Northwest **Power** and **Conservation** Council

October 5, 2022

MEMORANDUM

TO: **Council Members**

FROM: **Leann Bleakney, Energy Policy Analyst**
Oregon office

SUBJECT: **Presentation by Dr. Ted Brekken, OSU**

BACKGROUND:

Summary:

Dr. Ted Brekken, Professor in Energy Systems at Oregon State University, will talk with the Council regarding research the university has initiated regarding the integration of fast-acting energy storage into traditional hydroelectric units for improved response and stability. The research is focused on ultimately improving system performance of the hydroelectric units for increased greater operational flexibility, particularly when it comes to integration with renewable power.

This is new work, made possible by a US Dept. of Energy grant. Researchers at OSU are working in cooperation with colleagues at the University of Utah as well as the U.S. Army Corps of Engineers.

Presenter:

Ted K.A. Brekken is a Professor in Energy Systems at Oregon State University. He received his B.S., M.S., and Ph.D. from the University of Minnesota in 1999, 2002, and 2005 respectively. He studied wind turbine control at the Norwegian University of Science and Technology in Trondheim, Norway in 2004-2005 on a Fulbright scholarship. His research interests include control and modeling of renewable energy

systems and electrical system resilience. He is co-director of the Wallace Energy Systems and Renewables Facility (WESRF). He has received an NSF CAREER award, the IEEE Power and Energy Outstanding Young Engineer award, and numerous teaching awards.

Background:

This is a transcript of a KGW TV story about this project that aired on July 9, 2022.

CORVALLIS, Ore. — More and more, how we get our electricity is critically important. And there are a lot of reasons for that, from increasing needs to climate change. As a result, researchers at Oregon State University are looking at how to make systems more efficient and flexible — and they've got a federal grant to do it.

In the Pacific Northwest, hydropower has long been the top source of renewable energy. The Columbia River Basin leads the nation in hydropower production. But hydropower is not without its downsides for rivers, fish and other animal habitats. And the dam and power generation system, despite updates, is 100-year-old technology.

So part of the OSU research is to revisit hydropower plants and figure out what can be done to bring them into the modern age. " ... and see what we can do to make them more flexible so that they play well together, and we leverage that capacity with some of the modern sources we have by using some storage that we have called 'super capacitors' — so that's short-term energy storage," said Eduardo Cotilla-Sanchez. Cotilla-Sanchez is an associate professor of engineering and computer science, and one of three OSU faculty on the project, helped by three graduate students.

The team is looking at hydropower storage improvements and how to make the entire electric grid system more flexible as it receives more power from solar and wind generation. It's a big job.

"The power grid is the largest machine ever created by humans, so it is very tricky to do research when we need the grid to be connected to it right now," said Cotilla-Sanchez.

Researchers look to prototypes and computer-generated models to do a lot of the research work. Over the next three years they hope to find advancements large and small that can make a difference over the next five to ten years and have lasting impact for decades to come.

"I think the idea is to try to get the most out of the resources that we have locally. And locally is the cheapest that we can do in order to transport electricity — because if we send it far then we have a lot of losses," Cotilla-Sanchez said.

OSU's work is covered by $1.9 million in U.S. Department of Energy grants, part of a total $8 million in grant money for the project. Other entities involved in the larger project include researchers at University of Utah and the U.S. Army Corps of Engineers.