

Penn State Water Consortium Proposal

Submitted on behalf of the Penn State Water Council and Water Faculty
by Andrew Warner and Tom Richard

19 May 2021

Penn State Water Consortium Proposal

Executive Summary

Water has played a central role throughout history in the health, safety, and standard of living of people, the condition and productivity of ecosystems, the vibrancy of regional economies, and even the stability of nations. Despite its importance, *society continues to struggle to advance science, engineering, and governance in ways necessary to realize sustainable, equitable, and resilient water management. This is a proposal to catalyze Penn State into a preeminent water center of excellence addressing society's most pressing water challenges related to environmental and public health, human development and international security, and climate, energy, and food system resilience.* Consortium efforts will help advance all six foundations and five thematic priorities of Penn State University's Strategic Plan.

This proposal for a Water Consortium is designed to coordinate across established but largely disconnected pockets of water expertise at Penn State, based on the premise that many of the critical water innovations of this century will emerge from the spaces between traditional spheres of study. A two-track approach is proposed. Track 1 will focus on improving enabling conditions that foster convergence¹ work, such as strengthening Penn State Water as a community that permeates discipline- or program-based boundaries and adding priority to four identified areas of emphasis. Track 2 will focus on developing and advancing strategic water initiatives and external engagements with leaders of industry, government, other academic institutions, and civil society that further elevate the University's capacity and impact in the water arena. While these tracks will run in parallel, initial emphasis is to be given to Track 1 during the first year of the Consortium, with emphasis progressively shifting to Track 2 initiatives during the subsequent four years.

The scope, scale, and complexity of water challenges will require the Water Consortium to extend beyond 2025, to be guided by reviews at the end of years 2 and 5. **We are requesting formal recognition of the Penn State Water Consortium as a foundation for future activities.** An associated central budget request has been prepared for co-funded faculty positions and strategic initiatives. As is typical, co-funded positions will be cost-shared 50:50 (IEE:colleges) and rolled out based on support from the Provost and Office of the Senior Vice President for Research. Emerging priorities and associated resource requirements will be identified by the Consortium Director and elected Water Council, as described further below, and advanced through the Institutes of Energy and the Environment in coordination with contributing colleges and units across the University.



"ANYONE WHO CAN SOLVE THE PROBLEMS OF WATER WILL BE WORTHY OF TWO NOBEL PRIZES - ONE FOR PEACE AND ONE FOR SCIENCE."

President John F. Kennedy

¹ "Convergence" is used here adopting the definition from the National Science Foundation as a "...means of solving vexing research problems, in particular, complex problems focusing on societal needs. It entails integrating knowledge, methods, and expertise from different disciplines and forming novel frameworks to catalyze scientific discovery and innovation. Convergence research is related to other forms of research that span disciplines - transdisciplinarity, interdisciplinarity, and multidisciplinary." <https://www.nsf.gov/od/oia/convergence/index.jsp>.

Background and Purpose

Water is essential. It is the lifeblood of people and communities, ecosystems, regional and national economies, and the security of nations, supporting personal health, food production, manufacturing, energy generation, recreation, and a spectrum of other socially and culturally valued services. The challenges of droughts, floods, and degraded water quality – which underscore our dependence on a balanced quantity and adequate quality of water – are expanding with the demands of a growing global population, and are being exacerbated by climate change, aging infrastructure and long-stagnant modes of governance.

While water challenges have long been recognized as multi-disciplinary, most water-related institutional constructs and investments during the past century have remained compartmentalized and specialized, including at our academic institutions. A series of initiatives at Penn State during the past decade – including the work of both an internal Water Task Force (2013) and an External Review Team of Penn State Water Programs (2014) – has clearly identified these challenges at the University. For example, the External Review Team, comprised of recognized faculty and administrators from other academic institutions, articulated a systemic issue in stating “Ironically this [water embedded in many academic programs] contributes to multiple, decentralized efforts arising in different administrative wings of the University, with the potential to duplicate facilities, diffuse efforts and intellectual synthesis, and spread resources thin.” While there are examples of interdisciplinary efforts, these have typically been driven by individual faculty initiative, often in the face of myriad obstacles. This proposed Water Consortium is designed to address this problem and better leverage existing University expertise and resources, reduce University transactional costs, and help unleash Penn State’s full potential in the water realm.

