# SPECIAL RELEASE

INTERNATIONAL CHROMIUM DEVELOPMENT ASSOCIATION icdaCr

# MARCH 2022

## "TO LIMIT CLIMATE CHANGE, WE HAVE TO CHANGE OUR CONSUMPTION SYSTEM, IT WILL MAKE OUR SOCIETIES MORE RESILIENT IN THE FACE OF FOSSIL FUELS DEPLETION."

**Interview with MAXENCE CORDIEZ, independent expert in energy issues**

**● CAN YOU PLEASE TELL OUR READERS ABOUT YOUR BACKGROUND, ACHIEVEMENTS AND GOALS?**

I studied at Chimie ParisTech in 2014, which is a French school of chemical science and engineering and hold a master in nuclear fuel cycle. After graduated, I did technical work for the IRSN in neutron physics and thermal hydraulics, before joining the Embassy of France in the United Kingdom as deputy nuclear advisor. It was in 2016, right after the vote on Brexit.
It was a very interesting time, because of the Brexit negotiations and because the British government was beginning to realise the pressing need for them to begin investing again in their electricity and energy systems. Indeed, ***oil and gas production in the UK has been dwindling for almost 20 years, the country is aiming at phasing out coal in 2024 and most nuclear reactors will have to be shut down for ageing and safety reasons before 2030.***

The stakes were (and still are!) huge and it was fascinating to see how a country could change swiftly and profoundly several of its previous positions to better take into account its energy needs. What I witnessed between 2016 and 2018 in the UK is close to what France is experiencing today.

INTERNATIONAL CHROMIUM DEVELOPMENT ASSOCIATION www.icdacr.com

94 rue Saint Lazare
75009 Paris
FRANCE

Tel. +33 (0)1 40 76 06 89
info@icdacr.com
www.icdacr.com

Association loi 1901
Siret : 332 077 007 00059
TVA : FR 02332077007
Code APE : 8230Z

I came back to France in 2018, to work for a major public research organisation, first to carry out strategic analyses and then work on EU affairs. At the same time, from around 2017, I began communicating about energy and climate matters.

These are major topics for the whole population, if we consider the essential role energy – coming mostly from fossil fuels – has been playing in our societies and economies for the last 200 years. ***The unique prosperity growth in human history that we have experienced since then and the profound evolution of our social models are mainly due to the abundance of energy provided by fossil fuels.***

However, today we need to make profound transformations to the energy system that has been so favourable to us until now, for two reasons: climate change and the depletion of fossil fuels, especially the most accessible ones.

It may be the main challenge of our generation, if we want to keep a habitable planet for as many people as possible, while preserving as much as possible the core of the services fossil fuels got us used to. And to meet this very difficult challenge, the population, companies, politicians, NGOs, etc. must understand the stakes and the necessary systemic approach to these questions.

Therefore for almost 5 years now I've been studying these topics and trying to popularize them to the public, through articles, social networks, conferences, university courses, etc. Finally, in March 2021, I joined the expert committee of Connaissance des énergies, a French website dedicated to information and analysis around energy topics.

**THE ENERGY CRUNCH FACED BY MANY COUNTRIES RANGING FROM CHINA TO EU COUNTRIES IN LATE 2021 AND EARLY 2022, AND THE ACCOMPANYING HIKE IN ENERGY PRICES, HAS BROUGHT THE QUESTION OF ENERGY SUPPLY IN A WORLD GEARING TOWARDS DECARBONIZATION TO THE FOREFRONT OF THE DISCUSSION IN A FLASH. HOWEVER, IT SEEMS THAT, IN PUBLIC DISCOURSE, NUCLEAR ENERGY IS BEING VOLUNTARILY LEFT OUT OF THIS DISCUSSION EVEN THOUGH EU TAXONOMY REGULATIONS IS PLANNING TO CONSIDER NUCLEAR POWER AS A LOW-CARBON ENERGY SOURCE. HOW CAN WE EXPLAIN THIS MISTRUST OF NUCLEAR POWER?**

The situation around nuclear energy differs according to the country you look at. Some countries are strongly in favour of nuclear power (China, the United Kingdom, the United States, Russia, Finland, Czech Republic...), some are against without having nuclear power plants (Denmark, Luxembourg, Austria...) and some are against and intend to phase out their nuclear power plants (Germany, Belgium, Spain...).

Actually, to understand this situation, we have to go back in time a bit. For the last 10 years, fossil gas has been very cheap worldwide, partly due to the boom of shale gas in the US. ***Countries are driven much more by economic considerations than by the climate.***

Therefore, some countries with anti-nuclear feelings put the phasing out of nuclear power as a priority of their energy transition, even if it implied to keep – or even grow – a dependence

on fossil fuels. Today, the situation is changing fast for several reasons.

Conventional oil and gas discoveries have been dwindling for decades. It is increasingly difficult and costly to find deposits that are less and less interesting. For this reason, plus the oil price fall in 2014 and the growing social pressure, investments in upstream oil and gas dropped in 2015, a trend that has become more pronounced with Covid.

***The consequence is that last year (2021), discoveries have not even covered 10% of oil and gas production ... Since oil & gas demand is still growing strongly globally, it is likely that we are heading towards a shock.***[1] Hydrocarbons are going to get more expensive in the coming years than they have been during the last decade.

In addition, for gas, geopolitical aspects can make the equation even more complex, especially in Europe: ***we are witnessing the shrinking of Russian gas supply for geopolitical reasons, which is very difficult for us (not to say impossible) to replace...***

### How safe is nuclear power today and how safe are the different conventional sources of energy?

Globally, nuclear power is one of the safest sources of energy. The death rate per kWh is amongst the lowest of all energy sources. Of course accidents can (and have happened).

This is why it is essential for nuclear countries to have a safety authority, which is at the same time competent, independent of the executive power and has the power to stop nuclear installations if necessary. I will not come back to the Chernobyl accident because it was an old Soviet-era concept of reactor, unstable in certain operating regimes, built in violation of Soviet standards and the accident occurred during a test in its instability regime, which was carried out despite numerous errors and warnings.

This accident is too far from occidental standards to provide useful feedback.

***Fukushima is much more interesting because it happened in a rich and democratic country on a safer concept of reactor. A major problem it illustrated was the lack of independence of the Japanese safety authority. It was too dependent on the Japanese ministry of industry to be able to impose truly constraining measures on operators.***

For instance, the explosions that occurred in Fukushima were caused by dihydrogen. At that time, French reactors were already equipped with dihydrogen recombiners in order to avoid this risk of explosion in case of an accident. What one should keep in mind though, is that safety standards are different around the world.

They can be very high in some countries and much lower in other ones. It is like any industry: in some countries you have many standards and controls to ensure compliance and not in other countries. ***But if an accident were to happen in a country with less stringent standards and controls, if would affect the***

1 https://www.rystadenergy.com/newsevents/news/press-releases/2021-global-oil-and-gas-discoveries-projected-to-sink-to-lowest-level-in-75-years2/

***whole industry worldwide.*** To finish on that topic, a difference between nuclear energy and other energies is that accidents – even very rare – are serious and cause much more fear than other energy sources. People do not really understand what radioactivity is, nor its consequences.

***Fossil fuels may be much more lethal, yet we live with them and they are less frightening. The risk and the perception of a risk are two very different things...***

### ● When will fossil fuels run out?

***The quick answer is never.*** But it does not answer the question! ***There are still huge amounts of fossil fuels in the ground and our societies will never exhaust them, in particular because some deposits are virtually inaccessible.***

The question is therefore much more complex and it resonates with a topic we will talk about later, the concept of energy return on investment. To get energy, one needs to spend energy first: to find a deposit, to drill and get the oil for instance.

***As time goes by, the most profitable energy sources get depleted and humanity has to exploit less profitable ones.*** For a time, efficiency improvements enabled by technologies can compensate for this decline in accessibility.

But it only lasts for a while. If we focus on oil, we might be around the turning point. Indeed, conventional oil discoveries peaked in the 60s, production became higher than discoveries in the 80s and production peaked in the years 2000.

This peak is logical and was expected: ***if you earn 1,000$/month, want to spend 2,000$/month and have 20,000 on your bank account, you can indeed spend more than you earn for a time, but after a while you face a problem.***

Unconventional oil – mostly tapped in the US and Canada – has enabled the world to resume with oil extraction growth for the last 10 years. But today, this boom (with a 1 to 2 million barrels per day of growth per year) has ended.

Actually, it happened before the pandemic. The "shale" oil industry in the US was not profitable; it managed to grow by taking on debt and issuing shares. In 2018-19, investors began asking for a return and this industry reduced its investments in new drillings.

Today, the strategy is to be profitable instead of growing at all costs. We can therefore expect a slow growth of the shale oil production in the US but it is unlikely that growth will return to its pre-Covid level. And if there are many unconventional reserves elsewhere in the world, it is uncertain that the US "shale boom" can be replicated elsewhere.

It was made possible by the state-of-the art oil infrastructures in the US, a very favourable mining law, low interest rates, the fact the US own most of the oil rigs in the world, etc.[2]

2 P. Hacquard, M. Simoën and E. Hache, Is the oil industry able to support a world that consumes 105 barrels of oil per day in 2025?, Oil Gas Sci. Technol. Volume 74, 2019

***Therefore, a growing gap between oil supply and demand is expected in the coming years.*** As the International Energy Agency explained in its latest World Energy Outlook[3] , upstream oil investments are compatible with its "net zero" scenario, whereas demand is not at all following this same trend.

### ● Why is it so hard to quit fossil fuels even though we are well aware of their negative impact on our environment?

Fossil fuels are powering all the machines that produce the goods and services we got used to. This is that simple. These energy sources are very easy to use and they have a very good energy return on investment for a given level of service. Since the choice of the energy sources is mostly driven by economic considerations, it is very difficult to get rid of fossil fuels.

For instance, ***oil fuels about 95% of the world's transports because it is liquid, energetically dense, that liquid fuels based on oil can be stored for a long time, and they do not weigh anything anymore once they are burnt.***

It is very difficult to replace them in planes, ships, or even heavy road mobility. Synthetic fuels – whether they are produced from biomass or derived from hydrogen – are much more expensive because... we have to produce them (and not just tap them), which requires infrastructures and leads to energy losses.

### ● Oil and gas prices have gone up recently and even further up since the Russian military intervention in Ukraine, how such disruptions are impacting the decarbonization plan?

Can we consider the way to 2050 without considering innovation and geopolitical conflicts? Where to watch to carefully prepare a global decarbonization plan? Before thinking about decarbonisation, countries need to ensure their energy supply. This is what we are witnessing today in Europe: faced with threats on the Russian gas supply, the priority has become to reduce gas consumption in Europe, even before coal.

Therefore ***if we want our climate policies to be a success, we need to think about the geopolitical implications of our choices is key.*** Is a given dependence sustainable? And what happens if we realize in a few years that it is not? What are our fallback options?

***Some countries are intending to replace their dependence on imported fossil fuels with a dependence on imported metals, technologies or low carbon/renewable hydrogen.*** For different reasons, and not even speaking about the probability of seeing a massive future low carbon/ renewable hydrogen market emerging globally, it is a huge bet.

Who can be sure that we will be able to access key materials of technologies from countries with different political agendas and stakes in the long run?

Without defending an isolationist view of the economy, countries have to ensure a minimal domestic supply of critical materials

3 IEA, World Energy Outlook, 2021

and technologies, to be able to run their vital services whatever happens.

And ***the new dependencies the energy transition will create must be carefully considered and thought through, from the beginning.***

A positive aspect of decarbonisation policies is that reducing fossil fuel consumption will in any case represent a reduction in geostrategic dependencies. ***Dependence on fossil fuels is one of the most costly and problematic dependencies countries have to face today.***

**ON THE TOPIC OF DECARBONIZATION, IT APPEARS THAT FROM A WORLD REGION TO ANOTHER THE GOALS ARE DIFFERENT WITH SOME COUNTRIES HAVING NO PLANS TO MOVE TOWARD THE NET-ZERO GOAL, WHY? WE ALL KNOW THAT IT IS A GLOBAL ISSUE AND THAT ALL WORLD REGIONS MUST DEVELOP THE NECESSARY POLICY TO PHASE OUT HIGH-CARBON ENERGY SOURCES TO REACH THE NET-ZERO GOAL, WHAT COULD ENCOURAGE THEM TO DO? WILL DECARBONIZATION BECOME THE NEXT SOURCE OF GEOPOLITICAL CONFLICT?**

The main preoccupations can be very different in a country or another. If economic growth is still a main concern in wealthy countries, it is even more so in developing countries. When not all people have access to reliable energy, food supply, adequate medical care, etc. these are the priority. ***People think about their next lunch before thinking about the future of the planet. That is why so little is done around the world for the climate.***

This is also true in rich countries. For instance, ***in Belgium and Germany the priority is still to get rid of nuclear power, even it implies a lasting dependence on fossil gas.*** We will of course see if the current crisis with Russia changes anything but even in that case, those countries will not have acted for climate reasons.

China is trying to reduce its reliance on coal, but it is less for the climate than to answer a growing concern amongst the population regarding air pollution in large cities. ***The standard of living in China has improved much in the last two decades, and now the population begins giving more importance to its health. It is not yet the case in India for economic reasons.***

***In the US, the coal decline is not the result of policies. It is a consequence of the shale gas boom***, which has also led to the closure of some nuclear power plants. Once again, very little has been done for the climate. And if the coal decline in the last few years in some countries is the result of its loss of competitiveness compared to fossil gas, we can be happy about it but nothing guarantees that it will last. ***For instance in Europe, coal has declined in the last few years but it is strongly coming back owing to the rise of gas price.***

***There is a thing that could motivate countries to reduce their carbon footprint (ie their fossil fuel consumption): it is to realize that the access to fossil fuels will become increasingly difficult for countries, which do not have them in their ground and are heavily reliant on imports.***

As these imports will become more difficult due to a contraction in supply in the face of structurally rising demand, fossil fuels will become more expensive. It will encourage decarbonisation strategies. We had an example in France during the last oil shock (end of 2000s): oil used for domestic heating and in the industry dropped.

