



UNIVERSITY of NEW HAMPSHIRE

Office of Sponsored Research
Service Building
51 College Road
Durham, New Hampshire 03824-3585
603.862.3564 Fax

March 20, 2009

Jack Ruderman
Director, Sustainable Energy Division
Public Utilities Commission
21 South Fruit Street, Suite 10
Concord NH 03301

RE: UNH Ref# 09-548

Dear Mr. Ruderman:

On behalf of the University of New Hampshire, it is my pleasure to endorse the attached proposal entitled "Tracking Progress: Analyzing Greenhouse Gas Emission Reductions," Cameron Wake, Project Director for UNH.

Please direct any questions regarding this proposal to my attention at the address below, or contact me by phone at 603-862-1942 or by email at dianne.hall@unh.edu. Your consideration is appreciated.

Sincerely,

Dianne Hall
Grant and Contract Administrator

Enclosure

UNIVERSITY OF NEW HAMPSHIRE



COOPERATIVE PROJECT PROPOSAL
TO
NH STATE SPONSOR: Public Utilities Commission

1. Cover Page

PROPOSAL SUBMISSION DATE: March 23, 2009

PROJECT TITLE: Tracking Progress: Analyzing Greenhouse Gas Emission Reductions

PROJECT PERIOD: May 1, 2009 – June 30, 2010

PROJECT DIRECTOR

Name: Cameron Wake

Title: Research Associate

Address:

UNH Climate Change Research Center
8 College Rd.
Durham, NH 03824

Phone: 862.2329

E-mail: cameron.wake@unh.edu

PROJECT ADMINISTRATOR

Name: Dianne Hall

Title: Grant and Contract Administrator

Address:

UNH Office of Sponsored Research
51 College Rd.
Durham, NH 03824

Phone: 862.1942

E-mail: dianne.hall@unh.edu

1.1 Program Title

Tracking Progress: Analyzing Greenhouse Gas Emission Reductions and Economic Impact of GHGERF Projects

1.2 Program Type

This is an information program that promotes energy efficiency, conservation, and demand response by tracking, analyzing, and reporting the results of projects funded by the GHGERF (Program Type 10), and scaling up the results to estimate the state wide impacts.

1.3 Program Summary

For every project funded by the GHGERF, Carbon Solutions New England (CSNE) proposes to: (1) track the energy savings, greenhouse gas emissions reductions, costs, and economic benefits in a secure online database; (2) independently verify the results; (3) provide baseline information (with semi-annual reporting) to determine the effectiveness of different types of projects funded by GHGERF and (4) “scale up” project-specific results to estimate the state wide energy efficiency potential and broader impacts on state greenhouse gas emissions and the state economy (including costs/benefits/job creation) of different types of projects.

1.4 Low Income Residential Customer Qualification

This program will support the cost-effectiveness of low income residential energy efficiency retrofits by highlighting effective retrofit practices and identifying practices that do not meet expectations and are ineffective. This information can be used by programs to inform low income residents and other concerning the benefits of the most effective and tested energy efficient retrofits. As this project evaluates GHGERF projects, the percentage of the proposed program resources devoted to low income residential customers will be equal to the percentage of GHGERF projects which serve low income residential customers.

1.5 Identification of Applicant Organization

Carbon Solutions New England (CSNE)
Institute for the Study of Earth, Oceans and Space, Morse Hall, 8 College Road
University of New Hampshire Durham, NH 03824
Type of entity: University
Main contact and contact info.
Dr. Cameron Wake
Tel: 603-862-2329
e-mail: cameron.wake@unh.edu

1.6 Identification of Subcontractors and Partners

A key partner will be the entity at the NH Public Utility Commission that oversees the GHGERF.

1.7 Authorized Negotiator(s)

Dr. Cameron Wake

Tel: 603-862-2329

e-mail: cameron.wake@unh.edu

Dianne Hall

Tel: 603-862-1942

E-mail: Dianne.hall@unh.edu

1.8 Projected Energy Savings

This program does not directly create energy savings. However, the information provided by this program can be used to identify and fund the most effective energy saving projects in the future and therefore indirectly could result in significant energy savings in the future.

1.9 Projected Greenhouse Gas Emissions Reductions

This program does not directly reduce greenhouse gas emissions. However, the information provided by this program can be used to identify and fund the most effective greenhouse gas emission reduction projects in the future and therefore indirectly could result in significant emission reductions in the future.

1.10 Length of Program

The expected life of the program is initially three years, with funding requested on an annual basis. This proposal seeks funding for the first year of the project.

1.11 Total program costs

\$139,945

1.12 GHGER

\$139,945

NOTE: As this program only indirectly reduces energy use and greenhouse gas emissions, we have not completed the "Cost Effectiveness Analysis" spreadsheet. The main goal of our proposal is to verify actual reductions in energy use and greenhouse gas emissions of all GHGERF funded projects and so one of the main outcomes of our efforts will be a verified cost effectiveness analysis for all projects.

2) Executive Summary

Any expenditure of public funds should have a system in-place for tracking the effectiveness of the expenditure for fulfilling program objectives. The State's Greenhouse Gas Emissions Reduction Fund (GHGERF) is to be used to support energy efficiency, conservation, and demand response programs as well as administrative costs. A system that provides energy efficiency Evaluation, Measurement & Verification (EM&V) services is essential to quantify the overall success of the GHGERF program and provide the data to identify the most effective individual projects. Evaluation is a critical part of any successful energy efficiency program, including the NH Core Energy Efficiency programs, and should therefore be considered as a necessary and valuable administrative cost.

CSNE proposes to provide these essential EM&V services by tracking and verifying the energy savings, greenhouse gas emissions reductions, costs, and economic benefits of every project funded by the GHGERF. This includes initial evaluation of all funded projects, tracking project progress, independently verifying the results, quantifying the atmospheric and economic impact of each project and providing baseline information (with semi-annual reporting) to determine the effectiveness of different types of projects. This also includes developing technical capacity and workflow protocols to help make the project evaluation process more efficient. All information will be loaded into a secure online database that will be made accessible to the NHPUC.

