ARTICLE

Net-zero innovation hubs: 3 priorities to drive America's clean energy future

Series: Reimagining Modern Industrial Policy for America and Regulatory

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Net-zero US innovation hubs could help America's industrial sector cut emissions while creating new jobs and boosting competitiveness. This report lays out three priorities for building these hubs: prioritize industrial decarbonization, leverage existing assets, and mobilize private investment. It also highlights how these hubs can support broader economic and national security goals, including job creation, supply chain resilience, and global competitiveness.

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These challenges are coming against the backdrop of the rapid and transformative unfolding in the energy sandwiches and steel plant decarbonization, and policymakers are rather investment in oil and gas. In order to successfully develop a clean energy workforce, new standards and practices are needed to retrain workers from the old energy economy into the new one.

Incubators of innovation that are properly structured and set up for success can overcome these barriers to deep decarbonization and be a real game-changer in the fight against climate change.

To this end, the Department of Energy (DOE) could begin by announcing a competition for cities to submit bids to become home to these innovation hubs. The winning cities would receive a share of a $5 billion pot of funding using funds from the recent infrastructure bill. This would include helping public-private partnerships to raise capital in return for access to national laboratories for conducting experiments and demonstrations, sponsoring fellowships and ideas to attract top talent from around the world, and offering technical assistance and purchase agreements to support commercialization.

HEAVY LIFTING FROM HEAVY INDUSTRIES

The industry sector produces the building blocks of modern life—like cement, steel, iron, and chemicals—that also accounts for nearly 25% of US greenhouse gas emissions. Decarbonizing these hard-to-abate industrial subsectors is the critical climate mission. Because of the extremely high temperatures and chemical processes required to create heavy industry products, fossil fuels are an integral, and often unavoidable, part of their creation.

As explained above, demand is only expected to increase for these materials as economies around the world industrialize and modernize. Paradoxically, the reading out of the green economy will also contribute to issue as wind turbines, electric vehicle parts, and carbon capture equipment will require a substantial amount of steel and cement, among other industrial products. As a result, industry-related emissions are on pace to double by 2050 if no action is taken, according to the IEA. Fortunately, Brookings, Rhodium, the U.S. Industrial Initiative, and the U.S. Industrial Decarbonization Agenda in May 2021 to push forward new solutions.

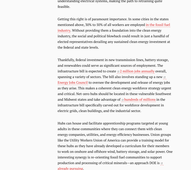
A heavy industry net-zero hub should focus on decarbonizing hard-to-abate sectors, and the most promising sectors to date may be carbon capture, utilization, and storage (CCUS) to remove CO2 from the exhaust stream and pump it underground. Carbon capture is a key tool in the climate toolbox, and commercial CCUS projects already exist. The Inflation Reduction Act of 2022 (IRA) ensures that this technology will be responsible for nearly 20% of emissions reductions in the industrial sector. Over time, however, is net-zero hub could advance for CCUS to include bonding technology, which uses CO2 to make building materials, such as concrete. Cement is the most produced from cement clinker and steel to improve CO2 capture efficiency.

ON THE ROCKS: ADDRESSING THE SCARCITY OF CRITICAL MINERALS

A crucial area zooming focused innovation is critical minerals. The whole world is undergoing a clean energy transition at the same time and the building blocks for these technologies—like copper, lithium, nickel, cobalt and rare earth elements (REE)—are already strong actionsand demand, supply, supply prices have been 2021 during the pandemic.

As of today, the U.S. imports 51 of the 35 critical minerals and two or domestic production of the 1 list of these. There is only operating lithium mine in the country. To address this, a critical minerals hub should focus on increasing domestic production, diversifying international supply chains to supply chains and environmental vulnerabilities, open mines to increase domestic sources of REEs, and improve the technology for mineral recycling and recovery. Without this kind of innovation, the clean transition will be the worry of unpredictable price volatility, supply chain disruptions, and increased geopolitical tensions. Critical minerals are a crucial concern in most of the minerals.

Take, for example, wind power and electric vehicles. They are both highly dependent on neodymium, a rare earth element without which they could not manufacture the magnets needed to operate the motors. Nearly all of this mineral is mined and processed in China, which uses a Department of exports of rare earth and other REEs to Japan over a trade dispute.



Source: IEA (2021). « The Role of Critical Minerals in Clean Energy Transitions. Add on functionality, drawing a clean energy hub.

What would we do if this happened again over a different political or trade disagreement? Wind turbines are ill-equipped to switch to non-magnet or solid-plastic configurations. Production of electric vehicles would pose permanent magnet synchronous motors (PMSM) and electric motors to be halted and switch to switching reluctance, induction motors.

Towards this end, the hub can leverage the infrastructure bill's $7 billion investment in batteries and critical minerals to create science centers in Wyoming, Texas, and California, where REEs like neodymium, dysprosium, and terbium are found, as a leading alternative motor design to avoid using these minerals at all.

A more straightforward path could be developing better recycling of these minerals from electronic waste or enhanced recovery from mining sites. Recycling and recovery are critical to ensure we have a sustainable supply of these minerals at all.

It's estimates that meeting the commitments of the Paris Climate Agreement would require a quadrupling of mineral requirements for clean energy technologies by 2040. A net-zero hub tasked with finding innovative solutions to critical minerals can be a powerful ally in achieving this goal.

MAKING IT HAPPEN: ENSURING THE CLEAN ENERGY WORKFORCE

Even if we are able to find technical solutions for hard to abate sectors and secure the raw materials needed for green technologies, bringing the clean energy workforce of the future into the fold will be critical. The IEA has been imagined that addition to generate 100% of electricity by 2050 or earlier. Achieving this will require unprecedented investment in workforce development. We propose a third priority area to the clean energy workforce of the future.

Luckily, a skilled, energy-savvy workforce exists in the fossil fuel sector today. Nearly 1 million workers in the oil and gas industry, mostly in Texas, Oklahoma, Louisiana, West Virginia, Pennsylvania, Wyoming, Kentucky, Montana, and Montana. Given the geography and topography of these states, there is actually a lot of potential for clean energy. Areas where fuel jobs are now and where renewable energy generation could be happening