

**Summary Minutes of the
U.S. Department of Energy (DOE)
Secretary of Energy Advisory Board (SEAB)
Public Meeting**

Advisory Board Members:

In attendance: Arun Majumdar (Chair), Trenton Allen, Norman Bay, John Dabiri, Kerry Duggan, Bryan Garcia, Phil Giudice, Paula Gold-Williams, Shirley Ann Jackson, Maria Pope, Adrianna Quintero, and Michael Skelly.

Date and Time: October 25, 2022, 9:00 a.m.- 2:00 p.m. EDT
Location: Oak Ridge National Laboratory (ORNL)
Purpose: Secretary of Energy Advisory Board (SEAB) Meeting
SEAB Staff: Karen Skelton, Senior Advisor to the Secretary; David Borak, Designated Federal Officer (DFO) and Acting Director of the Office of Secretarial Boards and Councils.

Meeting summary

This is the fifth SEAB convened under Secretary of Energy Jennifer M. Granholm. The meeting was physically conducted at ORNL and virtually via Zoom. The meeting was called to order by Mr. Borak at approximately 9:02 a.m. EDT. The meeting was attended by Secretary Granholm (virtually), members of her staff, 12 SEAB members, members of the public and the press. The purpose of the meeting was to discuss grid resiliency and the maturity of various grid-scale storage technologies.

Public Meeting

DFO David Borak Mr. Borak opened the meeting by addressing housekeeping and logistical items attendant to the meeting. He proceeded by thanking Dr. Thomas Zacharia, Laboratory Director of ORNL, welcoming the SEAB members, thanking Karen Skelton and other DOE staff members, and members of the SEAB for their attendance. Mr. Borak took roll call to ascertain a quorum of attendees for the record (12 members responded). Upon completion of roll call, he introduced Dr. Arun Majumdar, the SEAB Chair, for meeting direction.

SEAB Chair Dr. Arun Majumdar Chair Majumdar thanked Mr. Borak and welcomed the attendees to the SEAB, noting that this was the fifth SEAB meeting during Secretary Granholm's tenure. He thanked everyone at ORNL for their help in hosting the meeting. Chair Majumdar noted that this was a transformational time for the laboratory system and for DOE. He spoke of how money from the Inflation Reduction Act (IRA) would provide money for modernization and update of the national laboratories. Chair Majumdar stressed that the role of SEAB was to assist the Secretary in the execution of her transformational vision, and that the agenda would pick up where SEAB had left off at the conclusion of the last SEAB meeting at Argonne National Lab. The Chair remarked that the SEAB would continue talking about the work of the Grid team, and

that as with all SEABs, there would be a public comment period prior to the conclusion of the meeting. He then introduced Dr. Thomas Zacharia, Laboratory Director, ORNL for comments.

Director of Oak Ridge National Laboratory Dr. Thomas Zacharia Dr. Zacharia began his remarks by commenting on how proud he was to be a member of the Laboratory, and how looking ahead to the next decade he saw great opportunities for ORNL. Dr. Zacharia noted that he had announced his retirement within the next year and did so with mixed emotions, recounting briefly, his time at Oak Ridge. He again thanked everyone for all of their efforts in supporting him and ORNL.

Dr. Majumdar then opened the floor to questions for Dr. Zacharia by the various SEAB members. Upon the conclusion of questions from the SEAB, Dr. Majumdar introduced the Secretary of Energy, Jennifer Granholm for her remarks.

Secretary of Energy Jennifer Granholm Secretary Granholm remarked that she had been called back to Washington but was happy she could be with SEAB virtually. She thanked Dr. Zacharia for his long service, Mr. Borak for accepting the position of DFO for the SEAB, and Karen Skelton for her leadership on SEAB. Further, Ms. Granholm remarked that a former SEAB member, Priscilla Almodóvar had left the board to become the new CEO of Fannie Mae.

