



Joint Center for Deployment and Research in Earth Abundant Materials

The Joint Center for Deployment and Research in Earth Abundant Materials (JCDREAM)

Operating Plan

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This operating plan is being submitted in response to a request stated in the authorizing legislation leading to the establishment of the Joint Center for Deployment and Research in Earth Abundant Materials (JCDREAM).

1. Overview:

Clean energy and transportation technologies, as well as consumer products, depend on many high-cost strategic materials at risk of supply disruption. The increased utilization of earth-abundant materials in these technologies is desirable because it would reduce the nation's dependence on strategic materials with potential supply risks. Home to leadership-class research capacity, technological innovation, and economic development, the state of Washington would greatly benefit from a strategic, integrated, and coordinated approach that could lead to groundbreaking and environmentally beneficial advances for the clean energy and transportation sectors, and propel the region to a position of national leadership in these areas. During its 2015 session, the Washington state Legislature approved House Bill 1897 to establish the Joint Center for Deployment and Research in Earth Abundant Materials (JCDREAM) to provide the organizing framework to stimulate such an approach and the catalyst to capture the unprecedented opportunities afforded by environmentally beneficial advances in earth-abundant materials and technologies.

Leveraging the research capacity of Washington State University, the University of Washington and the Pacific Northwest National Laboratory, JCDREAM will establish an innovative platform to promote a collaborative and transformative program of research, development, deployment, and training in earth-abundant materials science, engineering, and advanced manufacturing to accelerate the development of next-generation clean energy and transportation technologies in the state of Washington. To this end, JCDREAM will provide the framework to establish a broad regional alliance that brings together researchers from academia and national laboratories, together with industry innovators, **who share the common objectives of accelerating the integration of earth-abundant materials and development of needed manufacturing science and technology through synergistic and leveraged efforts.** Moreover, JCDREAM will help support the development and commercialization of next-generation clean energy and transportation technologies in Washington toward the goal of achieving national and energy security, economic sustainability, and sound environmental stewardship.

2. Goals:

As stated in the authorizing legislation, the goals of JCDREAM include:

1. Establishing the foundation for a transformative program in earth-abundant materials to accelerate the development of next-generation clean energy and transportation technologies in Washington;
2. Establishing a coordinated framework and deploying resources that can facilitate and promote multi-institution collaborations to drive research, development, and deployment efforts in the use of earth-abundant materials for manufactured clean technologies or recycling of advanced materials used in clean technologies; and
3. Promoting environmentally responsible processes in the areas of manufacturing and recycling of advanced materials used in clean technologies.

3. Implementation strategy:

The JCDREAM implementation strategy to support these goals includes:

1. Collaborative research and development: Incubate and enhance collaborative research and development efforts to advance the state-of-the-art in materials science and engineering, and advanced manufacturing with a focus on clean energy and transportation technologies; including



- a. Collaborative research and product development that would further the commercialization of renewable energy and battery storage technologies that substitute earth-abundant materials for high-cost strategic materials with limited supply;
 - b. Collaborative research for scalable processing and manufacturing of functional and structural materials in clean energy and transportation products and components from earth-abundant materials; and
 - c. Collaborative research and deployment of technologies and processes that reduce the environmental impacts and materials waste in manufacturing processes.
2. **Regional center for advanced materials and manufacturing:** Deploy a modern, responsive, and geographically distributed research and development infrastructure that collectively integrates advanced capabilities and “signature” user facilities as a regional center for materials processing and manufacturing through the establishment of networked gateways located at (and operated by) the partner institutions and available to the JCDREAM community at-large.
 3. **Education and training:** Implement a transformative educational and training program that is responsive to the needs of the state of Washington and serves as the basis to develop the skilled workforce trained in advanced materials and manufacturing science and technology supporting next-generation earth-abundant clean energy and transportation technologies.

These strategic elements will be implemented in a manner that is responsive to enduring and emerging industry needs and resources at the regional and national levels. In particular, JCDREAM will establish strategic partnerships to leverage resources and enhance the state of Washington’s competitiveness in attracting large-scale industrial investments and federal programs consistent with the JCDREAM goals and objectives. These partnerships will also form the basis to integrate and coordinate regional efforts mounted in response to emerging funding opportunities.