**During our conversation you mentioned about the net energy or EROI (Energy Return on Energy Invested) which is the amount of energy that can be used once the energy needed to produce and make it available has been removed. Comparing the different sources of energy what are the best and poorer performers in terms of both EROI and carbon emissions?**

It is difficult to compare the EROI of different energy sources providing different kind of services. For instance, electricity is a more transformed energy vector than crude oil, therefore its EROI can be lower (for crude oil, energy losses are ahead in the process, for electricity they are behind).

What we see today is that EROI of fossil fuels is dwindling. For oil, it was around 1000:1 in the US at the beginning of the 20th century. It means that for one barrel invested in drilling at that time, one could expect to get a return of 1000 barrels.

In Saudi Arabia, the EROI is around 100:1. In 2014, globally conventional oil was around 20:1[4]. Shale oil in the US was around 7:1 and oil produced from tar sands in Canada is around 4:1... It means that replacing a barrel of oil from an old conventional field with a barrel of unconventional (or deep offshore conventional) oil leads to a decline of net energy.

***What is important to keep in mind when comparing EROIs is to always do it for a same level of service. For instance we should not compare the EROI of a wind turbine and a nuclear power plant but the EROI of two systems providing electricity on demand.***

**Energy has never been under such a demand pressure, decarbonized energy is even more rare, have leading governments lacked anticipation or strategic vision on that issue? Why?**

***Governments have a short-term view, the time of one or two mandates. In addition, politicians have to compromise to get elected.*** It is difficult to draw a programme in which you ask effort (investments, energy savings, etc.) to the population to answer a problem it does not already face.

Another problem, regarding energy, is the lack of information of most governments. ***The fossil fuel industry is opaque. Reserves are not public. If you want the data, you have to buy it to intelligence firms such as Wood Mackenzie, IHS Markit, Rystad Energy... and those are very expensive.*** Governments that have a carbon neutrality target do not see the point in monitoring the fossil fuels markets with a medium-long-term prospective approach since they took the engagement to get rid of it.

They do not consider the fact that to take an engagement is not sufficient in itself to

4 Charles A.S. Hall, Jessica G. Lambert and Stephen B. Balogh, "EROI of different fuels and the implications for society", Energy Policy 64 (2014) 141-152

fulfil it. And since we are from putting enough efforts to fulfil them, we'll keep a longer than expected dependence on fossil fuels. We should therefore be more aware of the prospects.

Finally, there is the belief that "market will provide". Countries ensure that they have the necessary infrastructures on their territories (oil ports, refineries, strategic stocks, gas stations, etc.) but the fact that they will be able to import oil (or gas) is implicit.

There is a strong belief that we cannot face a long-term structural shortage. A shortage can only be temporary and the price increase will bring new fossil fuels on the market. Once again, it is only true up to a certain point. Besides, ***a price increase for fossil fuels can destroy demand: it is the ground for an economic crisis.***

### WHAT CAN BE CONSIDERED AS A DECARBONIZED SOURCE OF ENERGY? EVEN THOUGH NATURAL GAS HAS A LOWER CARBON FOOTPRINT THAN COAL ITS EMISSIONS ARE FAR FROM BEING LOW, WHY THE EU TAXONOMY DECIDED TO CONSIDER NATURAL GAS ENERGY AS CLIMATE-FRIENDLY?

***A low carbon energy source is an energy source that emits a low amount of greenhouse effect gases (CO2, methane...) on its lifecycle.*** In practice, those are most non-fossil energy sources and fossil-fuels with carbon capture and storage (even if those technologies are not yet deployed on a large scale).

***The fact that nuclear energy, wind and solar power, hydropower... are low carbon is evident: there is no combustion to produce energy and the emissions on the lifecycle are low.*** For biomass it is more difficult. Burning a tree emits CO2 that will be captured on several decades if a new tree is planted. Wood biomass will therefore have a climate impact for decades (even if it varies according to the origin of the wood). For plants, the carbon cycle is much shorter – a few month.
The carbon captured in the atmosphere by the plant will be released when the biofuel or biogas is burnt but it will be captured next year if the plant is planted again, etc. In that case, the main thing is to take care of land use: to produce biofuels with intermediate crops if positive for the climate, but if it is from principal cultures (with dedicated land), the climate benefits are much more uncertain...

### AS THE NEED FOR ENERGY IS INCREASING GLOBALLY, SOME COUNTRIES ARE COMMISSIONING NEW COAL POWER PLANTS, CAN COAL BE PART OF THE TRANSITION TO A LOW-CARBON ENERGY MIX? HOW CLOSE OR FAR ARE WE NOW FROM THE OBJECTIVES SET BY THE PARIS AGREEMENT? CAN WE HAVE IT ALL: FLOURISHING ECONOMIES AND LOW CARBON EMISSIONS?

***If every country were to respect its Paris Agreement commitments, we would still overshoot the 2°C of global warming target.*** But most countries are far from fulfilling their objectives. ***To respect the Paris Agreement, not only should we not open any more coal-fired power plants, but we should also close some of the existing ones before their end of life.***[5]

5 Charles A.S. Hall, Jessica G. Lambert and Stephen B. Balogh, "EROI of different fuels and the implications for society", Energy Policy 64 (2014) 141-152

***Coal cannot be part of our medium term energy future if we are to keep global warming below 2°C.***
***It is the most carbon intensive source of energy, therefore it is the first we should try to get rid of.***

The main difficulty is the one you mention: our way of life depends on cheap energy and coal is a very cheap fuel indeed. Even countries where coal has almost disappeared as France, the UK, Belgium... are very dependent on coal through their imports.
***Without coal, we could not have access to the current diversity of cheap goods and products. Coal is part of our purchasing power.***
And in developing countries, coal is a strong economic asset. This is why it is so difficult to phase it out: to be able to do so, we would have to question our ways of life and consumption habits.

### SHOULD WE WANT TO LIMIT OR IMPACT ON CLIMATE CHANGE, CURBING DOWN BEING ALMOST IMPOSSIBLE TODAY, WHAT WOULD BE THE IDEAL PLAN TO BE IMPLEMENTED GLOBALLY FROM NOW?

***To limit climate change, we should first acknowledge the importance of energy in our way of life and the major role of fossil fuels in our energy supply. If we continue to underestimate the challenge of moving away from fossil fuels, we will continue failing to curb our emissions.***

Then, we have to accept the fact that reaching carbon neutrality is more a societal challenge than an engineering one. ***To limit climate change, we have to change our consumption system.*** It is difficult but it as a major benefit: ***it will make our societies more resilient in the face of fossil fuels depletion.***

The less fossil fuels we will need to ensure the core services we got used to, the longer we will be able to ensure those services.
***Eventually, we have to develop massively all low carbon energies.***

There are already not that many alternatives to fossil fuels. We cannot offer to refuse some. It would only make the challenge even more difficult... and our chances of success thinner.

### WHAT IS THE ENERGY RESILIENCE OF THE WORLD OUTSIDE CHINA WITHOUT RUSSIAN GAS? ARE WE READY?

Regarding fossil gas production, Russia is second only to the US. It supplies 17% of the world's gas consumption (especially to Europe). Gas has been the fastest growing energy source worldwide in the last decade: to fuel economic growth in emerging countries and to replace coal or nuclear power in some other countries.

Weaning ourselves off fossil gas is a particularly difficult challenge, especially for Europe, where several countries have cultivated this dependence on Russia in recent years. ***It will take some time and require dramatic policy changes.***

For instance, a huge, populated and industrial country such as Germany cannot phase out nuclear, coal and gas at the same time. It is not possible. To reduce the dependence on Russian gas, ***European countries will have to strengthen their existing decarbonisation policies by speeding up the renovation***

***of buildings, helping the upgrade of some industries and accelerating the deployment of low carbon energies in general (nuclear, wind, solar, biogas...).***

It will also require some major policy changes. That's why, to take again the example of Germany, Minister Habeck announced end of February that he was considering an extension of nuclear and coal power, along with the construction of two new LNG ports...

Europe was not ready to what happened. Face with a lack of anticipation, it has now to react. LNG imports from new suppliers will increase but due to tight market, the potential is limited.

To reduce our dependence on Russian gas will require systemic and ambitious policies, both on the energy supply and demand sides.

SPECIAL RELEASE

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# MARCH 2022

# "ANY COUNTRY PREMATURELY CLOSING NUCLEAR REACTORS AND INCREASING ITS RELIANCE ON COAL AND LNG IS BEING ENVIRONMENTALLY IRRESPONSIBLE"

Dr Jonathan Cobb is Senior Communication Manager at World Nuclear Association. He is the author of the World Nuclear Performance Report, an annual digest of information on nuclear generation and construction. He also leads the Association's activities at the UNFCCC COP climate change conferences. World Nuclear Association is the international organization that represents the global nuclear industry. Its mission is to promote a wider understanding of nuclear energy among key international influencers by producing authoritative information, developing common industry positions, and contributing to the energy debate.

● **THE ENERGY CRUNCH FACED BY MANY COUNTRIES RANGING FROM CHINA TO EU COUNTRIES IN LATE 2021 AND EARLY 2022, AND THE ACCOMPANYING HIKE IN ENERGY PRICES, HAS BROUGHT THE QUESTION OF ENERGY SUPPLY IN A WORLD GEARING TOWARDS DECARBONIZATION TO THE FOREFRONT OF THE DISCUSSION IN A FLASH. HOWEVER, IT SEEMS THAT, IN PUBLIC DISCOURSE, NUCLEAR ENERGY IS BEING VOLUNTARILY LEFT OUT OF THIS DISCUSSION EVEN THOUGH EU TAXONOMY REGULATIONS IS PLANNING TO CONSIDER NUCLEAR POWER AS A LOW-CARBON ENERGY SOURCE. HOW CAN WE EXPLAIN THIS MISTRUST OF NUCLEAR POWER?**

> I do think things are changing. During the COP26 climate change conference in Glasgow in November last year we saw announcements from the UK, from France, Romania, the United States, Canada, among others, all

INTERNATIONAL CHROMIUM DEVELOPMENT ASSOCIATION icdaCr www.icdacr.com

94 rue Saint Lazare
75009 Paris
FRANCE

Tel. +33 (0)1 40 76 06 89
info@icdacr.com
www.icdacr.com

Association loi 1901
Siret : 332 077 007 00059
TVA : FR 02332077007
Code APE : 8230Z

highlighting how nuclear energy would be contributing to the energy and climate change objectives of each of those countries.

This is a change, previously some governments have been more hesitant to include nuclear energy among that climate change policy communications.

And, while I think in many countries there is in fact good support for nuclear energy, this failure to include nuclear energy among the discourse on climate change policy is one reason why there has been less public recognition of the value of nuclear energy.

There has been something of a vicious cycle because wind turbines or solar panels are more clearly used as a visual representation for low carbon generation, it is something that people recognize.

Nuclear energy has not been so prominently featured and that is one reason why it is less well known that nuclear also has an important role to play. There needs to be a more straight forward and clear communication of the energy choices we have before us. There also needs to be a clearer application of a level playing field to the development of energy policy.

**● NUCLEAR ENERGY PROVIDES ABOUT 10% OF THE WORLD'S ELECTRICITY, WHAT IS THE MAXIMUM SHARE WHICH CAN BE REACHED TAKING INTO ACCOUNT URANIUM RESOURCES?**

> Technological options mean that uranium resource is need not be a constraint on the contribution that nuclear energy can make to electricity generation.

A rapid expansion of nuclear generation using the current once through fuel cycle would need a significant expansion in the extraction of uranium and subsequent fuel fabrication.

But in terms of available resource, uranium is relatively common. Ultimately extraction from uranium in sea water would present essentially an inexhaustible supply, research in ongoing into the economic feasibility of this option.

More immediately available are technological options that would make much more effective use of existing conventional uranium resources. Used uranium fuel can be recycled extracting the uranium as well as the plutonium generated through the power generating process so that they can be formed into new fuel for conventional reactors.

Beyond this, fast reactors would make much greater use of the available uranium resource.



Technology demonstrators of such reactors are already in operation.

**● WHAT ARE THE FORTHCOMING NUCLEAR POWER PROJECTS WORLDWIDE?**
**ARE NUCLEAR PROJECTS REPLACING SITES WITH A POOR ENVIRONMENTAL PERFORMANCE?**

> There are currently 57 reactors under construction in 19 countries. Beyond that, plans are well advanced for the construction of almost 100 reactors, which could start construction in the next few years. But to make a meaningful contribution to achieving net zero by 2050 a much greater use of nuclear energy will be needed.
One potential application of new nuclear generation is to replace coal as the power source that existing coal fired power stations.

This would have the advantage of re utilising some of the existing infrastructure around coal power plants that are being closed down because of their pollution. It would also enable a more just transition for those communities that have been supported by the economic activity that coal power has provided. Construction of a new nuclear plant would generate thousands of new jobs and operation of that plant for many decades would provide hundreds more highly skilled employment opportunities.

There is also great potential to produce additional low carbon electricity for decades from existing nuclear reactors. With the majority of reactors around the world less than 40 years old, many will have the potential to be contributing to a net zero energy system in 2050.

**● THE QUESTION OF NUCLEAR WASTE IS OFTEN DEBATED, WE HAVE READ THAT FOLLOWING RECYCLING OPERATIONS, 96%**

**OF THE SPENT NUCLEAR FUEL CAN BE REUSED TO GENERATE ELECTRICITY, CAN YOU PLEASE TELL US MORE ABOUT WHAT IT IMPLIES? IS NUCLEAR WASTE BEING RECYCLED CURRENTLY?**

> Used nuclear fuel is being recycled in some cases. France is one of the leading countries in this practise. The process involves dissolving the used fuel in acid and separating it into its constituent parts.

The waste fission products can be isolated, while the uranium and plutonium can be reused. Mixed oxide fuel made from reprocessed plutonium and uranium is already being used in reactors to generate more electricity.
But this isn't being carried out with all used fuel produced. One reason for this is that uranium is readily available, so there isn't the economic imperative to recycle the fuel. But ultimately reprocessing provides an option to recycle not only conventional fuel from the current generation of reactors but fuel produced by the next generation of reactors, including fast reactors.