The Secretary reflected on a previous comment concerning “this moment” and serving the nation at this moment. She very briefly outlined what the President had done to bring the U.S. research and technology efforts back to the forefront, remarking “promises made-promises kept.” The Secretary noted that she felt the tide had shifted with respect to accelerated deployments and research regarding clean energy. Ms. Granholm noted that as of today the DOE team had 553, days left in this administration. She further noted feeling an enormous sense for deploy, deploy, deploy subsequent to demonstration, and that the Department would be executing on this effort. She referred to the Bipartisan Infrastructure Law (BIL) as the backbone of the trilogy of recent laws affecting the Department. The other two laws include the CHIPS and Science Act which she referred to as the “brains” of the trilogy that authorizes \$50 billion for DOE Office of Science, and the Inflation Reductions Act (IRA), which would provide another \$1.5 billion for Science.

The Secretary noted however that the biggest game changer in the IRA is what it would do for climate action. The IRA will let companies have the certainty to move forward and lower the cost of energy to low-income Americans. She commented that now the real work of implementation of the clean energy agenda could begin, and that, in fact, at DOE they were referring to it as “the season of implementation.”

The Secretary further pointed to the first tranche of money, some \$2.8 billion that left DOE in mid-October and was destined for battery research. As a separate matter, she wanted to ensure that every American was aware of the available tax credits, how to get them, how to use them, and how to save money. She underscored the intent of getting private sector money off of the sidelines and actively involved in the research of clean energy technology. She stressed that through all of the ongoing activity she wanted to be sure to get both the SEAB and the public’s feedback. She highlighted the number of Requests for Information that were being issued by the

Department to get the important feedback in order to properly shape the award of monies from the BIL.

She concluded her remarks by again thanking the SEAB for their engagement and counsel and opened the floor for questions from the SEAB.

Dr. Majumdar asked the Secretary if she would touch on the role of DOE on the international front. She responded by mentioning the geopolitical realignment around energy as the result of the Ukrainian conflict. As well, the Secretary explained briefly about the DOE Foundation and discussed NetZero World. This is an effort on the part of DOE to use the national laboratories to partner with countries that have net zero goals but do not have the technology to implement their visions.

Bryan Garcia asked the Secretary if she would speak a bit about Puerto Rico in the aftermath of Hurricane Fiona. The Secretary stated that there was a lot of work to do to meet Puerto Rico's goal of 100% clean energy, particularly in the wake of Hurricane Fiona. Having visited Puerto Rico the week before SEAB, she articulated the need to get money moving to the island, and that we wanted to promote distributed systems and micro grids on the island.

Maria Pope asked the Secretary to comment on her concerns regarding energy supplies in light of the onset of winter weather. The Secretary briefly commented on the historic bottlenecks associated with getting energy to the Northeast U.S. due to aged pipelines, referendums, and infrastructure. She also touched on permitting reforms to speed construction of new projects on public lands to facilitate the movement of energy throughout the country.

Chair Majumdar commented again on how big the current moment in history is as efforts are made to transform the energy infrastructure, noting that the current model has been around for about 120 years. He asked the Secretary to comment on the magnitude of the change we are embarking on as it related to where the American people are today. Secretary Granholm commented on how critical it is to get the messaging right for the American people – having American energy independent from those nations that do not share our ideals. She mentioned that problem that we have with not manufacturing transformers in the U.S. and highlighted that we needed to construct the “soup-to-nuts” supply chain relative to clean energy. She likewise noted that free trade is not free trade if it is not fair trade. She again highlighted the importance of “made in America.”

Shirley Ann Jackson thanked the Secretary for her leadership and focus. She asked how much the very supply chain issues would intersect in a way that would slow our progress, and having been a university president, how did the Secretary view DOE's role in talent development. Dr. Jackson clarified that she was interested not so much in the bachelor or masters level, but in the broader population. The Secretary responded with the notion that there would be a lag in pulling in the supply chain vis-à-vis critical minerals and mining relative to the supply chain. She noted that manufacturing should be incentivized by the IRA to re-shore their supply chains. With respect to talent, the Secretary spoke of how critically important the right talent is to the clean energy effort. She noted that about 75% of the jobs required in that sector did not require a four-year degree. She noted that the apprenticeship programs by the International Brotherhood of

Electrical Workers and others is vital to the effort of creating streams of talent to flow into the right areas of the country in support of the clean energy effort.

