

Research and Development Continuation Application Summaries and Staff Recommendations September 2016

The R&D Committee will meet on September 20th to consider seven requests for “continuation” or phase two funding of projects that previously received one round of R&D program funding. The R&D Committee has a current available balance of \$21.5 million to address these proposals. Included below are the applicants’ Executive Summaries and reports on phase one results. Staff has added a bulleted summary of each proposal, comments and recommendations. One item of Other Business is also included.

Req #	Organization	Project Title	Requested Amount	Staff rec
3208	Dan River Business Development Center	Sustainable Tree-free Pulp from Specialty Tobacco and Ag Waste	\$1,500,000	\$1,500,000
3210	Floyd County EDA	Advanced Nonwoven Filtration: Phase II	\$500,000	\$500,000
3211	Halifax County IDA	TMI AutoTech Continuation of Grant #2868: R&D of a New Autocycle	\$275,000	\$275,000
3207	Region 2000 Research Institute	LiteSheet: Energy Efficient and Lower Cost LED Lights - Phase II	\$2,000,000	\$1,360,000
3212	Southwest Virginia Higher Education Center Foundation	Micronic Technologies Water Field Pilot Program to Support Commercialization Phase 2	\$1,999,750	table
3209	VTT, LLC	Acquisition of Equipment to Expand Tire Test and Research Capabilities at The Global Center for Automotive Performance Simulation	\$2,000,000	<\$2,000,000 Loan
3213	Washington County Industrial Development Authority	Brand X – New Compression Technology	\$1,000,000	\$1,000,000

Total (7 requests/6 funding recommendations)

\$9,274,750

\$6,633,000

Dan River Business Development Center
Sustainable Tree-free Pulp from Specialty Tobacco and Ag Waste (#3208)
\$1,500,000 Requested

Executive Summary Provided by Applicant: Tyton BioEnergy Systems developed a solution for producing high value tree-free pulp from tobacco, agricultural products, and ag-waste (leftover biomass after harvest). Supporting Tyton's commercialization of tree-free pulping technology will allow rural Virginia to address an underserved \$2.75 billion market. With completion of the first TRRC grant, Tyton succeeded in achieving its goals to develop technology at a pilot scale to turn its proprietary tobacco into sugar and other co-products for energy markets. Using the same core technology, this project will allow Tyton to produce pulp samples at a larger, pre-industrial scale, which will unlock financing to build commercial machines that produce tree-free pulp for paper mills and food manufacturers. Tyton pulp production could create new revenue for farmers. Our technology promises to convert multiple agricultural products into pulp valued at \$500 per ton (compared to \$50-70 per ton), helping stimulate the economies of rural Virginia.

Previous Funding Status for Research and Development Continuation Application

Tyton completed the first phase of TRRC funding, achieving numerous agricultural, scientific and business milestones. Tyton developed an intellectual property portfolio, including patents and trade secrets, that protect knowledge and capabilities in agronomics, biotechnology and processing. With the completion of design, construction and installation of a pilot-scale extractor to convert Tyton's proprietary energy tobacco into sugars, oils and other products for the bioenergy and biochemicals markets, Tyton discovered new applications for its technology in the pulp and paper industry and filed new patent applications. The additional funding requested by Tyton will support us in achieving a series of tasks that will lead to commercialization of this pulp technology in Southside Virginia.

Staff Summary:

Beneficiary Company: Tyton Bioenergy Systems (www.tytonbio.com), with research lab in DRBDC, Danville.

Phase 1 investment and research results (proposed and achieved research and outcomes): #2282 in 2012 for \$2,783,900 for development and staffing of research lab in DRBDC. Grant was recently completed in August 2016. Development phase projection of 9.5 jobs appears to have reached <nine on-site at DRBDC.

Proposed Phase 2 research objectives & activities: Produce industrial scale paper pulp samples from tobacco and other non-tree agricultural waste for testing by prospective customers.

IP foundation: Nine company-owned patents in various stages of approval (one approved), with exclusive license for an additional patent.

Business Plan: well-detailed, identifies prospective markets, customers and sales potential including jet biofuel, food grade sugars, chemicals, biochar etc.

Phase 2 uses of TRRC funds: personnel (\$950k), contractual (\$200k), supplies/materials (\$84k) and plant improvements (\$266k). Expand growing trials to four Southside counties, scale-up pulp production unit to industrial scale, convert existing pilot unit to food-grade.

Phase 2 uses of match and status of commitment: \$2.6 million across multiple budget lines; majority shown as already committed by company's chairman and investors.

