MINUTES
Joint Meeting Between the Boards of Regents of
Washington State University and the University of Washington
November 27, 2015

The Boards of Regents of the University of Washington and Washington State University held a special meeting, beginning at 9:15 a.m., in the Jim Houston Boardroom at Husky Stadium. The notice of the special meeting was provided appropriately to the public and the media.

Present from the University of Washington (UW): Regents Pat Shanahan (Vice Chair), Joanne Harrell, Vanessa Kritzer, Constance Rice, Rogelio Riojas, Orin Smith; and the University President, Ana Mari Cauce.

Present from Washington State University (WSU): Regents Ryan Durkan (Chair), Ted Baseler, Scott Carson, Harold Cochran, Laura Jennings, Lura Powell, Ron Sims, Jansen VanderMeulen; and the Interim University President, Dan Bernardo.

1. **Opening Comments and Introductions.** Regent Shanahan invited each Regent to introduce himself or herself and pointed out that the Regents from the two Universities were seated inter-mingled around the table.

Following introductions, he invited President Cauce to provide brief remarks.

UW President Cauce welcomed everyone and said in the spirit of Thanksgiving, she wanted to thank the UW Regents for appointing her as President and to thank the WSU Regents for attending the meeting. UW President Cauce stated that she and WSU Interim President Bernardo worked together as Provosts of their respective Universities at the same time, and that it is wonderful to continue the tradition of partnering. She expressed her appreciation to Professors Liu and Schwartz for attending the meeting to share their research, and said that together WSU and UW are doing “fabulous work.”

UW President Cauce thanked Governor and Trudi Inslee for their support of higher education and energy policy. She offered her personal thanks to the Governor for his recent newspaper editorial in which he welcomed refugees to the state. As a refugee from Cuba, and a naturalized citizen, UW President Cause has experienced the freedom to prosper offered by the United States.

She took a moment to remember, and acknowledge the accomplishments of, WSU President Elson Floyd, who died in June of this year.
UW Regent Shanahan welcomed the Governor and Mrs. Inslee and thanked them for attending.

Governor Inslee said he has the best job in the world. He echoed UW President Cauce’s comments about missing Elson Floyd. He was excited about the faculty presentations from two great research institutions stepping up to the plate with their research. He thanked leaders for recognizing the importance and necessity of research and development. Policy, he said, doesn’t mean anything without research. UW and WSU are two of the finest places for research in the entire world.

2. Presentations: Innovative Research at WSU and UW

UW Regent Shanahan said the great problems of the world are solved by knowledge and collaboration. He introduced the two Boeing Professors—Chen-Ching Liu from WSU and Daniel Schwartz from UW—and invited them to present their innovative research. Presenter bios and presentation slides were distributed and are attached to the minutes.

*Leading the Way in Smart Grid*
Chen-Ching Liu, Boeing Distinguished Professor of Electrical Engineering; Professor, School of Electrical Engineering and Computer Science; and Director, Energy Systems and Innovation Center, WSU

*Accelerating Our Clean Energy Future*
Daniel T. Schwartz, Boeing-Sutter Professor of Chemical Engineering and Director of Clean Energy Institute, UW

During the discussion following the presentations, Regents commended the strong collaboration between UW and WSU and a variety of other partners in industry and government.

3. Discussion: Gubernatorial Priorities, Governor Jay Inslee

UW Regent Shanahan invited Governor Inslee to make remarks. The Governor said, “Things are great.” He cited two issues of importance:

1) **Energy Research.** After hearing presentations about UW’s Clean Energy Institute and WSU’s Smart Grid work, he envisions the two research institutions as “giants” in the world ecosystem of research and development in clean energy. He projects a high demand for this information. He believes there will be a transformative challenge and economic opportunity as fossil fuel is replaced by renewable energy sources. Washington, he said, is the perfect place to do this because of its unique ecosystem–
Building on hydropower, materials science, and government support. The Governor pledged to look for opportunities to grow the research and asked Regents for their support. Currently, the use of clean energy faces challenges including how to manufacture lower-cost solar cells and how to maximize storage to integrate renewable energy sources. Washington is leading in both of those intellectual challenges.

2) Labor Relations. Some UW and WSU employees are interested in becoming organized and represented by labor organizations. Governor Inslee expects this will present associated challenges and opportunities and suggested the decision whether or not employees are to be represented by a bargaining unit be left to the employees. He hopes Regents and administrators will honor this individual decision-making.

Governor Inslee gave a brief report on the state’s financial situation. A task force is making good progress, including bipartisan discussion, regarding the Supreme Court decision requiring funding for education. In the next few weeks, he hopes to see an agreement on a plan to provide a framework to present to the legislature early in the next session.