Adriana Quintero asked the Secretary to share her thoughts relative to how we build support among the public for things that seem less evident and less “kitchen-table” like the grid modernization and hydrogen, while recognizing the needs of disadvantaged communities. The Secretary noted that this is a priority for the Department. That is that the buildout of hubs and transmission lines are done in partnership with the environmental justice community, at the table. She noted that the BIL rewards the placement of clean energy manufacturing with an additional 10% if it is located within a disadvantaged community. She noted that this would be more of a challenge with things like hydrogen hubs and CO2 capture, and that we would not be funding leaky hubs. She noted how important community involvement and embracing the communities is for the success of the clean energy buildout effort.

Chair Majumdar thanked the Secretary for her time and involvement, and the opportunity to ask questions. He outlined the exiting agenda ahead. Chair Majumdar announced that he had just learned that Ash Carter, former U.S. Secretary of Defense and a former SEAB member, had passed away and offered a moment of silence. He then introduced Elliott Mainzer, the CEO of the California Independent Systems Operators; Maria Pope, CEO of Portland General Electric; and Christopher Davis, DOE Chief of Staff, to discuss grid resilience and reliability during the Western heat wave.

Elliott Mainzer thanked everyone and moved into discussing lessons learned through the 2022 Western heat wave. He highlighted the extraordinary heat wave culminating on September 6, 2022 that caused an Independent System Operator (ISO) all-time high usage of 52,061 MW while the Western interconnect set a record at 167,500 MW. His presentation demonstrated that as the solar ramp down occurred, other electricity delivery resources kicked in. He highlighted the declaration of the energy emergency for the state, and how the Governor triggered a wireless emergency alert (WEA) which led to a significant decrease in demand. Mr. Mainzer noted that California had the largest fleet of lithium-ion (Li-ion) batteries.

Maria Pope noted that Portland General is driven by customer goals and on where they want to go, noting that 15% of the country’s silicon chip manufacturing takes place within Portland General’s service area. She spoke about how the Western power pool resource adequacy program has become much more than just the northwest but encompassing much of the country. She spoke of DOE’s critical role in protecting electric infrastructure and in advancing to clean energy transition.

Christopher Davis spoke of the DOE programs aimed at bolstering grid resilience, noting that the U.S. is primarily a private sector system. He further discussed the DOE toolbox for grid reliability, the DOE emergency powers through the Federal Powers Act which are utilized to preserve grid reliability, and finally the historic funding opportunities in the BIL and IRA.

Upon completion of Mr. Davis’ comments, the floor was opened to SEAB member questions.

Norman Bay thanked all three presenters. His question to Mr. Mainzer concerned the top three priorities from a Cal ISO perspective, that Mr. Maizner would address to policymakers that would help restore reliability during extreme weather events. Mr. Maizner responded that the three areas he would stress are the demand response, resource adequacy to ensure construction of new clean resource capacity, and the third would be the transmission space.

Mr. Bay asked the same question to Ms. Pope, to which Ms. Pope echoed Mr. Maizner's answers. She also highlighted that the ability of the industry to work together is critical.

Michael Skelly was interested in understanding the general perspective in the West with respect to resource adequacy.

Phil Giudice wondered if the battery sources of electricity suffered economic harm by being held off by Cal ISO during the heat emergency, wanted to understand if there was a process to reimburse them for any loss, and if there would ever be a scenario where Cal ISO would tell the battery operators when to charge and when to discharge vis-à-vis price signals. Finally, he wondered what DOE could do to facilitate the Western interconnect.

Bryan Garcia was interested in the balancing of the entire grid to get it to a baseline configuration so as to facilitate modernization.

Chair Majumdar closed out this section of the agenda by asking the Secretary to offer her comments. The Secretary complimented Mr. Maizner on his efforts to hold the Western interconnect endeavor all together. She noted that she was looking forward to the next session of the agenda. The SEAB then paused for a break.

The next part of the agenda featured the topic of long duration storage and had four presentations by four noted researchers in the area.

Paul Alburdis from the University of Maryland presented on stationary electricity storage, daily and beyond. His presentation touched on the various quantities of terawatt-hour (TWh) encompassed by battery, solar plus thermal, pumped storage hydro, and natural gas media.