Recognizing there exists at Penn State considerable expertise within individual water-related disciplines, **the purpose of the Penn State Water Consortium is to coordinate and enhance convergence research, education, and service across the disciplines, and to catalyze development and demonstration of lasting solutions to the world’s most pressing water challenges.**

Water Consortium Scope

The Penn State Water Consortium will bring together faculty, staff, and students from across the University, building upon long-standing strengths in engineering, natural and social sciences, while expanding engagement with the health sciences, law and policy, emerging technologies, arts and the humanities, and other disciplines. The Consortium will benefit the Commonwealth of Pennsylvania and communities around the world by advancing understanding and demonstrating solutions in the **four areas of emphasis** below, each of which is aligned with one or more University strategic plan thematic priorities, *as noted*:

- 1) **Protecting Public Health and the Environment** – Advancing understanding of human and ecological health and ecosystem services, supporting vibrant and sustainable economies, and developing



“IRONICALLY THIS [WATER EMBEDDED IN MANY ACADEMIC PROGRAMS] CONTRIBUTES TO MULTIPLE, DECENTRALIZED EFFORTS ARISING IN DIFFERENT ADMINISTRATIVE WINGS OF THE UNIVERSITY, WITH THE POTENTIAL TO DUPLICATE FACILITIES, DIFFUSE EFFORTS AND INTELLECTUAL SYNTHESIS, AND SPREAD RESOURCES THIN.”

EXTERNAL REVIEW TEAM REPORT (SEPT 2014)

solutions to address both enduring water quality problems and contaminants of emerging concern. (*Enhancing Health, Stewarding Our Planet's Resources*)

- 2) **Advancing Resilient Communities on a Dynamic Earth** – Strengthening understanding and modeling of fundamental Earth processes across scales, including shifts in all aspects of the hydrosphere and related social and ecological implications, and developing and demonstrating innovations that enhance resilience through actionable climate solutions. (*Stewarding Our Planet's Resources*)
- 3) **Driving Innovation and Technology** – Developing and deploying next-generation tools, techniques, materials, and processes; advancing data-driven solutions; and actively using the University as a living lab in the service of meeting the world's most pressing water challenges. (*Empowering Through Digital Innovation*)
- 4) **Guiding Social Action, Policy, and Corporate Transformation** – Strengthening public governance, water ethics, and environmental justice, enhancing water security at individual to national scales, improving private sector performance, and integrating the arts and humanities for improved awareness, understanding, and culturally-appropriate solutions. (*Advancing the Arts and Humanities*)

In addition to and across these four areas of emphasis, the Consortium will further advance the University's land grant mission through actions on **two cross-cutting strategies**:

- 1) **Transforming Water Education and Student Opportunities** – Expanding formal (degreed) and extracurricular opportunities that engage our graduate and undergraduate students and expose them to cross-disciplinary and diverse perspectives on water to enhance their Penn State experience and strengthen their knowledge and networks for an impactful future. (*Transforming Education*)
- 2) **Engaging People, Communities, and Partner Institutions** – Supporting current and future community-based water initiatives, providing outreach and extension services, identifying and developing public, private, and civil society partnerships strategic to University water priorities, and enhancing water-related communications. (*across thematic priorities*)

These four areas of emphasis and two cross-cutting strategies constitute the goals of the Consortium.

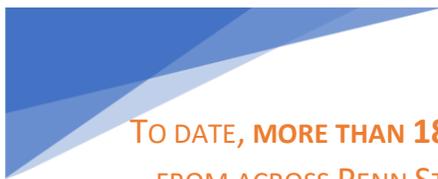
Consortium actions toward these goals will collectively contribute to all six foundations and five thematic priorities of Penn State University's Strategic Plan.