Governor Inslee expressed no predictions for the day’s game, but said he would be proud to present the Apple Cup to either University.

In the spirit of Thanksgiving, WSU Board Chair Regent Durkan added remarks thanking the UW leaders and the Governor for attending the memorial for Elson Floyd. It was, she said, a very difficult time. She acknowledged Interim President Dan Bernardo, and said he has done a fabulous job for WSU. She gave a brief update on their presidential search. Recently they completed twenty-two listening sessions throughout the state. Regent Mike Worthy is serving as Chair of a twenty-five member Search Committee, which includes three Regents. The Committee is in the process of completing a job posting, serving as a statement of opportunities and challenges for the position. Regents are optimistic about finding the right fit, acknowledging Elson Floyd left big shoes to fill but also left WSU in a great place. She congratulated UW’s Board on completing a successful search with the terrific appointment of President Cauce. She thanked UW for its hospitality.

UW Regent Shanahan thanked the Governor for attending the meeting and for his hard work and leadership. He believes if the two Universities continue to partner and collaborate they will find solutions to the “wicked” problems they face.
4. **Adjourn:** UW Regent Shanahan adjourned the meeting at 10:20 a.m.

Approved by the Board of Regents at its meeting held January 29, 2016, on the WSU Vancouver Campus.

**SIGNED COPY AVAILABLE IN THE PRESIDENT’S OFFICE**
Chen-Ching Liu

Dr. Liu is Director at Washington State University's Energy Systems Innovation Center and is a Boeing Distinguished Professor of Electrical Engineering. Liu is a Fellow of the Institute of Electrical and Electronics Engineers. He is an international leader recognized for his pioneering contributions to the development of decision support systems for power systems. Dr. Liu received his Ph.D. from the University of California, Berkeley, and has held academic and administrative posts at the University of Washington, Iowa State University, and University College Dublin. He is a recipient of the IEEE PES Outstanding Power Engineering Educator Award in 2004. Dr. Liu is a member of the U.S. National Academies Board on Global Science and Technology.

Daniel T. Schwartz

Daniel Schwartz is the Director of the Clean Energy Institute and is currently Boeing-Sutter Professor of Chemical Engineering at the UW. He received his Ph.D. in Chemical Engineering from the University of California, Davis in 1989. Prof. Schwartz is a Fellow of the Electrochemical Society and has been recognized for his contributions by awards from the NSF, DOE, ECS, and others. He served on the Technical Advisory Board for the State’s Energy Strategy and is a current board member for the Washington Clean Tech Alliance. His research explores transport and reaction in electrochemical systems, including the performance of complex electrodes used in energy storage and conversion.
Leading the Way in Smart Grid

Chen-Ching Liu
Boeing Distinguished Professor
Director, Energy Systems Innovation Center
Washington State University, Pullman

UW-WSU Boards of Regents Meeting, Nov. 27, 2015
Energy Systems Innovation Center (ESIC): Smart Grid in a Societal Context

WSU: A Top Power Program in U.S.

Dave Bakken, Professor
Anjan Bose, Regents Professor
Chen-Ching Liu, Boeing Distinguished Prof
Robert Olsen, Professor
Mani Venkatasubramanian, Professor

Carl Hauser, Associate Professor
Ali Mehrizi-Sani, Assistant Professor
Anurag Srivastava, Associate Professor
Adam Hahn, Assistant Professor
Saeed Lotfifard, Assistant Professor
Tosh Kakar, Clinical Associate Professor
Anamika Dubey, Assistant Professor (SP2016)

with Additional 21 Faculty in Allied Disciplines
WSU’s Smart Grid Research

- Self-healing & resilient grids
- Wide-area monitoring & control
- Wide area real-time secure communications
- Cyber security
- Economic and sociological issues
- Renewable energy, smart meters
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Industry Collaborations

Alstom Grid
Avista
Bonneville Power Administration
Hyosung, Korea
Idaho National Lab
Itron
Pacific Northwest National Lab
Puget Sound Energy
Snohomish County PUD
Wuhan University (China)
Close collaboration: Tsinghua University, China

ESIC Members

Avista
Alstom Grid
Benton County PUD
Cowlitz County PUD
Grays Harbor PUD
Lewis County PUD
Pend Oreille County PUD
Potelco
Power Systems Consultants
Puget Sound Energy
Tacoma Power
Chelan County PUD

Power Engineering Partnership

- WA/DoE Transactive Energy Systems (PNNL-WSU-UW) /Battery $1.49M
- NSF Resilient Independent Infrastructure $1.26M
- NSF Cyber-Physical Systems $1.1M
- UC-LBNL Oscillation Monitoring System $1.14M
- DoE/UIUC Cyber Resilient Energy Delivery $1.76M
- Murdock Smart City Testbed (w/Cost Share) $1M
- DoE/PNNL Resilient Distribution Systems $600K
- NSF S-STEM Smart Grid Scholarships $639K
Projected Graduate Enrollment

