

ENST 698

Environmental Capstone

DELTA Energy Intern Monitoring

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Introduction

1.1 Background Info

The DELTA program, Developing Energy Leaders Through Action, is a program that supports more than 60 interns that are all working on energy-related projects, monitored by the DELTA Capstone Team. The program is funded by the North Carolina State Energy Office (SEO) using American Recovery and Reinvestment Act (ARRA) funds. The 2011 DELTA capstone team has elaborated on the work of the fall 2010 DELTA capstone team, using its guidelines and recommendations in reporting both quantitative and qualitative energy-related impacts and outcomes from the internships. The team collected information regarding the energy savings, greenhouse gas emissions reductions, or renewable energy production that flow from interns who work in a variety of settings: on and off the UNC-Chapel Hill Campus, in private businesses, and non-profit organizations. Each internship is unique in its goals and tasks, but whether they deal with reduction in use of conventional energy and in greenhouse gas emissions, or increased capacity for generation of renewable energy, they all are related to energy use. The capstone team's role with the interns is to monitor their achievements within their internships and how those achievements support the mission of the DELTA program. The analysis of the internships comes from the information the team gathered from the interns' work plans, group and individual introductory meetings, a mid-semester survey, an end-of-semester survey, and SEO quarterly reports that are required by the state.

1.2 Internship Summaries

A brief summary of the duties and responsibilities of the 12 DELTA interns is given below.

Intern Name: S. Hatcher

School Year: 1st year masters

Major: UNC Gillings School of Global Public Health

Internship Site: UNC Institute for the Environment

Mentor Name: Dr. Elizabeth Shay

Project Topics: Monitoring DELTA internships

Summary: This intern's duties included providing the tools and technical assistance that were required for the DELTA capstone team to track the energy-related impacts and outcomes of the DELTA internships. This intern also delivered feedback to the DELTA capstone team on documents and survey instruments targeted to the interns and mentors in order to gather the data required by the SEO reports. The intern also supported the interactions with DELTA project personnel and Institute for the Environment faculty and staff, while providing critical feedback and guidance on the capstone team's reports and presentations.

Intern Name: B. Callaway

School Year: Post-Masters

Major: City and Regional Planning

Internship Site: Town of Chapel Hill

Mentor Name: John Richardson

Project Topics: Energy and greenhouse gas emissions management for the Town of Chapel Hill

Summary: This intern was responsible for a variety of tasks that included developing an efficient system to track and manage the town's energy use, evaluating various energy savings of proposed projects, monitoring the town's greenhouse gas emissions from both municipal and community-wide sources, and assisting with various other energy-related projects conducted by the Office of Sustainability at the Town of Chapel Hill. Some of the projects the intern took part in were developing processes for data acquisition of energy use, analyzing energy use, assisting with the development of energy-saving strategies, taking inventory of greenhouse gas emissions, and investigating and implementing reduction strategies for those emissions.

Intern Name: D. Brookshire

School Year: 1st Year Masters

Major: MCRP City and Regional Planning

Internship Site: UNC Energy Management

Mentor Name: Jessica O'Hara

Project Topics: Life Cycle Cost Analysis

Summary: This intern's duties included developing a simple life cycle cost analysis spreadsheet, preparing Renewable Energy Special Projects Committee (RESPEC) projects, and a Labs21 database on building audits. The internship focused on the reduction in energy consumption and carbon emissions. This intern also started research on energy savings with Direct Digital Control (DDC) thermostat controlled buildings in comparison to pneumatic building controls.

Intern Name: H. Kuestner and M, David

School Year: Junior (both)

Major: Kuestner - Environmental Sciences, David – Environmental Sciences, Biology Minor

Internship Site: UNC Energy Management

Mentor Name: Jessica O'Hara

Project Topics: Reporting and Outreach

Summary: These two interns' duties included assisting in the data entry of campus building energy into the Energy Star database portfolio and creating energy analysis reports. They also contributed to the implementation of an energy conservation reward program, coordinating and facilitating campus outreach events, and updating and maintaining web-based outreach through websites, a Facebook profile, blogging, and twitter.

Intern Name: A. Mui and R. Browne

School Year: Junior and Senior, respectively

Major: Environmental Science (both)

Internship Site: UNC Chapel Hill

Mentor Name: Dr. Harvey Seim

Project Topics: Offshore Wind Resources

Summary: The interns were responsible for exploring extrapolation schemes using *in situ* data, or data collected from the original and natural location. They also were in charge of aggregating satellite-based wind speed estimates. Interns were expected to produce a large amount of data analysis and data visualization in order to ultimately determine the wind power potential on the North Carolina coast.

Intern Name: C. Kennedy

School Year: Senior

Major: Environmental Science & Biology

Internship Site: Research Triangle Institute (RTI)

Mentor Name: Glenn Osmond

Project Topics: Green Renewable Land Use

Summary: This intern's duties included identifying criteria for ideal renewable energy sites in order to apply and evaluate the criteria for use with GIS (Geographic Information Systems) software. After evaluation, the intern was responsible for distinguishing the most applicable and useful criteria and tools.

Intern Name: A. Ginn

School Year: Senior

Major: BSBA

Internship Site: RTI

Mentor Name: Tony Marimpietri

Project Topics: Green Renewable Land Use

Summary: This intern's duties included searching through the available literature for information about brownfield and legacy properties' best practices. The intern was also responsible for investigating state and federal programs that promote renewable energy development, in order to create a finance-based feasibility analysis of the brownfield/legacy properties that were available for renewable energy reuse.

Intern Name: E. Hiatt

School Year: Junior

Major: Public Policy

Internship Site: Progress Energy

Mentor Name: Julie Hans

Project Topics: Project Energy Energywise

Summary: This intern's duties largely dealt with assisting the Progress Energy EnergyWise (Smart Grid) Change Management Program. Some of the tasks were maintaining the program communications plans, reviewing these project communications plans to

determine with the Program Office what coordination and integration efforts were necessary, and assisting with the development of the EnergyWise Program's internal communications. This intern also contributed to the development of Communications Effectiveness Surveys and the EnergyWise Program Change Management Lead. The intern continually helped with updating and maintaining a Stakeholder Listing and associated Stakeholder Action Plan, the EnergyWise Onboarding materials, and the EnergyWise SharePoint site.

Intern Name: N. Fernando

School Year: Senior

Major: International Studies (Global Health, Environment concentration)

Internship Site: Piedmont Biofuels

Mentor Name: Miller McCayne

Project Topics: Biodiesel, Sustainability, and Community Implementation

Summary: This intern had duties that included participating in activities related to the collection, production, and distribution departments of Piedmont Biofuels. The intern also worked in the office to perform marketing, database management, oil collections tracking and other information system management tasks. The intern assisted in planning the Sustainable Biodiesel Summit, attended and assisted in other educational opportunities and events, and participated in grant administration and financial system implementation.

Intern Name: C. Lazinski

School Year: Senior

Major: Environmental Science

Internship Site: UNC Environmental Finance Center

Mentor Name: Glenn Barnes

Project Topics: RESPC revolving loan fund

Summary: This intern's duties included the implementation, continual development, and analysis of the RESPC's revolving loan fund for energy efficiency on UNC's campus. The intern also was responsible for investigating other sources of capital for use in the revolving loan fund such as UNC's endowment and state grants. When needed, the intern contributed to other Environmental Finance Center projects that involved assisting communities with developing energy-related financing programs. The intern also studied how student "green fees" are managed at other universities and how units of government manage their revolving loan fund programs. This was done in order to understand the possibilities for developing the fund at UNC, as well as the difficulties that could arise.

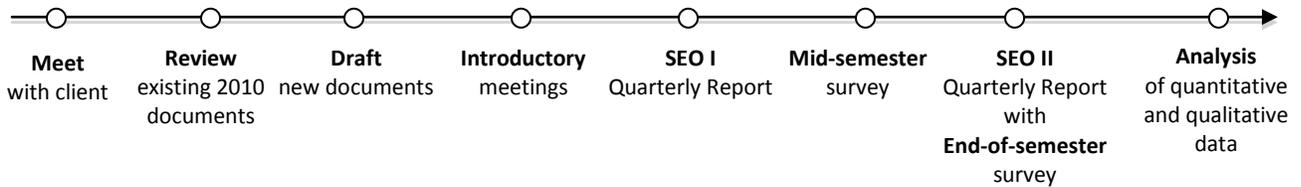
Methods

The process of preparing and distributing documents as well as collecting and analyzing data is detailed in this section. The spring 2011 capstone team was charged with collecting data from the DELTA interns and developing a reporting framework. The first task involved collecting qualitative and quantitative results from several reporting documents. The second task involved creating a systematic method by which the DELTA internships could be monitored and reported on. This framework was designed to be utilized in the current semester as well as in future semesters of the DELTA internship.