While this proposal includes basic EM&V services by CSNE, it also includes additional broader analysis that leverages the expertise of CSNE in integrated carbon reduction and economic cost/benefit analysis. This includes "scaling up" the project-specific results to estimate the state wide energy efficiency potential and broader impacts on state greenhouse gas emissions and state economy (including costs/benefits/job creation) of different types of projects. This scaling up analysis is of particular importance because it will allow us to use "real world" examples in New Hampshire to test and modify the assumptions we originally used to perform the emission reduction and economic impact analysis for the NH Climate Change Policy Task Force. These assumptions were spelled out in detail in four CSNE authored "*Approach and Assumption*" documents, one each for the Agriculture, Forestry, and Waste (AFW), Electrical Generation and Use (EGU), Residential, Commercial, and Industrial Building (RCI), and Transportation and Land Use (TLU) Task Force Working Groups and appear in an appendix in the recently released NH Climate Action Plan¹. These "*Approach and Assumption*" documents also appear the CSNE website (www.CarbonSolutionsNE.org).

Another aspect of our proposed project is the development an online database that serves data to both a secure internal (password protected) web site and an external project web site to report out the results of our analysis on individual projects (for

¹ NH Climate Change Policy Task Force (2009) *New Hampshire Climate Action Plan: A Plan for New Hampshire's Energy, Environmental and Economic Development Future*. NH Department of Environmental Services.
http://des.nh.gov/organization/divisions/air/tsb/tps/climate/action_plan/index.htm

NHPUC staff only) and to report out on the aggregated results of the projects with corresponding analysis (to the general public). This project evaluation website will therefore serve as an evaluation tool for the NHPUC as well as serving information to a variety of stakeholders regarding the carbon reduction and economic costs/benefits associated with different types of energy efficiency projects funded by GHGERF. Finally, this project will provide research opportunities for undergraduate and graduate students in data collection, analysis, and generation of decision relevant information regarding energy efficiency projects and will help educate the next generation of leaders to effectively address key issues in the low-carbon society of the future.

While this program only indirectly supports energy efficiency and the associated environmental and economic benefits, our proposed evaluation and information dissemination should be considered an essential and valuable component in the to the administration of the GHGERF program. The cost of this project is about \$140,000 for an entire year of effort which represents 1.0% to 1.5% of the range of income estimated from the first four auctions (\$9 - \$13 million; calculated by just doubling the estimate of income from the first two auctions). This is very competitive with the cost of evaluating the NH CORE Energy Efficiency programs by the state utilities which were 5.0% of the overall 2008 CORE program budget.

This program is expected to last for at least three years with this proposal only requesting the first year of funding. Proposal will be submitted in coming years requesting additional funding from future GHGERF RFPs. There are no other sources of matching funds. The program leverages the existing institutional capacity of Carbon Solutions New England and the University of New Hampshire. CSNE foresees the NHPUC being a key partner in the administration of this program and use of the data and analyses generated.

This is a project that can begin immediately. The project provides the necessary framework and tools for informed decision making that will serve to assist in selecting the projects in the future with the lowest cost to benefit ratio. This will provide decision relevant information to the NHPUC to help ensure that funds from the GHGERF are prudently and wisely invested to maximize the economic benefits to the public of the increased electricity costs of RGGI. Our ultimate goal is to be able to identify – through detailed data collection and analysis – the most effective set of projects that serve to reduce emissions while maximizing economic benefits and to use this information to encourage similar effective projects around the state and region.

3) Proposed Work Scope and Schedule

For every project funded by the GHGERF, Carbon Solutions New England (CSNE) proposes to: (1) track the energy savings, greenhouse gas emissions reductions, costs, and economic benefits in a secure online database; (2) independently verify the results; (3) provide baseline information (with semi-annual reporting) to determine the

effectiveness of different types of projects funded by GHGERF and (4) “scale up” project-specific results to estimate the state wide energy efficiency potential and broader impacts on state greenhouse gas emissions and state economy (including costs/benefits/job creation) of different types of projects. In summary, we propose to evaluate the effectiveness – in terms of greenhouse gas emissions and economic benefits – of all projects funded by GHGERF.

In addition, CSNE proposes to develop, host, and maintain a database-driven information system with a web-based access component to provide the results of our analysis of all of the energy efficiency projects funded through GHGERF. This system will serve as a centralized aggregation of project information and also provide easy access to the results of our detailed analysis. Types of data recorded in the database system will include proposed and actual energy savings, greenhouse gas emissions reductions, implementation costs, cost savings, estimates of jobs created, project type, and project location of all funded projects.

Initial efforts will focus on recording all GHGER funded projects into a central non-public database that maps funded projects to discrete, standardized data types, as well as evaluating the proposed energy savings, emission reductions, and costs/benefits. This will provide a tool for the NH PUC to summarize the potential impact of all funded projects. This system will serve as the first stage in a system to track the effectiveness and efficiency of funded projects in terms of energy savings, carbon reductions, and economic costs and benefits (including job creation benefits).

CSNE will next develop and utilize an energy efficiency Evaluation, Measurement, and Verification (EM&V) protocol in close collaboration with the NHPUC. This protocol will include, for each individual project, a review and analysis of all energy use and expenditures on an annual basis both before and after the project. Separate residential, commercial, and industrial building models will be developed to normalize energy consumption to allow for meaningful comparisons and to verify results provided by each project. This data will also be normalized for heating and cooling degree days and across demand requirements (such as square footage and variability in commercial production). The database system and the normalization models will be documented and public available via the project website.

CSNE will collaborate with the NHPUC in an ongoing manner to guide the data handling and analysis of the funded projects. CSNE will also hold update meetings as necessary with the NHPUC to keep the agency informed of the empirical progress of the program and to provide the opportunity for changes and refinements to the data collection, data monitoring, and IT systems.

We also plan to gather information from the regional effort driven by the Northeast Energy Efficiency Partnerships (NEEP; <http://www.neep.org/>) to standardize EM&V of state energy efficiency programs. NEEP is currently planning to develop these standards in a collaborative fashion during the summer and fall of 2009. CSNE will learn about these standards through discussion with NEEP staff and representatives

and refine the data collection methods of GHGERF funded projects to maintain compatibility with these standards. This will provide the opportunity for “apples to apples” comparison of New Hampshire’s project results with other Northeastern state energy efficiency programs.