Outputs/Outcomes – Phase 2 research: 12 jobs (3 of which are new) and \$315k investment

Outputs/outcomes – Commercialization: 771 jobs and \$20 million investment (relies on creation of large pulp processing facility in region, and includes 400+ contract growers)

Revenue return proposal: Company proposes job creation, private capital investment as TRRC's ROI. No direct revenue return to TRRC offered.

Staff Comments and Recommendation: Following on the phase one grant in 2012 for nearly \$2.8M, this next phase would expand field planting trials to 4 SoVA counties (Brunswick, Buckingham, Franklin and Mecklenburg), update the existing pilot processing equipment for food grade production, and acquire equipment to allow scale up to industrial scale tree-free paper pulp production. Tyton has a strong IP platform, thorough business plan and several key market opportunities (e.g. plant-based sugars, etc.) that have been identified in addition to paper pulp. This phase proposes a 2.1:1 match in the research phase (\$2.5M committed now) and 10:1 in commercialization. More than 40% of match would come in year 3, so there must be assurance the match requirement is met before TRRC funds are exhausted. The budget has been revised to request 390k in personnel, \$200k contractual and 910k in TRRC-funded equipment. Jobs in the research phase is 12, of which nine are existing positions, but positions would primarily be funded by the company (\$2.2M in match). The company will make a \$315k capital investment in the research phase. Estimated job and investment numbers during commercialization are substantial (771 and \$20M) and may not be overly inflated when accounting for 400+ farmers as contracted growers, numerous truckers to transport plant materials, etc. It must be noted that these outcomes are entirely contingent on a significant pulp processing facility being constructed in the tobacco region (several sites are reportedly under preliminary consideration). Any offer should therefore protect the Commission if commercialization occurs outside footprint, and the company has stated its intention to commercialize in the region, and willingness to agree to clawback with penalty if commercialization was to occur elsewhere. **Staff recommends award of \$1,500,000, contingent on negotiated clawback provisions in the event commercialization does not occur in the tobacco region.**

Floyd County EDA

Advanced Nonwoven Filtration: Phase II (#3210)

\$500,000 Requested

Executive Summary Provided by Applicant: Hollingsworth and Vose is a global, advanced filtration media corporation with two plants and an R&D Center of Excellence in Floyd, VA. H&V is the largest (and highest-paying) employer here with more than 125 employees. They have been here since the mid-1970's and have gradually grown their investment and employment. In 2012 they received Tobacco Commission R&D funding to work on 5 tracks of next-generation filtration media. Based in part on portions of that work, they have added a Technostat line in a second plant here and are planning additional investment of greater than \$10 million in capital expenditures (total jobs of these two will be greater than 25 jobs.) In this application, we propose the continuation of 3

of those Phase 1 tracks, based on highest potential. If all are successful, this has potential for additional investment of \$11-13 million and 22-29 additional jobs in the next 6-10 years.

Previous Funding Status for Research and Development Continuation Application

H&V was awarded a \$750,000 R&D grant in 2012, and successfully completed that work in 2015 using only \$584,325 of the grant funds, while investing \$1,428,012 in private match (more than committed). Phase 1 was geared towards making laboratory prototypes and testing ideas and technologies internally. The prototype generation in Phase 1 along with market analysis and customer response has led H&V to focus on specific areas for commercialization for Phase 2. These areas and products have been selected based on H&V's potential for successfully moving from prototyping to commercialization. The full Grant Proposal document (attached as Confidential and Proprietary document) shows in much more detail the technical and milestones achievements in and beyond Phase 1.

Staff Summary:

Beneficiary Company: Hollingsworth & Vose (www.hollingsworth-voose.com) a Massachusetts-based company with 13 manufacturing facilities across the globe, including a Floyd facility opened in mid-1970s.

Phase 1 investment and research results (proposed and achieved research and outcomes): #2225 in 2011 used \$584,325 of the \$750,000 TRRC award, matched by H&V with \$1,428,012 of private match. Phase 1 involved development and testing of 5 tracks of new filtration media resulting in the addition of the Technostat line and proposed \$10M investment and 17 new jobs. Commercialization goals appear to have been largely met with a \$6.5M investment, 17 announced jobs and significant future investments in the planning stages.

Proposed Phase 2 research objectives & activities: Phase 2 will continue the development of three of the five Phase 1 tracks using market feedback with the intent to move towards customer sampling and commercialization.

IP foundation: H&V has filed three patents to support the Phase 2 proposal.

Business Plan: Very detailed business plan was provided describing commercialization potential for each product track.

Phase 2 uses of TRRC funds: Personal Services (\$362,000), Contractual Services (\$37,200), Supplies and Materials (\$46,000), and Continuous Charges (\$54,000). Funds will be used to support existing R&D personnel salaries, trial costs, and external testing. A small portion (10%) will be used for non-Virginia H&V R&D employee support for testing that is not able to be conducted at the Floyd location.

