In the final weeks racing toward August, Congress is having one of the busiest summers it has had in several years. The House Appropriations Committee is expected to finish mark ups of the remaining appropriations bills next week and the Senate plans to advance four appropriations bills before the August recess. The Senate also plans to vote on a bipartisan infrastructure package. However, Congress is also focused on several other pending priorities that are putting constraints on the process. Both chambers are expected to debate and vote on the fiscal year (FY) 2022 budget resolution using reconciliation instructions that would also lay out a path forward for a larger infrastructure package that would include Democratic priorities.

The University of Minnesota Washington Update provides intelligence and analysis on recent federal activities. Faculty visiting Washington, D.C. are encouraged to contact Sarah Neimeyer, Director of Government Relations, at neimeyer@umn.edu. Contact Christina Laridaen, Lewis-Burke Associates LLC, at christina@lewis-burke.com with any questions or comments related to the Update’s content.

### Congressional and Administration Updates

#### Appropriations Update: House Appropriations Committee Approves FY 2022 Interior and Environment Funding Bill

On July 1, the U.S. House of Representatives Appropriations Committee voted 32-24 to approve the fiscal year (FY) 2022 Interior, Environment, and Related Agencies (Interior-Environment) Appropriations bill which would provide increased funding for the Environmental Protection Agency (EPA), U.S. Geological Survey (USGS), and National Endowments for the Arts (NEA) and Humanities (NEH), among other agencies. The overall House Interior-Environment bill totals $43.4 billion, an increase of $7.3 billion or 20 percent over the FY 2021 level, per the Appropriations Committee press release. Unlike last year’s bill, which called for modest increases to USGS, EPA, NEA, and NEH reflecting the more constrained budget environment that characterized the FY 2021 appropriations process, the FY 2022 spending measure proposes dramatic growth for these four agencies. Compared to the FY 2021 enacted levels, the bill would boost USGS funding by $327 million or 24.9 percent, EPA funding by $2.1 billion or 22.8 percent, and NEH and NEA by $33.5 million or 20 percent each. The House topline funding for these agencies would either accept the increases proposed by the Biden Administration or provide higher increases.

House climate change and environmental justice priorities are reflected in the bill’s USGS and EPA funding, however the House did not embrace the Biden Administration’s request for funding a new Advanced Research Projects Agency – Climate (ARPA-C). The budget request proposed this new initiative be funded at $500 million in total from several environment-related federal agencies and hosted at the Department of Energy (DOE). In the Interior-Environment bill, the House would fund half of the President’s $60 million request for ARPA-C funding at USGS and would reject the President’s request for ARPA-C funding at EPA. The House
Agriculture Appropriations bill also rejected the President’s request for ARPA-C funding at the U.S. Department of Agriculture citing a lack of detail in the budget request. The House’s approach to funding or rejecting ARPA-C investments at other agencies including the DOE is not known until those bill reports are released.

Interior-Environment Appropriations Subcommittee Chair Chellie Pingree (D-ME) noted in her opening statement at the Committee markup that the House bill invests in key areas such as protection of the environment and biodiversity, Biden Administration climate change efforts including the Civilian Climate Corps, science to be used for decision-making, wildland fire management and resilience efforts, and renewable energy development, among other areas. Ranking Member David Joyce (R-OH) thanked Chair Pingree for bipartisan portions of the bill but led Republican opposition to the legislation due to objections over policy riders unrelated to education and research and the amount of total funding. The next step for this bill is a vote on the House floor, likely to take place later in July. The Senate has not yet released its version of the Interior-Environment Appropriations bill for FY 2022.

U.S. Geological Survey

The House bill would provide the U.S. Geological Survey (USGS) with $1.64 billion, which is $326.9 million, or 24.9 percent above the FY 2021 level, and flat compared to the President’s FY 2022 budget request. USGS mission areas would see increases across the board including a 61 percent increase for Energy and Mineral Resources and a 37 percent increase to Ecosystems. $30 million would be provided for “assessment of biodiversity collaborative climate adaptation and resilience research (ARPA–C),” which would be half of what the Administration requested as the USGS contribution to President Biden’s proposed new ARPA-C initiative.

