I-WEST

Intermountain West Energy Sustainability & Transitions

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Executive Summary

Funded by the U.S. Department of Energy (DOE), the Intermountain West Energy Sustainability & Transitions (I-WEST) project is focused on delivering a regionally relevant technology roadmap to transition six U.S. Intermountain West states to a carbon neutral energy economy. I-WEST encompasses Arizona, Colorado, Montana, New Mexico, Utah, and Wyoming—six states with significant existing fossil-based economies that are already being impacted by transition to carbon neutrality. The project is taking a place-based approach, which prioritizes the geographical attributes, economic landscape, and societal readiness of the region so that the resulting technology roadmap reflects pathways that are regionally relevant and can be put on an accelerated timeline to deployment. This place-based approach involves 1) translating national decarbonization goals into regional goals; 2) engaging with local communities to understand state-level energy needs, goals, and expectations; and 3) facilitating the formation of regional coalitions to deploy and implement the I-WEST technology roadmap. The primary technology pathways under consideration include: the capture, utilization, and storage of carbon dioxide (CCUS); the generation and utilization of carbon-neutral hydrogen; the production of sustainable, carbon neutral fuels and feedstocks; and the production of sustainable power. The I-WEST technology roadmap will be based on an assessment of various technology options within these pathways, as well as realistic timelines for their deployment. Additionally, the effort will consider other critical factors that will be needed for an effective and sustainable regional energy strategy, including implications for workforce, regional economies, and environmental and social justice. The assessment will target a timeline of 15 years, identifying options that could deploy early to achieve goals at five years and options that have the potential to deploy later with additional R&D, allowing more aggressive goals at 10 and 15 years.

The following are major accomplishments from FY22-Q1:

- We have completed a collection of information on regional attributes, including regional geography, demographics, geology, energy resources and economy, existing infrastructure, and climate. We have prepared an initial summary of the regional attributes utilizing this information. We have begun integrating this summary with the information collected during the first quarter and are in the process of converting the combined information into Chapter 2 of the final report focused on providing the regional context that will be taken into consideration for developing the technology deployment roadmap.
- We have compiled an analysis of existing regional energy economies. The main takeaways are as follows:
  - The contribution of energy-related industry to the regional GDP decreased from 2010 to 2020 for all six I-WEST states, with the largest decline in Wyoming.
  - Natural resource and mining jobs, coupled with mining including fossil fuels, contribute almost 14% of all jobs in Wyoming and 6.5% of all jobs in New Mexico. In Arizona, Colorado, Montana and Utah, the numbers are 1.7%, 2.4%, 4.1% and 1.6%, respectively.
  - The contributions of energy revenues to state revenues vary across the I-WEST states due to a combination of differences in energy production and differences in state tax policies. Wyoming is on the high end with 60% of state revenue coming from energy, while Colorado is on the low end where energy revenues make up less than 5% of state revenue.
- We have compiled an extensive list of existing policies relevant to energy and energy transition, including federal, state, as well as tribal government policies. We have identified policies applicable to major energy-related sectors, including cross cutting, transportation, electricity, industrial, fossil fuels, pipelines, agriculture, and R&D. Within each of these sectors, policies specific to CO_2, CCUS, H_2,

biofuels, solar, wind, oil, and gas were assessed relative to the transition towards a low CO_2 energy economy.

- We have compiled an initial draft of the final report chapter on existing energy workforce and future workforce needs. The draft is included as part of this quarterly report.
- We organized six topical workshops, focused on CO_2 Capture from Point Sources, CO_2 Storage & Utilization, H_2 Production, H_2 Utilization, Direct Air Capture, and Bioeconomy. Combined, the workshops were attended by ~200 stakeholders (from 100 different organizations) who are engaged in developing and deploying various decarbonization technologies in the region. The two primary outcomes of these workshops were gathering of information relevant to technical assessment and facilitating the formation of regional coalitions. Some of the important workshop learnings include:
    - The regional stakeholders recognize that there will be trade-offs between different technologies during the transition to a net-zero carbon energy economy and a regional, grassroots carbon-neutral strategy is the best approach for the long-term economic viability of the region. They also believe that the primary barriers to widespread deployment of a carbon-neutral economy in the region are not technology based but rather tie to a lack of long-term commitment by the government (e.g., establishing supporting policy and regulations and by developing supporting infrastructure).
    - There are multiple projects under development in the region deploying various technologies associated with the pathways mentioned above, including multiple CO_2 capture projects with an anticipated cumulative capture target of 12 million tons of CO_2 over the next 5 years, multiple H_2 production projects utilizing all commercial pathways (green, blue and gray) with combined production of 500 kt/yr over next 5-10 years, and several small- to medium-scale projects focused on conversion of different regional feedstocks into renewable bioenergy. (For reference, the regional CO_2 emissions are ~390 Mt/yr.)
    - Carbon capture and sequestration (CCS) will be critical to reduce the carbon intensity of natural gas derived H_2. Most project stakeholders expressed comfort with the technology readiness of capture but were concerned about demonstrating secure storage sufficient to accommodate their projects' needs; the concerns tied mainly to a clear, streamlined permitting process and the need for additional site-specific assessments within the region. Water scarcity in the I-WEST region is a concern for large scale H_2 production. Also, H_2 deployment at large scale will require significant capital investment, including for developing transportation and storage infrastructure.
    - Meeting med-term goals of CO_2 emissions reduction through CCS will require massive regional industrial infrastructure deployment and will need significant raw materials and specialty capture technology materials, as well as craft and specialized technical workforce. The biggest challenge for large-scale deployment of Direct Air Capture (combined with geologic sequestration or utilization) is lowering the costs from $500/ton to less than $100/ton but currently there is no guarantee that this can be achieved in the next 20 years.
    - Extension of the current 45Q, including its applicability to blue H_2 projects, would help to accelerate regional deployment of CCS, as well as blue H_2 technologies.
    - Promotion of a distributed model of smaller scale technologies, empowering local communities, and deploying projects that engage local communities can all help to accelerate deployment.
    - Providing technical assistance to communities affected by closures of coal-fired power plants is crucial, especially those located on tribal lands.
- We have initiated technical assessment of different technology pathways. Some key preliminary results include:
    - Projections of electricity generation mix in the region show a sharp increase in the use of renewable sources in the near future but their overall contributions will plateau after the next 10 years.

- There will be increased reliance on natural gas for electricity generation. The projected regional CO_2 emissions resulting from electricity will only be reduced by ~27% from current levels due to expected increase in natural gas usage.
- There is potential to deploy CCS technologies in the near future by addressing sources with lower capture costs, which could account for ~80% of regional point source emissions.

- The final major outcome from this quarter was the launch of a permanent I-WEST website. This enhanced, more robust version of the website has enabled the I-WEST team to actively engage key stakeholders by providing regular updates in the form of blog posts, project catalog updates, and content related to the final I-WEST report.

If you would like to receive a copy of this report in its entirety, please send an email request to iwest@lanl.gov