RTI International Annual Report

State Fiscal Year 2012–2013 Report of Program Activities, Objectives and Accomplishments; and Itemized Expenditures and Fund Sources

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REPORT OVERVIEW

- For the 2012–2013 fiscal year (FY), RTI received a nonrecurring State appropriation of $500,000 to match U.S. Department of Energy research and development funds.
- RTI utilized $429,629 of the State's investment in this program, allowing RTI to draw down an additional $2,376,986 in federal energy research funds along with private sector investment.
- This fiscal year, RTI did not need to fully utilize the state appropriation due to a delay in an anticipated project award from the U.S. Department of Energy and RTI's success in attracting private sector cost share. RTI will therefore return $70,371 to the State.
- As a result, for every $1 in State FY 2013 funds, North Carolina received a direct return of $5.53 in federal and private investment to North Carolina's economy.

As provided in Session Law 2011-145, Section 14.12B.(a)(1), RTI International 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 3,700 in more than 40 countries today, RTI is now one of the world's leading independent, nonprofit research and development (R&D) 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 energy security, energy efficiency, sustainability, climate change, and water conservation. Our research supports national and worldwide goals of reliable, sustainable, economically viable, and secure energy supplies. In a newly created program, RTI also addresses the water-energy-nexus through technology development that improves the energy efficiency of industrial water treatment.

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

- Process technology licensors
- Gas processing companies

- Oil refiners
- Chemical manufacturers
- Electric utilities
- Clean fuels developers
- Catalyst manufacturers
- Lighting companies.

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 to develop new energy technologies.

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 $500K GRANT APPROPRIATED TO RTI IN THE FY 2012–2013 STATE BUDGET

North Carolina State Funding as an Investment in Energy Technology Development

RTI develops advanced energy technologies mainly under the funding from the U.S. Department of Energy. These federal research awards require a cost share—or match, from non-federal sources. RTI's first priority is to develop partnerships with industry that can attract this cost share match from the private sector, and RTI has a successful track record for building these industry alliances. In the very early stages of technology development, it is at times necessary for RTI to cover the cost share independently before an industrial partnership can be formed.

The State Budget approved by the legislature for Fiscal Year (FY) 2012–2013 included a $500,000 grant to assist RTI in winning federal energy research grants that require cost share—or match. The goal of this grant is to help RTI advance energy research in North Carolina and create jobs in this important and growing part of the state's economy. The key points of how RTI utilizes the grant and the benefits to the State can be summarized as follows:

- North Carolina state funding helps RTI to initiate development of three to five additional energy technology concepts per year. This year, a total of eight development projects have been benefitting from the state funding.

