



Technology Validation and Start-Up Fund

Round 7 Submittal Evaluations

Submitted: 01 OCT 2014

Submitted To:

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EXECUTIVE SUMMARY

YourEncore was selected as the contractor to perform the review process based upon having over 7,000 subject matter experts with a collective average of over 25 years of experience. For each of the ten areas of “project focus” a technical expert was selected to review the proposals. Once the technical review was complete, a business reviewer and senior YourEncore managers reviewed each proposal. These experts have diverse backgrounds and a plethora of experience that make them ideally suited to review the proposals and recommend where the state of Ohio should invest to achieve maximum benefit for the state’s economic development goals. The Review Team evaluated each proposal based on the information submitted for review, and according to the criteria specified by OTF.

For Round 7, a total of 28 requests for funding were submitted to OTF’s Technology Validation and Start-Up Fund, 18 for Phase 1 and 10 for Phase 2. This represents a quantity of requests for this round that was a little below average.

While proposal quality again varied from highly professional and complete to unfocused and incomplete, the overall quality of proposals was greatly improved from prior rounds. Of the 28 requests, 10 requests in Phase 1 (56%) and 6 in Phase 2 (60%) are recommended for funding to OTF by the expert Review Team. Three of the ten Phase 2 applications were prior Phase 1 awardees; all of which have been recommended for funding this round.

A total of 13 applications not previously recommended for funding were resubmitted in this round, which is the key driver of the overall improvement in funding recommendations – resubmissions which are responsive to past feedback generally have a much higher quality than other proposals. Four of six Phase 1 reapplications (67%) are recommended, and five of seven Phase 2 resubmissions (71%) are recommended. 31% of these resubmissions still do not meet the full criteria necessary for approval. Therefore, teams that plan on resubmission are encouraged to take advantage of the opportunity to debrief with the review team to discuss potential improvements, as this may help clarify and focus the comments offered in this report.

Generally, the technologies as proposed are sound, and most requests that were not recommended for funding were lacking in fundamental elements of business strategy. Phase 1 proposals were not recommended for funding due to concerns in Generation of Proof (5 of 18 had this fatal flaw); Path to Market (3 of 18); and IP Protection (3 of 18). While Generation of Proof can be a technical issue, for most applications it was a business issue; that is, even if technical goals are met for the project, those goals are insufficient to validate the technology. Deficiencies in the Path to Market category were most often linked to a poorly articulated sales channel and marketing plan, though in some instances it was apparent that a viable market may not exist. Phase 2 proposals not recommended for funding were nearly all deficient, at least to an extent, in their business model (3 of 10), which is a continuing theme from earlier rounds. The review team saw a lack of adequate business acumen represented on the applicants’ teams, which correlates with the business model deficiencies. Another area of

deficiency is related to project financials. Budget or Use of Funds was of concern in two of ten applications (20%), a minor but recurring theme.

Grant dollars recommended for funding is approximately \$1,100,000, versus \$950,000 for round 1, \$900,000 for round 2, \$610,000 for Round 3, \$864,000 for round 4, \$1,462,000 for Round 5 and \$998,000 for round 6. Dollar amounts are slightly above average and percentage approvals are the highest compared to past rounds. This high approval rate reflects the large portion (46%) of applications that were resubmittals.

Round	Approval Rate	\$\$ Recommended
1	35%	\$950,000
2	52%	\$900,000
3	44%	\$610,000
4	30%	\$864,000
5	46%	\$1,462,000
6	39%	\$998,000
7	57%	\$1,100,000