Approach

There are two factors driving the approach we propose here for advancing the Water Consortium, including: i) the premise that many critical water innovations of this century will emerge from the spaces between traditional spheres of study and be made accessible by diverse teams advancing research, education, and demonstration; and, ii) the reality that many primary funding institutions increasingly require a convergence approach. Consequently, a two-track approach is proposed. **Track 1 will emphasize improving enabling conditions at Penn State for convergence research and innovation.** This will include coordinating efforts across the University, strengthening the Water Consortium as a community that permeates traditional discipline-based boundaries, further refining each of the four areas of emphasis to guide research investments, and laying the foundation for enhancing education. While coordinating and strengthening the Penn State water community will be ongoing, **Track 2 will focus on implementing strategically designed initiatives on research, external engagement, and other related and supporting efforts** to elevate the University's impact in the water arena. Track 1 efforts will be emphasized in the first year of the Consortium, with increased attention given to Track 2 actions during the subsequent years.

Organization and Governance

The Water Consortium is unique in its construct, having been conceived and advanced through the grassroots efforts of water faculty from across the University, and designed with a democratic governance structure. More than 180 people representing 10 colleges and institutes and 13 campuses and extension offices across the Commonwealth have self-identified as water faculty and staff, contributed to this proposed design, enrolled in the Penn State water community, and elected a Water Council to coordinate and advance their efforts. This reservoir of motivated expertise will be released and channeled through the Consortium to maximize Penn State's impact.



TO DATE, MORE THAN 180 INDIVIDUALS FROM ACROSS PENN STATE HAVE SELF-IDENTIFIED AS WATER FACULTY AND STAFF AND HAVE ENROLLED TO BE IN THE WATER CONSORTIUM. THESE FACULTY AND STAFF COLLECTIVELY REPRESENT 10 COLLEGES AND INSTITUTES, AS WELL AS 13 CAMPUSES AND EXTENSION OFFICES ACROSS THE COMMONWEALTH.

The structure, operational management, and leadership of the proposed Water Consortium will align with the guiding principles and organizational articles presented in the [Penn State University Water Faculty Guiding Principles](#), developed by faculty in 2019. The Consortium will be governed by the [Water Council](#), elected from the Penn State water community comprised of faculty and professional staff from across the University, including Commonwealth Campuses and Extension. The Water Council will consist of seven elected faculty and staff members, as well as a Consortium Director and two student members nominated by faculty and selected by the Council. Elected faculty and staff serve three-year terms on the Water Council, while student representatives serve one-year terms. The Consortium Director, who is an employee of the Institutes of Energy and the Environment (IEE) reporting to the IEE Director, is a non-voting, ex officio member of the Water Council. The Water Council will elect co-chairs annually, hold regular meetings to carry out its responsibilities, and organize at least one annual meeting for the Penn State water community. Within Penn State, a critical function of the Water Council will be to coordinate activities across existing water-related centers and institutes, to include quarterly meetings with relevant center and institute directors who represent the organizational members of the Consortium. The Water Consortium will also serve as a clearinghouse to advertise, promote, and complement water-related activities and events from across the University.

In addition, the Water Consortium will engage interested organizations external to Penn State from industry, government, other academic institutions, and civil society. Initial and ongoing strategic opportunities for engaging external institutions will be identified and assessed by the Water Council, in consultation with appropriate centers, institutes, and college and unit leaders. Such opportunities might include forming institutional memberships in the Consortium, launching a corporate partner or sponsor program, and establishing an external advisory group comprised of leaders of industry, government, academia, and civil society.

Consortium Actions

Through the governance structure described above, the Water Consortium will undertake a range of actions, to be carried out by the Director, the Water Council, and committees and working groups comprised of members of the broader Consortium, examples of which are listed in the sidebar.

Specific Water Consortium priority actions are to be identified annually by the Consortium Director and Water Council and summarized in a *Water Action Plan*. As appropriate, associated resource requirements, including staffing and funding needs, are also to be identified by the end of April to be used in budget development for the upcoming fiscal year. The Water Council and Consortium Director will be responsible for implementing priority activities, engaging and coordinating with others from across the University – including the broader Water Consortium members, colleges and units, and leadership – and evaluating implementation success. It is recognized that some priorities will require multi-year implementation, in which case the Director and Council will articulate both the longer timeline and short-term milestones for gaging progress.

We further propose panel reviews at the end of both years 2 and 5 to evaluate the priority actions chosen by the Water Consortium and their implementation and impact. The panels should report to the Director of IEE and the IEE Executive Committee, and include recommendations to the University related to the Consortium’s future activities.