Projected Undergraduate Degree Program
WSU Smart City Testbed
Protection of cyber attacks by Anomaly Detection System
Monitoring of Power Grid Stability

- Phasor Measurement Units (PMUs)
  - Traditional real-time data: Every 2-4 seconds
  - PMU data: Time synchronized using GPS and 30-120 times per second
- Without PMU, stability status cannot be predicted in real-time.
- With PMUs, oscillations predicted with data in a time window.
Resilient and Smart Distribution Systems

- Integrated Volt Var Control (IVVA)
- Fault Detection Isolation and Restoration (FDIR)
- Extreme conditions: Use WSU microgrid, PV, and battery to serve critical load in Pullman when utility power is not available
PV on WSU campus has to generate 1 unit less electricity than is scheduled in the next 5 minutes.

I can reduce 1 unit usage for $90/unit.

I will buy from you 1 unit reduction for $90/unit.

I can increase 1 unit discharging for $100/unit.

Power Time
0

Power Time
0
Special Thanks

• State of Washington, Dept of Commerce
• Department of Energy/Pacific Northwest National Lab/University of Washington
• WSU Provost and VP Research Offices, Voiland College of Engineering and Architecture, School of EECS, ESIC Faculty and Staff
• M. J. Murdock Charitable Trust, Alstom Grid, Avista
• ESIC/PEP Industry Members
• Schweitzer Engineering Laboratories
• Other Contributors
Accelerating our Clean Energy Future

Daniel T. Schwartz
Director of the Clean Energy Institute
Boeing-Sutter Professor of Chemical Engineering
Scalable Clean Energy
A Grand Challenge, a Grand Opportunity
Foundations of a scalable clean energy future

Abundant & ubiquitous renewable resources

Made available when & where it is needed

Meshed with energy infrastructure, markets
Foundations of a scalable clean energy future

Abundant and ubiquitous renewable resources made available when and where it is needed

Led by a new breed of innovative scientists and engineers.

Meshed with energy infrastructure, markets
In our experience, the best opportunities are found when there is a real gravitational pull from existing activities.

- Brock Mansfield and Shelley Whelan, Partners, Keeler Investment Group
Acceleration Means: Integrating UW & Regional Strengths

Focus
- Materials & Devices
- Prediction & Control
- Manufacturing
- Systems & Operations

Molecules → Miles

#1 Impact

GLOBAL RESEARCH REPORT
MATERIALS SCIENCE
AND TECHNOLOGY

UNIVERSITY of WASHINGTON

Corporate, State Partners

Pacific Northwest
NATIONAL LABORATORY
Acceleration Means: Solar & battery “inks” from abundant materials

**Copper Ore (Chalcopyrite)**

**Zinc Ore (Sphalerite)**

**Tin Ore (Cassiterite)**

**Sulfur**

Printable CZTS Ink  Record Efficiency for non-toxic CZTS Solar Cell

Hugh Hillhouse Rehnberg Professor

**UNIVERSITY of WASHINGTON**
Acceleration Means: Breakthroughs in high volume manufacturing

Solar and Battery Inks

Devices made by printing inks

Devon MacKenzie
WRF Professor

IMPRINT energy
Acceleration Means: Safely squeezing more from batteries

![Graph showing Electrode Overpotential vs Charging Time]

- Optimal fast charger control
- Standard fast charger control

Venkat Subramanian
WRF Professor
PNNL Chief Sci.
Acceleration Means:
Preparing the next generation of leaders

Students need to understand wicked problems, those that are both socially and technically complex…which is why the focus on systems is so important.

- Dr. Ann McMahon, Director, Pacific Science Center
Acceleration Means:
Preparing the next generation of leaders
Acceleration Means:
Clean Energy Testbeds for Prototyping

Translating clean energy research ideas into promising technologies would benefit from more time spent in the nurturing university environment.

- Dr. Ron Howell, President and CEO, Washington Research Foundation
Acceleration Means:
Clean Energy Testbeds for Prototyping
Acceleration Means:
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Acceleration Means:
Clean Energy Testbeds for Prototyping
PNW: A Global Hub for Clean Energy Innovation

Anchored by materials innovations that drive novel new devices for solar electricity generation and energy storage.

Connections across regional strength in grid systems and operations raise all boats.

Developing global relationships with LG Chem, Panasonic, Waseda University, Tsinghua University, Sichuan Province, State Grid.

Leveraging State leadership with the Clean Energy Fund