

RTI International Annual Report

*State Fiscal Year 2010–2011 Report of Program Activities, Objectives & Accomplishments;
and Itemized Expenditures and Fund Sources*

Citation of Law or Resolution:

S.L.2010-31

Section Number:

Section 14.17A

Due Date:

September 1, 2011

Submission Date:

September 1, 2011

Receiving Entities:

The Joint Legislative Commission on Governmental Operations
The Fiscal Research Division
Department of Commerce
reports@ncleg.net

Submitting Entity:

Research Triangle Institute d/b/a/ RTI International
3040 Cornwallis Road
Research Triangle Park, N.C. 27709

Table of Contents

Section	Page
About RTI	1
Energy Research at RTI	1
Importance of the \$482,500 Grant Appropriated to RTI in the FY 2010–2011 State Budget	2
State Fiscal Year 2010–2011 Program Activities, Objectives, and Accomplishments	4
State Fiscal Year 2010–2011 Itemized Expenditures and Fund Sources	7
Summary	7
Appendix	
A State of North Carolina Cost Share Funding.....	A-1

As provided in Session Law 2010-31, Section 14.17A, RTI International (RTI) is pleased to submit this report of State fiscal year program activities, objectives, and accomplishments and prior State fiscal year itemized expenditures and fund sources.

ABOUT RTI

Growing from a handful of scientists in central North Carolina in 1959 to a staff of more than 2,800 in more than 40 countries today, RTI is now one of the world's leading independent, nonprofit research and development organizations and one of the largest employers in the Research Triangle region.

Our activities both mirror and support national priorities and policies as well as diverse commercial, industrial, and academic endeavors. For instance, as public and government interest in environmental protection grew in the 1960s, so did related programs at RTI, building on our expertise in statistical, physical, and life sciences.

As our mission affirms, we are dedicated to improving the human condition by turning knowledge into practice through cutting-edge study and analysis in advanced technology, energy and the environment, health and pharmaceuticals, education and training, surveys and statistics, international development, economic and social policy, and laboratory and chemistry services.

We are proud of our scientific stature and our reputation for innovation. By continuing to conduct impartial, reliable, multidisciplinary research and by helping to develop and broker new technologies for our clients, we seek to be the world's preferred resource for turning knowledge into practice.

ENERGY RESEARCH AT RTI

RTI develops advanced energy technologies to address today's significant energy challenges, such as climate change, energy security, energy efficiency, sustainability, and water conservation. Our research supports national and worldwide goals of reliable, sustainable, economically viable, and secure energy supplies.

RTI scientists and engineers conduct applied research and development (R&D) for a variety of stakeholders in the power, chemical, and petroleum refining industries, as well as for transportation. These stakeholders include

- process technology licensors
- gas processing companies
- oil refiners

- chemical manufacturers
- electric utility
- clean fuels developers
- catalyst manufacturers.

In addition to these and other commercial clients, RTI also works with the U.S. Department of Energy (DOE), Department of Defense (DOD), and other government agencies.

Our R&D programs are also directly engaged with the social, political, and economic aspects of energy. Examples include the following:

- RTI energy economists provide detailed, quantitative analyses of the economic benefits derived from new energy technologies.
- RTI experts perform prospective and retrospective studies of technologies and industries and create and present economic return measures for R&D programs as a whole.

IMPORTANCE OF THE \$482,500 GRANT APPROPRIATED TO RTI IN THE FY 2010–2011 STATE BUDGET

The State Budget approved by the legislature for FY 2010–2011 included a \$482,500¹ grant to assist RTI in winning federal energy research grants that require cost share—or match. The goal of this grant was to help RTI advance energy research in North Carolina and create jobs in this important and growing part of the state's economy.