● **WITH FOSSIL FUELS, THE QUESTION OF AVAILABILITY OF RESOURCES FOR FEEDSTOCK IS OFTEN RAISED WITH WARNINGS THAT SUPPLY MAY NOT BE ABLE TO MATCH DEMAND IN THE NEAR FUTURE. IS THERE SUCH AN ISSUE WITH NUCLEAR POWER? WHAT IS THE STATE OF FUEL RESOURCES FOR NUCLEAR POWER TODAY AND HOW MUCH DEMAND CAN THEY MATCH?**

> While there are ample uranium resources for current needs, and technologies that can utilize that resource even further, current mining production does not supply all current demand, as secondary sources of uranium have been contributing to the front end of the fuel cycle.

A rapid expansion of nuclear generation would require an increase in all front-end fuel cycle activities, not only mining, but also conversion, enrichment and fuel fabrication.
The potential demands on front end fuel services are one issue studied by World Nuclear Association's Fuel Report, which examines potential future demand under different scenarios.



● **NEW TECHNOLOGIES, E-VEHICLES, INDUSTRIES TO TRANSFORM MINERALS INTO SUSTAINABLE PRODUCTS REQUIRE A LOT OF ENERGY. CHARGING AN ELECTRIC CAR WITH A SOURCE OF ENERGY WHICH IS HIGH IN CARBON IS NOT HELPING TO LOWER GLOBAL EMISSIONS, WE HAVE TO MAKE A CHOICE BETWEEN OUR CURRENT WAY OF LIFE, SOBRIETY OR A FAST INCREASE THE DEVELOPMENT OF LOW CARBON ENERGY SOURCES. DO YOU SEE DECARBONIZATION TARGETS AS AN OPPORTUNITY FOR DEVELOPMENT?**

> One of the key UN Sustainable Development Goals is for people to have access to affordable and clean energy. This goal also underpins many of the other goals, as access to energy is so important for many of their objectives.

It is relatively easy for those in the most energy-affluent countries to contemplate reducing energy consumption, and there are opportunities for increased efficiency. But for the majority of the world's citizens there is insufficient access to energy supplies, let alone the opportunity to reduce consumption.
We must ensure that the transition to net zero – which is an existential requirement – is achieved in an equitable and just manner. We do have the technologies to ensure ample provision of clean energy to all. And development underpinned by low carbon energy, including nuclear, will have many spillover benefits, such as lower levels of air pollution and better public health.

● **GLOBAL WARMING IS THE MOST TOPICAL ISSUE, DESPITE WARNINGS SENT BY THE GLOBAL SCIENTIFIC COMMUNITY FOR DECADES MOST GOVERNMENTS HAVE NOT TAKEN STRONG ACTIONS TO ANTICIPATE THIS PROBLEM WHICH IS CURRENTLY THREATENING OUR NEAR FUTURE, WHY?**

> I think when the issue of climate change first started being discussed in earnest thirty or more years ago, it did not seem so much of an urgent threat. The science was not as well developed, and with global emission not as high as they are today there was greater scope for a more gradual reduction.

Now there is much greater certainty in climate science, and with emission having continued to rise, much more rapid and substantial action is needed.

● **HOW LONG WILL IT TAKE UNTIL WE REACH THE OBJECTIVES SET BY THE PARIS AGREEMENT AND HOW CAN THE GLOBAL COMMUNITY SUPPORT DEVELOPING COUNTRIES WHICH ARE STILL HEAVILY RELIANT ON HIGH-CARBON ENERGY SOURCES?**

> To reach the objectives of the Paris Agreement, namely to limit the temperature increase caused by anthropogenic global warming to less than 2 degrees Celsius, and to aim for 1.5 degrees, will require global greenhouse gas emissions to reach net zero by 2050.

This will be extremely challenging, particularly because the demand for energy in developing countries is growing. Those in many developing countries rightly point out that to the fact that the economic growth achieved by developed countries have reached have been by using fossil fuels.

We can support developing countries by making available the resources needed for them to deploy low-carbon technology. Multilateral banks, including the World Bank, should help by backing investment in nuclear generation.

**● RENEWABLES SUCH AS SOLAR AND WIND ARE DEPENDENT ON WEATHER PATTERNS AND CAN, DEPENDING ON THE ENVIRONMENT, PROVE TO BE UNRELIABLE LEADING THEM TO NEED BACK UP WHICH IS CURRENTLY OFTEN PROVIDED BY CARBON INTENSIVE ENERGY SOURCES. COULD NUCLEAR POWER PLAY A ROLE IN SUPPORTING RENEWABLE POWER IN A SUSTAINABLE ENERGY MIX?**

> Nuclear power can work alongside renewables, including intermittent renewables, and support a low carbon, sustainable energy mix. Nuclear energy is already being used in a load-following capacity in France to support a growing share of generation from intermittent renewables, and variations in overall demand.

New reactor designs are being developed that could more readily provide variable output, or can divert excess electricity output into alternative uses, such as hydrogen production.

**● WHAT WOULD THE IDEAL ENERGY MIX OF THE FUTURE LOOK LIKE?**

> The ideal energy mix will vary from country to country and place to place, depending on each region's circumstances and resources. The Harmony Goal is the nuclear industry's overall target for nuclear energy's contribution to achieving net zero. The goal is for nuclear to be meeting 25% of the world's electricity demand before 2050, with the remainder of the electricity supply coming from other low carbon generation options.

Additionally, we would expect to see nuclear meeting a greater share of energy demand more broadly, with nuclear technologies being used to supply high temperature process heat to industry and lower temperature district heating, as well as being used to produce hydrogen.

**● WHAT ARE THE CHALLENGES THE NUCLEAR INDUSTRY FACES TODAY AND WHAT CHALLENGES DO YOU ANTICIPATE FOR THE FUTURE?**

> If nuclear energy is going to play a much bigger role in energy, then there will be a need for energy markets to drive investment in nuclear generation, with nuclear being recognized for its reliability and contribution to emissions reduction, just as is the case for other low carbon generation options.

There is also a need for harmonized regulatory processes, to provide a more internationally consistent, efficient and predictable nuclear licensing regime, to facilitate growth of nuclear capacity and timely licensing of innovative designs.

A lack of international standardization places unnecessary regulatory burdens on nuclear activities, and delays in the licensing of new designs hinders innovation.

**● IF NUCLEAR POWER HAS THE BEST ENERGY GENERATION TO EMISSIONS RATIO, WHY ARE CERTAIN COUNTRIES, WHO AIM TO BE LEADERS IN DECARBONIZATION, TURNING AWAY FROM THIS TECHNOLOGY AND INCREASING COAL AND LNG USAGE IN THE PROCESS?**

> Any country prematurely closing nuclear reactors and increasing its reliance on coal and LNG is being environmentally irresponsible. Germany's decision is particularly poor. In 2010 approval was given to extend operations at many of its nuclear plants, which would see some reactors operating until the mid-2030s.
However, after the Fukushima Daiichi accident in March 2011, that approval was reversed, and the last three reactors in Germany are due to close this year, even though its Reactor Safety Commission concluded in May 2011 that Germany's reactors were safe to operate.

The premature closure of reactors in Germany has meant that, despite massive investments in renewable generation, Germany remains the largest coal producer and consumer in Europe and has some of the dirtiest electricity production in terms of greenhouse gases and particulate emissions.

It is failing to meet its emissions targets, and even an accelerated coal closure plan means it expects to continue to rely on coal for electricity generation until 2030 at the earliest.

**● SOME COUNTRIES, INCLUDING FRANCE WHICH IS A LEADER IN THE FIELD OF NUCLEAR ENERGY, ARE NOW LOOKING TOWARDS SMALL MODULAR REACTORS. WHAT IS THE ADVANTAGE OF HAVING THESE SMALLER REACTORS COMPARED TO EPRS?**

> France has recently announced a programme of new large reactor construction, as well as investment to develop small modular reactors.

The two technologies each have their own complementary advantages, SMRs will add to the range of applications to which nuclear energy can be applied.

Small modular reactors can be used where the demand does not exist for a conventional large reactor, such as remote regions, where electricity demand is still relatively low or to supply direct power to a single site. There are also a broader range of technologies being developed for SMRs that will allow for more diverse applications, such as high-temperature industrial process heat supply or hydrogen production.

The smaller size of SMRs means that they will have a lower capital cost per unit. This may make it easier to secure financing for the first unit, with construction of further units following. There may also be on-site nth-of-a-kind efficiencies and cost reductions for the subsequent units.

**● IS THE USE OF MORE WIDESPREAD AND LESS COSTLY SMRS THE SOLUTION TO ENCOURAGE THE DECARBONIZATION OF DEVELOPING COUNTRIES WITH BOOMING INDUSTRIES?**

> The smaller capacities and lower initial capital cost per unit may make SMRs a more attractive option in some cases, including in developing countries.

However, in other emerging economies the rate of growth and desire to decarbonize at pace can mean that large scale nuclear reactors are the preferred option. In several new nuclear countries we have seen multiple large-scale reactors built on their first nuclear power plant.

**● HOW SAFE IS THE NUCLEAR TECHNOLOGY TODAY?**

> Nuclear reactors are very safe. When the safety of nuclear is compared with other electricity generation, looking both at the impacts of accidents and day-to-day operations, nuclear energy ranks alongside technologies such as solar power and wind turbines.

One key point is, while there have been many deaths in coal mining accidents, the main impact of fossil fuel generation arises from their day-to-day operations. Air pollution, particularly from coal-fired generation, has devastating impacts on the health of millions of people worldwide each year.


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**● How will the current sanctions against Russia disrupt the energy market and supply?**

> I think it is too early to tell. But clearly the issue of security of supply for fossil fuels has become even more of a priority for many governments and will likely influence energy policy permanently.

**● The energy needs for the ferroalloy industries are very high, most of the ferroalloys are however produced in regions which are using high-carbon energy sources and new coal-power projects are being commissioned, why is nuclear power not as developed in South Africa for example?**

> Nuclear plants of have high initial capital costs. Even if they are competitive in terms of overall generations costs, this initial capacity requirement can be a barrier to their deployment, particularly if the right financing options are not available.

Additionally, coal-fired power plants have until recently not had to account for the real costs of their carbon emissions. Although inclusion of carbon emissions costs is still not universally applied, the introduction of such measures is addressing what has been effectively a subsidy for fossil fuel generation.

**● What are your best recommendations for the world to reach its decarbonization goals?**

> My best recommendation is that both the pace and the scale of decarbonization must be accelerated. Over the last three decades, despite the political and public focus on the need to decarbonize, global greenhouse gas emissions have continued to rise and the share of fossil fuels in the global generation mix has barely changed, with more than 60% of electricity produced from fossil fuels.

This has been a huge missed opportunity, as electricity generation is one of the few sectors where a broad range of proven technologies exist, including nuclear, which could have started the world on the path to net zero much sooner. But it is not too late.

Worldwide there needs to be massive expansion in the use of all low-carbon technologies, with a very significant contribution from nuclear energy.

Planning needs to start now for the deployment of many hundreds of reactors in the coming few decades.

Only with this level of commitment to new nuclear build as part of a low-carbon energy mix can we meet both the environmental objectives of the Paris Agreement and ensure that all people have the clean energy supplies they need to achieve the UN sustainable development goals.





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# SPECIAL RELEASE

INTERNATIONAL CHROMIUM DEVELOPMENT ASSOCIATION icdacr

# MARCH 2022

## "WHATEVER RUSSIA WINS OR LOSES, ITS INVASION IN UKRAINE EXPLODED THE SYSTEM AND HAS A SYSTEMIC WORLDWIDE POTENTIAL IMPACT. "

Didier Julienne worked as C-suite executive in European, American and Russian groups specialized in strategic and critical metals. He was worldwide trader in gold, silver, platinum, palladium, rhodium, iridium, ruthenium, copper, nickel, zinc, lithium, cobalt, rare earths... with Comptoir-Lyon-Alemand-Louyot ; Worldwide Vice-President, Metals Director and Member of the Executive Committee: management of precious metals risk management, trading, marketing, procurement, audit and finance with Engelhard-CLAL, Continental Europe marketing and Country Manager with Norilsk Nickel ; Founder, Managing Director & Chairman with NeoMetal.

Didier Julienne has an excellent strategic vision of the international metals market and mining world and is now involved in industry, trade, market & finance on metals-mining & energy.

He also advises on national strategies and policies in natural resources. He elaborated various government reports, notably on business secrecy, the building of strategic stocks, critical metals and mineral policy in the Pacific Ocean. Didier Julienne has also been an independent director and Chairman of private healthcare companies.

> "The challenge of the global energy transition is to avoid that the poorest countries industrialize through the coal and that, on the contrary, they go directly to renewable energy."

Didier Julienne worked as C-suite executive in European, American and Russian groups specialized in strategic and critical metals. Didier Julienne's expertise is regularly called in the media, at conferences and in Le Monde, La Tribune, Les Échos, "Mining & Business" in DRC, Think-Tank, Iris, ParisInnovationReview.com, Choiseul, etc. (see https://didierjulienne.eu ).

INTERNATIONAL CHROMIUM DEVELOPMENT ASSOCIATION www.icdacr.com

94 rue Saint Lazare
75009 Paris
FRANCE

Tel. +33 (0)1 40 76 06 89
info@icdacr.com
www.icdacr.com

Association loi 1901
Siret : 332 077 007 00059
TVA : FR 02332077007
Code APE : 8230Z

Didier Julienne graduated from the University of Aix-Marseille, he hold HEC's EMBA, and is auditor of IHEDN, INHESJ and CHEDE.

**● OIL AND GAS PRICES HAVE GONE UP MORE RECENTLY ON SUPPLY CONCERNS WORSENED BY GEOPOLITICAL TENSIONS. HOW WILL THE RECENT DEVELOPMENTS IN THE UKRAINE AFFECT THESE MARKETS?**

> After having worked for several years at the world-class Russian mining leader, Norilsk Nickel, I have to point out a few things from reality.