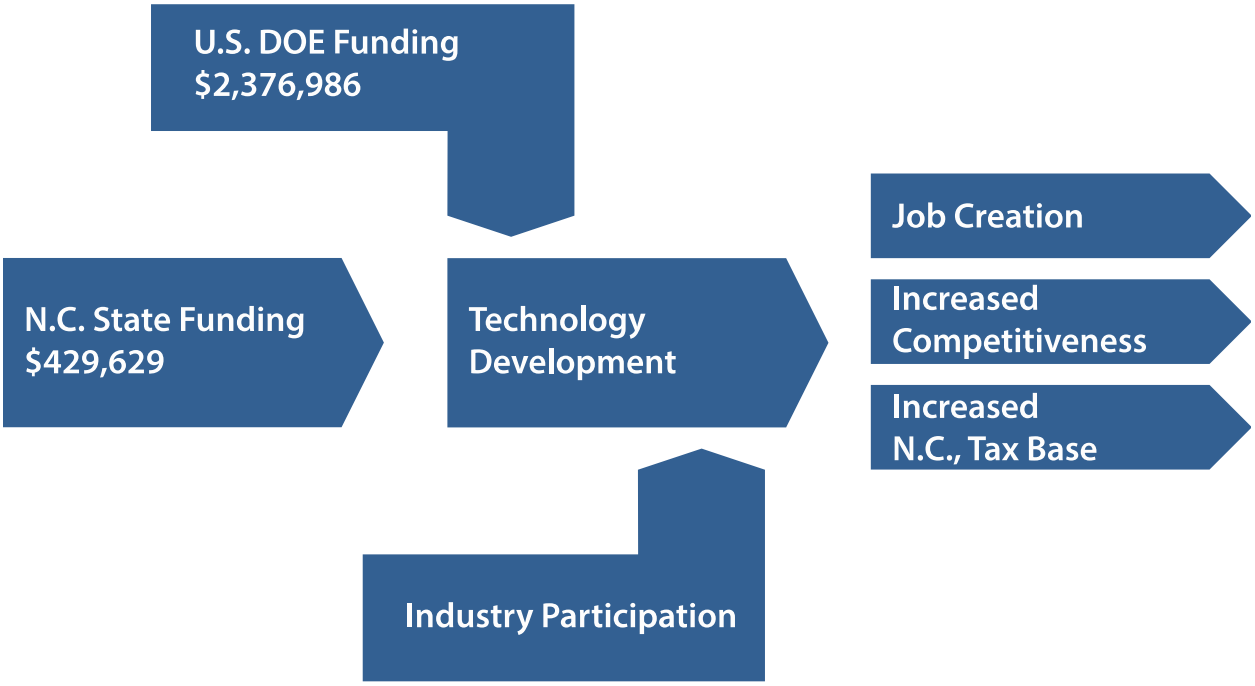
- This fiscal year RTI utilized $429,629 of the State's funding to attract an additional $2,376,986 in federal energy research funds along with private sector investment.

- Together with U.S. DOE funding and in partnerships with leading industrial companies RTI builds a pipeline of innovative technologies addressing the energy challenges of the nation.

- Technology development moves through scale-up phases, attracting further large-scale investment. RTI has invested more than $1 million of internal funding to develop RTI's Energy Technology Development Facility (ETDF) on RTI's RTP campus to house bench- and small pilot scale process units. For example, a pilot plant to scale up a technology to make gasoline from cellulosic biomass has been constructed and is starting operation this summer in the EDTF, supported through a $4 million award from the U.S. Department of Energy. The facility is also the host site for a bench scale process unit for a CO_2 capture process that RTI is developing with BASF. We expect this facility to attract further interest by commercial entities for biomass conversion testing and other process scale-up efforts.

Biomass Pyrolysis Unit in RTI's new Energy Technology Development Facility

- Commercialization of technologies leads to increased economic competitiveness. It creates high-paying jobs, typically attracting talent from outside of the state and resulting in significant economic input.


U.S. DOE Funding
$2,376,986
N.C. State Funding
$429,629
Technology
Development
Industry Participation
Job Creation
Increased
Competitiveness
Increased
N.C., Tax Base

Current RTI energy projects in the development phase with industrial partners

The following table shows the most relevant examples in RTI's development pipeline for new energy technologies, our industry partners, and the expected progression to the next scale-up phase toward commercialization.

Table 1. RTI Energy R&D Pipeline

Projects	Funding Level	Industry Partners	Current Scale	Next Step
Warm Syngas Clean-Up	$170 million	Tampa Electric Company, Eastman, Clariant, AMEC	Large-scale demonstration (50 MW)	Commercialization 2015/16
Biomass Pyrolysis	$9 million	ADM, Phillips66, Haldor Topsøe	Small Pilot	Demonstration 2014–15
Novel Water Treatment Process	$6 million	Veolia & Duke University)	Lab	Prototype 2015
CO_2 Capture Sorbents	$6 million	Masdar, Foster Wheeler, Clariant (& Penn State University)	Lab	Small Pilot at RTI (2014), small pilot in cement facility in Norway (2015)
Vehicular Natural gas Storage	$3.0 million ($878K RTI)	General Motors (& Texas A&M University, LBNL)	Lab	Prototype
Solid State Lighting Component	~$3 million	Manufacturing partner TBD	Manufacturing scale up	Secure manufacturing partner
CO_2 Capture Solvents	$2.8 million	BASF	Small pilot summer 2013	Small Pilot Demonstration 2014–15 at RTI
CO_2 Utilization	$1.4 million	TBD	Concept development	Lab
Trace Metals Removal	$0.8 million	Tampa Electric Company	Small pilot plant	Demonstration 2014