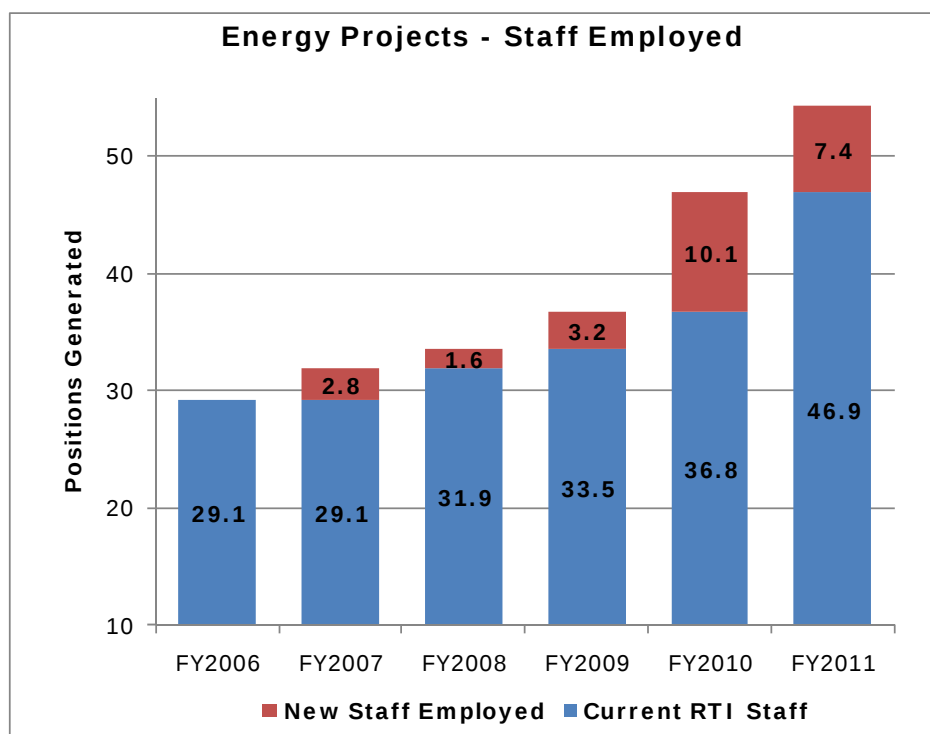
To date, the funding appropriated to RTI has greatly assisted it in accomplishing these goals. Indeed, for every \$1 of state funding, RTI has been able to leverage \$9 in federal funding for new energy research conducted in North Carolina. More specifically, the appropriation provided to RTI has allowed RTI to bring \$4,543,987 in federal research dollars to the state.

The appropriation also allowed RTI to fund 18 technology-related positions in North Carolina. These jobs include project managers, direct project technical staff, and G&A positions related to accounting and contracts. The 18 FTEs represent 13 jobs retained and 5

¹ NOTE: The \$482,500 appropriated directly to RTI in the FY 2010–2011 State Budget for matching federal energy grants should NOT be confused with a separate appropriation of \$1 million made to and administered by the N.C. Department of Commerce to distribute to North Carolina research organizations for the same purpose. Although RTI advised the Department regarding its administration of the \$1 million, RTI did not apply nor make use of the Department of Commerce funding. Also, the FY 2010–2011 State Budget appropriated \$500,000 to RTI for U.S. DOE energy grant cost share. The grant was reduced to \$482,500 as a result of across-the-board budget reductions imposed by the Executive Branch to address a budget shortfall during the State's economic crisis.

newly created positions. Of the 13 jobs retained, 4 are bachelor degree level, 4 are master's degree level, and 5 are PhD level. Of the 5 new hires, 2 are bachelor degree level, 2 are master's degree level, and 1 is PhD level.

In addition to the aforementioned positions, the \$4.53 million in federal research dollars support 18 jobs and \$2.14 million in additional economic output in the state through the consumption of products and services from local companies and the spending power of RTI's NC employees. Thus, total gains from the state's investment in RTI amount to \$6.77 million in output and 36 jobs.²



RTI has successfully retained and created jobs in the state of North Carolina, leveraging federal funds, through use of the FY11 NC Grant Funds as detailed below.

Federal Dollars Leveraged through Use of State Funding		
Project / Proposal	NC Funds Used (\$)	Federal Dollars Leveraged (\$)
CO ₂ to CO Conversion	200,000	800,000
CO ₂ Solvent & Capture	49,460	197,840
50 Megawatt—Phase: Analysis and FEED	92,258	2,983,021
System Reliability Model for SSL Luminaries	140,782	563,126
Total	\$482,500	\$4,543,987

² Minnesota IMPLAN group using the North Carolina statewide input/output model (2011).

