U.S. DEPARTMENT OF ENERGY | Office of Policy

[6450-01-P]

DEPARTMENT OF ENERGY

Notice of Request for Information (RFI) on Energy Sector Supply Chain Review

AGENCY: Undersecretary for Science and Energy and Office of Policy (OP); U.S. Department of Energy (DOE).

ACTION: Request for information.

SUMMARY: The U.S. Department of Energy (DOE) Undersecretary for Science and Energy and Office of Policy (OP) request information on energy sector supply chains. This request for information (RFI) seeks input from all stakeholders involved directly and indirectly in the supply chains of energy, energy systems and technologies, and energy efficiency technologies from raw materials, processed materials, subcomponents, final products, to end-of-life material recovery and recycling—including but not limited to U.S. industry, researchers, academia, local governments, and civil society. This stakeholder input will inform the Department's efforts in building an energy sector industrial base that is diverse, resilient, and competitive while meeting economic, national security, and climate objectives.

DATES: Responses will be reviewed and considered on a rolling basis but are due no later than 5 PM (ET) on January 15, 2022.

ADDRESSES: Interested parties are to submit comments online (**Strongly Preferred**): Submit all electronic public comments to www.regulations.gov/docket/DOE-HQ-2021-0020. Click on the "Comment" icon, complete the required fields, and enter or attach your comments. If you are unable to submit online, you may submit by email to *supplychain@hq.doe.gov* and include "RFI: Supply Chain

Review" in the subject line of the email. Email attachments can be provided as a Microsoft Word (.docx) file or an Adobe PDF (.pdf) file, prepared in accordance with the detailed instructions in the RFI. Documents submitted electronically should clearly indicate which topic areas and specific questions are being addressed and should be limited to no more than 25MB in size. The complete RFI document is located at *www.energy.gov/policy*. **Please refer to the Disclaimer and Important Note section at the end of this RFI on how to submit business sensitive and/or confidential information.**

FOR FURTHER INFORMATION CONTACT: Questions may be addressed to Tsisilile Igogo at 202-586-0048. Please direct media inquiries to Jennifer Mosley through jennifer.mosley@hq.doe.gov. Further instructions can be found in the RFI document posted at *www.energy.gov/policy*.

SUPPLEMENTARY INFORMATION:

Background

Executive Order 14017 "America's Supply Chains" directs the Secretary of Energy to "submit a report on supply chains for the energy sector industrial base (as determined by the Secretary of Energy)" within one year of the date of the order 86 FR 11849 (February 24, 2021). This RFI seeks public input to inform DOE on approaches and actions needed to build resilient supply chains for the energy sector. Resilient supply chains as defined by the Executive Order 14017 means "supply chains that are secure and diverse—facilitating greater domestic production, a range of supply, built-in redundancies, adequate stockpiles, safe and secure digital networks, and a world-class American manufacturing base and workforce."

DOE recognizes that meeting U.S. jobs, economic, and emissions goals (which include a 50-52% reduction in emissions by 2030 from a 2005 baseline and net zero greenhouse gas emissions economy-

wide by no later than 2050), will require a significant number of clean energy (and clean energy enabling) technologies to be deployed at a dramatically increasing scale at a time when other countries are expanding their clean energy sectors. DOE has identified technologies and crosscutting topics for analysis in the timeframe set by the Executive Order. The list of the selected technology sectors includes solar photovoltaic (PV); wind; electric grid, including transformers and high-voltage direct current (HVDC); energy storage; hydropower, including pumped storage hydropower (PSH); nuclear energy; fuel cells and electrolyzers; semiconductors; neodymium magnets; platinum group metals and other catalysts; and carbon capture materials. Crosscutting topics include cybersecurity and digital components, and commercialization and competitiveness. DOE has additional ongoing supply chain analysis on other technologies and topics as well. For this effort, DOE is reviewing the full supply chain—from raw materials, processed materials, subcomponents, final products, to end-of-life material recovery and recycling—for each technology. DOE is taking an in-depth assessment in each of the selected technologies, including:

- Mapping the supply chains;
- Identifying existing and future threats, risks, and vulnerabilities;
- Identifying major barriers, including financial and commercial, scientific, technical, regulatory and market;
- Identifying conditions needed to help incentivize energy sector companies and communities to both transfer energy manufacturing back to and scale up supply chains in the United States.

- Identifying areas where collaboration between the government and private sector, as well as between government entities (federal, state, local, and Tribal), is necessary to expand the energy industrial base, what private sector leadership might look like in this area, and where or how government can help; and
- Identifying specific actions to address threats, risks, and vulnerabilities and help build resilient supply chains.

This RFI seeks input from all stakeholders involved directly and indirectly in the supply chains of energy and energy efficiency technologies—including but not limited to U.S. industry, researchers, academia, local governments, labor organizations, and civil society. This stakeholder input will inform the Department's efforts to build an energy sector industrial base that is diverse, resilient, and competitive while meeting economic, national security, and climate objectives.

