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THE IMPACT OF THE RUSSIAN FEDERATION'S WAR IN UKRAINE ON EUROPEAN AND GLOBAL ENERGY SECURITY ONE YEAR AFTER THE INVASION

HEARING

BEFORE THE

COMMITTEE ON ENERGY AND NATURAL RESOURCES UNITED STATES SENATE

ONE HUNDRED EIGHTEENTH CONGRESS

FIRST SESSION

FEBRUARY 16, 2023

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THE IMPACT OF THE RUSSIAN FEDERATION'S WAR IN UKRAINE ON EUROPEAN AND GLOBAL ENERGY SECURITY ONE YEAR AFTER THE INVASION

THURSDAY, FEBRUARY 16, 2023

U.S. SENATE,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
Washington, DC.

The Committee met, pursuant to notice, at 10:07 a.m. in Room SD–366, Dirksen Senate Office Building, Hon. Joe Manchin III, Chairman of the Committee, presiding.

OPENING STATEMENT OF HON. JOE MANCHIN III, U.S. SENATOR FROM WEST VIRGINIA

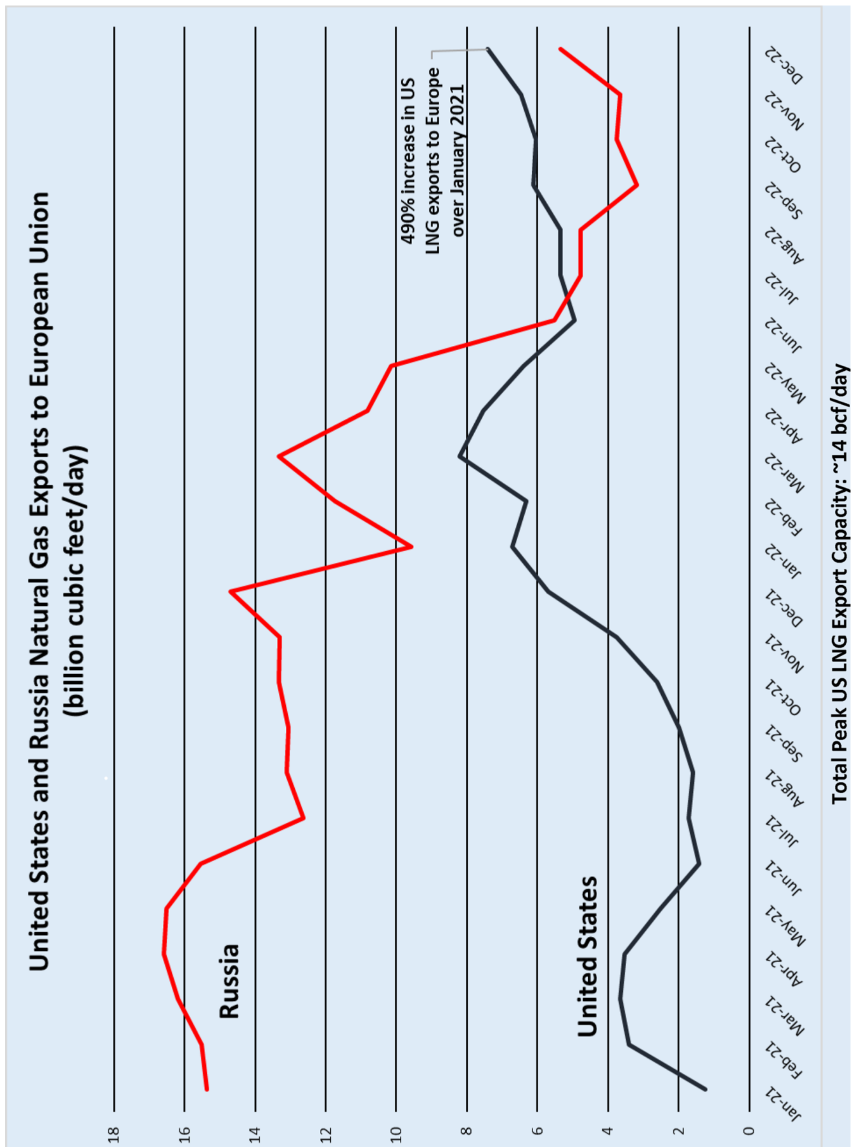
The CHAIRMAN. The Committee will come to order.

On February 24, 2022, nearly one year ago, Putin launched an unprovoked full-scale invasion of Ukraine. This war has taken precious human lives and has had immediate international consequences that will be felt for decades. Food, energy, and shipping prices have all increased, making it difficult for families all over the world to meet their most basic needs. We are here today to reflect on how we got here and what the impact has been on global energy security, and discuss our pathway forward. Putin has played the long game in weaponizing Russia's abundant energy resources in the region by getting Europe hooked on their cheap gas and energy. And more recently, in an effort to weaken the national resolve, Russia is targeting and systematically destroying Ukraine's water and energy infrastructure, leaving millions without power, water, or heat during the coldest winter months.

The U.S., the EU, and our other allies are working together to support Ukraine and have enacted various sanctions targeting Russian entities, trade, and specific economic sectors. On energy, the U.S. has led the free world's response. We have more than doubled LNG shipments to Europe, exported record levels of crude oil, and have grown our coal and refined product exports to meet the demand and break the chokehold Putin has on Europe. We have worked with the EU and the rest of the G7 to set price caps on Russian oil exports, which has helped to reduce Putin's oil revenue by more than one-third. We are also responding by working with the Ukrainian Ministry of Energy to ship emergency electricity equipment for Ukrainian grid repairs, led by the Department of Energy. The Department continues coordinating with public-private entities to deliver critical resources to Europe and Ukraine. I look forward to learning more about these efforts from Dr. Light, who is with us today.

Approximately one quarter of Europe's energy is generated from natural gas, and prior to the war, Russia supplied the bulk of that energy. Throughout 2022, Russia began decreasing natural gas supplies to Europe, but still supplied roughly 15 percent of the EU's natural gas consumption in 2022, but that is down from 40 percent the prior year. As shown on the chart behind me, within six months of Putin's invasion, the U.S. sent more natural gas to Europe via ship than Russia sent by pipeline.

[The chart referred to follows:]


United States and Russia Natural Gas Exports to European Union
(billion cubic feet/day)
Russia
United States
490% increase in US LNG exports to Europe over January 2021
Total Peak US LNG Export Capacity: ~14 bcf/day
0
2
4
6
8
10
12
14
16
18
Jan-21
Feb-21
Mar-21
Apr-21
May-21
Jun-21
Jul-21
Aug-21
Sep-21
Oct-21
Nov-21
Dec-21
Jan-22
Feb-22
Mar-22
Apr-22
May-22
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Sep-22
Oct-22
Nov-22
Dec-22

The CHAIRMAN. That was an incredible feat that no one would have thought possible only one year ago. But as the chart also shows, we still have a long way to go to replace the Russian energy which Europe has relied on. In 2023, the EU is facing a supply shortfall roughly equivalent to what Russia supplied in 2022—approximately 2 trillion cubic feet. The EU has been remarkably successful in diversifying its natural gas supplies, but the shortfall means the EU must continue to arrange for increased LNG imports, build out infrastructure, and also look to other generation technologies to fill that gap. I was encouraged to hear that this week European Commission officials met with representatives from our natural gas industries to discuss additional export agreements.

Director-General Jorgensen, we look forward to hearing from you about Europe's progress in moving off Russian energy and how our energy industries can continue to help. Now, I think it is important to point out that we, the United States, are not currently immune to the threat of resource weaponization. At the beginning of the war, we were importing 500,000 barrels of Russian oil daily, despite having huge oil and gas resources domestically, and our Canadian friends to the north were happy to send us even more. I am proud that immediately following Putin's invasion last year, members of this Committee acted quickly, on a bipartisan basis, to introduce legislation to ban U.S. imports of Russian energy. President Biden followed our lead and implemented the ban, but still, we are reliant on Russia for the uranium needed for our zero-emission baseload nuclear fleet and advanced nuclear reactors of the future. That is why Senators Barrasso, Risch, and I are introducing bills to cut our reliance on Russian nuclear fuel while reestablishing our uranium conversion and enrichment capacity to meet our domestic nuclear fuel needs. As the superpower of the world, we must evaluate our supply chains and ensure that we are not beholden to countries that do not share our values, lest we fall victim to the same weaponization that we have seen play out over the last year.

The fact is, business leaders and policymakers on both sides of the Atlantic have an opportunity to do much more to help Ukraine, our European allies, and ourselves. Energy companies and shareholders must prioritize energy security, which may mean focusing on growing production before near-term profits. But that also goes for the Federal Government, which must start balancing lofty climate goals with geopolitical needs if we are going to remain a superpower of the world while also making progress on decarbonization. You see, my view of decarbonization includes displacing dirtier fuels sourced from around the world, whether that be dirty environmentally or politically, and we have the abundant natural resources right here to do it. Let's be honest, increased energy imports from the U.S. mean a cleaner fuel for our European friends. Russia emits 38 percent more methane and more than three times as much carbon dioxide from flaring per barrel of oil production than we do in the U.S.

To that end, industry also needs the Federal Government to signal with both words and actions that we will support the responsible development of all types of energy here in the United States. This means timely, predictable energy permitting and an end to the regulatory assault on fossil fuels, which we can produce and use cleaner than anywhere else. Our country continues to need fossil fuels, and our allies are desperate for greater access to our resources. As of today, the war shows no sign of coming to a peaceful resolution. The U.S and our allies must continue to work in concert to respond and prepare for the coming challenges while we continue to seek an end to these hostilities. The U.S. has a responsibility and opportunity to support our friends and allies. We must not allow Russia to dictate the economic and security terms of postwar Europe. That is why Senator Murkowski and I just introduced a bill that would enhance the ability of the Secretary of Energy to establish international partnerships to secure our supply chains while reducing our allies' reliance on Russian energy resources. We must create a future of energy independence and security from any undemocratic regime seeking to weaponize energy to win a war.

I appreciate our witnesses joining us today to discuss the important issues, and look forward to the discussion. With that, I will turn it over to Senator Barrasso for his opening remarks.

OPENING STATEMENT OF HON. JOHN BARRASSO, U.S. SENATOR FROM WYOMING

Senator BARRASSO. Well, thanks so much, Mr. Chairman and thanks for your incredible remarks as we open this Committee hearing today. I want to thank you for holding the hearing. I want to thank you for your opening statement. And as we know, Europe has learned some very hard lessons following Russia's invasion of Ukraine. None are clearer than the need to have access to an affordable and dependable supply of energy. Unfortunately, President Biden has not learned a thing from Putin's war of aggression and the energy crisis in Europe. Europeans understand the crucial importance of increasing U.S. oil and natural gas production and exports. The President still does not.

A week after Russia's invasion began, President Biden delivered his 2022 State of the Union Address. With Russia rampaging through Ukraine, energy prices in Europe skyrocketed. President Biden did not say a word about increasing American energy production, and he should have. Just last week, at this year's speech, the President again refused to support any policies that would increase American energy production. He would rather increase energy taxes than increase U.S. energy production. It does not seem to matter to him about the cost, he is focused solely on the climate. The President also seems to believe that we can stop producing oil and gas in just ten years. That is a dangerous fantasy. No wonder oil and gas companies are thinking twice before investing in American energy. The reality is that the world still runs on oil, natural gas, and coal. It will do so for the foreseeable future, even as we reduce greenhouse gas emissions. Killing American production is not going to change that. It will just enrich our adversaries and leave America and our allies weaker and less secure.

The President has also doubled down on his zealous approach to climate. His focus on climate change above all else is hurting American families, and it is harming our national security and our national competitiveness. Look at the damage that Europe's climate policies have inflicted so far. They brought the continent some of the highest energy prices in the world and they increased the continent's dependence on Russian energy. Many in Europe have had to turn to wood, to peat, and to garbage to heat their homes. But for President Biden, Europe's energy policy is a model. He believes that he can impose the same goals and policies here and somehow get different results. But following Europe's example means living with Europe's results. Europe's energy policy is a warning, not a model. What has not worked in Europe will not work here. Europe's experience should also teach us the folly of depending on tyrannical regimes for energy.

Thanks to the shale revolution, the United States no longer needs to depend on cartels and rogue nations for our energy. It took us decades to achieve that. But the President's assault on American energy production will surrender this vital economic and geopolitical advantage. His unrealistic renewable and electric vehicle goals will also make us much more dependent on our adversaries, like China and Russia, for critical minerals and materials. The President's goals would require massive amounts of copper, cobalt, nickel, lithium, graphite, and many other minerals. China and Russia control the supply chains of many of these minerals. We need more American production, but it is almost impossible to get a permit for a new mine in the United States. In fact, the Biden Administration recently killed two U.S. copper mines. President Biden would prefer that we import these minerals, even sending money to our enemies.

It is a disgrace that we do not have the capability to fuel our own nuclear reactors. You mentioned it, Mr. Chairman. Ensuring a secure supply of American uranium for existing and advanced reactors is a top priority of mine. Yesterday, our Chairman, Senator Manchin, as well as Senator Risch and I, introduced legislation to do just that. We also plan to introduce a bill to ban Russian uranium imports. We cannot allow President Biden to throw away America's hard-won energy independence and increase our reliance on China and Russia. Europe's plight makes it abundantly clear that this would be a colossal mistake.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you, Senator Barrasso.

I would like to turn to our witnesses, and we will begin with Assistant Secretary, Dr. Andrew Light.

He will be followed by Director-General for Energy of the European Commission, Ms. Ditte Juul Jorgensen.

And finally, a Fellow in Energy Studies at Rice University, Dr. Anna Mikulska.

I want thank you all for joining us, especially Director-General Jorgensen, for traveling so far, and you know, maybe the jet lag, you will be able to turn it around so quickly, it will not affect you.

[Laughter.]

The CHAIRMAN. But I do appreciate the effort you have made to be here, and it is a pleasure.

Assistant Secretary Light, we are going begin with your opening remarks, sir.

STATEMENT OF HON. ANDREW E. LIGHT, ASSISTANT SECRETARY, OFFICE OF INTERNATIONAL AFFAIRS, U.S. DEPARTMENT OF ENERGY

Dr. LIGHT. Chairman Manchin, Ranking Member Barrasso, and members of the Committee, it is an honor to appear before you today to discuss energy security in Europe and the role of the U.S. Department of Energy in supporting Ukraine.

Nearly one year ago today, Putin's Russia brutally, illegally, and immorally began its full-scale invasion of Ukraine. Even before Russia attacked with tanks and troops, it had already used energy as a weapon to terrorize the Ukrainian people, actions which were quickly expanded to Europe and the rest of the world. Let me be clear: Russia's use of energy as a weapon has backfired. It has spurred an international response unprecedented in the history of global energy cooperation, and the United States has been a leader in that response. Nonetheless, the current status of the energy system in Ukraine is dire. Over the last four months, an estimated 700 Russian missiles have hit energy facilities throughout the country. The Ukrainian grid operator is using rolling blackouts to meet about 75 percent of normal customer demand, sometimes losing up to 50 percent of generation. Make no mistake, Russia's attacks on Ukraine's grid are brutalizing the civilian population.

The U.S. Department of Energy has a special relationship with our Ukrainian counterparts across a range of issues. Secretary Granholm led the U.S. Presidential delegation to Kyiv in August 2021 to attend the ceremonies marking the 30th anniversary of independence, and our relationship has been very close since then. This relationship enabled the Department to deliver indispensable assistance quickly after Russia's further invasion of Ukraine.

Before the war, Congress appropriated my office $30 million to assist Ukraine in creating a permanent interconnection with the European energy grid and eventual capacity to export electricity to neighboring countries. Following Russia's attacks on Ukraine's grid, DOE began delivering some $15 million worth of critical energy infrastructure equipment, starting last December, primarily from surplus supplies in the U.S. By early March, we will deliver the third tranche of this equipment. DOE is also monitoring Ukraine's nuclear power infrastructure and working closely with the International Atomic Energy Agency to ensure proper safeguards remain in place. And finally, DOE and our national labs are working to help Ukraine build a secure, resilient, independent, and adaptable energy system. We have invested $10 million in our national labs to help plan Ukraine's future energy system, post reconstruction.

It is clear to us that energy security and the energy transition are two sides of the same coin. There can be no lasting energy security without diversifying energy supply, including expanding the use of clean energy. Recognizing the danger posed by Russia's unitary position in the European energy market, the President took decisive action and directed the Administration to take all available measures to work with our allies in Europe and around the world to ensure a surge of LNG and pipeline gas was available for Europe, as the Chairman indicated earlier. Last year, some two-thirds of U.S. LNG shipments went to Europe, more than doubling the volumes exported to Europe in 2021. President Biden also launched the U.S.-EU Task Force on Energy Security with President von der Leyen to help the EU reduce overall demand for natural gas and to more quickly decarbonize. And just yesterday, Secretary Granholm co-chaired a meeting on the current natural gas crisis in Europe with over 40 countries through the International Energy Agency to prepare options to help ensure European and global natural gas security, consistent with net-zero transitions through the 2023–2024 winter. Make no mistake, next winter will almost certainly be harder with China ramping back to pre-COVID consumption levels and no Russian gas for European storage.

Over the past year, the United States has also led coordinated efforts to ensure a secure supply of oil to the global market by working with partners and allies on a coordinated release of 270 million barrels of oil from strategic reserves around the world. We have also worked to limit Russia's profits from oil sales through our efforts with G7 partners, the EU, and Australia on a price cap on Russian crude oil and now on refined products.

However, energy security is not only about oil and gas, and is not only about Russia. Overreliance on a single supplier, any supplier, leaves the United States and the rest of the world vulnerable to other countries. China currently produces about 75 percent of all lithium-ion batteries and controls most of the midstream capacity for battery supply chains, as well. Congress has recognized this vulnerability and provided the tools to counter it through the historic investments in the Bipartisan Infrastructure Law and IRA. DOE's work on diversifying energy supply, stabilizing energy markets, ensuring secure supply chains, and accelerating the energy transition, benefit all of our partners and allies around the globe and will also create hundreds of thousands of good-paying, clean energy jobs here at home.

With continued perseverance, we will win this energy conflict and come out more secure than before. I look forward to your questions.

[The prepared statement of Dr. Light follows:]

Testimony of Assistant Secretary Andrew Light

Office of International Affairs

U.S. Department of Energy

Senate Committee on Energy & Natural Resources

February 16, 2023

Chairman Manchin, Ranking Member Barrasso, and Members of the Committee, it is an honor to appear before you today to discuss energy security in Europe, and the role of the U.S. Department of Energy in supporting the development of infrastructure, systems, and policies in Europe that will support a secure, sustainable, diversified energy sector.

Introduction

Nearly one year ago today, Putin's Russia brutally, illegally, and immorally began its full-scale invasion of the sovereign nation of Ukraine. Even before Russia attacked with tanks and troops on the ground, it had already used energy as a weapon to terrorize the Ukrainian people, actions which were quickly expanded to Europe and the rest of the world designed to intimidate the United States and our allies and divide our efforts to support Ukraine.

Let me be clear: Russia's use of energy as a weapon has backfired. It has spurred an international response unprecedented in the history of global energy cooperation. The United States has been a leader in this response.

As part of the U.S. effort, the Department of Energy has become a reliable partner to the Ukrainian people. As we speak, U.S. military planes are being readied to deliver the third shipment of critical electrical equipment that the Department of Energy has located in the U.S. to keep their grid operating. If we wish to create a secure energy system, resilient to the destructive whims of individual bad actors, we must continue to cooperate with Ukraine and our allies across the globe to accelerate the transition to a diverse and decarbonized energy supply.

Ukraine – DOE Partnership, Nuclear Risks, and Reconstruction

The current status of the energy system in Ukraine is dire. Over the last four months, an estimated 700 Russian missiles have hit energy facilities in Ukraine. Open sources are reporting significant Russian troop build-ups are underway as many expect a new offensive in the weeks ahead. Ukrenergo, the Ukrainian grid operator, is using rolling blackouts throughout the country to meet about 75 percent of normal customer demand—sometimes losing up to 50 percent of generation. The Ukrainian Minister of Energy German Galushchenko, recently reminded European ministers that increased electricity imports from the European Union would be necessary to sustain critical services in Ukraine, in addition to replacements for critical energy infrastructure equipment throughout the nation's electrical grid.

The Department of Energy has a special relationship with our Ukrainian counterparts. Well before Russian boots trampled Ukrainian soil last February, Secretary Granholm led the U.S. Presidential delegation to Kyiv in August 2021 to attend the ceremonies marking the 30th Anniversary of Ukrainian Independence and President Zelensky's "Crimea Platform" to continue to raise awareness of Russia's occupation of Crimea. Since then, we have continued to work closely with the Ukrainian government and in particular the Ministry of Energy across a variety of issues in the lead-up to the full-scale invasion.

This relationship enabled the Department to deliver indispensable assistance quickly after the further invasion began. Congress appropriated DOE $30 million in the Ukraine Supplemental Appropriations Act of 2022 to assist Ukraine's efforts to create a permanent interconnection with the European energy grid, known as the European Network of Transmission System Operators for Electricity or "ENTSO-E," and eventually be able to expand commercial electricity trade with neighboring EU countries and the broader European market. Soon after Russia's full-scale invasion, we began using that money to position Ukraine to fully integrate with ENTSO-E. Later, DOE began delivering some $15 million worth of critical energy infrastructure equipment, primarily from surplus supplies in the U.S. to keep the Ukrainian grid functioning. By early March, we will deliver the third tranche of this equipment, which will fill several U.S. Air Force C-17s and C-5s. We also managed to secure a $600,000 donation of oil and gas equipment.

DOE was able to relatively quickly develop the capacity to ship this equipment to Ukraine because we already had the in-house technological expertise and the long-standing industry relationships to find surplus compatible hardware that could be quickly and efficiently integrated with Ukraine's energy systems. Make no mistake, Russia's attacks on Ukraine's grid are brutalizing the civilian population. As the attacks continue, the Ukrainians must force rolling blackouts into the system to keep the grid from collapsing. These forced blackouts in turn threaten the stability of water, sewage, and heating systems. As Russia continues to target Ukrainian energy infrastructure, U.S. shipments are playing a vital role in averting a humanitarian crisis, while denying Russia its ability to cripple Ukraine through lost power generation and transmission capacity.

Additionally, DOE is monitoring Ukraine's nuclear power infrastructure and working closely with the International Atomic Energy Agency to ensure proper safeguards remain in place at Ukraine's nuclear power plants. Nuclear energy provided nearly 50% of the pre-conflict generation capacity in Ukraine. As evidence of Putin's flagrant disregard for civilian suffering, Russia has seized the Zaporizhzhya Nuclear Power Plant, resulting in 6 GW of power generation, or 45 percent of Ukraine's total nuclear power capacity, coming off the grid. At the other nuclear power plants, many supplies are needed to ensure their continued safe operation or shutdown. Should Ukraine's high voltage integrated electrical grid fracture due to Russian attacks, Ukraine's nuclear power plants may face additional significant risks. Accordingly, the United States is assisting in the stockpiling of additional diesel fuel and consumables at these plants and is procuring mobile back-up generators and has worked with allies to provide spare parts for generators currently in place to ensure resilient safety systems are in place and available.

Finally, while we are actively working to meet Ukraine's immediate needs, we are also working to help them build a secure, resilient, and adaptable energy system for the future that will be fully independent of Russian energy, and create capacity to decouple from reliance on Russian-origin equipment and supply chains. To that end, we have invested $10 million in our national labs to partner with Ukrainian experts to plan Ukraine's future energy system post-reconstruction. In collaboration with DOE's Net Zero World program, we are also striving to assist Ukraine in restoring and improving their grid, but also to position them to become an energy exporter in the region.

Energy Security and Energy Transition

We must now recognize that energy security and the energy transition must be two sides of the same coin. There can be no lasting energy security without diversifying energy supply, including expanding the use of clean energy. Over the past few years, Russia has effectively demonstrated the vulnerability of parts of the global energy system to over-reliance on a single source.

Even before the Russian full-scale invasion of Ukraine, Gazprom, the Russian State's gas supplier, had started slowing and sometimes stopping natural gas supplies to Europe, just as the Ukrainians predicted they would when we were in Kyiv in August 2021. According to the International Energy Agency, these actions by Russia tightened energy markets and increased energy security vulnerabilities across Europe.

Recognizing the danger posed by Russia's position in the European energy market, DOE formed a plan of action alongside our European counterparts through channels such as our Deputy Secretary or Secretary level U.S.-Germany, U.S.-UK, and U.S.-France energy dialogues, as well as the U.S.-EU Energy Council co-directed with the State Department's Bureau of Energy Resources. With determination and cooperation, about two-thirds of U.S. liquified natural gas (LNG) shipments went to Europe last year, more than doubling the volumes exported to Europe in 2021. Further, President Biden launched the U.S.-EU Task Force on Energy Security to continue cooperation in this sector to first ensure sufficient gas supplies and diversify those supplies, and second to help the EU reduce overall demand for natural gas and to more broadly and quickly decarbonize. As the war intensified, and Russia began retaliatory actions against Europe in the natural gas sector, the Department of Energy urged full injection of gas into Europe's gas storage reservoirs despite their storage having reached a five year low in 2021 and early 2022, and offered help on demand reduction measures so that Europe was in a better position to get through this winter without an energy-driven economic collapse.

When Russia's full-scale invasion threatened a stable supply of oil to the market, the United States acted swiftly, by ourselves and in coordination with allies through the International Energy Agency, to release around 240 million barrels of oil from strategic reserves in order to maintain supply to the global market. Through this collective action, the United States shielded consumers against supply disruptions and mitigated the effects of Putin's war.

More recently, the United States along with the G7, the European Union, and Australia worked to prohibit companies in our jurisdictions from assisting in the maritime transport of Russian crude oil and refined products, unless those cargoes were sold at or below a predetermined price cap. This past December 5, this coalition set this price cap level on Russian crude oil at $60 per barrel. Later on February 5, the price cap for refined products typically trading at a premium to crude was set at $100 per barrel, while the cap for discount-to-crude products was set at $45 per barrel. The goal of this mechanism is to promote market stability by allowing Russian oil to flow on the market, while limiting how much Putin can earn from Russian oil exports.

