, interaction with other entities within the company, etc.). The interview with the HR manager or with the supervisor to be is preferred when it is a deep dive into what that position will look day-to-day.

Once in the company, performing, exceling and staying owes a lot to recruits involvement, deep diving into important tasks and continuous education according to one participant. Giving young graduates the basis to demonstrate some ideas, enthusiasm and knowledge is also crucial.

Continuous education, internal mobility between different departments, changing roles and tasks provide a useful bridge to learn more about other teams and activities of the company. Such environment gives young recruits some reassurance and reasons to stay with their present employer.

Integration with colleagues, especially the older ones who are more experienced in the field because a gap of 30-years' experience provides a lot to younger colleagues. Designing a company's culture to be inclusive is key to attracting young graduates.

One participant mentioned the difficulty hydrocarbons sector face to retain its talents. Young employees who have the skills to join renewables-oriented companies are not only attracted by such companies because their activities are aligned with the young employees' personal values.

Asked about their preference for working in the public versus private sector, the young participants concurred on the fact that the public sector today is very much outpaced by the private sector in terms of compensation, speed, and the ability to take decisions.

One participant indicated that some employers mentioned that they found during recruitment interviews overly confident candidates in their "labour market" value and assume they can pick and choose who they want to work for, how long, that they want to end at five, have Friday free, telework on Friday and Monday!

Session 3: What role for nuclear power in energy transition?

The third session of the meeting attempts to address the following (key) question: is there a role for nuclear energy in the energy transition and is it indispensable?

As the energy transition is expected to be an electrified transition, the question of clean electricity generation capacity is central. Because nuclear energy does not directly contribute to greenhouse gas emissions, its role in providing clean electricity is put forward by its advocates. Indeed, nuclear power has avoided the equivalent of 55 gigatons of CO2 emissions over the past 50 years, equivalent to 2 years of global energy related emissions. Should nuclear energy had been allowed to continue without disruption several times, this number could have doubled or tripled in terms of carbon savings. Given global electricity demand projection by 2050, ability to achieve net zero emissions call for much more electricity, and nuclear is ideal because it has one of the lowest footprints, even lower than some of the renewables according to one participant.

In addition, nuclear energy is available 24/7 and can easily complement the intermittent renewable energy.

Others, such as those who oppose CCS in the oil and gas industry, believe that investing in new nuclear capacity will make the future energy choices much more difficult to adapt due to such stranded investments. Despite such "opposition", some countries are really thinking about turning to nuclear power to meet their energy needs, not least because they do not have that many other options. The ongoing war in Ukraine has also raised stronger focus and emphasis on domestically based supplies to serve energy security objectives.

Such renewed interest and a budding Renaissance led to see nuclear energy discussed at the COP27 last year in Egypt for the first time in decades, with nuclear energy advocates allowed in the central hall to discuss nuclear related issues. However, nuclear was not mentioned as part of low-carbon technologies in the final communiqué.

One of the participants indicated that the so-called Renaissance of nuclear energy is a Renaissance of expectations driven by R&D which is mostly outside the nuclear vendors themselves (in national laboratories, pushed by new small firms doing R&D and developing innovative designs, etc.)

However, a few key challenges remain and continue to constitute headwinds for nuclear:

- Economic competitiveness of nuclear power, especially in OECD countries, compared to alternatives such as renewables.
- Safety, to minimise the risk of release of radioactivity from operations, accidents, etc.
- Security, to protect and secure radioactive material and the facilities themselves.
- Safeguards; to prevent proliferation of nuclear weapons by using civil nuclear energy and diverting nuclear material from civil to military uses.

- Rising public opposition to nuclear power, mainly in OECD countries and mainly by the young generation, especially after the Fukushima accident. There are also concerns about the lack of demonstration of a solution for high-level or radioactive wastes.

IEA examined how a very low nuclear energy contribution to the global energy mix would translate in terms of carbon emissions; with a nuclear share of total electricity generation declining from as much as 10% in 2020 to 3% in 2050, achieving carbon neutrality by the middle of the century would require more investment for other forms of power generation and would raise consumer electricity bills on average by USD 20 billion per year to 2050.

According to International Atomic Energy Agency projections, keeping temperature at 1.5 degrees will require tripling nuclear contribution to the global energy mix compared to IEA's figures. There is however a limited potential for growth in OECD countries, with the United Kingdom, France, Poland, etc. Prospects in the non-OECD countries remain relatively bright in China, India, Pakistan, Russian Federation, some countries in Latin America, Africa, the Middle East and others. However, the future of nuclear power for the time being is going to be dependent on China, India, and Russia in terms of providing nuclear technology and to a less extent on South Korea, France and the United States.

Yet, public apprehension is beginning to spread from the OECD to other countries with social media, television and communications.