The methods section is divided according to the two primary reporting periods: SEO quarterly report I and SEO quarterly report II. The SEO requires quarterly reports prepared by the business office and filled out with the data that the capstone team collects from the interns. The team reviewed existing 2010 monitoring documents and met with the DELTA client, Kathleen Gray (DELTA co-principal investigator, and Director of the Environmental Resource Program) before beginning capstone tasks. To complete the SEO quarterly report I, it was necessary to establish contact with the interns, explain the SEO reporting criteria, transfer the questions to an online survey system, aggregate the completed surveys, and submit the final aggregated document to the State Energy Office.

After analyzing the results from the SEO quarterly report I, it was apparent that the capstone team needed to supplement the SEO reporting document with additional surveys to gain a more complete understanding of each internship’s progress. In addition to a streamlined and personalized SEO quarterly report II, a mid-semester survey and an end-of-semester survey were also prepared and distributed to each intern. A final analysis of these results was performed after all the responses were aggregated.

Below is a snapshot of the capstone team’s monitoring framework and methods with the key steps outlined.



2.1 SEO Quarterly Report I

Once the capstone team reviewed the work of the fall 2010 DELTA capstone team and became generally familiar with the goals and tasks of monitoring DELTA Interns, the team met with the DELTA client. She provided the main framework from which the monitoring system was developed. She shared with the team the State Energy Office quarterly reporting questions and 2010 mentor and intern exit surveys, and provided a more comprehensive idea of what was expected for the final outputs. Additionally, the team met with Institute for the Environment Internship Coordinator Lindsay Leonard, who provided documents relating to the 2011 internships, including work plans, job descriptions, and general information.

Using the framework from fall 2010 and new information for spring 2011, the capstone team developed a reporting framework, an introductory meeting agenda, a mid-semester

report for interns, and an end-of-semester survey for both interns and mentors. The capstone team also developed an intern-mentor agreement to be used for the 2011 summer DELTA interns.

The State Energy Office (SEO) established quarterly reporting questions for all energy-related grant recipients. Questions that related to the DELTA program and internships were used to gather qualitative and quantitative information from interns. The topics included project milestones, renewable energy, energy efficiency, technical assistance and training, and transportation. The capstone team conferred with IE Staff to clarify the meaning and purpose of the questions. These questions were translated into the online surveying program, Qualtrics Online Software (Qualtrics Labs Inc.). Figure 1 provides a screenshot of the Qualtrics online survey interface.

The SEO quarterly report I contained all the questions that were provided to the capstone team by the SEO and the client. Each intern filled out a single Qualtrics survey. DELTA interns working together (UNC Wind Study and undergraduate UNC Energy Management interns) were allowed to complete a combined survey to avoid duplicating results. Before distributing survey links to interns, the capstone team scheduled introductory meetings with each intern.

Contact with interns was initially established via email. The capstone team used the email address DELTAcapstone@gmail.com to send surveys, update interns about upcoming surveying, and to correspond about any questions regarding the reporting process. The introductory meetings were scheduled via email correspondence with interns. Interns were asked to attend one of two group meetings or schedule an individual introductory meeting. The meetings served as an opportunity for the capstone team to meet the interns, gain a better understanding of their work, and explain and review the reporting requirements and process with the interns. Appendix II B includes the introductory meeting agenda that was used for each meeting. Each intern was given a condensed version of SEO quarterly reporting questions. This document replicated SEO questions but removed the reporting format that was part of the original SEO document, found in Appendix II C.

The capstone team explained the SEO reporting questions to interns and made it clear that they were to answer only those questions that were relevant to their internships. During this meeting, it was also made clear that questions left unanswered on the initial Qualtrics survey would be removed from future SEO reporting surveys that were to be tailored to specific internships. Consequently, interns were also asked to note which questions they could possibly answer in the future, even if they couldn't answer it during this first reporting period. In this way, the capstone team was able to gather as much information as possible without overburdening interns with irrelevant questions. The capstone team also asked interns to consult mentors while completing the online SEO quarterly report I. At the conclusion of each meeting, interns were emailed the survey link and asked to complete it within one week.

Number of technical assistance provided

Details of technical assistance provided

Number of expected people to attend workshops, training, and education sessions

Number of contacts

Number of audits performed

Floor space audited (square feet)

Auditor's projection of energy savings (kwh)

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Survey Powered By [Qualtrics](#)

Figure 1. SEO Quarterly Report I, Qualtrics interface.

After the interns completed the SEO quarterly report I, the responses were aggregated into a single spreadsheet using Microsoft Excel. The capstone team sent this spreadsheet, along with notes that were taken during introductory meetings to IE staff for final review. Institute for the Environment staff were vital to meeting the March 7th reporting deadline. They took the aggregated responses provided and synthesized them into an appropriate format for SEO reporting.

Once the capstone team and interns returned from Spring break, the graduate team leader debriefed the capstone team on the SEO quarterly report I that was submitted by IE staff. The capstone team used this opportunity to learn the best way to format SEO quarterly reports.

2.2 SEO Quarterly Report II

After the SEO quarterly report I was completed, the capstone team reflected on the overall success of the monitoring process thus far. The capstone team created a revised timeline that served as a guide for future reporting steps in the remainder of the semester. A timeline for interns was also created to inform them of deadlines for future reporting dates. These steps included a mid-semester survey, additional intern specific reporting questions, SEO quarterly report II, and an end-of-semester survey.

The team created and distributed a mid-semester survey to elicit feedback from interns on the reporting systems being used, specifically the introductory meetings and Qualtrics interface. Another goal of the mid-semester survey was to receive feedback from the interns regarding current obstacles associated with their internships and to elaborate on the progress of their projects. These qualitative questions were used to further extract information about internships and also as a source for finding qualitative themes among internships. Appendix I B contains an annotated version of the mid-semester survey that was used for interns. These surveys were sent out via email on a Microsoft Word document, and had a one-week return deadline. In the email, the capstone team also included the short timeline for interns regarding the remaining reporting steps with dates and deadlines.

The capstone team personalized the SEO quarterly report II Qualtrics surveys for each intern based on their responses to the first quarterly report. Interns were assigned to capstone team members and each team member was responsible for personalizing a Qualtrics survey for their assigned intern(s). These personalized surveys became the SEO quarterly report II.

After collecting mid-semester surveys from interns, the capstone team used the responses to create additional internship specific questions to be added to the SEO quarterly report II. These questions were framed in such a way that allowed interns to report quantitative and qualitative data related to their specific work that was not captured in SEO reporting questions. Appendix II C contains the intern-specific questions that were created by the capstone team to capture further information.

The capstone team created an intern end-of-semester survey based on exit survey questions created by the 2010 capstone team. (Appendix I C contains an annotated version of the intern end-of-semester survey.) The intern end-of-semester survey reflected each intern's overall experience with the internship placement, mentor, and monitoring group. The purpose of the intern end-of-semester survey is to inform DELTA internship monitors and IE staff about the overall success of internships. The capstone team took advantage of Qualtrics online surveying and added the intern end-of-semester survey questions to each interns' corresponding personalized SEO quarterly report II.

Mentors from 2010 and 2011 were also included in the reporting process. In response to a request from IE Staff for a mentor end-of-semester survey, the capstone team created a survey from exit survey questions created by the fall 2010 capstone team. The capstone team enlisted the help of the capstone coordinator to distribute these surveys to previous and current mentors, anticipating that this might elicit more thorough responses than a request from a student team. The survey allowed each mentor to comment on the intern, the work they performed, and their overall experiences with the DELTA program. Appendix I D contains an annotated version of the mentor end-of-semester survey. Mid-semester surveys were not administered to mentors because the capstone team put more emphasis on the interns'

responses. However, in future monitoring periods, mentors should be evaluated at the mid-semester mark and should also review intern responses.

2.3 Additional Monitoring Documents

The capstone team developed an intern-mentor agreement document to be used for the 2011 summer DELTA interns. (Appendix I A contains an annotated version of the intern-mentor agreement.) The document is based on IE staff's original workplan as well as entrance survey questions from the fall 2010 capstone team and expands on the specifics of internships. The document serves as an agreement between the intern and mentor for establishing expectations from both parties, detailing the student's workplan, and discussing expected outcomes and impacts of the internship. With this document, the future monitor (discussed below, in recommendations) will have a clear idea of each intern's duties and responsibilities and the expected outputs at each internship site, which will facilitate the monitor's understanding of the SEO quarterly reporting themes that are applicable to internships.

Results and Analysis

The State Energy Office granted funding for DELTA internships that would promote workforce development in the “green” energy economy and have measurable impacts in terms of conventional energy savings, greenhouse gas emissions reductions, and renewable energy production. While the internships made important contributions related to each of these three impact areas, the nature of the internships made it difficult to capture significant quantitative data through the SEO reporting questions. The resulting quantitative and qualitative data from the internships are detailed in this section.

3.1 External Reporting

Quantitative DELTA data was limited but its analysis was an important part of the program. The internships primarily focused on databases within each organization and potential energy savings and capacity while the SEO document emphasized audits, retrofits, and other larger-scale tasks. Quantitative data was collected on financial incentives, audits, potential energy savings, and technical assistance. In order to compare data, quantitative values were compiled into a spreadsheet by the DELTA Capstone team. The team also reported more qualitative data, such as descriptions of activities such as training events and public outreach; in addition, some qualitative data provides a basis to generate useful quantitative data in the future. Below are the results for SEO quarterly reports I & II.