This RFI seeks responses on the energy sector industrial base and individual technologies as well as crosscutting topics. Specifically, DOE is interested in gathering information relevant to the following topic areas:

1. Crosscutting topics relating to the energy sector industrial base
2. Solar PV Technology
3. Wind Energy Technology
4. Energy Storage Technology
5. Electric Grid - Transformers and HVDC
6. Hydropower and Pumped Storage Technology

7. Nuclear Energy Technology
8. Fuel Cells and Electrolyzers
9. Semiconductors
10. Neodymium Magnets
11. Platinum Group Metals and other materials used as Catalysts
12. Carbon Capture, Storage, and Transportation Materials
13. Cybersecurity and Digital Components
14. Commercialization and Competitiveness

Questions for Input

This RFI is an initial step in improving DOE understanding of interests, concerns, challenges, and policy needs of the private sector and communities at large, with respect to manufacturing supply chains of the evolving energy sector industrial base. This RFI is a general solicitation for public input, which sets forth topics for discussion and comment. Specific questions to which responses are requested for each focus area are listed below. Respondents may provide input regarding any or all the topic areas and may address any or all the questions.

Area 1: Crosscutting Topics Relating to the Energy Sector Industrial Base

The concept of the "energy sector industrial base" as a defined group of critical industry partners does not currently exist in the same way that it does for the Defense Industrial Base. The one-year reports responding to Executive Order 14017 present an opportunity to define the energy sector industrial base.

This section targets crosscutting/technology neutral input; for technology specific comments, please respond in the respective technology in Area 2 to Area 13.

1. How would you define the energy sector industrial base? For the purposes of informing comprehensive supply chain policies—including promoting supply chain resilience—what entities are included or not included in the energy sector industrial base?
2. For adoption of clean energy technologies in the United States, what are the crosscutting vulnerabilities and gaps in the supply chain and manufacturing capabilities given the likely ramp-up in demand for these technologies?
3. What are opportunities to expand domestic energy-related manufacturing in the United States? What conditions will lead manufacturers to reshore or expand domestic clean energy manufacturing?
4. How can the government partner with the private sector and communities to build domestic energy manufacturing capabilities? What investments and other policy mechanisms are needed to enable these partnerships?
5. How can policies and programs that support domestic energy manufacturing also support workforce opportunities and the creation of competitive, long-term manufacturing careers, especially for communities impacted by energy transition?

Area 2: Solar PV Technology

1. What are the current and future supply chain gaps and vulnerabilities as we scale up the adoption and use of solar PV technologies? Of these gaps and vulnerabilities, which are the most crucial for the U.S. to address and focus on and why?
2. Where in the solar PV supply chain does it make sense for the U.S. to focus and prioritize its efforts both in the short-term and the long-term, and why? Where in the supply chain do you see opportunities for the U.S. to build durable domestic capabilities of solar PV manufacturing? For areas in the supply chain where U.S. opportunities to build domestic manufacturing capabilities are limited, which foreign countries or regions should the U.S. government prioritize for engagement to strengthen/build reliable partnerships, and what actions should the government take to help ensure resilience in these areas of the supply chain?
3. What challenges limit the U.S.'s ability to realize opportunities to build domestic solar PV manufacturing? What conditions are needed to help incentivize companies involved in the solar PV supply chains to build and expand domestic manufacturing capabilities?
4. How can government (federal, state, local, and Tribal) help the private sector and communities involved in solar PV manufacturing build and expand domestic solar PV manufacturing in the U.S.? What investment and policy actions are needed to support domestic manufacturing of solar PV?
5. What specific skills are needed for the workforce to support the solar PV manufacturing supply chain? Of those skills, which ones are lacking in current education/training programs? What resources (including time) and structures would be needed to train the solar PV workforce? What worker groups, secondary education facilities, and other stakeholders could be valuable partners in these

training activities? What new education programs should be included (developed?) to prepare the workforce?

6. What other input should the federal government be aware of to support a resilient supply chain of this technology?

Area 3: Wind Energy Technology

The following questions may have different applicability to land-based wind and offshore wind. In your response, please note whether the response is applicable to land-based wind, offshore wind, or both.

1. What are the current and future supply chain vulnerabilities as we scale up the adoption and use of wind energy technologies? Of these vulnerabilities, which are the most crucial for the U.S. to address and focus on and why?
2. Where in the wind energy technology supply chain does it make sense for the U.S. to focus and prioritize its efforts both in the short-term and the long-term, and why? Where in the supply chain do you see opportunities for the U.S to build domestic capabilities of wind energy technology manufacturing? What areas of the supply chain should the U.S. not prioritize for attraction or expansion of domestic manufacturing capabilities, and why? For areas in the supply chain where U.S. opportunities to build domestic manufacturing capabilities are limited, which foreign countries or regions should the U.S. government prioritize for engagement to strengthen/build reliable partnerships, and what actions should the government take to help ensure resilience in these areas of the supply chain?