Following the war in Ukraine, energy security became another driver of nuclear. Ten energy ministers from the EU wrote to the Commission saying that they need nuclear as part of their decarbonisation. In Europe, the European Parliament approved in July 2022 a legislation that includes nuclear in the taxonomy for sustainable technology.

Some countries (Belgium, South Korea, the United Kingdom, even France) reversed their position vis a vis nuclear energy, compared to pre-war in Ukraine, from intent to phase out nuclear power plants to plans to build new ones. Germany agreed dismantle its remaining three nuclear power plants operating last year on stand-by. Japan, Australia and other countries with or without nuclear power (Slovenia, Poland, Latvia, Serbia, the Philippines) are also showing interest.

There are however possible negative impacts on nuclear industry from the war in Ukraine, which may restrict, through sanctions, Russia's ability to supply the global nuclear services.

Until recently, financial institutions were reluctant to invest in nuclear due to extremely high economic risks (large capital outlay required and significant delays), but SMRs are attracting the interest of financial institutions that have showed readiness to fund new SMRs as well as some venture capital money going into start-ups, new designs, etc.

The standard advantages set out by the IEA are:

- Economic, with lower upfront capital costs
- Modularisation
- Flexible application: to be used in remote regions or small grids, especially in developing countries.
- A smaller footprint for the nuclear plant itself, which means smaller emergency planning zone, of one rather than 20-30 kilometres.

The benefits include better affordability, shorter construction times, wider range of use and site flexibility.

17 of IEA member states that are not nuclear power countries have shown interest in SMRs, and the OECD agency has recently estimated that there are about 40 SMRs projects being pursued at the conceptual design level, about 25 at the basic and detailed design, but only less than a handful under construction with only two being operated. It is worth noting that the first two SMRs were built by Russia and China because the governments were behind them, and both are operating.

SMRs come in all kinds of types, light water reactor, high temperature, gas-cooled reactors, fast reactors, molten salt reactors, etc.

The beauty of the SMRs is that they can provide different applications even in the oil industry with petroleum refining, heavy oil at different temperatures, coal gasification at very high temperature SMRs.

Before getting to market, SMRs requires technology selection as a first step, but SMRs projects success depends on enabling conditions, whether policy, regulatory, fuel cycle, supply chain, talent, public engagement, waste disposal, economic competitiveness, etc.

Despite some questions and challenges, SMRs have a great potential to make the nuclear Renaissance happen, with nuclear energy at least doubling its generation capacity over the next 20 or 30 years. SMRs can play an integrating and linking role in a balanced way between renewables, fossil fuels, carbon capture and all energy demand sectors.

However, SMRs projects will not succeed without a long-term government policy and support. As an example, United Kingdom is launching a competition for small nuclear reactor design, aimed at choosing one or two by the end of the year. The government would then be ready to participate in the financing of the implementation if there is a design that is actually implementable.

During the last two years, regulatory and technical developments took place in some countries. National regulatory agencies, like in the United States, got ready to develop technically tailored regulations to meet the need for new advanced reactor design, including small modular reactors. The IEA initiative launched last June to harmonise and standardise regulatory procedures for all new reactors, especially the SMRs[2] is a very positive move that could help nuclear deployment.

Regulation on SMRs remains difficult due to the large number of SMRs types which calls for a standardisation. The IEA is taking the initiative on the standardisation front and there are also regional initiatives (US, Canada, etc.). However, standardisation is going to be more difficult for the non-standard, non-light water reactors, the gas cooled reactors, high temperature, the fast reactors, as they do not have a counterpart that is presently operating.

One participant was to the idea that nuclear Renaissance will only become a reality if governments support private investors in nuclear capacity as they did for renewables (subsidies in one form or another, such as feed-in tariffs, tax relief, etc.).

As far as resources (uranium) reserves is concerned, there is no problem with uranium availability; uranium is available in the earth's crust and if mines on the land are insufficient, you can obviously extract it from the ocean at a higher cost.

Very large power reactors cannot be operated in a free market as owners will be exposed to a high risk, the reason why financial institutions are unwilling to invest in large new water reactors or even advanced reactors on large sites. Smaller reactors (25, 50, 100 to a few

[2] Nuclear reactors but with a very small electricity generating capacity of 25 to 300 MWe, although they can go as low as 5 Mwe (micro SMRs).

hundred megawatts) can compete, especially they are designed to complement variable renewables (not competing with them).

One participant indicated that fast modulation is possible using nuclear power plants, with a gradient of 50 MW per minute for normal nuclear reactors. On the economic side, regulatory provisions can be found to help financing SMRs in case there is some modulation. Today, there is already a capacity mechanism that provides some fixed revenues to power plants, which are also paid for system services. Such capacities are therefore remunerated even when they are not producing, as far as they are needed for the overall balancing of the electricity system.

Overall, public acceptance remains probably the biggest challenge to the expansion of nuclear capacity as the general public is still expecting nuclear industry to demonstrate its capacity to prevent accidents and store the waste safely for a long period of time.