STATE FISCAL YEAR 2012–2013 PROGRAM ACTIVITIES, OBJECTIVES, AND ACCOMPLISHMENTS

In this fiscal year, utilizing $429,629 of the State's funding has greatly assisted in further building RTI's technology development pipeline, attracting $2,376,986 in federal research dollars to the state, successfully retaining and creating jobs in the state of North Carolina. Table 2 below shows the leveraging of Federal funds through State funding.

This fiscal year, RTI did not need to fully utilize the state appropriation of $500K mainly for two reasons:

1. RTI had anticipated and planned for an award from the U.S. Department of Energy related to RTI's biomass-to-fuels process technology. While RTI's proposal received excellent technical ratings, the project award has been delayed by the federal government. We anticipate at least a partial award for the federal fiscal year 2014.

2. RTI has been very successful in attracting private sector cost share. In particular, RTI has entered into a collaboration agreement with Veolia Water Solutions & Technologies, a global leader in water treatment technologies, which supports a joint technology development in RTI's new industrial water program and covers the main portion of the cost share in that program.

RTI will return the remaining $70,371 to the State.

Table 2. Leveraging of Federal Funds through State Funding

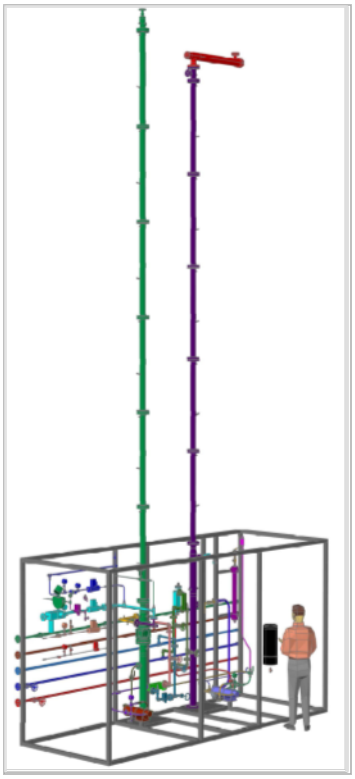
Federal Dollars Leveraged Through Use of State Funding		
Project / Proposal	**NC Funds Used ($)**	**Federal Dollars Leveraged ($)**
Conversion of CO_2 into Commodity Chemicals Using Carbon Feedstocks	74,978	299,912
System Development for Vehicular Natural Gas Storage	43,898	834,062
Industrial Water Reuse	106,468	425,872
Novel Non-Aqueous CO_2 Solvent-based Capture Process with Substantially Reduced Energy Penalties, Phase II	70,000	280,000
Reliability Model for Solid State Lighting	53,287	213,148
Validation of the RTI Therminator Syngas Cleanup Technology	20,060	80,240
CO2 Electroreduction for Electrofuel Applications	23,438	93,752
Advanced Biofuels Consortium	37,500	150,000
Total	**429,629**	**2,376,986**