3. What challenges limit the U.S.'s ability to realize these opportunities to attract or expand land-based or offshore wind energy technology manufacturing in the U.S.? What conditions are needed to help incentivize companies involved in the wind energy technology supply chains to both attract and expand wind energy technology manufacturing in the U.S.?
4. How can the federal government help the private sector and interested communities attract and expand land-based or offshore wind energy technology manufacturing in U.S.? What investment and policy actions are needed to support domestic manufacturing of wind energy technologies?
5. In implementing policy to support expansion of the domestic wind energy technology supply chain, how should the federal government prioritize tier 1 (major components such as nacelles, blades, towers, or offshore foundations) and lower-tier (other components, subcomponents, raw and processed material inputs) manufacturing? Do you agree with this tiering? If not, why?
6. What specific skills are needed for the workforce to support wind (onshore and offshore) energy technology manufacturing supply chains? Of those skills, which ones are lacking in current education/training programs? What resources (including time) and structures would be needed to train the wind energy workforce? What worker groups, secondary education facilities, and other stakeholders could be valuable partners in these training activities? What new education programs should be included (developed?) to prepare the workforce?

7. How can the federal government most effectively expand and improve logistics networks for large wind energy technology components, both land-based and offshore? For land-based wind energy technology, how could the federal government ease transportation of large components across jurisdictions (e.g., R&D to modularize components, funding for permit harmonization, funding for

specific infrastructure improvements to allow for greater throughput and/or movement of larger components)? For offshore wind energy technology, how can the federal government best support the development of Jones Act-compliant vessels and necessary port infrastructure?

8. How can the federal government most effectively support increasing circularity (collection and reuse, remanufacturing or refurbishing, and recycling) in wind energy technologies and supply chains, especially for rare-earth element magnets and hard-to-recycle components such as blades?
9. What other input should the federal government be aware of to support a resilient supply chain of this technology?

Area 4: Energy Storage Technology

1. What are the current and future supply chain vulnerabilities as we scale up the adoption and use of energy storage technologies? Of these vulnerabilities, which are the most crucial for the U.S. to address and focus on and why?
2. Which storage technologies have the greatest chance of achieving long-duration storage targets (>10 hours) and what specific supply chain vulnerabilities are present for these technologies?
3. Where in the energy storage technology supply chain does it make sense for the U.S. to focus and prioritize its efforts both in the short-term and long-term, and why? Where in the supply chain do you see opportunities for the U.S to build domestic capabilities of energy storage technology manufacturing? What areas of the supply chain should the U.S. not prioritize for attraction or expansion of domestic manufacturing capabilities, and why? For areas in the supply chain where U.S. opportunities to build domestic manufacturing capabilities are limited, which foreign countries or regions should the U.S. government prioritize for engagement to strengthen/build reliable

partnerships, and what actions should the government take to help ensure resilience in these areas of the supply chain?

4. What challenges limit the U.S.'s ability to realize these opportunities to build domestic energy storage technology manufacturing? What conditions are needed to help incentivize companies involved in the energy storage technology supply chains to build and expand domestic manufacturing capabilities?
5. How can government help the private sector and communities involved in energy storage technology manufacturing build and expand domestic manufacturing? What investment and policy actions are needed to support domestic manufacturing of energy storage technologies?
6. What specific skills are needed for the workforce to support the energy storage technology manufacturing supply chain? Of those skills, which ones are lacking in current education/training programs? What resources (including time) and structures would be needed to train the energy storage technology workforce? What worker groups, secondary education facilities, and other stakeholders could be valuable partners in these training activities? What new education programs should be included (developed?) to prepare the workforce?
7. How can the government help increase the market demand for responsibly sourced materials (e.g., sustainable or recycled) for energy storage technologies? What mechanisms exist to encourage the use of these materials and recycling/reuse solutions? How can the federal government most effectively support increasing circularity (collection, reuse or processing, and recycling) in energy storage technologies and supply chains?
8. What other input should the federal government be aware of to support a resilient supply chain of this technology?

Topic Area 5: Electric Grid - Transformers and HVDC

1. What are the current and future supply chain vulnerabilities given the anticipated growth in demand for electric grid technologies to support decarbonization, particularly large power transformers (LPT) and high-voltage, direct current technology (HVDC)? Of the vulnerabilities, which are the most crucial for the U.S. to address and focus on and why?
2. Where in the supply chain does it make sense for the U.S to focus and prioritize its efforts both in the short-term and the long-term, and why? Where in the supply chain do you see opportunities for the U.S to build domestic capabilities of LPT and HVDC manufacturing? What areas of the supply chain should the U.S. not prioritize for attraction or expansion of domestic manufacturing capabilities, and why? For areas in the supply chain where U.S. opportunities to build domestic manufacturing capabilities are limited, which foreign countries or regions should the U.S. government prioritize for engagement to strengthen/build reliable partnerships, and what actions should the government take to help ensure resilience in these areas of the supply chain?
3. What challenges limit the U.S.'s ability to realize these opportunities to build domestic LPT and HVDC manufacturing? What conditions are needed to help incentivize companies involved in the LPT and HVDC supply chains to build and expand domestic manufacturing capabilities?
4. How can government help the private sector and communities involved in energy storage manufacturing build and expand domestic manufacturing capabilities? What investment and policy actions are needed to support domestic manufacturing of LPT and HVDC?
5. What specific skills are needed for the workforce to support the LPT and HVDC manufacturing supply chain? Of those skills, which ones are lacking in current education/training programs? What

resources (including time) and structures would be needed to train the LPT and HVDC workforce? What worker groups, secondary education facilities, and other stakeholders could be valuable partners in these training activities? What new education programs should be included (developed?) to prepare the workforce?