The Committee would fund the Natural Hazards account at $207.7 million, 18.4 percent above the current enacted level and equal to the budget request. The ShakeAlert earthquake early warning (EEW) program would receive $28.6 million, an increase of $2.9 million over both the FY 2021 enacted level and the President’s request. The Committee would fund “deferred maintenance and modernization for the Advanced National Seismic System, Regional Seismic Network Support, and the Seismic Network” at no less than the FY 2021 enacted level. The House bill would essentially provide flat funding of $7.2 million for the Global Seismographic Network, level with the President’s request. The report additionally notes funding of $3.7 million for subduction zone science, $2.1 million for induced seismicity, and $3.1 million for “modernization and hardening of infrastructure in support of earthquake analysis.” Additionally, the USGS Geomagnetism program, part of the interagency U.S. National Space Weather Program (NSWP), would receive $5.7 million in FY 2022, an increase of $1.6 million over the FY 2021 enacted level, “to ensure that all magnetic observatories remain open and operating and to avoid any disruption to this work as well as to expand the number of observatories to improve coverage.” The funding would include resources to support the Magnetotelluric Survey of the contiguous United States. The Committee directs funding for the Administration’s priorities for “coastal blue carbon and risk reduction and community resilience” within the Coastal and Marine Hazards and Resources account.

The House bill would fund the Ecosystems mission area at $355 million, an increase of $96 million or 37 percent over the FY 2021 enacted level. The bill would increase funding for the National and Regional Climate Adaptation Science Centers (CASCs) by $40.6 million, or 98 percent over the enacted level. This would be $2.5 million less than the President’s request, but both the request and the House bill would roughly double funding for the program. Of this amount, $10.5 million would be provided for Tribal adaptation climate science and $3 million would be to “facilitate synthesis of regional findings to the national level.” The Committee reiterates in the report that in FY 2020 Congress directed USGS to create a new Midwest
CASC. The Committee also directs USGS to provide a report “on the Environmental Health research it plans to conduct in fiscal year 2022” within 60 days of the bill being enacted. The Committee additionally calls on USGS to host a Mississippi River Science Forum, including participation from federal agencies, local and tribal governments, and academia, within a year of the bill’s enactment “to share current science, identify data gaps and areas of concern, and to prioritize next steps and identify resources.”

Also within Ecosystems, the bill would provide an increase of $2.5 million over the FY 2021 enacted level for the Cooperative Research Units (CRUs) for a total funding level of $27.5 million. The Committee again directs “critical vacancies” at research institutes to be filled expeditiously, “specifically vacancies needed to build quantitative fisheries capacity in inland waters of the Upper Mississippi Basin.” The report states that USGS “may use the increase to support existing CRU’s as well as establish a CRU at an institution of higher education that does not have a CRU to address pollinator declines, fish and wildlife disease, and new invasive species.”

The bill would fund the Water Resources mission area at $293 million, an increase of $30 million or 11.5 percent over the FY 2021 enacted level. The bill would increase funding by $4 million or 36.4 percent for the Water Resources Research Act program that supports the Water Resource Research Institutes. The Committee looks for USGS to “continue to engage with universities and other partners to utilize the best available technology to develop advanced modeling tools, state-of-the-art forecasts, and decision support systems for water emergencies and daily water operations.”

The House would fund Core Science Systems at $328 million or 30 percent above the FY 2021 enacted amount and 4 percent below the President’s FY 2022 request. The bill would fund the National Cooperative Geological Mapping Program at $44.6 million, an increase of $4.2 million over the enacted level and $4.0 million over the budget request, “to accelerate subsurface mapping and sustain Phase Three of the National Geologic Map Database.” The bill would provide an increase of $5 million for the 3D Elevation Program (3DEP), and the Committee supports the goal of achieving national coverage of high-resolution elevation data by 2026. The Committee additionally encourages USGS “to examine the efficacy of working with academic partners to develop new capability to incorporate elevation changes near coastal areas into elevation maps.”