STATE FISCAL YEAR 2010–2011 PROGRAM ACTIVITIES, OBJECTIVES, AND ACCOMPLISHMENTS

Specific projects benefiting from State of NC funds and the goals of those projects are highlighted below:

1. **CO₂ to CO Conversion.** The goal of this project is to demonstrate the feasibility of a carbon dioxide (CO₂) utilization process for producing valuable chemicals based on reduction of CO₂ with abundant low-value carbon sources. Advantages of using this process include increasing U.S. energy security, increasing U.S. scientific discovery and innovation, and providing fossil fuel-based power plants. \$200,000 in labor costs were paid for with state funds and provided the required 20 percent cost share match under federal rules. To date, the project has been successful and has been awarded the second phase of DOE funding worth more than \$440,000. Current development of the economic models for the process, which produces a mixed product of CO and H₂ that can be further converted into value-added fuels products methanol, dimethyl ether (DME), gasoline, and Fischer Tropsch (FT) wax and diesel, indicates a sound economic potential. Figure 1 presents a flow diagram for the CO₂ utilization process.

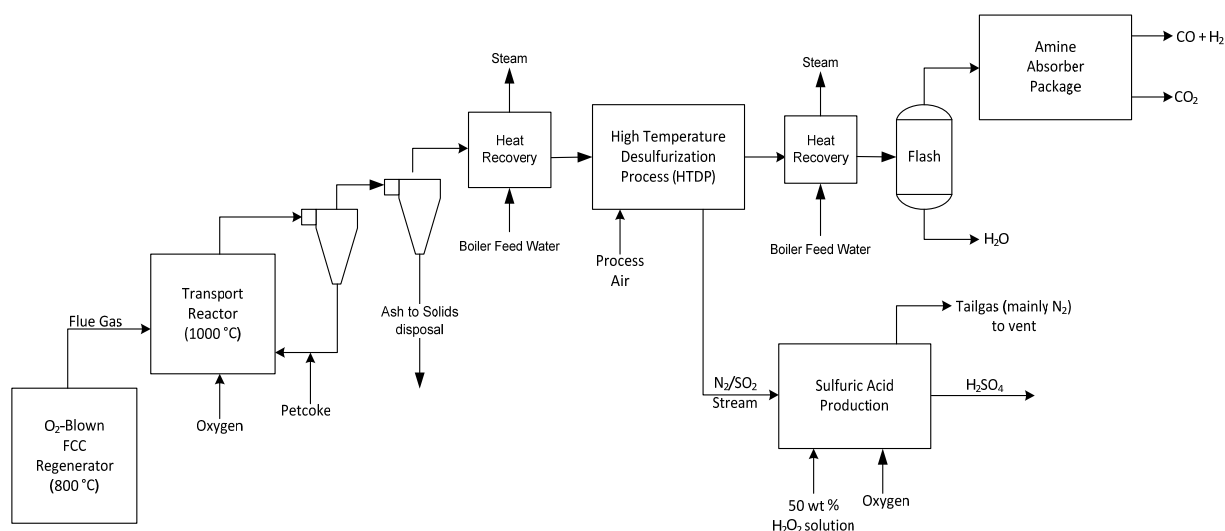


Figure 1. Block Flow Diagram of the CO₂ utilization process

2. **CO₂ Solvent and Capture.** The overall objective of this project is to develop novel, non-aqueous CO₂ scrubbing solvents and a capture process that substantially reduces CO₂ emissions from existing and new coal-fired power plants while reducing the parasitic energy penalty and corresponding increase in cost of electricity associated with CO₂ capture compared to state-of-the-art CO₂ capture processes. Our novel CO₂ capture process has the potential to enable cost-competitive clean energy production from coal-fired power plants using domestic coal, improve U.S. energy and economic security, and keep the United States at the forefront of

advanced energy and greenhouse gas control technologies. The project has also attracted BASF, the leading global chemical company as a development partner, providing global reach and recognition for this technology developed in North Carolina.

Detailed technical and economic assessments have indicated that the our novel CO₂ capture process has substantial potential for lowering the cost of CO₂ capture by ~50% compared to the state-of-the-art CO₂ capture processes. The State of NC grant funded \$49,460 in labor costs, which was leveraged to capture an additional \$197,840 in federal funding. These funds were essential in expanding RTI's, experimental capabilities, which included the development of an instrumental experimental resource. With these grant funds, we were able to construct a first-of-a-kind experimental apparatus that has significantly improved the team's ability to rapidly identify and thoroughly characterize the most promising non-aqueous solvent formulations (see Figure 2).