As we look to next winter's energy challenges, DOE remains supportive of our partners in Europe. Without Russian natural gas to refill Europe's gas storage reservoirs, we predict that the spring and summer refill season could prove much more difficult than in years past, and in turn again put at risk the European economy next winter. Yesterday, Secretary Granholm co-chaired a meeting on the current natural gas crisis with ministers from the International Energy Agency and select other countries in Eastern Europe. Together they outlined options to help Europe get through the 2023-2024 winter. We expect that these discussions will continue across many international energy meetings in the months ahead, especially the upcoming G7 energy ministers' meeting in April and the G20 energy ministers' meeting in July, both of which Secretary Granholm will attend.

In the nuclear energy area, Russia has long used nuclear energy-related exports to exert political and economic pressure on its customers globally. Its military attacks on and subsequent seizure of ZNPP have only underscored the nuclear energy security concerns related to Russia. As a result, several European countries have taken steps to reduce their reliance on Russian nuclear fuel, including Finland, Czechia, Ukraine, Bulgaria, and Slovakia. In addition, G7 nations have resolved to reduce their reliance on Russian nuclear energy supplies and services and to help other countries seeking to do the same. The United States currently relies on Russia for roughly 20% of the enriched uranium used in our commercial nuclear power reactors. This is strategically unsustainable. Consistent with our G7 pledge, the Department of Energy is working with other Departments and Agencies to identify alternatives and we welcome Congressional support for that effort.

Looking forward, it is abundantly clear that Europe must end its dependence upon Russian energy. It will take our partnership to help Europe successfully navigate that transition. While U.S. LNG has been and will continue to be a critical resource to address Europe's energy security needs, the fact is that there is currently not enough available LNG in the world to replace the more than 142 billion cubic meters of piped gas that the EU imported from Russia in 2021 before the war. Addressing this challenge will also mean diversifying energy supply and reducing demand for fossil fuels through aggressively expanding clean energy and improving energy efficiency. But this crisis and these solutions are not limited to the current situation in Europe. Nor is energy security only about oil and gas. Overreliance on a single supplier—any supplier—leaves the United States and the rest of the world vulnerable to other countries.

The People's Republic of China currently produces about 75 percent of all lithium ion-batteries and controls most of the midstream capacity for battery supply chains as well. Congress has recognized this vulnerability. It also recognized the tremendous economic opportunity and other benefits associated with a just and equitable clean energy transition. Through the Bipartisan Infrastructure Law, Congress has provided more than $62 billion to DOE to foster the domestic capacity needed to develop and deploy clean energy technologies, including batteries, in the United States. This investment, paired with tax incentives in the Inflation Reduction Act positions U.S. suppliers and businesses to tap into the, at a minimum, $23 trillion international clean energy market opportunity by 2030.

Our growing domestic energy supply chains will serve as reliable sources for us and for the world, as we recommit to serving as a trusted trading partner to our friends in Europe and beyond. We have secured agreements to strengthen minerals security, enhance market transparency, and advance sound environmental, social, and governance standards in the International Energy Agency via new consensus mandates championed by Secretary Granholm when she chaired the last IEA ministerial last March. We are also working with partners in the G7 and elsewhere to implement new clean energy supply chains, while spending the investments entrusted to DOE through the Energy Act of 2020, the Bipartisan Infrastructure Law, and the Inflation Reduction Act, to build capacity here at home.

DOE's work on diversifying energy supply, stabilizing energy markets, ensuring secure supply chains, and accelerating the energy transition benefit not only our friends in Europe, but our partners and allies around the globe. We lead over two dozen Secretary or Deputy Secretary level energy dialogues with non-European countries, including G20 parties India, Brazil, Indonesia, Canada, and Australia, working on a range of energy issues. Everyone, from developing economies just beginning their energy transition to those seeking to avoid the influence of malign actors, will benefit from a diversified and decarbonized energy system. We stand ready to help them get there.

Diversifying energy supply chains away from Russia and the PRC, creating hundreds of thousands of new, good-paying energy jobs at home, and growing an industry that respects the environment and human dignity is essential not only to our energy security, but also to the vitality of our economy and our communities. It is also for these reasons that we must invest in a domestic uranium capacity, and reduce reliance on Russian and Chinese uranium. In addition to building a resilient nuclear supply chain, we should no longer send American dollars to Rosatom—especially after their disregard for nuclear safety in Ukraine.

Conclusion

I want to thank you for the opportunity to speak before you today. The Department of Energy looks forward to continuing to work with this Committee on the critical energy security and transition issues facing Europe and the world. I look forward to your questions.

The CHAIRMAN. Thank you so much. I appreciate it, Dr. Light.

And now, first of all, I would like to introduce some of the dignitaries we have with us. We want to thank the EU Ambassador Lambrinidis for being here with us, and also the Head of Global Issues for the EU, Ms. Pérez. I want to thank you all. We appreciate it very much.

And also, again, Director, we are so happy that you made this effort and we would like to hear from you now.

STATEMENT OF DITTE JUUL JORGENSEN, DIRECTOR-GENERAL FOR ENERGY, EUROPEAN COMMISSION

Ms. JORGENSEN. Thank you, Honorable Chairman Manchin, Ranking Member Barrasso, members of the Committee, fellow speakers Anna and Andrew, thank you very much for the invitation, and to you, Mr. Chairman, for your leadership in the Senate response to the global energy crisis.

Today I want to focus on three messages. First, one year into the Russian war on the European continent, the crisis is not over, but the European Union's response has been immediate, strong, and effective. We have managed to combine energy security with the objectives of clean energy transition and climate neutrality. Within weeks of Russia's invasion into Ukraine, the European Commission proposed the REPowerEU plan, which aims to reduce our dependence on Russian fossil fuels by reducing our overall consumption by more and faster renewable energy and by replacing Russian energy sources with supplies from reliable partners. Quickly replacing Russian natural gas was, of course, key. The transatlantic alliance has been essential in this regard, and I would like to thank you for that. Imports of U.S. LNG almost tripled in 2022, and the United States is now the biggest LNG exporter to the European Union.

The EU also lowered its consumption and increased the share of renewable energy. In just a few months, we reduced our gas demand by 20 percent. We filled our gas storage facilities ahead of winter from a historically low level. We upgraded our infrastructure to ensure gas from alternative sources. We created an EU energy platform that can aggregate demand and jointly purchase gas. We reduced our peak electricity demand. We accelerated permitting for renewable energy. And we have significantly increased installed capacity of renewables. Russian natural gas supply to the European Union is now less than half of what it used to be and we are working under the assumption—we have prepared for that scenario that there would be zero natural gas imports from Russia next winter.

My second message today is that we have supported our neighbors in Ukraine, but also in Moldova, who suffer from the war. We provided economic and technical support to Ukraine. We synchronized our electricity grid so as to make their system independent from the Russian electricity system. And we have provided both Ukraine and the Republic of Moldova candidate status to join the European Union. In total, the European Union and member states have provided more than €50 billion—$73 billion—so far in financial, military, humanitarian, and refugee assistance of support to Ukraine. We have sent more than 5,000 generators to Ukraine and we will continue to provide aid and assistance to the Ukrainian people. We have also demonstrated our solidarity and support for Ukraine by swiftly imposing unprecedented sanctions. We have adopted nine sanctions packages, and just yesterday proposed a tenth sanctions package.

My third and final message is on our very strong transatlantic cooperation. The United States has been a reliable ally in supplying energy, particularly LNG, and in the global clean energy transition, supporting us in this crisis. We have had a close cooperation with the Administration, and the fight against climate change is, indeed, a shared responsibility, as is the response to the energy crisis. With our European Green Deal, we have shown global climate leadership. We enshrined climate neutrality by 2050 into law and we are transforming our energy system to achieve that objective. We in the European Union see natural gas as an important energy source for the transition. We count on further engaging with the United States, including as regards the supply of LNG, the exports of LNG, to reduce methane emissions, to spur investments into renewables and into hydrogen, to roll out heat pumps, to make sure that the transition is just and fair, working together for access to critical raw materials and reliable supply chains, while of course ensuring that global markets also in energy and related products are fair and open for both sides.

In summary, the European Union has shown unity and determination in handling this crisis. We have also shown that energy security and the transition toward climate-neutral energy systems are aligned and mutually reinforcing. But above all else, peace on our continent and Ukraine's reconstruction are our highest immediate priorities, and we look forward to continuing the partnership with the United States toward that. I look forward to your questions. Thank you.

[The prepared statement of Ms. Jorgensen follows:]

Impact of the Russian Federation's war in Ukraine on European and global energy security one year after the invasion

Written testimony before the U.S. Senate Committee on Energy and Natural Resources by

Ditte Juul Jørgensen

Director-General for Energy at the European Commission

16 February 2023

Senator Manchin, Senator Barrasso, Distinguished Members of the Committee, thank you for the opportunity to appear before you today to present the European Union's work to address the impacts of Russia's illegal and unprovoked war of aggression in Ukraine on European and global energy security. Our efforts to boost energy security and resilience are fully aligned with accelerating our clean energy agenda for climate neutrality by 2050. The urgency and importance of this work has never been more apparent.

I have been a European civil servant for over 30 years, having had the privilege to work in international trade, competition, sustainable development, and energy. I currently serve as Director-General for Energy at the European Commission, the executive arm of the European Union, and I am proud to work under the political leadership of our President, Ursula von der Leyen, Executive Vice-President Frans Timmermans, and Commissioner Kadri Simson. In this capacity, I have worked with highly committed EU staff to develop and deliver our policy response to this unprecedented challenge at an exceptional pace to stabilise the situation and protect businesses and households from the most severe consequences of the crisis.

The European Union (EU) has reacted in unity, swiftly and decisively, proving that our institutions and democracy are robust and prepared for the challenge. If anything, the current challenges have only strengthened our commitment to liberty and to double down on a clean energy transition, for our health and wellbeing, for jobs and growths in a new economy, and for strong geopolitical reasons.

Throughout my professional life, the Transatlantic partnership has been central, from addressing bilateral trade questions through negotiations and dialogue to our close cooperation on energy security today. Indeed, while the last year has been by far the most challenging in terms of ensuring secure, affordable and climate friendly energy to our citizens, it also showed just how far the solutions to the energy crisis in Europe rely on working with our partners and allies, most notably the United States.

Introduction

The Russian invasion of Ukraine and Russia's weaponization of energy have caused human suffering and have sharply impacted global security and the global energy system. The resulting rise in prices of energy, food and commodities has had a direct impact on our citizens and businesses, especially on the most vulnerable groups and on developing countries.

A key part of my message today is that the events of 24 February 2022 demonstrated that, despite previous efforts, we were still too dependent on imports of gas from the Russian Federation. In the aftermath of the Russian gas supply disruptions in 2006 and 2009, the Union took important steps to develop a more resilient and interconnected pan-European energy market, ensuring alternative sources of natural gas and reverse flows.

A key part of these reforms relates to the European Green Deal. Europe is the first continent to have committed to achieve climate neutrality by 2050. The European Union remains fully committed to this objective. The transformation of our energy systems towards greener energy also improves security and affordability of our energy, it helps avoid new dependencies and gives a boost to our competitiveness. The European Green Deal also aims to make sure that the transition is fair and just, leaving nobody behind. With the legal frameworks in place, the EU was already on track to reduce natural gas consumption by 30 per cent by 2030 even before Russia started its illegal war in Ukraine. The Russian war and its unilateral disruption of natural gas supplies have accelerated this energy transition.

While the backbone of the future European carbon free power system will predominantly be renewable energy sources, nuclear will continue to play an important role, complementing renewables as a reliable baseload electricity generation. Already now, nuclear power is the most prevalent low-carbon source in the European Union. And we acknowledge its potential in decarbonising the energy sector and ensuring energy security.

At the same time, the EU sees natural gas as an important energy source for the transition towards climate neutrality in 2050. In this context, it is critical to ensure that natural gas is produced and transported to the highest environmental and sustainability standards, in line with our shared climate objectives. EU's continued cooperation with the United States on methane emissions reductions is crucial, in line with the ambitions of the Global Methane Pledge and the Joint Declaration from Energy Importers and Exporters on Reducing Greenhouse Gas Emissions from Fossil Fuels adopted in November 2022.

With this testimony I would like to present our energy policy response to the global energy crisis and the results, our immediate and strong support to Ukraine and the Republic of Moldova, and the outlook in the short-, mid and long-term including on our Transatlantic partnership.

1. The EU's swift and forceful response to the Russian aggression against Ukraine

The timing of the Russian aggression against Ukraine coincided with the global energy supply crunch. Natural gas prices had been rising in the second half of 2021 among others due to the global economic rebound from the COVID-19 pandemic. At the same time, offers of Russian gas supplies on certain trading facilities ahead of winter 2021 were already significantly reduced and Russian-owned gas storage facilities in Europe were undersupplied compared to previous years. These factors further exacerbated the supply crunch and led to more volatility in the European and global energy prices.

The EU's response came just two weeks after the invasion, on 8 March 2022. With the **REPowerEU Plan**, the European Commission presented **a strategy to reduce EU's demand for Russian natural gas by two-thirds before the end of 2022**. It rests on three complementary and mutually reinforcing pillars: reducing demand through energy savings, expanding generation of renewables, and energy diversification through new and deepened partnerships. We have underpinned this proposal with an investment plan of up to EUR 300 billion. Meeting on 10 March 2022, European leaders were unanimous and unequivocal in endorsing the plan, agreeing to phase out EU's dependency on Russian gas, oil and coal imports as soon as possible in response to the Russian aggression in Ukraine. REPower EU also recognises the need to diversify energy sources away from Russian supplies in the nuclear sector. A high dependence on Russian nuclear fuel and related services poses a risk not just in Europe but in global markets.

In a short period of time, the EU has taken **ten** steps to turn the REPowerEU Plan into concrete results. And we managed to replace more than 70 bcm of Russian gas by diversification, demand reduction and fuel switch.

First, we are saving energy, especially gas. We have introduced a common European target to reduce gas demand by 15% over six months. Data for the first half of this period (August-November) shows that we are currently exceeding this goal with overall savings reaching more than 20%. The EU consumes less energy, and it consumes it more responsibly.

Second, we are accelerating the roll-out of renewable energy sources. In 2022 alone, we added over 55 gigawatts of new wind and solar capacity to the grid - over 40% more than the previous year. This is contributing to our European Green Deal objectives towards climate neutrality by 2050 and a 55% reduction in greenhouse gas emissions by 2030 compared to 1990, expanding high quality jobs and fostering innovation. In this context, there is a special focus on faster deployment of heat pumps and efficient appliances.

Third, to further accelerate the deployment of renewables, we have introduced faster permitting processes, simplifying the approval procedures for projects. This will facilitate also renewable hydrogen production, as we aim to double renewable hydrogen production in Europe to 10 million tons by 2030, to be matched by 10 million tons of renewable hydrogen imports.

Fourth, we have diversified away from Russian fossil fuels towards reliable suppliers. The United States of America has stood in solidarity with the EU. The US exported 56 billion cubic meters to EU countries in 2022 exceeding the target agreed by President Ursula von der Leyen and US President Joe Biden and announced in the Joint Statement of 25 March 2022; a record supply almost tripling the level compared to 2021.

Fifth, we ensured that our gas storage facilities were as full as possible ahead of the winter 2022/2023, in line with EU rules put in place last summer. Thanks to a swift political agreement at EU level and the determination of all EU Member States, at the onset of this winter, the storage level in the EU was above 95%. This overshot the legal target of 80%.

Sixth, we reinforced the solidarity mechanisms within the EU. We established binding arrangements for the supply and sharing of gas between Member States. This ensures that, in an energy emergency, gas will flow to where it is most needed.

Seventh, we have set up the EU Energy Platform for demand aggregation, joint purchasing and improved coordination of natural gas purchases. The Platform supports increased LNG inflows and maximization of inflows from pipelines from reliable suppliers. We are also looking region by region at how best to optimize our use of existing infrastructure to help ensure the gas gets to where it needs to go.

Eighth, we have identified existing bottlenecks in our energy infrastructure and are addressing them through targeted investments and upgrades. Already on 1 October 2022, we inaugurated the interconnector between Greece and Bulgaria, a crucial pipeline for the diversification of supplies in Southeast Europe, a region historically dominated by Russian gas. Further identified needs include the expansion of the Southern Gas Corridor, the construction of the second LNG terminal in Poland and the expansion of the existing LNG terminal on the Krk island in Croatia. We will continue our efforts under our "Trans-European networks in energy (TEN-E)" framework to provide funding for better connected energy networks across national borders, new energy infrastructure projects where they are needed.

Ninth, we have ensured tailored support for vulnerable households and businesses across Europe to enable them to withstand high and volatile energy prices.

Tenth, we have agreed on a financial market mechanism which will make it possible to correct the prices of futures and derivatives to avoid the extraordinarily high gas prices like those we experienced over August 2022, with a number of careful conditions to avoid market disruption.

Finally, next to our actions at EU level, the EU has demonstrated immediate solidarity with **Ukraine and the Republic of Moldova** by swiftly imposing unprecedented sanctions. The measures are intended to reduce Russia's ability to develop and exploit its resources and deprive its industry of modern and critical technologies. Regarding energy, we imposed sanctions on Russian coal, oil, petroleum products and relevant technologies for energy.

For Russian crude oil, sanctions are in place since December and for refined petroleum products, they took effect this month, February 2023, with only limited exceptions due to Security of Supply. In addition, together with G7+ partners, the EU has agreed to price caps on oil and petroleum products with the double objective of limiting Russia's revenues while keeping global markets stable. It has also prohibited related services such as technical assistance, brokering services or financing or financial assistance along the same conditions on prices. The crude oil price cap has delivered, with Russian revenues decreasing in December by 26% while prices have even decreased.

Our response has proven effective

In the past year, in the face of the unprovoked aggression against Ukraine, Europe has shown its capacity to take rapid and far-reaching decisions to ensure we are more resilient and better prepared for the future. The actions in 2022 have shown that Russia's capacity to use energy as political leverage has been sharply curtailed: the EU has been able to obtain natural gas volumes from reliable partners, and prices have gone down.

While we will not allow ourselves to become complacent, the security of supply situation in Europe is now stable. As a result of extensive and timely policy measures undertaken by the EU and Member States as well as close cooperation with international partners, no imminent physical shortage of gas is expected.

Let me focus on the main indicators.

First, the EU is on track to exceed the 15 per cent target for gas demand reduction this winter. The EU has managed to reduce demand significantly without a significant drop in industrial output. We expect additional savings in 2023 to come from an expedited rollout of renewable energy capacity equivalent to replacement of almost 14 bcm of natural gas.

Second, our gas storage situation. The level of gas storage is now at satisfactory levels for the rest of this winter. So far, all Member States are overshooting their intermediate targets of 55 per cent for 1 February with an expected filling level between 68 per cent and 75 per cent. We now expect storage levels to be above 50 per cent at the end of this winter season which will serve as a strong starting point for preparing for the 2023/24 winter season, and in turn contribute to avoiding price spikes in 2023 by relieving demand pressures. While prices are expected to remain higher than over the last few years, less volatility is also expected in 2023 thanks to the decisive policy actions taken.

Third, our work with alternative gas suppliers continues in 2023. Let me once more underline the role of the U.S. LNG in this regard. We expect that the U.S. will remain a key LNG supplier to the EU in 2023 and beyond with imports overshooting the records set in 2022.

In addition, we expect further LNG deliveries from producers in Africa, and the high levels of pipeline gas in 2022 from Norway, Algeria and Azerbaijan to be sustained. We also expect that some Asian producers will step up their production, notably Malaysia and Indonesia, so that the demand pressure from the Asian markets is eased. New and upgraded infrastructure has increased EU import capabilities in 2022 and further improvements are expected in 2023 with the commissioning of projects under development, including floating LNG terminals coming into operation.

Fourth, the role of renewables has significantly increased, and it will continue to grow. Market estimations of the solar industry forecast a significant growth in solar rooftop installations in the coming years - around 50 GW in 2023 and 85 GW by 2026. Moreover, we expect that new EU permitting rules, which entered into force in December 2022, will have a catalytic effect on the development of new sources of renewable energy.

We will also set and implement a new industrial strategy. With the Green Deal Industrial Plan, we want to create the right conditions for net-zero industries to thrive in Europe – without having to compromise on our open economy. Access to critical raw materials and reliable supply chains remain a concern also in this context and call for close partnership and coordination with international partners such as the U.S. We are conscious that the United States in the Inflation Reduction Act, as well as other major economies, is also stepping up their investment in the net-zero industry. The EU and the U.S. must work together to fight climate change; for our planet and citizens, for our economic prosperity, and for our strategic independence and security, based on fair and open markets and a level playing field.

2. Integration of and support to Ukraine and the Republic of Moldova

Regarding our response in **support to Ukraine and the Republic of Moldova**, the EU has demonstrated immediate solidarity with numerous actions. I would like to highlight four points here.

First, the clear path for Ukraine's future in the European Union.

The aspiration to become part of the European Union has for many years been an important priority for Ukraine, its governments and citizens and a strong driver for democratic change and reforms founded on shared European values.

On 28 February 2022, Ukraine applied for EU membership, and on 17 June 2022, the European Commission issued its opinion on Ukraine's application. In less than a week, on 23 June 2022, European leaders, in the European Council, granted candidate status to Ukraine, and at the same time granted candidate status to the Republic of Moldova.

Second, Europe is committed to the economic security of Ukraine. The EU has mobilised EUR 67 billion of support to Ukraine in the last 12 months – from budget support to fast recovery; from energy supply to military capabilities; from humanitarian aid to refugee support. In January, we delivered the first tranche of our EUR 18 billion financial assistance for 2023.

Just 2 weeks ago, on 3 February, the EU-Ukraine Summit took place in Kyiv. One week later, a Special European Council met on 9 February - the first European summit that President Zelenskyy attended in person since the outbreak of Russia's war.

The European Commission brought a set of proposals to ensure Ukraine seamless access to the European Single Market, giving a clear signal to investors. This will ensure vital revenues for Ukraine by trading with and through Europe and will help to mobilise Ukraine's full economic potential now and during the reconstruction phase.

Third, we integrated the Ukrainian and Moldovan systems with the EU.

Following an urgent request by Ukraine and the Republic of Moldova for emergency synchronisation, the Transmission System Operators of Continental Europe agreed on 16 March 2022 to start the trial synchronisation of the Continental European Power Grid with the electricity grids of Ukraine and the Republic of Moldova. Trading electricity across the borders is now a fact since June 2022; we aim to increase as fast as possible the available capacity for commercial electricity trade with Ukraine and the Republic of Moldova, in coordination with the European Network of Transmission System Operators for Electricity (ENTSO-E). This will help Ukraine cover their generation deficit amid Russian shelling of critical energy infrastructure, including the nuclear power plants.

Finally, the EU is providing emergency support. In light of the systematic, targeted destruction of the Ukrainian energy system by Russian forces, the EU has been supporting the repair and replacement of Ukrainian energy infrastructure by providing coordination, logistics and financial help since the beginning of the Russian invasion. Generators as well as transformers and other specialised energy equipment are crucial for both immediate support and to ensure that the energy system remains functional.

So far and among others, the EU and Member States have provided 40 large generators to ensure uninterrupted power supply to 30 hospitals in Ukraine that need these generators to operate and around 1 600 generators and 1420 transformers overall via the Union Civil Protection Mechanism (UCPM).

The EU responded to President Zelenskyy's call on the international community to support the purchase of 50 million energy efficient LED light bulbs for Ukrainian households. When deployed, they would save some 1 gigawatt of electricity, which is equivalent to the annual output of one nuclear power plant. These savings are crucial to reduce the pressure on the

Ukrainian power grid. Therefore, the Commission has announced funding that will cover roughly 30 million of these LED light bulbs.

The EU, the European Commission together with the Energy Community Secretariat and EU Member States, is first in line in supporting urgent repairs of energy infrastructure by providing needed funding and equipment. We are also continuing to support essential supplies for nuclear safety and radiation protection in Ukraine, having provided over 50 million EUR of EU material assistance and financing for restoring safety equipment and infrastructure. In addition, the EU has provided funding to the International Atomic Energy Agency for their safety and security missions to Ukraine's nuclear power plants.

3. Transatlantic partnership

From the very beginning of the energy crisis, the Transatlantic energy relationship, based on common goals of security and shared values, has played a critical role in our efforts. Our partnership is unique and stronger than ever.

In March 2022, President Von der Leyen and President Biden established a Task Force on Energy Security to reduce Europe's dependence on Russian fossil fuels and strengthen European energy security through the diversification of LNG supplies and reducing demand for gas. The United States and the EU, in this Task Force, have worked with international partners and secured additional LNG volumes for Europe: 56 billion cubic meters of LNG have been delivered from the U.S. to the EU in 2022, almost tripling compared to 2021 (22 bcm). The US LNG exports to the EU have played an essential role to keep the EU market supplied and are expected to continue to do so in the forthcoming years.

In parallel, the U.S. EU Energy Security Task Force has been looking into immediate measures to reduce energy consumption. The Task Force has coordinated a series of vital discussions between the EU and its Member States and the U.S. Government, as well as with industry and NGOs for example to establish best practices for successful consumer campaigns for energy saving, gas demand reduction and peak shaving.

The U.S. EU Energy Council, which has existed since 2009, has also remained a key Transatlantic energy forum during the energy crisis. The next Energy Council is scheduled to meet again on 4 April 2023.

With the continued efforts to diversify supplies of natural gas, and in particular LNG, the EU aims to attract further LNG supplies from the U.S. in 2023. U.S. companies can play an important role in EU joint purchasing. Under the political leadership of Vice-President Maroš Šefčovič, we are working to establish the key mechanisms for joint purchase in the coming weeks and stand ready to address the questions that these companies may have in order to make the EU energy platform attractive from the perspective of American gas producers including in relation to long-term contracts.

The EU welcomes plans to increase LNG liquefaction and export capacities in the U.S. This aligns with the EU efforts to increase LNG regasification and infrastructures across the EU. In the longer term, this mechanism could support U.S. companies to export the renewable hydrogen capacities they may produce in the future.