Phase 2 uses of match and status of commitment: H&V will match TRRC funds for each category at a 1.5:1 rate. Personal Services (\$543,000), Contractual Services (\$55,800), Supplies and Materials (\$70,200), and Continuous Charges (\$81,000).

Outputs/Outcomes – Phase 2 research: no jobs and investment data provided.

Outputs/outcomes – Commercialization: 25 new jobs, \$12M private capital investment

Revenue return proposal: Company proposes job creation and private capital investment that will benefit the TRRC region. No direct revenue return to TRRC offered.

Staff Comments and Recommendation: This Phase 2 request seeks to continue development of three of the original five tracks from Phase 1 which resulted in \$6.5M of new private capital investment and the creation of 17 jobs. In Phase 1 the company matched \$584,325 of TRRC funding with \$1,428,012 of private funds. The Return on Investment resulting from the Phase 1 project is well aligned with the intent of the R&D program and is, to date, perhaps the most significant private commercialization results from an R&D grantee. Phase 2 match is proposed at a 1.5:1 rate with funds committed from H&V. The continued development proposed in this application is estimated to result in an additional \$12M of private capital investment and the creation of 25 new jobs. Given the company's phase one research results and its 40+ year history of job creation and investment in Floyd County, it is reasonable to anticipate significant commercialization results from this Phase 2 project, As such, it was the highest scoring project in this funding round. **Staff recommends an award of \$500,000**

Halifax County IDA

TMI AutoTech Continuation of Grant #2868: R&D of a New Autocycle (#3211)

\$275,000 Requested

Executive Summary Provided by Applicant: This project will continue and expand the scope of the current R&D Vehicle Development Project through use of the assets and product development capabilities funded in the original grant to develop an autocycle type vehicle. These include: Vehicle Design/Development, Composites Parts Manufacturing, Assembly and Product Sales/Distribution. Please, see the detailed business plan associated with the existing Grant #2868. The development, manufacture and sales of this third vehicle will mirror and extend that plan.

Previous Funding Status for Research and Development Continuation Application

Milestones achieved that lend themselves to the current project include: 3-D vehicle design, prototype development, composites manufacturing capability, manufacturing and assembly process improvements.

Staff Summary:

Beneficiary Company: TMI Autotech (www.tmiautotech.com), based in IDA-owned space in Halifax

Phase 1 investment and research results (proposed and achieved research and outcomes): #2868 for \$838,786 in 2014, developed and is producing prototype Nomad off-road vehicle in new facility; composites production facility still in development (grant remains open for those costs). Estimated 19 jobs have largely been achieved.

Proposed Phase 2 research objectives & activities: Design, develop and fabricate prototype “autocycle” (three-wheel) on-road vehicle, using capabilities at facility developed in phase one grant.

IP foundation: none described

Business Plan: not well-detailed, consists of Powerpoint with bulleted information, limited financial projections provided.

Phase 2 uses of TRRC funds: equipment (\$225k) and contractual (\$50k).

Phase 2 uses of match and status of commitment: \$369k private funds shown as “in hand.”

Outputs/Outcomes – Phase 2 research: one job and \$200k private capital investment.

Outputs/outcomes – Commercialization: six jobs and no private capital investment.

Revenue return proposal: no information provided

Staff Comments and Recommendation: The phase one R&D grant (\$838,786) to design and produce the Nomad off road vehicle has been successful to date, with substantial North American marketing of the vehicle and the initiation of pre-orders. TMI has stated the composite facility from phase one is still under development and should be generating product for internal production and external sales within the next 90 days. This new phase requests \$225k for equipment to design and produce four prototype Autocycles for testing and marketing, with the balance of the request (\$50k) for personnel. One job would be created in this research phase, and 6 new jobs by 2018 for production that is anticipated to begin by May 2017. First year production is conservatively estimated at 50 units, ramping up to production of < 500 units/year by 2019. While this is a modest request with relatively modest outcomes, it should be noted that TMI has created a unique research and production operation in Halifax, and the current request to develop the Autocycle is substantially built on the foundation of physical plant and skilled workforce that was enabled by the phase one grant. TMI has an internationally-reknowned partner in Ariel, an established North American dealer network for Ariel and Nomad, and has identified a market niche for Autocycle that could allow substantial growth of the company. Ultimately this appears likely to result in significantly more job creation and investment in facility expansion than indicated in the proposal as Autocycle production grows over the next several years, which would greatly enhance ROI for the requested funding. **Staff recommends award of \$275,000.**