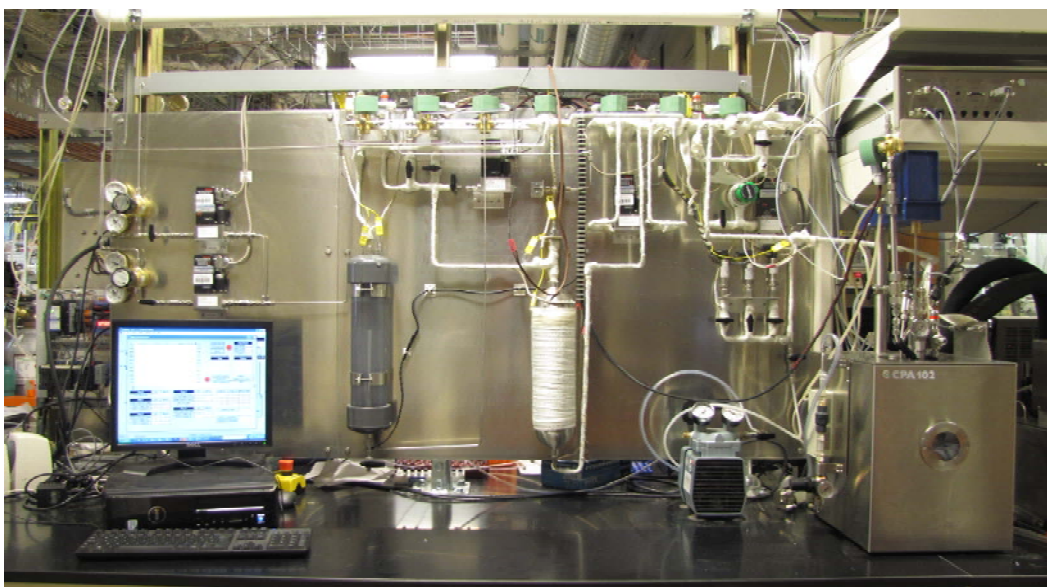


Figure 2. Highly Automated, Coupled Vapor-Liquid Equilibrium and Reaction Calorimeter

In July 2011, the project successfully completed its first year achieving all project milestones and Year 1 Go/No-Go decision points. In Year 2, our focus shifts to thoroughly evaluating the most promising solvent formulations, identified in Year 1, in a realistic process using real flue gas. Figure 3 shows the flow diagram for this process unit.