3.1.1 State Energy Office Quarterly Report I

The SEO quarterly report I submitted on March 7th contained little quantitative data due to limited correlation between SEO questions and outputs of specific internships.

The UNC Energy Management graduate intern provided quantitative energy savings data. The intern calculated that installing Safe-T-Element™ on 361 units would save \$16,752.66 in annual energy costs, 268043 kWh of electricity, and 125980 kg of CO₂ emissions. The estimated payback period for the project is 7.2 years. This reduction in energy consumption and CO₂ emissions advances UNC’s commitment to energy conservation and lower greenhouse gas emissions.

Particularly, the intern from Town of Chapel Hill had significant quantitative reporting data. The intern analyzed electricity rates for all accounts and implemented changes that will avoid \$4,488 in annual costs and resulted in \$2,729 in direct refunds from incorrect rates. The intern eliminated service to inactive and incorrect accounts that will avoid \$8,051 in annual costs (calculated based on service charges from previous 12 months of inactive/incorrect service) and also engaged in over 60 hours of instructional training—48 hours through a State Energy Office Energy Management Diploma Program. This intern identified and oversaw the installation of programmable thermostats in February 2011 that will yield a projected cost avoidance of at least \$717 annually and gathered 6-years of historical energy data on all town operated buildings as part of the development of an energy management program for Town of Chapel Hill.

Some interns experienced obstacles or delays that prevented them from reporting quantitative data in this reporting period. Aside from time constraints, other interns experienced obstacles that were specific to their internship. The UNC Energy Management

interns reported slight delays in identifying buildings that qualified for Duke rebates due to different identification methods used at UNC. The UNC Environmental Finance Center reported that the process of getting feedback from participating parties that will be using the revolving fund took longer than expected, resulting in delays for developing the final revolving fund contract. There were delays for the Piedmont Biofuels intern due to transitions in employment in the oil collections committee at Piedmont Biofuels.

Most other interns were unable to provide quantitative data for this reporting period and reported the following data, which could potentially be quantified in the future:

Undergraduate UNC Energy Management interns identified buildings that qualify for the Duke rebate program, developed a Life Cycle Cost analysis spreadsheet and began research into energy savings comparing two heating and cooling systems. They also helped enter four UNC buildings into the EPA's National Building Competition for energy conservation, have created promotional materials to raise student and manager awareness about energy issues (materials included a flyer, a nomination form, and a piece about Energy Management for the New Student Guide), and have begun promoting energy management via social networking.

Student interns at RTI researched and compiled information regarding programs, incentives and site location criteria on solar and wind energy for renewable energy and brownfield redevelopment.

An intern at Piedmont Biofuels managed their newsletter, webpage, database, and oil prospect list. Database management over the first quarter focused on accumulating data to make waste vegetable oil (WVO) collection routes more efficient so that the amount of fuel used to collect oil was less than the gallons of WVO collected.

UNC Wind Study interns downloaded, compiled and stored National Data Buoy Center (NDBC) buoy data. These interns used a series of analyses on NDBC buoy data, including Matlab, power output, and quality control to further their research.

The UNC Institute for the Environment intern assisted the capstone team in meeting the first reporting requirement deadline and helped develop a strategy for collecting relevant information from interns related to reporting requirements.

3.1.2 State Energy Office Quarterly Report II

For the State Energy Office quarterly report II, interns reported on the following criteria: project milestones, quarterly accomplishments, problems or delays, dollar value of projected monetary energy savings, reduction of electricity consumption and demand, and technical assistance provided. Quantitative data was retrieved from UNC Wind Study interns, the Town of Chapel Hill, the UNC Environmental Finance Center, UNC Energy Management, and Piedmont Biofuels.

UNC Wind Study interns finished retrieving *in situ* data from 13 offshore monitoring stations and completed quality control tasks for the data to prepare it for analysis. The interns explored five extrapolation schemes for estimating the wind speed given the data measurements. The various schemes were examined in detail and comparisons were made among them.

The Town of Chapel Hill received \$36,761.81 in refunds from Duke Energy for a billing error identified by the work of the graduate intern. The town also received \$16,328.60 in reimbursements from UNC for incorrect utility payments made on invalid accounts. Had the errors persisted, these two corrections would have amounted to \$53,090.41 in direct refunds to

the town and \$31,145.36 in annual avoided costs. There is also a projected \$2,000 savings in annual avoided costs from bill adjustments and another \$2,000 in energy savings projects. The graduate intern completed preliminary building audits in nine buildings using a technical assistance program from the State Energy Office. The town is building momentum for designing and implementing a Strategic Energy Plan for the town operations. The intern is also investigating and determining payback potential for several small-scale energy savings projects including vending machine economizers and automation systems in buildings.

The UNC Environmental Finance Center will give out the first payment using the RESPC Revolving Fund program by the end of this semester. The UNC Environmental Finance Center estimates an electricity consumption reduction of 2,968MWh over 20 years and an electricity demand reduction of 0.0169MW. They estimate that with a \$150,000 investment, there will be a \$600,000 savings over 20 years.

The SEO report asks for accounting of technical assistance, which may take the form of workshops, trainings or other education sessions that the interns either attend or organize. There were four instances of technical assistance provided in this reporting period. UNC Energy Management presented an energy awareness class to building managers with 10 attendees, and included an additional follow-up meeting. The Progress Energy interns scheduled a training that 80 Progress Energy representatives attended. Piedmont Biofuels planned to host a Photovoltaic Solar Panel workshop with an expected 10-person attendance. The Piedmont Biofuels intern also assisted in organizing the Shakori Hills Clean Hills education event and the NC State Clean Tech education event.

The UNC Energy Management graduate intern and UNC Environmental Finance intern reported on obstacles or delays that prevented them from fully capturing quantitative data for SEO reporting. Below are their summarized responses to the inquiry from the SEO quarterly report II.

It has been difficult for UNC Energy Management to identify buildings eligible for Duke Rebates because the meter numbers used to identify buildings are not the same as the meter numbers UNC uses. This has made it difficult to pair the data sets of eligible buildings with those that have been designated with projects to apply for rebates. It has also taken a while to double check which air ventilation system (DDC-HVAC, pneumatic, hybrid) the buildings use because it requires verification with energy services and building managers.

The UNC Environmental Finance Center has met some bureaucratic and policy delays. Regulations governing who receives the money saved by energy efficiency projects on campus severely limit the number of possible projects that can be funded by a revolving fund created either by the RESPC or UNC's endowment. Removing these obstacles would involve an act of the legislature in Raleigh.

3.2 Internal Reporting

Largely qualitative data about internship administration and process was gathered from intern workplans, mid-semester surveys, and end-of-semester surveys. In order to analyze the qualitative information received, the team compiled all responses to each survey in separate

spreadsheets. This method allowed the team to compare and contrast similarities and differences between internships, and to determine overarching themes across internships. These themes were then analyzed to determine how they related to the three measurement criteria identified by SEO (conventional energy savings, greenhouse gas emissions reductions, renewable energy production).

3.2.1 Fall 2010 Mentor End-of-Semester Survey

The DELTA capstone team not only monitored the outcomes of DELTA internships over the course of the current semester, but also drew conclusions from previous semesters. The mentor end-of-semester survey allowed the capstone team to include fall 2010 mentors in the review. The results of the mentor end-of-semester surveys are compiled and analyzed below.

Based on the mentor feedback, the DELTA internship was a positive and beneficial addition to each company. All of the mentors responded that they would gladly host another intern. One mentor even suggested that interns be offered the opportunity to remain for two semesters so that they would be able to take on more substantial projects. Nearly all of the mentors felt that the time spent with their intern each week was sufficient. The one exception responded that this amount of time was insufficient. Additionally, one mentor added that they would have liked more warning and planning time before the start of the semester in order to better prepare for the internship itself.

According to mentors, the goals established at the start of the internships were met and accomplished across the board. All of the mentors except one were very satisfied with the interaction with the Institute for the Environment staff. The one exception stated that more effective communication was necessary for the future. This, however appears to have been an isolated issue, as the other mentors stated that communication was not an issue and that the staff were extremely helpful.

3.2.2 Intern Mid-Semester Survey

The mid-semester survey was a tool that allowed the capstone team to gauge internship progress. The team inquired about interns and mentors being on schedule with goals as well as elaborating on current projects since the SEO quarterly report I.

The mid-semester survey responses reflected that most interns were following their projected timeline for the semester. With the exception of the UNC Environmental Finance Center intern, most DELTA interns did not encounter significant barriers. The Environmental Finance Center intern reported significant obstacles related to regulations that govern the recipients of money saved by energy efficiency projects on campus and hence severely limited the number of possible projects that could be funded by a revolving fund created either by the RESPC or UNC's endowment. According to the intern, the challenges in the implementation of a revolving fund involve factors that are off campus, such as the state legislature.

Each intern also provided the capstone team with descriptions of events and/or projects that they were currently involved with or had completed.

The RTI interns planned to meet with a representative from Cherokee Investment Partners to further discuss their project. They compiled incentives for renewable energy and brownfield redevelopment and were looking at the feasibility of such implementation.