Region 2000 Research Institute

LiteSheet: Energy Efficient and Lower Cost LED Lights - Phase II (#3207) **\$2,000,000 Requested**

Executive Summary Provided by Applicant: Adaptive AC Direct LED Technology is developed and patented by LiteSheet Solutions. The company, based in Bedford County, is at the leading edge of LED lighting in the commercial/industrial marketplace. LiteSheet’s technology delivers the most energy efficient, longest life, maintenance free, with the lowest cost of total ownership of any LED lighting product in the commercial/industrial market. With the help of the TICRC Phase I grant funding in the last 3 years, LiteSheet has opened a UL/MET and ETL certified manufacturing facility and begun hiring employees. It has developed, commercialized, and generated revenue on 13 UL Certified interior lighting product families (representing over 120 products), all of which are DLC compliant. In addition, LiteSheet has partnered with other local businesses to stimulate economic growth by purchasing local goods for the company’s products. This Phase II funding will be used to develop Generation 3 product technology and expand current operations.

Previous Funding Status for Research and Development Continuation Application

In Phase I, LiteSheet met and exceeded the milestones initially described in its application. The milestones reached include

- Setting up a manufacturing facility with Generation 1 products in production and assembly,
- Manufacturing and test equipment purchased, setup and commissioned for full production runs,
- Generation 2 products were designed, developed, and put into full production.

Other significant achievements that exceeded the defined milestones are

- MET and ETL certified 13 product families to the UL standard,
- MET and ETL certified the Bedford, VA facility,
- Additional patents filed and issued,
- Commercial orders from customers such as Dominion Virginia Power, Case Western University, Hilton Hotels, Woolworth Building in NYC, Bedford Township, Glad Products, Reagan National Airport, etc.
- Potential orders expected from Virginia Department of Transportation, Ameren, Boeing, and McDonalds to name a few.

Staff Summary:

Beneficiary Company: Litesheet Solutions LLC (www.lstus.com), a wholly-owned subsidiary of Connecticut-based LiteIdeas LLC

Phase 1 investment and research results (proposed and achieved research and outcomes): #2699 in 2013 for \$2 million, developed a UL certified design and production facility in Bedford County for manufacturing of first two generations of LED lighting products. 120 products in 13 “families” in development, testing and certification. First commercial sales secured. Job growth goal of 44 not yet met, in part due to zoning of the current facility.

Proposed Phase 2 research objectives & activities: further develop exterior products lines, add manufacturing line and relocate to a larger facility.

IP foundation: LiteIdeas has four approved patents and nine in review, licensed solely to LiteSheet.

Business Plan: very thorough business plan as part of investor prospectus

Phase 2 uses of TRRC funds: personnel (\$518k), contractual (\$103k), supplies/materials (\$178k), equipment (\$200k), plant improvements (\$1M to construct new building).

Phase 2 uses of match and status of commitment: \$2,538,235 from sales revenue and private investors for personnel, research, sales/marketing etc.

Outputs/Outcomes – Phase 2 research: two new jobs, no private capital investment

Outputs/outcomes – Commercialization: six new jobs, no private capital investment

Revenue return proposal: no information provided

Staff Comments and Recommendation: This request follows on a September 2013 grant of \$2M, of which \$1.77M has been released to date. The phase one grant has resulted in certification of both the company's facility and several of its earlier generation products, which has resulted in a

substantial early customer clientele of major corporations, institutions and other commercial buyers. The Litesheet product family is growing substantially, and is gaining customer acceptance due to its products' long life, higher efficiency, lower operating costs and industry-leading power technology. This additional phase would continue product development and certification across a broad swath of exterior lighting fixtures utilizing LiteSheet's patented technology. The company has a very thorough business plan, an impressive technical advisory board, and strong IP platform owned by its parent company LiteIdeas and licensed exclusively to LiteSheet, the wholly-owned subsidiary. TRRC funds are requested for: \$1M to construct a new building to house LiteSheet; \$518k for personnel; \$200k for equipment; \$178 for supplies/materials; and \$103k contractual. The request cites 8 new jobs, which is still well short of the 44 new jobs described in the phase one request, though it must be noted the company is constrained by zoning at its current site to no more than 10 employees. No private capital investment was indicated but the company has stated that it has been exploring larger locations for several months, and when a decision is made to relocate to a larger facility there will be significant construction, upfit and additional equipment costs that are not yet known and can't yet be quantified. Given the ongoing search for leased versus new build spaces (potentially to be leased from the Bedford EDA), there are no specifics about cost, location and who will own building that could be 100% TRRC funded. TRRC staff questions whether constructing a building for private beneficiaries should be a priority for the remaining R&D funding, and therefore asked the company for more specifics on budgeting for sufficient rent for a larger facility during the proposed project period. The response indicated \$720,000 of estimated rental costs for a three year period for a 15,000 sq. ft. or greater building, which Staff suggests should be cost-shared with the company. **Staff recommends award of \$1,360,000 to continue product development and assist the company in relocating to a larger leased facility in the tobacco region.**