4. Mechanisms and processes to accomplish the JCDREAM duties:

As requested by the authorizing legislation, the specific processes, methods, and mechanisms to accomplish the JCDREAM duties are provided in **Table 1**.

JCDREAM duties (per the authorizing legislation)	Implementation mechanisms and processes
1. Work with the clean technology and transportation industry associations and firms of all sizes to identify the research areas that will benefit the intermediate and long-term economic vitality of Washington's clean technology and transportation industries.	<ul style="list-style-type: none"> — Develop and implement a JCDREAM communication strategy. — Sponsor an inaugural symposium with regional economic development alliances, academic institutions, and industry representatives to identify and prioritize research areas that will benefit the intermediate and long-term economic vitality of Washington's clean technology and transportation industries.
2. Identify entrepreneurial researchers to join or lead research teams in the JCDREAM research areas and the steps the UW and WSU will take to recruit and retain such researchers.	<ul style="list-style-type: none"> — Sponsor topical workshops to inform the research community of the goals, objectives and scope of JCDREAM. — Identify leading researchers through a competitive proposal solicitation process and integrate recruiting and retention opportunities



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	within the WSU and UW long-term workforce planning strategies.
3. Assist firms to integrate existing technologies into their operations and align the activities of the joint center for deployment and research in earth-abundant materials with those of impact to Washington to enhance services available to clean technology and transportation firms.	— Ensure that the JCDREAM industrial partners have access to the comprehensive set of capabilities and research infrastructure deployed and operated by JCDREAM to accelerate the integration of existing and next-generation technologies into their operations.
4. Develop internships, on-the-job training, research, and other opportunities and ensure that all undergraduate and graduate students enrolled in programs for clean technology and earth-abundant research and deployment-related curriculum have direct experience with the industry.	— Work with JCDREAM academic, industrial, and federal partners to identify and support internships, on-the-job training, and research opportunities. — Integrate industry-based internships into curriculum development among JCDREAM academic institutions.
5. Assist researchers and firms in safeguarding intellectual property while advancing industry innovation.	— Leverage the resources available among the JCDREAM partners to safeguard intellectual property.
6. Develop and strengthen university-industry relationships through promotion of faculty collaboration with industry and sponsor at least one annual symposium focusing on clean energy earth-abundant research and deployment in the state of Washington.	— Develop and strengthen university-industry partnerships through promotion of faculty collaboration with industry by sponsoring at least one (1) annual community symposium focusing on areas of clean energy and transportation technologies that can benefit from earth-abundant research and deployment in the state of Washington.
7. Encourage a full range of projects from small research projects that meet the specific needs of a smaller company to large scale, multi-partner projects.	— Develop a balanced research program portfolio that supports a spectrum of activities ranging from single-investigator projects to large-scale multi-disciplinary, multi-institution initiatives.
8. Develop supplemental sources for non-state support of the center's research activities through leveraging dollars from federal and private for-profit and nonprofit sources.	— Participate in the development and submission of proposals in response to federal funding opportunities announcements (FOA). — Work with federal agencies, industrial partners, and non-state organizations in the formulation of national initiatives in clean energy and transportation technologies.
9. Leverage JCDREAM financial impact through joint support arrangements on a project-by-project basis as appropriate.	— Establish a set of proposal evaluation criteria that requires documented proof of joint financial support in the form of direct and/or in-kind funding.
10. Establish mechanisms for soliciting and evaluating proposals and for making awards and reporting on technological progress, financial leverage, and other measures of impact.	— Establish and support a research grants program for multi-year awards. — Issue an annual funding opportunity announcement (FOA) to solicit proposals aligned with the JCDREAM research areas and supporting



	<p>the JCDREAM strategic goals and objectives.</p> <ul style="list-style-type: none"> — Develop review criteria for proposal evaluation, including: technical merit, appropriateness of proposed methods and approaches, qualification of the investigator(s)’ team, anticipated impact, alignment with JCDREAM goals, level of leveraged resources, and reasonableness of budget request. — For each awarded project, request an annual progress report documenting technological progress, financial leverage, and other measures of impact. — Request final report upon completion of awarded projects.
<p>11. Allocate appropriated seed funds in support of the JCDREAM research areas.</p>	<ul style="list-style-type: none"> — Issue a request for proposals (RFP) among the JCDREAM partners to competitively allocate the seed funding appropriated for capital improvements, infrastructure, and equipment in support of the JCDREAM research infrastructure.