Closing remarks

Let me summarise my key messages that I would want to leave with you today:

First, a year ago, Europe was dependent on Russian natural gas for 40 per cent of its imports and on Russian fossil fuels, a dependency built up over decades. In less than a year, Europe has proven that it can become independent from Russia successfully and without interruption of supplies to its citizens and industries.

Our energy systems are stable: we did not experience any shortages of supply or blackouts. The European response to the energy crisis has been united, decisive, and impactful. It is clear evidence that we are strongest in our response when we work together, united in purpose and in action, both within the European Union and with our international partners. And we have shown that energy security and the transition towards a climate neutral energy system are aligned and mutually reinforcing.

Second, the global energy crisis remains of concern and the supply situation is tight. There is no room for complacency. This calls for continued efforts to reduce our energy consumption, both in the European Union and by international partners. The European response will continue to be based on further energy savings, acceleration of renewable energy and close cooperation with our partners.

Third, our cooperation with United States is indispensable. We expect that the U.S. will remain a key LNG supplier to the EU in 2023 and beyond with imports overshooting the records set in 2022. Transatlantic trade of LNG is more than just trade. It is also about security, shared values, and a strong partnership. I am hopeful that we will see the support of this committee for a continued Transatlantic energy security partnership.

Our Transatlantic bond is stronger than ever. Our joint action is critical for global peace and economic stability and for this planet and our climate.

The CHAIRMAN. Thank you so much, Ms. Jorgensen.

And finally, we have Dr. Mikulska from Rice, thank you.

STATEMENT OF DR. ANNA MIKULSKA, FELLOW IN ENERGY STUDIES, BAKER INSTITUTE FOR PUBLIC POLICY, RICE UNIVERSITY

Dr. MIKULSKA. Chairman Manchin, Senator Barrasso, and the Committee, thank you very much for inviting me here to share my expertise.

The Russian invasion of Ukraine has brought back the issue of energy security to energy policy in the EU in a way that probably could only be compared with the 1970s oil shocks. At that time, Western European nations decided that reliance on crude oil would be attenuated by bringing in Russian natural gas to support European energy and European industry and heating needs. Now, half a century later, the EU is facing another energy crisis that results from mismanagement of energy security, including overreliance on Russian energy, underestimation of Russia's readiness to use gas flows for geopolitical purposes, and a general lack of alternatives for immediate and seamless substitution. As a result, for almost a year now, Europe has relied on energy efficiency measures, demand curtailment, and ability to pay record prices for energy.

Also critical has been support from the U.S. oil and gas industry, which turned out record volumes, helping to sustain anti-Russian efforts around the world with flexible and commercially oriented supply and active energy diplomacy that U.S. status as an energy exporter has made possible. While these measures prevented a complete breakdown of Europe's energy system, they do point to the fact that Europe failed to ensure its energy security, as defined by availability, accessibility, affordability, and acceptability of supply. The mismanagement of the energy security dimension of energy policy has been especially stark for natural gas, where immediate and full replacement of lost ration volumes has not been possible due to insufficient infrastructure that would allow access to globally traded liquefied natural gas. Recent infrastructure additions, especially floating storage regasification units being installed hastily and at a great cost in Germany, the Netherlands, and Italy may help, but only to an extent, given that global supply of LNG will not expand much over the next two to three years. There is also the potential for rebounding Chinese demand that could tighten the markets even further.

Europe will need to continue competing for supply with added LNG-importing countries. And while wealthy European countries are likely to outbid others, as they did last year, this will impact the affordability of their energy supply. Last fall, wholesale prices of natural gas in Europe peaked to $90 per million BTU, which is compared to the average of $6 to $10 from before the invasion and about $6 in the U.S. at the peak of gas prices last year. Similarly, prices of electricity and coal, used to substitute for natural gas, have risen to record highs, and even though prices have abated, right now, they are still at multiples of what they were before. High energy prices have dealt a blow to European industry, including most prominently the chemical and fertilizer industries. The prospect of high energy prices in the short- to medium-term also creates concerns about potential de-industrialization as companies consider options to re-shore to countries where the costs of energy are lower and less volatile.

In the face of energy crisis, Europe accepted natural gas as well as nuclear power as decarbonizing options. This allowed for certain investment, as I mentioned, FSRUs, as well as gas interconnections. However, many European countries see this fix as short-term, which translates into a hesitant approach and insufficient commitment to longer-term contracts, deficiency that can impact availability, affordability, as well as nature of LNG flows in the future, as some currently planned commercially oriented projects, including those in the U.S., may not come to fruition without sufficient financial backing. At the same time, state-supported enterprises, including Russian entities, do not face the same constraints. As the European crisis shows, responsible energy policy can and should consider "all of the above" options. Plans that are realistic, well-founded, and accessible will have a chance to propel actual change rather than those that are only written out as policy goals. For the U.S., this means responsible development and use of all of its resources that allow the country to use its competitive advantage while ensuring the well-being of its population. The abundant and diverse resources also increase U.S. geo-economic power, which, as we have seen over the last year, allows the country to step in and help its allies when the need arises.

Thank you.

[The prepared statement of Dr. Mikulska follows:]

RICE UNIVERSITY'S
BAKER INSTITUTE
FOR PUBLIC POLICY

Testimony of

Anna B. Mikulska, Ph.D.
Fellow In Energy Studies
Rice University's Baker Institute for Public Policy

to the

Senate Committee on Energy and Natural Resources
Washington, D.C.

for the

"Hearing to examine the impact of the Russian Federation's war in Ukraine on European and global energy security one year after the invasion."

February 16, 2023

Energy security has re-entered the conversation surrounding European energy policy in a way that could only be compared with the 1970s oil shocks. At that time Western European nations decided that reliance on crude oil could be attenuated by bringing in Russian natural gas to support European industry and heating needs. Now, half a century later, the EU is facing an energy crisis, much of which is based on the combination of overreliance on Russian energy, underestimation of Russia's readiness to use gas flows for geopolitical purposes, and general lack of alternatives for immediate and seamless substitution.

The situation unraveled after Russia attacked Ukraine on February 24th, 2022. For almost a year now, to avoid a breakdown of its energy system, Europe has relied on energy efficiency measures, demand curtailment and ability to pay record prices for energy. Critical has been also U.S. support, both via active energy diplomacy and from the U.S. oil and gas industry, which turned out record volumes helping to sustain anti-Russian efforts around the world with flexible and commercially oriented supply.[i]

Europe and especially the EU are often painted with broad brush strokes as a unit, a black box with EU regulation or West European considerations determining the approach to and direction of policies. In the meantime, often multiple European approaches exist. In particular, the approach to energy security distinguishes the Europe's more developed and generally wealthier "West" from the Eastern bloc of countries, which emerged from Soviet dependance. While Western European countries have pushed energy security considerations to the side, their neighbors to the East have often worked tirelessly to ensure secure energy access. Countries like Poland, Lithuania, Latvia, and Estonia have been particularly concerned about dominance of Russian energy in Europe and often highlighted the need for diversification of both supply sources and supply routes. These efforts helped after Russia invaded Ukraine but could not completely diminish the impact that curtailment of Russian energy flows has had on Europe as a whole.

The "Four A's" of Energy Security

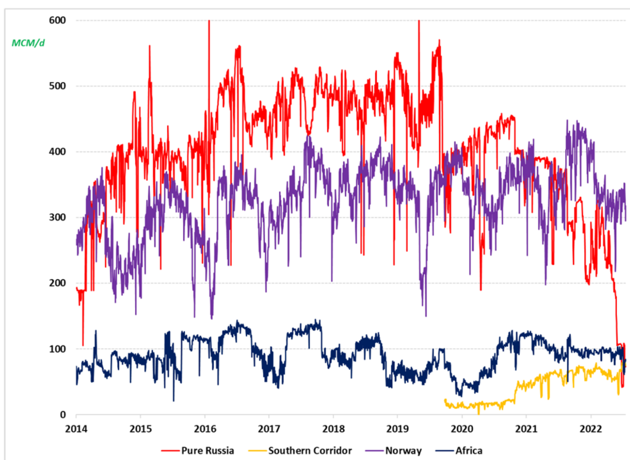
Europe's situation with regard to energy security lends itself well to analysis within the "*four A's*" framework as defined by: 1) availability, 2) accessibility, 3) affordability, and 4) acceptability of energy supply. While more expansive definitions of energy security exist, this approach is both, simple (yet not simplistic) and broad enough to provide a good understanding of energy security considerations in Europe and beyond.

As the events of 2021 and 2022 have shown, Europe has not been able to ensure any and all of the four building blocks of the energy security equation. Much of the European "West," and most notably Germany, has been willing to overlook the warnings coming from Central and East Europe about the growing Russian dominance over the European energy supply and Russian willingness to use those supplies as an energy weapon. The case has been especially acute in the natural gas market, where Europe has visibly lacked a sufficient back up, or "credible threat," an alternative supply that could step in at any given moment and in doing so attenuate geopolitical and economic consequences of heavy reliance on Russian supply.[ii] Instead, countries like Germany and France were leading in the EU's move toward decarbonization, a transition underwritten by an ill-founded conviction that Russia would continue delivery of energy resources while Europe works toward phasing out fossil fuels.[iii] Consequently, new LNG import capacity became an unpopular option in many countries outside of the post-Soviet bloc, seen as an unnecessary expense and burden given energy transition goals.

Availability and Accessibility of Supply

The system had begun to unravel already in 2021, when Russia cut volumes of natural gas flowing to Europe to a contracted minimum while draining (instead of restocking) Gazprom-owned gas storage inventories in the runup to the 2021/2022 winter.[iv] The ***Availability*** of supply has been hit even harder post-February of 2022 after Russia's invasion on Ukraine. First, Gazprom halted deliveries via Yamal pipeline as part of the sanctions against "unfriendly countries." Second, the company continued decreasing amounts of gas flowing via Ukrainian transit. Gazprom had also progressively cut volumes to Germany via Nord Stream 1. The pipeline eventually exploded as a result of what seems was an act of sabotage and has been unable to operate ever since. This impacted ***Accessibility*** of supply for what would be half of typical German annual demand or ¼ of total Russian exports to Europe before the Covid -19 pandemic (See Figure 1 for curtailment of Russian gas volumes).

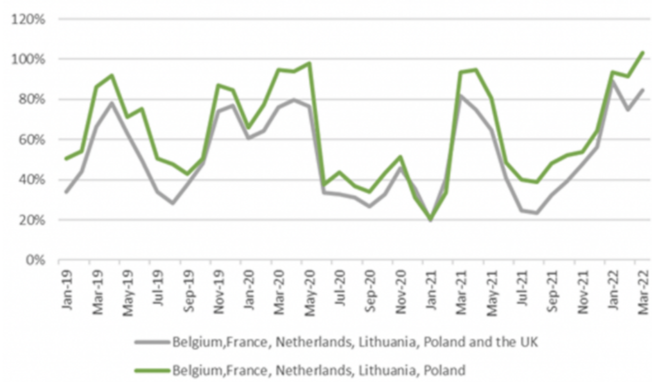
Figure 1. EU27 Natural Gas Imports



Source: Collins et al.[v]

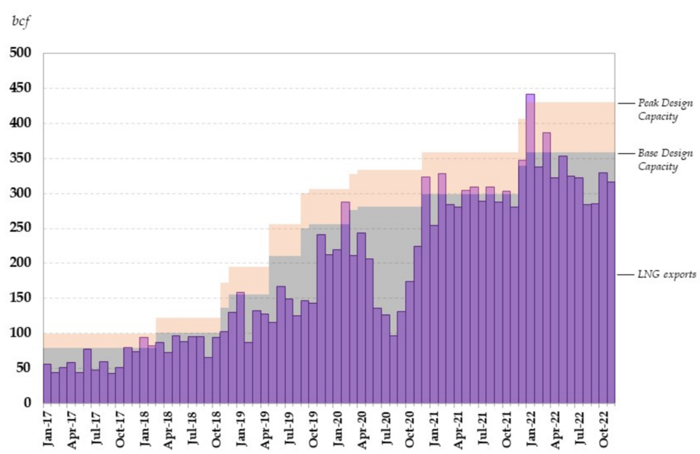
Crucially, global gas supply has not been able to fill the void left by Russian gas. Much of the Russian gas that would otherwise go to Europe became stranded with no infrastructure ready to send it to other demand centers. In the meantime, Europe has drawn as much as possible of the globally available but limited in volumes LNG, which significantly tightened the market. Some inroads have been made in the short-term by pushing the limits of productivity or capacity, including increase in gas production from Norwegian fields, delaying maintenance, as well as pushing limits of both, regasification capacity in the EU (Figure 2) and liquefaction capacity in the US (Figure 3).[vi] China's economic downturn in the face of no-Covid policy has also helped allowing for additional flexibility and redirection of some LNG volumes to Europe. [vii]

Figure 2. EU LNG Import Terminals Capacity Utilization



Source: Mikulska and Miles (2022)[viii]

Figure 3. US LNG Exports, Monthly Jan2017-Nov2022



Source: Kenneth B. Medlock III (2023)[ix]

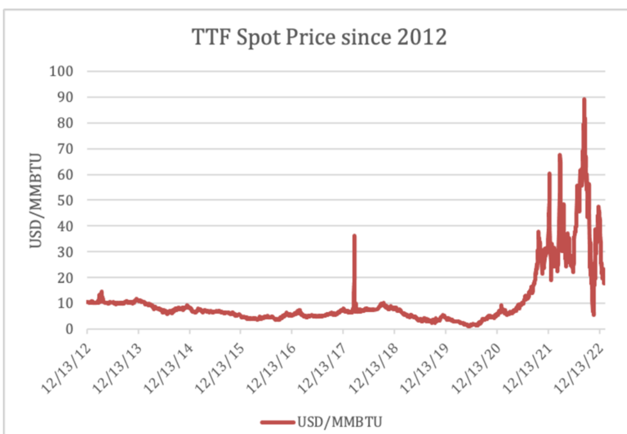
At the same time, it's worth noting that limitations to ***Accessibility*** were a big impediment to securing even the gas supply that was available to Europe. This includes 1) insufficient LNG import capacity, especially in Germany which had the largest gas shortage after Russian gas volumes decreased but no LNG import terminals until the very end of last year; 2) lack of interconnections to channel the supply from existing LNG import infrastructure to centers of immediate demand, including lack of access to plentiful LNG import infrastructure in Spain and Portugal but also, to an extent, in Italy and the UK. And while the advances in diversification infrastructure in Central and Eastern Europe helped, they were too small to assuage the deficits on the European scale, even with new LNG terminals often operating far above nameplate regas capacity.[x]

Going forward, accessibility is likely to improve given new floating storage and regasification units installed or soon to be installed in Germany, Finland, and the Netherlands among others. However, with little new LNG coming into the markets in 2023 and 2024 this could make markets even tighter, especially if Chinese demand rebounds. In addition, the market will likely tighten in the non-heating season as Europe strives to fill its gas storage to legally mandated levels of at least 90% until November 1st, 2023.

Affordability of supply

The push for winter preparedness has already been a contributing factor to extreme price rises in 2022, highlighting ***Affordability*** as a crucial feature of secure energy supply. Figure 4 shows how the prices skyrocketed in the Fall of 2022 as the last push for storage fill in preparation for winter was taking place and explosions idled Nord Stream 1 pipelines.

Figure 4. Natural Gas Prices in Europe, Dec. 2021-Jan. 2023 (Spot-Day Ahead)

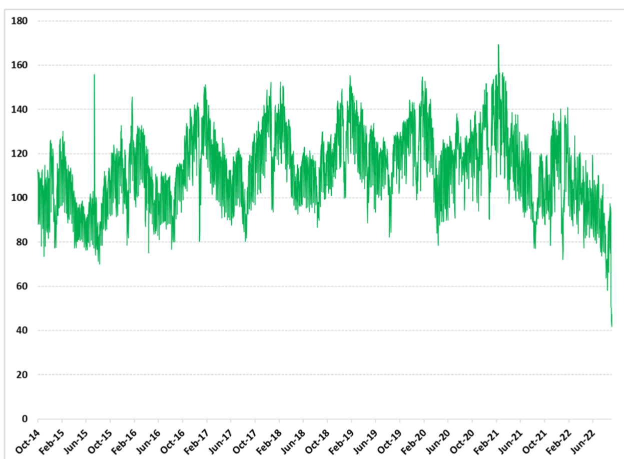


Data: Bloomberg; Author's Analysis

Thanks to the high storage levels and a very mild fall and winter 2022/2023, the prices of natural gas in Europe abated significantly, though they still stand at multiples of prices before the Russian invasion. But even though gas storage is filled to record high levels, promising a smaller burden for the next summer filling season, much of the gas that it contains was bought at the height of the price runup. In effect, many European utilities are faced with no good option to choose from: while sales of the stored gas mean heavy losses and the potential need to buy again in a high-price environment, a lack of sales leads to a lack of financial liquidity.

High prices of energy have also dealt a severe blow to the European industry (See Figure 5), with high-energy and high-gas intensive users affected the most, including most prominently chemical and fertilizer industry.[xi] The prospect of high energy prices into the short-to-medium term also creates a reason for concern about potential de-industrialization as companies consider options to re-shore to other countries where costs of energy are lower and less volatile.

Figure 5. Industrial Gas Demand in Europe*



Data source: ENSTOG; Analysis: Collins et al.[xii]

**This is not a Europe-wide picture, but still constitutes a material indicator that includes gas flows to industrial consumers in Belgium, part of France (Terega), Part of Germany (ONTRAS), Italy, Luxembourg, the Netherlands, and the UK*

Europe is trying to avoid this outcome by introducing heavy subsidy schemes, at both national and EU-levels, including some developed as a response to the U.S. Inflation Reduction Act. Whether these will be successful remains to be seen. However, subsidies toward energy prices for individual consumers and industry are likely to be a heavy burden on European states and tax payers. This, in turn, could negatively impact the ability of at least some EU member countries to address other societal needs while not being able to completely neutralize the spike in energy prices. Inflationary pressures that already exist are likely to deepen, which can potentially lead to societal dissatisfaction, electoral upsets, and a general backlash and instability that could make Europe even less attractive for investment. Heavy governmental and regulatory involvement and the willingness of governments to step in could also become a serious deterrent for some commercially-minded actors.

The mild winter in 2022/2023 has allowed the European gas and electricity markets and consumers some breathing room. With no need for governmentally regulated gas rationings and storage levels high in February 2023, Europe is currently rather assured of availability of natural gas for the rest of this winter season (at least under average winter conditions). Indeed, if the winter continues to be mild, the next storage filling season is also likely to be less challenging as some of the storage-retained volumes substitute for what usually would be Russian gas flowing over summer into the European storage. Even so, the pressure on prices of natural gas and gas-powered generation will continue to impact the European industry, consumers, and European budgets well into the future, even if additional LNG supply relaxes the markets in the second half of the 2020s. The pressure will, among others, result from the hurried, previously unbudgeted investments in natural gas infrastructure that Europe did not plan to make but which have been clearly critical to support its energy security.

Acceptability of Supply

This leads to the last feature of the *"Four A's"* framework: ***Acceptability***. What's acceptable in energy supply to Europe has changed dramatically in February of 2022 with Germany's cancelling of the Nord Strom 2 pipeline right before Russia entered Ukrainian soil. Suddenly Russian energy became undesirable while natural gas (in particular LNG), nuclear power and even coal from non-Russian suppliers became acceptable and sought after.

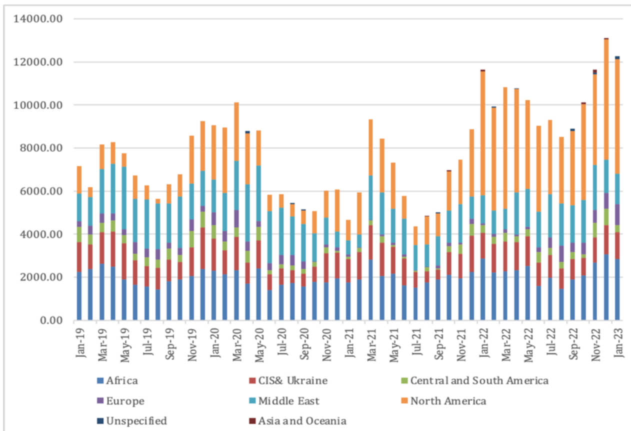
The reliance on piped Russian gas has been particularly difficult to address in an immediate fashion given the need for expensive infrastructure that takes times to build on both ends of the demand-supply equation. In effect, much of Europe is still accepting whatever gas Russia is willing to flow its way. Since these volumes diminished, however, and non-Russian supply is either unavailable and/or inaccessible, other fuels are being put to work, including coal and nuclear power, even in countries which have been trying to eliminate either or both from their energy mix. In addition, domestic natural gas production that was had been slotted for a permanent phaseout (i.e., in Groeningen) remains online. Importantly, natural gas and nuclear power have been included in the taxonomy of decarbonizing fuels, all pointing to another change in acceptability of fossil fuels among Europeans. But this acceptability is only short-term, portrayed as a setback, rather than a matter of necessity as Europe hopes to transform into a zero-carbon economy. At the same time, it's unclear how short the short-term will be, given the current lack of immediately available alternatives to traditional energy sources and long lead times for renewable investment.

The short-term rhetoric is also not without consequences to both European and global security of gas supply. To begin, if European customers fail to commit to long-term contracts, they will likely have to purchase natural gas on a secondary and/or spot market. This could mean volatility, high prices and possibly shortages of natural gas and not only in Europe. Also, countries that committed to long-term contracts could lose those volumes if unable to outbid wealthy European customers. Indeed, this has already been the case last year where countries such as Pakistan, Vietnam, or Bangladesh were not able to attract LNG shipments and even saw their contracted LNG volumes travel to Europe instead. And while Europe was able to fill their gas storage to the rim and prevent explicit gas rationing, these countries were less fortunate with Pakistan,[xiii] in particular, in the midst of experiencing an acute energy crisis and many in the region rethinking previously planned investment in natural gas, decreasing the number of potential long-term contracts even further.

Importantly, lack of long-term contracts will not impact all LNG providers to the same degree. Instead, private, commercial LNG producers, including those in the U.S., are likely to be impacted more given their general reliance on anchor consumers for financing and reaching a final investment decision. Thus, gas markets would be more likely to become dependent on state-owned or state-supported LNG producers, including Russia, increasing their geopolitical and/or economic leverage. Such development would undermine the trend toward a more flexible and more liquid natural gas market that the entry of U.S. LNG producers in particular has introduced.

If anyone wondered previously whether U.S. LNG makes a difference, those doubts should have completely disappeared over the last year as U.S. LNG poured into Europe (Figures 6 & 7). It is also easy enough to imagine a counterfactual where Russian attacks on Ukraine and the diminishing supply of natural gas to Europe come while the U.S. is a net gas importer or depends on Russian gas itself. The response from the US would possibly have been much more muted, and the U.S. would have to engage in price competition with Europe and Asia for the limited supply of natural gas available in the global market, with prices of energy skyrocketing in the U.S. as much as, if not more than they did in Europe.

Figure 6. EU27 LNG monthly imports by region of origin

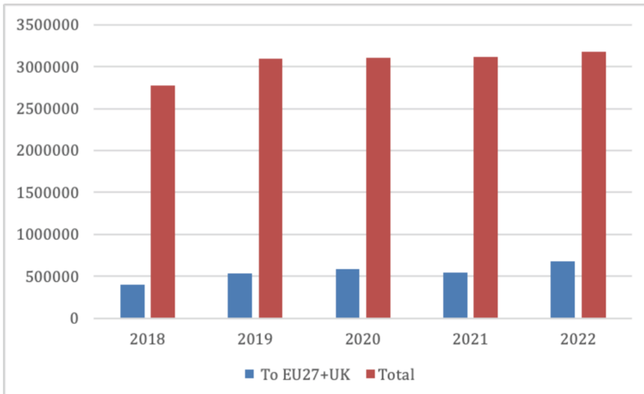


Data Source: Cedigaz; Author's analysis

Oil and oil products

The geopolitical value of US energy exports is also very much pronounced in the case of oil. More geographically diversified supply of crude oil and crude oil products has been able to diminish the economic and geopolitical power of large oil suppliers improving energy security of the U.S. and globally.[xiv] A relatively quick response time to changes in price by US shale oil producers led to moderate oil prices in the past decade, offsetting global oil crunches resulting from political and geopolitical events and instability in oil producing countries, including most-recently Russia.[xv] We have also seen an increase in the flows of U.S. oil to Europe as the latter tries to wean itself off Russian crude and its products (Figure 7).

Figure 7. Annual U.S. Exports of Crude Oil and Petroleum Products (Mbbl)



Data Source: EIA / Author's Analysis

What's Next

Going forward, European energy security will be impacted by a myriad of factors, many of them political in nature, including the push for an energy transition. As Europe admitted itself, albeit too late to prevent the 2021/2022 energy crisis, natural gas and nuclear power should be counted as decarbonizing options. The admission has allowed for certain investments like FSRU's and new gas interconnections. However, many European countries see these fixes as short-term, which translates into a hesitant approach and insufficient commitment to longer-term contracts, deficiency that can impact availability, affordability, as well as nature of LNG flows in the future as some currently planned, commercially-oriented projects – including those in the US- may not come to fruition without sufficient financial backing while state-supported enterprises will.

At the same time, U.S. involvement in new nuclear power development in Central and Eastern Europe is an encouraging signal that incorporates both, energy and economic security. Responsible energy policy can and should consider "all of the above" options. Plans that are realistic, well-founded and accessible to all countries will have a chance to propel actual change, rather than those that are only written out as policy goal. For the U.S. this means responsible development and use of all of its resources that allow the country to use its comparative advantage while advancing the wellbeing of its population. The abundant and diverse resources also increase U.S.' geoeconomic power, which - as we have seen over the past year – allow the country to step in and help its allies when the need arises.[xvi]

[i] Anna Mikulska and Steven Miles, *US LNG 'GasLift' Floods European Terminals Ahead of Russia Gas Cutoff*, available at: https://www.bakerinstitute.org/research/us-lng-gaslift-floods-european-terminals-ahead-of-russia-gas-cutoff.