Southwest Virginia Higher Education Center Foundation
Micronic Technologies Water Field Pilot Program to Support
Commercialization Phase 2 (#3212)
\$1,999,749.61 Requested

Executive Summary Provided by Applicant: Micronic developed a patented water-treatment technology that cleans water from any source more cheaply, efficiently, and effectively than the competition. It provides increased throughput and significant savings in capital expenditures, operation-and-maintenance requirements, and waste-disposal needs. Independent testing verifies that water processed, via MicroDesal™ is effectively free of salts, chemicals, bacteria, and fungal spores. Micronic is in the final design and staged implementation of four (4) pilots. Two of these pilots will serve as deliverables under the first TRRC award. The Phase 2 project will follow a two-tier path. The first tier is to take data obtained from the field pilots and enables Micronic to perfect pre-production engineering for a low flow application MicroDesal™ unit for market by third quarter 2017. The second tier scales to a larger moderate flow application MicroDesal™ unit. It will use data obtained in the process of perfecting the smaller unit and mathematical modeling for scalability.

Previous Funding Status for Research and Development Continuation Application

Micronic Technologies is in the final design and staged implementation of 2 pilots under the initial Phase I grant. Fabrication of the Flow Bench that will be used for every pilot in the future is

complete and significant sampling and testing continues daily. Milestones stated for Phase I are substantially complete despite the setback of a roof collapse at the facility and the 100% loss of equipment. A series of bench-scale experiments have been conducted with both MicroDesal™ prototypes 1.0 and 2.0 with myriad source water samples including landfill leachate, agricultural runoff, Potomac River water, storm water runoff, four Chesapeake Bay watershed rivers, Peruvian mine water, acid mine drainage, and a lab formulated ultra-high TDS (380,000 ppm) concentrated source water. Overall, MicroDesal™ removed at least 94% of 34 contaminants studied, including inorganics, metals, bacteria, suspended solids, and TDS. Independent, state-licensed laboratories have analyzed the pre- and post-test waters.

Staff Summary:

Beneficiary Company: Micronic Technologies (www.micronictechnologies.com)

Phase 1 investment and research results (proposed and achieved research and outcomes): #2872 in 2014 - Phase 1 is in year 2 of a proposed 3 year project.

Approximately \$831,182 (including \$152,406 of advanced funds) remain from the \$1,995,145 grant. Some delays were experienced after the company experienced a roof collapse at their initial location, resulting in relocation to the AAERC in early-2015. The fabrication of a Flow Bench for testing various system settings is complete and sampling and testing is conducted daily. A partnership with UVA-Wise (the Phase 1 applicant) was established and continues to be a participant for the sampling and testing. The proposed 2 field pilots are in final design and will be implemented in the final year of the Phase 1 grant.

Proposed Phase 2 research objectives & activities: In the second phase Micronic Technologies will utilize data from the 4 phase one field pilots to perfect pre-production engineering for a low flow application MicroDesal™ unit (1500GPD) for market (by Q3 2017). Additionally a larger scale moderate flow application for the MicroDesal™ (5,000 GPD) will be developed using data obtained in the process of perfecting the smaller unit and mathematical modeling for scalability. Production facilities will be designed and supply chain mapped.

IP foundation: Three approved patents owned by the company's CTO have been assigned to Micronic Technologies. Additional patents will be pursued as the technology is further developed/scaled.

Business Plan: Thorough business plan reflecting potential application across numerous global markets (agriculture, gas fracking, mining, landfills, etc.)

Phase 2 uses of TRRC funds: *Personal Services* - \$1,311,953 (\$1,202,577.20 for 50% support for 16 positions cost shared at a 50% rate, \$77,373.08 for 7% support for UVA Wise faculty members, \$32,000 for 100% of internship stipends for UVA Wise Natural Sciences and Mathematics students), *Contractual Services* \$179,111.11 (\$172,111.11 Micronic, \$7,000 UVA Wise), *Supplies and Materials* - \$122,375 (Micronic \$74,375, UVA Wise \$48,000), *Equipment* - \$226,834.22 (\$79,750 Micronic, \$147,084.22 UVA Wise), *Plant and Improvements* - \$26,000 (Micronic)

Phase 2 uses of match and status of commitment: Matching funds are uncommitted and will be sought from People Inc. (\$450,000 loan filed) and through an intended \$1.3M request

to DMME for a potential application to ARC, \$250,000 will be sought from private investors.