The House would fund the Energy and Mineral Resources mission area at $145.0 million, an increase of 61 percent over the enacted level and 3.6 percent above the request. The bill would fund the Earth Mapping Resources Initiative (Earth MRI), at $10.6 million, equal to the FY 2021 enacted funding level.

Environmental Protection Agency

The House bill would provide historically high funding to the U.S. Environmental Protection Agency (EPA) with $11.34 billion, an increase of $2.1 billion or 22.8 percent above the FY 2021 enacted level and $110.8 million or 0.9 percent above the budget request. Most of the EPA accounts would grow under the House bill relative to the FY 2021 enacted levels – and the priorities are consistent with those emphasized as a part of the President’s FY 2022 budget request including environmental justice (EJ), climate change, and strengthening capacity and transparency within the EPA. Notably, while the House proposal is centered around similar areas of emphasis as the Administration’s proposal, the Committee did not fully embrace some of the larger climate and EJ-focused initiatives proposed by the Biden Administration. The House bill also included $428.6 million in Community Project Funding to support over 280 water management projects across the U.S.

The EPA Science and Technology (S&T) account would receive $807.3 million, an increase of $77.9 million or 10.7 percent above the FY 2021 enacted level and $22.7 million or 2.7 percent below the President’s budget
request. The S&T request largely mirrors the budget request across three of the four main research programs including Chemical Safety and Sustainability, Sustainable and Healthy Communities, and Safe and Sustainable Water Resources—with increases relative to FY 2021 enacted levels ranging from 3 to 6.5 percent. Importantly, while the Administration requested $30 million in support for ARPA-C out of the Air and Energy Research Program, the Committee would not provide any funds for this purpose. Instead, the report accompanying the bill includes language directing the EPA to “consult with and seek approval from the Committee prior to undertaking any collaborative research with the Department of Energy on climate adaptation or resilience work.” It is noteworthy that, like the budget request, the funding increases proposed by the House for the S&T accounts are, on average, lower than the average increase across the entire EPA budget.

Most relevant to the extramural research community, the House bill would grow Science to Achieve Results (STAR) by $1.4 million for a total of $30 million, which would be the first increase to the program in several years and mirrors the House proposal in FY 2021 which was not enacted into law. STAR is EPA’s primary mechanism for funding external research, but the program has received declining or stagnating budgets since 2002 and has been flat funded at $28.6 million for the past five fiscal years. The report accompanying the bill includes language directing EPA to continue to use STAR funding to support research into the use of green stormwater infrastructure to prevent water-borne pollutants from entering estuaries. The report also highlights the Committee’s interest in the following two changes to STAR championed by Lewis-Burke, which were also reflected in final FY 2021 appropriations. First, the Committee re-affirms its interest in learning about EPA’s effort to explore re-establishing the STAR Graduate Fellowship program, which prior to elimination in 2016 provided support for training of environmental health scientists. Second, it reiterates the FY 2021 directive for the EPA to explore new mechanisms to allow for the submission of unsolicited, principal investigator-initiated proposals to STAR.

Other research areas that would be supported by the House bill include:

- $8.5 million to support extramural research on water quality and availability by not-for-profit institutions through National Priorities grants, a rejection of the Administration’s proposal to eliminate this program and $1 million more than appropriated in FY 2021.
- $248 million for Environmental Justice (EJ) activities, including $100 million for six new EJ grant programs in disadvantaged communities and $148 million in programmatic funds to expand EPA’s incorporation of EJ across all its work and to enable EPA to assist other agencies to do the same.
- $4 million for Enhanced Aquifer Use and Recharge research, which would be distributed to research centers, including those from universities, Tribes, and water related institutions working in collaboration with USGS.
- $2.5 million for intramural research related to coronavirus and health outcomes. The report notes recent findings that communities of color are currently suffering disproportionately from COVID-19 and are more likely to be exposed to air pollution. The Committee directs the Office of Research and Development to coordinate with the Office of Environmental Justice on an associated research plan.
- $61.8 million for research to inform the regulation of per- and polyfluoroalkyl substances (PFAS).