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

1. **Conversion of CO_2 into Commodity Chemicals Using Carbon Feedstocks**. The primary objective of this project is to produce high-volume value-added chemicals from CO_2 and hydrocarbon reactants with the specific benefit developing a commercially viable use for CO_2. The key accomplishments for this year on this project have been the successful demonstration of a specific catalyst technology to extract oxygen from CO_2 and use this oxygen for hydrocarbon oxidation under commercially relevant process conditions. These accomplishments have the potential for a technical breakthrough, and RTI has used $75K in State funds to leverage $300K of Federal funds and build a strong research platform to continue this development work for multiple applications in the chemical industries.
2. **System Development for Vehicular Natural Gas Storage**. This project is focused on developing and scaling up innovative materials for natural gas (NG) storage, particularly as it relates to storage tanks for light-duty vehicles. This technology represents a safer, simpler, and more cost-effective method for storing NG at reasonable pressures compared to current storage methods (e.g. compression or liquefaction) and is designed to enhance the economics associated with the United States' use of abundant, domestic NG supplies in light-duty vehicles. Our initial two-year effort is focused on improving the NG storage capacity and stability of these novel porous materials as well as mitigating the challenges to producing bulk-scale quantities of these materials. This year, RTI has identified pathways to reduce production cost by a factor of 100 and has developed a comprehensive "technology-to-market plan". Involved is a diverse project team consisting of RTI International, Texas A&M University, Lawrence Berkeley National Laboratory, and the world's largest automobile manufacturer in General Motors. RTI has used $44K in State funds to secure $834K in DOE funding to invest into the lab facilities and development work for this material development.
3. **Industrial Water Reuse**. In the U.S. manufacturing sector, current industrial water use practices are energy-intensive and utilize and discharge high volumes of waters, rendering them not sustainable especially in light of the growing scarcity of suitable water supplies. To help address this problem, the goal of this project is to develop an advanced, cost-effective, hybrid membrane-based water treatment system that can improve the energy efficiency of industrial wastewater treatment by at least 50% relative to current state-of-the-art technology (e.g., reverse osmosis), while allowing at least 50% water reuse efficiency. RTI has entered into a collaboration agreement with Veolia Water Solutions & Technologies, a global leader in water treatment technologies and based in Cary, NC. Accomplishments of the current fiscal year included the modeling, development and optimization of process technology

components. A North Carolina based membrane manufacturer has already indicated interest in providing components once the technology will be commercialized. With $106K of State funds, RTI has leveraged $426K in DOE funds to build and operate RTI's newly developed water technology labs.

4. **Novel Non-Aqueous Solvent-based CO_2 Capture Process**. The overall objective of this project is to develop novel, non-aqueous CO_2 scrubbing solvents and a capture process that substantially reduces CO_2 emissions from existing and new coal fired power plants while reducing the parasitic energy penalty and corresponding increase in cost of electricity associated with CO_2 capture. Our novel CO_2 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 can keep the United States at the forefront of advanced energy and greenhouse gas control technologies. Detailed technical and economic assessments have indicated that our novel CO_2 capture process has substantial potential for lowering the cost of CO_2 capture by ~50% compared to the state-of-the-art CO_2 capture processes. State Funds in the amount of $70K were instrumental in securing an important add-on of $280K from DOE, which has been critical to accelerating the technology development through operation of a bench scale system (see figure) in RTI's new Energy Technology Development Facility.



5. **Reliability Modeling for Solid State Lighting**. RTI has used $53K of funds from the State of North Carolina to supplement $213K in additional funding from the U.S. Department of Energy (DOE) for the development of a reliability model for light fixtures utilizing energy efficient light emitting diode (LED) technologies. Displacing less efficient, high maintenance light sources such as incandescents requires demonstration of the reliability and long-term durability for a new lighting technology such as LED. Through extensive testing and model development, this project demonstrated within the past year that LED light sources are extremely durable and can be expected to operate much longer than conventional light sources under normal operational conditions. By testing LED light fixtures under high stress conditions designed to simulate years of field use, we have been able to identify the weak points in LED lighting systems and compare them to conventional light technologies. These findings are currently being summarized in multiple reports, which will provide the first publicly available LED lighting benchmarks for the

industry and potential users of LED lighting such as municipalities, businesses and consumers.