Outputs/Outcomes – Phase 2 research: 5 new jobs and \$71,000 private capital investment

Outputs/outcomes – Commercialization: 18 jobs and \$221,000 private capital investment

Revenue return proposal: The Revenue Return proposal describes previous economic impact associated with salaries paid during Phase 1 and other investments in Wise County. It also discusses its ongoing relationship with UVA Wise and the potential to create new jobs and additional private capital investment in the region during commercialization. No direct revenue return to TRRC offered.

Staff Comments and Recommendation: Micronic Technologies presents a well developed business plan as well as a reasonable and defined scope of work in this Phase 2 application. However, significant deliverables are not yet completed under the Phase 1 project and a large balance (approximately \$831k) remains available in that earlier grant to deploy four field pilot plants in September 2016 and continue testing for up to a year. The application cites those field pilots as the deliverables for the phase one funding, and states that "data and operational experience acquired from the current field pilots will be used to improve the performance of the 1500 GPD unit" that will be designed and produced in phase two. In the current application UVA Wise, although no longer serving in the applicant role, will continue to partner with Micronics to conduct testing activities using approximately \$279K of the requested funds for personnel support, supplies/materials, and equipment. Approximately \$1.2M of the requested funding will be used for 50% support of 16 Micronic positions. Matching funds from People Inc., DMME, and private investors are uncommitted at this time (it appears DMME will partner with Micronics to apply for federal POWER funds). Commercialization outcomes are estimated at 18 jobs and \$221,000 private capital investment although the business plan shows significant growth within 5 years. Given the substantial tasks and funding that remain in the Phase 1 project Staff feels that a Phase 2 award at this time would be premature. **Staff recommends this request be tabled pending substantial completion of Phase 1 activities and commitment of Phase 2 matching funds.**

VTT, LLC

Acquisition of Equipment to Expand Tire Test and Research Capabilities at The Global Center for Automotive Performance Simulation (#3209)

\$2,000,000 Requested

Executive Summary Provided by Applicant: The purchase of an MTS Flat-Trac CT Plus Tire Test System will enable the GCAPS to expand its research and test capabilities. The machine will be used for research into test methodologies, prototype materials and designs of motorcycle and passenger car tires. This characterization will also be used in the development of modeling techniques and simulation. An additional benefit of this is the expanded capacity for standard testing currently being conducted on the LTRe. This opens time on the LTRe to continue and expedite on going research into wet testing, surfaces, and dynamics. The additional equipment will be co-located

with the existing LTRe to take advantage of existing facility benefits, though renovations will be required. Additional staffing from technicians to engineers will be required to conduct the research and operate the new equipment.

Previous Funding Status for Research and Development Continuation Application

The MTS Flat-Trac LTRe has been designed, installed and operational for 3 years. The GCAPS facilities currently operate three shifts, five to six days a week; two shifts for testing and the third for required maintenance of the LTRe machine and support equipment. The original job and wage projections of 22FTEs with a gross annual payroll of \$1.1 Million by 2020 were met in 2014 with current employment of 22 FTEs and gross annual payroll exceeding \$1.1 Million excluding employee benefits. There are current openings for both Technician and Engineering positions. With OEM acceptance and integration of current tire research services into product development, the demand for additional tire test offerings is increasing. This demand drives the need to develop new, unique modeling, simulation and test services, as well as, expand testing capacity.

Staff Summary:

Beneficiary Company: VTT, LLC

Phase 1 investment and research results (proposed and achieved research and outcomes): #2302 in 2010 for \$5 million awarded to the Virginia Tech Foundation purchased the initial tire testing equipment to create the National Tire Research Center at VIR Raceplex in Halifax County. NTRC has met its phase one goals of 22 FTE (working in three daily shifts) and \$1.1M annual payroll.

Proposed Phase 2 research objectives & activities: purchase of additional tire testing equipment that will free up time on the previously-funded equipment (which is fully-booked), will open up testing for motorcycle tire manufacturers and other customers that do not require the larger machine, and allow additional research.

IP foundation: licenses and IP are owned by the equipment manufacturer. No additional IP generation indicated.

Business Plan: relatively brief business plan was provided, describing research focus, customer markets and monthly operating costs.

Phase 2 uses of TRRC funds: entirely in equipment to purchase the MTS Flat Track CT-Plus Tire Test System.