[ii] See: Kenneth B. Medlock III (2014), *A 'Credible Threat' Approach to Long Run Deterrence of Russian-European Hegemony*, available at https://www.bakerinstitute.org/research/us-lng-exports-weapon-against-russia/ & Anna Mikulska, "*How Much Gas Is Enough: Energy Security and Natural Gas Infrastructure in the Baltic Sea Region,*" chapter in *The Future of Energy Consumption, Security, and Natural Gas,* Edited by Kari Liuhto. Palgrave, 2021 Available at; https://link.springer.com/chapter/10.1007/978-3-030-80367-4_11 .

[iii] See: Kenneth B. Medlock II, Anna Mikulska, and Luke (Leelook) Min, *Natural Gas Balance in Europe: Germany as a Case Study*, available at: https://www.bakerinstitute.org/research/natural-gas-balance-europe-germany-case-study

[iv] See EIA report available at: https://www.eia.gov/naturalgas/weekly/archivenew_ngwu/2021/09_30/

[v] Gabriel Collins, Anna Mikulska, and Steven Miles, *Gas Geoeconomics Essential to Win the 'Long War' In Ukraine—And Asia*, Baker Institute Research Presentation, September 2022

[vi] Steve R. Miles, Gabriel Collins, and Anna Mikulska, *US Needs LNG to Fight a Two-Front Gas War*, available at: https://www.bakerinstitute.org/research/us-needs-lng-fight-two-front-gas-war

[vii] Gabriel Collins, Kenneth B. Medlock III, Anna Mikulska, and Steven Miles , *Strategic Response Options if Russia Cuts Gas Supplies to Europe,* available at: https://www.bakerinstitute.org/research/strategic-response-options-if-russia-cuts-gas-supplies-europe

[viii] Anna Mikulska and Steven Miles, *US LNG 'GasLift' Floods European Terminals Ahead of Russia Gas Cutoff*, available at: https://www.bakerinstitute.org/research/us-lng-gaslift-floods-european-terminals-ahead-of-russia-gas-cutoff

[ix] Kenneth B. Medlock III, *U.S. LNG Exports: Supply, Siting, and Bottlenecks. The U.S. Natural Gas Market in Global Setting*, Publication upcoming March 2023.

[x] For pre-2022 Russian invasion considerations see: Gabriel Collins and Anna Mikulska (2018), *Gas Geoeconomics in Europe: Using Strategic Investment to Promote Market Liberalization, Counterbalance Russian Revanchism, and Enhance European Energy Security,* available at https://www.bakerinstitute.org/research/egas-geoeconomics-europe; A 2022 follow up: Gabriel Collins, Anna Mikulska, Steven R. Miles, *Winning the Long War in Ukraine Requires Gas Geoeconomics*, available at: https://www.bakerinstitute.org/research/winning-long-war-ukraine-requires-gas-geoeconomics-0

[xi] Aura Sabadus, *Poor Demand, High Costs Stifle Europe Industry Despite Falling Prices*, available at: https://www.icis.com/explore/resources/news/2023/01/18/10846094/insight-poor-demand-high-costs-stifle-europe-industry-despite-falling-gas-prices/

[xii] Gabriel Collins, Anna Mikulska, and Steven Miles, "*Gas Geoeconomics Essential to Win the 'Long War' In Ukraine—And Asia*," Baker Institute Research Presentation, September 2022, available at: https://collinsresearchportal.com/2022/09/12/gas-geoeconomics-essential-to-win-the-long-war-in-ukraine-and-asia/

[xiii] Charles Kennedy, *Pakistan has no option but to ration natural gas this winter*, available at https://oilprice-com.cdn.ampproject.org/c/s/oilprice.com/Energy/Natural-Gas/Pakistan-Has-No-Option-But-To-Ration-Natural-Gas-Supply-This-Winter.amp.html

[xiv] Jim Krane, Kenneth B. Medlock III, "Geopolitical dimensions of US oil security," *Energy Policy*, Volume 114, 2018, Pages 558-565, ISSN 0301-4215, available at: https://doi.org/10.1016/j.enpol.2017.12.050

[xv] Jim Krane and Mark Agerton, *OPEC Imposes 'Swing Producer' Role Upon U.S. Shale: Evidence and Implications*, available at: https://www.bakerinstitute.org/sites/default/files/2015-08/import/CES-Krane-Agerton-2015EnergyForum3qtr.pdf

[xvi] Gabriel Collins, Anna Mikulska, and Steven Miles, "*Gas Geoeconomics Essential to Win the 'Long War' In Ukraine—And Asia*," Baker Institute Research Presentation, September 2022, available at: https://collinsresearchportal.com/2022/09/12/gas-geoeconomics-essential-to-win-the-long-war-in-ukraine-and-asia/

The CHAIRMAN. Thank you so much.

Now we will start our questioning, and I will start. I will begin with Director Jorgensen. The prices that Dr. Mikulska mentioned are absolutely accurate. It is just unbelievable the prices that Europe was paying at the peak of things, but we didn't have the production at that time and the spot markets were just out of control. We understand all of that. We are putting about 13 billion cubic feet a day into LNG. We have four more terminals coming online, so we should be up near 20 to 25 billion cubic feet a day fairly soon, I am understanding. And with that, and other opportunities—I think Qatar is bringing more gas into the market—are you able, and Director Jorgensen, are you all looking at your longer-term contracts? Because I know the American producers are looking for a longer-term contract with the Europeans to make sure you don't have that spike as you had.

And one final thing, I want you to compare—everything that we are hearing about ESG, you have been hearing about that being kind of a governance. I am concerned, if you are only looking at ESG and you are not looking at the geopolitical risk and what you all have fallen into, geopolitical risk, that we never thought that Russia would do what they have done, but the havoc it has created in the economy and the suffering of the people, and also, just throwing caution to the wind on environmental concerns when it's survival, and could that be prevented or should that be taken into consideration with, basically, countries and companies making these decisions based only on one parameter and not on both equally?

I know that is a lot in one question, but do the best you can.

[Laughter.]

Ms. JORGENSEN. Thank you. Thank you very much, Senator.

So first of all, we have expanded our import capacity. I just want to mention it, that there is significant additional capacity to import LNG as a response to the crisis. So we are able to offtake any additional supplies that will come online globally. Secondly, as you have said, long-term contracts are an important feature of the global natural gas market, and in particular, of the global LNG market, and it is a commercial position for companies whether they want to sign long-term contracts. And I think one consideration there is that the extreme volatility and uncertainty in global markets is certainly not helpful in that regard.

We see an interest in long-term contracts to provide the security of supply, the stability in markets. We see with some concern that a number of U.S. suppliers have signed long-term contracts with Chinese buyers, and so we are following that market very closely and looking at what we can do from the European level, from the European Commission and member states to further support the development of long-term, stable markets and offtake. One of the things we have done there, as I mentioned, is to establish an energy platform that will work on joint purchasing, and we are currently working both with suppliers, but also with energy companies in Europe to see how to best support developments there to get more stability into the market and what is the role of long-term contracts in that context——

The CHAIRMAN. I noticed this morning, so this morning's prices—you are at about $17 per million BTU, and we are down to about $2.50. But it has come down tremendously.

Ms. JORGENSEN. Yes.

The CHAIRMAN. But it's still multiples. Where is your sweet spot? What are you looking for as far as the stability of your economy?

Ms. JORGENSEN. I would not be able to put a specific price level on that, but I do think we have seen the worst in the volatility.

The CHAIRMAN. Okay.

Ms. JORGENSEN. Last year, we had in Europe—our gas prices at our domestic benchmarks were around 350 and they are now down close to 50. And so, in other words, we are out of that very worst volatility and extremely high prices. We have done what we can to avoid it by the demand reduction by the investments.

The CHAIRMAN. Can you talk about the ESG versus, basically, geopolitical risk——

Ms. JORGENSEN. Yes.

The CHAIRMAN [continuing]. And what the geopolitical risk has cost? I am understanding the UK has kind of thrown caution to the wind completely just trying to get through difficult times.

Ms. JORGENSEN. So ESG remains an important factor to guide our taxonomy as an important element——

The CHAIRMAN. Sure.

Ms. JORGENSEN [continuing]. To guide investors to the extent they want to have a green profile or a green portfolio—green funds, and that is useful in itself. That does not mean that investments into security, security of supply, are not relevant. It is an important selling point as well, if you will, from a sector perspective. And the way we have looked at it in terms of our public financing, our European financing, is that we will be financing more into the energy transition, but financing into the security of supply has been high priority, not least this last year, which is why we have helped fund a number of the new infrastructures that have come online.

The CHAIRMAN. And I think the mild winter, the European mild winter, basically helped tremendously, I think, with your supply chain and also your reserves. What are you all anticipating for next year? Are you preparing for next winter—next year, 2023?

Ms. JORGENSEN. Yes.

The CHAIRMAN. Or this year.

Ms. JORGENSEN. So this winter we were indeed helped by somewhat milder weather, but it was not that unusually mild. It was milder, and that was a good thing in the current circumstances, but we were also helped by our measures on storage filling, on demand reduction, on price stabilization mechanisms, on solidarity mechanisms, and we were helped by the very close cooperation and support by allies, and in particular, the United States, supplying significant amounts of LNG to the European Union over the last year.

As we go into next winter, and my co-panelist referred to the International Energy Agency ministerial yesterday, which indeed focused on energy security going into this next winter. It was an interesting discussion and there is interesting analysis from the International Energy Agency, essentially confirming that in the scenario of things continuing where they are, we are actually ready for next winter. We have given ourselves the instruments we need. We have built the supply opportunities that we need. We have built the infrastructure that we need. So barring a very cold winter, barring shortages from suppliers, barring other accidents, exogenous factors, we would be ready for next winter, provided of course, that we continue to reduce our demand and do the right thing across the European Union.

The CHAIRMAN. One final thing, real quick before I turn to Senator Barrasso is, when you talk about long-term contracts, what time frame are you talking about? That means you are going to be needing this product and you are willing to sign a contract for—is it 5, 10, 15, 20, or longer?

Ms. JORGENSEN. So as I mentioned, we see natural gas as being part of the energy transition in the European Union. So our forecast, our analysis of how to get to climate neutrality in 2050 includes a share of natural gas in our energy system all the way between now and 2050.

The CHAIRMAN. 2050.

Ms. JORGENSEN. The duration of long-term contracts, again, is up to the commercial actors, but there is nothing in our system that would stand in the way of that.

The CHAIRMAN. That is very good. Thank you very much.

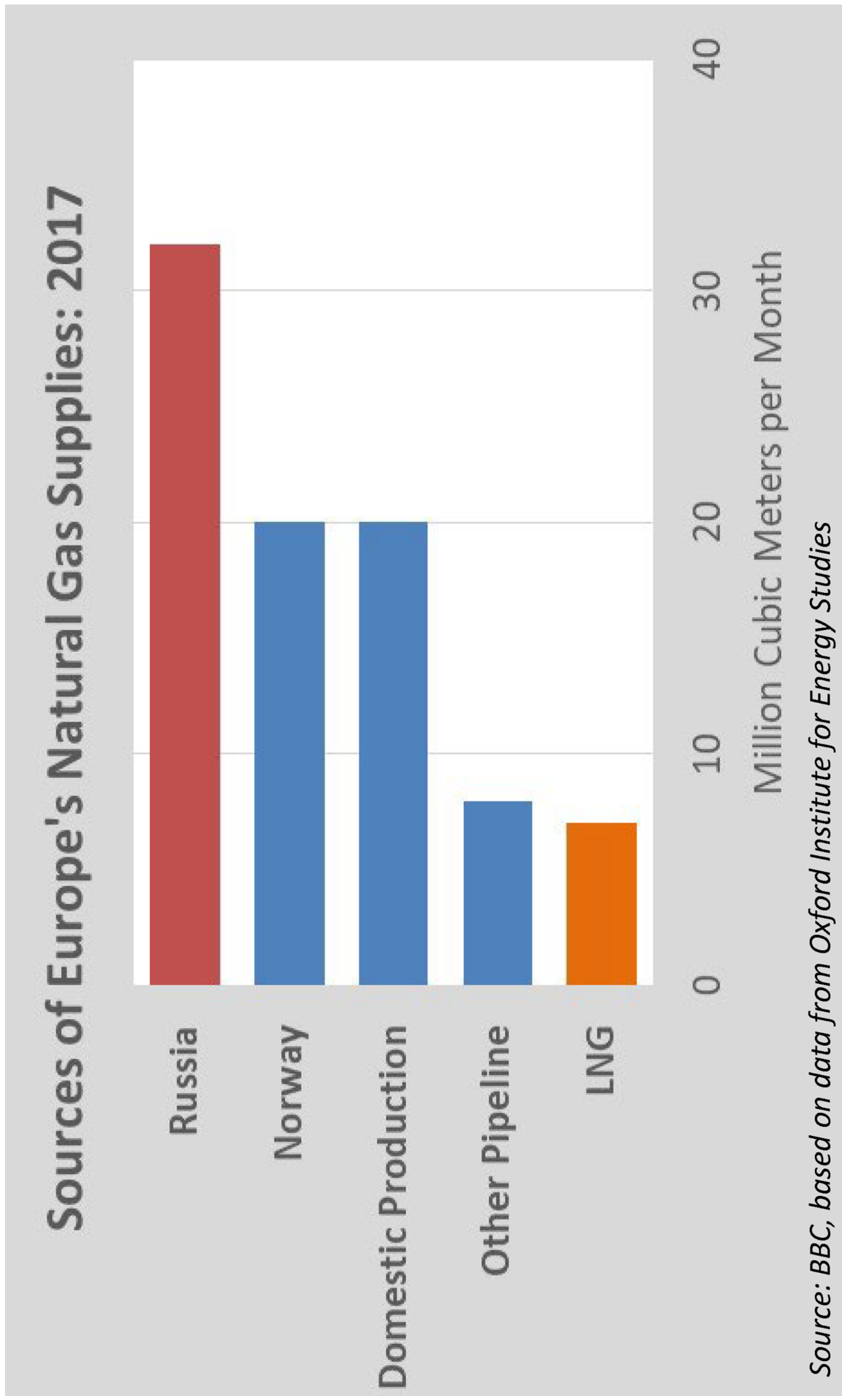
Now to Senator Barrasso.

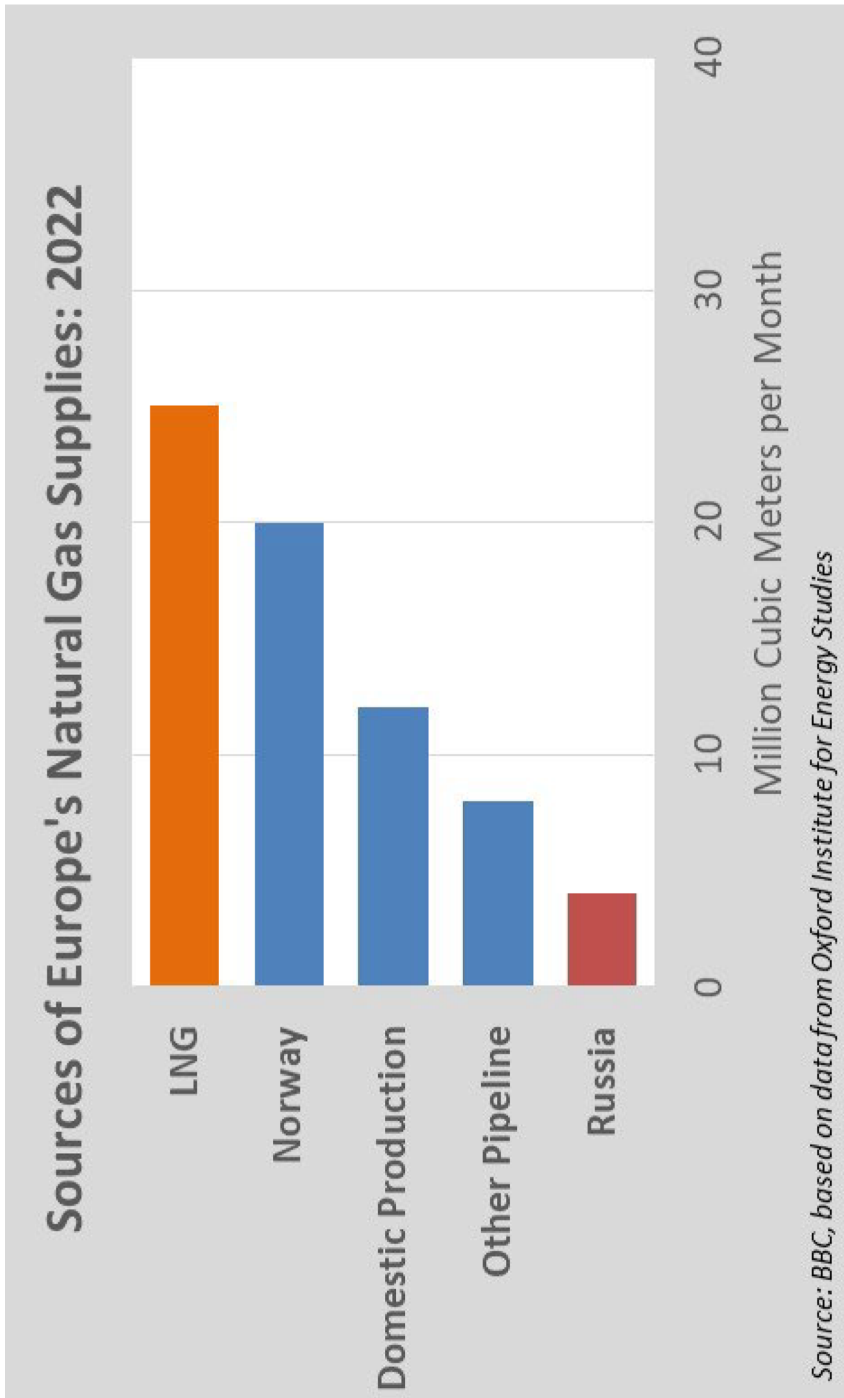
Senator BARRASSO. Well, thanks so much, Mr. Chairman. I think your questioning is very insightful and informative. So thank you.

I have a question for each of the three. I want to start with Dr. Mikulska.

You know, many European countries have dramatically reduced their reliance on Russian natural gas. You can see where Russian natural gas supplies were up there in 2017 in terms of Europe's need. The two charts are showing it. The Russian natural gas is being replaced by liquefied natural gas, and where we are today, in 2022, LNG is the top. It used to be at the bottom. Now it is up at the top. And all of you have mentioned that.

[The charts referred to follow:]


Sources of Europe's Natural Gas Supplies: 2017
Russia
Norway
Domestic Production
Other Pipeline
LNG
0
10
20
30
40
Million Cubic Meters per Month
Source: BBC, based on data from Oxford Institute for Energy Studies


Sources of Europe's Natural Gas Supplies: 2022
LNG
Norway
Domestic Production
Other Pipeline
Russia
0
10
20
30
40
Million Cubic Meters per Month
Source: BBC, based on data from Oxford Institute for Energy Studies

Senator BARRASSO. So before the war, Russia was the lead source of Europe's gas with LNG imports from all countries limited. The second chart, 2022, LNG imports moved to the top of the list, replacing Russian gas.

So my question to you is, as more of our allies in Europe and around the world look to wean themselves off of Russian gas, how important is it, here in the United States, that we increase U.S. LNG export capacity?

Dr. MIKULSKA. It is very important and that is because of the type of capacity that the U.S. releases—commercially oriented, not driven by politics or policy. So while we can talk about the different ways in which markets may be unpredictable, they still react to the demand and supply equation. And that is why Europe was able to attract so much LNG, because the prices were there and they were supporting the movement of U.S. LNG and other LNG into Europe.

I think it is interesting to see that part of the LNG that Europe receives is from Russia though. So that is something also that needs to be considered going forward and it is probably better to have the U.S. commercially oriented LNG in Europe.

Senator BARRASSO. And then let me just turn then to Dr. Light regarding that answer and what you have just seen here on these charts. So we have heard how important increasing U.S. LNG export capacity is for European energy security. Now, I am aware of at least one project that, right now, is awaiting Department of Energy approval to build a floating LNG terminal off the coast of Mexico which would use U.S. natural gas. Would exporting this U.S. LNG from such a facility help boost global energy security?

Dr. LIGHT. It would, Senator Barrasso. If you are referring to the two Sempra projects, both of them have been permitted though, as of December.

Senator BARRASSO. All right. Well, we are going to continue to make sure that the permitting goes through.

The CHAIRMAN. Build-out, right?

Senator BARRASSO. Well, yes. There are a number of issues and different permits for different components of it.

Dr. LIGHT. Absolutely, sir. And anything that you would like to flag for our attention we, of course, welcome it.

Senator BARRASSO. Great, thanks.

And now for Director Jorgensen. So last month, the Washington Post published a front-page story. I have it right here: "Power Titan Quietly Aids Russian War Effort." And the first line of the article reads, "Russia's State nuclear power conglomerate is working to supply the Russian arms industry with components, technology, and raw materials for missile fuel, aiding Russia's deadly onslaught on Ukraine." Washington Post, front page story.

[The article referred to follows:]

The Washington Post Democracy Dies in Darkness

EXCLUSIVE

Russia's state nuclear company aids war effort, leading to calls for sanctions

[This article appeared in the January 21, 2023 print edition of the Washington Post as "Power titan quietly aids Russian War effort"]

By Catherine Belton

January 20, 2023 at 2:00 a.m. EST

Russia's state nuclear power conglomerate has been working to supply the Russian arms industry with components, technology and raw materials for missile fuel, documents show, aiding Moscow's deadly onslaught on Ukraine and leading to calls for the company, Rosatom, to be put under sanctions.

A letter from a Rosatom department chief, dated October 2022 and obtained by Ukrainian intelligence, refers to a recent meeting with the Defense Ministry and representatives of Russia's military-industrial complex. It shows the state nuclear company offering to provide goods to Russian military units and to Russian weapons manufacturers that are under sanctions.

The weapons manufacturers include Almaz-Antey, a missile systems producer; NPK Tekhmash, which manufactures unguided bombs and multiple missile launch systems; Vysokotochniye Kompleksy, which makes Iskander missiles; NPO Splav, which produces the Uragan rocket launchers that fire cluster bombs; the state-owned aircraft conglomerate; and several Russian armored carrier and tank makers. Detailed descriptions of the products available for use by the Russian military and the arms industry are attached to the letter, which was provided to The Washington Post.

Rosatom has long presented itself as a civilian entity operating nuclear power plants in commercial partnerships across the globe, despite its role in also developing nuclear weapons for Russia. "Rosatom is known in the nuclear world as a civil nuclear company. That's basically what its brand name is," said Mark Hibbs, senior fellow in the Carnegie Endowment for International Peace's nuclear policy program.

But Russia's war against Ukraine is exposing how closely the company, which has a board stacked with current and former senior officials from Russia's security services, is intertwined with its military-industrial complex — and even Russian military operations in Ukraine.

After Russia invaded Ukraine last year, Rosatom's employees facilitated Moscow's illegal seizure of Ukraine's Zaporizhzhia nuclear power plant, according to Ukrainian officials and a Russian presidential decree. The plant, Europe's largest, was cut off several times from Ukraine's electric power grid, and the military standoff at the facility brought the world "one step away from a nuclear accident," according to International Atomic Energy Agency chief Rafael Mariano Grossi.

Witnesses said Rosatom employees stationed at the plant appeared to have directed some of the Russian artillery targeting the plant, while at the height of the shelling in August, Ukrainian President Volodymyr Zelensky decried the attack as "nuclear blackmail" by Moscow. The Ukrainian government said Russia was intentionally seeking to cut off the plant, which is now in cold shutdown because of the artillery fire, from supplying electricity to Ukraine.

Rosatom said in response to a request for comment that "all the claims in your request are completely untrue."

Previous calls by Ukraine — backed by Lithuania, Estonia, Latvia and Poland — to impose sanctions on Rosatom over its involvement in the seizure of the Zaporizhzhia nuclear power plant have not led to action, but disclosures about its role in aiding Russia's arms industry will now add to pressure to list the company.

"If Rosatom is providing support for the Russian arms industry, that's sanctionable," said Daniel Fried, the State Department's sanctions coordinator until 2017.

The company has so far escaped sanctions, in part amid concerns over the potential economic fallout because of its extensive involvement in the civilian nuclear power industry across the globe, including in Western Europe and the United States. There are 18 Russian-designed nuclear power plants operating in the European Union, "and that means the Russians ... have leverage over the continued operation of most of these facilities," Hibbs said, noting that in Slovakia, Russian-designed plants produce half of the country's electricity. The United States depends on Rosatom for about one-quarter of its enriched uranium supplies.

In addition, Rosatom controls about 30 percent of the global market for uranium enrichment and 17 percent of the market for reactor fuel, and out of the approximately 450 nuclear power plants around the world, about 20 percent of them are Russian-designed, Hibbs said. Rosatom is currently working on 23 nuclear power units across the globe, including in India, Turkey and Egypt, with its foreign order book standing at $200 billion.

An attempt to immediately unwind dependence on Rosatom for nuclear fuel supplies, waste management and other partnership agreements could cause major new energy price volatility at a time when the E.U. is only just emerging from a bruising year of soaring energy costs as it weaned itself off Russian oil and gas.

The Ukrainian government, however, has been ramping up the pressure for sanctions in recent weeks. Zelensky's chief of staff, Andriy Yermak, met the State Department's sanctions coordinator, James O'Brien, on Jan. 12 to discuss Rosatom and "strengthening sanctions against individuals and legal entities that continue to support Russia's aggression against Ukraine."

After talks this month with European Commission Vice President Frans Timmermans, Ukrainian Prime Minister Denys Shmyhal indicated that he expected sanctions on Rosatom to be included in the E.U.'s next package of sanctions against Russia, saying that Moscow "must be punished for attacks on Ukraine's energy industry."

Ukrainian Foreign Minister Dmytro Kuleba said revelations over Rosatom's involvement in supplying the Russian arms industry "ring the alarm bell even more and prove that the problem is larger than previously known."

In a statement to The Post, Kuleba said: "Nuclear cooperation with today's Russia is not only immoral because it sponsors Russia's war crimes in Ukraine, but also dangerous. ... We call on all states to halt any nuclear cooperation with Russia, avoid getting into any new joint projects with Russia in this field, and impose personal sanctions on the key Rosatom officials and employees who had interfered with Ukraine's nuclear system." Kuleba said imposing personal sanctions is "an absolute bare minimum."