6. What other input should the federal government be aware of to support a resilient supply chain of this technology?

Area 6: Hydropower and Pumped Storage Technology

*Hydropower refers to hydropower and pumped storage hydropower.

1. What are the current and future supply chain vulnerabilities given the anticipated growth in demand for hydropower technology to support decarbonization? Of these vulnerabilities, which are the most crucial for the U.S. to address and focus on and why?
2. Are there any hydropower generation plant components that are critical to operations and depend on extended supply chains (e.g., long time needed to procure a replacement for the component)? Do any of the critical-to-operation components with extended supply chains have a high risk of failure or the potential to negatively impact entire plant operations? Which components are harder to procure domestically (meaning domestically manufactured) and typically need to be imported?
3. Do you have concerns about "extinct" supply chains where components need to be produced on an ad hoc basis from bespoke component developers? Are there components that have a long lead time because they have to be fabricated? Are components (e.g., programmable logic controllers (PLCs)) being replaced before the end of their useful life because of supply chain risks (e.g., manufacturers no longer supporting certain legacy equipment, not producing replacement parts for it anymore)?

4. For components that are not unique to hydropower plants (e.g., batteries, transformers), have there been shortages or difficulties for hydropower plants to secure the components due to competition from other uses within the electric generation sector (e.g., wind and solar generation, batteries for grid storage)?
5. Where in the supply chain does it make sense for the U.S to focus and prioritize its efforts both in the short-term and long-term, and why? Where in the supply chain do you see opportunities for the U.S. to build the domestic supply chain of hydropower technology component manufacturing? What areas of the supply chain should the U.S. not prioritize for attraction or expansion of domestic manufacturing capabilities, and why? For areas in the supply chain where U.S. opportunities to build domestic manufacturing capabilities are limited, which foreign countries or regions should the U.S. government prioritize for engagement to strengthen/build reliable partnerships, and what actions should the government take to help ensure resilience in these areas of the supply chain?
6. What challenges limit the U.S.'s ability to realize these opportunities for domestic hydropower technology component manufacturing in the U.S.? What conditions are needed to help incentivize companies involved in the hydropower technology components manufacturing to build and expand operations in the U.S.?
7. How can government help the private sector and communities involved in hydropower components manufacturing onshore and scale up hydropower components manufacturing in the U.S.? What investment and policy actions are needed to support domestic manufacturing of hydropower technology component manufacturing?
8. What specific skills are needed for the workforce to support the hydropower technology manufacturing supply chain? Of those skills, which ones are lacking in current education/training

programs? What resources (including time) and structures would be needed to train the hydropower workforce? What worker groups, secondary education facilities, and other stakeholders could be valuable partners in these training activities? What new education programs should be included (developed?) to prepare the workforce?

9. How are hydropower plant components disposed of at the end of their operational life? Are there practices already in place or being considered to contribute to a circular economy[1] approach involving recycling? What barriers are associated with recycling and reuse of hydropower components? How can the federal government most effectively support increasing circularity (collection, reuse or processing, and recycling) of hydropower components?
10. What other input should the federal government be aware of to support a resilient supply chain of this technology?

Area 7: Nuclear Energy Technology

1. What are the current and future supply chain vulnerabilities as we continue operation of existing commercial nuclear reactors and accelerate the deployment of new reactor technologies? Of these vulnerabilities, which are the most crucial for the U.S. to address and focus on and why?
2. Where in the supply chain does it make sense for the U.S. to focus and prioritize its efforts both in the short-term and long-term, and why? Where in the supply chain do you see opportunities for the U.S. to build domestic capabilities of nuclear energy technology manufacturing? What areas of the

[1] "Circular economy – is an industrial system that is restorative or regenerative by intention and design." Circular economy aims to reduce waste of resources by maximizing use, recovery, reuse, and recycling of products. *https://reports.weforum.org/toward-the-circular-economy-accelerating-the-scale-up-across-global-supply-chains/from-linear-to-circular-accelerating-a-proven-concept/*

supply chain should the U.S. not prioritize for attraction or expansion of domestic manufacturing capabilities, and why? For areas in the supply chain where opportunities to build domestic manufacturing capabilities are limited, which foreign countries or regions should the U.S. government prioritize for engagement to strengthen/build reliable partnerships, and what actions should the government take to help ensure resilience in these areas of the supply chain?

3. What challenges limit the U.S.'s ability to realize these opportunities to build the domestic nuclear energy technology supply chain? What conditions are needed to help incentivize companies involved in the nuclear energy technology supply chain to build and expand domestic manufacturing capabilities?
4. How can government help the private sector and communities involved in nuclear energy technology manufacturing build and expand domestic manufacturing? What investment and policy actions are needed to support onshoring the nuclear energy supply chain?
5. What specific skills are needed for the workforce to support the nuclear energy technology supply chain? Of those skills, which ones are lacking in current education/training programs? What resources (including time) and structures would be needed to train the nuclear energy technology workforce? What worker groups, secondary education facilities, and other stakeholders could be valuable partners in these training activities? What new education programs should be included (developed?) to prepare the workforce?
6. What other input should the federal government be aware of to support a resilient supply chain of this technology?