Phase 2 uses of match and status of commitment: \$2M to be raised from each of three international tire manufacturers (company names are confidential at this time, but letters of interest were provided)

Outputs/Outcomes – Phase 2 research: six new jobs and \$1 million private capital investment (investment appears to be understated by as much as \$5M in equipment and facility expansion).

Outputs/outcomes – Commercialization: six new jobs, no additional private capital investment indicated)

Revenue return proposal: Proposes to use revenues for future operating costs, maintenance, research and education. No direct revenue return to TRRC offered.

Staff Comments and Recommendation: The proposal would add 4th generation testing equipment that is currently in use at foreign tire manufacturer research labs, and some of those well-known companies desire access to similar equipment in the US for testing near their research and manufacturing sites. A significant new market opportunity and added research capability would be testing for manufacturers of motorcycle tires and motorcycle race teams. GCAPS has met the research and "commercialization" targets of phase one grant (22 FTE working in three daily shifts, with annual payroll of more than \$1.1M). GCAPS reports 25 global clients, \$4M in annual spending, and that the equipment funded in phase 1 is effectively maxed out with testing 16 hrs/day six days per week, leaving no time for independent research. The addition of this equipment will allow some testing to be moved to it from the existing equipment, enabling additional testing time and accompanying revenues from that earlier investment. The combined effect of the new equipment generating revenue from new markets, plus allowing additional testing and revenues from the existing equipment, is expected to result in six-ten new jobs and estimated additional revenues of more than \$1.5M annually. This request is highly-leveraged at a 3:1 match, once funds are committed by the partner tire manufacturers (letters of interest were provided). The proposal cites a \$1M taxable investment in facility expansion and \$1M new annual spending. While the revenue return proposal states intention to apply additional revenues to research activities, this appears to be a viable candidate for a TRRC/VRA loan, given the additional new revenues, and assuming a local government would provide a loan moral obligation as required by VRA. An additional consideration is the eligibility of the current applicant (VTT LLC) , which is a private company solely owned by Virginia Tech Transportation Economic Development Inc., which is a IRS-designated 501C3. Subject to advice of counsel, funding consideration may need to be directed to VTTEDI on behalf of VTT LLC. Ultimately the request is likely to produce several well-paying new jobs and significant economic impact in the region for the foreseeable future. **Staff recommends the project be referred to VRA for loan credit analysis, with VTTEDI as the revised applicant on behalf of VTT LLC.**

Washington County Industrial Development Authority ***Brand X – New Compression Technology (#3213)*** **\$1,000,000 Requested**

Executive Summary Provided by Applicant: Bristol Compressors International, LLC and DHX Electric Machines, Inc. have established a program to develop, test, and approve a new high efficiency, quiet compressor/motor technology that utilizes alternate refrigerants classified as “flammable.” The development of this compression platform will be tested and approved using the Phase One grant asset, “Alternate Refrigerant Test Laboratory,” issued and approved by the TICR through the Washington County IDA in October of 2013. This grant is applied for as a Phase Two, and offers a unique product to the HVAC and refrigeration market. The product referred to as “Brand X” will offer the HVAC industry a hermetically sealed compressor that has a patented DHX motor technology attached to a BCI patent pending compression technology powered and controlled through the BCI patented epoxy power terminal. The development of “Brand X” will allow an opportunity to market and sell a unique and industry-changing product.

Previous Funding Status for Research and Development Continuation Application

- Alternate Refrigerant study results from ORNL presented at Low-GWP AREP Phase II Conference on January 21, 2016 in Orlando, FL.

- Zoning exception was passed by Washington County Zoning Board.
- The construction of the building is completed. A temporary certificate of occupancy (CO) has been issued by Washington County Code Enforcement. A permanent CO will be issued when all equipment is installed.
- Electrical equipment hookup and installation is in the process of being completed. Wiring to test fixtures will be completed when test fixtures are completed.
- Chiller water has been tied into existing cold water loop currently being used Engineering lab.
- The construction of the Calorimeter by Environmental Tectonics Corporation and Engineering is in process. The calorimeter is currently being tested with baseline compressors. Once baseline data is matched, the Calorimeter will be shipped to Bristol Compressors Int.
- Life test components have been ordered and the first stands are currently being built.
- Process Hazard analysis has been done by Blue Ridge Compliance.

Staff Summary:

Beneficiary Company: Bristol Compressors International, LLC
(www.bristolcompressors.com) and Georgia-based DHX Electrical Machines, Inc.

Phase 1 investment and research results (proposed and achieved research and outcomes): #2832 in 2014 for \$808,744 to establish a testing lab for testing of compressors using flammable refrigerants. Construction of the lab building is complete. The calorimeter to test different sizes of compressors is in the final phase of construction and is due to be delivered to BCI in the Oct/Nov timeframe. A final payment request for the balance of #2832 (\$271,144) will be submitted upon receipt of the calorimeter.