The UNC Wind Study interns completed data acquisition and data quality analysis. They were then able to use the processed data in wind extrapolation schemes to determine offshore wind potential at various NC offshore locations.

The Town of Chapel Hill graduate intern completed the 2010 Energy and Greenhouse Gas Inventory for municipal operations within the Town of Chapel Hill. He continued work related to a community-wide energy and GHG inventory for the town. He also continued work on developing a municipal energy management plan and discovered potential savings in audits already performed by his DELTA internship work. He reported that he was managing a grant opportunity that has enabled 100,000 square feet of facilities to be detailed for energy audits to identify potential energy savings opportunities.

The UNC Environmental Finance Center intern was working on two main projects. First, he was working with the RESPC to establish a small-scale revolving fund for energy efficiency projects in receipt-supported entities on campus, which include Housing, Dining, the Student Union, Athletics, and Parking. This fund would put up the initial capital necessary to pay for an energy efficiency project (LED lighting, HVAC maintenance/upgrade, etc) and then require the receiving entity to use the savings they get on their energy bills to pay the RESPC back over time. This way, the receiving entity never has to raise their energy budget and can still receive upgrades to their energy systems. The second main project was his effort to establish a large-scale revolving fund on campus using a portion of UNC's endowment money. Such a fund would likely be over \$1 million in size and would fund capital-intensive renovations of energy-inefficient buildings. This fund would operate on the same mechanism as the RESPC fund. The difference is that the savings generated by the projects would pay back to the endowment until the receiving entity has paid back more than the endowment's initial investment, thereby helping the endowment grow. This proposal has gotten support from the Vice Chancellor's Sustainability Advisory Committee, which has recommended the creation of a task force to investigate the development of an endowment-based revolving fund for the Chancellor. Such a task force may be formed by the end of the school year.

The UNC Energy Management graduate intern was working on an analysis of direct-controlled or DDC HVAC systems vs. pneumatic systems in terms of energy savings. He had also completed several life-cycle cost analyses on proposed energy efficiency projects on campus to help determine payback periods, long-term savings, and to rank potential energy efficiency projects.

The UNC Energy Management undergraduate interns were entering campus buildings' utility billing data into the EPA's Portfolio Manager Database. This would make it possible to analyze energy consumption over time in all of the buildings and to apply for the Energy Star designation for those that qualify. Four of these buildings were entered into the EPA's National Building Competition for energy conservation. They found a more efficient method of mass entry and were nearly finished with entering buildings into a database by mid-semester. One intern spent time designing promotional materials for Energy Management, with a goal of increasing student and staff awareness of Energy Management and how they can get involved. These efforts included a flyer for an Energy Awareness class for building managers, a flyer for the new "X-treme Energy Teams" initiative involving building staff in energy conservation, a nomination form for the "Conserving Carolina Energy Award" program rewarding members of the UNC community for exceptional initiative in energy conservation, a write-up for the New

Student Guide introducing first year students to Energy Management and how they can reduce their carbon footprints, and a new Facebook organization page which was linked to UNC's social media database.

The Progress Energy intern worked on orientation materials for new employees that summarize the projects underway in EnergyWise. She also scheduled Project Assurance training sessions and helped compile organizational materials.

The Piedmont Biofuels intern took part in planning and attending the Sustainable Biodiesel Summit and the Biodiesel Intensive Workshop. She was in the process of organizing Oil Collections Database, black-box testing for Productions database then in progress, website redesign and maintenance, and a Photovoltaic Solar Panel Workshop scheduled for April 16-17.

The Institute for the Environment graduate intern assisted the capstone team in completing the first reporting requirement and discussed errors in first report, guided the team in editing all documents requested by DELTA advisers, and helped the team create a more functional timeline for the second half of the semester.

The DELTA interns reported that the introductory meetings with the capstone team were helpful because the capstone team helped clarify SEO reporting questions. Interns were able to meet other interns and learn what others were doing within the DELTA program. The main concern that interns had was that SEO reporting questions did not capture a lot of the work being done by DELTA interns. Several interns suggested that the capstone team get more of a sense of what interns are learning and provide more emphasis on expanding perceptions about energy in addition to trying to measure energy saved as a result of the internships. Another main concern was specifying the SEO questions and making them internship-specific, which the team took into consideration and applied to the second round of SEO reporting.

Most interns agreed that the Qualtrics surveying would have been more difficult without meeting with the capstone team. Some interns consulted with mentors for completing the SEO quarterly report I, while others were able to answer the questions without advice. This may be attributed to the level of relevancy between the interns' work and SEO reporting questions. Many interns admitted that the format for SEO quarterly report I was easy to complete, yet a lot of the questions were inapplicable to their particular internships, confusing, or difficult to calculate within the timeframe of the internship. Interns reported that meeting with the capstone team was helpful in explaining the reporting process. All the interns were very understanding of the reporting and monitoring process, acted cooperatively, and were willing to answer questions if needed.

Below are a few representative responses from interns to questions from the mid-semester survey. Responses below include responses to the following questions: Was your meeting with the DELTA capstone group helpful in understanding the reporting the process? Why or why not? Please provide suggestions for any improvements to the surveying process. How well did you understand the Qualtrics reporting document you filled out? Did you consult your mentor while filling out the survey?

“The surveying process is totally fine, and I know that you all don't control the survey itself, which is the thing that needs work.”

“I would suggest that the group get more of a sense of what interns are learning and provide more emphasis on expanding perceptions about energy in addition to trying to measure energy saved as a result of the internships.”

“The survey was vague because it was meant to be taken by all interns – and we’re all doing different things. I think our progress should be reported on an individual basis or project basis. Maybe within the first two weeks of internship, the capstone team or whoever is in charge of progress reporting can meet with interns individually or interns working on similar projects to make surveys that more specifically apply to their internship while still providing delta an idea of how all internships are progressing collectively. Didn’t have to consult my mentor. I understood it because of the meeting with the capstone group and knowing what I could skip, what didn’t really apply.”

“I understood most of the questions, though many were not directly related to my particular internship.”

3.2.3 Intern End-of-Semester Survey

The purpose of the Intern end-of-semester survey was to have interns report on the overall experience of the internship. The capstone team inquired about each interns’ perceived impacts to the community as well as their host organization, impacts on future academic and career goals, the skills and knowledge that were acquired during the internship, and the overall themes that were present in their internship work. Below are some results from the Intern end-of-semester survey.

Impacts from outputs

Interns were asked various questions in the end-of-semester survey regarding the potential and definite impacts that these internships would have on the university, the state of North Carolina, the environment, their future academic and career goals, and their host organization.

One RTI intern reported that his work on a financial model for valuing renewable energy development on brownfield sites would be helpful for rethinking the possible uses of brownfield sites and growing the economy with the production of renewable energy at these sites. The intern also reported that this work has led him to further pursue a related project working with Cherokee Investment Partners.

Undergraduate interns at UNC Energy Management reported that their work was beneficial to identifying, understanding, and reporting the efficiency of many campus buildings. They worked to compile building information that is helpful for future identification of the most inefficient buildings on campus and they created promotional material to increase awareness of efficiency as well as possibly institute behavior change in regards to building energy use. The interns entered buildings into EPA competitions and established X-treme Energy Teams to foster participation in building efficiency from students, faculty, and staff. One Energy Management intern reported that her involvement in this internship has solidified her decision to pursue a career in the energy field.

The UNC Finance Center intern helped establish the revolving fund for his host agency, which in turn affects student-funded projects for renewable energy. This greatly impacts the campus community in that student investment leads to energy and carbon savings. Below is the response to his perceived long-term impacts for the UNC Environmental Finance Center:

“For the Environmental Finance Center, I hope that the long-term impact of my internship will be a closer connection between the center and campus. UNC has this amazing resource in the Environmental Finance Center (EFC), but so few people on campus have even heard of it. I hope that this internship is the start of more students getting connected to the EFC and thinking about how we can pay for environmental services in the future.”

UNC Wind Study interns organized *in situ* data from 13 offshore monitoring stations for future use. According to the interns, this data will be helpful for later estimating potential power output along offshore North Carolina. This internship has served to reinforce and validate one Wind Study intern’s interest in environmental engineering.

Skills and knowledge

Because DELTA internships were unique, interns gained a wide range of new skills and knowledge. The UNC Energy Management graduate intern reported that he learned about life cycle cost analyses and gained a greater understanding of electricity and energy efficiency engineering. The Piedmont Biofuels intern learned about management, consulting, data organization, and grant administration. She also reported that working with an industry that lost its subsidy, went bankrupt, and struggled to make ends meet again was an interesting experience. Other general skills and knowledge acquired included data collection and analysis, understanding of energy systems as they pertain to UNC and beyond, financial structures behind these systems, problem solving in a "real-world" work environment and presenting knowledge to others.

These skills and knowledge are an integral part of the internship experience. It is important to note that interns are learning from these internships and that these skills are transferable to future academic and professional pursuits.