Writing these lines 48 hours after the start of the Russian army's invasion of Ukraine, I can say that this war does not correspond at all to the ideas of the Russian managers I worked with. They considered the Wladimir Putin of the first mandates of the 2000s as a kind of Russian General de Gaulle because he had restored pride to the country, rebuilt its finances, reorganized its industry, rebuilt economic growth and restored dignity to the Russians after the collapse of the USSR and the Yeltsin episode.

But, like the Russian youth who have only known the Putin era, this private sector elite has largely divorced itself from the Putin "verticality of power" and its political leaders.

For them Kiev had all the advantages of a free, European capital, where Russian language was spoken and which was perceived as a potential land of retreat and asylum.

That is why the invasion of Ukraine, which will never bring 40 million Ukrainians to heel, is for them, who were not necessarily in favor of NATO's advances, as important a drama as it is a risk for Europe. For them, to destroy Kiev and Ukraine is to destroy the heart of the Slavic nation, and therefore the heart of Russia.

This danger will last as long as the government of Vladimir Putin has not been overthrown by the Russians themselves. There are already a few in the wings of power and the security services who could replace him advantageously.

In the short term, the intensity of the Ukrainian resistance already allows us to predict that Russia has lost the invasion of Ukraine. In the longer term, thirty years after the break-up of the USSR at the end of 1991, the battle of Kiev will have the unexpected effect of provoking a second implosion of the Russian house. Its territory and the natural resources it contains are heading towards a new collapse and a fragmentation between its western and eastern neighbors.

Russia is the second largest oil producer in the world, producing and exporting 10% of the world's supply. The inflationary scope of this geopolitical oil crisis is certain in the immediate aftermath of the invasion of Ukraine. It will be even more so in the future if the sanctions reduce Russian oil production and divert it to a single customer, China.

At the same time, negotiations to ease the embargo on Iranian oil could mitigate but not reverse the Ukrainian inflationary effect, as a new energy supercycle emerges with oil prices forecast to reach $125-$150 per barrel.

The situation is the same for natural gas, but it is more acute in Europe given its dependence on Russian gas.

The world consumes nearly 4000 billion m3 of natural gas each year, 90% of which is transported by pipeline and 10% by LNG carrier. The European Union consumed nearly 500Bm3, but its domestic production is declining; The Netherlands became a net importer of natural gas.

South of the Union is supplied by Algeria, North by Norway and East by Russia for 50 years. Moscow now supply 35% of European needs via the Fraternity gas pipeline since 1984, by the Yamal pipe crossing Belarus and Poland since 2005 and directly to Germany by the Baltic Sea pipe, Nord Stream1 since 2011. Nord Stream2 will not be operational for long.

In the South, South Stream delivers Bulgaria, Greece and Italy. In total including Turkey, Russian western exports are 200Bm².

The Union imported also about 50Bm3 of LNG. USA expressed strong interest in this market as they switched from a Gas Consumer Doctrine and the slogan "Energy Independence" to a Shale Gas Producer Doctrine and its new mantra "Energy Dominance".

Qatar, Russia, Algeria, USA or Norway, as every producer of natural gas exercise a powerful Gas producer Doctrine. On the other hand, Europe manages a Gas Consumer Doctrine that is expressed through influence strategies.
I have already explained these two doctrinal concepts, especially in a special article for ICDA.

Past geopolitics cut Europe in two, Western Europe in favor of Russian pipes -notably Germany and Italy, Eastern Europe favorable to US LNG tankers -notably Poland redelivering to Kiev, both piped natural gas and LNG


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were essential for phasing out coal in the Eastern European crescent from Denmark, Germany, Poland and Ukraine down to Romania.

In 2021 although prices were already historically high worldwide, this dual system worked well as long as everyone respected the terms of the contract, the producer delivers safely and the customer pays. Now thing have change, whatever Russia wins or loses, its invasion in Ukraine exploded the system and has a systemic worldwide potential impact.

All in all, in the long term Europe will refuse Russian oil& gas which will go east toward China. The Union will diversify and increase its procurement via LNG from Algeria, Australia, Indonesia, Malaysia, Nigeria, Qatar, and the United States.
European can indeed increase LNG imports in the short term. However this option should be considered with some caution.
The European LNG terminals network throughout the Union is a real asset as they have a capacity over 270 Mm3. However, European terminals cannot operate at full speed yet.
On the one hand, the number of gas loading terminals located in producing countries is unlikely to be sufficient to provide a growing global demand both in Asia and Europe.

On the other hand, the global LNG fleet is undersized to meet the growing demand in Europe and the Japan-Korea-China triangle. Besides this logistic to be resolved , ocean routes already overcrowded, such as the Channel, the Baltic Sea or the Indonesian straits, are a risk to be revisited with more LNG tankers at sea. Finally, unlike a natural gas pipeline, LNG tankers pollute as long as they will not operate on hydrogen.

## THE 2021 AND EARLY 2022 ENERGY CRUNCH HAS HIT MANY COUNTRIES, FROM CHINA TO EU MEMBER STATES, LEADING SOME COUNTRIES TO IMPLEMENT POWER RESTRICTIONS AND SENDING ENERGY PRICES UP ACROSS THE BOARD.

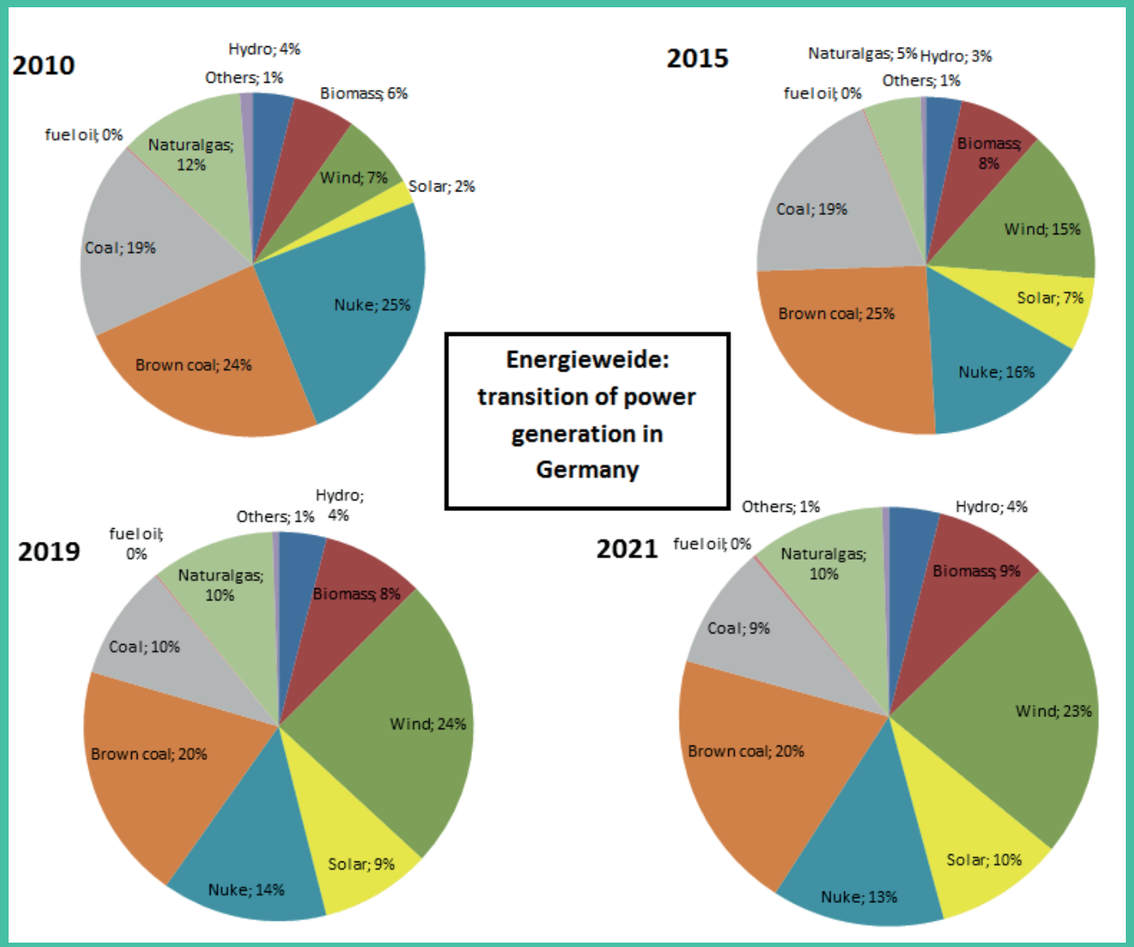
## WHAT HAS LED TO THIS SITUATION?

Two main factors are at the origin. The coronavirus pandemic caused a drop in prices generated by a crisis of underproduction and underconsumption. The first one faded more slowly than the second one, causing a first series of tension that was exacerbated by the global logistic bottleneck of the year 2021.

The second factor will have been different anti-carbon energy models that have accelerated to varying degrees, causing effects in particular in two major consumers: Germany and China.

Everyone is familiar with the Enegieweide and the deletion of nuclear, lignite and coal in German electricity production. As the diagram below shows, the development of this electricity transition between 2013 and 2021 is already remarkable.
It will be even more astounding in the future if the 55% of German electricity represented by nuclear power, lignite produced in Germany and coal imported from Russia in particular, disappears in favor of renewable energy and natural gas. A deadline has been set for 2030.

The big question is this: is it wise for Germany to base its electricity production on renewable energies when the climate model is changing and we know neither the extent of this change nor its direction nor its impact on the future yields of wind and solar power?




Another question in the near future is how much natural gas will really be used to ensure the intermittency of renewable energies? No one is able to give a reliable answer, especially because without natural gas, we would have to make up for the intermittency of renewable energies with systems that are not yet cost effective, such as stationary batteries or green hydrogen.

China has a different trajectory. Its electricity transition consists in reducing its electricity consumption, notably by ceasing to be the world's factory. This means limiting production that consumes a lot of electricity, like the cuts in production before and during the Olympic Games. Beijing also wants to achieve carbon neutrality by 2060.

It should be noted that France has already made this energy transition in the 1970s, fifty years ago, since almost all of its electricity production is decarbonized thanks to its nuclear and hydroelectric power.

## WHICH COUNTRIES ARE MORE EXPOSED TO POTENTIAL POWER SUPPLY ISSUES IN CASE A SEVERE WORSENING OF THE TENSIONS BETWEEN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**RUSSIA AND THE UKRAINE LEADS TO INCREASED WESTERN SANCTIONS AND A CUTTING OF RUSSIAN ENERGY EXPORTS?**

Because they did not manage a solid Energy Sovereignty Doctrine with backup solutions any countries bonded with Russian gas and decided to cut ties with Moscow's natural gas will meet medium term problems, IE Germany, Austria and Italy, Germany will have to accelerate RE infrastructures; maybe delay lignite and coal phase out and accept to consume more nuclear electricity either produces on its on soil or from its European neighbors.

**AMID THESE TENSIONS, GERMANY IS EFFECTIVELY CANCELLING THE DEVELOPMENT OF THE NORD STREAM 2 PIPELINE, ON WHICH IT WAS BASING MUCH OF ITS ECOLOGICAL TRANSITION STRATEGY. WHAT WILL THIS MEAN FOR GERMANY, FOR EUROPE AND FOR DECARBONIZATION TARGETS? WILL WE SEE INCREASED COAL CONSUMPTION? WILL THE USA TRY TO PUSH ITS SHALE GAS ON GAS-DEPRIVED EUROPEAN COUNTRIES?**

As a result of various policies, environmental, geopolitical and operational constraints, Germany has lost its electric sovereignty. The growth of non-pilotable renewable electricity capacities further weakens its dependence and increases inflation.

This weakening comes at a time of declining availability of cheap fossil fuels, as shown by the gas episode this winter, or coal if Germany can no longer import from Russia.

Despite its inconsistencies, which are reserved for specialists but revealed to everyone in the light of the invasion of Ukraine, Germany has always followed its energy transition plan. Now, with a war on its doorstep involving its main energy supplier, Berlin is caught in various deadlocks.



The first difficulty is political. Germany should harden its renewable energy system, i.e., increase its energy capacities and destroy its landscapes a little more by connecting wind-generated electricity from the North Sea to consumers in Bavaria via ultra-high-voltage lines, but this prospect is opposed by German civil society.

The second is economic. Germany will cut itself off from Russian gas pipelines: Fraternity through Ukraine, Yamal through Poland and Nord Stream 1 and 2 landing in Germany. This means diversifying and paying more for its gas, in particular by increasing its LNG capacity from overseas.

Let's take an example.
The cost of producing Russian gas is on average close to $0.9 per Million Btu and transporting it by pipeline costs $1.2/MBtu to the Russian border. There, a 30% tax is levied, and the Russian gas price is delivered between $2.5 and $3/MMBtu.

The production cost of US shale gas is about $3-4/MMBtu. Transportation costs when everything is going well are $2-3 MBtu: total, $7 MBtu.

However, without mentioning the word "dumping", a war economy could force the United States to consider that the cost of extracting shale oil also covers the cost of shale gas. The latter, instead of being flared and exported to Europe, would have a break-even point at zero and its selling price would then be close to its transportation cost. But there is little chance that this price configuration will last over the long term. The German gas bill could therefore double in the long term.
The third is moral. Germany will have to reverse its anti-nuclear power policy. It is important to stop zigzagging around this issue, as has been the case in France over the past few years, and to reinvest resolutely and forcefully in decarbonized electricity sovereignty in both France and Germany.

**CHINA ANNOUNCED PLANS TO GRADUALLY PHASE OUT COAL, WHICH MEANS IT WILL EVENTUALLY HAVE TO TURN TO LESS CARBON INTENSIVE ENERGY SOURCES. WITH ITS HEAVY INDUSTRIAL PRODUCTION, IS THE DECARBONIZATION OF CHINA FEASIBLE? WHERE WILL THE SUPPLY OF LESS CARBON INTENSIVE ENERGY COME FROM?**

To counterbalance the disappearance of coal, it was recently predicted that by 2030 China, Japan and Korea (without including India and Southeast Asia) will consume almost 100% more LNG than in 2018; 55% of this consumption was to be Chinese instead of 25%. Beijing will import first from Australia 45%, Qatar 11%, Russia 7%, Malaysia 7%, then from Indonesia, PNG, USA, Canada, etc.