6. **Validation of the RTI Therminator Syngas Clean-up Technology**. RTI has been developing this technology component for the conversion biomass into power, fuels or chemicals. In this fiscal year, RTI leveraged $20K in State funding to obtain additional $80K in DOE funds to support the completion of a field test phase of the technology and return the process unit to RTI for further evaluation.
7. **CO_2 Electro reduction for Electrofuel Applications.** The goal of this newly awarded DOE/ARPA-E Electrofuels project is to develop an electrochemical bioreactor that efficiently reduces CO_2 to formate, the feedstock for genetically modified bacteria that are engineered to produce liquid fuels such as isobutanol. The project is a highly multi-disciplinary, $4 million collaboration effort between UCLA, UNC-Chapel Hill, and RTI International. RTI used $23K in State funds to secure $94K in federal funding for RTI's proposed work to markedly improve the device design, materials (e.g. electrodes, catalysts), and overall performance of the electrochemical bioreactor, together with UNC.
8. **Advanced Biofuels Consortium (Biomass Hydropyrolysis)**. RTI is a member of the National Advanced Biofuels Consortium, which is funded by the DOE to conduct cutting-edge research to develop infrastructure-compatible, fungible "drop-in" biomass-based transportation fuels. The Consortium develops the technology necessary to deliver processes ready for pilot scale that maximize the use of existing refining and distribution infrastructure, and it consists of group of organizations (industrial partners such as refiners, technology developers and feedstock developers, as well as university partners and National Labs).

   Within the framework of the consortium, RTI used $38K in State of NC funds to win an additional $150K from the U.S. DOE to continue the development of a new technology that can process biomass into a raw crude oil that can be refined to transportation fuels. Specifically, the funding has enabled RTI to continue the development of catalysts and the process design for this important technology.

STATE FISCAL YEAR 2012-2013 ITEMIZED EXPENDITURES AND FUND SOURCES

The $429,629 in appropriation funds used by RTI were applied to labor costs inclusive of indirect overhead charges. See **Appendix A** for detail.

OUTLOOK FOR STATE FISCAL YEAR 2013–2014

For the State fiscal year 2013-2014, RTI plans to continue to utilize State of NC funding to further strengthen its energy program. The funds will be used to leverage federal funds for the following technology development projects:

- **CO_2 Solvent and Capture**. In May 2013, a proposal for $3.2 million over 2 years (Oct. 2013 to Sept. 2015) was submitted to the DOE to support the continued development of RTI's novel, non-aqueous CO_2 capture process, with the objective of addressing process design and operating cost challenges. The goal of this project is to transition the process from the pre-pilot scale to full pilot scale representing a 20-times scale up and another important step toward commercialization. While we have seen significant interest by a major industrial player in the engineering space, RTI may utilize State funds to complement industrial cost share and initiate this larger scale test program at RTI's facilities.

- **Biomass Pyrolysis**. This technology development for the conversion of biomass to transportation fuels has been funded by U.S. DOE, and RTI submitted a proposal for $3.9 million in U.S. DOE funding to continue the development and further improve the efficiency of this technology, with the goal to maximize the biomass carbon and energy recovery. While the proposal received excellent technical reviews, the anticipated award has been delayed. If successful, RTI intends to leverage State funding to complement cost share from our industry partners for this project.

- **Advanced Gasification Technologies**. RTI expects an award from the U.S. DOE during the fall of 2013 to provide funding for a detailed techno-economic and process integration study of RTI's warm syngas clean-up technology with other advanced gasification technology. This study, performed with industry partners, will be a critical element in the commercialization of RTI's syngas clean-up technology, which is currently being demonstrated at a power plant in Florida.

- **CO_2 to CO Conversion**. The goal of this project is to demonstrate the feasibility of a carbon dioxide (CO_2) utilization process for producing valuable chemicals based on reduction of CO_2 with abundant low-value carbon sources. RTI has been in extensive discussions with the U.S. DOE to further fund the expansion of this new, early stage technology platform, provided certain technical targets can be met. We anticipate utilizing State funds during the first half of calendar year 2014 to leverage additional federal funds for this effort.