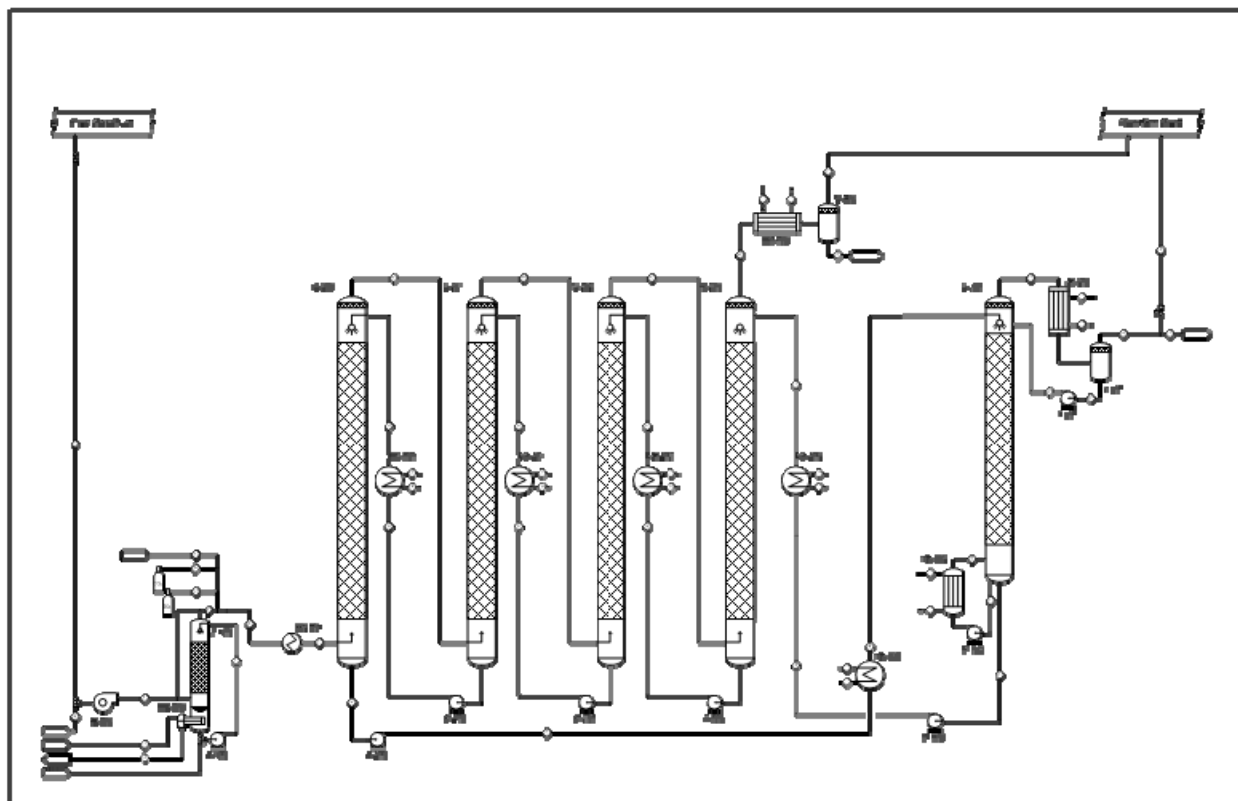


Figure 3 Prototype CO₂ Capture Process Unit

3. **50 Megawatt Syngas Clean-up Technology Demonstration.** In this project, RTI and its partners propose to use new technology to eliminate the need for syngas cooling and expensive heat recovery systems, significantly reducing the capital and operating costs of an integrated gasification combined cycle power plant. The State of NC grant funded \$92,258 in labor costs and provided a critical portion of the cost share match required under federal rules. RTI was able to hire a senior project manager with experience in managing \$100+ million capital projects. Adding this project management strength to the RTI team will position the energy program at RTI to accelerate its growth in the segment of medium-to-large energy pilot and demonstration projects. With the expansion of RTI's energy program in mind, RTI is now looking at developing new world-class facilities in Research Triangle Park that can accommodate some of these large-scale efforts and that can further contribute to the generation of energy technology jobs in the region.
4. RTI has allocated and will use the remaining funds (\$140,782) for a newly awarded project, **System Reliability Model for SSL Luminaries**. This is a very exciting DOE project that involves NC-based businesses CREE, SAS, and RTI. This project will investigate optical properties of nanofibers for solid-state lighting (SSL), develop methods to combine nanofibers with luminescent nanoparticles, develop and measure prototype performance, and assess manufacturing options. Project work will begin in the fall of 2011.

STATE FISCAL YEAR 2010–2011 ITEMIZED EXPENDITURES AND FUND SOURCES

All appropriation funds were applied to labor costs inclusive of indirect overhead charges.
See Appendix A.

SUMMARY

All of the funds received by RTI have been used for the purposes for which they were granted. Financial data for all listed projects, inclusive of forecasts, have been provided for FY11 through June 2011. The line item budget for the FY11 use of funds is attached. We appreciate the support of the above projects and the continued opportunity to hire and retain jobs in the State of North Carolina. Please direct any questions to Dr. David Myers, Vice President, Engineering Technology Unit, RTI International, dmyers@rti.org or 919-541-7183.