THE PHASE 1 PROPOSALS THAT ARE RECOMMENDED FOR FUNDING

Proposal #	Lead Applicant	Title	State Funds Requested	Total Budget	Recommend
14-501	Cincinnati Children's Hospital Medical Center	<i>Human Assisted Needle Delivery System</i>	\$50,000	\$100,000	\$50,000
14-502	University of Akron	<i>Rare-Earth-Material-Free Multiphase Electric Machine (FMEM) for Low Power Applications</i>	\$50,000	\$100,000	\$50,000
14-503	University of Akron	<i>Integrated Imaging Goggles for Guiding Basal-cell Carcinoma Surgeries</i>	\$50,000	\$100,000	\$50,000
14-504	University of Akron	<i>Transparent Conductive Coating for Flexible Electronics</i>	\$50,000	\$100,000	\$50,000
14-509	Kent State University	<i>Polarizing Waveguide Plate for Liquid Crystal Displays</i>	\$50,000	\$100,000	\$50,000
14-510	University of Akron	<i>Additively Manufactured Prosthetic Socket Cooling System</i>	\$50,000	\$100,000	\$50,000
14-512	Kent State University	<i>Bistable Light Modulator for Light Extraction in OLED Device Applications</i>	\$50,000	\$100,000	\$50,000
14-515	University of Akron	<i>Akron Fast Fourier Transform (FFT)</i>	\$50,000	\$100,000	\$50,000
14-516	The Cleveland Clinic Foundation	<i>Autism Spectrum Disorder</i>	\$50,000	\$100,000	\$50,000
14-518	The Ohio State University	<i>KAir Battery</i>	\$50,000	\$100,000	\$50,000

THE PHASE 2 PROPOSALS THAT ARE RECOMMENDED FOR FUNDING

Proposal #	Lead Applicant	Licensing Institution	Proposal Title	State Funds Requested	Total Project Budget	Recommended
14-520	<i>Miach Medical Innovation, Inc.</i>	<i>Case Western Reserve University</i>	<i>Novel, Cost-effective, Smart Feeding Tubes</i>	\$100,000	\$120,000	\$100,000
14-521	<i>iRxReminder LLC</i>	<i>Kent State University</i>	<i>iLidRx: Interoperating Medication Container for mHealth Management of</i>	\$100,000	\$200,000	\$100,000
14-522	<i>Innovations LLC</i>	<i>University of Akron</i>	<i>Scalable Electrospinning Techniques</i>	\$100,000	\$100,000	\$100,000
14-524	<i>QuTel, Inc.</i>	<i>Ohio State University</i>	<i>Quantum Tunneling Electronics for Ultra-Low Power Electronics</i>	\$100,000	\$100,000	\$100,000
14-525	<i>OsteoNovus, Inc.</i>	<i>University of Toledo</i>	<i>Improving Bone Graft Technology</i>	\$100,000	\$110,000	\$100,000
14-527	<i>Rekovo, LLC</i>	<i>The Ohio State</i>	<i>Synaptic Arts</i>	\$100,000	\$100,000	\$100,000

