Environment and Natural Resources Trust Fund
2009 Phase 2 Request for Proposals (RFP)

LCCMR ID: 090-D1

Project Title: Options to De-carbonize Minnesota's Electrical Power System

Total Project Budget: $ $144,811

Proposed Project Time Period for the Funding Requested: July 2009 to January 31, 2011

Other Non-State Funds: $ $20,000.00

Priority: D1. Renewable Energy Life Cycle Costs and Impacts

First Name: Melisa **Last Name:** Pollak

Sponsoring Organization: U of M

Address: 154 Hubert H. Humphrey Center 301 19th Ave. S.
Minneapolis MN 55455

Telephone Number: 612-625-3046

Email: fryxx035@umn.edu

Fax: 612-625-3513

Web Address:

Region: Statewide

County Name:

City / Township:

Summary: This project will analyze the Minnesota Climate Change Advisory Group's greenhouse gas reduction recommendations related to electrical power from a life-cycle analysis perspective and also from a socio-political perspective.

Main Proposal: 1008-2-026-proposal-2009_LCCMR_EJW_SWS_MFP_9_30.doc

Project Budget: 1008-2-026-budget-Wilson RFP_2009_Project Budget-FINAL.xls

Qualifications: 1008-2-026-qualifications-PMqual&orgdescript.doc

Map:

Letter of Resolution:

Evaluation of Options to De-carbonize Minnesota's Electrical Power System: Life-cycle Technical and Socio-political Analyses

I. PROJECT STATEMENT

There is wide agreement that de-carbonizing Minnesota's electrical power system will require a portfolio of options, but choosing the composition of that portfolio depends on technical, institutional, regulatory, political, economic and social factors. The Minnesota Climate Change Advisory Group (MCCAG) submitted recommendations to the state legislature on a portfolio of emission reduction policies designed to meet the greenhouse gas (GHG) reduction targets of the 2006 Next Generation Energy Act. This project will analyze the MCCAG recommendations related to electrical power (including their assessment of the recently enacted renewable portfolio standard) from a technical perspective and also from a socio-political perspective, with the goal of providing information useful in the ongoing deployment of low-carbon electrical technologies in Minnesota from both technical and policy perspectives.

We will evaluate the following technologies:

- Renewables—Wind power, solar power, biomass
- Advanced combustion (high efficiency coal, biomass co-firing, carbon capture with pipeline CO_2 transport to out-of-state reservoirs)
- Nuclear power

II. DESCRIPTION OF PROJECT RESULTS

Result 1: Assessment of the MCCAG electrical sector recommendations using lifecycle analysis (LCA) **Budget: $ 72,405**

Life cycle GHG reductions and cost aspects will be analyzed mainly by reviewing literatures and on-going studies. For example, current photovoltaic (PV) technologies, require an electricity price of $0.25 – $0.30/kWh to recover installation cost, while wholesale electricity costs from the grid are currently $0.02 - $0.05/kWh. Therefore, in today's electricity market, the cost of solar must decrease by 10 times for PV to become economically competitive, and the same is true for other emerging technologies as well. However, over a life-cycle perspective, PV has some distinct advantages (air quality, carbon emissions, scalability, etc…). Using life-cycle cost estimates for renewable energy technologies, we will calculate the carbon price at which each low carbon energy technology could become competitive. From this figure we will explore policy options that could support or thwart technology deployment. Climatic, spatial and geographical constraints also influence MN's capacity to produce low carbon electrical power. For example, renewable energy takes generally larger land acreage per unit energy production as compared to fossil energy technologies, and the availability of land area in MN to support various renewable energy technologies will be reviewed.