Table 1: Summary of processes and mechanisms to accomplish the JCDREAM duties.

5. Operations:

The following narrative outlines the operational activities in the initial phase of implementation of the JCDREAM program.

5.1 Acquisition Strategy for Capital Research Infrastructure:

The JCDREAM will work with the center’s partners to lead the development and implementation of a competitive process for the allocation of the seed funding appropriated for capital improvements, infrastructure, and equipment in support of the joint center’s research infrastructure. Capital equipment for consideration might include specialized materials synthesis and characterization capabilities, advanced manufacturing tools, as well as high-performance computing equipment and research cyber-infrastructure. This research infrastructure will be made widely available to the JCDREAM partners and provide a coordinated framework of distributed resources and assets to facilitate and promote multi-institution collaborations to drive research, development, and deployment efforts in the use of earth-abundant materials for clean energy and transportation technologies. As appropriate, a “scientific user facility” governance model may be implemented for the utilization of the JCDREAM research infrastructure by the center’s partners.

Opportunities for leveraged investments and cost sharing will be identified and explored for the acquisition and deployment of the JCDREAM research infrastructure. Acquisition of the equipment supporting the JCDREAM capital research infrastructure will proceed pending a Board of Directors decision on a capital procurement in CY2016. **A subcommittee will review the proposals and make a recommendation for funding to the board for a vote to approve or not approve the recommendations.**

Criteria for proposal review include the following:

- 1. Relevance to the JCDREAM mission (30%)**
- 2. Demonstrated interest from academic, national laboratory, and industrial researchers (30%)**



3. Fraction of leveraged (matching) funding secured (30%)
4. Management and access plan for JCDREAM users (10%)

In the longer-term, JCDREAM will support a modern, responsive, and geographically distributed research and development infrastructure in the form of networked research gateways located at the partner institutions. These research gateways — or collaborative portals — will consist of “signature” user research and/or prototype-scale production facilities and capabilities readily accessible by the JCDREAM community of partners across the state of Washington. A mechanism for the allocation of resources for the acquisition and operation of equipment to support these user facilities will be implemented to ensure that utilization of this infrastructure by the JCDREAM partners is optimized and that duplication of capabilities is minimized.

5.2 Research Grants Program and Mechanisms for Soliciting and Evaluating Proposals:

As a core element of its operational model, JCDREAM will support a competitive research grants program and issue an annual funding opportunity announcement (FOA). Pending availability of funds, the JCDREAM partners will issue annual requests for proposals (RFP) for competitive multi-year awards to engage the broad research community in support of the center’s efforts and to seek innovative ideas and approaches to advance the center’s strategic goals and objectives.

A mechanism for the solicitation and evaluation of proposals submitted in response to these RFPs will be established. Proposal evaluation criteria will include, but not be limited to: technical merit, appropriateness of proposed methods and approaches, alignment with JCDREAM objectives, likelihood of success, anticipated impact in clean energy and transportation technologies, qualifications of the applicant(s), opportunities for cost sharing, and reasonableness of requested budget. Appropriate financial assistance mechanisms will be implemented to provide funding to the successful applicants and a review process will be established to monitor the progress of the funded projects. This competitive process will be structured in order to encourage a broad spectrum of activities, ranging from small-scale research projects that meet the specific needs of a small company to large-scale, multi-partner initiatives.

As available funding and schedule allow, a community-building symposium will be held to coincide with the release of the RFP. This coordination will ensure that potential responders to the RFP have the opportunity to become familiar with the goals and objectives of JCDREAM and develop proposals that are responsive to the solicitation.