Consortium Impact

Investments in the Penn State Water Consortium will manifest as follows, with example key performance indicators (*KPI*) noted:

- **Penn State is a center of excellence in water and water-related research**, supported by strategic co-funded water faculty cluster hires and Seed and other grant programs designed to catalyze Penn State institutional alignment and interdisciplinary and cross-college research teams that advance science, spur new industry innovation and growth, and address society’s most pressing water challenges related to environmental and public health, human development and international security, governance and climate, energy, and food system resilience.
KPI: number, diversity, or impact of Penn State water and water-related publications; research funding and diversity of funding sources (e.g., public, foundation, and industry).

WATER CONSORTIUM EXAMPLE ACTIONS

- Develop, coordinate, and implement University-wide strategic action plans for water research, education, outreach, and social impact
- Advance strategic cluster-driven water faculty hires and mentor new water faculty
- Launch a Visiting Water Scholar program
- Catalyze convergent water research through Seed and *H2GO!* Grant programs
- Develop a vibrant Penn State Water Community through events, such as guest lecture, seminar, and film and discussion series, an annual water faculty meeting and water festival
- Stand up an interdisciplinary and cross-college water graduate degree program and support the emerging water student organization
- Initiate undergraduate water opportunities, such as water REUs, with focus on students of color and from under-represented communities.
- Support utilization and coordination of University-wide water research lab facilities and field sites
- Develop and strengthen strategic partnerships with industry, academia, public sector, and civil society
- Establish an external advisory group for the Water Consortium

- **Penn State Water innovations are expressed through public policy and social impact**, benefiting public health, improving the environment, advancing water security and social equity and justice, and strengthening community resilience.
KPI: faculty are engaged on water and water-related topics with local, state and federal officials, such as through community-based projects, briefings, white papers, consultations, press coverage, and publications on policy, socioeconomics, and culture.
- **Penn State is a 21st century leader in water and water-related education**, founded upon traditional discipline-based instruction, complemented by unique interdisciplinary programs, energizing extracurricular student opportunities, and an engaged and diverse student body.
KPI: new interdisciplinary water graduate degree program is established and thriving; new water oriented REUs are established and thriving; water student organization is established and active; students of color and those from under-represented communities are engaged across undergraduate and graduate water opportunities.
- **Penn State is home to a diverse and vibrant Water Community with active partnerships**, that elevates Black, Indigenous, People of Color (BIPOC) and otherwise under-represented communities, and fully engages leaders of industry, other academic institutions, the public sector, and civil society in addressing grand water challenges.
KPI: Water Council and broader Consortium are active, with engagement across diverse disciplines and University units; BIPOC faculty and students are increasingly represented within the Penn State Water Community; Water-related events and activities consistently address topics of justice and equity; Penn State Water external partnerships are energized, productive, and diverse; Active and diverse Penn State student opportunities are available through our water partnerships, such as internships and industry-supported research.

Investment and Risk

Given the scope, scale, and complexity of water challenges, the Water Consortium is envisioned to become a signature example of Penn State’s interdisciplinary excellence. As described above, the Water Council will identify and synthesize Consortium priorities in an annual *Water Action Plan* and develop an associated budget to be advanced through IEE in coordination with contributing colleges and units. Efforts and focal areas beyond five years will be guided by performance reviews at the end of years 2 and 5.

There are risks and uncertainties associated with launching this Consortium. One uncertainty relates to its governance structure, as this democratic model has not been attempted previously at Penn State. For example, there is some risk of “faculty fatigue” and a drop-off in meaningful faculty engagement that could challenge the long-term viability of the Consortium. However, the most immediate risk is from the potential to lose existing momentum. Since 2018, water faculty have invested themselves in signing on to, designing, and advancing this model of a Water Consortium. Presently there is tremendous energy within the 180-strong water faculty and a highly motivated leadership body of the Water Council and Director laying groundwork for priority initiatives. The Penn State Water Consortium is poised for accelerated advancement. **Required now are formal recognition of the Consortium and catalytic funding to support strategic Consortium initiatives over its initial years of implementation.** These actions will further energize current and attract new water faculty and students, galvanize faculty participation in the Consortium, and help secure important early Consortium wins that will bolster its potential to become self-sustaining and have long and lasting impact.