Internship themes

The capstone team used a simple content analysis technique of reporting frequency of terms, to help report on the major activities and priorities of the internships. In the End-of-Semester survey interns were asked to rank a list of 11 themes from most (1) to least (11) relevant to his or her particular internship. These themes were identified by the capstone team to create a more specific categorization of each internship. The themes stemmed from the three measures of the DELTA program: renewable energy production, greenhouse gas emissions, and conventional energy savings. The themes included: renewable energy, management/organization of new projects, management/organization of existing projects, building efficiency, finances, education, conservation, on-campus projects, off-campus projects, feasibility studies, and other. The capstone team focused on the interns’ top three rankings for analysis. The capstone team then analyzed similarities and differences among interns.

A value was assigned to each of the top three themes to easily quantify the relevance of each theme to internships. A ranking of 1 was given a value of 3 points; a ranking of 2 was given a value of 2 points; and a ranking of 3 was given a value of 1 point. Rankings of 4 and above were given a value of zero. A sum was calculated for each theme to determine its ranking amongst the other themes. For example, renewable energy had the following rankings from different interns: 1, 1, 1, 2, 8, 8, 9, and 10. Each ranking of 1 was given 3 points for a subtotal of 9 points and the rank of 2 was given 2 points for a subtotal of 2 points. The rankings 8, 8, 9, and 10 were dismissed because they represented no value toward ranking the theme. The subtotals are combined for a sum of 11 points. Figure 2 below displays the sum of these values for each of the 11 themes identified.

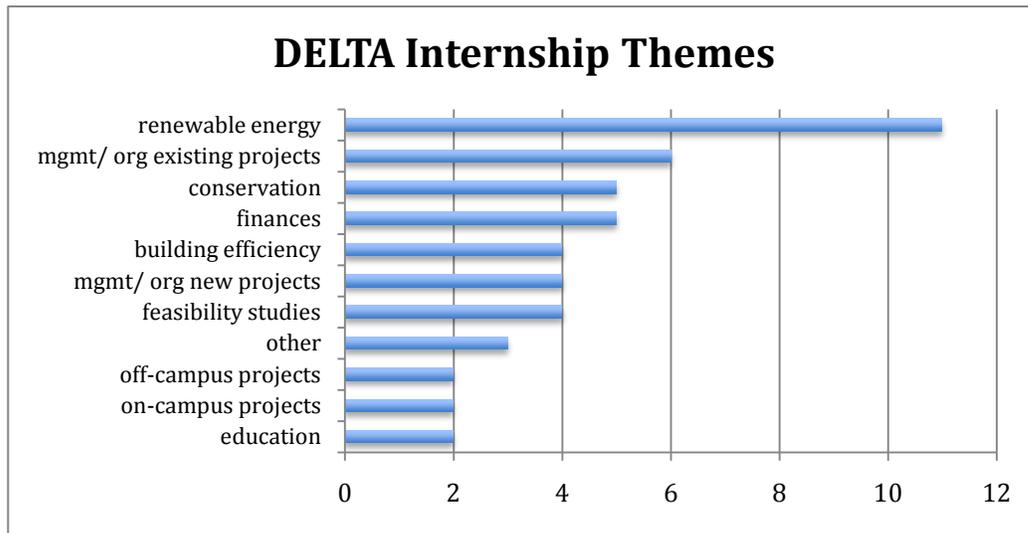


Figure 2. Internship theme rankings

Based on this ranking system and its design, renewable energy is by far the most common and relevant theme to the DELTA internships with a value of 11 points. This is followed by management/organization of existing projects with a sum of 6 points. Conservation and finances tie with 5 points while building efficiency, management/organization of new projects and feasibility studies tie at 4 points. One intern reported to be doing ‘other’ as her top ranked theme, and identified it as technology. Although they were included in some interns’ top three rankings, on-campus, off-campus, and education had the lowest value rankings.

The themes and their corresponding values provide an indication of possible and actual impacts of the internship that were not captured with the quantitative data collections. This ranking system was an especially useful tool by which the capstone team could determine the primary foci of the internships. These results helped in the team’s analysis and in providing recommendations for future reporting questions for the State Energy Office.

Comparing undergraduates working together at UNC Energy Management, there were no overlapping top three rankings. For example, one intern reported management/organization of existing projects, education, and management/organization of new projects as her top three,

respectively. The other intern at UNC Energy Management ranked conservation, building efficiency and on-campus projects as her top three themes, respectively. These interns were working together on projects for UNC Energy Management. It is logical that all of these themes are captured in their internships. However, the lack of consistency in theme rankings may be an indication of different responsibilities that each intern may have been assigned. Though the interns were working collaboratively, they may have been contributing to different aspects of a single project and therefore have different perceptions of what themes were relevant to their particular duties.

From other documents and reporting steps, it was clear that the graduate intern at UNC Energy Management was doing much different work from the undergraduates. The graduate intern was working with data analysis rather than data entry. However, the graduate intern and the second undergraduate intern at UNC Energy Management both ranked building efficiency as the second most relevant theme of their internships. This may be representative of the work that UNC Energy Management is currently involved in: finding and funding potential energy projects specifically focused on buildings.

It is important to note that interns ranked management of existing projects as the second most relevant theme for the DELTA internships. This is important because it shows that interns are committed to continuing and possibly improving existing energy-related projects. Management/organization of new projects ranks lower in the themes list, yet many interns noted in surveys that new projects had been created and would potentially become well-established and carried on in the future.

It is worth noting that education ranked as one of the lowest among the themes. However, interns created pamphlets, organized educational events, and used social media to increase public attentiveness to energy conservation and reduction of emissions. The DELTA program provided undergraduates and graduates an opportunity to make real-world impacts while working hands-on with data and they do not normally get access to in regular classroom setting.

Conclusions

The reporting framework, results, and analyses allowed the capstone team to conclude that the DELTA program has positive impacts for workforce development, development of student skills and knowledge, building interest in green energy careers and providing opportunities to share their work. The three energy measures of the DELTA program (quantifying reduced energy consumption and emissions, and increased capacity and production of renewable energy) are useful and valuable reflections of positive impacts of the DELTA energy internship program. However, the State Energy Office reporting criteria may not, by themselves, be the most accurate or comprehensive tool for monitoring the success of the program.

The first reporting effort in early March generated quantitative and qualitative data on DELTA impacts for the State Energy Office. The SEO framework provided to the capstone team was initially a poor fit for the DELTA internships, but provided a basis for the capstone team to develop a customized reporting framework that served both the external (to SEO) reporting requirements and internal (to the UNC Institute for the Environment) reporting needs. The DELTA capstone team learned from the complications in the first reporting period to improve the monitoring process, identify data gaps, and prepare for a complete and reliable set of data in advance of the June SEO quarterly report, which covers all the work of the spring 2011 interns.

The second SEO quarterly report was more successful than the first because the DELTA capstone team gauged progress of internships with a mid-semester survey, was able to incorporate questions that would gather more internship-specific data, and personalize the second SEO quarterly report Qualtrics survey for interns. This data, along with a qualitative end-of-semester survey, allowed the capstone team to capture the full scope of DELTA internships. The capstone team is able to make recommendations for future internship monitors based on the aggregation from fall 2010 and spring 2011 monitoring processes.

Recommendations for DELTA Monitoring

The DELTA capstone team learned about monitoring a group of interns with energy-related outputs. The different steps in the monitoring and capstone processes have helped give the capstone team insight as to the most effective and efficient way to monitor DELTA interns. Below are recommendations for the future DELTA intern monitor based on capstone successes, obstacles, and learning experiences.

The capstone team recommends creating a clear language with which all parties are familiar. Knowing the purpose of documents, who receives specific documents, when to send and receive surveys, and how to administer surveys would be extremely helpful in the monitoring process. For example, the capstone team encountered problems in the multiple terms used to refer to a mentor, supervisor, advisor, etc. There was also confusion identifying the different elements associated with each document. For example, the 2010 capstone team used “initial survey questions,” which were often confused with workplans and the SEO quarterly report I. A consistent and clear language about DELTA and SEO will help alleviate confusion amongst monitor, staff and client. Suggested language is listed in Appendix I.

The initial steps in this semester’s DELTA monitoring process were aimed at familiarizing the 2011 DELTA capstone team with the program’s mission, who is involved, and what is expected. However, it was difficult for the capstone team to gauge the specific nature of internships based solely on workplans and online descriptions. In order to put faces to names and internships, and also to acquire a more concrete understanding of what interns were doing, the 2011 capstone team met with interns either individually or in small groups. We recommend that these short introductions be made at the beginning of the semester so that the DELTA monitor and each intern can begin a conversation about the internship and also understand reporting roles.

During these short meetings, the capstone team explained to the interns the SEO reporting criteria, to the best of their knowledge. Some questions were sufficiently vague that even the project staff were not completely certain about the nature and purpose of the questions. Other reporting questions were completely inapplicable to the majority of internships. The capstone team recommends the DELTA monitor, faculty, staff, and client all meet with a representative from the State Energy Office to inform everyone of the meaning and purpose of the reporting criteria. It may not be necessary for all parties to know, but it could be helpful in case a problem arises later in the semester in which an intern or monitor is confused about a certain question. If all parties involved in monitoring were well informed of SEO reporting criteria, anyone would be able to answer questions for clarification. Once everyone is familiar with reporting criteria, these should be explained to interns and mentors alike.