Among the materials Rosatom's subsidiaries offered to provide to the Russian defense industry, the documents show, are aluminum oxide, a vital component for missile fuel. Other goods include lithium-ion batteries to power tanks, missile defense systems and other armaments; 3D-printing technology; and chemical compounds used in aircraft and missile engineering, the documents show.

It's not clear which — if any — of these products were supplied to the Russian arms industry. But in an address to Rosatom on its 15th anniversary in December, Russian President Vladimir Putin praised the nuclear company for its "huge contribution ... to developing advanced weapons systems and military hardware and putting them on combat duty."

Pavel Luzin, an independent Russian military analyst, told The Post that Rosatom had developed a long-term strategy to supply the Russian arms industry. The Russian Defense Ministry has also spoken, in official statements, of long-running cooperation on "nonnuclear" weapons with the state nuclear conglomerate.

Customs data provided to The Post by the Washington office of the James Martin Center for Nonproliferation Studies shows that at least one Rosatom subsidiary, Renera, has imported at least $1 million worth of lithium-ion battery components from South Korea since the war in Ukraine began.

Experts said they feared Russia could be using Rosatom's current non-sanctioned status as a way to obtain components that would otherwise be embargoed. "It's a big potential loophole," said Jacob Nell, former chief Russia economist for Morgan Stanley and now a member of an independent group of international experts working with the Ukrainian presidential administration on sanctions against Russia. "Specialized imports are being sourced through the nuclear sphere."

Ukrainian officials say Rosatom's involvement at the Zaporizhzhia plant is reason enough to sanction the company. Groups of about a dozen Rosatom employees, accompanied by a contingent of officers from Russia's Federal Security Service (FSB) and hundreds of armed Russian troops, have been present at the plant since mid-March, soon after the Russian army seized control of it.

Rosatom has sought to shield itself from possible sanctions by insisting that its employees were present only to provide technical advice for the safety of the plant. In August, Rosatom said its staff played no role in the plant's management or defense.

But Rosatom has since officially taken operational control of the plant after Putin unilaterally signed a decree on Oct. 5 transferring the Zaporizhzhia facility to Russian federal property in the wake of Moscow's illegal annexation of the region. The decree handed the use of its "financial, material and other resources" to a new operating company owned by a Rosatom subsidiary, "to ensure the safety of nuclear facilities, radiation sources, storage facilities for nuclear materials and radioactive substances, and radioactive waste storage facilities."

A key Rosatom employee present at the plant since late March, Oleg Romanenko, was appointed general director of the plant's new operating company two days before Putin issued the decree, company registration documents show. The plant's Ukrainian chief engineer was appointed general director of the power station itself. In response to the request for comment, Rosatom said the transfer to the new operating company was aimed at "ensuring the safe and reliable operations of the plant."

"Ensuring nuclear safety and security of nuclear facilities and installations is Rosatom's number one priority," the company said.

One eyewitness, Oleh Dudar, a former head of operations for the Zaporizhzhia plant's nuclear reactor and turbine unit, however, told The Post that Rosatom employees, although initially in the background, increasingly took control over the summer, at first issuing demands to inspect the plant's systems, including its electricity circuits. "The longer time went on, the more they began dictating to us," said Dudar, who has since fled to safety in Western Europe.

Dudar said he believed Rosatom employees, under the direction of Romanenko, had helped direct Russian artillery fire targeting parts of the facility and its territory, including its transmission lines, to cut it off from supplying the Ukrainian electrical grid while blaming Ukraine for the fire. "They were studying the electricity circuits, the transmission lines, our equipment and the communication systems. They were studying them closely over a week," Dudar said. "And then the next week, the objects they'd been studying were shot at and the equipment went offline. It seems to me they were looking. I had the impression that they directed and managed this."

There are also questions about whether Rosatom staff may have been involved in the summary detentions of hundreds of the plant's Ukrainian workers, who, according to Dudar and other witness accounts described by Ukrainian officials, were held for weeks in cellars and tortured by FSB officers, sometimes with electricity. The detentions first occurred over the plant workers' pro-Ukrainian sentiments, but increasingly they were used as a mechanism to force workers to sign contracts to work for Rosatom, according to Dudar.

Kuleba said that Ukraine has moved away from dependence on Russian fuel supplies for its nuclear industry and that other countries should follow suit. In recent years, he noted, Ukraine switched to alternative supplies from Westinghouse, an American company, which developed the capability to replicate Russian-made fuel supplies so it could service Soviet-era plants.

There are signs that the war is beginning to affect Rosatom's bottom line. Bulgaria in the past month signed two supply deals, first with Westinghouse and then with France's Framatome, to replace the Russian fuel its nuclear power plant currently relies on. Last year, Finland walked away from a multibillion-dollar project with Rosatom to build the Hanhikivi-1 nuclear plant, which would have generated 10 percent of Finland's electricity needs.

An international working group on Russian sanctions working with Yermak, the Ukrainian presidential chief of staff, has proposed a gradual process that would first focus on personal sanctions and barring supplies of raw uranium from Russia, where Moscow has only about 5 percent of the global market, while preparing the ground for a longer-term shift from dependency on Rosatom.

"Serious moves to reduce the West's critical dependency on Rosatom across the nuclear fuel cycle are more important over time," Nell said.

Senator BARRASSO. The article provides proof, and it is a long, involved article, that Russia's state-owned nuclear energy company, Rosatom, uses revenue from its nuclear sales, including uranium, to fund Putin's brutal invasion of Ukraine. The article suggests that the European Union may soon implement sanctions against Rosatom.

Can you update us on the status of the European efforts to cut off Russian uranium?

Ms. JORGENSEN. Yes, thank you, Ranking Member, indeed. First of all, the role of Russia and Rosatom in the global nuclear market—the fuels market—is indeed of concern. Within the European Union, we have five member states that are specifically dependent on Rosatom for the technical support for the fuel type, and that is for historic reasons that these countries have Russian-built nuclear facilities in their countries. So one priority for us is to reduce that dependence, to get out of that dependence, and help those countries and those nuclear facilities step out of the dependence on Russian supplies. That is part of our REPowerEU plan, and we will continue working on that and working with international partners, because some of the alternative fuel supplies could come from American companies or European companies. So we are working on that. And as Chairman Manchin mentioned, there is also concern about the high dependency on uranium, and that is a global concern that we need to work together to address.

As regards sanctions, our approach is the following: we seek to apply the sanctions that are most effective vis-à-vis Russia—that have the most significant impact on Russia, while, of course, harming ourselves as little as possible. And in the field of the nuclear sector, we see that the impact would, at this point in time, probably be limited and it could cause a number of challenges for ourselves. We presented a tenth sanctions package yesterday. It does not cover these aspects, but, of course, we will see what happens and we will continue developing our response.

Senator BARRASSO. Mr. Chairman, if I could just ask Dr. Light to follow up on what we just heard there?

The CHAIRMAN. Sure.

Senator BARRASSO. So in 2021, Russia was our third largest supplier of uranium to the United States, about 14 percent of our demand. It seems every dollar we give to Russia supports Putin's war against Ukraine. Our nuclear energy industry is ready to transition away from Russian uranium. My home State of Wyoming has vast uranium resources. It does seem that our nuclear fuel suppliers need assurance that Russia is not going to be able to continue to flood our market with cheap uranium. Do you agree we need to ban Russian uranium to provide American nuclear fuel suppliers with some market certainty?

Dr. LIGHT. Yes, Senator, I completely agree. We have got to explore all tools to limit Putin's ability to continue funding his invasion of Ukraine, certainly including nuclear. I think any uranium ban must be accompanied by, obviously, strategic investments in our own supply chain. So we completely support your efforts, all the efforts here, to try to include that in previous legislation, but also in proposed legislation. We look forward to discussing that with you. We definitely believe that our current nuclear reactors need to wean themselves off of the Russian supply. Absolutely.

Senator BARRASSO. Thank you, Mr. Chairman.

The CHAIRMAN. Senator Heinrich.

Senator HEINRICH. Thank you all for being here.

Director-General, can you talk a little bit about the role of electrification, and particularly heat pumps, in eliminating Europe's over-dependence on Russian fossil gas?

Ms. JORGENSEN. Yes, thank you. Electrification in general, and the deployment of heat pumps is an important part of becoming independent from Russian gas—Russian fossil supplies—but it is also an important part of the overall energy transition. We are going to see significantly increased electrification of our energy systems as a necessary part of the transition. It is going to rely on renewables, but also nuclear, as just discussed, and move away from fossil. And in that context, heat pumps are a very interesting option. We use about a third of our natural gas to heat homes, and if we can replace just some of that with heat pumps, we are better off. In addition to that, heat pumps are significantly more energy efficient. So it is an overall saving as well as a saving in fossil. So that is part of our REPowerEU plan. We have got a heat pump plan to secure the fastest possible rollout of heat pumps.

In some of our member states last year, and I can state one example—in Poland, there was an increase of 120 percent in the installation of heat pumps last year. So quite an interesting example of the response to the crisis.

Senator HEINRICH. Director-General, with regard to ESG, which our Chairman brought up, do you think that governments should dictate governance priorities for private businesses, or should we generally leave that to the market and to the boards of those businesses to make those decisions?

Ms. JORGENSEN. Those decisions are business decisions, and for companies, the government role, the way we have approached it in Europe, is to set out guidance of what we would consider green investments. That is our taxonomy, but it is obviously from our——

Senator HEINRICH. So basically, a standard, and leave the decisions to the businesses themselves.

Ms. JORGENSEN. Indeed. And not a binding standard.

Senator HEINRICH. Right.

Ms. JORGENSEN. A type of guidance.

Senator HEINRICH. Yes.

Dr. Light, U.S. utilities depend on imports of Russian-enriched uranium for about 20 percent of their needs in our fleet of commercial nuclear reactor plants. That enriched uranium, as we heard from the Ranking Member, comes from Rosatom, which was exposed, as he mentioned, in the press recently as providing materials and other support to Russia's war effort in Ukraine. So in addition to a potential domestic ban on imports of Russian uranium, which I think is highly appropriate, what else could the U.S. be doing internationally to ensure that other nations do not indirectly support Russia's war effort through their nuclear sectors?

Dr. LIGHT. Thanks for the question, Senator.

So there are a number of things here. While it is true that, for example, let's take some of the legacy Soviet-built plants in Eastern Europe that are dependent on a particular version of nuclear fuel. We are seeing U.S. providers, Westinghouse, in particular, moving into that market and trying to develop capacity there and have signed a number of MOUs, including with Ukraine, to help to displace that fuel. So that is a very good signal there.

Number two, my office has been working with the State Department, with Commerce, and with others, to really increase U.S. competitiveness on the market on nuclear power, and not just on the fuel side, but also on power generation itself. I am very pleased to say that we just recently saw this great deal emerge between the U.S. and Poland to build three of their first six civilian nuclear reactors, which is going to be a $45 billion deal, which will support 130,000 American jobs.

And I think, third, it is that supply chain at home, but also the supply chain in other countries where we can rely on them as good partners. So diversification doesn't only mean independence, but it also means having reliable partners around the world, and through different international forums, we are trying to create the capacity there so we can stand together against Russia.

Senator HEINRICH. So we should leverage our allies to create that independence?

Dr. LIGHT. Absolutely, yes. I think that is a great way of putting it. We have to leverage our allies. We have to leverage our relationships. That is why our engagement in the world on energy in the midst of a struggle or even outside the current energy struggle is so important.

Senator HEINRICH. In June of last year, the Biden Administration announced the Partnership for Global Infrastructure and Investment with the G7. As part of that initiative, our government provided $14 million to support the first-of-its-kind deployment of NuScale Power's small modular reactor in Romania. What role do you see SMRs playing to support our EU allies' transition away from Russian fossil gas—Russian fossil fuels, broadly—and what are the hurdles to SMR deployment in Europe that we may be able to assist with?

Dr. LIGHT. So, very quickly, this is the most exciting thing, I think, we have on the energy horizon right now, is the final emergence of SMRs as a real viable possibility. And I have to say, I have been absolutely impressed with the fact that the part of the world I focused on the most with respect to who will deploy SMRs first is Eastern and Central Europe, and that was before the war started. So it's not only Romania, but it's interest in Bulgaria. It's interest in Poland. It's interest throughout the region where they have the expertise and the comfort of this kind of technology and seeing the advantages of SMRs, not only for electricity, but for district heating, for industrial decarbonization across the board. And we have many providers we have been incubating, with your support for decades now, and they are ready to unleash.

I think we have got to work with these countries on the regulatory side, making sure that they are ready for the import of this technology, and even becoming regional hubs. And we have various programs throughout, again, many different international platforms we have been working on with our partners at State and Commerce and others to help to create that groundwork so countries can accelerate their import of that technology as these become available. It is incredibly exciting.

Senator HEINRICH. Thank you. Thank you, Chair.

The CHAIRMAN. Senator Hyde-Smith.

Senator HYDE-SMITH. Thank you, Mr. Chairman and thank you all for being here today. This is most helpful, and we certainly appreciate the efforts you have made to get here. And it is amazing that we are approaching the one-year anniversary of the invasion, and the effects of that and the continued Russian hostility certainly make it necessary for us to analyze everything we can of the critical role the United States has in a stable source of energy across the globe. But we can only do this with energy policies that allow Americans to flourish, that we can produce and not be paralyzed by policies and the agendas that harm that, and we witnessed the dangers firsthand when the Biden Administration enabled Russian energy initiatives before Putin's invasion. I believe more can be done to help stabilize that, both at home and across the globe if we were to unleash domestic energy production, including oil and gas, here in this country.

Dr. Mikulska, this question is for you. In your written testimony, you discussed the four A's of energy security and your struggle to incorporate them, as well as some countries' willingness to overlook the risk associated with Russian energy dominance and dependence, particularly when it comes to the natural gas market. And the world watched as this came to a head after Russia's illegal invasion on Ukraine, and in response, U.S. LNG exporters boosted shipments to Europe by more than 137 percent in the first 11 months of 2022 from that same time period in the previous year in 2021, supplying more than half of Europe's imported LNG and helping the region survive a nearly 55 percent plunge in pipe shipments from Russia.

What else besides LNG can the United States do that we can supply to help Europe grasp the four A's of energy security? What more can we do to accomplish that?

Dr. MIKULSKA. I think nuclear power and engagement of the U.S. in Europe is critical, especially in Central and Eastern Europe. The deal in Poland has been extremely important on both ends, for energy security but also for the geopolitical security and for the working together of the two nations. Some countries in Europe do not have the environment to support efficient and effective solar or wind generation, and nuclear power helps accomplishing the goals of having domestically available supply at any given moment while also kind of addressing the goals that the EU is setting for those states.

So I think nuclear energy cooperation is very important. SMR is as well—a lot of industry is quite interested in that. I know in Poland, in particular, industry parks and so on, so I think this is going to be critical, and having the U.S. as an ally and as a partner is extremely important.

Senator HYDE-SMITH. Okay. You were pretty confident and quick in that answer of nuclear energy.

And how did the Biden Administration's early action to restrict U.S. oil and gas production, how did that aid Russia's plan for energy dominance to flourish?

Dr. MIKULSKA. Well, I think it allowed Vladimir Putin to feel sure that the invasion that he was planning would actually put a bigger hardship on Europe, for example. So that probably emboldened President Putin in getting through with his plans. Thankfully, these plans did not realize, but this is because of the way that U.S. LNG exports were ramped up. When we look at the exports and how they ramped up toward the peak of capacity, it has been something that is exceptional, something that U.S. industry—not only the government, but also U.S. industry—helped Europe weather the storm, or at least until now, and hopefully going forward.

Senator HYDE-SMITH. Thank you, Mr. Chairman.

The CHAIRMAN. Thank you.

Senator Hawley.

Senator HAWLEY. Thank you, Mr. Chairman. Thanks to the witnesses for being here.

Assistant Secretary Light, if I could just start with you. In the years leading up to Russia's invasion of Ukraine, almost a year old now, many European governments prioritized what they called the climate objectives. I'm not sure that their policies actually improve their environment, but that was their surmise—climate objectives over energy abundance, and in particular, they prioritized cheap energy from an authoritarian regime over energy independence. Do you think that that playbook, executed by governments in Europe, is something we ought to be doing in the United States?

Dr. LIGHT. I think that the clear lesson is that no country should be beholden to one supplier for its energy sources, or a very large proportion of its energy sources, and that energy security is built on energy diversification. I think that energy diversification is at the backbone of U.S. energy policy, and so I do not see any risk that the United States will follow suit in that respect.

Senator HAWLEY. Well, you say energy security is built on energy diversification. I would have thought energy security would be based on energy independence. Am I wrong about that?

Dr. LIGHT. I think it's independence, but I also think that it's not just one source of energy, because things can go wrong. No one should put all of their chips right on one marker when it comes to energy security. So I think to have as diverse a supply as possible while still looking at other goals, like climate goals, is a very good path forward for countries to take, and it is something that the United States wants to support other countries in helping to do.

Senator HAWLEY. Why wouldn't we put our chips on American energy? We have got various sources of energy in this country. Why wouldn't we put our chips there?

Dr. LIGHT. I think we are putting our chips——

Senator HAWLEY. No, we are not. We are producing less oil and gas in this country than we were previously. The President, when he came to office, his first day in office, he imposed a moratorium on oil and gas leases on federal lands. Since then, he has leased the fewest acres of federal land for oil and natural gas since the Truman Administration. Why are we shutting down American oil and natural gas production, taking away American jobs, and making ourselves more dependent on foreign sources of energy? I don't understand this policy.

Dr. LIGHT. Well, the U.S. will produce a record amount of both crude oil and natural gas in 2023, even higher than the spikes, the pre-COVID levels. And the President is actively encouraging U.S. oil producers to increase production and reinvest their profits back into production rather than buying back stocks, and I think that is the right policy to pursue.

Senator HAWLEY. He is doing that while he is shutting down the ability to lease federal land for oil and natural gas, the fewest acres of federal land leased since the Truman Administration. He has boasted about how he hopes—he just said in the State of the Union that we may not need American oil after another ten years. I mean, what kind of a message does that send? Is that energy security?

Dr. LIGHT. So any questions about leasing on federal land, I would direct to the Department of the Interior, not the Department of Energy, sir.

Senator HAWLEY. Listen, don't play that game with me. We are talking here about energy production. Oil and natural gas are energy production. And the facts of the matter are, this President has reduced our ability to be energy independent. And you are sitting here telling me that that increases our energy security. It looks just the opposite to me. It seems to me that you are recommending the European playbook, which left them dependent on foreign nations, left them dependent, ultimately, on hostile actors, and that is what you are trying to replicate here again in the United States. I just don't understand why this course of action is being recommended, why your Administration is pursuing it. I also don't understand why you would shut down pipelines that canceled thousands of good-paying American energy jobs. I mean, why is that a healthy energy policy for this country?

Dr. LIGHT. With all due respect, sir, I really don't see much of a comparison between where Europe was before the outbreak of the war and their energy mix and where they were getting energy from and where the United States is today.

Senator HAWLEY. Well, let me just ask you, just on the topic of dependence on authoritarian regimes, about China. China is one of the largest processors of the materials that serve as the building blocks for many of the so-called green energy transition that the Administration is pursuing. According to the IEA, China processes 40 percent of the world's copper, more than 30 percent of the nickel in the world, 60 percent of cobalt, 60 percent of lithium, and more than 80 percent of rare-earth minerals. Now, in light of that, many commentators have suggested that the United States is even more dependent on China for key components of solar power panels, wind turbines, and batteries than Europe was on Russia in the lead-up to the invasion of Ukraine.

So I say again, in light of all of that, don't you think that this Administration's climate agenda is making us more dependent on China while we lessen our reliance on our own domestic energy sources?

Dr. LIGHT. Well, sir, as I said in my testimony before, I think you are absolutely right. China does own too much of the critical minerals supply chain from the beginning—from ownership of resources through processing and through the creation of modules and other parts of clean energy components——

Senator HAWLEY. So why would you want to make us more dependent on them?

Dr. LIGHT. That is why we use the tools that the Congress has given us, sir, to make sure that we diversify the supply chains, reshore many of them, and create sound relationships with non-Chinese suppliers. That is absolutely a top priority of this Administration.

Senator HAWLEY. For heaven's sake. Here's what you have done. You came to office. You took us from being an energy independent nation to being an energy dependent nation. You have made us more dependent. Now this Administration has gone begging to OPEC and dictators all around the world. You have made us less energy secure. Now you are making us energy dependent on China. You are canceling good-paying American jobs. It's a disaster. And all the while, increasing the costs of energy across this nation. It is an absolute disaster, and I can't imagine why, in light of what happened in Ukraine, we would want to replicate those disastrous policies here.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you.

And now we have Senator Hickenlooper.

Senator HICKENLOOPER. Thank you, Mr. Chair. Thank you all for being here. It's a lively discussion.

Let me start with Ms. Juul Jorgensen. Ms. Director-General, ten years ago, it would have been impossible to imagine anyone responding to an acute energy shock primarily by accelerating a move to renewable energy, but I think that is what we have seen over the last 12 months. We have a map here that shows a small sampling of headlines from across Europe over the past year.

[The map referred to follows:]


THE WALL STREET JOURNAL.
Europe Plots Solar Revival to Replace Russian Gas
WORLD ECONOMIC FORUM
Wind and solar power generated more electricity in the EU last year than gas did. Here's how
EURACTIV
Commission doubles ambition for EU biomethane production from agricultural waste
REUTERS
Swedish wind power generation to rise 70% by 2024 - agency
USA TODAY
The 'world's largest floating wind farm' off Norwegian coast produces its first power, company says
The Maritime Executive
Finland Advances First Offshore Wind Farm Projects
The New York Times
Giant Wind Farms Arise Off Scotland, Easing the Pain of Oil's Decline
Oil and gas workers, losing their jobs as fossil fuel investment wanes, find work in the wind energy business.
REUTERS
Denmark takes first steps towards green hydrogen economy
The Brussels Times
Electricity generated by Belgian solar panels continues to break records
REUTERS
Netherlands ramps up plan for doubling offshore wind capacity by 2030
REUTERS
UK needs to go big on nuclear and offshore wind, Johnson says
Germany backs phasing out combustion engine cars by 2035
REUTERS
Poland looks to ease rules blocking development of onshore wind power
CleanTechnica
Ireland's Big 7-Gigawatt Offshore Wind Power Push Underway
The Guardian
France to require all large car parks to be covered by solar panels
REUTERS
Germany to speed renewables push due Ukraine crisis
EURACTIV
Austria commits to significant renewables boost
Bloomberg
Russia's War Teaches Austria the Security Role of Wind and Solar
Clean power is vital to nations' independence, Austrian minister says
REUTERS
France ends gas heaters subsidies, boosts heat pumps in bid to cut Russia reliance
Bloomberg
Spain's Rooftop Solar Grows Tenfold Amid Surging Energy Prices
• Government studies installing panels on public buildings
• Expansion consolidates a trend already ongoing in the country
REUTERS
Switzerland's new energy asset: hydro plant with capacity to charge 400,000 car batteries
REUTERS
Portugal to speed up switch to renewable power in wake of Ukraine war
FRANCE 24
The Med gets first offshore wind farm as Italy vows energy revolution
Bloomberg
Turkish Companies Go Solar at Record Pace to Cut Energy Costs
EURACTIV
Italy expands Europe's first solar 'gigafactory'
Greece powered entirely last week by renewables for first time ever

Senator HICKENLOOPER. Wind, solar, EV—records being set almost monthly. Permitting reforms to accelerate deployment. First-of-kind projects, proving out promising clean technologies, like floating offshore wind and green hydrogen. What has made modern renewable and other clean technologies Europe's first and best tools for heading off the acute energy crisis you are dealing with now?

Ms. JORGENSEN. Thank you, Senator.

I think the first part of my response is a fact of geology and geography. We do not have the abundance of energy sources in Europe. We are net importers, to a very significant extent. So in other words, becoming completely independent is not possible. We need to rely on partners like the United States for secure energy. But we also need to become as resilient as possible within that reality. And one of the aspects, one necessary component of that resilience and that independence is renewable energy—solar, wind, hydro, geothermal, as the most used ones as well as biofuels and biomethane in the European Union. So the green transition is an absolute necessity for our security, for our independence, for our resilience in energy terms. Those two objectives—security of supply and the green transition—go hand-in-hand. The green transition is necessary for security of supply.

The other aspect that I just want to flag briefly is the fact that the technology for renewable energy has developed very, very significantly over the last decades. The first offshore wind turbines that were established about three decades ago were essentially onshore turbines that were just put out into the water and they said let's see how it works. It worked, but with a fairly limited production generation. Now they are specifically produced. The technology has developed very, very significantly. And so, there is a significant quantity of energy coming from our renewable sources—offshore wind, but also solar, as the map shows.

Thank you.

Senator HICKENLOOPER. Yes. And as you say, it is able to allow geographies that don't have traditional access to their own energy resources to create energy resources where they did not exist before.

Dr. Mikulska, last year, our LNG exports provided a vital lifeline to our European allies. You have heard a fair amount about that. While Europe's need for LNG is acute now, and will remain so for the near- and mid-term, who knows how long, what the long-term looks like is somewhat uncertain. What should the U.S. be doing now so that we can best continue to support Europe's energy security through the shipment of LNG while planning for a range of possible futures? Do you understand the question?

Dr. MIKULSKA. Right.

Senator HICKENLOOPER. Good.

Dr. MIKULSKA. So what the path of the U.S. should be, right? And as the Director-General has mentioned here, the U.S. situation is quite different than the European situation. So it would be a mistake not to think all-of-the-above, in particular, what is currently available and what are currently the most reliable sources of energy supply. Renewable energy is there. It provides electricity. It provides additional sources, but it is not reliable yet. And that provides an issue for economic development, and it does create an issue of what kind of backup power do we want. So until then, we will be relying on fossil fuels—that we know—and nuclear energy and geothermal if it gets developed a little bit more or hydro. And the U.S. should look at all-of-the-above while making sure that its resources now are well-developed, and make sure that we have them, not only for ourselves, but also can supply our allies. And as we have seen, and by the admission of the Director-General, our allies want those resources, it is just the question which you actually put out there, what is the length of the short-term or medium-term that they need it for?