National Endowment for the Humanities and National Endowment for the Arts

For FY 2022, the House bill would provide the National Endowment for the Humanities (NEH) and the National Endowment for the Arts (NEA) $201 million each, an increase of 20 percent or $33.5 million for both agencies. While the House bill aligns with the President’s budget request for NEA, the bill would keep budget
parity between the two agencies, rejecting the President’s smaller proposed increase for NEH in favor of a funding level in line with the NEA request.

In the accompanying report to the House bill, the Committee notes funding would be directed to benefit cross-cutting agency initiatives, including: “the celebration of the U.S. Semiquincentennial, the advancement of civic education, and NEH’s ‘Standing Together’ initiative which promotes a deeper understanding of the military experience and supports returning veterans and their families.” The report also reiterates the Committee’s interest in NEH supporting veterans and their families as well as continues support for cultural preservation for American Indian and Alaska Native communities and partnerships with Tribal communities. The Committee also directs NEH to increase diversity both in its own internal operations and with external outreach and engagement.

In a shift in direction, the report would direct NEA to support projects to “combat systemic racism through the arts” and encourage programming access to minority and underserved communities, reflecting broad Biden Administration priorities. The House Committee also encourages NEA to support music projects that promote maternal-child wellbeing and projects in support of Native American culture and language. Similar to past years, the House report also reiterates the Committee’s support of the NEA’s successful “Creative Forces: Military Healing Arts Network” program in order to assist service members and veterans in healing and reintegration.

**Interior-Environment Appropriations Bill, FY 2022**
*As released by the House Appropriations Subcommittee on Interior-Environment on June 30, 2021*

**U.S. Geological Survey**
*(in thousands of $)*

<table>
<thead>
<tr>
<th></th>
<th>FY 2021 Enacted</th>
<th>FY 2022 Request</th>
<th>FY 2022 House</th>
<th>House v. FY 2021 Enacted</th>
<th>House v. FY 2022 Request</th>
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<tr>
<td><strong>USGS, total</strong></td>
<td>1,315,527</td>
<td>1,642,437</td>
<td>1,642,437</td>
<td>326,910 (24.9%)</td>
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<td><strong>Natural Hazards</strong></td>
<td></td>
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<tr>
<td>Earthquake Hazards</td>
<td>175,484</td>
<td>207,748</td>
<td>207,748</td>
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<tr>
<td>Global Seismographic Network</td>
<td>85,403</td>
<td>92,637</td>
<td>92,637</td>
<td>7,234 (8.5%)</td>
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<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td><strong>Ecosystems</strong></td>
<td>259,077</td>
<td>358,217</td>
<td>355,217</td>
<td>96,140 (37.1%)</td>
<td>-3,000 (0.8%)</td>
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<tr>
<td>National and Regional Climate Adaptation Science Centers</td>
<td>41,335</td>
<td>84,403</td>
<td>81,903</td>
<td>40,568 (98.1%)</td>
<td>-2,500 (3.0%)</td>
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<td><strong>Energy and Mineral Resources</strong></td>
<td>90,041</td>
<td>139,973</td>
<td>144,973</td>
<td>54,932 (61.0%)</td>
<td>5,000 (3.6%)</td>
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<td><strong>Water Resources</strong></td>
<td>263,120</td>
<td>288,394</td>
<td>293,394</td>
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<td>Water Resources Research Act</td>
<td>11,000</td>
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<td>15,000</td>
<td>4,000 (36.4%)</td>
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### Core Science Systems

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<tr>
<th></th>
<th>FY 2021 Enacted</th>
<th>FY 2022 Request</th>
<th>FY 2022 House</th>
<th>House vs. FY 2021 Enacted</th>
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<tr>
<td></td>
<td>252,688</td>
<td>341,874</td>
<td>328,192</td>
<td>75,504 (29.9%)</td>
<td>-13,682 (4.0%)</td>
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<td>Science Support</td>
<td>95,734</td>
<td>121,421</td>
<td>118,103</td>
<td>22,369 (23.4%)</td>
<td>-3,318 (2.7%)</td>
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<tr>
<td>Facilities</td>
<td>179,383</td>
<td>184,810</td>
<td>194,810</td>
<td>15,427 (8.6%)</td>
<td>10,000 (5.4%)</td>
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</table>