The 2011 DELTA capstone team did not complete the State Energy Office quarterly report I in a format suitable for submission to the State Energy Office. Future monitors should take the following steps in order to meet reporting deadlines and formats: acquire SEO reporting dates and deadlines to be included in their workplan/timeline; create a workplan/timeline that accounts for any major holidays or reporting obstacles for the students (i.e. 4th of July); set intern response deadlines 2 weeks prior to actual SEO reporting date; aggregate SEO intern responses one week prior to actual SEO reporting date so that advisors and staff can review, edit, and approve the document for submission. Once these dates and timelines are approved and concrete, the capstone team recommends providing interns with survey and reporting

dates at the start of their internship so they know when to expect a reporting survey and possibly have time to prepare for the reporting session and not delay the process.

The capstone team recommends using online surveying resources such as Qualtrics for easy submission of SEO reporting responses. The capstone team had not worked with Qualtrics previously, but acquired sufficient knowledge of the program to satisfy the purposes of the task. Microsoft Word documents were sent out via email for the mid-semester surveys. The capstone team found this was the most efficient way of distributing and aggregating responses and recommends that the future monitor uses this method as well. The capstone team combined the end-of-semester surveys with the SEO report II in order to save time for the interns and the capstone team. If there is more time during the next DELTA monitoring session, the capstone team recommends keeping SEO and qualitative surveys separate from each other. This way interns will be more likely to respond with more elaborate qualitative answers because there will not be as many questions to answer in one sitting.

In regards to the mid-semester survey the capstone team recommends adding the question, "Are you on target, and if not, what is your plan to get back on track?" This question gives the intern an opportunity to think critically about the goals set forth in the intern-mentor agreement and the expected outcomes of the internship.

Appendix I Recommended DELTA Monitoring Framework

Position Descriptions

Intern: student assigned to an individual organization to capture the impacts of renewable energy production, greenhouse gas emissions, and conventional energy savings.

Mentor: representative from selected organization who guides interns throughout the DELTA program with education, mentoring, and supervision.

Faculty and staff: Institute for the Environment representatives that manage DELTA program logistics. Lindsay Leonard is the project staff member responsible for sending surveys, receiving responses and communicating with interns and mentors.

Monitor: Institute for the Environment representative(s) responsible for monitoring, surveying, and analyzing intern progress throughout the DELTA program. Monitor is responsible for communicating with Lindsay Leonard, preparing documents, processing results, and organizing monitoring process. The 2011 Capstone team recommends this monitor be a single individual rather than a large group because of the inefficiencies associated with tracking multiple people, documents, and communications. The best way to accomplish this could be to have a DELTA intern hired for this particular job and use the recommended framework below. This framework is a modification of the 2010 and 2011 capstone models.

Client: DELTA program manager

SEO: State Energy Office

Document Descriptions

DELTA Mentor-Intern Agreement

What: This document will serve as an agreement between intern and mentor by establishing expectations from both parties, detailing the student's workplan, and discussing expected outcomes and impacts of the internship. This document is a combination of Lindsay Leonard's original workplan, 2010 capstone team initial survey, and 2011 capstone team questions.

Who: This document is to be completed by the mentor and intern together with Lindsay Leonard.

When: This document should be filled out at the beginning of the internship, ideally prior to the start of the intern's start date.

Why: This form will give the monitoring team an idea of what the internship entails and what reporting criteria are applicable to this internship.

SEO Quarterly Report I

What: This document is a condensed version of the SEO reporting questions, which are asked of every energy related grant. This document can be administered in the form of an online survey. With the mentor/intern agreement, the monitor should receive feedback and develop an idea of what particular sections of the quarterly reporting will most likely be answerable. The full survey should be administered during the first reporting period to ensure that all applicable SEO questions are answered. Interns should answer all the questions they can, and note questions they cannot answer at the time but will be able to as the semester progresses. It is to be understood, therefore, that all questions left unanswered will not pertain to the intern at any point throughout the semester, and those questions will be omitted from the following report.

Who: This document is to be filled out by the intern with appropriate guidance and review from the mentor. Some interns may be working with other interns on the same projects and may want to complete this survey together if they are doing similar work for the same organization. The monitor is responsible for explaining SEO questions to all interns so that they understand what each question means, what details SEO is asking for, and how to answer the question. The monitor will meet with an SEO representative to become familiar with these questions.

When: For interns starting in May, this report should be turned in to the State Energy Office by June 7.

Why: This document encompasses the main pillars of the DELTA program. This document provides the State Energy Office with quantitative data on the interns' progress.

DELTA Mid-Semester Survey

What: This document is a short survey consisting of qualitative questions about the progress of internships. Questions should focus on: interns meeting their target goals, more details on their projects thus far, and feedback on the administrative process.

Who: This document is to be filled out by the intern. A similar survey should be administered to mentors to track their overall perception of internships.

When: This survey should be sent to interns at the midpoint of their internship.

Why: This document provides the monitoring group/individual with qualitative information about how the semester is progressing for the DELTA intern.

SEO Quarterly Report II

What: This survey is a personalized survey administered to interns through Qualtrics. All questions that were not answered or were not marked as answerable in the future in the SEO quarterly report I are omitted. This survey may also contain some general, but customized questions for the intern that the SEO survey does not cover.

Who: This document is to be filled out by the intern with appropriate guidance and review from the mentor.

When: For interns starting after May, this report should be turned in to the SEO by September 7.

Why: This document encompasses the main pillars of the DELTA program. This document provides the SEO with quantitative data on the interns' progress.

DELTA Intern End-of-Semester Survey

What: This document is an exit survey for the intern to evaluate his or her internship, mentor, overall experience, and to reflect on the outputs and impacts of the internship.

Who: Each intern is to complete this survey independently.

When: This document is to be sent to interns at the conclusion of their internships.

Why: Interns will exit the semester with qualitative questions pertaining to their individual internship. This will allow programmers to know if the intern was satisfied with their internship, mentor, experience, monitoring group, etc.

DELTA Mentor End-of-Semester Survey

What: This document is an exit survey for mentors to evaluate internships, mentor, overall experience, and reflect on output and impacts of internships.

Who: Mentors complete this document.

When: This document is to be sent to mentors at the conclusion of internships.

Why: Mentors will exit the semester with qualitative questions pertaining to their individual intern. This will allow programmers/monitors to know if the mentor was satisfied with their intern, experience, staff, etc.

Appendix I A- Annotated Intern-Mentor Agreement

Student-Mentor Internship Agreement

Student Name: _____
Major: _____ Year: _____
Phone: _____ Email: _____

Mentor/Agency/Organization: _____
Address: _____
Phone: _____ Email: _____
Start Date: _____ End Date: _____
Internship Schedule (days/ times): _____

Internship Project Description

Project Topic:

Internship Duties and Responsibilities: How will the learning objectives of this internship fulfill the spirit of DELTA program and help further the organization’s mission?

Source: Lindsay Leonard’s original workplan and DELTA Capstone Team 2011

Goal: To assess how this specific internship fits within the DELTA program.

What new skill sets will the intern obtain as a result of this internship?

Source: DELTA Capstone Team 2011

Goal: To assess the impact of internship on the interns.

Work Products and Timeline: Detail a projected work plan based upon the defined duties, responsibilities, and objectives listed above. Include dates, a description of projects, and strategies for accomplishing the work plan.

Source: Lindsay Leonard’s original workplan and DELTA Capstone Team 2011

Goal: To establish an understanding of the expectations for when and what, as well as to provide the intern-mentor with a framework from which to move forward.

How will the mentor and intern work together to quantitatively assess measureable energy impacts?

Source: DELTA Capstone Team 2010 Initial Survey and DELTA Capstone Team 2011

Goal: To understand how energy impacts of the internship can be quantitatively measured.

Which of the following State Energy Office reporting criteria does the mentor/agency/organization foresee the intern being involved with directly either through researching, planning, or implementation? (mark all that apply)

Renewable Energy: renewable energy capacity or generation; renewable energy market development; renewable energy installation (developing a plan or physically installing); emissions reduction

Energy Efficiency: conventional energy savings (utility bills, mileage reports); building retrofits; purchasing units (CFL bulbs, exit signs, etc); building energy audits

Technical assistance: leading, assisting in, planning, providing and/or attending workshops, trainings, brochures, posters, pamphlets, education sessions, etc.

Transportation: purchasing alternative fuel vehicles; forming car or vanpools

Clean energy policy

Source: DELTA Capstone Team 2011

Goal: To find the most common/relevant theme of Delta Internship that matches SEO reporting criteria.

Evaluation Criteria (to be completed by Mentor): What are the expected major outputs and impacts of the intern’s work?

Source: Lindsay Leonard’s original workplan and DELTA Capstone Team 2011

Goal: To compile mentor’s expectations for the intern’s work.