CSNE will analyze and evaluate the carbon reductions and economic costs/benefits of each individual projects. Carbon emission reduction will be calculated by analyzing the before and after energy performance of buildings based on both thermal and electrical energy use and expenditures (provided to CSNE by the projects funded by the GHGERF) using standard methods we developed for our analysis for the NH Climate Change Policy Task Force. Implementation costs will also be obtained from each of the projects, as well as overall project expenditures (from the NHPUC). The economic benefits of reduced energy costs will then be directly calculated. Where appropriate, an economic multiplier will be used to estimate the broader economic impacts of cost savings and estimates of green jobs created. All economic costs/benefits analysis will follow the methods we developed for our analysis for the NH Climate Change Policy Task Force. The actual dollar and carbon savings of the projects as well as other economic benefits will be determined on a semi-annual basis. This information will be summarized in report form and entered into the secure online database This “real world” empirical data will be essential in informing future NH public policy initiatives related to energy efficiency expenditures in the future.

Annually, the CSNE team will scale up the progress of individual projects to estimate the impact of the different categories of energy efficiency initiatives at the state level. This will involve developing several scenarios based on the rate of implementation of energy efficiency projects across the state. This will help to inform the potential carbon dioxide reductions, implementation costs, cost savings, and employment impacts from these categories of projects within the State out to 2025. This information will be presented and discussed in a report provided to the NHPUC and presented on the project website. These analyses will build directly upon the analysis we have already completed for the NH Climate Change Policy Task Force.

All assumptions used in our modeling and analysis will be documented and available via the project website for comment and revisions to future modeling runs. We are committed to transparent analysis so that our assumptions are clearly spelled out. Results of the analysis will also be presented on-line in table format, carbon dioxide emission reduction "wedge" graphs, and graphs of emissions reductions versus economic benefits. In addition to the scheduled reporting of aggregated project data, CSNE staff will be accessible to address ad-hoc data requests and analysis requested by the NHPUC.

At all times in the collection, analysis, and presentation of project data, strict project privacy standards will be observed. These standards will be developed in collaboration with the NHPUC.

Project Schedule

May-June, 2009

Create a non-public database of funded GHGERF projects:

- a. Meet with NHPUC staff to discuss objectives and methods of proposed CSNE analysis and dissemination
- b. Input details of GHGERF funded projects including projected energy savings, greenhouse gas emission reductions, costs/benefits and other key project metrics listed in funded proposals
- c. Evaluate projected energy savings, greenhouse gas emission reductions, costs/benefits
- d. Collect by an interview process with grant recipients data on past energy use at project site (at least one year; preferably three years) for funded projects and input into the database
- e. Submit a summary report to the NHPUC

Develop project web site for internal (i.e., PUC, EESE Board) and external use.

Develop an Evaluation, Measurement & Verification (EM&V) protocol and other supporting procedures:

- a. Collect information on existing EM&V protocols (e.g., NH CORE Program and NEEP) to guide development of GHGERF protocols. The methodology will seek to be compatible with existing reporting to allow for meaningful comparisons.
- b. Develop additional protocols/procedures (e.g., data request protocol; privacy [confidentiality] policy for project-specific data).

End of June 2009

Convene a workshop at the NHPUC to review draft protocol, information system design, and consider additional data features.

Establish meeting schedule with NHPUC to discuss updates/changes/deletions to data collection process

July 2009

Finalize EM&V protocols with standards documentation. Submit semi-annual report (and presentation if desired). Integrate protocols and standards into GHGERF request for proposals as necessary.

October 2009

Begin discussions with NHPUC regarding development of version 2.0 of database with web-based access that utilizes the new EM&V protocol

May 2009 – April 2010

On-going evaluation and analysis function.

- a. Independent analysis by CSNE to verify numbers submitted in RFP process documents.
- b. Utility data and other data collection, and input into EM&V system
- c. Semi-annual reporting of aggregated project performance Includes specific report outputs to track NH Carbon Task Force action items
- d. Respond to Ad-hoc NH PUC and authorized party data requests
- e. Update project website to allow the public to view aggregated results of estimated costs/benefits of different types of energy efficiency projects
- f. “scale up” project-specific results to estimate the state wide energy efficiency potential and broader impacts on state greenhouse gas emissions and the state economy (including costs/benefits/job creation) of different types of projects
- g. Engage UNH undergraduate and graduate students in research and analysis on project.

March 2010

Submit year-end report

Submit proposal for Year 2 funding

Project Oversight, Quality Assurance Measures, and Financial Management

Dr. Cameron Wake, Director of CSNE, will provide oversight for the entire project, including oversight of energy, greenhouse gas emission, and economic analysis, report writing, presentations, database and web development, and financial management. He will be assisted in the financial management by Linda Tibbetts, business manager at the Institute for the Study of Earth, Oceans and Space.

Dr. Ross Gittell will provide oversight of the economic analysis and assist with report writing and presentations.

Matt Frades and Matt Magnusson will work closely together to integrate their respective analyses. Matt Frades will focus his efforts on analysis of energy use and greenhouse gas emission reduction, while Matt Magnusson will focus on the economic costs/benefits analysis. All data, assumptions, and results will be discussed by the entire team as the analysis progresses and during weekly team meetings.

The UNH Research Computing Center (RCC) will build and maintain the project web site and secure online database. RCC has worked extensively with CSNE to develop similar websites and databases.

4) Project Benefits

4.1 Reduce greenhouse gas emissions from all fuels used to provide electricity, heating and cooling in New Hampshire

This project does not provide direct reduction of greenhouse gas emissions. It is a supporting mechanism to evaluate the greenhouse gas emission reductions of GHGERF funded projects and place those results in a larger state-wide context..

4.2 Be cost-effective

As this program only indirectly supports the reduction of energy use and greenhouse gas emissions, we have not estimated the cost-effectiveness of this proposal using the Total Resource Cost suggested in the GHGERF RFP document. Rather, the cost effectiveness of this proposal is estimated by analogy. The cost of our proposed project is about \$140,000 for an entire year of effort which represents 1.0% to 1.5% of the range of income estimated from the first four auctions (\$9 - \$13 million; calculated by just doubling the estimate of income from the first two auctions). This is competitive with the cost of evaluating the NH CORE Energy Efficiency programs by the state utilities. According to the 2008 NH Core report (NHPUC Docket No. DE 07-106), total evaluation costs for all state utilities was \$939 thousand out of an \$18.7 million budget or 5.0% of the overall CORE program budget. We feel our proposed evaluation and information dissemination should be considered an essential and valuable component in the administration of the GHGERF program.