### Environmental Protection Agency

*(in thousands of $)*

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<thead>
<tr>
<th></th>
<th>FY 2021 Enacted</th>
<th>FY 2022 Request</th>
<th>FY 2022 House</th>
<th>House vs. FY 2021 Enacted</th>
<th>House vs. FY 2022 Request</th>
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<tbody>
<tr>
<td>EPA, total</td>
<td>9,237,153</td>
<td>11,233,279</td>
<td>11,344,071</td>
<td>2,106,918 (22.8%)</td>
<td>110,792 (0.9%)</td>
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<td>Science and Technology</td>
<td>729,329</td>
<td>829,972</td>
<td>807,262</td>
<td>77,933 (10.7%)</td>
<td>22,710 (2.7%)</td>
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<td>National Priorities Program</td>
<td>7,500</td>
<td>0</td>
<td>8,500</td>
<td>1,000 (13.3%)</td>
<td>8,500 (N/A)</td>
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<tr>
<td>Science to Achieve Results Grants</td>
<td>28,600</td>
<td>--</td>
<td>30,000</td>
<td>1,400 (4.9%)</td>
<td>--</td>
</tr>
</tbody>
</table>

### National Endowment for the Humanities & National Endowment for the Arts

*(in thousands of $)*

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<thead>
<tr>
<th></th>
<th>FY 2021 Enacted</th>
<th>FY 2022 Request</th>
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<th>House vs. FY 2021 Enacted</th>
<th>House vs. FY 2022 Request</th>
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<tbody>
<tr>
<td>NEH, total</td>
<td>167,500</td>
<td>177,550</td>
<td>201,000</td>
<td>33,500 (20.0%)</td>
<td>23,450 (13.2%)</td>
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<tr>
<td>Research Programs</td>
<td>14,500</td>
<td>15,000</td>
<td>15,000</td>
<td>500 (3.4%)</td>
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<tr>
<td>Education Programs</td>
<td>13,000</td>
<td>13,500</td>
<td>13,500</td>
<td>500 (3.8%)</td>
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<tr>
<td>Federal/State Partnerships</td>
<td>51,576</td>
<td>54,376</td>
<td>61,836</td>
<td>10,260 (19.9%)</td>
<td>7,460 (13.7%)</td>
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<td>NEA, total</td>
<td>167,500</td>
<td>201,000</td>
<td>201,000</td>
<td>33,500 (20.0%)</td>
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<tr>
<td>Grants</td>
<td>80,310</td>
<td>98,310</td>
<td>98,310</td>
<td>18,000 (22.4%)</td>
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<tr>
<td>State and Regional Partnerships</td>
<td>53,540</td>
<td>65,540</td>
<td>65,540</td>
<td>12,000 (22.4%)</td>
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*Sources and Additional Information:*
• The accompanying report is available at https://docs.house.gov/meetings/AP/AP00/20210701/112878/HMKP-117-AP00-20210701-SD002.pdf.

Funding Opportunities and Agency Updates

Agency Update: DOE Renewable Energy and Energy Efficiency Priorities

The Department of Energy (DOE) proposed $4.7 billion, an increase of $1.9 billion or 65 percent, for renewable energy and energy efficiency research, development, deployment, and demonstration activities in fiscal year (FY) 2022. While congressional appropriations will determine final funding levels, DOE still plans to advance new programmatic priorities. A significant portion of new proposed funding is for industry- and DOE national lab-led projects. This analysis highlights new initiatives and funding opportunities of most relevance to research universities and other research organizations. A separate analysis was provided on new advanced manufacturing research, development, and demonstration initiatives.