- **Water Treatment**: RTI has proposed to the U.S. DOE the development of advanced membranes for treating flowback and produced water from unconventional gas development. The technology will conserve precious water resources and reduce

environmental impact of shale gas and tight oil production. The technology will build upon the industrial water treatment technology platform that RTI is currently developing together with Veolia. Due to the early stage nature of the specific membrane approach, RTI plans to utilize State funds to cost share federal funding, until industrial partnerships can be formed.

- **Solid State Lighting**. Working together with North Carolina-based Cree and SAS, RTI plans to perform further test work to validate its model of the long-term reliability of solid-state lighting (SSL) luminaires. The validated model will provide a tool to quantify the return on investment for energy-efficient lighting. RTI expects to utilize State of North Carolina to attract more than $575K from the U.S. DOE.

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 FY 13 through June 2013. The line item budget for the FY 13 use of funds is attached. We appreciate the State's 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 and 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 $500,000						
Project/Proposal	**Start Date**	**Total Cost**	**DOE Award**	**Cost Share Requirement**	**Use of NC Funds**	**Federal Dollars Leveraged**
Conversion of CO_2 into Commodity Chemicals Using Carbon Feedstocks	10/1/2012	$ 374,890	$ 299,912	$ 74,978	$ 74,978	$ 299,912
System Development for Vehicular Natural Gas Storage Using Advanced Porous Materials	10/1/2012	$ 877,961	$ 834,063	$ 43,898	$ 43,898	$ 834,062
Industrial Water Reuse	9/1/2012	$ 1,953,266	$ 1,562,613	$ 390,653	$ 106,468	$ 425,872
Novel Non-Aqueous CO_2 Solvent-based Capture Process with Substantially Reduced Energy Penalties, Phase II	10/1/2012	$ 350,000	$ 280,000	$ 70,000	$ 70,000	$ 280,000
Reliability Model for Solid State Lighting	10/1/2012	$ 707,023	$ 565,521	$ 141,502	$ 53,287	$ 213,148
Validation of the RTI Therminator Syngas Cleanup Technology	10/1/2012	$ 97,286	$ 77,226	$ 20,060	$ 20,060	$ 80,240
CO_2 Electroreduction for Electrofuel Applications	3/1/2013	$ 117,188	$ 93,750	$ 23,438	$ 23,438	$ 93,752
Advanced Biofuels Consortium	2/7/2013	$ 187,500	$ 150,000	$ 37,500	$ 37,500	$ 150,000
			TOTAL	**$ 802,029**	**$ 429,629**	**$ 2,376,986**
			Unallocated Funding (to return to state):		***$ 70,371***	

Funding Breakout - by Project by Quarter					
7/1/12 - 6/30/13 = Actuals, 7/1/13-9/30/13 = Forecast	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**
	7/1/12 - 9/30/12	**10/1/12 - 12/31/12**	**1/1/13 - 3/31/13**	**4/1/13- 6/30/13**	**7/1/13- 9/30/13**
Conversion of CO2 into Commodity Chemicals Using Carbon Feedstocks, Phase II & III					
Labor (w/ Fringe)	$ 57,981	$ 32,698	$ 60,474	$ 29,817	$ 24,552
Travel, Services, etc.	$ 1,010	$ -	$ -	$ 238	$ 125
Equipment, Materials, Subcontractors	$ 2,459	$ 5,227	$ 1,538	$ 1,132	$ 850
Overhead (Indirect) Costs	$ 76,045	$ 43,617	$ 80,460	$ 38,405	$ 32,607
Total	**$ 137,495**	**$ 81,542**	**$ 142,472**	**$ 69,592**	**$ 58,134**
Labor (fully loaded)	***$ 133,728***	***$ 68,079***	***$ 138,352***	***$ 68,215***	***$ 56,170***
Labor (fully loaded) towards State Cost Share Funds	**$ -**	**$ 34,142**	**$ 1,134**	**$ 17,697**	**$ 22,005**