4.3 Reduce New Hampshire's peak electric load

This project does not provide direct reduction of peak electric load. It is a supporting mechanism to evaluate the carbon and economic impacts of projects that do reduce peak electric load.

4.4 Promote market transformation

This project supports the goal of market transformation by providing publicly available analysis of the effectiveness of energy efficiency projects at the local and state level. This information will highlight energy efficiency technologies that are effective in reducing greenhouse gas emissions and will be supportive of the goal of increasing the adoption rate of energy efficiency technologies.

4.5 Promote innovative technologies

Same as 4.4

4.6 Promote economic development

This program will provide 1 full time equivalent (FTE) job for a research analyst at the University of New Hampshire. This job will last for the duration that the project is funded through the GHGREF fund. However similar to 4.4, by highlighting real life economic costs and benefits of energy efficiency technologies in a publicly available format it is expected to spur increased development of the most effective energy efficiency projects and the associated economic activity.

4.7 Promote energy cost savings

Same as 4.4

4.8 Promote collaboration and provide useful information for future program evaluation and improvement

Project specific data will be measured and analyzed allowing for benchmarking of energy efficiency projects; this allows for an objective and unambiguous mechanism to track progress towards energy efficiency performance goals.

The information system we propose to develop to track GHGREF funded energy efficiency projects will provide for the collection and analysis of the performance of “real world” projects. This will include estimates of job creation and other direct and indirect economic impacts related to the project. Without accurate information and detailed analysis, it will be difficult for the State to quantify how well proposed project benefits match actual results. This information system will also allow for tracking of performance over time helping identify areas of energy efficiency opportunity and areas for improvement. This system will help the State identify the most cost-effective means for reducing the State’s consumption of fossil-fuel based energy sources.

This also includes scaling project specific, “real-world” data to the State level. This level of analysis will help guide State public policy initiatives by understanding the energy efficiency potential and also the economic cost and benefits (including “green job” creation) of different types of energy efficiency projects.

4.9 Otherwise be consistent with the public interest and the purposes of RSA 125-O:19. This section could include the identification of any other benefits of the program not otherwise addressed.

This project is also consistent with the intent of proposed goal *RCI Action 4.5 Create an Energy Efficiency and Sustainable Energy Systems Web Portal* from the NH Climate Action Plan to increase adoption of energy efficiency products & technologies. This project will create a web-based clearinghouse of NH energy efficiency statistics from GHGREF funded projects. This will serve to increase public awareness of the costs and benefits of energy efficiency projects helping to accelerate the adoption of energy efficiency products and technologies. The portal will serve a range of specific New

Hampshire audiences, including local energy committees, city and town managers, business owners, industrial and commercial facility managers, and residents.

5) Measurement and Verification

This proposal actually seeks to provide Evaluation, Measurement and Verification services of all funded GHGERF programs. As such it meets Criteria #6 set forth in Puc 2604.03 (a), *Effectively measure and verify program performance against stated goals.*

CSNE will measure and verify its own progress through analysis of progress against stated timeline, posting of results on the project specific website, development and data entry into the secure online database, and summarizing progress against goals in semi-annual reports to the NHPUC.

The EM&V services will be based on a protocol approved by the NHPUC. In addition, CSNE will seek input from the NHPUC regarding changes and refinements to the data collection, data monitoring, and IT systems. The methodology will also seek to be compatible with the existing NH CORE Programs reporting to help provide meaningful comparisons.

Program results will be reported in a manner compatible with GHGERF fund requirements. Program results will also be mapped to track progress of applicable action items listed in the New Hampshire Climate Action Plan. This will simplify the reporting process for these different public policy initiatives.

Drawing on CSNE expertise in economic evaluation, the job creation (including “green jobs”) benefits and other direct, indirect and induced economic benefits will be publicly reported. This will help track the State’s progress related to overall green economic development.

This project provides transparency through a reputable third party source while at the same time protecting confidentiality of individual project recipients. Tracking the results of the funded projects will inform and grow the market for energy efficiency technologies in New Hampshire.

6) Budget

We are requesting one month of support for Cameron Wake (\$9,232) who will manage the entire project, oversee the work done by CSNE analysts, and prepare reports for the NHPUC. One half month of salary is requested for Ross Gittell (\$7,272) who will oversee all of the economic analyses. We seek halftime support for two PAT staff (\$44,000). They will work as a team, with one focusing on carbon emission analysis (Frades) the other on economic analysis (Magnusson). Fringe Benefits are calculated at

43.8% on Wake (for academic year salary) and PAT staff salaries (\$23,316), and 8.7% on Gittell (for summer salary) and hourly labor (\$894).

We are requesting \$3,000 for travel to visit GHGREF funded sites, \$7,950 for materials and supplies (\$2000 for office supplies and printing, \$5950 for Implan software and RIMS II county level input/output multipliers from Bureau of Labor statistics) and \$5,000 for UNH Research Computing Center to develop the password protected web page and secure online database.

Facilities and Administrative costs are calculated at 35% of the total direct cost base of \$103,664 for a total of \$36,282.

Facilities and Administrative Costs Rate: The Facilities and Administrative Cost Rate is based on UNH’s most current Rate Agreement with the U. S. Department of Health and Human Services, as required under OMB Circular A-21, unless capped by the State of New Hampshire or Federal Sponsor. A copy of the Rate Agreement is provided to the NH Department of Administrative Services when rates change.

CSNE Budget 1 May 2009 to 30 April 2010

Cameron Wake	1 months	\$9,232
Ross Gittell	0.5 month	\$7,272
2 PAT Staff	6 months each	\$44,000
Student hourly		\$3,000
Fringe Benefits		\$23,316
Travel		\$3,000
Materials and supplies		\$7,950
Computer services		\$5,000
Total Direct Costs		\$103,663
Facilities and Administration (35%)		\$36,282
Grand Total		\$139,945

7) Applicant Qualifications

Dr. Cameron Wake (resume attached below)

Research Associate Professor, Institute for the Study of Earth, Oceans, & Space, UNH
 Director, Carbon Solutions New England

For the past decade, Cameron Wake has focused his research on climate change in the Northeast and over the past five years has worked to identify and develop viable solutions to reduce emissions of heat-trapping gases in the region. He is Director of Carbon Solutions New England (CSNE, www.CarbonSolutionsNE.org), played a leadership role in the Northeast Climate Impacts Assessment (NECIA, www.northeastclimateimpacts.org), served on the NH Climate Change Policy Task

Force, lead the team that provided the technical analysis for the NH Climate Change Policy Task Force, and helped write the NH Climate Action Plan.