Vehicle Technologies

• **$66 million for battery research and development**: DOE supports research and development of high-energy and high-power battery materials, cells, and battery development to significantly reduce the cost, weight, volume, and charge time of plug-in electric vehicle batteries. DOE plans to expand research efforts focused on next-generation lithium ion and other chemistries, including silicon-based anodes, novel liquid electrolyte formulations, low and/or no cobalt cathode materials, lithium metal anodes, sulfur-based cathodes, and solid-state electrolyte materials. The highest priority research area will be solid-state material systems that can meet key performance metrics for weight, volume, and cost, while achieving further improvements in cycle life. DOE also plans to initiate new cooperative research agreements for lithium metal and solid-state battery materials scale up including processing and cell development and expanding participation in the Battery500 R&D Consortium.

• **$20 million for a new Clean Energy Mobility Solutions for Underserved Communities initiative**: DOE plans to launch a new research initiative to design transportation solutions that meet the needs of various underserved populations, including those in energy communities, and to conduct pilot demonstrations to evaluate their effectiveness. Research efforts would explore a variety of mobility solutions, such as improving public transportation (access, affordability, efficiency, convenience), implementing new last-mile services and modes (micromobility, automated point-to-point transportation), and other connected and automated transportation technology solutions for both urban and rural communities. Demonstrations would focus on zero carbon emission/electric transportation solutions and include participation from members of the community to address their specific needs.

• **$12 million for lightweight materials**: DOE supports research and development in advanced high-strength steels, aluminum alloys, magnesium alloys, carbon fiber composites, and multi-material systems with potential performance and manufacturability characteristics that greatly exceed today’s technologies. DOE plans to compete and award new projects on multi-functional materials, including polymer matrix composites, to reduce the cost, weight, and volume of electric vehicle batteries and support the transition to electric light duty vehicles. DOE also plans to address knowledge gaps in the

UMN Washington Update
Prepared by Lewis-Burke Associates LLC
July 9, 2021
specific contributions of vehicle non-exhaust emission sources in the U.S. and their health effects. DOE has found that adverse health effects have been correlated to increased exposure to particulate matter that is present near roadways and in urban environments with stop and go traffic, representing an environmental injustice to the communities located in those areas.

- **$9 million for powertrain materials**: DOE supports research and development for higher performance materials to address the future properties and needs of electric and hydrogen fuel cell vehicles to increase efficiency and decrease manufacturing cost, supporting the transition to all electric light duty vehicles by 2035. DOE plans to fund a new research effort on affordable, recyclable, high conductivity materials for lightweight electric powertrain components. DOE also plans to fund a new research effort to address the materials property requirements of challenging electric vehicle powertrain components such as inverters, motors, and gear-trains. Key challenges include electrical conductivity, thermal conductivity, magnetic materials, and high temperature operation currently limiting advances in electric powertrain and wireless charging.

**Bioenergy**

- **$10 million for a new research and development program on biogenic carbon drawdown, soil carbon sequestration, and bioenergy with carbon capture and sequestration**: DOE’s new focus is on the interface of carbon management and how sustainable agriculture and forestry can advance climate priorities.

**Fuel Cell Technologies**

- **$10 million for materials and components**: DOE supports research and development activities needed to make a membrane electrode assembly (MEA), as well as other stack components. DOE’s primary areas of focus include catalysts, electrodes, membranes, ionomer, bipolar plates, and gas diffusion layers, as well as advances in modeling and MEA manufacturing approaches. In FY 2022, DOE plans to advance research and development efforts beyond early-stage concepts, including manufacturing processes, funded at research universities. DOE plans to shift the focus to components beyond catalysts, including gas diffusion layers, to reduce dependence on imports and strengthen the domestic supply base.

**Solar Energy**

- **$36 million for manufacturing**: DOE supports efforts focused on developing and validating new solar technologies which can be domestically manufactured. This includes the full value chain, from innovative approaches to producing solar cells and module materials to new tracking technologies to power electronics to technologies to reduce maintenance costs. DOE plans to fund new projects to develop and scale new solar cells and materials, manufacturing processes and products, supply chain integrations, and building-integrated photovoltaics/photovoltaic building materials which can lead to increased domestic manufacturing across the solar value chain.