Yet-Ming Chiang from MIT presented on long duration energy storage, noting the number of TWh needed to fill a decarbonized electric grid worldwide. He also discussed Li-ion, short duration redox, metal-air batteries, long duration redox batteries, and mechanical energy storage.

Yi Chi from Stanford discussed grid-scale energy storage using metal hydrogen batteries, and scaling challenges associated with metal hydrogen batteries.

Asegun Henry from MIT presented on thermal energy storage. He began by explaining the difference between potential and kinetic energy and the relationship to sensible heat.

The SEAB recessed for lunch and following lunch, began the agenda with questions to the presenters relative to the presentations prior to lunch.

Secretary Granholm asked Dr. Alburtis what technologies related to grid-scale storage he thought DOE should focus on. Dr. Alburtis responded that so many technologies can work with the grid. He would not pick a “technology winner” but stated that there has never been a new stationary storage technology specifically for grid that has ever been deployed at large scale. **Dr. Majumdar** wondered if there could be simultaneous technology road map development among grid technologies. Various members of the SEAB asked questions of the presenters on energy technology, energy storage, and the decarbonization of the grid. Asegun Henry noted that the technology that wins does not really matter as the scalability of the problem is extremely large and expensive. Chair Majumdar asked the presenters to articulate where the competing technologies would be vis-à-vis decarbonization of the grid in 2026, 2027, and 2030. All of the presenters were reluctant to prognosticate.

Secretary Granholm closed the discussion by the encouraging note that there were a variety of technologies available that could get us to the point of decarbonization but that we just had not had the grid scale multi-gigawatt deployment yet. She voiced her optimism about the ability to achieve the decarbonization goal by 2035 and thanked each of the presenters for their involvement in the research and the discussion.

Chair Majumdar passed the agenda to Mr. Borak for the public comment section of the SEAB meeting. Mr. Borak noted that there were four members of the public to address the SEAB at the meeting. They were Lawrence Goldenhersh, Tommy Waller, Glen Rhodes, and Daniel Bardin.

Mr. Goldenhersh is the President of the Center for Sustainable Energy. He opened his remarks by commenting that the mission of his organization is decarbonization and noted that the Center had over 200 employees working across 24 states, with an annual revenue of \$200 million. He explained the Center’s current portfolio of programs around clean transportation and articulated the data collection efforts that the Center had undertaken to keep the public informed of the programs’ progress and to provide data for decision makers relative to the California electric vehicle (EV) clean energy program. He noted how the data collected would be used to extrapolate the California experience relative to EV to a national level.

Mr. Waller is from the Center for Security Analysis. He proceeded to share the Center’s support for all of the Secretary’s initiatives and moved into a discussion of the damage caused by ground effect currents on transformers in the system, with a monetized annual value of about \$10 billion. Mr. Waller underscored that the Center is a non-profit and does not take any government money.

Mr. Rhodes is from the EMP Task Force on National and Homeland Security. He highlighted a number of looming threats to the national power grid. He further presented four actions to help promote and secure the nation’s energy future and requested the Secretary of Energy’s assistance with all four efforts.

Mr. Bardin described and articulated a process called scrimmaging relative to the security side of energy. He briefly described some specific threats and vulnerabilities, and recommended the Secretary choose an area where the country may be under protected as the topic for the scrimmage.

Mr. Borak thanked the members of the public for their comments and passed the agenda back to Dr. Majumdar for closing thoughts.

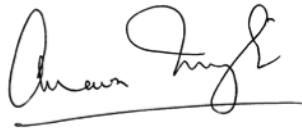
Dr. Majumdar ended the meeting by thanking the public for their comments and input and passed the agenda to Secretary Granholm for her final comments.

Meeting Adjourned

Meeting adjourned at approximately 2:30 pm EDT.

Respectfully Submitted:
David Borak
Designated Federal Officer

I hereby certify that these meeting minutes of the October 25, 2022, SEAB meeting are true and correct to the best of my knowledge.

A handwritten signature in black ink, appearing to read "Arun Majumdar", written over a horizontal line.

Dr. Arun Majumdar
Chair, Secretary of Energy Advisory Board