The reversal of energy alliances that will follow the invasion of Ukraine could accelerate these forecasts if Beijing is the big natural gas winner of the war. In the long term, if the Siberian and far east of Russia fall under Chinese influence, more Russian gas will be made available for the Chinese coal phase out and less Russian natural gas will be directed to Europe. That is, the major project of interconnecting the Russian gas pipelines directed to the west with those delivering gas to China should be accelerated.

However, the centerpiece of China's strategy is not energy sourcing, but the reduction of energy consumption by abandoning the idea of being the world's factory. The pandemic is helping this

reconversion since every corner of the planet wants to regain its industrial sovereignty.
The example of steel is interesting. China's net steel exports have halved since 2015 to 52 million tons.

This is a reflection that peak steel is over in Beijing, that the great period of Chinese urbanization is over, and that civil society's demand for respectful air ecology is stronger.

Steel production will therefore decline steadily until 2030, while coal consumption will fall more sharply, as part of China's steel industry will run on waste.

With access to cleaner energy to achieve carbon neutrality by 2060 and by reducing its energy consumption, China can maintain its coal phase-out target.

## IS THERE A RISK OF AN ECOLOGICAL DECOUPLING BETWEEN INDUSTRIALIZED, CARBON-HEAVY, EMERGING MARKETS AND INCREASINGLY SERVICE ORIENTED AND "ECO-FRIENDLY" DEVELOPED MARKETS?

Every country wants to keep an industry and our duty is to eradicate coal from developed countries with a temperate climate: United States, Poland, Eastern Europe, Germany, China.

But not all countries are as lucky as Iceland or New Zealand to be self-sufficient in electricity thanks to geothermal or hydroelectric power, and the questions about solutions are serious. Invariably these require technical progress and not "less growth".

For example, after having disfigured the countryside with wind turbines, is the right conclusion really to push wind turbines offshore when this option does not address the problem of sovereignty related to intermittency? We will talk about nuclear later on.

However, there is a more urgent matter. For the sake of the planet, we should reserve modern, coal-free solutions for undeveloped countries. Just as Africa has adopted mobile telephony without going through the wireline telephone, the challenge of the global energy transition is to avoid that the poorest countries industrialize through the coal and that, on the contrary, they go directly to renewable energy.

Let's make the most profit of these resources by concentrating solar infrastructures between the 35th parallel (Morocco is doing excellent things in this field) and wind turbines in the trade winds in Africa and South Asia.

The energy transition requires us to think planet.



## THE DEVELOPMENT OF RENEWABLE ENERGY SOURCES AND THE DEVELOPMENT OF E-MOBILITY WHICH ACCOMPANIES IT ENTAILS THE EXTRACTION OF RARE EARTHS AND OTHER MATERIALS. ARE RARE EARTHS ACTUALLY "RARE"? WHO IS CURRENTLY LEADING IN TERMS OF EXTRACTION OF NECESSARY MATERIALS AND INDUSTRIAL PRODUCTION OF THESE RENEWABLE ENERGY SOURCES? ARE THE "RARE EARTHS" OF TODAY THE "RARE EARTHS" OF TOMORROW TAKING INTO ACCOUNT THE FAST DEVELOPMENT OF NEW TECHNOLOGIES?

The topic of rare earths has been surrounded since 2015 by a multitude of fake news.
The first hoax about rare earths is semantic. The name "rare earths" was not chosen because the resource was scarce, but because it was difficult to refine.
The second is geological.

Estimates indicate that there are more than 10,000 times more rare earths accumulated in the earth's crust than gold. Of course this figure hides heterogeneity among the 17 rare earths.

If the soil contains more than 62,000 times more cerium than gold, there would only be about 500 times more thulium than gold, but the latter has well over 500 times more consumption than thulium. In a word, rare earths are not rare.

It is also a geostrategic fake-news because apart from China, many countries have rare earth deposits. They are scattered all over the earth's crust.

It is also an economic infox. Prices rose speculatively between 500% and 7000% from 2007 to 2011 because of tension between China and Japan around a trawler, then they collapsed in 2012, and in 2014 they sank to levels sometimes lower than those of 2007. Since mid-2021 they have returned to higher levels, but lower than in 2011.

To imagine that the high price of rare earths is a plot by Deng Xiaoping or Chinese industry against the rest of the world is another hoax. The first to protest of the 2011 Chinese price crisis were not the Japanese or European industries, but the Chinese industrial consumers themselves, because this raw material upstream of their factories was unaffordable. Their interest was and is to have low and stable prices.

China is the leader in the production of rare earths, simply because it exploits its rich subsoil. But China is doing everything possible to protect its know-how in the refining of rare earths, because it has a technological advantage. This know-how was that of France and the United States before it became that of Beijing.

The United States has just relaunched its rare earth mining industry with new mines and refining plant in Texas. Conversely, Paris has abandoned this industry, as the only rare earth refinery outside of China was located in France at La Rochelle.

This plant was recently closed due to a strategic error linked to the “rare metal war” infox, which was widely spread in France in order to counter the advances of e-mobility.

However, as is often the case when an industrial situation is blocked, substitution efforts are successfully increasing.
A simple copper coil can replace rare earths in an electric motor and already electric models from Renault, BMW, Nissan, Toyota, Volkswagen, etc. no longer contain rare earths.

It is also useful to annihilate another fake news, the one about “rare metals” focused on the batteries of electric cars by specifying that they never contained rare earths. Moreover, nickel and cobalt, which are not rare in the earth’s crust, are already substitutable in these batteries, as is already the case in the Tesla 3.

**IN YOUR OPINION, IS NUCLEAR ENERGY A GOOD AND RELIABLE VECTOR TOWARDS DECARBONIZATION TARGETS? CAN IT HELP REDUCE DEPENDENCE ON CHINA FOR RENEWABLES?**

Nuclear electricity is obviously the solution to have decarbonized, sovereign, cheap and long-term pilotable electricity, i.e. not intermittent. It is regularly opposed to the management of radioactive waste, whereas this problem is an advantage.
Tomorrow’s nuclear power plants, equipped with generation 4 fast neutron reactors, will use the waste from today’s nuclear power plants. Not only does this process no longer need mined uranium and transform our radioactive waste stockpile into a free and immediately available fuel stockpile, but it also acts as a cleaner by burning this waste.

The volume of this stockpile is capable of supplying Europe with the equivalent of its electricity consumption for more than 2,000 years.

Such reactors are in operation in Russia and China. Faced with the invasion of Ukraine, Europe and particularly France and Germany have on their soil the sovereignty of this free fuel. What are we waiting for to consume it?




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# SPECIAL RELEASE

INTERNATIONAL CHROMIUM DEVELOPMENT ASSOCIATION icdaCr

# MARCH 2022

## "ONE MISTAKE BY ANALYSTS AND POLICY MAKERS ALIKE IN 2021 WAS TO ASSUME THAT ENERGY WOULD SOMEHOW BE INSULATED FROM THE SUPPLY-CHAIN DELAYS AND INFLATIONARY PRESSURES AFFLICTING THE BROADER GLOBAL ECONOMY"

**DAVID FYFE** is Group Chief Economist for Argus Media based in London. Argus provides pricing benchmarks, market intelligence and advisory/consulting services to the global commodity industry. David has over 30 years of oil, energy and commodity market experience. Prior to joining Argus in April 2019, he spent six years as Chief Economist for global commodity trader Gunvor in Geneva.

That was preceded by ten years at the IEA in Paris, where David headed the IEA's Oil Industry and Markets Division and edited the monthly Oil Market Report. He has also worked in oil and gas market fundamentals consulting and began his career with an engineering consortium supplying North Sea oil and gas operators. David has a degree in geological sciences and a Masters in Energy Policy & Economics from Imperial College in London.

**NATASHA FIELDING** is editor of Argus' European Natural Gas publication. She has worked on this publication for over five years and has a particular focus on the Netherlands, Germany and the UK.


INTERNATIONAL CHROMIUM DEVELOPMENT ASSOCIATION www.icdacr.com

94 rue Saint Lazare
75009 Paris
FRANCE

Tel. +33 (0)1 40 76 06 89
info@icdacr.com
www.icdacr.com

Association loi 1901
Siret : 332 077 007 00059
TVA : FR 02332077007
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**● THE ENERGY CRUNCH FACED BY MANY COUNTRIES RANGING FROM CHINA TO EU COUNTRIES IN LATE 2021 AND EARLY 2022, AND THE ACCOMPANYING HIKE IN ENERGY PRICES IS ONE OF MANY. HOW DIFFERENT IS THIS ENERGY CRISIS FROM THE PAST?**

**> David Fyfe**

This energy crisis differs from those in the past both in terms of the combination of precursors that underpin it, and also in terms of the changing dependency of the global economy on different fuel and energy forms over time.

The term "perfect storm" is over-used, but it is safe to say that the 2021/2022 combination of a prior period of subdued upstream investment, followed by a global pandemic, a resultant abrupt halt to mobility, industrial and social activity, then resurgent demand allied to supply chain bottlenecks and simmering geopolitical and trade tensions has not been seen before.

One mistake by analysts and policy makers alike in 2021 was to assume that energy would somehow be insulated from the supply-chain delays and inflationary pressures afflicting the broader global economy after the worst of the pandemic was behind us. It wasn't.

So, energy market fundamentals were already very tight, and prices highly volatile, ahead of Russia's launch of military attacks across Ukraine. With Russian oil and gas exports accounting for 10% of global petroleum trade and 25% of world gas trade, the threat of sanctions or disrupted supplies has been enough to drive prices to heights not seen since 2008.

A further difference with the energy crises of the 1970s, 1980s and 1990s however is that the oil, gas and broader energy intensity of the global economy (the amount of fuel needed to generate every USD of income) has declined sharply.

This varies by region and fuel form, but generally we today use 90% less energy for every USD of wealth created compared to the 1970s, and 55% less energy than in the 1990s. Nonetheless, the disruption and inflationary impacts caused by the current crisis could be significant, with recent estimates for global GDP growth in 2022 having been revised lower by between 0.5pp and 1.0pp compared to pre-crisis estimates.

**● HOW IS THE CURRENT CONFLICTUAL SITUATION BETWEEN RUSSIA AND THE UKRAINE AFFECTING THE OIL AND GAS MARKETS? WHAT CAN WE EXPECT IN THE COMING MONTHS IN TERMS OF SUPPLY, COST AND IMPACT ON INDUSTRIES AND ECONOMIES ALREADY WEAKENED BY**

## ALMOST 3 YEARS OF COVID-19 CRISIS?

**> David Fyfe**

For oil, the last two weeks have seen international upstream companies, banks, insurance companies, traders and shippers shy away from trade in Russian barrels due to concerns about becoming entangled in western financial sanctions.


Urals crude which normally trades within $2-$3/bbl of benchmark North Sea Dated Brent has sold at discounts of $25 or more to Brent, although trade has become very illiquid. The US and UK have subsequently announced plans to embargo Russian crude and refined products supplies.

Other European and Asian buyers have not yet directly sanctioned the import of Russian oil, with the broader Europe depending on Russian crude for 30% of its total imports and 40% dependent on Russia for its refined products imports.

Nonetheless, the "chilling" effect of the conflict on trade in Russian barrels, and the current paucity of alternative supplies with which to replace 7 mb/d of Russian petroleum exports were they shut-out of the market entirely has driven European crude prices towards $130/bbl.

**> Natasha Fielding**

In Europe's gas markets, there is yet to be any disruption to Russian pipeline gas flows, with Russia's state-owned gas supplier Gazprom underlining on 7 March that it was meeting all gas supply requests from foreign customers.

But mounting fears of a cut in Russian supplies either because of fighting in Ukraine — a key transit route to Europe for Russian gas — or as a result of sanctions from Russia or the EU have sent European gas prices soaring to all-time highs, easily breaking the previous records set in mid-December 2021. Western sanctions have so far steered clear of gas, but the European Commission on 8 March outlined plans to cut EU demand for Russian gas by two thirds, or 100bn $m^3$/yr, by the end of 2022.

The Argus front-month gas price at the Dutch TTF, Europe's benchmark gas hub, hit over €212/MWh on 8 March, which was up by nearly 140% from 23 February, the day before Russia's military attacks against Ukraine began.

● **WESTERN EUROPE, MOSTLY GERMANY, ITALY AND AUSTRIA, AND OTHER COUNTRIES IN THE REGION AROUND THE BLACK SEA ARE DEPENDENT ON RUSSIAN GAS IMPORTS. GIVEN THE CURRENT SITUATION, THE PAUSING OF "NORD STREAM 2", THE POOR CAPACITY FOR**

**REGASIFICATION OF LNG IN EUROPE, AND WITH THE COMING EXPANSION OF RUSSIA'S GAS NETWORK TOWARDS CHINA THROUGH "POWER OF SIBERIA 2" TO SUPPORT ITS PROGRESSIVE COAL PHASE-OUT, HOW WILL EUROPEAN COUNTRIES FACE THIS UNPRECEDENTED SITUATION? TO WHICH EXTENT IT WILL IMPACT THE DECARBONATION AGENDA?**

**> Natasha Fielding**

A very cautious approach to the restocking of gas storage facilities this summer will help bolster Europe's resilience ahead of the 2022-23 winter. The European Commission is preparing a legislative proposal that will require EU gas stocks to be at least at 90% of capacity by the start of October. This will require the EU to inject a record volume of gas into its storage facilities in the summer.

In order to reach that stocks target the EU will have to significantly ramp up its LNG imports compared with previous years, particularly if it is to cut Russian imports by two thirds in 2022 in line with the commission's plans. Europe will also have to increase its deliveries of pipeline gas from Azerbaijan, Algeria and Norway as much as possible.

The European Commission also envisages a reduction in Europe's gas demand, which will largely complement the decarbonisation agenda. The commission expects an increase in biogas production to reduce demand for natural gas. And energy efficiency measures, an increase in solar installations on roofs and the deployment of heat pumps could enable additional cuts to gas demand.

There is also scope for a rise in wind and solar power generation to curb gas demand from the power sector. But part of the reduction in power-sector gas demand will be achieved through burning more coal at the expense of gas, conflicting with Europe's net zero agenda given that coal-fired plants emit significantly more CO2 than gas-fired units.

