

Energy, Information, and the New Work of Building Operations in the Digital Age

Letter of Intent - Campus Sustainability Fund

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My name is Daniel Dimitrov and I am a second year PhD student in the College of Built Environments at the University of Washington. My research interests are in sustainable facility maintenance and innovative sustainable technologies for building operations. I am writing this letter of intent with the hopes of receiving funding for my doctoral research project titled *Energy, Information, and the New Work of Building Operations in the Digital Age*.

Within the United States, buildings are some of the leading consumers of energy as they account for over 40% of the energy consumption nationwide (energy.gov), impacting both humans and the environment in which we live. On a campus as large and complex as the University of Washington, buildings vary in age and operation technologies making it difficult to manage the campus energy consumption and reach sustainability benchmarks. At the University of Washington, new digital twin/energy modeling technologies have been integrated into many of the University buildings, however it is very difficult to achieve energy efficiency if work practices and building operators do not change the way they do “work” around these new and more complex technologies. With an excess of data that can be used to increase campus sustainability coming from such technology, it is essential that we understand how to make this data actionable by the technicians and operators who are interacting with the technology regularly. The aim of this project is to understand how organizations/operations will need to change and adapt in order to leverage modern and advanced building automation systems, such as digital twin technologies/strategies, to achieve lower energy consumption and better performing built environments. An example of such a University building technology initiative that we would like to investigate is the UW energy meter monitoring program which aims to assist in achieving long-term carbon reduction goals, making this study timely and relevant to reaching the sustainable potential of the University.

This project seeks to understand the evolution of “work” with the implementation and use of technology promoting sustainable energy operations as the main driving force. Our team would like to develop a guideline or practice memo which can be used by managers with specific recommendations for things like training, team formation, technological guidelines, routine formation, and collaboration in order to accelerate the sustainable transformation of this university and help ease the burden of technological adoption. The traditional methods of data management in the facility maintenance sphere will need to change as modern technology calls for new methods of data collection, governance, and analysis in order to make data actionable for sustainable operations. The outcome of this project will guide operations managers in sustainable technology adoption and therefore address the needs and goals of reducing their facilities’ energy consumption and carbon footprint.

The research questions are outlined below:

1. How will the existing work (roles, responsibilities, teams, practices) change for facility managers/operators on the UW campus when transitioning from a traditional BAS to a modern energy management system to promote energy efficiency on campus?

2. What new work will emerge when transitioning from a building operated by a BAS to a modern energy management system such as a digital twin?

The University of Washington will serve as a perfect site for this study due to its abundance of campus buildings at different levels of technological implementation for sustainable energy management in addition to its extensive and active facility management teams. To complete this research we propose a series of case studies centered around UW facilities at different stages of technological implementation in order to compare older practices with new ones. Using a comparative case study strategy for this research will allow us to see and explore the organizational changes which will need to accompany a building that is managed using a modern energy management system and strategy. As part of this case study process we intend to use a qualitative approach including methods such as participant interviewing, participant observation, and document collection. Participant interviewing will focus on members of the facility management team including facility managers, technicians, University sustainability strategists, IT professionals, and any other facility operators. We would also like to leverage our professional network of building technology professionals from both the technology and management side of operations for interviews in order to validate our results and compliment our case studies. Participant observation will include spending time with the facility management/maintenance team and shadowing them for an extended continuum of time during their regular operations and meetings. Our team has already had the opportunity to speak to a facility manager at UW and have determined our proposed study to be very fitting to the University's current sustainable energy management position due to the general lack of organizational understanding and integration of modern energy management technologies being implemented on campus.

Our project team for this research study will be student led by me, Daniel Dimitrov, with the guidance of Prof. Carrie Sturts Dossick from the College of Built Environments. We will also be supported by the help of a UW graduate student from the Department of Construction Management in the College of Built Environments. This graduate student's role will be to support in interviewing, data collection, observation, and analysis. We intend to disseminate our adoption guideline/practice memo as well as our research findings to be used by the facility maintenance teams at UW as well as in industry and academic journal articles to build awareness of the research results. For examples of similar research led by our research lab please visit <https://cerc.be.uw.edu/ctop-lab/> , and focus on projects such as *Integrated Project Delivery: An Action Guide for Leaders*. Through this project partnership with the University of Washington, we hope to be able to fully immerse ourselves into the facility management sphere of the University and pinpoint just how the campus facility management organization needs to evolve how they do “work” in order to reduce the energy consumption of our campus buildings and utilize modern technologies to their full potential.

Thank you,

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