Funding Breakout - by Project by Quarter				
7/1/12 - 6/30/13 = Actuals, 7/1/13-9/30/13 = Forecast	**Q1**	**Q2**	**Q3**	**Q4**
	7/1/12 - 9/30/12	**10/1/12 - 12/31/12**	**1/1/13 - 3/31/13**	**4/1/13- 6/30/13**
System Development for Vehicular Natural Gas Storage Using Advanced Porous Materials				
Labor (w/ Fringe)	$ -	$ 17,501	$ 40,271	$ 56,570
Travel, Services, etc.	$ -	$ 3,751	$ 13,031	$ 1,927
Equipment, Materials, Subcontractors	$ -	$ 20,121	$ 23,081	$ 9,597
Overhead (Indirect) Costs	$ -	$ 24,901	$ 32,749	$ 74,467
Total	**$ -**	**$ 66,274**	**$ 109,131**	**$ 142,562**
Labor (fully loaded)	***$ -***	***$ 19,042***	***$ 92,132***	***$ 129,422***
Labor (fully loaded) towards State Cost Share Funds	**$ -**	**$ -**	**$ 43,898**	**$ -**

Funding Breakout - by Project by Quarter				
7/1/12 - 6/30/13 = Actuals, 7/1/13-9/30/13 = Forecast	**Q1**	**Q2**	**Q3**	**Q4**
	7/1/12 - 9/30/12	**10/1/12 - 12/31/12**	**1/1/13 - 3/31/13**	**4/1/13- 6/30/13**
Industrial Water Reuse				
Labor (w/ Fringe)	$ 38,002	$ 86,779	$ 106,204	$ 129,623
Travel, Services, etc.	$ 1,100	$ 2,866	$ 2,655	$ 1,196
Equipment, Materials, Subcontractors	$ -	$ 108,584	$ 52,370	$ 204,185
Overhead (Indirect) Costs	$ 36,742	$ 95,774	$ 120,037	$ 138,891
Total	**$ 75,844**	**$ 294,004**	**$ 281,267**	**$ 473,895**
Labor (fully loaded)	***$ 74,480***	***$ 174,926***	***$ 242,974***	***$ 296,551***
Labor (fully loaded) towards State Cost Share Funds	**$ 74,380**	**$ 32,088**	**$ -**	**$ -**

Funding Breakout - by Project by Quarter				
7/1/12 - 6/30/13 = Actuals, 7/1/13-9/30/13 = Forecast	**Q1**	**Q2**	**Q3**	**Q4**
	7/1/12 - 9/30/12	**10/1/12 - 12/31/12**	**1/1/13 - 3/31/13**	**4/1/13- 6/30/13**
Novel Non-Aqueous CO2 Solvent-based Capture Process with Substantially Reduced Energy Penalties, Phase II				
Labor (w/ Fringe)	$ 26,588	$ 12,185	$ 42,652	$ 40,454
Travel, Services, etc.	$ 2,361	$ -	$ 4,121	$ 238
Equipment, Materials, Subcontractors	$ 7,230	$ 24,467	$ 108,412	$ 95,680
Overhead (Indirect) Costs	$ 32,619	$ 17,154	$ 61,648	$ 53,567
Total	**$ 68,798**	**$ 53,805**	**$ 216,834**	**$ 189,938**
Labor (fully loaded)	***$ 61,328***	***$ 27,876***	***$ 97,579***	***$ 92,551***
Labor (fully loaded) towards State Cost Share Funds	**$ -**	**$ 14,439**	**$ 55,561**	**$ -**

Funding Breakout - by Project by Quarter				
7/1/12 - 6/30/13 = Actuals, 7/1/13-9/30/13 = Forecast	**Q1**	**Q2**	**Q3**	**Q4**
	7/1/12 - 9/30/12	**10/1/12 - 12/31/12**	**1/1/13 - 3/31/13**	**4/1/13- 6/30/13**
Reliability Model for Solid State Lighting				
Labor (w/ Fringe)	$ 65,834	$ 53,897	$ 52,460	$ 59,841
Travel, Services, etc.	$ 6,933	$ 1,327	$ 3,215	$ 2,255
Equipment, Materials, Subcontractors	$ 77,331	$ 801	$ 11,532	$ 80,683
Overhead (Indirect) Costs	$ 87,044	$ 68,064	$ 68,940	$ 90,930
Total	**$ 237,143**	**$ 124,090**	**$ 136,146**	**$ 233,709**
Labor (fully loaded)	***$ 145,903***	***$ 119,700***	***$ 118,217***	***$ 140,589***
Labor (fully loaded) towards State Cost Share Funds	**$ -**	**$ 53,287**	**$ -**	**$ -**