Proposed Phase 2 research objectives & activities: The Phase 2 request (\$1,000,000) will complete the establishment of the test lab through the purchase and installation of the second calorimeter, additional test stands and equipment etc. All required tests necessary to obtain customer and UL approvals, and to pass BCI required reliability tests will be completed using the proposed additional calorimeter. Upon completion of these tests the compressor will be ready for additional testing by BCI customers to achieve system UL approval for commercialization.

IP foundation: Motor patents – one issued and five pending; Epoxy Power Terminal patents - three issued and one pending; Compressor Patents – To be submitted in Q4 2016.

Business Plan: Detailed business plan was provided outlining the commercial potential for this product. “Brand X” will introduce new compression technology to the HVAC market using the highest efficiency and the smallest size motor technology and combining those with a new power terminal for higher product safety standards and lower overall product/system risk with flammable refrigerants. The commercialization of this project will allow BCI to regain the 5% market share lost over the previous 10 or more years.

Phase 2 uses of TRRC funds: Calorimeter (\$380,000), Reliability Test Strands (\$260,000), Lab Infrastructure (\$360,000)

Phase 2 uses of match and status of commitment: Bristol Compressors International (in hand) - DHX motor test samples (\$380,000), Reliability Test Strands (\$260,000), Lab Infrastructure (\$360,000)

Outputs/Outcomes – Phase 2 research: eight new technician and engineering positions; private capital investment of \$650,000.

Outputs/outcomes – Commercialization: 206 jobs (BCI and DHX combined figures); private capital investment of \$4,025,000 (BCI and DHX combined). *Commercialization results provided in the application reflect only the period associated with early commercialization (initial shipments). Outcomes are expected to grow substantially as demand for the product grows. An estimate of \$10-\$12M PCI could be expected within 3 years post commercialization from construction of an additional plant to meet full scale demand.*

Revenue return proposal: Revenue return is based on business growth that leads to the addition of manufacturing jobs and tax base revenue generation in Southwest Virginia. No direct revenue return to TRRC offered.

Staff Comments and Recommendation: The equipment and related infrastructure proposed in this application will result in the creation of a testing facility that will be the only one of its kind in the United States. The lab construction and equipment proposed in Phase 1 is largely complete with the calorimeter purchased with those grant funds expected to be delivered and installed in the near future. In this phase BCI will partner with Georgia-based DHX to develop a new compressor that will introduce a new compression technology to the HVAC market. The goal is to develop and test prototype compressors, motors and power terminals that are smaller, quieter, safer and more efficient than competing technologies, and could be a significant market-leading technology owned exclusively by BCI/DHX. Commercialization of this technology that is already patent-protected will result in the location of DHX motor manufacturing to Washington County where 100% of the manufacturing of the compressor will occur. The Return on Investment for this proposal is promising through both the growth potential for Bristol Compressors and the new investment resulting from the location of DHX to the region. While the significant outcomes projections provided in the application reflect only initial commercialization of the product (\$4M investment and 200+ production jobs), these figures can be expected to increase - perhaps dramatically - as industry acceptance and demand for the technology rises in future years. **Staff recommends an award of \$1,000,000.**

R&D Other Business

Wise County Industrial Development Authority

Appalachia America Energy Research Center (#1840)

Approved for \$750,000 in July 2009 – request for additional extension

This R&D grant to provide operating funds for AAERC has a remaining balance of more than \$326,000. AAERC originally housed NanoQuantics, a FY2011 R&D grantee who subsequently ceased operations in Wise County. AAERC now houses Micronics Technologies, which was funded by an R&D grant in 2014 to UVA-Wise. Previous grant extensions were provided by the R&D Committee, most recently in May 2015, and that extension expired July 31, 2016. Recent reimbursements have covered AAERC's monthly utilities and maintenance costs at an approximate total of \$3,000 monthly (staff notes that at this rate it could take up to ten more years to fully utilize the remaining grant funds). The Wise IDA now requests further extension to continue supporting

operating costs, maintenance, utilities, etc.. This is the last open grant remaining from the six grants awarded to fund initial operations of the Commission-supported R&D Centers in 2009. The last extension was approved based on a budget provided by the grantee in May, 2015 totaling \$245,700. Since that approval, \$179,584.16 of expenses have been approved.

Staff recommends a final extension through December 31, 2016 for use of the final \$66,116.84 remaining in the 2015 budget revisions (excluding lease payments). No further extension is recommended for the remainder of the grant's balance (\$259,951.21). These funds will be deobligated and returned to the R&D program budget