Deliverables:

1. Summary of existing LCA and cost analyses on low carbon technologies in the electric power sector **Completion Date: January 31, 2009**

2. Assessment of the GHG reductions and cost effectiveness of MCCAG electrical sector recommendations from an LCA perspective. **Completion Date: June 30, 2010**

3. Assessment of MN's electrical power generation potential energy production potential from low-carbon technologies, including analysis of break-even carbon price that will make these technologies competitive **Completion Date: January 31, 2011**

Result 2: Development of socio-political map of low-carbon electricity deployment context for Minnesota **Budget: $ 72,405**

The socio-political analysis will be conducted using an analytical framework developed by Stephens et al. (2008). It will evaluate institutional, regulatory and legal, political, economic and social factors in Minnesota that influence choices in low carbon technology deployment.

- Institutional factors include characteristics of the current electric power infrastructure, use, projected demand, planned expansion market, and the interstate flow of electricity through the 11 Midwest Independent System Operator (MISO) states.
- Regulatory and legal factors include energy and environmental regulations (air, water, waste, and climate) interrelated with low carbon electricity technologies, as well as siting policies, and transmission issues.
- Political factors include the relationship between state and federal climate and energy policies, the existence of coalitions that support or oppose particular technologies, and the pressures of competing political priorities
- Economic factors include the benefits, costs and risks to local residents, potential for economic development, employment considerations, and impacts on important state businesses and industries.
- Social factors include the perception of technologies by key actors, the perceived fairness of risks and benefits, the public trust and past relationships with the electric power industry, and the potential impact on social groups and relationships.

Research will consist of reviews of law, regulations, and literature, as well as interviews with key actors involved with low carbon electrical technologies listed in section 1.

Deliverables:

1. **Assessment of socio-political factors that influenced MCCAG recommendations**
   Completion Date: June 30, 2010
2. **Socio-political map of low-carbon electricity deployment context for Minnesota**
   Completion Date: January 31, 2011

III. PROJECT STRATEGY AND TIMELINE

A. Project Partners
Elizabeth Wilson, Asst. Prof., Humphrey Inst. of Public Affairs: PI for socio-political analysis
Sangwon Suh, Asst. Prof., Bio-Products Bio-Systems Engineering: PI for lifecycle analysis and assessment of low carbon electrical energy potential
Melisa Pollak, Humphrey Inst. of Public Affairs: Lead Researcher/Project Manager
B. Project Impact: Incorporating life-cycle considerations and real and perceived policy challenges into a comprehensive study of the MN electricity sector will help to better identify opportunities and challenges for Minnesota in the transition to a low-carbon energy system, and develop appropriate policies and metrics.
C. Time: Two students will be supported at 50% time on this project and each professor will receive 1 month of summer salary. Researcher Pollak will manage report and paper production, and manage the project. Funding is required to support faculty, researcher and student engagement.
D. Long-Term Strategy This proposal builds on several ongoing efforts by the research team. Wilson and Pollak are involved in a Doris Duke Foundation project to develop a regulatory framework for carbon sequestration, Suh is involved in studying water use for biofuels production nationwide. This effort builds upon these projects and makes it specifically relevant to Minnesota and the Minnesota policy context.

Reference: Stephens, J.C., Wilson, E.J. & Peterson, T.R. 2008. Socio-Political Evaluation of Energy Deployment (SPEED): An integrated research framework analyzing energy technology deployment. Technological Forecasting & Social Change 75: 1224-1246

Project Budget

INSTRUCTIONS AND TEMPLATE (1 PAGE LIMIT)

(One page limit, single-sided, 10 pt. font minimum Retain the bold text and remove all instructions typed in italics. Add or delete rows as is necessary. If a category is not applicable you may write "N/A" , leave it blank, or delete the row.)