Funding Breakout - by Project by Quarter				
7/1/12 - 6/30/13 = Actuals, 7/1/13-9/30/13 = Forecast	**Q1**	**Q2**	**Q3**	**Q4**
	7/1/12 - 9/30/12	**10/1/12 - 12/31/12**	**1/1/13 - 3/31/13**	**4/1/13- 6/30/13**
Validation of the RTI Therminator Syngas Cleanup Technology in an Integrated Biomass Gasification/Fuel Synthesis Process Ph2				
Labor (w/ Fringe)	$ 71,687	$ 12,691	$ 15,019	$ 6,761
Travel, Services, etc.	$ 14,274	$ 6,544	$ 16,987	$ -
Equipment, Materials, Subcontractors	$ 1,106,181	$ 219,702	$ 12,264	$ 16,146
Overhead (Indirect) Costs	$ 135,256	$ 18,811	$ 24,071	$ 9,217
Total	**$ 1,327,398**	**$ 257,748**	**$ 68,340**	**$ 32,124**
Labor (fully loaded)	***$ 165,713***	***$ 29,270***	***$ 34,361***	***$ 15,468***
Labor (fully loaded) towards State Cost Share Funds	**$ -**	**$ -**	**$ 17,200**	**$ 2,860**

Funding Breakout - by Project by Quarter				
7/1/12 - 6/30/13 = Actuals, 7/1/13-9/30/13 = Forecast	Q1	Q2	Q3	Q4
	7/1/12 - 9/30/12	10/1/12 - 12/31/12	1/1/13 - 3/31/13	4/1/13- 6/30/13
CO_2 Electroreduction for Electrofuel Applications				
Labor (w/ Fringe)	$ -	$ -	$ 8,045	$ 10,435
Travel, Services, etc.	$ -	$ -		$ 10
Equipment, Materials, Subcontractors	$ -	$ -	$ 2,094	$ 1,479
Overhead (Indirect) Costs	$ -	$ -	$ 10,723	$ 13,880
Total	**$ -**	**$ -**	**$ 20,863**	**$ 25,804**
Labor (fully loaded)	***$ -***	***$ -***	***$ 18,406***	***$ 23,874***
Labor (fully loaded) towards State Cost Share Funds	**$ -**	**$ -**	**$ 11,440**	**$ 11,998**

Funding Breakout - by Project by Quarter				
7/1/12 - 6/30/13 = Actuals, 7/1/13-9/30/13 = Forecast	Q1	Q2	Q3	Q4
	7/1/12 - 9/30/12	10/1/12 - 12/31/12	1/1/13 - 3/31/13	4/1/13- 6/30/13
Adanced Biofuels Consortium				
Labor (w/ Fringe)	$ 4,875	$ 61,836	$ 48,556	$ 34,312
Travel, Services, etc.	$ 48,918	$ 4,379	$ 2,092	$ 156
Equipment, Materials, Subcontractors	$ 39,223	$ 35,883	$ 28,740	$ 41,960
Overhead (Indirect) Costs	$ 29,233	$ 84,540	$ 66,081	$ 46,473
Total	**$ 122,249**	**$ 186,639**	**$ 145,469**	**$ 122,901**
Labor (fully loaded)	***$ 20,685***	***$ 136,674***	***$ 111,087***	***$ 78,499***
Labor (fully loaded) towards State Cost Share Funds	**$ -**	**$ -**	**$ 9,857**	**$ 27,643**