● **NATURAL GAS PRICES ARE SOARING, WITH RUSSIA BEING THE LEADING PRODUCER OF NATURAL GAS AND THE FACT**

**THAT IT TAKES YEARS TO BUILD PIPELINE INFRASTRUCTURE SHOULD EUROPE WANT TO DIVERSIFY ITS SOURCES, WHAT CAN ACT AS A PLAN B TO LIMIT THE NEGATIVE IMPACT?**

**> Natasha Fielding**

It is possible for Europe to increase its LNG imports significantly compared with previous years without building new infrastructure, because its LNG terminals have been underutilised in the past. In addition to this, greater coordination between European countries and fast-tracked projects to increase the region's gas interconnections could allow for a more efficient use of infrastructure while also helping countries that are particularly reliant on Russian pipeline gas.

● **NO MORE GAS WILL LEAD TO A DRAMATIC ECONOMIC CRISIS, COULD RUSSIA TOTALLY STOP EXPORTING GAS TO EUROPE? INSTEAD OF RAISING THE THREAT OF A NUCLEAR WAR, CUTTING GAS WOULD ALREADY BE A TOUGH RETALIATION, WHY IS RUSSIA NOT DOING SO YET?**

**> Natasha Fielding**

Russia and Europe have an interdependent energy relationship. Revenues generated from energy exports help to support Russia's economy, meaning that a stop to gas exports to Europe would have considerable financial implications for Russia as well as Europe.

Russia has, however, already raised the possibility of cutting gas exports to Europe. Deputy prime minister Alexander Novak said on 7 March that Moscow could halt gas flows through Nord Stream 1 in response to EU and US sanctions. But "we are not taking that decision yet", Novak said.

● **OIL PRICES HAVE RISEN ON SUPPLY CONCERNS, INCREASED BY GEOPOLITICAL TENSIONS. IS THERE ENOUGH OIL TO MEET DEMAND? WHAT TRENDS CAN WE EXPECT TO SEE ON THE OIL MARKET IN THE FUTURE? IS OIL BECOMING A FUEL OF THE PAST?**

**> David Fyfe**

Replacing 7 mb/d of Russian petroleum exports with alternative supplies of equivalent quality on a timely basis would be extremely challenging, albeit the volumes of oil currently shut-off from the market remain substantially below that.

Attempts are being made by the US and its allies to ease sanctions on Iran and Venezuela that could enable increased supplies from those two sources, although this might entail a 3-6 month lead time before substantial volumes become available to the market.

Other OPEC producers are thought to hold less than 4 mb/d of spare production capacity, though again there may a time lag of 1-3 months before this could be activated. Moreover, OPEC Ministers have so far been reticent about accelerating the return of shuttered production to the market post-pandemic.

Nor is there a likelihood that high crude prices will enable a rapid acceleration of supply increases from US shale oil producers, hampered by tighter financial discipline and inflationary/supply chain challenges of their own.

If Russian oil export volumes fall further and crude prices remain high, it is likely that a repeat of the IEA's recent coordinated release of government strategic petroleum stocks may take place. Last week's 61mb release failed to materially calm prices,

suggesting the Agency and its member governments may need to repeat the exercise from their stockpile of 1.5 billion barrels. However, strategic stocks are a tool designed for providing short-term liquidity in a market suffering temporary supply outages. If Russian supplies remain curtailed for a prolonged period, the market can only rebalance ultimately via sustained high prices, lower economic growth and weaker oil demand.

**● HOW DO YOU EXPECT THE OIL AND GAS INDUSTRIES TO REMAIN COMPETITIVE AMIDST DECARBONIZATION GOALS AND THREAT OF DEPLETION?**

**> David Fyfe**

The last two years have highlighted the complexities inherent in a transition to a lower carbon future. Energy Transition by its very nature will take decades to achieve, will lead to unexpected market outcomes via disparate national and regional energy policy pathways, and will increase rather than decrease price volatility for energy in the short and medium term. Renewable energies alone cannot provide all of the CO2 reduction and mitigation necessary to attain net zero. Energy policy will need to better harmonize the joint goals of energy sustainability, affordability and security of supply.

Recent price volatility has illustrated the inadequacy of recent policies that have been overly reliant on simply switching supply-side investment away from hydrocarbons (oil, gas and coal) and into renewable energy. Much more adaptation investment will be needed downstream and on the demand-side, with OECD nations needing to treble annual clean energy investment this decade from prevailing levels, and developing countries needing to raise spending by a factor of seven (7) if net zero targets are to be met. That will be immensely challenging in a post-pandemic environment of higher costs of capital and rising price inflation.

Ultimately, oil and gas will remain part of the global fuel mix, particularly in the developing economies, for decades to come. That requires increased in investment in traditional fuel forms alongside increased low carbon investment and, crucially, widespread adoption of carbon pricing at levels sufficient to incentivize carbon mitigation technologies (CCUS).

# SPECIAL RELEASE

INTERNATIONAL CHROMIUM DEVELOPMENT ASSOCIATION

# MARCH 2022

## "IT IS AN UNDENIABLE FACT THAT COAL-FIRED POWER PLANTS ARE A SOURCE OF GHG EMISSIONS, BUT THERE ARE A RAFT OF CLEAN TECHNOLOGIES WHICH CAN MAKE COAL CLEAN."

**MICHELLE MANOOK**
**is Chief Executive Officer of the World Coal Association.**

She has held the role since July 2019. Previously, she was Head of Strategy, Government and Communications for Europe, Asia and Africa for the multinational company, Orica.

Her career spans over 25 years in senior roles in the energy, oil and gas and mining industries in both developed and developing markets.

She has also held non-executive director positions in energy and healthcare sectors and early in her career, worked in policy and public affairs for The Government of Western Australia.

**● THE ENERGY CRUNCH FACED BY MANY COUNTRIES RANGING FROM CHINA TO EU COUNTRIES IN LATE 2021 AND EARLY 2022, AND THE ACCOMPANYING HIKE IN ENERGY PRICES, HAS BROUGHT THE QUESTION OF ENERGY SUPPLY IN A WORLD GEARING TOWARDS DECARBONIZATION TO THE FOREFRONT OF THE DISCUSSION IN A FLASH. HOWEVER, IT SEEMS THAT THIS HAS BENEFITED THE COAL INDUSTRY, WITH COAL DEMAND GROWING 6% IN 2021 AND POTENTIALLY SET FOR NEW ALL-TIME HIGHS IN 2022 ACCORDING TO THE IEA. HOW DO YOU EXPLAIN THIS?**

> Coal's performance overall in 2021, was largely attributed to pandemic recovery based on a year-on-year growth from a difficult outlook in 2020. wOver the past six months, the world has "sleepwalked" into an energy crunch due to poor planning and nascent geopolitical tensions, Western governments rushed into embracing renewables without considering how that rush would affect the affordability, resilience, and reliability of the region's energy and power systems.


INTERNATIONAL CHROMIUM DEVELOPMENT ASSOCIATION www.icdacr.com

94 rue Saint Lazare
75009 Paris
FRANCE

Tel. +33 (0)1 40 76 06 89
info@icdacr.com
www.icdacr.com

Association loi 1901
Siret : 332 077 007 00059
TVA : FR 02332077007
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**Renewables alone are not sufficient - the U.K. and other European countries have been pushed into an energy crisis that is partly due to a wind drought which has reduced the output of the region's wind sector by as much as 15% over the past few months.**

Worldwide, coal-fired power plants still generate a greater share of electricity than any other type of fuel, and power most of China's and India's power grids.

This is why the IEA's Coal 2021 report highlights coal consumption beyond 2021 reverting to similar patterns from the previous decade – declining in advanced economies offset by growth in emerging and developing economies.

A developing phenomenon in the context of the ongoing Russian invasion of Ukraine, which could contribute to coal demand growth in the short to medium term, would be the extent of fuel substitution away from LNG in Europe in favor of other baseload energies such as nuclear and prolonged use of coal, something which Germany recently has not ruled out.

**● THE NEED FOR ENERGY FROM GROWING ECONOMIES IS ALSO FUELING THE DEMAND FOR COAL. COUNTRIES LIKE CHINA, SOUTHERN AFRICA, AND INDIA ARE HIGHLY RELIANT ON COAL, ARE GOVERNMENTS UNREALISTIC IN ASKING FOR BOTH ECONOMIC STABILITY AND GROWTH ALONG WITH DECARBONIZATION? CAN WE HAVE IT ALL?**

This is not an unrealistic characterization but it will be informed by individual decarbonization pathways and realistic considerations existing energy systems. Decarbonization does not equate to "no coal", especially not for coal producing and consuming countries.

ASEAN Centre for Energy (ACE) and World Coal Association (WCA) studies confirm that clean coal technology is affordable and often more affordable than renewables. We are happy to share this analysis.

Also, due to their intermittent nature, renewables cannot provide the same level of security of power supply as coal.

Yes, countries such as India expects to invest 4 trillion rupees ($54.5 billion) in clean coal projects over the next decade. Clean coal technologies are currently being developed in China have had many successes so far. Ordering more coal-fired power plants larger than 600 MW and new orders for supercritical and ultra-supercritical systems are increasing rapidly.

**● ACCORDING TO THE IEA, COAL-FIRED POWER PLANT PROVIDES AROUND 37% OF THE WORLD'S ELECTRICITY, MAKING IT THE MAJOR FUEL FOR POWER GENERATION. HOW WILL THE RECENT ANNOUNCEMENTS FOR DECARBONIZATION TARGETS AFFECT COAL'S POSITION IN THE MARKET?**

**The WCA Climate Change Commitment**

> The WCA recognizes the Paris Agreement which articulates the needs for all fuels and all technologies to be used in meeting climate change targets.

> The WCA has worked with countries that have outlined a role for coal in their NDCs

We believe there is a clear pathway towards zero emissions from coal, which starts with clean coal technologies of which there are many.
Greater action, investment and commitment is needed to implement clean coal technology.

**● WESTERN EUROPE, AND OTHER COUNTRIES IN THE REGION AROUND THE BLACK SEA ARE DEPENDENT ON RUSSIAN GAS IMPORTS. GIVEN THE CURRENT SITUATION, DO YOU EXPECT GERMANY TO RESTART COAL-FIRED POWER PLANTS?**

Germany has announced the phase-out of coal-fired power by 2038 at the latest. However, the current situation with Russia forces Germany to change course on its type of energy as about 55% of Germany's gas imports come from Russia, as well as approximately 50% of hard coal and 30% of oil.

But concerns about German energy security are now calling everything into question. The Economic Ministers of the sixteen German states have already called for an examination of longer operating times for both coal-fired and nuclear power plants.

It is still too early to say how this will play out, and it would be imprudent of us to try and predict outcomes.

**● COAL-FIRED POWER WAS AT THE ORIGIN OF THE INDUSTRIAL REVOLUTION IN THE WESTERN DEVELOPED COUNTRIES, WHY IS IT SO REJECTED TODAY?**

The coal industry has done very little to change the narrative and we can take some responsibility for that. The industry has failed to sufficiently communicate coal's greater values and the clean coal technologies which exist; the technologies which qualify coal as legitimate,

verified (by climate science) clean energy option for the future.

Clean coal technology is an obvious partner to renewables when solar and wind power cannot perform at pique. The recent European summer has demonstrated this.

- **China has been very vocal in announcing its decarbonization plans, however it remains the largest consumer (over half of global demand), producer and importer of coal and it recently postponed its carbon peak to 2030. Will China remain a major driver for coal demand?**

Yes, clean coal technologies are currently being developed in China and China has had many successes so far. A new major coal-fired power project in northern China has partially gone into operation after a 1,000-megawatt unit began generating electricity in late December.

Chinese President Xi Jinping said China's green transition could not be achieved overnight and its coal-dominated energy structure was unlikely to change fundamentally in the short term. Article

- **India is also a large consumer of coal. With China's contribution, it equates to two-thirds of global demand. Their combined population is close to 3 billion people, and both countries are still developing their industries, indicating that the future will be energy intensive. . How can this be reconciled with global net-zero targets?**

The world needs to acknowledge that renewables alone will not solve all energy fallibilities.

All countries have their own, unique clean energy pathways. Let's respect that. Timing might differ but the goal is the same. We need to acknowledge that coal with clean coal technologies can support renewables as a partner not a protester, to produce clean energy.

We need to realise coal is not going away. – By 2030, coal is expected to be India's most commonly used commodity. Coal will account for approximately 48 per cent of primary energy use by 2040. What the world needs now are clear policies and financial instruments which highlight clean coal technologies – and we witnessed this instruction at COP26.

India's Finance Minister announced in February 2022 that the setting up of four coal gasification plants by Coal India marks the maturing of the country's coal sector and establishes its readiness for a clean energy future.

- **To which extent can coal contribute to decarbonization? Which economic impact will a sudden phase-out/slow-down have?**

A phase-out of coal will increase the amount you pay for energy bills from West to the East, from the North to South.

Over 1.5 billion people have been given energy access to coal for the first time between 1990 and 2010. Coal supports people's livelihoods, providing jobs, fuel, heating and food. It provides affordable electricity to support businesses and services, such as healthcare and education. Coal remains the only viable choice for critical industries, such as steel, cement and aluminium.

It is an undeniable fact that coal-fired power plants are a source of GHG emissions,

but there are a raft of clean technologies which can make coal clean.

They include:

> CCS
> HELE
> Coal gasification
> Coal to Hydrogen
> Integrated gasification combined cycle (IGCC)
> Coal to biomass
> Pollution control technology

These technologies significantly reduce greenhouse gas emissions up to 99.99%

**● WHAT IS THE INDUSTRY'S POSITION ON ENVIRONMENTAL CHALLENGES AND WHAT ARE ITS STRATEGIC OBJECTIVES IN THIS REGARD? IS THERE ANY AGREEMENT IN THE INDUSTRY THAT COAL SHOULD BE PHASED-OUT/SLOWED DOWN?**

WCA Members acknowledge climate change and have been stoic supporters of the Paris Climate Change Agreement. Members adhere to a rigid set of responsible coal principles as stewards of an industry in transition towards a sustainable net emissions future.

