Nutrient Sensor Challenge

FREQUENTLY ASKED QUESTIONS

Last revised: September 20, 2015

I am currently registered as a participant in the Nutrient Sensor Challenge. Do I need to apply again to participate in verification testing?

Yes. Applications for verification testing are required from all prospective participants, including those already involved in the Nutrient Sensor Challenge.

I did not register as a participant in the Nutrient Sensor Challenge during the original call. Can I still apply to participate in final Challenge verification testing?

Yes. Applications for verification testing can be submitted by all interested parties, regardless if you have already registered for the Nutrient Sensor Challenge or not.

When will we know if our team's sensor has been accepted into verification testing?

Participants will be informed by January 2016 of their acceptance into verification testing. A protocol development workshop will be held in February 2016 to refine and finalize protocols for lab and field-based verification testing.

What are the pilot opportunities? Are they new? Can anyone participate?

The pilot opportunities are being developed as a post-verification testing stage of the Challenge to highlight and showcase sensors that perform well working as parts of integrated systems and in unique environments/applications. Development of these pilot opportunities has been in response to the excellent response the Challenge organizers have received from colleagues and interested potential

users. Sensors that perform well in verification testing and/or may be especially well-suited for specific environments/applications will be eligible to collaborate with piloting partners following conclusion of the Challenge. More details on opportunities will be made available to Challenge participants at a later date, including the availability of any funds to support these activities.

I am unsure how best to estimate the "Estimated Consumer Price" required in the Application for Verification Testing.

This information should be based on the materials used to construct the sensor, expected number of units produced (i.e. 50-1,000), and any business models applicable to your team/company. We understand this is an estimate and is not binding; however the selection process may take into account how realistic these estimates are given the Bill of Materials also required in the application.

My sensor is still in prototype stage and likely cannot be deployed for longer than a day of measurements. Should I still apply for verification testing?

You are welcome to apply. However, a maximum of 8 N and 8 P sensors will be selected from the applications for verification testing, so it is likely that other applicants with more mature technologies may be accepted should space become limiting. You should also bear in mind that reports from verification testing will be made public via ACT, so it may be in your best interest to invest more time to maturing your prototype and engaging in more rigorous testing activities in the future.

I've been hearing a lot about Market Efficiencies, Visualization, etc. in association with the Nutrient Sensor Challenge. Do we need to be developing new business models or data analysis/visualization techniques to be successful in the Challenge?

The related efforts you hear about are being led by some of the Challenge organizers, colleagues, and champions. You do not necessarily need to be involved in these efforts to succeed in the Challenge, however we encourage innovation in all aspects of nutrient sensing and monitoring.

Are open data standards or methods required for sensors participating in the Challenge?

Not necessarily. However, we encourage innovation in all aspects of nutrient sensing and monitoring, and open data initiatives are seen by many as fundamental to the advancement of technology and information. As such, sensors that incorporate open data standards and/or are easily integrated into existing sensor networks may be seen as more innovative and rewarded accordingly by the independent panel of judges.

Does my sensor need to provide real-time, continuous data delivered via telemetry during verification testing?

Not necessarily. However, there may be some advantage to receiving information on sensor performance in real-time to minimize any potential down-times. Also, easy integration of telemetry may be seen and innovative and rewarded accordingly by the independent judging panel.

What is nutrient pollution?

Nutrients are essential for ecosystems and the production of food and livestock feed. However, excessive levels of nutrients – nitrogen and phosphorus – can harm our health, our environment, and our economy. Events in Ohio in August 2014 again highlighted the potential harmful impacts of nutrients in water, and the resulting harmful algal blooms, on drinking water supplies and public health.

Why are next-generation sensors important to managing nutrient pollution?

Nutrients exist in a variety of forms and vary with space and time in aquatic ecosystems. Current methods for detecting and measuring nutrients do not capture this complexity and are expensive. We need more data to inform decisions to reduce nutrient loads on land, in the air, and in waterways. Affordable, accurate, and reliable sensors would help us improve measurement; expand monitoring and forecasting of nutrients in lakes, rivers, streams, estuaries and coastlines; and track progress.

Where can I learn more about nutrient pollution?

http://oceanservice.noaa.gov/facts/nutpollution.html

http://www.unep.or.jp/ietc/publications/short_series/lakereservoirs-3/3.asp

http://www.fws.gov/chesapeakebay/nutrient.html

www2.epa.gov/nutrientpollution

What is the Nutrient Sensor Challenge?