Senator HICKENLOOPER. Got it.

Dr. MIKULSKA. We don't know that.

Senator HICKENLOOPER. Yes, I agree.

And I am out of time, but Dr. Light, I just wanted to thank you for all your work, and I do agree that having more solutions—more energy sources—makes our country and the world more resilient and creates redundancy that is of immense value in times of hardship. So keep up the good work.

The CHAIRMAN. And now we have Senator Daines.

Senator DAINES. Chairman Manchin, thank you.

Over the past year—in fact 11 months—I have traveled to Europe several times. I visited ten countries across the continent—Ukraine, Romania, Germany, Lithuania, Estonia, Poland, Latvia, Moldova, Slovakia, and Hungary. One lesson stood out in every single country I visited—energy security is national security. I met with high-level leaders in government and industry. They all told me about the importance of reducing dependence on Russian energy and the critical role the United States can play. In Lithuania, I had a chance to visit their new LNG import terminal. By the way, that big ship that has the regasification process on top of it is called the *Independence*, for good reason, because with this terminal they now can turn away from Russia and begin importing LNG from the United States and other friendly nations. It's a big step for the energy security of Eastern Europe. We should be applauding and promoting more projects like it.

What I fear though, is, we have an Administration that might say one thing occasionally in public, but they are not learning from the lessons of Europe. Europe's green delusion resulted in a near complete dependence on Russia for energy. Many countries shut down their baseload coal and nuclear plants without having a real plan. One leader in Europe, describing some of his colleagues to the north, said, "a vision without an action plan is a hallucination." In fact, Europe went so far as to set a condition for Lithuania to get into the EU to decommission their nuclear plant. Lithuania used to be a net energy exporter, but because it was the green whim of the moment, went anti-nuclear for a period of time, they had to shut down their plant to get in the EU, leaving them very vulnerable. And thank God for LNG that is helping make up now for that loss of baseload power. It's truly baffling. We can't let this Administration take us down this same dangerous path. I don't think this Administration is learning anything from it. This religion, this pursuit of this green hallucination, is a dangerous moment in U.S. history and for the world.

They are talking out of two sides of their mouth. On one hand, DOE is approving more LNG terminals to supply our allies. On the other hand, FERC is slow-walking pipeline approvals that would support these export terminals. You have to have infrastructure to get the gas to the ports. We take a step forward by banning Russian oil imports, but then the Department of the Interior cancels lease sales, increases fees and taxes on small producers, stalls a plan for offshore oil, enacts regulation after regulation to close on domestic production, and of course, he shuts down the Keystone Pipeline in Montana, which was, besides being a million barrels a day of oil, is $80 million of tax revenues every year to impoverished counties across Montana. You have the President of the United States, in a State of the Union speech, he ad-libs, and he says we only need oil for the next ten years. It was a laughable moment. But even his own Energy Information Administration (EIA) says, "petroleum and natural gas will remain the most consumed sources of energy in the United States through 2050." That is coming right out of a subset of the DOE.

Dr. Light, what's the deal? Does this Administration have a real plan to stop Putin's stranglehold on Europe, cut off his war chest that is funded by energy exports, or is this Administration talking out of both sides of its mouth?

Dr. LIGHT. Thank you very much for the question, Senator Daines. And I just have to say, personally, thank you very much for the travel that you have done in the region and the expressions of support of the American people to these countries who are on the front lines of everything. We really do appreciate that.

I do believe we have a plan. I think that we have seen it in action. We have seen an absolute surge in LNG exports to Europe, far more than we did in 2021 and 2022. This did not happen by accident. It was not just, you know, purchasers in Europe deciding that they were going to turn to LNG out of desperation. There were a lot of concentrated efforts by this Administration, including at a very critical moment when there was a price crunch, and a supply crunch last year persuading the Japanese and the Koreans to defray some of their LNG tanker shipments that they were getting there, instead, to send some to Europe where they were more needed.

Senator DAINES. Yes.

Dr. LIGHT. So there is an effort here for cooperation that we were——

Senator DAINES. But I will tell you what, and I appreciate that. If I may interrupt, we just put the 100th judge on the bench of the Biden Administration. So while you talked about something that says it is necessary as an important step, it is not sufficient. When these far-left ideological judges are being put on the bench here, that interject themselves, stopping projects on the natural resource side of the equation that are lifetime appointments. And until we fix this problem, which is a long-term problem, permitting reform is a very good thing, but we still run a very real risk right now to activists, judicial leaders here who are driving an ideological agenda here who are anti conventional sources of energy.

I want to move on to gas stoves. Europe is begging us for American energy, and now we have got the DOE throwing out all common sense, prohibiting 96 percent of existing gas stoves. Just when I thought it could not get more ridiculous, it did. My question is, the White House recently said it does not support banning gas stoves, but the proposed rule effectively bans 96 percent of existing gas stoves. What is the truth?

Dr. LIGHT. The President does not support the banning of gas stoves, Senator——

Senator DAINES. I want to know what the rule is though. I understand what the President says up in front because he knows, politically, he has got an absolute firestorm on his hands because people are looking back and they are saying this is ridiculous.

Dr. LIGHT. So sir, I would be very happy to arrange for a meeting between the staff for the——

Senator DAINES. Is it the truth? Does the rule ban 96 percent of existing gas stoves?

Dr. LIGHT. Right, and that is outside the purview of my office. I am sorry, sir, but I am International Affairs.

Senator DAINES. You don't have an answer. We want to get an answer to that. Yes.

Dr. LIGHT. EERE, I am sure, would be very happy to have a meeting with your staff to talk about those questions and get to a good answer.

Senator DAINES. Thank you.

Senator CHAIRMAN. Thank you, Senator.

Senator Cortez Masto.

Senator CORTEZ MASTO. Thank you, Mr. Chairman. Thank you to the panel members who are here today.

Assistant Secretary Light, both you and Director-General Jorgensen, in your testimonies, discussed the need for the U.S. and European Union to work together to secure reliable access to critical mineral supply chains. And as you know, Secretary Granholm was in northern Nevada last week to announce a $2 billion loan guarantee to help Nevada-based Redwood Materials manufacture and recycle critical components of lithium-ion batteries. We all know these batteries are going to play a crucial role in expanding our clean energy economy. These investments are possible due in part to the creation of the battery grant program that was created here as part of the Bipartisan Infrastructure Law, something that I absolutely supported and will continue to, and we need to continue to support the processing and refining that we have done here through the programs that we have passed.

Nevada, and I cannot stress this enough, is really the growing nexus for a clean energy and critical mineral future because it is the only state in the U.S. that encompasses every facet of the critical mineral and advanced battery economy, from the mining of the critical mineral deposits, to the research and development, to processing and manufacturing, and finally, to the recycling operations. This is a perfect example of the economy that we believe that we should be investing in.

So let me ask you this, and let me start with Assistant Secretary Light. One, how is DOE utilizing these new programs that we have been talking about, and authorities to address these international supply chains? And then, how do you envision the collaboration that the two of you have been talking about that we need to do? So Secretary Light, let me start with you.

Dr. LIGHT. Thanks very much, Senator, for the question. I know the Secretary enjoyed her trip to Nevada very much. I mean, it is, as you said, just a great object lesson in how we can sort of see the future, where all of it is done, you know, in one place, from the mining to the manufacturing and refining, and it goes on through the entire supply chain. So using the authority and the funds provided by the Bipartisan Infrastructure legislation and the Inflation Reduction Act, we are doing a number of things. We have already issued a number of awards and announcements, including $74 million in funding to selected advanced domestic battery recycling and reuse, $315 million for a long-duration energy storage demonstration project FOA, $30 million for energy storage lab calls, $12 million for lithium extraction and conversion from geothermal. It just goes on and on and on. The people working on that, in that part of the building, have one of the greatest jobs because they get to be as creative as possible on this to make sure that we can, as Senator Barrasso pointed out, respond to China, which is already way out in front in a very dangerous way, in a way that is analogous to where Russia was with Europe on the gas supply. And so, we have got to stop that and we are deploying everything we can, not only to reshore, but to create those supply chains here on those credits.

I would also like to say that we are doing this globally, internationally. DOE, along with the European Commission, is part of four platforms, separate platforms from the Mineral Security Partnership, where we are looking at how we can combine resources on acquisition of this technology to advance work through different platforms to work on recycling and all these other measures to increase diversification of supply in critical technologies. And I am very proud to say that one of the singular achievements that Secretary Granholm achieved when she chaired the International Energy Agency Ministerial last March, was to create a new voluntary stockpiling program for critical minerals in the International Energy Agency. IEA, as you know, was created to stockpile oil. Now we are going to look at stockpiling critical minerals as well in case we get these bottlenecks, whether they happen by accident or intentionally, and have something to hedge against them.

Senator CORTEZ MASTO. Thank you.

And Director-General Jorgensen, any thoughts on the collaboration, what we should be thinking about here?

Ms. JORGENSEN. Yes, I think first of all, that indeed, collaboration, cooperation with partners, with allies, is absolutely essential for our energy security because our energy security relies on critical raw materials—in particular, raw materials for renewable energy, but also for batteries and energy storage. So it is essential that we work together.

We have our own program, and will be presenting in just a few weeks a Critical Raw Materials Act within the European Union, as well as a Net Zero Industry Act, and so that is our European part of it. And linked to that, of course, is the very close international cooperation. We have got the Critical Raw Materials Alliance. We have got work in the International Energy Agency. And so, we are going to continue the close cooperation and step it up, also, in the context of the USEU Energy Council meeting just a few months from now.

Senator CORTEZ MASTO. Thank you.

I know my time is just about up. I will submit the rest of my questions for the record.

Thank you again for the panel members that are here today.

The CHAIRMAN. Thank you, Senator.

Now, we are going to Senator Risch because of the generosity of Senator Murkowski.

Senator RISCH. Thank you, Senator Murkowski. Well, and thank you, Mr. Chairman.

I wanted to come today to talk a little bit about a really significant and serious problem that the U.S. is facing, and I am going to ask Dr. Light about it a little bit, but first of all, let me set the stage for this. The world collectively relies on Russia for the nuclear fuel supply chain, with one-third of conversion and half of the enrichment capacity coming out of Russia. This is for nuclear generating electric facilities. The U.S. receives about 20 percent of its enriched uranium from Russia, which is not currently sanctioned. We have almost no domestic uranium processing with no operational conversion and only one active enrichment facility. We cannot currently produce the necessary enriched uranium to supply the current nuclear fleet that we have, and for research needs, and obviously, for national defense needs. Idaho, as most of you know, is the home of the Idaho National Lab, the birthplace and flagship lab for nuclear energy in America—indeed, in the world—indeed, in the universe. In 1951, we generated the first electricity there using nuclear energy. And since then, we have been on the cutting edge of that.

Right now, all of us are familiar with the fact of what Russia has done, this illegal war that it is pursuing against Ukraine, and its absolute lack of judgment in conducting its affairs in the world is really remaking the face of Europe and the face of the world when it comes to supply chains in a lot of matters. When this war is over, it won't be over. We, along with 29 other countries, formed NATO to push back against Russia, and it kind of went to sleep as we went along over the decades, everybody thinking that when the Iron Curtain came down that Russia was going to more or less behave itself and join the international players, maybe poison a few people once in a while. That is what they do. Interfere in elections once in a while. That is what they do. But other countries do that too, and we started doing business with them, as did Europe, and Europe got tied into them even more than we did.

Nobody believed that they would start a medieval war in the 21st century, but that's where we are. When this is over, our relationship with Russia is not going to repair for a long, long time, nor is, obviously, Ukraine or Europe. There is not going to be a reconciliation commission where we all get together. What these people—what the Russians have done in Ukraine is barbaric. It's unforgiveable. And it's going to be decades and decades before anybody that is in their right mind does business with Russia again. So that brings me to the problem that we have. And that is that we have this supply chain with the fuel coming out of Russia. Now, the Ranking Member and Chairman and I have produced legislation that we are going to get in and try to resolve this problem to a degree, but this is a serious problem.

So Dr. Light, your question, since you are in charge of International Affairs at the Department of Energy, what would you do tomorrow if you got to the office and somebody handed you a pink slip that said, oh, the Russians called and they are done. They are not giving us any more supply. What plan do you have to respond to that situation?

Dr. LIGHT. Can I say, sir, that the way that you articulated where we are with Russia and the problems going forward, I could not agree more, a thousand percent. I think you are absolutely right. It is astonishing what has happened, and this energy struggle will continue.

Senator RISCH. It changes the world, and for the foreseeable——

Dr. LIGHT. It totally does, sir, and having grown up in the Cold War, I can't believe we are here again, frankly.

Senator RISCH. Here we are.

Dr. LIGHT. But I will not take up your time with that.

If we had that pink slip, sir, then I hope we have your legislation in hand to already start the process to get out of that dependency. We absolutely have to make strategic investments to strengthen our domestic supply chain so that we are not in this position—we never are in that position again. Our current reactors will need some time to wean off, but if it is shut off, then we have got to be there, and I think that we are going to do everything we can to make sure, with the current authority that we have already in the legislation that you planned, that we are in a position where we can respond to that.

Secondly, we have got to look also at the technologies of the future. The most amazing thing about Idaho today is these test beds on the small modular reactors, which are just so encouraging and so fantastic and so, I think, where we really, definitely need to——

Senator RISCH. Those are the future. There is no question about that.

Dr. LIGHT. Those are the future, and we need to make sure that the fuel for those SMRs, again, we do not find ourselves in a position where the United States is not producing its own supply for that, so in HALEU as well, we have got to move forward and make—and move toward nuclear fuel independence.

Senator RISCH. Well, thank you, Dr. Light. And I am sure you will agree with me, as the Ranking Member and Chairman and I believe that this is not a partisan issue. This is an American issue.

The CHAIRMAN. For sure.

Senator RISCH. And it is an issue that is of critical importance, and more importantly than that, the issue, unfortunately, does not lend itself well to the pace at which we move around here. And this really needs to move forward. So thank you for your thoughts in that regard. I hope you will join us in doing our best to get this legislation passed.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you, Senator.

Senator Kelly.

Senator KELLY. Thank you, Mr. Chairman.

Dr. Light, there are some U.S. oil companies that are still operating in Russia, despite pledges to wind down their operations. National Oilwell Varco, which is a U.S. company based in Houston, has oil field services in Russia, still even after announcing in a press release a year ago that it was, and this is a quote, "actively examining our alternatives, including the potential to further curtail our activities." In March of last year, 2022, Schlumberger announced that it would, another quote, "immediately suspend new investments in technology deployment to our Russian operations." But just seven months later, Schlumberger, still in Russia, was caught distributing military draft notices to 9,000 of its Russian employees to supply forces to Putin's mass mobilization effort.

So Dr. Light, for some of these companies, it sounds just like business as usual in Russia. In May, I wrote a letter to Secretary Granholm and Secretary Yellen asking them to evaluate oil companies that are still operating in Russia. So could the Department please take a closer look into this and provide me with a report on the operating status of U.S. oil companies still in Russia? And things specifically like this, I mean, I just find this, you know, just very concerning that a company that is based in London, that trades on the New York Stock Exchange, is assisting Vladimir Putin in getting his draft notices to his citizens. That is just unacceptable.

So I would appreciate you looking into this.

Dr. LIGHT. I am happy to take that on, sir, and even though it is Treasury and Commerce who enforce those sanctions and compliance, I am very happy to work with you and your staff to schedule a briefing as soon as possible to talk about the Russian sanctions, their impact on the industry, and what we know and what we need to know in order to address this problem moving forward. So we would welcome that conversation.

Senator KELLY. Yes, I think these companies should have had plenty of time to wind down operations by now and shouldn't be assisting in Russia's war in Ukraine.

Ms. Jorgensen, as you know, oil revenue is how Putin finances his illegal invasion, and in December, the West capped the price of Russian oil at $60 a barrel, well below the global market price of $85. It appears that the cap is having the intended effect of depressing revenue without directly cutting the global supply. The Kremlin's income from oil and gas is the lowest that it has been since the beginning of the pandemic. Some analysts estimate that Russia only earned $5 billion from fossil fuels in January, which is about half compared to January of the previous year. So on Friday, Russia—this past Friday—Russia announced it was cutting crude oil production by 500,000 barrels per day, which is about five percent of the country's output, and the propagandists there say that the cuts are in retaliation for the oil price caps, but I think it is worth noting that Russia's decision came days after it endorsed the OPEC Plus plan.

So Ms. Jorgensen, how would you describe the effectiveness of these price caps, and could they eventually diminish Russia's ability to invest in future production?

Ms. JORGENSEN. Thank you, Senator.

So far, as your question indicates, we have seen quite a significant effect of the price cap. I think it is important to note that the price cap comes on top of what was already a full embargo on oil and coal exports, with a small exception for some pipeline oil for reasons of security of supply for a couple of member states, but really 90 percent of our oil imports were already under a full ban. We have banned investments into the energy sector in Russia and we have banned exports of any technology that is necessary for extraction or LNG. So the price cap comes on top on these very significant sanctions already in place.

Senator KELLY. And are our allies complying with this, fully complying with this cap?

Ms. JORGENSEN. So far, the results are good, both in terms of reducing the profits for Russia in this sector, but also in terms of ensuring compliance. This measure, put together jointly with partners, including the United States, seems to be effective. We have, within the European Union, appointed an official to be responsible, including formulations with international partners to ensure that there is compliance with the sanctions. So, I think, so far so good, but we of course continue to monitor very, very closely.

Senator KELLY. What would happen if we changed the cap to $50 or $40?

Ms. JORGENSEN. It is possible within the cap, within the measure we have taken, to reduce downward, so we will see over time how the markets develop and what is the most effective way of approaching it. So I think we have, so far, as I said, put in place nine sanctions packages. We have presented a tenth. And we will be ready to do what is necessary——

Senator KELLY. Yes, I think that is worth looking into.

Thank you.

Senator BARRASSO [presiding]. Senator Murkowski.

Senator MURKOWSKI. Thank you, Mr. Chairman.

And I want to thank both you, Ranking Member Barrasso, and Chairman Manchin for convening this really timely discussion on global energy security and thank the panelists for your contribution to this. I think it is absolutely clear, the energy world has changed. It has changed in the here and now, and to the point that Senator Risch made, you know, you can't undial this. You cannot take back the atrocities that we have seen perpetrated on the innocent people of Ukraine. You can't just say that once this war is ended, we are back to normal. There is no new normal. Well, there will be a new normal, but the normal will not be what we know today. So when we think about the disruption of a global pandemic and what that meant to energy supply and security and then you overlay the war in Ukraine, brought about by Russia, it is transformational in a way that I am not sure that any one of you, with as much expertise as you bring to the table, really can anticipate how we build this out in a way that is capable of really recognizing the changed dynamic.

And so, you kind of look back when you are trying to figure out how you move forward. There is a little bit of a parallel, historically, when you think about the oil crisis of the 70s, and here in this country we woke up and said, well, we have an opportunity to weigh in and make a difference here. We can produce more supply, and it was that very transformational decision in the mid-70s that allowed Alaska to help lead the country with building our oil pipeline from the North. It really helped to make a difference, not only for the United States, but for our allies.

It has been noted that Russia has just made this announcement that they are cutting production another 500,000 barrels a day. We have an opportunity in Alaska, as we speak, the Administration has just a matter of weeks to determine whether they are going to announce a final record of decision on a project up north, the Willow Project, that would provide for 180,000 barrels a day. That's real production. That's real production in the here and now, and yet, there is some concern by the Administration that perhaps the recommendation from their own agency might take them in a different direction—might take them in a direction where they either do not approve the Willow Project or, worse, it's kind of a sleight of hand and they approve it, knowing that what they have changed results in an economically unviable project. That would be a travesty, not only to Alaska, but to the country, and, I think, our allies, who are wondering—we have got issues here that we are facing.

Director-General, you have noted the efforts that the European Union has taken to work through some very scary winter months, and looking at next year, you think you can make it again, but our reality is that when we move to address the supply, supply makes a difference.

And so, I have not asked a question here, but I want to just make clear my message to you, Dr. Light. You may say that this is a decision within the Department of the Interior and you are Energy, but you are also part of the Administration, and I would kindly ask you to take back to the White House the imperative of what it can mean to bring on meaningful production in this country in an area where we are poised to refill that pipeline that we built in the mid-70s.

I want to direct a question to you, Director-General. I spent a lot of time with our Arctic partners. I was in Norway just recently and they shared with me how they had really ramped up their production of natural gas to help offset Europe at this time of real crisis with supply, and it has been remarkable what they have been able to do just as one producing nation there. And when I asked them, well, how sustainable is this? If this continues, and again, we have a new energy world in front of us, can you continue to meet that demand? And it's not unlike what we face here. It's about the capacity. How do you move it through existing pipe?

So my question to you is, have these discussions continued at a level where you are looking to the longer-term solutions of additional supply within Europe that can help move the European Union forward?

Ms. JORGENSEN. Thank you, Senator, and indeed, we have had as an immediate focus to get through that first winter of crisis, that first year of the war to make sure we got that security, and I have outlined the mechanisms, the instruments we have given ourselves. The next focus was then on the coming years, the coming winter, how do we fill our storage for the coming winter? How do we put more renewables online, more alternative energy sources online, and how do we reduce our consumption so that we can help contribute also to stabilizing global markets? And the focus, then, is on the years after that. As I said, the next winter looks encouraging. We have done what we can. We still have to be careful. There is no room for complacency, but we are prepared. And if we look between now and 2030, we can see that global energy markets and the natural gas markets will remain tight. There will be some supply/demand gap, and so we need to respond to that together.

Our planning in terms of how the energy system stays both secure, affordable, and sustainable goes to 2050 with the Green Deal plan for the changes in the system. And that includes all the different relevant energy sources. We have mentioned natural gas as part of that transition. That will stay with us over the coming decades, increasing—significantly increased levels of renewables, continued nuclear as part of the European energy system, and a continued effort and investment into energy efficiency to lower consumption. So that long-term planning is very much part of what we do and part of what we do together with our member states. Each member state is responsible for its own energy mix and each member state draws up a national energy and climate plan for how to achieve the targets for 2030 and beyond. So there is a close coordination as part of that.

You mentioned Norway. We have seen significantly increased supplies from Norway, primarily of pipeline gas. We had, in the second half of last year, the very important opening of the Baltic Pipe that transports natural gas from Norway to Poland. So that has been a very important contribution to making that part of Europe energy secure.

Senator MURKOWSKI. But we also recognize the vulnerability of those pipelines as well, something that the Ranking Member has focused on as well.

Thank you, Madam Chairman. I am well out of time.

Senator CORTEZ MASTO [presiding]. Thank you.

Senator Cantwell.

Senator CANTWELL. Thank you, Madam Chair. I want to thank the Chairman of the Committee and Senator Murkowski for leading the charge last year in banning Russian energy imports and I commend the Administration for putting a price cap on Russian oil to help cripple Russia's key revenue efforts in funding its war. I think the vast majority of Congress and the American public agree that we need to continue to punish Putin and his cronies for the outrageous assault on Ukraine.

I think what we also need to think about is how we continue to learn lessons here and move forward to make sure that our economy is not as vulnerable to the continued rule and pain from various markets, and to continue to make investments that are going to help us diversify off of the sources of energy that we are on today.

I do want to focus on an aspect of this hearing though, and that is the vulnerability of our nation to cyberattack, our pipeline to foreign agents. The weapon here is not withholding oil or natural gas supplies, but rather disrupting them. I see a nod already from the Director-General. The Colonial Pipeline system cyberattack two years ago was a wakeup call, exposing the threat facing our nation's pipeline infrastructure, and it was not just pipelines. According to a CEO who testified before this Committee on cybersecurity threats last year, Russian hackers got dangerously close to knocking out a big chunk of the American grid, and the Russian malware they used is still out there.

So after Colonial Pipeline, as well as the Texas big freeze event, it became clear that we cannot ensure the reliability of the bulk power system without ensuring the reliability of the natural gas pipeline, and the two are linked—our bulk electricity system and our energy pipeline system. So this Committee, thanks to the leadership of Senators Manchin and Murkowski, recently directed FERC to establish incentives for cybersecurity technology investment in the Bipartisan Infrastructure bill, but I believe more needs to be done. FERC Chair Chatterjee and Commissioner Glick called for a 2018 mandatory cybersecurity standard for pipelines, and with the help of the North American Electric Reliability Corporation—NERC and FERC—they have approved and enforced vital mandatory cybersecurity standards for the electricity system. These standards work and have been around for over a decade, but as I understand it, there are no comparable mandatory comprehensive standards for nearly three million miles of natural gas, oil, and hazardous liquid pipelines across the United States. That is why I plan to introduce legislation that FERC has a clear role in protecting our pipelines from cybersecurity attacks.

So Dr. Light, do you believe that cybersecurity threats to the national gas pipeline system, including those by foreign state actors like Russia, represent a serious threat to our national security?

Dr. LIGHT. I do, Senator.

Senator CANTWELL. Okay, thank you. Well, we will look forward to working with the Administration then on trying to get that done.

Dr. LIGHT. Absolutely, Senator. And can I say——

Senator CANTWELL. Yes.

Dr. LIGHT. Can I add one quick thing?

Senator CANTWELL. Yes.

Dr. LIGHT. We have also been working out of my office on strengthening cybersecurity with our partners in Eastern and Central Europe. We started with Ukraine. Some of the $30 million appropriation that my office got before the war started was focused on trying to clean out the Ukrainian energy system so that it could prepare for integration with the European energy system. We have our signature partnership with Eastern and Central Europe, which is called the Partnership for Transatlantic Energy and Climate Cooperation, our ministerial with 24 countries, and Secretary Granholm will be in Zagreb on March 1 and 2. We have a working group on cybersecurity that I co-chair with Lithuania and several members there so we can use the abilities that we have at Idaho National Lab and at PNNL, as well, to train a number of governments in the region, also, to know how to hunt out, find, and secure themselves against cyberattacks from actors like Russia.

Senator CANTWELL. Thank you, Dr. Light, I appreciate that.

Senator CORTEZ MASTO. Senator Lee.

Senator LEE. Thank you.

Director-General Jorgensen, I would like to start with you, if that is all right?