Dr. Ross Gittell (resume attached below)

James R. Carter Professor, Whittemore School of Business and Economics, UNH

Professor Gittell's scholarly focus involves applying economic, organizational and management theory to regional, state, and community economic development issues. His main areas of specialization and research include entrepreneurship, employment generation, equitable development and collaborative (public and private sector) efforts.

Professor Gittell's applied research activities in the New England region include work for the states of New Hampshire and Massachusetts, the New Hampshire Business & Industry Association, the State of New Hampshire's, Department of Environmental Services, the New Hampshire Small Development Center, the Children's Alliance of New Hampshire and the Josiah Bartlett Center for Public Policy. Professor Gittell is Vice President, forecast manager and on the board of the New England Economic Project. He is also on the board of the Exeter Trust Company, the Endowment for Health, Foundation for Healthy Communities and Exeter Hospital. He is a senior fellow at the Carsey Institute at UNH and an academic fellow at the Center for Transformation and Strategic Initiatives at the London School of Economics.

Matthew Magnusson (resume attached below)

Research Scientist, Carbon Solutions New England, University of New Hampshire

Matt Magnusson is a graduate of the University of New Hampshire 's Whittemore School of Business and Economics with a Masters of Business Administration. He has worked with Professor Ross Gittell to provide analysis on the economic impacts of several different public policy initiatives in the state of New Hampshire, the Renewal Portfolio Standard (RPS) and the Regional Greenhouse Gas Initiative (RGGI) for the New Hampshire Department of Environment and Services. Their analysis of the policies proposed by the state agencies has been influential in passage of NH state laws implementing those policies. He was part of the economic team estimating the economic costs and benefits of actions proposed in the NH Climate Change Action Plan. He has specific research experience analyzing green job employment in New Hampshire and is a co-author of the report *New Hampshire's Green Economy and Industries: Current employment and future opportunities* prepared for the NH Rockingham Economic Development Corporation and the *Economic Impact of Granite Reliable Power Wind Power Project in Coos County, New Hampshire* requested by Granite Reliable Power LLC. He is a member of the United States Association for Energy Economics and recently presented at their 28th annual conference.

Matt Frades (resume attached below)

Research Scientist, Carbon Solutions New England, University of New Hampshire

Matt Frades is a graduate of the University of New Hampshire, earning a Bachelor of Science degree in Geology and a Master of Science in Hydrology. His academic work and interests span a wide range, including hydrology, geology, energy issues, climate science, biogeochemistry, isotope geochemistry, GIS, remote sensing, public policy, and public awareness of science. Since 2008, Matt has worked collaboratively with Drs. Cameron Wake and George Hurtt as an analyst for *Carbon Solutions New England* and performing detailed analysis for the New Hampshire Climate Change Policy Task Force. Through this year, Matt worked closely with state administrators, industry stakeholders, and academic researchers to develop grounded analyses of almost one hundred proposed actions. He has presented these analyses to regional, national, and international audiences.

8) Additional information None

9) Letters of commitment None

Requested

NH PUC Greenhouse Gas Emissions Reduction Fund		2/23/09 RFP Proposed Budget Worksheet						REQUESTED AMOUNTS FOR TARGETED PROGRAM SIZE					
Program Title:		Enter Program Title Here											
Applicant Name:		Enter Applicant Name Here											
	2009							2010					2011
USE OF FUNDS	April	May	June	Q2	Q3	Q4	Total CY09	Q1	Q2	Q3	Q4	Total CY10	Total CY11
EXPENSES													
Salaries & Wages				\$0	\$15,876	\$15,876	\$31,752	\$15,876	\$15,876			\$31,752	
Benefits/Fringe				\$0	\$6,052	\$6,052	\$12,104	\$6,053	\$6,053			\$12,106	
Contracted Labor & Services				\$0			\$0					\$0	
Rent & Utilities				\$0			\$0					\$0	
Advertising & Marketing				\$0			\$0					\$0	
Travel & Mileage Reimbursement				\$0	\$750	\$750	\$1,500	\$750	\$750			\$1,500	
Tools, Supplies, Subscriptions				\$0	\$1,987	\$1,987	\$3,974	\$1,987	\$1,989			\$3,976	
Other Current Expenses (such as office expense, insurance, maintenance, repairs, taxes, legal, etc.)				\$0	\$1,250	\$1,250	\$2,500	\$1,250	\$1,250			\$2,500	
Cost of Goods Installed				\$0			\$0					\$0	
General Overhead & Profit*				\$0	\$9,070	\$9,070	\$18,140	\$9,070	\$9,072			\$18,142	
TOTAL EXPENSES	\$0	\$0	\$0	\$0	\$34,985	\$34,985	\$69,970	\$34,986	\$34,990	\$0	\$0	\$69,976	\$0
Capital Invested in Building Improvements							\$0					\$0	
Funds used for Loan Fund capital							\$0					\$0	
Loan Fund credit enhancement (such as interest rate buy-down)							\$0					\$0	
TOTAL USE OF FUNDS	\$0	\$0	\$0	\$0	\$34,985	\$34,985	\$69,970	\$34,986	\$34,990	\$0	\$0	\$69,976	\$0
	2009							2010					2011
SOURCES OF FUNDS	April	May	June	Q2	Q3	Q4	Total CY09	Q1	Q2	Q3	Q4	Total CY10	Total CY11
Applicant Cash Contribution				\$0			\$0					\$0	
Applicant In-kind Contribution				\$0			\$0					\$0	
Program Participant Contribution				\$0			\$0					\$0	
Loans & Other Financing				\$0			\$0					\$0	
Forward Capacity Market Payments				\$0			\$0					\$0	
Other Grants				\$0			\$0					\$0	
GHGER Fund (this proposal)				\$0			\$0					\$0	
TOTAL SOURCES OF FUNDS	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GHGER Funds as a % of TOTAL							#DIV/0!					#DIV/0!	#DIV/0!

Note: for General Overhead & Profit, please indicate to what extent any amounts are proposed to be contingent on program performance.