Area 8: Fuel Cells & Electrolyzers

1. What are the current and future supply chain vulnerabilities for fuel cells and electrolyzers? Of these vulnerabilities, which are the most crucial for the U.S. to address and focus on and why?
2. Where in the fuel cell and electrolyzer supply chain does it make sense for the U.S to focus and prioritize its efforts in the short-, medium-, and long-term and why? Where in the supply chain do you see opportunities for the U.S. to build domestic capabilities of fuel cell and electrolyzer manufacturing? What areas of the supply chain should the U.S. not prioritize for attraction or expansion of domestic manufacturing capabilities, and why? For areas in the supply chain where U.S. opportunities to build domestic manufacturing capabilities are limited, which foreign countries or regions should the U.S. government prioritize for engagement to strengthen/build reliable partnerships, and what actions should the government take to help ensure resilience in these areas of the supply chain?
3. What challenges limit the ability to expand domestic fuel cell and electrolyzer manufacturing capacity?
4. What conditions (economic drivers, policies, or investment) are needed to help incentivize companies involved in the fuel cell and electrolyzer supply chains to build and expand domestic manufacturing capabilities? What will be needed to double and eventually increase manufacturing capacity by an order of magnitude?
5. What conditions (economic drivers, policies, or investment) are needed to ensure the long-term health of domestic fuel cell and electrolyzer supply chains? What will be needed to prevent future issues in that supply chain?

6. How can the U.S. government help the fuel cell and electrolyzer industry build and expand domestic manufacturing capabilities? What economic drivers, investment, and policy actions will help accelerate domestic fuel cell and electrolyzer manufacturing?
7. What conditions (economic drivers, policies, or investment) are needed to increase recycling/re-use of critical materials and components for fuel cells and electrolyzers and minimize supply disruptions? How can the U.S. government facilitate the reduction of critical material requirements and increase recyclability at end-of-life for fuel cells and electrolyzers?
8. What specific skills are needed for the workforce to support the fuel cell and electrolyzer supply chain? Of those skills, which ones are lacking in current education/training programs? What resources (including time) and structures would be needed to train the fuel cell and electrolyzer technology workforce? What worker groups, secondary education facilities, and other stakeholders could be valuable partners in these training activities? What new education programs should be included (developed?) to prepare the workforce?
9. What other input should the federal government be aware of to support a resilient supply chain of this technology?

Area 9: Semiconductors

1. What is the current state of U.S. and global supply chains for both conventional semiconductors used in data and sensor applications related to the energy sector and wide bandgap semiconductors used for controlling power flow in power electronics applications? What are the current and future semiconductor supply chain vulnerabilities as we scale up our efforts to transform the energy sector

(energy supply, energy efficiency, demand technologies, grid, fuels, etc.) to support decarbonization? Of these vulnerabilities, which are the most crucial for the U.S. to address and focus on and why?

2. For both conventional and wide bandgap semiconductors used in the energy sector, where in the supply chain does it make sense for the U.S. to focus and prioritize its efforts both in the short-term and the long-term, and why? Where in the supply chain do you see opportunities for the U.S. to build domestic capabilities for semiconductors manufacturing? What areas of the supply chain should the U.S. not prioritize for attraction or expansion of domestic manufacturing capabilities, and why? For areas in the supply chain where U.S. opportunities to build domestic manufacturing capabilities are limited, which foreign countries or regions should the U.S. government prioritize for engagement to strengthen/build reliable partnerships, and what actions should the government take to help ensure resilience in these areas of the supply chain?
3. What challenges limit the U.S.'s ability to realize opportunities to build domestic semiconductor manufacturing? What conditions are needed to help incentivize companies involved in the semiconductor supply chains to build domestic manufacturing capabilities and scale up manufacturing? How do these challenges and conditions differ between conventional and wide bandgap semiconductors?
4. How can government help private sector and communities involved in semiconductor manufacturing build domestic manufacturing capabilities and scale up semiconductor manufacturing? What specific government policies or investments will be most important in supporting semiconductor manufacturing and supply chain resilience?

5. What are opportunities for improving energy efficiency in semiconductors? How can the government help the private sector achieve competitive advantages in domestic manufacturing of more energy efficient semiconductors?
6. What specific skills are needed for the workforce to support semiconductor manufacturing? Of those skills, which ones are lacking in current education/training programs? What resources (including time) and structures would be needed to train the semiconductor technology workforce? What worker groups, secondary education facilities, and other stakeholders could be valuable partners in these training activities? What new education programs should be included (developed?) to prepare the workforce?"
7. What other input should the federal government be aware of to support a resilient supply chain of this technology?