In your opening statement, in your written statement submitted to the Committee, you have indicated that you have, in your words, "doubled down on a clean energy transition" and that recent events have "proved that European institutions and democracy are robust and prepared for the challenge." Recent events, however, tell a little bit of a different story, a slightly different story than that. Russia extorted the EU by throttling gas flows into the continent, and member countries started the winter with severely depleted natural gas stores. EU energy prices doubled in many member states, and mercifully, the EU was bailed out of a dire situation when 56 billion cubic meters of U.S. natural gas came through, along with an unusually mild winter. We saw Green New Deal member states cutting down old growth forests and starting coal-fired power plants just to keep warm. These are not necessarily signs of things going well.

So what can you tell me about what steps the EU is taking to ensure that we have got proven, dispatchable energy sources that will be available in the future when these interruptions occur, because as I am sure you would agree, burning wood is one of the dirtier things people can burn.

Ms. JORGENSEN. Indeed, thank you, Senator, for the question. I think there is a history until the 24th of February 2022 and the history after that. Before February 2022, before the 24th of February, we were highly dependent on Russian fossil fuels as part of our energy mix. As I mentioned earlier, we are net importers. We do not have significant domestic extraction of energy, and so the most domestic source we have is renewable energy. And we have invested in that to build that out as part of our energy system.

Senator LEE. Is sawdust considered part of that? Sawdust? Wood chips? I am told by some definitions those are considered renewable when they burn the pelletized sawdust.

Ms. JORGENSEN. Part of our renewable mix is what we call biofuels, and we have sustainability criteria to make sure that there is not a negative impact overall in the environment and climate in using biofuels as part of the energy mix.

From the 24th of February 2022, very shortly after that, we decided to reduce that dependence on Russia. We decided that that was not an acceptable situation. This was decided unanimously by all European heads of state in government. And what you have seen since the 24th of February last year is a significant reduction—more than a significant reduction, as a cut in that dependence on Russia. We got through that year without any shortages. We got through that year with secure supplies. We got through that year, as you said, with very high energy prices as a result of the global energy crisis, as a result of that global supply/demand gap in natural gas.

Senator LEE. Right, even during a wet, mild winter, right?

Thank you. I have got limited time.

Dr. Mikulska, you described the potential impact of EU countries, in effect, crossing their fingers, and not purchasing long-term gas contracts, hoping that they will be able to sort of will themselves into carbon neutrality, hoping for the best, despite past performance and no sign that they are going to be able to do that.

What impact could this have on Russia's ability to continue to use natural gas as a geopolitical tool for economic extortion?

Dr. MIKULSKA. Well, we do know, as many tables here have shown, that the Russian gas is still flowing to Europe both via pipeline and as LNG, which speaks to the persistence of that fuel. While EU was able to ban oil in most of the cases, this has not been the case for Russian gas, and that creates instability that is there. Thankfully, there are ways in which LNG imports can be ramped up. However, for the next two to three years, those LNG imports will be limited by the supply, so there is a big problem with potential instability—volatility of prices—even if the storage that is currently at really high levels remains at high levels.

Senator LEE. Right, and that—this could all lead to a problem, I assume, if, especially—what I would like to know is, what would happen if American LNG were no longer available to flow into foreign markets, particularly into Europe? I ask because on the domestic front, we have seen extraordinary efforts by the current Administration to prevent future oil and gas exploration. What would be the effect of that if we no longer had American LNG to go into global markets?

Dr. MIKULSKA. It is almost hard to imagine, so I am hoping that is not going to be the case, because what U.S. LNG is helping with is making the markets much more commercial, depending on supply and demand, and in a way, actually reducing the volatility that could be caused by political actors. And I think that is very important. We will see potentially high prices based on shortages of supply and hikes in demand, but having those shortages based on political decisions of foreign actors that are not friendly toward us or our allies is the biggest problem, and we have seen this with Russia and the war in Ukraine. And that is something that we would like to absolutely avoid. And U.S. exports of both oil and gas have provided the U.S. with geopolitical power that literally checks the power of other actors, the large producers, that are often authoritarian states, and that do not necessarily have the best interests of the U.S. or its allies in mind.

Senator LEE. Thank you. I see my time is expired. Thanks.

The CHAIRMAN [presiding]. Thank you, Senator.

Senator Hirono.

Senator HIRONO. Thank you, Mr. Chairman.

Ms. Jorgensen, I commend the EU for its decision to reduce its dependence on Russian oil and to lend a lot more support for renewables. That is exactly what Hawaii is doing. It is going to take all of us to stop the Russians.

Hawaii has made a lot of progress toward its renewable energy goal, reaching over 40 percent last year, but it is still the most petroleum-dependent state in the nation, and basically, Hawaii started off being 100 percent, pretty much, dependent on importation of oil from outside of our state because we are not an oil-producing state at all. So after Russia's invasion, people in Hawaii faced high prices at the gas pump and on their energy bills. Not the only state to have that experience, but with Hawaii having increases of 10 to 20 percent due to the use of oil to generate electricity. Fortunately, oil prices have come down and the addition of new renewable projects is set to lower bills across Hawaii.

Ms. Jorgensen, your testimony mentioned that the EU has, "ensured tailored support for vulnerable households and businesses to withstand high and volatile energy prices." What are the policies that you think have been helpful to people in Europe?

Ms. JORGENSEN Thank you, Senator.

Indeed, households and businesses across the European Union were faced with extremely high energy prices during this crisis over the last year, since the war and before the war, as Russia was starting to weaponize energy——

Senator HIRONO. Yes.

Mr. JORGENSEN [continuing]. And bring up prices. We have put in place a series of measures. First of all, given flexibility, given room for member states to support some of their industries with the very, very high energy prices, we have created fiscal space to compensate consumers—both households and businesses—through a revenue cap in electricity generation and through a solidarity contribution. So we have created instruments, at a European level, common European instruments that give room for member states to provide the compensation and help households. One of the issues we are seeing in this energy crisis is, we of course need to maintain the incentives for demand reduction. Continued demand reduction is necessary for the European Union to remain energy secure. We need to act both on the demand and on the supply side. And so, in order to do that, we have sought to design the measures in a way that did not take away the energy-saving incentives that high prices do constitute.

Senator HIRONO. So what role do you see for the additions of renewable energy in the European Union for reducing the level and volatility of energy prices in the future?

Ms. JORGENSEN. We see a significant role for renewable energy in that context, again, both for our security of supply, for our resilience, and for our climate targets, our climate goals. We have already, last year, accelerated significantly the build-out of renewables in the European Union, a significant amount of gigawatt was added. What we did to achieve that was both to facilitate our permitting rules to accelerate permitting because there is typically some delay in the procedures——

Senator HIRONO. For renewables.

Ms. JORGENSEN. For renewables.

And in addition to that, we have made investment and funding available at the European level to go into renewable energy. We will continue with that over the coming years, so as to achieve the targets we have set for ourselves for the renewable share.

Senator HIRONO. What are your targets in terms of reliance on renewables? Do you have a percentage target? Because Hawaii is seeking to be 100 percent renewable for electricity by 2045. What are the EU's targets, as a percentage?

Ms. JORGENSEN. We aim to have a 45 percent share of renewables in our energy mix by 2030. That is a proposal from the European Commission that is currently under discussion with our co-legislators.

Senator HIRONO. My best to you in achieving those targets.

Ms. JORGENSEN. Thank you.

Senator HIRONO. Thank you, Mr. Chairman.

The CHAIRMAN. Thank you, Senator.

And now, we have a returning member, who just can't stay away from this electric type of committee we have and the vibrant hearings that we hold. So we are happy to have you back, Senator.

Senator LANKFORD. Thank you. Mr. Chairman, thank you for allowing me to be able to slip back in as well. So the witnesses, thank you for your ongoing work on this.

I do have just a couple of questions dealing with LNG, specifically, and how we are getting natural gas to Europe and some of the gaps that are there.

Dr. Light, let me start on the permitting process for the export terminals. Obviously, we have additional export terminals that are coming online, trying to increase additional capacity. What is our timeline to be able to increase our capacity for exporting LNG to Europe and those allies that are really interested in getting replacement gas at this point? How long will it take to increase that?

Dr. LIGHT. Thank you for the question, Senator. I would need to know what particular permit you are talking about.

Senator LANKFORD. Yes, I am not looking for a specific one, I am just talking—because there is no specific company I am trying to pursue to say, can theirs go faster.

Dr. LIGHT. Yes, yes, sure.

Senator LANKFORD. I am just trying to figure out how fast can we ramp-up, because this is not an instantaneous thing to say, well, let's just send more natural gas to be able to substitute.

Dr. LIGHT. Absolutely.

Senator LANKFORD. We have natural gas, but it is the infrastructure to actually get it out and the terminals themselves to be able to permit, obviously, to make the decision that it's in our national interest.

Dr. LIGHT. Right.

Senator LANKFORD. And I think that would be my first question. Is it in America's national interest for our allies to get more access to American gas?

Dr. LIGHT. Absolutely, yes.

Senator LANKFORD. Okay, so then, how quickly could we ramp-up over the next couple of years to increase capacity going to Europe?

Dr. LIGHT. So the Department is involved in a number of internal conversations to try to streamline the process, to try to look at what is in the pipeline in terms of applications and make sure that those move forward expeditiously. There is another problem that we are facing, which is that we have permitted much more capacity than we are actually currently seeing, that we are going to ramp-up 20 billion cubic feet per day permitted by the end of this decade. We have 29 that has already been permitted, but there isn't movement to construct, based on those permits yet. And so that is an additional problem, where we don't actually have to wait on the permitting process. It's really how do you make sure that you don't create this interminable gap and ledge where companies are not moving forward on permits that they already have. And that is something we are looking at as well.

Senator LANKFORD. So is the focus on getting permits to say we will get you a permit to be able to do this, if you are actually going to do it? What is the emphasis there?

Dr. LIGHT. That is part of the calculus there, and we would be happy to work with your staff. It is my colleague, Brad Crabtree, who runs the Office of Fossil Energy and Carbon Management, who is at the front line of that, but I am in constant conversations with him every day about this.

Senator LANKFORD. Well, part of the issue for them is, they are always looking for long-term contracts, to say, okay, we actually spend the billions of dollars to be able to create this. Are we going to be able to get the long-term contracts to be able to actually do it? That will actually pay for it, obviously, to be able to recoup that cost on it. Is that what seems to be holding some of the companies back, is just the long-term contracting portion of it?

Dr. LIGHT. I think there is a concern there, and that is one of the reasons that President Biden and President von der Leyen created this U.S./EU gas task force last March, to try to actually drill down into that as one of the key things in order to create investment confidence into the future.

Senator LANKFORD. Okay, we have had sections of the northeastern United States that have actually been purchasers of Russian gas, which has always been the most ironic thing to me, that the United States is a purchaser, long-term, of Russian gas, because we don't have the pipeline capacity to be able to get American—we have American gas not very far away from it, but you don't have the pipeline capability to actually get there.

Where is that gas coming from now that is coming into the northern part of the United States, because we are not buying it from Russia anymore. Where are we getting it from?

Dr. LIGHT. I am—so this is sort of outside of my lane.

Senator LANKFORD. Sorry.

Dr. LIGHT. So I don't know the answer. I will make sure I get it to you. I believe some of that is coming up from the Gulf and getting redirected, but I don't want to swear to that here. I think that, you know, one of the important things here, as we move forward on this as well, is to make sure that we have the cleanest, most competitive gas supply system in the world. Russia did not have that.

Senator LANKFORD. Right.

Dr. LIGHT. It was not a transition fuel that they were selling to Europe and the rest of the world. The United States wants that to be a secured, decarbonized supply. That is something you and I have talked about before, and I really see that as the future there. But I will absolutely get you an answer back.

Senator LANKFORD. Thank you. I appreciate that. And that is one of the issues for me is, we produce energy and our exploration cleaner than anyone else in the world, in the way that we do it, actually going to pursue the natural gas. And so, for me, there is an incentive to say, if we are going to do this as clean as possible, because we are going to need natural gas for decades and decades still in the future as we are transitioning to whatever that other fuel source will be in the day to be able to substitute for that consistent power source that natural gas is. We need to make sure it is coming from the cleanest possible production and exploration that we possibly can.

Dr. LIGHT. That's right. And I also think investment in abatement technologies as well.

Senator LANKFORD. Right.

Dr. LIGHT. I mean, this is the way that we are going to make the world secure and decarbonize and solve all the problems together with respect to energy security, diversity of supply, and attending to our climate goals as well.

Senator LANKFORD. Okay, I appreciate that. And I know I don't have a lot of time to be able to do this. Mr. Chairman, thank you for allowing me to be able to jump in and ask questions because this is a big issue—just a steady supply. We have, obviously, got a lot of natural gas companies here that are producing, that are hoping that they are actually helping support global peace, quite frankly, and not only American stability of our energy prices, but also ——

The CHAIRMAN. And we have to have the pipelines to move them, right?

Senator LANKFORD. We have to have the pipelines to move them. We have to have the export terminals to be able to get it there. They have got to be able to regasify on the other side as well. But it's also the contracting portion.

The CHAIRMAN. Well, Senator, you are always welcome to come back anytime you want.

Senator LANKFORD. Thank you.

The CHAIRMAN. I appreciate it.

Let me just finish up real quick. Dr. Light, if you want to talk about the IRA and the effect it's having and basically, my problem, as you know, is that that bill was designed to be energy secure. There is a basic, balanced approach, and I think a lot of people have been misled because—and honestly, the Administration has sold it as an environmental bill only, or they used that more to their base. And I have been very engaged with them, trying to change and be accurate.

But as you see that bill, basically, for a ten-year period, the bill is designed to have the United States of America totally energy independent. That means we will produce more fossil, but we do it cleaner than anywhere in the world. So as we replace to our friends around the world, they are getting the cleanest extraction of gas and oil, and coal even, than anyplace else, and that helps the climate tremendously from relying on the dirtier areas of the world that produce and not with the environmental oversight such as methane capturing, carbon capture utilization, things of that sort.

So if you can just speak briefly on that, and I am having a problem with the permitting too. We are slow on permitting. You know that. And we have got to speed that up in order to do the job.

I don't know if you all understand that basically, all the people who want more renewables, more renewables—we tied the two together. Remember, there's not going to be any big movement on more wind out on the Gulf unless we are extracting gas and oil from the Gulf. There are not going to be large projects, as far as solar projects on BLM land, unless we are extracting the critical minerals that we need and other resources that we have. I don't know if they are really realizing they are inextricably connected. You can't do one without the other. That gives us a balanced approach. So all of us have reasons to want to decarbonize and be environmentally friendly and understand our responsibility. On the other hand, the risk that we take, and the dependency that we have and our allies have on what the abundance that we have that we can produce for at least the next decade, depends on us being accurate with that.

So if you have any insight on that whatsoever, any comments.

And then, Director, I am going to go to you, Director Jorgensen, to see your European comments on the IRA, which I know, with all of your friends sitting behind you, is going to be quite lively.

Dr. LIGHT. Thanks very much, Senator Manchin, and for your leadership in creating this astounding revolution, frankly, in energy legislation, the likes of which I don't think we have seen in the world before. This is our all-of-the-above energy strategy.

The CHAIRMAN. Right.

Dr. LIGHT. It's the only way we are going to see a real transition to net-zero emissions in the world, in the energy sector, which is going to actually provide security of supply, and will not increase prices, which will not hurt consumers. We have got all across the board, all the chips are covered, from renewables, to nuclear, advanced nuclear, to abated carbon energy.

The CHAIRMAN. I will say one thing, if I may interrupt you for one second. The whole reason we call it the Inflation Reduction Act—if we put more product in the market—pure economics. So you put more product in the market, you have better pricing. So you are helping the consumer. That was the reason for what we have done.

Dr. LIGHT. Exactly right. And it also attends to those over-the-horizon technologies.

The CHAIRMAN. Yes.

Dr. LIGHT. Clean hydrogen, everything else.

I have to say, sir, that I—that you have created—it is not only here in the United States where we have this vision, and now the resources to do that, and seriously move forward on it. Unstalling conversations about carbon capture and sequestration, making that a reality, finally, it has inspired the world. I was in Bangalore, India last week for the G20 negotiations. I have to tell you that India is ready to move forward on green hydrogen and on carbon capture and sequestration in a way that they can scale up in a way that is amazing, if you look at over a billion people, then, you know, in an energy system that is using that, as well as, now they want to talk with us about SMRs.

So that is coming from the capacity that has been created by this legislation. If you can see the United States partnering with countries like that, countries in Europe, you know, other countries around the world, that is where we are seeing an investment in new energy technology as important as the investment in, frankly, in military technology that we had before because it will really give these countries true independence and true security of supply.

The CHAIRMAN. I appreciate it. I know you are hearing a good bit as you go around, too, and we have been hearing it, and now to hear from our dear friend, Ditte Jorgensen, on your perspective of this. And I have heard from your colleagues and we hear you loud and clear.

So tell me how it's working, or not working, or challenging.

Ms. JORGENSEN. Thank you very much, Senator, for that opportunity.

So the Inflation Reduction Act—there are two perspectives that I would like to draw out. Now, the first one is that it is welcome that the United States is investing in green technologies and clean technologies, investing in climate change. That is good in terms of technological developments, innovation. It can help lower costs. So that is a welcome overall direction that is closely aligned with what we are doing in the European Union. We welcome that partnership and look forward to continuing that partnership. And our President, Ursula von der Leyen, has very clearly welcomed that direction of the Inflation Reduction Act.

At the same time, we are deeply concerned with some of the elements of the Inflation Reduction Act that are clearly discriminatory. There are domestic content requirements. There are requirements that will make it more difficult for Europe to attract investments, more difficult for Europe to stay competitive. If I put that into the wider context of the global energy crisis we are in and the current geopolitics, we are each other's most important trading partners. We are each other's most important investment partners. So we have an interest in both of our markets continuing to develop, to remain competitive, because that can help innovation, that can help energy security, that can help create the technologies that are necessary for the future.

So I think our take on that is we need to work together to solve those concerns, and we welcome the engagement we have seen from the U.S. on this. We need to continue that work to find solutions to the outstanding concerns and to the discriminatory elements of the Inflation Reduction Act so that Europe can also remain competitive and our partnership can remain a fair and open one.

The CHAIRMAN. Well, let me give you a little bit of insight as to how this all came about. It came about because we were not able to help our allies with the Ukraine war, what it created in the EU, and that was the purpose of having energy security here. I could not get this Administration to move in that direction because they were moving more toward just everything on the renewable end of it. Well, that is fine, and that is aspirational, but it is basically not reality. It is not what we needed. We needed hard fossil in order to replace, but we can do it cleaner and better.

So we put more for carbon capture utilization. We went from $60 to $85. We went from $35 to $50 on utilization, and on sequestering we went to $85. So we really upped the ante to find the new technologies that we can, and that was the whole thing. We are just trying to mature the industry and all these new technologies.

The difference of what we used—I have had a lot of my colleagues on both sides of the aisle, especially on my side of the aisle, criticize me for not adapting to cap and trade or carbon pricing. And the reason I didn't do that, and the reason I thought it was wrong was because once that pricing gets absorbed into the market, there are no resources going toward finding the cure, or finding a new technology. So we incentivized it with the money we put toward this so that it will mature it quicker so that we can share with you all and the rest of the world that wants to get less carbon, but be able to be realistic and meet the needs of your energy. We did that.

The other thing is, you all had a concern, and rightfully so, and I heard you all loud and clear concerning, basically, on when we said we are going to choose to secure our critical minerals from North America or from countries with free trade agreements. We need to expand that to our NATO allies. We understand that. We cannot be held captive, which we are right now, by Russia, China, Iran, North Korea, or countries that have nothing in common with our way of life and our desired governance and democracy and freedom.

So those are the things we are concerned about. We can work through that. I think we are going to see Europe move in a competitive mode, competing, and that is what it's all about. That is what we have been so great at, all of us have been, in the things that we have done together. It is amazing what we have accomplished together since World War II. We can continue to go into the 21st century, and on to the 22nd century, if we do it together, and we understand that. The value of the free world is based on allies and relationships. It's not based on one superpower. We know we can't do it without you. We know that. And we are going to have to make sure that we all do this together, if you will.

So I would hope that you will look at what we have done, not in retrospect of it harming or that it was intended to harm, especially our allies, our dearest allies, but it was basically to jump-start the technology that is going to be needed to take us into the future. But you are still going to have, you know, even the President said for ten years, but I think longer than that, we are going to be depending on fossil. So can we extract and utilize natural gas and capture all of our methane so there is no venting and no harm to the environment? Can we basically be able to develop hydrogen, which the technology has been around forever, and now be able to do it and do it cleaner than even blue hydrogen? We have got pink hydrogen. We have got green hydrogen. We can do it all. And every part of the world can benefit from this technology.

And then, we have small modular reactors with molten salt cooling, and basically, you can take those up and down like a peaking plant. That is all coming on strong. We are going to, with the amount of money, because, if not, they have got a ten-year window. They have never had a ten-year window in any government from the standpoint of giving you ten years of certainty that you have this pool of money to work out of, because it has always been a couple years and then another Administration or another philosophical ideology comes into play with a new Administration and things change. This one is locked in and funding is secured from the 15 percent minimum tax that we have on our largest corporations.

So we think it was a win-win, but we want to share that, truly. I don't want anyone to think—and when you see something that is being hindering or that you think it has been an obstacle, just let us know, because I think you brought it to my attention. I appreciate it very much, and we are working now. We have been working with the Secretary of Treasury, Janet Yellen, to make sure that we are able to apply this properly.

So hopefully you know that we value your friendship, your relationship, and most importantly the alliance that we have had—that the free world has basically profited by what we have been able to do for the last 60, 70 years. We intend to do it for a lot longer.

So I want to thank all of you for joining us. Dr. Mikulska, thank you for making an effort to be here.

And Dr. Light, as always, we appreciate having you and we are working with you on a piece of legislation that is going to give you the ability to do more of what you can do and what you need to do to help us be stronger with our allies and our friends around the world.

And again, Director-General Jorgensen, thank you so much for the effort that you made to be here and how much you have added to this hearing. I appreciate it very much.

Members will have until the close of business tomorrow to submit any additional questions for the record.

The Committee stands adjourned.

[Whereupon, at 12:12 p.m., the Committee was adjourned.]

APPENDIX MATERIAL SUBMITTED

U.S. Senate Committee on Energy and Natural Resources
February 16, 2023 Hearing: *The Impact of the Russian Federation's War in Ukraine on European and Global Energy Security One Year After the Invasion*
Questions for the Record Submitted to The Honorable Dr. Andrew E. Light

QUESTIONS FROM RANKING MEMBER JOHN BARRASSO

Q1. At least one application for a proposed floating liquefied natural gas (LNG) export facility off Mexico is pending at the Department of Energy (DOE). It is called Altamira. When operational, it will provide more U.S. LNG into the global market. At the hearing, I asked you:

"So we've heard how important increasing U.S. LNG export capacity is for European energy security. I'm aware of at least one project that right now is awaiting Department of Energy approval to build a floating LNG terminal off the coast of Mexico which would use U.S. natural gas. Would exporting this U.S. LNG from such a facility help boost global energy security?"

You responded:

"It would, Senator Barrasso."

What steps, if any, is DOE taking to expedite the evaluation of this and other pending natural gas export applications?

A1. New Fortress Energy (NFE) subsidiary NFE Altamira FLNG, S. de R.L. de C.V applied to DOE for exports of 0.4 billion cubic feet per day of U.S.-sourced natural gas as LNG to both free trade agreement (FTA) and non-free trade agreement (non-FTA) countries in September of 2022. Another subsidiary of NFE, New Fortress Energy Louisiana FLNG, has an additional application before DOE submitted in March 2022 for exports of 0.4 billion cubic feet per day of U.S. natural gas as LNG from a proposed liquefaction terminal in state waters off Louisiana.

DOE is currently reviewing both applications and is also acting as a cooperating agency in the U.S. Department of Transportation's Maritime Administration's (MARAD) review of New Fortress Energy Louisiana FLNG.

U.S. Senate Committee on Energy and Natural Resources
February 16, 2023 Hearing: *The Impact of the Russian Federation's War in Ukraine on European and Global Energy Security One Year After the Invasion*
Questions for the Record Submitted to The Honorable Dr. Andrew E. Light

QUESTIONS FROM SENATOR JAMES E. RISCH

Q1. The Russian invasion has expanded European interest and plans related to nuclear power and created many new opportunities for non-Russian suppliers, including U.S. companies and technologies. However, it is not evident that the U.S. government has responded in a significant or coordinated manner to support the European nations' nuclear energy needs and take advantage of this historic opportunity for global leadership of U.S. nuclear technologies.

Q1a. Can you please provide your assessment of this need and the associated opportunity for U.S. companies?

A1a. The Department has leveraged existing close working relationships and developed new relationships with our international partners in Central and Eastern Europe using both bilateral and multilateral engagement. The Offices of International Affairs (IA) and Nuclear Energy (NE) and have worked over multiple engagements with Slovenia, Czechia, Romania, and Poland within the past year to advance the case for selection of U.S. nuclear technologies and fuels, and contributed to interagency-funded technical assistance supporting the US bid on new builds in Poland as well as negotiated and executed intergovernmental agreements to increase the chances for commercial partnerships with U.S. companies. For example, our work since 2018 led by IA in Poland resulted in the selection of Westinghouse AP1000 technology for the first three of six reactors in Poland's inaugural civil nuclear sector. As we work to secure agreement on the next three reactors the total value of the project will be $40 billion, supporting or creating 135,000 U.S. jobs. NE contributed to this selection by proposing the deployment of a regional Clean Energy Training Center in Poland as described in the FY 2023 budget request to inform the host and regional partners how U.S. nuclear reactor designs, including small modular reactors, could be incorporated into planning for clean energy expansion. NE has led DOE's engagement with Romania since 2014 which led to the successful signing of an Intergovernmental Agreement in December 2020. The intergovernmental agreement (IGA) supports the government-to-government engagement which overlays the commercial partnership. This engagement has been managed by a Steering Committee co-chaired by the Assistant Secretary for Nuclear Energy and the Minister of Energy. This framework has focused on providing technical support for the project development team; coordinating national policies to support the Government of Romania's ability to provide political and financial; and supporting workforce development and capacity building. As a result of this, the Romanians have expanded their nuclear deployment plans and have announced their desire to own the first U.S. SMR in Central and Eastern Europe.