- **$15 million for solar thermochemical reactors**: DOE supports research and development of industrial processes driven by solar thermal energy, including the development of solar thermal pathways for the carbon-emission-free production of energy-intensive chemicals, commodities, and fuels, like ammonia, steel, cement, and hydrogen. DOE plans to increase funding for projects that can develop solar thermochemical processes and components for the production of solar-derived industrial products, chemicals, and fuels to enable decarbonization of the full energy sector by 2050.

- **$5 million for increased durability**: In the FY 2022 annual photovoltaics funding solicitation, DOE plans to increase funding for research and development focused on extreme weather and hardening of photovoltaic systems for increased resilience.
**Wind Energy**

- **$42 million for wind energy grid integration**: DOE supports new technologies and analytical tools that facilitate transmission access and improve grid reliability and resiliency with increasing levels of wind energy. The majority of this funding will support industry- and national lab-led projects but there are opportunities for research university partnerships. DOE plans to fund new activities in FY 2022 including new research to assess transmission infrastructure requirements to maintain system reliability and ensure cost-effective transmission access for offshore wind, while identifying innovative solutions to provide advanced grid services and reduce costs; in partnership with DOE’s Hydrogen and Fuel Cell Program demonstrate a multi-megawatt water electrolyzer coupled with wind power generation to produce low-cost, emissions-free hydrogen; in partnership with DOE’s Solar Energy Technologies Office demonstrate the robustness of grid services provided by utility scale wind and solar plants under various operating conditions and develop a roadmap to enable faster and simpler interconnection of solar and wind resources to the electric grid; and demonstrate and validate hybrid wind energy storage technologies.

- **$20 million for offshore wind manufacturing and materials research and development**: DOE supports research and development to reduce the technical challenges of installing offshore wind turbines by reducing turbine weight, finding turbine installation methods that do not require large European-type installation vessels, and using advanced materials and manufacturing technologies to reduce the fabrication costs of floating offshore turbine foundations. In FY 2022, DOE plans to initiate a new research initiative on advanced materials and manufacturing research and development to reduce full lifecycle costs and accelerate blade/tower/nacelle factory throughput. This would include new manufacturing methodologies using additive manufacturing techniques coupled with automated assembly approaches to reduce fabrication costs and mitigate transportation challenges of large and complex wind turbine components. The goal is to address existing challenges for wind, such as enabling continued scaling and light weighting, improving turbine reliability, using advanced manufacturing and better designs to overcome transportation constraints, and overcoming materials and supply chain issues. DOE also plans to launch a Wind Re-design for Recycling initiative to improve recycling and recovery of critical materials at wind plants end of life. The initiative would focus on recycling existing components and re-design for future components as well as using novel materials and manufacturing (“design for recycling”) to extend life and make it economically more cost effective to recycle in the future. The goal is to reduce demand for critical materials in wind turbines.

- **$18 million for offshore wind science and technology innovation**: DOE supports new offshore wind technologies that can open new markets, such as deep-water markets on the West Coast of the U.S., by developing floating technologies, supporting designs optimized for domestic supply chains, and advancing turbine and farm controls to increase output and improve predictability. DOE is also interested in how operations can be optimized and how operations and maintenance (O&M) costs decreased with the proper tools and data to decrease unplanned maintenance and extend the lifetime of components, especially in the harsh offshore environment. In FY 2022, DOE plans new investments in O&M optimization for larger turbines through prognostic health management tools, standardized data, remote and autonomous advanced inspection and fault detection, and repair techniques supported by AI and robotics that also reduce personnel actions at sea. DOE also plans to support floating platform designs that are suitable for U.S. manufacturing facilities and further reduce costs. DOE would also begin planning for the first major offshore wind measurement and validation campaign on the West Coast using lidar buoys off the coast of California to develop reliable wind and weather forecasts.
$9 million for social science and socioeconomic research: DOE plans to launch a new social science and socioeconomic research initiative to understand impacts of wind energy on communities and ocean co-users and provide technical assistance to communities considering offshore wind development. The focus would be on helping communities and ocean co-users understand the impacts of offshore wind development and develop strategies that reduce impacts and increase environmental justice for wind energy development. DOE also plans to offer technical assistance to coastal communities considering offshore wind development to ensure access to fact-based information during planning processes as well as expand collaboration with the NOAA Sea Grant program to support engagement with ocean users regarding offshore wind development.