Area 10: Neodymium Magnets

1. What are the current and future supply chain vulnerabilities as we scale up our efforts to the transform the energy sector to support decarbonization (such as significant increases in demand for magnets in direct drive or hybrid wind turbines and traction motors for electric vehicles)? Of these vulnerabilities, which are the most crucial for the U.S. to address and focus on and why? Are there supply chain vulnerabilities associated with manufacturing equipment, and, if so, what are they?
2. Where in the supply chain does it make sense for the U.S. to focus and prioritize its efforts both in the short-term and long-term and why? Where in the supply chain do you see opportunities for the U.S. to build domestic capabilities for manufacturing neodymium magnets—with an emphasis on the manufacturing of sintered neodymium-iron-boron magnets used in electric vehicle traction motors

and wind turbine drives? What areas of the supply chain should the U.S. not prioritize for attraction or expansion of domestic manufacturing capabilities, and why? For areas in supply chain where U.S. opportunities to build domestic manufacturing capabilities are limited, which foreign countries or regions should the U.S. government prioritize for engagement to strengthen/build reliable partnerships, and what actions should the government take to help ensure resilience in these areas of the supply chain?

3. What challenges limit the U.S.'s ability to realize these opportunities to build domestic neodymium magnets manufacturing? What conditions are needed to help incentivize companies involved in the neodymium magnets supply chains to build and expand domestic manufacturing capabilities?
4. What factors are necessary to promote resiliency in different stages of the magnet supply chain for neodymium magnets, and how can the U.S. government incentivize these factors?
5. How can government help the private sector and communities involved in neodymium magnet manufacturing build and expand domestic manufacturing capabilities? What specific government policies or investments will be most important in supporting neodymium magnets manufacturing and supply chain resilience?
6. What specific skills are needed for the workforce to support magnet manufacturing? How long does it take to train this workforce? Of those skills, which ones are lacking in current education/training programs? What resources (including time) and structures would be needed to train the magnet technology workforce? What worker groups, secondary education facilities, and other stakeholders could be valuable partners in these training activities? What new education programs should be included (developed?) to prepare the workforce?

7. What happens to neodymium magnets when associated end products reach the end-of-life? What barriers, if any, exist in collection of magnets containing products for eventual recycling or recovery? How can the federal government most effectively support increasing circularity (collection, reuse or processing, and recycling) of neodymium magnets?
8. What other input should the federal government be aware of to support a resilient supply chain of this technology?

Area 11: Platinum Group Metals Catalysts

1. What are the current and future supply chain vulnerabilities of platinum group metals (PGM) catalysts as we scale up the adoption and use of industrial decarbonization technologies and energy storage technologies, including fuel cell, electrolyzer, and chemical manufacturing technologies?
2. Where in the PGM catalysts supply chain does it make sense for the U.S. to focus and prioritize its efforts both in short-term and long-term and why?
3. If the U.S. had domestic PGM separation capacity, to what extent would this improve the ability of domestic mines (or secondary producers) to be competitive? To what extent would this improve the ability of domestic catalyst producers to be more competitive?
4. How can government help private sector and communities scale up the production of PGM catalysts needed for manufacturing in the U.S.? What specific government policies or investments will be most important in supporting PGM catalysts manufacturing for industrial decarbonization technologies, energy storage applications, and supply chain resilience?
5. How do the compositions and manufacturing processes of PGM catalysts for fuel cells and electrolyzers differ from those of PGM catalysts used in catalytic converters? How difficult is it for catalyst manufacturing facilities to produce multiple types of catalysts?
6. What is the recovery and reuse potential of PGM used in catalytic converter, fuel cell, electrolyzer, and chemical manufacturing technologies? What technological challenges exist to recover PGM from catalysts and incorporate PGM into different applications of catalysts? What are the areas of opportunities for the U.S. to onshore the supply chain of PGM manufacturing for catalytic

applications, including catalytic converters, fuel cells, electrolyzer technologies, and chemical manufacturing?

7. What happens to PGM catalysts when fuel cells and electrolyzers reach the end-of-life? Are there any known barriers to recycling materials from electrolyzers and fuel cells at the end-of-life? How does recycling of PGM from electrolyzers and fuel cells differ from recycling PGM from catalytic converters? How can the federal government most effectively support increasing circularity (collection, reuse or processing, and recycling) of PGM catalysts?
8. What specific skills are needed for the workforce to support PGM catalyst manufacturing? Of those skills, which ones are lacking in current education/training programs? What resources (including time) and structures would be needed to train the PGM catalyst workforce? What worker groups, secondary education facilities, and other stakeholders could be valuable partners in these training activities? What new education programs should be included (developed?) to prepare the workforce?
9. What other input should the federal government be aware of to support a resilient supply chain of this technology?

Area 12: Carbon Capture, Conversion, Transport, and Storage Materials

1. Which materials do you consider critical for carbon capture, conversion, transport, and storage technologies? Will this change as the U.S. scales up deployment over the next 30 years? Are there substitutes for these materials, and can they be ready for large scale deployment in 10, 20 years? What policies or government actions can help incentivize domestic production of these critical materials as well as production of substitutes?