Student: _____ Date: _____

Mentor: _____ Date: _____

Appendix I B- Annotated Mid-semester Survey

DELTA Intern Mid-semester Report

Intern Name: _____

Mentor Name & Title: _____

1. Please describe the current progress of your internship (circle one).

 ahead of schedule on schedule behind schedule

Have you encountered any significant obstacles? Please explain.

Source: Spring 2011 DELTA Capstone Team
Goal: Assess internship progress and delays

2. Please describe any events and/ or projects you are currently working on or have completed thus far.

Source: Spring 2011 DELTA Capstone Team
Goal: To further understand how the internship is progressing

3. Was your meeting with the DELTA capstone group helpful in understanding the reporting the process? Why or why not? Please provide suggestions for any improvements to the surveying process.

Source: Spring 2011 DELTA Capstone Team
Goal: To receive feedback on the initial meeting with the interns

4. How well did you understand the Qualtrics reporting document you filled out? Did you consult your mentor while filling out the survey?

Source: Spring 2011 DELTA Capstone Team
Goal: To verify that the interns were not hindered by any ambiguous questions in the State Reporting document, and to determine mentor input

Additional comments or suggestions:

Appendix I C- Annotated Intern End-of-semester Survey

DELTA Intern End of the Semester Report

Intern Name: _____

Mentor Name & Title: _____

1. How many hours **per week** did you spend working with your mentor? (circle one)

<2 >2 to 4 >4 to 6 >6 to 8 >8 to 10 >10

This amount of time was (circle one):

Too much Just right Too little

Source: Delta Capstone Team 2011
Goal: To assess intern-mentor work interactions

2. Did you accomplish the tasks set forth at the beginning of the semester with your workplan? Please explain.

Source: Delta Intern End of the Semester Report 2010
Goal: To evaluate if goals were accomplished

3. What are the major deliverables (outputs) from your internship? For each deliverable, what is its impact (to the university, your internship site, the State of NC, the environment, etc.)?

Source: Delta Intern End of the Semester Report 2011
Goal: To assess the practical implementation of the internship. Question on impacts added by the Delta Capstone 2011 to get detailed response of their impact.

4. What skills and knowledge did you acquire through your DELTA internship this semester?

Source: Delta Intern End of the Semester Report 2010,
Goal: To understand how the interns are being benefitted from the internship and ways it can be improved.

5. Would you recommend that this specific internship be continued for additional semesters? Why or why not?

Source: Delta Capstone team 2011
Goal: To understand if the internship was helpful to both the interns and the project

6. What changes, if any, would you recommend for improving the internship for future semesters?

Source: Delta Intern End of the Semester Report 2010

Goal: To better understand ways to improve.

7. How has participation in the DELTA Internship affected your future academic and career goals?

Source: Delta Intern End of the Semester Report 2010

Goal: To assess the effect of the internship on the interns)

8. In what ways did your internship promote conventional energy savings, emissions reduction, and/or renewable energy?

Source: Delta Intern End of the Semester Report 2010

Goal: To assess effectiveness of the internship

9. What do you perceive will be the long-term impacts of your internship to your agency?

Additional comments or suggestions

Appendix I D- Annotated Mentor End-of-Semester Survey

DELTA Mentor End of the Semester Report

Mentor Name & Title: _____

Intern’s Name: _____

1. How many hours **per week** did you spend working with your intern? (circle one)

0-2 2-4 4-6 6-8 8-10 10+

This amount of time was (circle one):

Too much Just right Too little

Source: 2010 Entrance Survey

2. What were your goals for the internship/ intern this semester? Were the necessary tasks completed to accomplish the tasks?

Source: 2010 Entrance Survey

Goal: To understand if necessary tasks were completed

3. What are the major deliverables (outputs) from your intern? What are some of the impacts (to the university, to your internship site, to the environment, etc.) of these outputs?

Source: 2010 Entrance Survey

Goal: To see the actual physical products of internships

4. Overall, do you feel this internship was effective? Do you feel that it should it be continued for additional semesters?

Source: Mentor & Intern Evaluation, 2010

Goal: To attain input from those who understand the internships the best

5. How did the internship project contribute to renewable energy generation, energy efficiency implementation or reduced greenhouse gas emissions?

Source: Mentor Evaluation 2010

Goal: To see how the internship accomplished the Delta goals

6. 6. I would be interested in hosting a DELTA intern again. Yes No
If not, why not?

Source: Mentor Evaluation 2010

Goal: To understand whether the current interns could be considered for future internship project. If not, what are the drawbacks that need to be addressed?

7. How could IE staff have been more helpful to you as a mentor?

Source: Mentor Evaluation

Goal: To understand ways we could improve our methods

Any further comments.

Appendix II A- 2011 Capstone Workplan

Group Members: Karla Capacetti, Vanessa Gil, Heather Hyde, Nawsheen Khan, Sarah Smith

Project Overview: The vision of this project is to develop a monitoring framework to track the progress of the DELTA Energy Internships. Monitoring will include tracking energy conservation, emissions reductions, and renewable energy research and innovation that will elaborate on the work of the 2010 Capstone students.

Goal 1.1: Collect baseline information for 2010 interns and their mentors (week of 1/31)

- Review 2010 Capstone project documents
 - Final public report and presentation
- Revise/create an exit survey for 2010 mentors regarding the 2010 internships
- Review data from 2010 internships with quantitative analysis
 - Example: Utility Bills, Gasoline
- Review data from 2010 internships with qualitative analysis
 - Determine the scope of the qualitative initiatives interns created: brochures, lessons, workshops, etc

Goal 1.2: Collect baseline information from 2011 interns and mentors (week of 2/7)

- Review online internship descriptions
- Ask Lindsay and Kathleen for intern work plans. We will use the interns' initial work plans to become familiar with their
 - Energy conservation: what is the internship site already doing and what how will the intern improve conservation?
 - Carbon emissions: intern will calculate current emissions as well as use our monitoring plan to keep track of emissions
 - Renewable energy production: intern will research potential for internship site to implement or install renewable energy production retrofits
- Meet with interns
 - Contact interns and set meeting date
 - The purpose of initial intern meetings is to: gather internship scope, explain reporting system

Goal 2: Develop methods of monitoring and compile information to meet State Energy Office reporting deadline (March 7) (February-March)

- Create Qualtrics online survey for interns and sponsors using State Energy Office quarterly reporting questions

- Create reporting document to be turned in to Lindsay, Elizabeth and Kathleen regarding introductory meeting notes and any notes about their responses
- Personalize SEO reporting II surveys for each intern based on quarterly reporting I responses
- Create a Mid-semester survey for interns with qualitative questions regarding obstacles, projects, reporting process
- Create an End-of-semester survey for interns with qualitative questions regarding expectations, outcomes, and overall effectiveness of internship
- Create an End-of-semester survey for mentors with qualitative questions regarding expectations, outcomes, and overall effectiveness of internship

Week of 2/21: meet with interns; send out SEO quarterly report I survey

Week of 2/28: meet with interns; send out SEO quarterly report I survey; compile survey answers from interns to present as midterm materials

Week of 3/21: send out and collect Mid-semester survey to interns

Week of 3/28: compile Mid-semester survey

Weeks of 4/4 and 4/11: begin working on presentation and public report

Week of 4/11: send out and collect SEO quarterly report II and End-of-semester survey questions to intern

Week of 4/25: finish final presentation and public document

Week of 5/2: present

Goal 3: Evaluate scope of each internship and develop a report

- Responses for each survey will be aggregated. Overall themes among internships and unique findings will be analyzed.
- We will develop a public report and power point presentation that includes general monitoring framework, data, and results, both quantitative and qualitative. The power point will also include recommendations for future monitors based on our findings.

Goal 4: Develop a reporting framework for future monitoring teams so that they can build upon our work and 2010 work so that further progress can be made.

Appendix II B- Introductory Meeting Agenda

1. Explain how the monitoring of the DELTA internships will work:

“We will be monitoring renewable energy production, greenhouse gas emissions reduction, and conventional energy savings. With this introductory meeting we will explain the online surveying system and SEO quarterly reporting questions. We will additionally use a Mid-semester survey and an End-of-semester survey to keep track of the progress and results of your internships.”

2. DELTA interns provide brief explanation of their internship.
3. Explain the Qualtrics online surveying system.
4. Explain SEO reporting requirements to the interns by reviewing each question and explaining the purpose.
5. Answer any questions interns may have.