$5 million for STEM and workforce development: DOE supports the Collegiate Wind Competition (CWC), which is an annual competition that challenges teams of undergraduate students to develop solutions to complex wind energy projects. In FY 2022, DOE plans to broaden the CWC to include an offshore wind focus. In addition, DOE plans to increase support for research universities to develop offshore wind curriculums, fellowships, and internships with an emphasis on ensuring diversity of the future offshore wind workforce.

Hydropower Technologies

$10 million for novel water infrastructure sensors: DOE plans to launch a new research effort to develop novel water infrastructure sensing capabilities to ensure the continued operability of human-made water systems. DOE has found that hydropower combined with water distribution and treatment systems can power behind-the-meter applications for resilience and reliability within water networks or neighboring infrastructure. However, advanced water sensor development and data analytics are necessary to ensure the continued operability of human-made water systems. The scope of this effort includes not only hydropower plants but also water conveyance systems, water treatment, and water storage capabilities.

$3 million for new STEM activities: DOE plans to launch a new Hydropower Collegiate Competition for undergraduate students, establish a new Hydropower Fellowship program, and compete a new hydropower data analysis prize for graduate students.

Geothermal Technologies

$28 million for subsurface research, development, and demonstration of enhanced geothermal systems (EGS): DOE plans to award a third set of near-field EGS demonstration projects through the Wells of Opportunity funding call. The goal is to illustrate that near-field and in-field EGS can be successfully deployed as a result of recent technology advancements and that low permeability/underproductive wells near and in existing hydrothermal fields can be turned into valuable assets using EGS techniques. DOE also plans to fund a second cohort of early career awards in EGS. The EGS STEM Early Career Awards provides seed funding to early career researchers to explore EGS concepts. A major goal of this effort is to increase geothermal literacy and grow advocates for geothermal energy as a preferred energy source. DOE also plans to form a High Temperature Smart Casing Working Group to identify promising research directions to reduce the cost of casing. DOE has found that completing a well – casing and cementing – is responsible for up to half the cost of drilling a geothermal well. DOE is interested in exploring how to lower the cost of casing, create dual purpose casing (for monitoring and wellbore stability), or eliminate the need for casing altogether to dramatically lower the overall costs of geothermal drilling and EGS development. Recommendations from the working group would lead to future funding opportunities.
Building Technologies

- **$32 million for buildings-to-grid research and development**: DOE supports flexible building loads research that includes advanced communication platforms and data management systems; advanced sensing, monitoring, fault detection and control capabilities; and interoperability, cybersecurity, user-centered research, and data analytics to maximize zero-carbon energy use and optimize productivity and occupant comfort. In FY 2022, DOE plans to fund up to six new projects focused on integrated scaling of advanced building energy management systems, improved building sector cybersecurity, interoperability, and multi-scale data analytics for grid-interactive efficient buildings to help enable a carbon-free electricity sector. DOE also plans to launch a Building Thermal Energy Storage Consortium centered on materials discovery, characterization, performance evaluation, scaling/manufacturability, and systems integration. The new consortium would issue funding calls for research universities to advance the development, validation, and demonstration of highly sustainable, scalable, and affordable thermal energy storage solutions for building applications, including low-temperature phase change materials with greater lifetimes and storage capacities, heat exchanger optimization for enhanced rate capability, active control and utilization of the full storage capacity of thermal mass, and advanced HVAC and envelope system designs for ease of integration and reduced costs. DOE also plans to select up to four new Next Generation Connected Communities Projects to support grid interactive efficient buildings.