2. For carbon capture, what materials are needed for the commercial and emerging separation process and balance of plant? What is the current domestic and global capacity to manufacture these materials, and is growth reasonable to meet demand in the next 10 to 20 years?
3. For carbon conversion, what materials are necessary for the transformation of CO2 into other products? Are catalysts and reactants readily available in the market? Are there known barriers to the availability or scaling up for the market to provide the materials if adopted at scales necessary to decarbonize?
4. For transport, are there specific critical materials necessary for the coating and compressors for pipeline infrastructure systems? Are there supply chain issues related to obtaining these materials?
5. For carbon storage, what are the specific critical materials necessary for non-reactive cements and well bore casings necessary to meet the existing underground injection control regulations? Are there barriers to increasing supply and manufacturing capacity for rapid deployment of carbon capture and storage?
6. What are the current and future supply chain vulnerabilities as the U.S. scales up the adoption and use of the carbon capture and conversion technologies needed to transform the energy and manufacturing sectors to a low carbon future? Of these vulnerabilities, which are the most crucial for the U.S. to address and why?
7. Which carbon capture, conversion, transport, and storage materials should the government focus and prioritize its efforts on both in the short-term and the long-term, and why?
8. What specific skills are needed for the workforce to support production of carbon capture, conversion, transport, and storage materials or critical materials production in general? Of those skills, which ones are lacking in current education/training programs? What resources (including

time) and structures would be needed to train the carbon capture and utilization technology workforce? What worker groups, secondary education facilities, and other stakeholders could be valuable partners in these training activities? What new education programs should be included (developed?) to prepare the workforce?

9. What other input should the federal government be aware of to support a resilient supply chain of this technology?

Area 13: Cybersecurity and Digital Components

For purposes of this supply chain review, digital components in the energy sector industrial base include firmware, software, virtual platforms and service, data, and industrial control systems. Please include any comments on this scoping in your response.

1. How should the government approach hardening of digital component supply chains for the energy sector industrial base against physical and virtual tampering and national security threats? How should the federal government prioritize protection of digital component supply chains?
2. Cyber threats to the critical infrastructure, including an explosion in Ransomware attacks, is a growing national security concern that can be enabled through digital component supply chain vulnerabilities, and there are several national initiatives underway to counter this threat. Are there energy sector-specific considerations or priorities the government should consider to support hardening of digital component supply chains against cyber threats including the use of ransomware?

3. What steps should the government take to improve the trustworthiness of digital components in the energy sector industrial base and reduce reliance on untrusted software suppliers, integrators, and maintenance?

4. Global digital component supply chains are highly dynamic and complex. What policies should the government pursue to illuminate provenance of digital components in energy sector systems? For example, who developed software, or hosts digital platforms, or curated data sets, and in what country? Who maintains these digital assets (if anyone) and who may have continuing access for maintenance? How should the government approach prioritizing digital components and/or systems to illuminate or examine components to manage supply chain risk?

5. Providers of digital components may not have the same supply chain security requirements as asset owners in the energy sector. Given the interconnected nature and transitive risk among different digital components that comprise energy sector systems, how should the government address gaps and/or ensure consistency for supply chain security requirements for digital components?

6. An increasing trend in the energy sector is remote operation of systems. What policy steps should the government take to ensure the supply chain security of platforms and services used to operate critical functions in the energy sector?

7. Aggregated and curated data has become a valuable global commodity (e.g., data as a service) and is now a critical part of global digital supply chains. Data presents a cyber supply chain risk similar to that posed by software; specifically, malicious manipulation can cause significant and nearly impossible-to-detect system failures. With the increasing application of artificial

intelligence/machine learning capabilities to energy sector systems, what policy steps could the government take to manage the cyber supply chain risk of data?

8. How can the government encourage and/or incentivize private sector owners and operators of energy sector critical infrastructure to include more national security risk considerations in their business risk decisions?

9. What specific skills are needed to develop and increase the workforce to support building, operating, and maintaining secure digital components for the energy sector industrial base? For example, is there a skills gap and/or supply gap in the workforce that develops and maintains software for industrial control systems? Of those skills, which ones are lacking in current education/training programs? What resources (including time) and structures would be needed to train the cybersecurity workforce? What worker groups, secondary education facilities, and other stakeholders could be valuable partners in these training activities? What new education programs should be included (developed?) to prepare the workforce?

10. What other input the should the federal government be aware of to support a resilient supply chain of cybersecurity and digital components?

Area 14: Commercialization and Competitiveness

1. What data, methodologies, and metrics can help assess current and future competitive advantages for clean energy technologies?

2. What existing economic and market analysis do you rely on to assess current and projected technology market demand?

3. Where do you see opportunities for government actions to shift business-as-usual investment and market trends in a way that is supportive of resilient domestic supply chains?
4. For what clean technologies and applications does the U.S. currently have a competitive advantage over other countries?
5. For what clean technologies and applications is the U.S. significantly at a disadvantage over other countries? What moves are other governments making to increase their advantage over the U.S.?
6. Where might additional federal investment or policy support U.S. leadership in particular clean technology categories or sectors in the next ten years? What specific investment or policy action will be needed to support these technologies?
7. What frameworks can help assess the relative competitiveness and commercialization potential of various clean technologies?
8. What do you see as important nascent markets and technologies that may see significant growth in the next 10-15 years? What specific policies can help support U.S. leadership in these technologies and sectors?
9. Given the complexity of global supply chains, how do you assess the costs and benefits of various global supply chain patterns and dynamics, including concentrations of supply and demand?
10. How do U.S. trade policies impact the commercialization and competitiveness of clean technologies in the U.S.? Where might changes to trade policy positively impact U.S. competitiveness in clean tech sectors?
11. What new and innovative actions can the government take to encourage commercialization of U.S. innovation and increase U.S. competitiveness?