DOE has also leveraged our leadership in multilateral fora to identify opportunities for U.S. nuclear industry to contribute to regional planning for new nuclear builds, including the Partnership for Transatlantic Energy and Climate Cooperation's (PTECC), created by IA in 2018 and expanded through the present as our preeminent platform for cooperation in the region with 23 Central and Eastern European countries. Secretary Granholm relaunched PTECC as co-chair of the Third PTECC Ministerial in Warsaw in September 2021 and continued this leadership as co-chair the Fourth PTECC Ministerial in Zagreb March 2023. These meetings also added the first ever PTECC Business Forum to the gatherings which have attracted hundreds of energy C-suite leaders.

PTECC's Nuclear Working Group has convened two High Level Sessions led by Deputy Secretary Turk, to discuss partnerships and determine the areas of focus to support the required resilience, supply chain restructuring, and infrastructure development needed to diversify energy supplies away from dependence on Russia. By working closely with U.S. industry, we have jointly planned PTECC High Level Sessions in conjunction with trade missions and workshops throughout Europe, to enable industry to create opportunities for national and regional partnerships.

Q1b. What actions have DOE and other federal agencies taken—such as constructs to streamline agreements or facilitate competitive financing—to expedite U.S. nuclear technology deployment in Europe?

A1b. The U.S. must aim to be the most attractive technology development partner for nations seeking to build or expand their nuclear energy sectors, while maintaining our commitment to nuclear nonproliferation and security goals. To compete, the U.S. can leverage financial and policy mechanisms to support the deployment of U.S. nuclear energy technology in international markets, including early-stage financing and equity investments. Team USA, a focused collaboration of DOE and partner U.S. government agencies with the goal to foster the export of U.S. nuclear technology, has made great strides, but these efforts have also demonstrated that much work remains. U.S. government and industry must work together to develop a strategy to expand U.S. nuclear energy technology's global footprint.

Q2. While much of the West has prioritized strengthening Ukrainian military capacities, securing their energy grid is just as important. Russian forces have brutally and systematically targeted Ukrainian grid infrastructure, leaving millions of civilians out in the cold in the middle of winter. After Ukraine made an emergency appeal for assistance in securing autotransformers and other energy assistance, the administration indicated they are working to locate available equipment.

Q2a. What options has the Department of Energy identified to meet Ukraine's urgent need?

A2a. The Department of Energy (DOE), led by the Office of International Affairs and Office of Cybersecurity, Energy Security, and Emergency Response, conducted comprehensive outreach to U.S. utilities, companies, and national laboratories to identify and procure electrical equipment that help Ukraine meet its ongoing urgent identified needs, resulting in ten military transports of high voltage electric grid equipment delivered to Ukraine and one commercial shipment since December 2022.

Q2b. What remaining obstacles exist to immediately shipping available equipment?

A2b. At this stage, DOE has completed its domestic procurement of available and compatible high voltage electricity equipment. Final shipments are underway and will be completed in August.

Q2c. How does the administration prioritize what equipment to ship to Ukraine?

A2c. DOE prioritized equipment based on lists provided by authorities within Ukraine's government including the Ministries of Energy and Restoration, and Ukrenergo (Ukraine's grid transmission system operator). DOE continues to coordinate with Ukraine and interagency partners on assistance priorities for the coming heating season.

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Q3d. Have you identified auto-transformers compatible with Ukraine's needs in the United States? What is the process to determine how many of them could be provided to Ukraine?

A2d. Autotransformers in Ukraine operate at a different frequency than those used in the United States. DOE found one autotransformer on the private market in the United States potentially compatible with Ukraine's network. However, before DOE could purchase the autotransformer, it was sold to another customer. State and USAID are now in the lead to work on opportunities to identify autotransformers from global sources that can be used in Ukraine's network.

Q3. U.S. energy companies have efficiently filled dire needs in the European energy grid as Russia's aggression has worsened energy shortages. In the past year, U.S. LNG exports alone have replaced nearly 88% of the reduction in Russian pipeline volume. However, there still remains more to be done, and the U.S. has the capacity to fulfill other needs, if we let ourselves.

Q3a. Does the Department of Energy have any standing plans to encourage and advocate for US energy exports in the EU?

A3a. DOE continues to have frequent engagement, both in-person and virtually, with our counterparts in the EU, including with the European Commission's Directorate-General for Energy (or DG-Energy) and through the International Energy Agency. Discussions to date have included the current and future availability of U.S. LNG, including information sharing on current and pending authorized U.S. LNG exporters under the auspice of the U.S.-EU Energy Council's Energy Policy Working Group, and participation on the U.S.-EU Energy Security Task Force. In 2022 and so far in 2023, over two-thirds of U.S. LNG exports have been delivered to Europe.

Q3b. What steps has the administration taken to ease the regulatory burden on US energy producers and incentivize increased exports to Europe?

A3b. DOE continues to act on LNG export applications, with current approvals for exports sourced from the lower-48 states to non-free trade agreement (non-FTA) countries at over 47 billion cubic feet per day (Bcf/d), nearly four times the current level of U.S. LNG exports. Most recently, on March 3, 2023, DOE issued a long-term authorization, DOE/FECM Order No. 4961, allowing increased volumes of LNG to be exported from the existing Freeport LNG Terminal in Texas to non-FTA countries (0.24 Bcf/d of natural gas).

Q3c. What progress has been made in implementing US financial and political commitments to the Three Seas Initiative?

A3c. The U.S. Department of Energy supports the goals of the Three Seas Initiative through its Partnership for Transatlantic Energy and Climate Cooperation (P-TECC) initiative, a collaboration of 24 Eastern/Central European countries, the European Commission, and the United States, working together to advance both diversification and decarbonization of energy resources. The most recent P-TECC Business Forum and Ministerial meeting was convened in March 2023 in Zagreb, Croatia, and featured the active participation of 21 countries and 16 energy ministers from the region, all focused on ways to enhance energy security in the region.

Q3d. What is the process for identifying projects to support?

A3d. DOE is not involved in implementing U.S. financial commitments to the Three Seas Initiative – questions related to such commitments should be directed to the U.S. International Development Finance Corporation (DFC).

Q3e. How does the Department of Energy plan to bolster long-term exports of LNG?

A3e. The United States is the top global producer of natural gas, with record exports of LNG set to average 12 billion cubic feet per day (Bcf/d) this year, an amount that is set to grow to 18 Bcf/d by the end of this decade once all the export capacity under construction is complete.

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QUESTIONS FROM SENATOR JOHN HOEVEN

Q1. Over the past decade, the shale energy revolution enabled the United States to transition from energy scarcity to energy abundance. U.S. producers lead the world in using the latest technology to produce more energy with better environmental stewardship.

Does the Department of Energy agree that the U.S. is stronger geopolitically when maximizing the ability to harness its abundant domestic oil and natural gas reserves?

A1. DOE has repeatedly acknowledged the global energy benefits of U.S. energy exports, and LNG exports in particular. In one DOE LNG export order issued in 2022, DOE states "…an efficient, transparent international market for natural gas with diverse sources of supply provides both economic and strategic benefits to the United States and our allies. For example, in light of the Russian invasion of Ukraine, there are renewed concerns about energy security for Europe and Central Asia, particularly given the relative share of Russian natural gas supplies into those regions. More generally, to the extent U.S. exports diversify global LNG supplies and increase the volumes of LNG available globally, these exports will improve energy security for many U.S. allies and trading partners."

Q2. Does the Department agree that U.S. crude oil and liquefied natural gas (LNG) exports to Europe are vital to countering Russia's weaponization of energy?

A2. U.S. energy exports remain an important component of global energy security, and DOE remains committed to finding ways to help supply our allies in Europe and around the world with the energy they need while continuing to work to mitigate the impact of climate change.

Q3. Does the Department agree that U.S. LNG is cleaner than Russian-sourced natural gas?

A3. There is scant reliable information on the environmental profile of Russian-sourced natural gas, but it is clear that Russia is not committed to being a reliable energy supplier, let alone one committed to high environmental standards for its energy production.

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Q4. Given that U.S. producers follow the best environmental standards, does the Department support increasing exports of U.S. crude oil and LNG as a means of improved energy security?

A4. U.S. energy exports remain an important component of global energy security, and DOE remains committed to finding ways to help supply our allies in Europe and around the world with the energy they need while continuing to work to mitigate the impact of climate change. At the same time, the energy security benefits of U.S. oil and LNG exports cannot be fully realized without working both domestically and with our international partners to reduce methane and carbon dioxide emissions associated with upstream oil and gas production, natural gas processing, oil refining, liquefaction in the case of LNG, and transport.

For instance, in ongoing discussions between DOE and EU counterparts, we are jointly working to advance a framework that would harmonize approaches to estimating the greenhouse gas emissions associated with delivered natural gas to provide fuel purchasers, including LNG importers, greater clarity into the emissions associated with different production and export practices. Such a framework would enhance our ability to address today's serious energy security concerns while also continuing to reduce our greenhouse gas emissions, and to do so in a way that enhances the competitiveness of U.S. LNG in European markets and other markets that have adopted or are poised to impose taxes on imports based on their carbon intensity. Such a framework could be expanded to other fossil fuels over time.

Q5. Russia is a major producer of nickel, and the U.S. spent over $181 million more in 2022 for nickel products from Russia than in 2021. Yet, the U.S. has nickel reserves that remain undeveloped due to permitting and regulatory challenges.

What steps need to be taken to lessen U.S. dependence on Russia and China-controlled mines and mineral processing facilities?

A5. There are both known and potential nickel resources in the upper midwest region of the United States, and DOE is engaged with impactful R&D and Infrastructure funding to companies working in that area. In addition, DOI (USGS) has targeted this area for additional data collection as part of its EarthMRI program, which aims to identify otherwise hidden mineral potential. The Talon-Rio Tinto Tamarack nickel project in Minnesota is currently undergoing regulatory review and has also received IIJA funding for a processing facility that will be located in Mercer County, North Dakota. Talon has also received funding from ARPA-E for innovative work which addresses CO2 mineralization and the energy requirements for mining operations.

To lessen U.S. dependence on other countries for minerals, the U.S. can advance and develop additional domestic mineral resources. We are seeing a significant increase in new critical mineral development –a new tellurium line at an existing mine in Utah, new lithium extraction work in Nevada and California, and announced new lithium projects in North Carolina, in addition to the nickel activity mentioned earlier. We expect this positive trend to continue. DOE is in the process of funding the creation of a Rare Earth Element Demonstration facility that will produce refined Rare Earth metals and other critical minerals, such as cobalt or nickel, from domestic mine waste. In addition, the DOE Loan Programs Office has announced conditional commitments for two critical mineral projects – the Syrah facility in Vidalia, LA for graphite processing, and to Ioneer for the Rhyolite Ridge lithium project in Nevada.

The U.S. can also strengthen supply chains involving trusted allies such as Canada and Australia, both being countries with significant critical mineral endowment. The U.S. can also look towards future opportunities to establish domestic processing of critical minerals, as we fully recognize that domestic processing coupled with domestic manufacturing is a winning combination.

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Questions from Senator John W. Hickenlooper

Question 1: The EU has set an "interconnection target," under which its member states would to be able to transfer at least 15% of their total installed electricity generation with their neighboring countries by 2030, up from 10% by 2020. The purpose of policies like these is in large part to protect against sudden shocks to the system. I can think of no greater shock to Europe's electricity system than the sudden need to move off of Russian gas over the past year.

- How have the EU's transmission policies helped your energy system withstand Russia's weaponization of energy?

Answer

Introduction

The benefits of integrating the electricity systems of EU Member States are unquestionable. Market integration has increased socio-economic welfare, rewarding the dispatching of the most efficient power plants, reducing CO2 emissions and increasing security of supply. A shock in the system can be better absorbed by an integrated energy market based on a collaborative framework, reducing risks that could otherwise be potentially unresolvable by a Member State alone.

Energy infrastructure pays a fundamental role in enabling such market integration, as it alleviates bottlenecks to match supply and demand, reduces energy isolation in specific areas and facilitates the uptake of renewables and distributed flexibilities. We clearly see in Europe how regional synergies between different energy mixes and weather conditions can be exploited thanks to interconnectors and integrated markets – e.g. hydro, wind (onshore and offshore), and solar.

Gas infrastructure

In terms of gas infrastructure, dependencies of Member States, in particular in Central and Eastern Europe, on Russian gas supply were already significantly reduced before the outbreak of the current crisis. The completion of key EU-supported projects of common interest and the creation of a well-integrated gas network contributed to this. Robust cross-border gas infrastructure alleviated the consequences of gas supply disruptions or export cuts from Russia. All projects completed since 2009, often with EU regulatory and financial support, have enhanced security of supply, enabling several Member States to replace Russian gas imports with supplies from different directions, notably through global LNG markets.

The political support for key projects has been underpinned by dedicated funding. The EU's Connecting Europe Facility for Energy has already committed 5.7 billion euros of EU grants identified in the regional initiatives. In the gas field, the EU's Connecting Europe Facility for Energy has already allocated 1.55 billion euros of EU grants to key gas projects by the end of 2022. Moreover, through the European Energy Programme for Recovery (EEPR), the EU supported 44 gas interconnectors, and gas reverse flow projects, amounting to almost 800 million euros.

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Only in 2022, almost 20 bcm/year of transmission capacity was added to the gas systems in Central-Eastern and South-Eastern Europe thanks to completion of the gas interconnectors between Poland and Lithuania, the Baltic Pipe, and the Interconnector Greece-Bulgaria.

The Member States were therefore able to react to recent Russian gas supply cuts in a spirit of solidarity. These pipelines will also guarantee new supply routes and sources in the years to come.

Electricity infrastructure

The benefits of electricity interconnectors, together with other policies in place, have also helped mitigate the impacts of the Russian war of aggression against Ukraine and its consequences for the energy sector. While the fuels markets have been disrupted by Russia following the Russian aggression on Ukraine, the functioning of the electricity system in Europe was not put at risk despite very high prices. Moreover, the resilience of the European system made it possible to fully synchronise the Ukrainian power system with the Continental European network shortly after the invasion.

The benefits of the European integrated electricity system in economic terms are significant. Cross-border trade in the EU is delivering annually EUR 34 billion of benefits while at the same time helping to smoothen price volatility. As part of these trade benefits, cross-border infrastructure also helps to reduce the curtailment of renewables locally. Our electricity Projects of Common Interest have so far contributed to reducing curtailed generation by 1.1 TWh and by 2030 we expect this amount to multiply roughly fourfold. This not only increases renewable generation, but also saves CO2 emissions from alternative fossil-fuel-fired power generation and saves costs - around EUR 305 million.

Looking ahead

The future energy system will increasingly need flexibilities, synergies and cooperation, especially as fluctuating generation increases as a share of the electricity mix. Security of supply will need to be fully factored in, which will require additional interconnectors between Member States.

To prepare for this we rely on our already applicable Trans-European Networks for Energy (TEN-E) policy1. It provides for a European framework to identify and implement the projects of the highest European relevance that are essential for well-connected networks across Member States and the internal energy market. It establishes a biennial list of Projects of Common Interest (PCIs) that helps the EU meet its short and long-term energy and climate objectives. PCIs benefit from accelerated permitting, rules for cross-border cost allocation, regulatory incentives and access to funding under the Connecting Europe Facility (CEF). So far 52 electricity and 33 gas PCIs have been completed and 39 electricity and 12 gas PCIs have been kickstarted.

Having agreed on the benefits of interconnectors, the EU has set the minimum electricity interconnection targets for Member States to reach. Under the existing framework all Member States should achieve a level of interconnectivity of at least 15% with its neighbors in 2030. This level is measured a ratio of the transmission capacity of interconnectors to the total installed generation capacity in a given Member State. For the moment, the majority of EU Member States meet this requirement and only 7 Member

[1] Regulation (EU) 2022/869 on guidelines for trans-European energy infrastructure, OJ L 152, 3.6.2022, p. 45, http://data.europa.eu/eli/reg/2022/869/oj

States are still below the 15% threshold. At the same time, next to the 15% threshold, the European Commission takes into account Member States' other aspects which could justify the need for additional electricity interconnectors, more specifically the price differences between Member States, level of installed renewable generation capacities or peak load levels in a given country.

Closing, our EU transmission policies were crucial to ensure stability of our energy systems: so far, we did not experience any shortages of supply or blackouts. These policies are clear evidence that we are strongest in our response when we work together with an integrated energy system, both within the European Union and with our neighbours.

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Answers to Questions from Ranking Member John Barrasso

Question 1: European countries have refused to enter into long-term contracts for liquefied natural gas (LNG). Meanwhile, countries, including Japan, South Korea, and China have signed long-term contracts to import LNG that last a decade or more. By refusing to agree to these contracts, European countries subject themselves to volatile prices in the daily market. If European countries continue to refuse to sign long-term contracts, will Europe reduce its ability to compete with Asia for LNG?

Anna Mikulska: Wealthy European countries could potentially outbid Asian customers on spot markets or if Asian buyers are purchasing their LNG from traders when price offered in Europe is sufficiently high to cover penalty for contract breach and still yield profits. However, if/when Asian companies/utilities contract LNG volumes directly, they will be able to bring them to their shores, especially if price is their secondary consideration and security of energy prevails. This is possible since many of the Asian companies that contracted LNG are state-controlled or state has influence over their decision. After all, the EU itself seems to set prices as secondary to supply security goals based on the EU regulation that requires storage to be filled to 90% by November 1st, each year.

Question 2: In your written testimony, you state the following:

"[C]ountries that committed to long-term contracts could lose those volumes if unable to outbid wealthy European customers. Indeed, this has already been the case last year where countries such as Pakistan, Vietnam, or Bangladesh were not able to attract LNG shipments and even saw their contracted LNG volumes travel to Europe instead. And while Europe was able to fill their gas storage to the rim and prevent explicit gas rationing, these countries were less fortunate with Pakistan, in particular, in the midst of experiencing an acute energy crisis and many in the region rethinking previously planned investment in natural gas, decreasing the number of potential long-term contracts even further."

A) Would you further explain how high spot market prices in Europe reduced the availability of LNG under long-term contracts with developing countries?

   Anna Mikulska: Hit by high LNG prices and inability to secure even contracted volumes, developing countries have been rethinking their future energy mixes. For example, Pakistan's Energy Minister has recently stated that LNG was no longer part of the long-term plan for the country pointing to coal-fired power generation as a replacement. Vietnam is also reconsidering LNG as it reviews feasibility of gas-power generation and reducing LNG-to-power capacity by 2030 while scaling up offshore wind. And while other countries, like Bangladesh, also consider adding more renewables to their energy mix, the country's domestically available coal is likely to take primacy in a short-to-medium term if indeed fewer LNG imports and investments are to take place.

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Volatility and high prices as well as inability to secure even contracted LNG volumes will likely curb the appetite for long-term contracts on the part of the developing world.

And volatility and high prices are more likely to persist if European buyers decide not to sign long-term contracts (or not to sign enough of them) to support their energy needs and rely on spot markets instead. If reliance on spot markets by Europe is high, we are likely to see factors like weather in both Asia and Europe influence price formation and encouraging price volatility.

Low levels of long-term contracting by the EU and the developing world are problematic particularly for those LNG providers that are commercially driven, this includes U.S. companies, which have to ensure financing for their projects to commence construction. As such, even already permitted US LNG export terminals will not be built unless financing is available. The latter will depend on ability of LNG companies to secure sufficient number of contracts from reliable off takers.

As a result, lack of appetite for long-term contracts not only could impact availability of LNG volumes in the future, it also would also likely impact the structure of the global LNG market. As most flexible volumes in terms of contracts and destination (U.S. LNG) are pushed out of the market, less flexible volumes become dominant, including volumes from Russia or Qatar where final investment decisions are often based on state and policy support. Excluding multitude of U.S. companies from the future of LNG markets will not only impact flexibility of the market but will also decrease the market's depth (number of sellers), which is problematic as diversity of supply is one of the defining elements of energy security.

B) If European customers signed long-term contracts with LNG exporters, would such contracts help increase the availability of LNG to developing countries?

Anna Mikulska: Long-term contracts would absolutely help, in particular for permitted US LNG providers or those seeking permit. Long-term contracts from trusted purchasers from Europe with high credit rating would give banks a better basis for financing LNG export projects and would make final investment decisions faster or at all possible. US LNG contracts are also based on Henry Hub (HH) pricing, which as last year has shown, has not been prone to extreme price hikes and volatility in the same way gas hubs in Europe or Asia were. Hence, if volumes bought by European utilities are delivered to Europe, reliance on HH for price should moderate prices there. In contrast, spot prices could be lower if weather cooperates, like this winter, but will rise if the opposite is true (this applies to both heating degree days as well as sun and wind performance for renewable energy generation). Prices are also bound to rise at times when storage is being filled as it increases the demand, which is going to be every summer for Europe given that EU regulation requires gas storage to be filled to 90% by November 1st, each year.

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Moderating prices and lessening volatility would be an encouraging sign for developing countries to also invest in LNG import infrastructure and sign long-term contracts themselves. In addition, if Europe in fact is able to wean itself off of natural gas before the US LNG long-term contracts expire or if it doesn't need all the volumes it contracted, the European providers are free to sell their cargos to anyone globally given the flexibility of US LNG contracts. This reduces risk exposure in a significant way.

Answers to Questions from Senator John Hoeven

Question 1: Would the expansion of natural gas pipeline capacity help increase U.S. LNG export opportunities, and thus help strengthen energy security for our allies in Europe and Asia?

Anna Mikulska: The U.S. expansive pipeline system has allowed quick development of US LNG export terminals as these have been able to access feed gas supplies without the need for new, expensive and time- consuming investment in new pipeline infrastructure. However, there still are deficiencies in pipeline infrastructure, even for domestic demand, in particular in the New England region where insufficient pipeline and gas storage infrastructure necessitates LNG imports. Also, while current pipeline infrastructure has been able to support current LNG export volumes, it is likely to become insufficient going forward, making it difficult for even currently approved LNG export terminals to be built. In fact, pipeline bottlenecks are currently a significant issue in the Marcellus and Utica shales, contributing to regional hub prices too low to encourage additional production.

Going forward there is a need for new pipeline infrastructure and/or reversal of current pipeline capacity so new production from each and single shale formation can access US and international markets.

Lack of sufficient pipeline capacity to deliver natural gas to both markets will negatively impact increases in domestic production, contributing to higher prices in the US and, in effect, raising impacting US consumer prices as well as damaging US LNG competitiveness globally. This, in turn, will negatively impact both, existing and planned LNG capacity.

As a result, global share of US LNG would decrease giving other LNG providers ability to impact markets. This includes Russia, which is determined to grow its LNG sector, as well as Qatar, which is expanding its LNG exports. Smaller share of US LNG will mean less diversification of supply and less flexibility in the contracts, both trends detrimental to energy security in general but particularly security of supply for our European allies.

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Question 2: Do you agree that increasing U.S. natural gas production capacity has the mutual benefit of keeping domestic prices low while helping meet the energy demands of our allies abroad?

Anna Mikulska : As per my answer to Question 1, increase in production capacity, combined with pipeline capacity development, will have an effect of encouraging additional gas production. As a result, in the long term, this will keep prices lower as compared to scenario where new production is discouraged. In addition, new economic activity will benefit the producing regions in specific, and the U.S. generally

In fact, since 2012 DOE has commissioned 5 different studies to evaluate economic effects of LNG exports and every single one of those studies, despite different approach to modeling, has confirmed net positive benefit of greater LNG exports.[1]

Net positive benefit indicates that some consumers may be negatively impacted by higher prices that result when exports begin. However, gains that those exports actually outweigh these losses. In addition, the study "The Macroeconomic Impact of Increasing U.S. LNG Exports" indicates that: the more low-cost production is available on the market, the lower the losses and the higher the benefits. This underscores the importance of infrastructure to encourage production, including pipelines as well as LNG export infrastructure that promises long-term off take.

Question 3: Would a shift by the Biden administration to promote development of federal oil and gas resources indicate more supply will be available to meet demand, thus leading to lower prices and greater energy security?

Anna Mikulska: My sincere apologies but the specifics of the U.S. oil and gas market developments and its economics are not squarely within the area of my expertise. I would direct

[1] "Effect of Increased Natural Gas Exports on Domestic Energy Markets" was performed by the U.S. EIA and published in January 2012, www.energy.gov/sites/prod/files/2013/04/f0/fe_eia_lng.pdf
"Macroeconomic Impacts of LNG Exports from the United States" was performed by NERA Economic Consulting and published in December 2012,
www.energy.gov/sites/prod/files/2013/04/f0/nera_lng_report.pdf
"Effect of Increased Levels of Liquefied Natural Gas Exports on U.S. Energy Markets" was performed by the U.S. EIA and published in October 2014. www.eia.gov/analysis/requests/fe/pdf/lng.pdf
"The Macroeconomic Impact of Increasing U.S. LNG Exports" was performed by the Center for Energy Studies (CES) at Rice University's Baker Institute and Oxford Economics and published in October 2015. www.energy.gov/sites/prod/files/2015/12/f27/20151113_macro_impact_of_lng_exports_0.pdf
"Macroeconomic Outcomes of Market Determined Levels of U.S. LNG Exports" was performed by NERA Economic Consulting and published in June 2018.
www.energy.gov/sites/prod/files/2018/06/f52/Macroeconomic%20LNG%20Export%20Study%202018.pdf

to my colleagues Kenneth Medlock III,[2] Gabriel Collins,[3] and/or Michelle Michot Foss[4] for an in-depth analysis of the topic. Importantly, most oil and gas development in the US happens on private land. However, federal land-based production is not trivial, and actually prevailing for some states. From the international viewpoint, greater support for federal development would signal US commitment and ability to aid global markets with market-based, commercial oil and gas production that contrasts with state-based and potentially geopolitically-charged production from large national oil and gas companies.

[2] https://www.bakerinstitute.org/expert/kenneth-b-medlock-iii
[3] https://www.bakerinstitute.org/expert/gabriel-collins
[4] https://www.bakerinstitute.org/expert/michelle-michot-foss