**● TO DATE, OVER 100 (AND COUNTING) GLOBALLY SIGNIFICANT ASSET MANAGERS/OWNERS WITH ASSETS UNDER MANAGEMENT (AUM) GREATER THAN US$50 BILLION, AND BANKS AND INSURERS/REINSURERS WITH AUM OR LOANS OUTSTANDING LARGER THAN US$10 BILLION, HAVE ANNOUNCED THEIR DIVESTMENT FROM COAL MINING AND/OR COAL-FIRED POWER PLANTS, WHAT DO YOU THINK OF THESE ANNOUNCEMENTS? HOW WILL IT IMPACT INDUSTRIES AND ACCESS TO ENERGY?**

Forecasts show that demand for coal will continue. The focus must be on how we can access the benefits of coal while

minimising environmental impacts.

Clean coal technologies have a vital role to play in ensuring we can meet our future energy and infrastructure needs as cleanly and sustainably as possible. This requires responsible investment decisions and balanced energy policies.

An appropriate response to any risk is a well-diversified portfolio that should include all fuels and technologies, including clean coal technology. In our experience, especially in emerging markets, investors are adapting to this change.

### WHAT ARE THE CHALLENGES AHEAD FOR BOTH ENERGY DEMAND AND ENVIRONMENTAL ISSUES FROM A COAL PERSPECTIVE?

The main challenge is investment. Coal needs responsible investment linked to Sustainable Development Goals (SDGs) and a greater understanding about how we cannot just switch it off and hope for the best.

Energy is an enabler of development. Without effective investment of capital in the real economy – particularly energy infrastructure – societies cannot prosper.

In addition, without investment in clean coal technologies, we will continue to face environmental challenges, as we are facing now and realising, that renewables alone is not the answer.
All fuels and technologies are needed but that can only happen with investment.

# SPECIAL RELEASE

INTERNATIONAL CHROMIUM DEVELOPMENT ASSOCIATION icdaCr

# MARCH 2022

# "DECARBONIZATION GOALS ARE AN OPPORTUNITY FOR COUNTRIES TO RADICALLY RETHINK AND IMPROVE THEIR ENERGY SECURITY"

**ARJUN FLORA,**
**Director, Energy Finance Studies, Europe.**
Arjun leads the Institute of Energy Economics and Financial Analysis research program in Europe, covering various topics relating to the energy transition. He is a UK-based analyst and previously worked in energy technology investment banking at Alexa Capital and Jefferies in London. He also holds a Masters degree in Engineering from the University of Cambridge.

The Institute of Energy Economics and Financial Analysis (IEEFA) examines issues related to energy markets, trends, and policies. The Institute's mission is to accelerate the transition to a diverse, sustainable and profitable energy economy (https://ieefa.org/).

● **THE 2021 AND EARLY 2022 ENERGY CRUNCH HAS HIT MANY COUNTRIES, FROM CHINA TO EU MEMBER STATES, LEADING SOME COUNTRIES TO IMPLEMENT POWER RESTRICTIONS AND SENDING ENERGY PRICES UP ACROSS THE BOARD. IS THIS SITUATION THE CONSEQUENCE OF THE CHAOS SEEN IN 2020, 2021 AND NOW 2022 OR THE RESULT OF AN ACCUMULATION OF ISSUES AND LACK OF ANTICIPATION? WHAT IS AT THE ROOT OF THE ENERGY CRISIS?**

> The energy crunch is a result of multiple factors combining together, a "perfect storm", but primarily it has been driven by global mismatches between energy supply and demand, during a period of constrained supply and rebounding demand after the lifting of restrictions related to the Covid-19 pandemic.

INTERNATIONAL CHROMIUM DEVELOPMENT ASSOCIATION www.icdacr.com

94 rue Saint Lazare
75009 Paris
FRANCE

Tel. +33 (0)1 40 76 06 89
info@icdacr.com
www.icdacr.com

Association loi 1901
Siret : 332 077 007 00059
TVA : FR 02332077007
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In Europe, reduced gas flows from Russia in particular combined with increased competition from Asia drove up prices – but at the root of it we are simply far too dependent on gas for power and heat.

**● Oil and gas prices have gone up more recently on supply concerns worsened by geopolitical tensions. How will the recent developments in the Ukraine affect these markets and the Western world's decarbonization goals?**


> It is important to separate the immediate or short term effects from longer term developments. Immediately there is a need for countries, especially in the EU, to reduce their dependence on Russian exports of gas, coal, oil and Uranium. This could temporarily lead to some regressive effects in the context of decarbonization, for example countries generating more power and heat by burning domestic lignite or woody biomass.

However in the longer term to 2030 and beyond, this conflict is likely to accelerate Europe's energy transition towards cleaner power, with a greater focus on energy efficiency and other demand-side solutions as well as renewables.

The invasion of Ukraine has brought home in a very direct and uncomfortable way the danger of having too much dependence on any single external supplier for energy, redefining our concept of energy security. In the new security-conscious, high-cost, inflationary economic environment that we find ourselves in, it is becoming harder to justify continued plans for longer term investments into gas, nuclear and coal-based power, which will only serve to increase exposure to geopolitical risks and the price volatility of global markets.

**● Are decarbonization goals also an opportunity for countries to become independent in terms of energy? Germany could be severely affected by the conflict in Ukraine, with Russia limiting its gas supply and therefore affecting Germany's ecological transition plan, what can we do to be less dependent?**

> Yes, decarbonization goals are an opportunity for countries to radically rethink and improve their energy security.

There has already been some encouraging direction offered on how to quickly become less dependent on Russian gas, for example in the RepowerEU communication

of the European Commission, or the 10-point plan of the International Energy Agency (IEA). I agree that our focus should be on increasing efficiency and electrification on the demand-side, as well as building in much more renewable generation on the supply-side.

Longer term we need more investment in long duration energy storage, and decarbonizing 'hard-to-abate' industry sectors.

We must not repeat our past mistake of only diversifying gas supply routes (e.g. see IEEFA analysis of Europe's failed strategy of diversification over the last decade, https://ieefa.org/ieefa-eu-gas-diversity-of-supply-or-diversity-of-routes/). On this point Germany and the EU are unfortunately heavily influenced by incumbent industry lobby groups, as we saw with the recent greenwashing of the EU taxonomy.

This already looks like a mistake in the light of unprecedented high gas prices and security concerns around nuclear plants in Ukraine. In the case of gas, the European Network for Transmission Operators of Gas (ENTSO-G), has successfully resisted attempts at regulatory reform in recent years to remain largely in the driving seat for our longer-term energy planning, despite its clear conflict of interest – gas TSOs are ultimately incentivized to build more pipelines. In my view it will be very difficult to become less dependent on gas externally, without addressing this internal co-dependency between incumbent industry lobbyists and political decision makers.

● **ENERGY PRICES WERE ALREADY IN AN UPWARD SPIRAL, IT'S LIKELY THAT THIS CRISIS WILL SEE THEM SKYROCKET WORLDWIDE. TO WHICH EXTENT IS THE**

### SITUATION SUSTAINABLE? WHAT ARE THE POSSIBLE OUTCOMES AND HOW WILL IT AFFECT PEOPLE AND BUSINESSES?

> The situation is not sustainable and that is why governments have been scrambling for emergency policies to reduce pressure on the most vulnerable energy consumers. The old commodities adage, that 'the cure for high prices is high prices' – i.e. that at some point they will force demand destruction – does still apply but is not to be encouraged, as this could happen in damaging ways.

The worst-case scenario is that bad decisions actually lead to greater energy poverty, economic recession and eventually public/political unrest.

In the best-case scenario, short term measures will alleviate the worst of the pain without delaying or distracting from the longer-term imperative to rapidly re-configure our energy consumption, away from increasingly costly, volatile (and outdated) fuel sources controlled by geopolitical cartels, and towards a more distributed and equitable energy system that can benefit rather than burden future generations.

There are many obstacles to this, but I remain optimistic that they can and will be overcome.

### WHAT ENERGY DIVERSIFICATION OPTIONS DO EUROPEAN COUNTRIES HAVE AT THE MOMENT? CAN EUROPE REALLY LIVE WITHOUT RUSSIAN GAS? WHAT WILL IT IMPLY?

> European countries vary greatly in their national energy mixes and some are more dependent on gas than others. The truth is that it is not going to be easy to unwind years of in-built dependency on Russian gas. The good news is that many of the solutions for doing so exist today and have been talked about already for many years (buildings efficiency, heat pumps, renewables, batteries, etc.). What has been lacking

is the political will to deploy these at sufficient scale.

**● SOME ARE SAYING THAT THE US MAY NOW INCREASINGLY TRY TO SELL ITS LIQUIFIED SHALE GAS TO EUROPE IN COMPENSATION OF THE LOSSES OF RUSSIAN GAS. IS THIS SCENARIO CREDIBLE AND SUSTAINABLE?**

> A sales and marketing push can be expected, but it is not credible, primarily for reasons of timing and cost.

Further buildout of LNG infrastructure carries risks for both sides. Any new US LNG plants will take at least three years to complete. By that point, Europe will have been working hard for three straight years to reduce its gas consumption and find alternate supplies.

And hopefully, by then, today's crisis will be in the rearview mirror. At that point, it's not clear whether US LNG will actually be needed -- and it could be an expensive albatross, with both renewables and pipeline gas providing cheaper sources of energy to Europe. In that scenario, LNG would wind up being an expensive, long-term solution to what could be a short-term problem.

Over the next few years as Europe deals with its gas supply issues, we're likely to see sustained high LNG prices across the globe, as Europe and wealthy Asian nations compete for a limited pot of LNG.

There's simply no way to ramp up global supplies in the short term, beyond the plants that are already under construction. Moving new supplies into the market will take years. Until then, this dynamic will likely drive-up LNG prices, which in turn force developing Asian nations to rethink their LNG growth strategies.

The crisis has effectively revealed reliance on global LNG markets as an unstable and expensive pathway for economic development, which could permanently suppress demand in the very regions that the LNG industry was counting on for long-term demand growth.

**● EUROPE, AND ESPECIALLY FRANCE, USED TO BE A LEADER IN NUCLEAR POWER. WITH THE CURRENT CRISIS, WE'VE SEEN INCREASED POPULARITY OF NUCLEAR ENERGY AS A MEANS TO ENSURE ENERGETIC INDEPENDENCE, WITH FRANCE, THE UK AND POLAND NOW FIRMLY BEHIND INCREASING NUCLEAR POWER CAPACITY IN THE REGION. GERMANY CONTINUES TO BE RELUCTANT DESPITE ITS EXPOSURE TO RUSSIAN FOSSIL FUELS. WILL WE SEE CONTINUED PUSHBACK FROM GERMANY AND OTHER COUNTRIES ON THIS QUESTION? HOW CAN WE EXPLAIN THIS PUSHBACK?**

> The problem with new nuclear generation is that it is prohibitively costly and slow to construct. It is one thing advocating for more nuclear, but another getting a project sited, financed, constructed and commissioned successfully.

Take the UK as an example: in 2009 the UK government proposed 10 sites for new power plants, saying the first would be operational by 2018. Now it is 2022, and only one of them has entered construction – Hinkley Point C – and that is billions of pounds overbudget and years behind schedule. This sort of project performance is the rule rather than the exception for new nuclear power plants projects around the world.

The UK government has now been trying to bring

in legislation to enable a 'regulated-asset-base' model of financing to support this and future projects. RAB-based remuneration is not a new concept, it has been used for other infrastructure including many of Europe's gas pipelines and LNG terminals, but it effectively involves passing on risk to consumers and/or taxpayers.

press for more political support. But simply put, large-scale nuclear is currently an economic no-go. This has led the nuclear industry to pivot towards so-called 'small modular reactors' or SMRs. However, this technology remains unproven, and I recommend readers look up a recent report by some of my US colleagues on the topic (https://ieefa.org/smr/).

but future development is held back by the factors mentioned above, plus the difficulty in siting and planning for the safe disposal of radioactive nuclear waste. In addition, nuclear has traditionally been seen as a 'baseload' technology, as it needs to run most of the time to be cost effective, and is less able to easily ramp power up and down. In the emerging paradigm of higher renewable penetration and grid flexibility, there is a question as to whether nuclear plants will be able to operate as required.

I would say the recent fears around Russian seizure of Ukrainian nuclear facilities highlight the security risks of nuclear power plants rather than making them more popular – they are a clear target for terrorists. But as for US LNG above, French and other nuclear industries are taking the crisis as an opportunity to

**● WE'RE VERY FOCUSED ON RUSSIA AND EUROPE AS THE MAIN PLAYERS OF A CRISIS WHICH WILL HAVE DEFINITE REPERCUSSIONS ON ENERGY PRICES AND THE GLOBAL ECONOMY, BUT HOW IS THE REST OF THE WORLD DEALING WITH ENERGY ISSUES AND DECARBONIZATION TARGETS?**

**● IN YOUR OPINION, IS NUCLEAR ENERGY A GOOD AND RELIABLE VECTOR TOWARDS DECARBONIZATION TARGETS? CAN IT HELP REDUCE DEPENDENCE ON FOSSIL FUELS AND DEPENDENCE ON OTHER COUNTRIES?**

> Nuclear energy has helped some countries decarbonize,

> Decarbonization is a global challenge, and energy is a global problem. One big development in recent years is that over 80% of global GDP is now covered by national net zero targets[1]. While some major economies like India and China still depend on coal, they are also investing heavily in low carbon technologies. IEEFA has

1 https://www.ox.ac.uk/news/2021-11-01-80-world-economy-now-aiming-net-zero-not-all-pledges-are-equal

analysts tracking developments in various countries around the world, I would encourage readers to explore some of their work for more information.

**● DECARBONIZATION SEEMS TO BE A DEVELOPED COUNTRY QUESTION WHILST DEVELOPING COUNTRIES ARE RATHER FOCUSED ON ECONOMIC GROWTH AND FEEDING THEIR POPULATION, IS THERE ANY INTERNATIONAL COOPERATION TO SUPPORT THE ECONOMIC DEVELOPMENT OF DEVELOPING NATION WHILST PROVIDING ACCESS TO CLEAN ENERGY? WITHOUT SUCH PLAN WE HAVE DOUBT THESE COUNTRIES WILL GIVE-UP ON COAL-POWER. WHAT ARE YOUR VIEWS?**

> In my view this was one of the big failures of COP26 – developed countries should be doing more to contribute to support the decarbonization of developing countries.