VITAE

Dr. CAMERON P. WAKE

Research Associate Professor, Climate Change Research Center
Institute for the Study of Earth, Oceans and Space,
University of New Hampshire, Durham, NH 03824
voice: 603-862-2329. fax: 603-862-2124
e mail: cameron.wake@unh.edu

EDUCATION:

Ph.D. (1993): Geochemical Systems, Institute for the Study of Earth, Oceans and Space
University of New Hampshire, Durham, N.H.
M.A. (1987): Dept. of Geography, Wilfrid Laurier University, Waterloo, Ontario.
B.Sc. (1984): Dept. of Geology, University of Ottawa, Ottawa, Ontario (Honors Program)

ACADEMIC AND RESEARCH EXPERIENCE:

Research Associate Professor	2003-present	Institute for the Study of Earth, Oceans and Space, and Department of Earth Sciences University of New Hampshire, Durham, NH
Faculty Fellow	2003-present	VP Research and Public Service University of New Hampshire, Durham, NH
Director	2006-present	Carbon Solutions New England
Research Assistant Professor	1995-2003	Institute for the Study of Earth, Oceans and Space, and Department of Earth Sciences, UNH
Research Scientist	1993-1995	Glacier Research Group, Institute for the Study of Earth, Oceans and Space, UNH
Research Assistant	1988-1993	Glacier Research Group, UNH

TEACHING EXPERIENCE:

Department of Earth Sciences and Institute for the Study of Earth, Oceans and Space curriculum:
Global Environmental Change (undergraduate general education)
Earth System Science: Understanding Our Global Environment (intro level graduate course)
Paleoclimate Analysis (advanced graduate course)
Department of Health and Human Services – Masters of Public Health curriculum:
Climate Change and Health (graduate course)

PROFESSIONAL SOCIETIES AND HONORS:

American Geophysical Union
Antarctic Service Medal (United States Congress)
International Glaciological Society
Union of Concerned Scientists

SELECTED PUBLICATIONS AND REPORTS

Burakowski, EA, CP Wake, B. Braswell, DP Brown (2008) Trends in Wintertime Climate in the
Northeast United States, 1965-2005. *Journal of Geophysical Research* 113, D20114,
doi:10.1029/2008JD009870.
Wake CP, P Frumhoff, J McCarthy, J Melillo, S Moser, and D Wuebbles (Eds)(2008) Special Issue:
Assessment of Climate Change, Impacts, and Solutions in the Northeast United States. *Mitigation and
Adaptation Strategies for Global Change*, 13(5-6), 419-660.

- Hayhoe, K., CP Wake, B Anderson, X-Z Liang, E Maurer, J Zhu, J Bradbury, A DeGaetano, A Hertel, and D Wuebbles (2008) Regional Climate Change Projections for the Northeast U.S. *Mitigation and Adaptation Strategies for Global Change*. Vol 13, 425-436.
- Frumhoff, PC, JJ McCarthy, JM Melillo, SC Moser, and DJ Wuebbles (2007) Confronting climate change in the US Northeast: Science, impacts, and solutions. *Synthesis report of the Northeast Climate Impacts Assessment*. Cambridge, MA: Union of Concerned Scientists (UCS), Available online at : <http://www.climatechoices.org>.
- Hayhoe, K., C.P. Wake, J. Bradbury, T. Huntington, L. Luo, M.D. Swartz, J. Sheffield, B. Anderson, A. DeGaetano, D. Wolfe and E. Wood (2006) Past and future changes in climate and hydrological indicators in the U.S. Northeast. *Climate Dynamics* doi: 10.1007/s00382-006-0187-8.
- UCS (2006) Union of Concerned Scientists – Climate Change in the US Northeast. A Report of the Northeast Climate Impacts Assessment. October. <http://northeastclimateimpacts.org/>
- Wake, C., E. Burakowski, and L. Goss (2006) Winter Recreation and Climate Variability in New Hampshire: 1984-2006. Clean Air – Cool Planet Report. <http://www.carboncoalition.org/education/winter.php>
- Wake, C., E. Burakowski, G. Lines, K. McKenzie, and T. Huntington (2006) Cross Border Indicators of Climate Change over the Past Century. Climate Change Task Force, Gulf of Maine Council on the Marine Environment Report. <http://www.gulfofmaine.org/council/publications/>
- Hurtt, G., C. Wake, T. Wawrzeniak, A. Frappier, C. Girod, L. Seidel, V. Salomonson. (2006) Broadening Student Horizons: The Development, Delivery, and Assessment of a New Course in Earth System Science. *Journal of Geoscience Education* 54(3), 329-338.
- Wake, C. and A. Markham (2005) Indicators of Climate Change in the Northeast. Clean Air – Cool Planet Report. <http://www.cleanair-coolplanet.org/information/pdf/indicators.pdf>

SYNERGISTIC ACTIVITIES

- Served on the Governor appointed NH Climate Change Policy Task Force, Dec 2007 – March 2009.
- Wake, C. and J. McCarthy – Climate Change in the Northeast U.S. Invited lecture for a joint session of the NH Legislature, Concord, NH, January 29, 2007.
- Convened special session at Fall 2006 AGU titled “Evaluating GCM Simulations of Climate Change in the Northeast US over the Last 100 years”
- Convened special session at Fall 2004 AGU titled “Regional Climate Variability and Change: Observations and Model Applications”
- Integrated instrumental records of climate change in New England into three classes taught at UNH (ECSI 405-Global Environmental Change; ESCI 795/895-Earth System Science; and ESCI 764/864-Paleoclimate Analysis).