The Challenge aims to accelerate the development and adoption of affordable, accurate, reliable nutrient sensors in water. The Challenge will mobilize markets and provide laboratory and field verification for sensor prototypes. The first phase of the Challenge will include no-risk beta testing of sensors, and the second phase will revolve around laboratory and field verification at several field sites around the United States. Verification results will be made public.

Is the Challenge only for sensors that measure nutrients in water?

The Nutrient Sensor Challenge is focused on sensors to better monitor nutrient concentrations in water. However, several complementary efforts are being led by Challenging Nutrients collaborators. Tulane University is preparing to launch a $1 million prize competition to incentivize development of in-field sensors measuring nutrients in either soil or plants themselves (http://tulane.edu/tulaneprize/waterprize/). In addition, the Everglades Foundation is launching a multimillion-dollar Grand Challenge in early 2015 to stimulate development of processes to remove excess phosphorus from waterways and recycle it into the phosphate needed for growing the world's food supply (http://www.evergladesfoundation.org/grandchallenge/).

Why is the Challenge only for measuring soluble nutrients instead of total nitrogen and total phosphorus?

The analytical methods required to measure total nitrogen and total phosphorus at present (e.g. use of acids, heat, high pressure, etc.) limit those parameters from being measured *in situ* by sensors. However, there is great interest in sensors that would measure these compounds and the Nutrient Sensor Challenge strongly encourages such innovations.

What will be the result of the Challenge?

The goal is to spur the commercial production of accurate, reliable, affordable nutrient sensors that will meet user needs and be available for purchase by 2017 by an identified, mobilized market of community organizations, states and federal agencies, and researchers.

What types of organizations are expected to be the market for these next generation sensors?

There is currently a wide array of organizations investing in nutrient sensors, including academic researchers, federal and state monitoring agencies, drinking water and wastewater treatment facilities, nonprofit and non-governmental monitoring groups, and private sector entities. It is expected that the more affordable, accurate, and reliable sensors will stimulate use, especially in sectors that are constrained by budgets but have strong drivers for better nutrient monitoring.

How will the data from these sensors be used?

The data from these sensors will be used for a variety of purposes, including monitoring and basic research on nutrient dynamics in aquatic ecosystems, trends assessments in impaired or target waterbodies, and evaluations of mitigation or restoration efforts.

Who will own/use the data collected from these sensors as part of the Challenge?

Data ownership will be solely determined by the owners and users of the sensors themselves and will not be influenced by the Nutrient Sensor Challenge organizers or collaborating organizations.

What is the prize for this Challenge?

This Challenge follows a highly successful model called "market stimulation" that has been demonstrated by both the U.S. Department of Energy and the Environmental Defense Fund. The non-monetary incentives for developers who submit sensors include third party laboratory and field testing, publicity throughout the Challenge, and characterization, quantification and mobilization of the market for these next-generation sensors.

Who can participate in the Challenge?

The Nutrient Sensor Challenge is open to global developers of nutrient sensors. Existing companies, research groups, and independent innovators are all encouraged to participate. We also encourage teamwork and collaborative efforts between multiple individuals or groups. Employees of federal agencies must abide by their employers' policies for participating in a challenge or prize competition. Members of the Technical Advisory Committee and/or Judging Panel, and their immediate family members, may not participate in the Challenge.

I'm a developer, and I'd like to submit my sensor for the Challenge.

Visit www.nutrients-challenge.org to register and to learn more about this opportunity to showcase your innovation.

I'm a developer, but I don't know if my sensor will perform well over a long field deployment.

The Challenge welcomes and encourages all innovations through the beta testing phase. The no-cost, no-risk beta testing phase (summer-fall 2015) was designed specifically to encourage participation from all developers to assess the performance of their own instruments under "real-world" conditions similar to those to be employed in final verification testing. Data from beta testing will not be reported or publicly released and as such will allow developers of promising new technologies to continue to innovate while gaining visibility and networking with leading sensor manufacturers. Although there are rather high expectations for field deployment length in the final verification testing phase, the Challenge wants to encourage and draw attention to all innovations in the field of nutrient sensing.

I'm a developer and just want to be a part of the beta testing portion of the challenge. Is this possible?

Yes, we encourage developers of promising new technologies to participate in beta testing and take advantage of these opportunities to network with other participants.

Will the reports from verification testing include cost information?

Proprietary information and confidential business information, including instrument components and costs, will not be included in the published individual Alliance for Coastal Technologies (ACT) technology evaluation reports for each sensor following verification testing. However, non-detailed information on cost estimates may be included in announcements of the winning sensors.

My organization would be interested in purchasing sensors if they met our specifications.