**APPENDIX A: STATE OF NORTH CAROLINA
COST SHARE FUNDING**

Summary

State of NC Funding \$482,500

Project/Proposal	Start Date	Total Cost	DOE Award	Cost Share Requirement	Use of NC Funds	Federal Dollars Leveraged
CO ₂ to CO Conversion	8/2/2010	\$1,000,000	\$800,000	\$200,000	\$200,000	\$800,000
CO ₂ Solvent & Capture	7/1/2010	\$2,750,000	\$2,200,000	\$550,000	\$49,460	\$197,840
50 Megawatt—Phase: Analysis and FEED	10/1/2010	\$6,095,283	\$5,912,424	\$182,859	\$92,258	\$2,983,021
System Reliability Model for SSL Luminaires	8/1/2011	\$2,124,146	\$1,699,317	\$424,829	\$140,782	\$563,126
TOTAL				\$1,357,688	\$482,500	\$4,543,987

Funding Breakout—by Project by Quarter

7/1/10–6/30/11 = Actuals, 7/1/11–12/31/11 = Forecast	Q1	Q2	Q3	Q4
	7/1/10– 9/30/10	10/1/10– 12/31/10	1/1/11– 3/31/11	4/1/11– 6/30/11
CO ₂ to CO Conversion (\$200K in Cost Share)				
Labor (w/Fringe)	\$3,884	\$13,983	\$27,478	\$65,621
Travel, Services, etc.	\$	\$1,438	\$3,564	\$8,488
Equipment, Materials, Subcontractors	\$	\$111	\$19,319	\$25,054
Overhead (Indirect) Costs	\$5,076	\$18,614	\$37,521	\$88,766
Total	\$8,960	\$34,146	\$87,882	\$187,930
Labor (fully loaded)	\$8,958	\$32,251	\$63,375	\$151,348
Cumulative Labor (fully loaded) towards State Cost Share Funds	\$8,958	\$41,209	\$104,585	\$200,000

Funding Breakout—by Project by Quarter

7/1/10–6/30/11 = Actuals, 7/1/11–12/31/11 = Forecast	Q1	Q2	Q3	Q4
	7/1/10– 9/30/10	10/1/10– 12/31/10	1/1/11– 3/31/11	4/1/11– 6/30/11
CO2 Solvent & Capture (\$49K in Cost Share)				
Labor (w/Fringe)	\$92,029	\$102,342	\$78,805	\$93,013
Travel, Services, etc.	\$6,327	\$6,179	\$1,167	\$10,252
Equipment, Materials, Subcontractors	\$85,254	\$102,234	\$49,112	\$28,542
Overhead (Indirect) Costs	\$124,908	\$139,323	\$104,992	\$125,175
Total	\$308,518	\$350,078	\$234,076	\$256,982
Labor (fully loaded)	\$212,256	\$236,034	\$181,756	\$214,525
Cumulative Labor (fully loaded) towards State Cost Share Funds	\$49,460			
	7/1/10– 9/30/10	10/1/10 – 12/31/10	1/1/11– 3/31/11	4/1/11– 6/30/11
50 Megawatt				
Labor (w/Fringe)	\$	\$160,504	\$234,524	\$156,879
Travel, Services, etc.	\$	\$13,521	\$71,104	\$25,896
Equipment, Materials, Subcontractors	\$	\$5,557	\$8,673	\$2,120,417
Overhead (Indirect) Costs	\$	\$212,581	\$322,977	\$295,401
Total	\$0	\$392,163	\$637,278	\$2,598,593
Labor (fully loaded)	\$0	\$370,186	\$540,906	\$361,826
Cumulative Labor (fully loaded) towards State Cost Share Funds	\$0	\$0	\$0	\$92,258

Funding Breakout—by Project by Quarter

7/1/10–6/30/11 = Actuals, 7/1/11–12/31/11 = Forecast	Q1	Q2	Q3	Q4	Q1	Q2
	7/1/10– 9/30/10	10/1/10– 12/31/10	1/1/11– 3/31/11	4/1/11– 6/30/11	7/1/11– 9/30/11	10/1/11– 12/31/11
System Reliability Model for SSL Luminaires						
Labor (w/Fringe)	\$	\$	\$	\$	\$34,197	\$51,295
Travel, Services, etc.	\$	\$	\$	\$	\$1,847	\$2,771
Equipment, Materials, Subcontractors	\$	\$	\$	\$	\$22,750	\$34,125
Overhead (Indirect) Costs	\$	\$	\$	\$	\$43,773	\$65,659
Total	\$0	\$0	\$0	\$0	\$102,567	\$153,850
Labor (fully loaded)	\$0	\$0	\$0	\$0	\$78,872	\$118,307
Cumulative Labor (fully loaded) towards State Cost Share Funds				Work will begin in Fall 2011	\$78,872	\$140,782