5.3 Communication, Outreach and Community-Building Symposium:

A community-building inaugural symposium will be organized in CY2016 to bring together participants from the JCDREAM partner institutions and stakeholders throughout the state of Washington. The objectives of the symposium will be to introduce JCDREAM to the communities representing the fields of clean energy and transportation technologies throughout the state of Washington and to ensure that the JCDREAM program is responsive to the needs of these communities and is meeting their expectations. The symposium will encourage broad participation from the industrial sector, community colleges and regional universities, the national security complex, and the field of energy and environmental policy. The findings and recommendations derived from the workshop will serve as the basis to frame the JCDREAM implementation plan and inform its investment strategy. As an important element of its outreach strategy to develop and strengthen university-industry relationships, JCDREAM will hold at least one (1) annual symposium focusing on clean energy and transportation technologies in the state of Washington.

6. Administration:



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Administratively, JCDREAM will be operated as a multi-institutional education and research center under the joint authority of Washington State University (WSU) and the University of Washington (UW), in partnership with the Pacific Northwest National Laboratory (PNNL). The administrative offices of JCDREAM will be located at WSU North Puget Sound at Everett with an integrated network of collaborative research and training gateways, collaborative portals, and user facilities located at, and operated by, the partner institutions.

7. Board of Directors:

The powers of the JCDREAM are vested in and will be exercised by a Board of Directors (BoD) consisting of ten voting members and a chair, appointed by the governor, who shall not vote except in the event of a tie vote among the voting members. It is anticipated that the board will meet for the first time in the first quarter of 2016.

As of December 1, 2015, the membership of the JCDREAM BoD includes:

Position #1: Chair (Appointed by the Governor): **Christina Lomasney, President and CEO, Modumetal**

Position #2: Dean of WSU or designee: **Kelvin Lynn, Professor of Physics and Materials Science and Engineering, and Director of the Center for Materials Research at WSU.**

Position #3: Dean of UW or designee: Ramulu Mamidala, Director of the Manufacturing Science and Technology Laboratory at UW

Position #4: Representative of Pacific Northwest National Laboratory: Suresh Baskaran, Chief Science and Technology Officer in the Energy and Environment Directorate at PNNL.

Position #5: Representative of Energy Institute at a Regional University: Elvin Delgado, Director of the Institute for Integrated Energy Studies and Assistant Professor of Geography at Central Washington University.

Position #6: Representative from Community Colleges engaged in training of next-generation workforce: Barbara Hins-Turner, Executive Director of Pacific Northwest Center of Excellence for Clean Energy at Centralia College.

Position #7: Representative of a Large Industry Company: Daniel Sanders, Senior Technical Fellow for the Boeing Company.

Position #8: Representative of a Medium Industry Company: **Recruiting**

Position #9: Representative of a Small Industry Company: Aaron Feaver, Chief Technology Officer at EnerG2.

Position #10: Professional Experience in National Security and Energy Policy: Timothy Lowenberg, Vice President, Gordon Thomas Honeywell Governmental Affairs.

Position #11: Professional Experience in Innovation and Development of Policy to Address Environmental Challenges: **Recruiting**

8. Performance metrics:

Once seated, the JCDREAM Board of Directors will establish and document a set of performance metrics as measured by total research dollars leveraged, total number of researchers involved, total workforce trained, and total number of products or processes that have progressed to commercialization and private sector deployment.

9. Biennial reporting:

The JCDREAM Executive Director will report biennially to the Legislature and to the Office of the Governor about the impact of the center's work on the state's economy and the development of next-generation clean energy and transportation technologies in Washington using earth-abundant materials. The JCDREAM report will include performance metrics results, projections of future impact, indicators of its current impact, and proposals for enhancing benefits to the state.



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10. JCDREAM status report:

The following items provide a status of the JCDREAM operations as of December 1, 2015.

1. Board of Directors: The application process for membership on the JCDREAM BoD is near completion. Approval by the Office of the Governor is expected to be finalized in early 2016.
2. Interim Administrative Director: **Dr. David P. Field, Professor in the School of Mechanical and Materials Engineering and Association Dean for Research in the Voiland College of Engineering and Architecture at WSU**, has been appointed as interim Administrative Director of JCDREAM.
3. Administrative offices of JCDREAM: Physical infrastructure and administrative support for the interim Administrative Director of JCDREAM have been made available at WSU North Puget Sound at Everett.