List of Collaborators within last 48 months: James McCarthy, Jerry Melillo, Susi Moser, Don Wuebbles, Peter Frumhoff, Paul Mayewski, Greg Zielinski, Dave Meeker, Roy Koerner, David Fisher, Kumiko Azuma, Erik Blake, Jean Jouzel, Michele Stievenard, Phil Dunphy, Qin Dahe, Robert Talbot, Jack Dibb, Qin Dahe, Kang Shichang, Barry Keim, Karl Kreutz, Vladimir Aizen, DeWayne Cecil, Erik Blake, Karl Kreutz, Linda Hayden, George Hurtt, Katherine Hayhoe, Tom Huntington. Barry Keim, David Brown

Graduate Student Committees: Yang Qinzhaoh (Ph.D. 1996), Nancy Grumet (M.Sc. 1997) Arun Shrestha (Ph.D. 1998), Chris Zdanowicz (Ph.D. 1999), Alison Murphy (M.Sc., 2000); Kaplan Yalcin (M.Sc, Fall 2001); Amy Frappier (M.Sc. 2002); Adam Wilson (M.Sc. 2003); Zak Irons (M. Sc. 2004); Kaplan Yalcin (Ph.D 2005); Amy Frappier (2006) Thomas Lambert (M.Sc 2006); Gerald Hornok (M.Sc expected spring 2007); Tracey Wawrzeniak (M.Sc. expected spring 2007)

Graduate Student Advisors:

Paul Mayewski, Jack Dibb, Robert Talbot, Berry Lyons, Nancy Kinner

Ross Gittel
James R. Carter Professor
University of New Hampshire
Whittemore School of Business and Economics
Ross.Gittel@unh.edu
<http://pubpages.unh.edu/~rgittel/index.html>

EDUCATION

Ph.D. (Public Policy), Harvard University, November 1989.
M.B.A. University of California, Berkeley, Beta Gamma Sigma, June 1981.
A.B. (Economics), University of Chicago, Phi Beta Kappa, June 1979.

FACULTY POSITIONS

James R. Carter Professor, Department of Management, *Whittemore School of Business and Economics, University of New Hampshire*. 2000-.

Professor, Department of Management, *Whittemore School of Business and Economics, University of New Hampshire*. 2004-.

ORGANIZATIONAL POSITIONS

Vice President, Board Member and Forecast Manager, *New England Economic Partnership*, 1999-present.

Director, *Exeter Trust Company*, 2001-present.

Trustee, *Exeter Health Services and Exeter Hospital*, 2008-present

Board Member, *Endowment for Health*, 2007-present

UNIVERSITY AWARDS

Outstanding Associate Professor Award, University of New Hampshire, 2004.

Excellence in Public Service Award, University of New Hampshire, 2002.

SAMPLE PUBLICATIONS

With Avis Vidal, Community Organizing: Building Social Capital as a Development Strategy (Newbury Park, CA: Sage Publications, 1999).

Renewing Cities (Princeton, NJ: Princeton University Press, 1992).

With Charles Colgan, "New England Regionalism: Economic Motivations and Barriers," in Charles Colgan and Stephen Tomblin (editors), Regionalization: Challenges for New England and Atlantic Canada in the New Continental Economy (Peterborough, Ontario: Broadview Press, 2003).

With Phil Thompson, "Making Social Capital Work: Social Capital and Community Economic Development" in Susan Saegert, Phil Thompson and Mark Warren (eds.) Social Capital and Poor Communities (New York: Russell Sage Foundation Press, 2002).

With Phil Thompson, "Inner City Business Development and Entrepreneurship: New Frontiers for Policy and Research," in Ronald F. Ferguson and William T. Dickens (eds.), Urban Problems and Community Development (Washington D.C.: Brookings Institute Press, 1999).

With Allen Kaufman, "Post-Industrial New England," The Encyclopedia of New England (New Haven: Yale University Press, forthcoming).

With Jeffrey Sohl, "Technology Centers During the Economic Downturn: What Have We Learned?" Entrepreneurship & Regional Development, forthcoming.

With Robert Woodward, "The Value of Accurate Air Quality Forecasts," International Journal of Environmental Technology and Management, forthcoming.

With Jeff Sohl and Edinaldo Tebaldi, "Factors Influencing the Long Term Sustainability of Entrepreneurial Tech Centers," Frontiers of Entrepreneurship Research, 2004.

With Fred Kaen, "A Framework for Evaluating State Assisted Financing Programs," Public Finance and Management, 2003: 3 (3), pp. 296-331.

"Business, Government and Society and the Management of Technology," International Journal of Knowledge, Culture and Change Management, Volume 3, 2003.

SAMPLE of GRANTS, CONTRACTS OR FELLOWSHIPS

U.S. Department of Commerce, National Atmospheric & Oceanic Administration, Lead Project Investigator, An Analysis of the Potential Economic and Social Benefits of Air Quality Information and Forecasts. Three-year project (2002-2004), \$450,000.

US SBA and NH OEI-SBDC, Economic Cluster Analysis and Manufacturing Industry Assessment of New Hampshire and New Hampshire Counties, 2003-2004, \$23,000.

Rockefeller Foundation, Economic Development Initiatives in the Inner City: An Assessment of Economic Initiatives by the Harlem Congregations for Community Improvement, 2002-03, \$20,000.

PROFESSIONAL & ACADEMIC AWARDS

NH Educational Opportunity Association, Champion of Educational Opportunity, 2005

International Biographical Centre, Leading Educators of the World

Who's Who Among America's Teachers

Phi Beta Kappa

Gamma Beta Sigma

Matthew Frades

Geoscience consultant and researcher
University of New Hampshire
Durham, NH

1.603.689.5891
mcfrades@gmail.com

EDUCATION:

- 2008 M.S. Hydrology, University of New Hampshire (4.0)
2005 B.S. Geology, University of New Hampshire (*magna cum laude*, 3.67)

RESEARCH AND OUTREACH INTERESTS:

Science public policy, public awareness of science, collaborative multi-disciplinary science, hydrology, geology, energy issues, climate science, biogeochemistry, isotope geochemistry, GIS, remote sensing.

PROFESSIONAL EXPERIENCE:

- 2008 Research scientist
Carbon Solutions New England
- 2008 Geospatial Analysis Consultant (*Part time*)
GS Environmental and Groundwater Associates
- 2007 Research Assistant, Isotope Mass Spectrometer Technician Assistant
University of New Hampshire
- 2006 Course Developer and Instructor (Techniques in Environmental Science)
University of New Hampshire
- 2005 – 2007 Teaching Assistant (Oceanography, Groundwater Hydrology, Earth History)
University of New Hampshire
- 2004 – 2005 Principal Investigator of Local Water Resources Evaluation
Lee, NH Town Water Resources Assessment
- 2003 – 2004 Hydrology Field Technician (*Part time*)
University of New Hampshire

SELECTED PUBLICATIONS:

- “Shallow Flow: Implications of Stable Water Isotopes on Groundwater Flow Paths, Southeast New Hampshire” Frades, Matthew; Davis, J. Matthew; Bryce, Julie; McDowell, William H. (*In prep. for publication*).
- “The Net Impact of Forest Management on Atmospheric GHG Levels: a Carbon Model of New Hampshire” Frades, Matthew; Aber, John D.; Hurtt, George; Wake, Cameron. (*In prep. for publication*).
- “Providing Decision-Relevant Information for a State Climate Change Action Plan” (2008) Wake, Cameron; Frades, Matthew (presenting); Hurtt, George; Magnusson, Matthew; Gittell, Ross; Skoglund, Chris; Morin, Joanne. American Geophysical Union Fall Meeting. (*Manuscript also in prep. for publication*).