Visit www.nutrients-challenge.org to learn more about how sensors developed through this Challenge will let you cost-effectively measure and track nutrients and provide better data to evaluate nutrient management approaches. The website also offers an opportunity to share how you/your organization would use these sensors and how many you might be interested in purchasing.

Who supports this effort?

The Nutrient Sensor Challenge is supported by Challenging Nutrients, a coalition of federal agencies, universities, and non-profit organizations. Challenging Nutrients is coordinating innovative approaches to develop a suite of effective and affordable sensors to measure nutrients in water and soil. The coalition was convened by the White House Office of Science and Technology Policy and includes the U.S. Environmental Protection Agency, the National Oceanic and Atmospheric Administration, U.S. Geological Survey, National Institute of Standards and Technology, Tulane University, the Everglades Foundation, and ACT.

What do federal agencies gain from hosting this Challenge?

Information from this suite of sensors will help improve our basic scientific understanding of a critical environmental issue; increase the effectiveness and reliability of management decisions; efficiently manage nutrient use to optimize crop yields; quantify the effectiveness of practices designed to reduce nutrient runoff; support nutrient trading markets by reducing uncertainty; and better measure, model, and manage nutrient levels, hypoxia, and algal blooms.

Will the sensors that are developed through the Challenge be EPA-approved methods?

Approval or certification of new technologies is not explicitly a part of the Challenge. However, data from third-party verification testing, which is part of the Challenge, may serve as a foundation for future instrument approval or certification.

The cost to purchase a sensor is only one component of the total cost. How is the Challenge addressing total cost of ownership?

The Challenge has designed the final verification testing phase to partially account for usability by 1) requiring reasonably trained technicians to prepare the sensors for deployment in a limited timeframe and 2) testing sensors in the field for periods of one to three months. This is based on the understanding that sensors that are easily prepared by a technician and reliably collect data for the full length of deployments represent sensors with greater ease-of-use and, therefore, with lower costs of operation and maintenance. Participants will also be asked to provide estimates for annual operations costs to consumers, a technical guide, and a description of expected effort and expected sensor lifetime in the Application for Verification Testing. This supplementary information will be available to the Judging Panel to consider in making its recommendations.

Won't retail sensor costs be much higher than the costs associated with the Bill of Materials?

While the goal of the Challenge is to stimulate the development of sensors that will cost less than $5,000 USD to the consumer, there is no robust way to gauge this within the timeframe and context of the Challenge. Therefore, the Bill of Materials is being used as a proxy to represent the base component costs to produce a prototype. Should a large number of sensors qualify to participate in verification testing, the Bill of Materials may be used to limit participation to 16 sensors (8 nitrate; 8 phosphate) as a way to ensure that the most promising <u>and</u> most affordable sensors are evaluated. Additional questions in the Application for Verification Testing (see below) will gauge the expected cost to consumers given two levels of volume-based production, and this information will be available for the Judging Panel to consider in its recommendations.

A Bill of Materials doesn't take into account volume-based purchasing of components. Does this matter to the competition?

Yes, this of course an important factor in determining the final cost to consumers of any sensors developed in the Challenge. Cost savings associated with production of sensors at higher volumes are expected. As such, participants will be asked to provide estimates for consumer price if (a) 50 and (b) 1000 units were produced in the Application for Verification Testing, and this information will be available to the Judging Panel to consider in making its recommendations.

Do sensors all have to be compatible with a specific system?

The Challenge is not specifying a datalogger or deployment system with which the sensors must be compatible. However, the Bill of Materials submitted in the Application for Verification Testing and verified prior to testing must include, as two components, both the sensor and any system requirements needed for three-month, unattended deployment. Additionally, information about data communication protocols and use of data standards will be included as part of the technical guide submitted prior to verification testing. Information on compatibility with accepted, existing standards will be available to the Judging Panel to consider in making its recommendations.

What if no sensors meet all of the target nutrient sensor features?

Awards for first, second, and third place will be given to the top performers in the nitrate and phosphate categories, regardless if all features are met. For example, if no sensor can be deployed for three months during verification testing, the sensors with the longest deployment times will still be considered for awards.

What are the protocols for beta testing?

Details on beta testing, including how and when samples will be collected, handled, and analyzed, will be released to participants in June 2015. Details on sites and exact timing will also be publicized at that time.

What are the specific protocols for verification testing?

Draft protocols for verification testing will be available on the Nutrient Sensor Challenge website by ___ and discussed and refined at the Protocol Workshop in February 2016. The purpose of that workshop will be to build consensus among participants around the detailed testing protocol, which will be laid out in the Final Verification Plan. Participants will be required to sign an Agreement to the Final Verification Plan in order to continue to the verification testing phase.