**● OVERALL, ARE THE ANNOUNCED DECARBONIZATION TARGETS COMPATIBLE WITH CONTINUED INDUSTRIAL GROWTH? SHOULD GROWTH BE EXPONENTIAL, OR SHOULD WE CONSIDER PROSPERITY DIFFERENTLY?**

> I view them as compatible, in particular for developing countries with good resources if they are supported in 'leapfrogging' gas to build a renewables-based, electrified energy system and economy. There are whole industries waiting to be scaled up around the solutions that can help drive decarbonization, such as heat pumps.

Considering our definition of prosperity, I think it is already becoming clear that shareholder value and GDP growth cannot be our sole barometers for success and prosperity. ESG considerations are becoming increasingly important in finance, and it was notable that the head of BlackRock, the world's largest asset manager, announced the launch of its Center for Stakeholder Capitalism in his annual letter to CEOs this year.[2]

Overall, there is movement towards incorporating sustainability in all aspects of corporate and industrial decision making. This means considering environmental health and social equity as well as the usual economic factors, which is frankly long overdue – we need to stop ignoring costs simply because they occur far in the future, are more difficult to quantify, or affect poorer communities.

**● WILL WE EVER REACH THE GOALS SET BY THE PARIS AGREEMENT, WHAT DO WE NEED TO CHANGE NOW TO GET THERE?**

> I remain optimistic – what we need is more political will and public demand for change. This is happening naturally as we all experience the growing negative effects (including financial costs!) of climate change and pollution, but we need to get ourselves out ahead of these effects, or we will be too late.

This is where I believe civil society, consumers and investors can really help move things forward, to overcome the inertia of existing vested interests – we cannot simply leave it to the heads of state. Thankfully it seems the younger generation are passionate about this, so there is hope!

2 https://www.blackrock.com/corporate/investor-relations/larry-fink-ceo-letter

● **WHAT IS THE IDEAL GLOBAL ENERGY MIX TO ALLOW FOR SUSTAINABLE AND PROFITABLE GROWTH, IN COMPLIANCE WITH GLOBAL CLIMATE CHANGE TARGETS?**

> There is no 'ideal mix' as such, as it is dependent on our collective consumer behaviors and energy consumption. Individual countries and regions must optimize their own energy mix in line with their resources and environment.

This has always been happening, but today we have access to low-cost renewable generation and other digital technologies, plus a much greater knowledge of the negative effects of our older, incumbent energy technologies.

In my view an ideal mix would be one that maximizes the use of these newer inventions to decentralize and democratize our energy system and better solve the energy trilemma of security, equity and the environment.

# SPECIAL RELEASE

INTERNATIONAL CHROMIUM DEVELOPMENT ASSOCIATION icdacr

# APRIL 2022

## "WE EMBRACE THE TRANSITION BOTH BECAUSE IT IS THE RIGHT THING TO DO, BUT ALSO BECAUSE WE BELIEVE WE CAN THRIVE IN IT."

**IMAN HILL**

**Executive Director, IOGP**

Iman Hill was appointed Executive Director of the International Association of Oil & Gas Producers (IOGP) in December 2020.

She is a petroleum engineer with 30 years' experience in the oil and gas industry with extensive global expertise in the technical and commercial aspects of the petroleum business, in particular field development, capital projects and production operations. Iman's experience has been gained in the Middle East, Africa, South America, the Far East, and the North Sea in diverse settings from onshore to ultra-deepwater.

Iman began her career with bp and worked in a variety of technical positions before becoming a Senior Reservoir Engineer.

In 1995 she joined Shell where she held positions such as Senior Regional Adviser Africa to the E&P CEO and the Chairman of Shell, as well as GM Shell Egypt and Chairwoman of Shell Companies in Egypt.

As Senior Vice President Brazil, Iman also led BG Group's first ultra-deepwater development of the supergiant Santos Basin pre-salt fields.

She went on to become SVP Developments and Operations, driving top quartile performance in operations and well engineering. Iman also held positions of VP Africa at Sasol and Technical Director, GM UAE and President Egypt for Dana Gas in the UAE, where she also ran an Egyptian joint venture in her role as Managing Director and Board member of The Egyptian Bahraini Gas Derivatives Company.

Iman also serves as Non-Executive Director on the Board of United Oil and Gas. She is as non-executive Independent Board Director of Oil Spill Response Ltd (OSRL).

She is Egyptian and a mother of five.

INTERNATIONAL CHROMIUM DEVELOPMENT ASSOCIATION www.icdacr.com

94 rue Saint Lazare
75009 Paris
FRANCE

Tel. +33 (0)1 40 76 06 89
info@icdacr.com
www.icdacr.com

Association loi 1901
Siret : 332 077 007 00059
TVA : FR 02332077007
Code APE : 8230Z

**THE ENERGY CRUNCH FACED BY MANY COUNTRIES RANGING FROM CHINA TO EU COUNTRIES IN LATE 2021 AND EARLY 2022, AND THE ACCOMPANYING HIKE IN ENERGY PRICES, HAS BROUGHT THE QUESTION OF ENERGY SUPPLY IN A WORLD GEARING TOWARDS DECARBONIZATION TO THE FOREFRONT OF THE DISCUSSION IN A FLASH. CAN YOU PLEASE EXPLAIN WHAT LED TO THE OIL AND GAS PRICE HIKES IN 2021? HOW DIFFERENT IS THIS CRISIS FROM THE 1970S?**

Whereas the oil crisis was created due to disruptions in supply, the recent price rises are caused by rapidly rising demand following a covid-related drop. They both resulted in supply not meeting demand. In addition, the ongoing war in Ukraine further exacerbates global oil & gas prices. We hope the war ends as soon as possible, and market conditions return to normal.

**WHAT CAN WE EXPECT IN THE COMING MONTHS IN THE LIGHT OF THE RUSSIAN-UKRAINIAN CONFLICT?**

IOGP and its Members are closely monitoring events in Ukraine, and assessing how we can help the EU reach its objective of replacing Russian gas supplies by the end of the year. Our industry is doing its best to boost production across the globe, and to source alternative supplies for Europe in the short term. We're also looking at which regulatory obstacles and infrastructure bottlenecks can be solved to help the EU in this regard.

**HOW WILL THE PAUSING OF "NORD STREAM 2" RESHUFFLE THE CARDS FOR EUROPE AND THE WORLD AMIDST DECARBONIZATION GOALS?**

The invasion of Ukraine by Russia, and the subsequent halt to Nord Stream 2, doesn't help the case for Russian gas, but there's an important distinction to be made between the role gas plays in the EU energy system, and where the EU gets it from. Policymakers still recognize the importance of gas for the transition, while also signaling an intention to reduce gas demand to cut reliance on Russian imports. We understand this, but we believe Europe should seriously consider maximizing the production of its own remaining gas resources. So far, individual Member States are looking into it, but this should be further encouraged at EU level as part of the overall response.

**NATURAL GAS IS OFTEN PRESENTED AS THE CLEANEST BURNING FOSSIL FUEL WHICH EXPLAINS WHY COUNTRIES HAVE TURNED TO IT FOR THEIR DECARBONIZATION STRATEGIES. HOWEVER, IT STILL CAUSES CARBON EMISSIONS. HOW DO YOU EXPECT THE INCREASINGLY STRINGENT DECARBONIZATION TARGETS SET BY COUNTRIES TO IMPACT NATURAL GAS DEMAND IN THE FUTURE?**

At global level, decarbonization targets are an opportunity for gas. The fact that the market is tight shows how much it is in demand. There is a clear benefit in using it to replace coal or even oil in power generation, or even in shipping and the transport sector in general. In the long term, gas can be used as feedstock to produce low-carbon hydrogen with CCS, for use across sectors of the economy and in energy-intensive industry in particular.

It's a very versatile fuel that can adapt to deliver both immediate and long-term value for society. Policymakers recognize this - the inclusion of gas-related activities by the European Commission in the proposed EU Taxonomy was a strong signal to be confirmed by the European Parliament and Council in the coming months, and a lot of countries around the world are following this closely. A rising share of variable renewable power

needs to be complemented by flexible gas generation – this trend will continue in the coming decades.

Role of gas aside, our job to make sure the environmental footprint of natural gas itself is as low as possible – the challenge of methane emission. IOGP is a strong advocate for this. We continue to spread best practices when it comes to methane management, and call on the industry to collectively raise its performance. It's the responsible thing to do and it strengthens the credibility of gas as a contributor to the transition.

**Oil prices have also rallied to historical levels following the sharp dip of 2020 as geopolitical tensions added to supply concerns. Are these supply concerns valid? Will we see continued demand in the market?**

So far there are no signs of structural demand reduction, despite what many thought would happen after the Covid crisis.
Supply remains very tight, aggravated by geopolitical tensions. If market volatility persists for a long time, we may begin to see demand destruction. If a new Covid wave materializes,
demand is likely to drop again.
On the other hand, in current market conditions, fields with a higher breakeven price become economic again. This may release additional volumes on the market, but they will need time to come online.
There are too many variables, it's simply impossible to say.

**What is the state of conventional oil global reserves today? What is ahead for global oil production? Have we reached peak oil?**

As recently reported by bp in its Energy Outlook, oil demand, up to 2050, is forecast to decline because of a drop in oil use within road transport, as the vehicle fleet become more efficient and increasingly electrified, and to a lesser extent due to a more generalized shift away from oil across other sectors of the economy, including its use in industry and buildings.
Oil consumption is forecast to become increasingly concentrated within emerging economies, with the use of oil as a feedstock, particularly in the petrochemicals sector, growing in importance.
The changes in oil demand may result in an abundance of oil, rather than the scarcity predicted by peak oil theory. More importantly, the world is likely to demand large quantities of oil for many decades to come.
The significance of peak oil is that we are likely to see a shift to a more competitive market environment.

**With an increased push towards e-mobility and decarbonization targets and a de facto exposure of the oil industry to many geopolitical and local security risks, what challenges do you see for the oil industry in the future? What do you see as potential drivers for the oil industry? Is there room for agility and adaptation?**

Oil is often under the spotlight but we are far from being the only sector exposed to geopolitical developments or changing demand patterns. Raw materials in general are subject to such exposure – these are issues for economies and societies as a whole, and something insufficiently mentioned in discussions on the energy transition.

Our Members companies are not bound to oil. In fact the oil and gas industry is slowly turning into the energy industry. Many of our companies are seizing the opportunities presented by the energy transition, expanding the range of energy sources and services to meet new demand patterns. This industry is as agile as it gets. We have been through ups and downs many times and always come out of it stronger. We embrace the transition both because it is the right thing to do, but also because we believe we can thrive in it.

**When talking about oil, people often think about fuel for vehicles and industries, however oil by-products are used for numerous applications (medical, clothing, accessories, toys, sports, furniture, agriculture...), abundance of oil has enabled the development of these applications which are also cost effective, are there any substitutes? How would oil depletion impact these sectors?**

As mentioned before, depletion may not be the main reason for a long term reduction in oil demand, but rather policy choices. We're good at finding more oil, but we're also good at many other things, and one of those is research and innovation.

Many companies around the world, including our Members, are working on substitutes to oil for manufacturing processes, from biofuels to bioplastics and biochemicals. Let's not forget about recycling, which plays a key part in making various manufacturing processes more sustainable today.
Humans are a creative species. We're good at finding alternatives and solutions when needed, when we put our mind to it. You can count on our industry to play a major role in delivering what comes next.

**To which extent can oil and gas have a role in the decarbonization objectives set by the Paris agreement?**

We already went over the role of gas – replacing coal, facilitating the integration of variable renewables, reducing emissions in the transport sector, turning it into low-carbon hydrogen to decarbonize hard-to-abate sectors. These are rather well-known.

Oil might be less obvious, but its importance shouldn't be underestimated. The non-burnable use of oil as a feedstock is an invisible and yet important contributor to the energy transition. Windmills need oil-based lubricants to run. We use oil in high-grade plastics to make cars lighter and increase their range. There are many non-burnable uses of oil which help reduce emissions, and these will likely grow in the future.

Apart from the fuels themselves, the infrastructure in place is a valuable asset for the transition. We know for example that a large part of the European oil and gas transport pipeline network can be used to carry CO2 and Hydrogen with minimal adaptation. Our offshore platforms can be used to store CO2 or produce hydrogen – be it renewable or low-carbon. Depleted reservoirs will serve to bury residual CO2 emissions forever.

All of these will be needed to reach our climate objectives. This is why calls to stop investments in oil & gas production are usually misinformed or misleading.

### WHAT COULD A WORLD WITHOUT OIL AND GAS LOOK LIKE, WHICH IMPACT COULD SUCH A SITUATION HAVE ON ECONOMIES AND INDUSTRIES?

It would simply be impossible – society cannot function without oil and gas, even if it is climate neutral. This isn't just about transport or heating, it's about food security, eradication of poverty. There are no credible net-zero scenarios with no role for oil and gas, and that's because both will be needed, even if they are used differently.

Many things are possible if the alternatives are developed at scale. This will take a lot of time still, but it's possible. Others will require redesigning or even reinventing entire

manufacturing processes, changing our habits drastically. Most people are not aware of the impact because they don't realize how essential oil and gas are, how embedded they are in their daily lives even if they don't own a car or use a gas stove.

There is also a discrepancy between the promise of an easy oil and gas phase out by activists and sometimes politicians, and the reality we are witnessing now – a shortage of both due to a strong post-pandemic economic recovery.

We don't need to imagine a world 'without' – we need balanced pathways that makes the best use possible of all energy sources and technologies. This is how we deliver on our climate objectives while not losing sight of people's fundamental need for a secure supply of affordable energy.

Ultimately, we all share the same goal, and our industry has the experience, skills and resources necessary to help find this balanced way forward, one which benefits society as a whole without compromising on climate.