IV. TOTAL PROJECT REQUEST BUDGET

BUDGET ITEM *(See list of Eligible & Non-Eligible Costs, p. 17)*	**AMOUNT**	**% FTE**
Elizabeth Wilson (PI)--1 month of summer salary	$ 10,530	8%
Sangwon Suh (Co-PI)--1 month of summer salary	$ 10,124	8%
Melisa Pollak (Lead Researcher/Project Manager) - 28% time	$ 25,000	28%
Research Assistants (2 at 50% for 18 months)	$ 95,407	50%
Administrative support--to cover costs of grant administration and cost support	$ 2,000	
Equipment/Tools:	$ -	
General operating supplies (copy, telephone, etc.)	$ 1,250	
Travel--funds to cover in-state travel and mileage reimbursement for interviews	$ 500	
	$ -	
	$ -	
TOTAL PROJECT BUDGET REQUEST TO LCCMR	$ 144,811	

V. OTHER FUNDS

SOURCE OF FUNDS	**AMOUNT**	**Status**
Remaining $ From Previous Trust Fund Appropriation (if applicable): *How much Trust Fund money remains not spent or legally obligated from any previous Trust Fund appropriation for any directly related project of the proposing project, project manager, or project organization? Specify the appropriation.*	$ -	*Unspent or Not Legally Obligated*
Other Non-State $ Being Leveraged During Project Period: *Funds from the Doris Duke Charitable Trust project on the Regulation of Carbon Capture and Sequestration will work in tandem with explorations of CCS in Minnesota. This will help to cover M. Pollak's time.*	$ 20,000	*Secured*
Other State $ Being Spent During Project Period: *What additional state cash $ (e.g. bonding, other grants) will be spent on the project during the funding period? For each individual sum, list out the source of the funds, the amount, and indicate whether the funds are secured or pending approval.*	$ -	*Secured or Pending*
In-kind Services During Project Period: *What in-kind services will be provided during the funding period? List type of service(s) and estimated value. In-kind services listed should be specific to the project.*	$ -	
Past Spending: *List money spent or to be spent on this specific project, cash and/or in-kind, for 2-year timeframe prior to July 1, 2009*	$ -	

Project Manager Qualifications and Organization Description

Melisa Pollak

EDUCATION

Master of Science in Science, Technology and Environmental Policy
Humphrey Institute of Public Affairs, University of Minnesota, Minneapolis MN
Degree awarded June 2008.

Bachelor of Science in Geophysics
University of Minnesota, Minneapolis MN
Degree awarded 1983.

EXPERIENCE

Research Fellow, Humphrey Institute of Public Affairs, Minneapolis MN
Doris Duke Charitable Foundation project on regulation of carbon capture and sequestration.
June 2008 to present

- Comparison of Federal and State regulations for geological sequestration.
- Analysis of policy drivers influencing state level geologic sequestration regulations.

Research Assistant, Humphrey Institute of Public Affairs, Minneapolis MN
Doris Duke Charitable Foundation project on regulation of carbon capture and sequestration.
January 2008 to May 2008

- Summarized recent proposals for geological sequestration regulation from Europe, Australia and the US, as well as federal and state rules for siting and monitoring analogous activities in the U.S.
- Analyzed evolving U.S. regulations for geological sequestration.

International Risk Governance Council (IRGC) project on regulation of carbon capture and storage
February 2007 to January 2008

- Coordinated IRGC submission to the United Nations Framework Convention on Climate Change on carbon capture and storage in the Clean Development Mechanism.
- Wrote report summarizing IRGC's expert workshop on regulation of carbon capture and storage.
- Co-wrote IRGC's peer-reviewed policy brief on regulation of carbon capture and storage.

Intern, Great River Energy, Elk River, MN, June 2006 to August 2006

- Developed portfolio of options to stabilize greenhouse gas emissions while meeting demand growth.

Hydrogeologist, Minnesota Pollution Control Agency, St. Paul, MN, 1989 to 1991

- Oversaw cleanups of contaminated soil and groundwater at gas stations
- Streamlined relationship between regulators and regulatees

Geologist, Barr Engineering Company, Minneapolis, MN, 1985 to 1989

- Conducted field work, including soil borings, mapping, and geophysical surveys
- Planned and conducted geologic site characterizations
- Supervised construction of monitoring and cleanup systems