12. What non-economic and non-financial factors are most significant in determining U.S. competitiveness in a given clean technology sector?

Response Preparation and Transmittal Instructions

Submit all electronic public comments to this RFI to *www.regulations.gov/docket/DOE-HQ-2021-0020*. Click on the "Comment" icon, complete the required fields, and enter or attach your comments. If you are unable to submit online, you may submit by email to *supplychain@hq.doe.gov*. Responses must be received by 5:00pm on January 15, 2022, for immediate consideration. Only electronic responses will be accepted. Comments and documents submitted will be posted to *http://www.regulations.gov*.

Please identify your answers by responding to a specific question or topic, if applicable. Please clearly state the specific question to which you are responding. All assumptions, including any assumed government support, shall be clearly identified. All proprietary and restricted information shall be clearly marked. Respondents may answer as many or as few questions as they wish. DOE will not respond to individual submissions. A response to this RFI will not be viewed as a binding commitment to develop or pursue the project or ideas discussed.

Submitting comments via email. Please include in the subject line "RFI: Supply Chain Review."

Responses must be provided as attachments to an email.

It is recommended that attachments with file sizes exceeding 25MB be compressed (i.e., zipped) to ensure message delivery; however, no email shall exceed a total of 45MB, including all attachments. Responses must be provided as a Microsoft Word (.docx) or Portable Document Format (.pdf) attachment to the email, and no more than 10 pages in length, 12-point font, 1-inch margins. Please provide the following information in a cover letter:

- Community, organization, or company (if applicable)

- Contact name
- Contact's address, phone number, and e-mail address

If you do not want your personal contact information to be publicly viewable, do not include it in your comment or any accompanying documents. Instead, provide your contact information in a cover letter. The cover letter will not be publicly viewable as long as it does not include any comments.

Submitting comments via http://www.regulations.gov. The http://www.regulations.gov webpage requires you to provide your name and contact information. Your contact information will be viewable to DOE staff only. Your contact information will not be publicly viewable except for your first and last names, organization name (if any), and submitter representative name (if any). If your comment is not processed properly because of technical difficulties, DOE will use this information to contact you. If DOE cannot read your comment due to technical difficulties and cannot contact you for clarification, DOE may not be able to consider your comment.

However, your contact information will be publicly viewable if you include it in the comment or in any documents attached to your comment. Any information that you do not want to be publicly viewable should not be included in your comment, nor in any document attached to your comment. Persons viewing comments will see only first and last names, organization names, correspondence containing comments, and any documents submitted with the comments.

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claimed as CBI. Comments received through the website will waive any CBI claims for the information submitted. For information on submitting CBI, see the Confidential Business Information section.

DOE processes submissions made through http://www.regulations.gov before posting. Please keep the comment tracking number that http://www.regulations.gov provides after you have successfully uploaded your comment.

Disclaimer and Important Note

This RFI is not a Funding Opportunity Announcement (FOA), prize, or any other type of solicitation; therefore, DOE is not accepting applications at this time. DOE may issue a FOA or other solicitation in the future based on or related to the content and responses to this RFI; however, DOE may also elect not to issue a FOA or solicitation. There is no guarantee that a FOA or solicitation will be issued as a result of this RFI. Responding to this RFI does not provide any advantage or disadvantage to potential applicants if DOE chooses to issue a FOA regarding the subject matter. Final details, including the anticipated award size, quantity, and timing of DOE funded awards, will be subject to Congressional appropriations and direction.

Any information obtained as a result of this RFI is intended to be used by the Government on a non-attribution basis for planning and strategy development. This RFI does not constitute a formal solicitation for proposals or abstracts. Your response to this notice will be treated as information only. DOE will review and consider all responses in its formulation of program strategies for the identified materials of interest that are the subject of this request. DOE will not provide reimbursement for costs incurred in responding to this RFI. Respondents are advised that DOE is under no obligation to

acknowledge receipt of the information received or provide feedback to respondents with respect to any information submitted under this RFI. Responses to this RFI do not bind DOE to any further actions related to this topic.

Confidential Business Information: Pursuant to 10 CFR 1004.11, any person submitting information that he or she believes to be confidential and exempt by law from public disclosure should submit via email two well-marked copies: one copy of the document marked "confidential" including all the information believed to be confidential, and one copy of the document marked "non-confidential" with the information believed to be confidential deleted. Submit these documents via email. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

It is DOE's policy that all comments may be included in the public docket, without change and as received, including any personal information provided in the comments (except information deemed to be exempt from public disclosure).

Signing Authority

This document of the Department of Energy was signed on [11/18/2021], by Carla Frisch, Acting Executive Director and Principal Deputy Director, Office of Policy, pursuant to delegated authority from the Secretary of Energy. That document with the original signature and date is maintained by DOE. For administrative purposes only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE Federal Register Liaison Officer has been authorized to sign and submit the document in electronic format for publication, as an official document of the Department of Energy. This administrative process in no way alters the legal effect of this document upon publication in the *Federal Register*.