“A Pilot Study of Watershed Flow Using Stable Water Isotopes in Support of the Development of the Lamprey River Watershed (Southeast New Hampshire) as a Hydrologic Observatory” (2008) Frades, Matthew; Davis, J. Matthew; Bryce, Julie; McDowell, William H. American Geophysical Union Fall Meeting.

“Forest management, wood use, and climate change: implications of a carbon model designed to generate decision-relevant information” (2008) Frades, Matthew; Wake, Cameron; Hurtt, George. Northeastern Ecosystem Research Cooperative (NERC) Annual Meeting.

“Hydrologic Analysis of the Headwaters Lamprey River Watershed Using Water Isotopes” (2008) Master’s Thesis.

“Strontium Isotopes and Trace Metals in the Delineation of Flow Paths in the Lamprey River Watershed” (2007) Smith, Melissa; Frades, Matthew; Scudder, Rachel; Bryce, Julia; and Davis, J. Matthew. Geological Society of America Northeastern Section Annual Meeting Presentation.

“Stratified Drift Aquifers, Arsenic in Groundwater, and the Future of Water Use in Lee” (2005) Lee, NH Water Resources Assessment Town Meeting and Presentation.

“The Importance of Geologic Map Scale when Evaluating Water Resources” (2005) Frades, Matthew; Davis, J. Matthew. Geological Society of America Annual Meeting.

SELECTED FUNDING AND AWARDS:

2006 – Geological Society of America Student Research Grant

2006 – UNH Graduate School Summer TA Research Fellowship

2005 – College of Engineering and Physical Sciences Alumni Scholarship

2004 – Capital Mineral Club Field Scholarship

Matthew Magnusson

66 Green Hill Road
Barrington, NH 03825
603- 285-5735
matt.magnusson@unh.edu

Experience:

2005–Current

University of New Hampshire, Durham, NH

Research Associate

Provided data collection, analysis, presentations and report authoring on several projects with research colleague UNH Professor Ross Gittell. Research projects include:

- **2009 – Economic Impact of Granite Reliable Power Wind Power Project in Coos County, New Hampshire**
Sponsor: Granite Reliable Power LLC
- **2009– New Hampshire’s Green Economy and Industries: *Current employment and future opportunities***
Sponsor: Rockingham Economic Development Committee (REDC), U.S. Dept. of Commerce-Economic Development Administration
- **2008 – Economic Analysis of Policies Proposed by the NH Climate Change Policy Task Force for the Governor’s NH Climate Change Action Plan**
Sponsor: New Hampshire Charitable Foundation
- **2008 - Economic Impacts of Regional Greenhouse Gas Initiative on New Hampshire**
Sponsor: New Hampshire Department of Environmental Services, The Energy Foundation
- **2007- Economic Impacts of a State Renewable Portfolio Standard in New Hampshire**
Sponsor: New Hampshire Department of Environmental Services
- **2006- Economic Modeling of Low Sulfur Heating Oil in the Northeast**
Sponsor: Northeast States for Coordinated Air Use Management (NESCAUM)
- **2006 - Fiscal Impact of Lower Ignition Strength Cigarettes in New Hampshire**
Sponsor: New Hampshire Office of State Fire Marshal

Recent presentations given related to research performed include:

- *12/5/2008* – Presentation at the 28th United States Association for Energy Economics on the economic costs and benefits of the Regional Greenhouse Gas Initiative
- *11/21/2008* – Presentation to NH Climate Change Task Force on the economic costs/benefits of proposed actions
- *4/15/2008* – Presentation to NH Senate finance committee on the economic costs of the Regional Greenhouse Gas Initiative to NH businesses
- *1/29/2008* – Presentation on the NH economic impacts of the Regional Greenhouse Gas Initiative at the Granite State Conservation Voters’ Building Bipartisan Solutions for New Hampshire’s Environment Breakfast
- *9/27/2008* – Presentation on the NH economic impacts of the Regional Greenhouse Gas Initiative at the Business & Industry Association’s Energy and Regulated Utilities Public Policy Committee

Task force member in several UNH sustainability initiatives including:

- Carbon Solutions New England
- Solid Waste Management Task Force
- Computer Waste Stream Committee
- Liaison for Student group Clean Energy Revolution

Matthew Magnusson

66 Green Hill Road
Barrington, NH 03825
603- 285-5735
matt.magnusson@unh.edu

- 2000–2008 **University of New Hampshire, Durham, NH**
Information Technologist III
Project manager for UNH Information Technology projects including management reporting and ERP system. Responsible for employee training of new IT related systems. Data analysis of student demographic data utilizing JMP, Microsoft Access, MapPoint and Excel.
- 2005–Current **University of New Hampshire, Durham, NH**
Recitation Instructor
Led classroom instruction for the Introduction to Business course for two sections of approximately 30 students for three semesters. Instruction included grading, leading classroom discussion and course development.
- Fall 2004 **Maine Green Power Connection, Brunswick, ME**
Internship
Presented on the electricity options available to Maine businesses. Consulted with businesses on energy certification for their product lines. Evaluated the effectiveness of the Clean Power Maine marketing campaign and developed a system to track inquiries.

Education:

- 2005 **Whittmore School of Business and Economics, University of New Hampshire, Durham, NH**
Masters Degree in Business Administration GPA: 3.85
- 1997 **University of New Hampshire, Durham, NH**
Bachelor of Science Degree in Kinesiology GPA: 3.7

Computer Skills:

- Data extraction, manipulation, integration, query development and reporting of complex data sets from government and proprietary sources
- Application and programming experience includes: SQL, XML, JavaScript, VBscript, HTML, Dreamweaver, Fireworks, PHP, MS Mappoint, MS Office Suite, JMP, WindowsXP, Oracle 10g, US Census X-12-ARIMA