Appendix II C: SEO Reporting Criteria

Questions for Quarterly Reporting: December-February

Award Number (Purchase Order Number)	<input type="text"/>
PROJECT INFORMATION	
<p>Project Milestones Please provide projected time frame for each milestone item.</p>	<div style="border: 1px solid gray; height: 60px; width: 100%;"></div> <div style="text-align: right; margin-top: 5px;"> <input type="button" value="↑"/> <input type="button" value="↓"/> </div> <p>2000 character maximum</p>
<p>Planned Schedule Are you following the planned schedule?</p>	<div style="border: 1px solid gray; padding: 2px;"> Yes <input type="button" value="▼"/> </div>
<p>Quarterly Accomplishments What are the accomplishments for this quarter? Please include major activities, significant results, major findings and key outcomes.</p>	<div style="border: 1px solid gray; height: 60px; width: 100%;"></div> <div style="text-align: right; margin-top: 5px;"> <input type="button" value="↑"/> <input type="button" value="↓"/> </div> <p>2000 character maximum</p>
<p>Problems or Delays Actual or anticipated problems or delays?</p>	<div style="border: 1px solid gray; height: 60px; width: 100%;"></div> <div style="text-align: right; margin-top: 5px;"> <input type="button" value="↑"/> <input type="button" value="↓"/> </div> <p>2000 character maximum</p>
<p>Next Quarter's Accomplishments What do you expect to accomplish in the following quarter?</p>	<div style="border: 1px solid gray; height: 60px; width: 100%;"></div> <div style="text-align: right; margin-top: 5px;"> <input type="button" value="↑"/> <input type="button" value="↓"/> </div> <p>2000 character maximum</p>
ECONOMIC IMPACT	
<p>Counties where funds distributed</p>	<div style="border: 1px solid gray; height: 60px; width: 100%;"></div> <div style="text-align: right; margin-top: 5px;"> <input type="button" value="↑"/> <input type="button" value="↓"/> </div> <p>2000 character maximum</p>

Counties Affected

2000 character maximum

FINANCIAL INCENTIVES FOR ENERGY EFFICIENCY AND OTHER COVERED INVESTMENTS

Monetary value of financial incentive provided (Dollar)
Enter the value of incentives received.

Total value of investments incentivized (Dollar)
Enter the value/cost of the materials that allowed you to receive the financial incentives.

Projected monetary value of energy savings (\$)

Renewable Energy

RENEWABLE ENERGY CAPACITY AND GENERATION

Please enter the amount for each renewable energy capacity and generation, if applicable.

Amount of Wind-powered Electric Generating Capacity Installed (MW)

Amount of Electricity Generated From Wind Systems (MWh)

Amount of Photovoltaic Generating Capacity Installed (MW)

Amount of Electricity Generated from Photovoltaic Systems (megawatts per year)

Amount of Electric Generating Capacity from Other Renewable Sources Installed (MW)

Amount of Electricity Generated from Other Renewable Sources (megawatts per year)

RENEWABLE ENERGY MARKET DEVELOPMENT

Please enter the number and capacity for each renewable energy market development installed, if applicable.

Solar Energy Systems Installed

Capacity of Solar Energy System Installed (kw)	<input type="text"/>
# Wind Energy Systems Installed	<input type="text"/>
Capacity of Wind Energy Systems Installed (kw)	<input type="text"/>
# Solar Thermal Systems Installed	<input type="text"/>
Capacity of Solar Thermal Systems Installed (square feet)	<input type="text"/>
# Ground Source Geothermal Systems Installed	<input type="text"/>
Capacity of Ground Source Geothermal Systems Installed (tons)	<input type="text"/>
# Biomass (non-transport) Systems Installed	<input type="text"/>
Capacity of Biomass (non-transport) Systems Installed (kw)	<input type="text"/>
# Biofuel Systems Installed	<input type="text"/>
Capacity of Biofuel Systems Installed (gallons per year)	<input type="text"/>
# Hydropower Systems Installed	<input type="text"/>
Capacity of Hydropower Systems Installed (kw)	<input type="text"/>
# Other Systems Installed	<input type="text"/>
Capacity of Other Systems Installed (btu/h)	<input type="text"/>
Capacity of Other Systems Installed (kw)	<input type="text"/>
EMISSION REDUCTION	
Criteria air pollutants reduced (tons)	<input type="text"/>
Greenhouse gases reduced (CO2 equivalents)	<input type="text"/>

Energy Efficiency	
ENERGY SAVINGS (kwh equivalents)	
Reduction of Natural Gas Consumption (mmcf)	<input type="text"/>
Reduction of Electricity Consumption (MWh)	<input type="text"/>
Reduction of Electricity Demand (MW)	<input type="text"/>
Reduction of Fuel Oil Consumption (gallons)	<input type="text"/>
Reduction of Propane Consumption (gallons)	<input type="text"/>
Reduction of Petroleum Consumption (gallons)	<input type="text"/>
Reduction of Gasoline and Diesel Fuel Consumption (gallons)	<input type="text"/>
BUILDING RETROFITS	
# Buildings Retrofitted	<input type="text"/>
Square Footage of Buildings Retrofitted	<input type="text"/>
TYPES OF UNITS PURCHASED	
Exit Signs	<input type="text"/>
Bulbs	<input type="text"/>
HVAC Equipment	<input type="text"/>
Office Equipment	<input type="text"/>
Streetlights	<input type="text"/>

Other
Enter the type(s) and quantity.

500 character maximum

Technical Assistance & Training

TECHNICAL ASSISTANCE

Technical Assistance Provided

Details of Technical Assistance Provided

2000 character maximum

WORKSHOP, TRAINING, AND EDUCATION SESSIONS

Expected # People to Attend

15 character maximum

Expected # Sessions to be Held

15 character maximum

of Contacts

BUILDING ENERGY AUDITS	
# Audits Performed	<input type="text"/>
Floor space Audited (square feet)	<input type="text"/>
Auditor's Projection of Energy Savings (kwh)	<input type="text"/>
<input type="button" value="Save and Proceed"/>	

[Need Support?](#)

Transportation	
# Alternative Fuel Vehicles Purchased	<input type="text"/>
# Vehicles Purchased	<input type="text"/>
# Conventional Vehicles Converted to Alternative Fuels Use	<input type="text"/>
# New alternative Refueling Stations Emplaced	<input type="text"/>
# New Carpool and Vanpool Formed	<input type="text"/>
# Energy Efficiency Traffic Signals Installed	<input type="text"/>
# Street Lane-Miles for which Synchronized Traffic Signals were Installed	<input type="text"/>
Codes and Policy	
BUILDING CODES AND STANDARDS; NUMBER OF NEW AND EXISTING BUILDING COVERED BY NEW CODE	
<p>This section is to be completed only by the contractor providing code training and code policy work.</p>	
Building Codes Old : NCECC 2006	<input type="text"/>
Building Codes New : NCECC 2009	<input type="text"/>

Building Codes Old : ASHRAE 90.1-2004	<input type="text"/>
Building Codes New : ASHRAE 90.1-2007	<input type="text"/>
CLEAN ENERGY POLICY (if applicable)	
# Alternative Energy Plans Developed	<input type="text"/>
# Alternative Energy Plans Improved	<input type="text"/>
# Renewable Portfolio Standards Established	<input type="text"/>
# Renewable Portfolio Standards Improved	<input type="text"/>
# Interconnection Standards Established	<input type="text"/>
# Interconnection Standards Improved	<input type="text"/>
# Energy Efficiency Portfolio Standards Established	<input type="text"/>
# Energy Efficiency Portfolio Standards Improved	<input type="text"/>
# Other Policies Developed	<input type="text"/>
# Other Policies Improved	<input type="text"/>
# Policies Established that Align Utility Financial Incentives with Consumer Energy Efficiency	<input type="text"/>
# Policies Improved that Align Utility Financial Incentives with Consumer Energy Efficiency	<input type="text"/>

Appendix II D- Example Additional Intern Questions

UNC Wind Study

1. What is the offshore potential wind capacity for NC?
2. How many/how much square footage offshore area is being examined?
3. What are the specifications for an area to be considered to have viable wind potential?
4. How many wind energy systems could potentially be installed if offshore wind development were to be implemented?

RTI

1. How are the incentives for renewable energy financed/ repaid?
2. What sites are being considered for Brownfield redevelopment? Only local or national sites?
3. Is all the research being conducted through internet databases? Any in person/ on-site interviews?
4. In general, what is/ are the most feasible renewable energy (or infill development) for Brownfield redevelopment?
5. Are you receiving technical assistance from sources other than your mentor?

Town of Chapel Hill

1. What sector/ neighborhood/ buildings have the most potential for energy savings through these audits?
2. What are the top 2-3 sources of greenhouse gas emissions for the town of CH?

UNC Environmental Finance

1. How many buildings are currently being considered for redevelopment (financed by one of the two revolving funds)?
2. Would the same buildings be eligible for both revolving funds once established, or will there be different criteria/ restrictions?

UNC Energy Management (graduate)

1. What is the difference in energy efficiency and life-cycle cost between DDC HVAC and Pneumatic systems?

UNC Energy Management (undergraduate)

1. How many (approx) people attended each of the four lectures on energy conservation?
2. How many buildings and/or faculty and staff would the "Xtreme Energy Teams" initiative involve?

Progress Energy

1. How many trainings do you expect to organize/ hold? How many people do you expect to attend (approx)?

Piedmont Biofuels

1. By how much (in miles or gallons of fuel saved) have the oil collection routes been

UNC Institute for the Environment

shortened?

2. Have any new positions or partnerships formed between Piedmont Biofuels and other organizations or entities during the past few months?
3. Has there been an increase in visitors to Piedmont Biofuels and/ or in biodiesel consumption in the area?
4. How many people are expected to attend the Photovoltaic Solar Panel Workshop?