PROPOSAL RECOMMENDATIONS - PHASE 1 SUMMARY MATRIX

PROPOSAL #	Licensing Institution	PROJECT TITLE	Generation of Proof to be Licensed	Project Plan / Team (1 Year)	Independent 3rd Party Review	Reasonable Path to Mkt	IP Protection	Start-up in Ohio	Market Opportunity / Size	Budget Narrative / Use of Funds
14-501	Cincinnati Children's Hospital	Human Assisted Needle Delivery System	Green	Yellow	Green	Green	Green	Green	Green	Yellow
14-502	University of Akron	Rare-Earth-Material-Free Multiphase Electric Machine (FMEM) for Low Power Applications	Green	Green	Green	Green	Green	Green	Green	Green
14-503	University of Akron	Integrated Imaging Goggles for Guiding Basal-cell Carcinoma Surgeries	Green	Green	Green	Yellow	Green	Green	Yellow	Green
14-504	University of Akron	Transparent Conductive Coating for Flexible Electronics	Yellow	Yellow	Green	Green	Green	Green	Green	Green
14-505	University of Toledo	Ring-closing metathesis approach for conversion of oleic acid to Nylon 11-13	Red	Green	Green	Yellow	Green	Red	Green	Green
14-506	University of Toledo	Injectable Macroporous Bone Growth Substitute	Red	Green	Green	Yellow	Green	Yellow	Green	Green
14-507	Kent State University	Low-Cost Electrically Tunable Color Filter with Wide Tuning Range	Red	Yellow	Green	Yellow	Green	Green	Green	Green
14-508	Case Western Reserve University	NeuroRadVision™: Decision Support Toolkit to reduce unnecessary surgical interventions for brain tumors	Red	Green	Green	Red	Red	Green	Yellow	Red
14-509	Kent State University	Polarizing Waveguide Plate for Liquid Crystal Displays	Green	Green	Green	Yellow	Green	Yellow	Green	Green
14-510	University of Akron	Additively Manufactured Prosthetic Socket Cooling System	Green	Green	Green	Green	Green	Green	Green	Green
14-511	University of Akron	Active clamp injection technology for health-monitoring of electric conducting cables	Yellow	Green	Green	Green	Yellow	Yellow	Yellow	Red
14-512	Kent State University	Bistable Light Modulator for Light Extraction in OLED Device Applications	Green	Yellow	Green	Yellow	Green	Yellow	Green	Green
14-513	Ohio University	Intelligence for Diabetes Support System (iDSS)	Red	Green	Green	Red	Green	Green	Green	Green
14-514	The Cleveland Clinic Foundation	Bronchial Stent	Red	Red	Red	Yellow	Red	Green	Yellow	Green
14-515	University of Akron	Akron Fast Fourier Transform (FFT)	Green	Green	Green	Green	Green	Green	Green	Green
14-516	The Cleveland Clinic Foundation	Autism Spectrum Disorder	Green	Yellow	Green	Green	Yellow	Green	Green	Green
14-517	The Cleveland Clinic Foundation	Sleep Apnea	Red	Green	Green	Red	Red	Green	Green	Green
14-518	The Ohio State University	KAir Battery	Green	Yellow	Green	Green	Green	Green	Yellow	Green

DEFINITION OF COLUMNS:

Proposal # – A unique OTF number for each proposal

Licensing Institution – The Ohio Institution of higher learning that is requesting funds

Project Title – The Project Title for the Request for Proposals Application Page

Generation of Proof to be Licensed – The proposed proof needed to move the technology to a point where it is ready to be licensed to a start-up or young company is deemed meaningful and likely impactful to that end

Project Plan/Team – Proposed proof that the technology can be generated during a one year project period with the proposed resources to move the technology to a point where it is ready to be licensed by a start-up or young company

Independent 3rd Party Review – Will the validation/proof process be conducted or overseen by an independent party

Reasonable Path to Market – The technology has a commercially reasonable path to market entry of first product

IP Protection – Degree to which the intellectual property is protected

Start-up in Ohio – Degree to which the proposed project will likely lead to a start-up company if the technology validation is successful and needed proof is generated

Market Opportunity/Size – Is this technology a viable commercial opportunity in regards to the potential market size and competition

Budget Narrative/Use of Funds -- description of how the entity proposes to use the funding if received

DETAILS OF PHASE 1 RECOMMENDATIONS

Proposal 14-501	Cincinnati Children's Hospital Medical Center	<i>Human Assisted Needle Delivery System</i>
Amount Requested: \$50,000	Recommended: \$50,000	

Rationale: This proposal from the Cincinnati Children's Hospital Medical Center (CCHMC) concerns further development of a robotic device for inserting a needle into a deep vein or artery. It has been christened the Human Assisted Needle Delivery System or HANDS. The device contains an ultrasound transducer that permits visualization of the target vessel, both on a liquid crystal display (LCD) screen incorporated in the device and on an external monitor. Though not described very well in the proposal or the video cited in the proposal, the device apparently allows the operator to designate a position in the ultrasound image where he or she wishes the needle tip to be located. The device calculates the angle and depth of insertion from its position on the body and, under robotic control, drives the needle tip to the desired location.

The applicants assert that in the US there are 150 million central venous catheters purchased annually.

They claim that manual needle insertion in deep veins and arteries may take 10-60 minutes and that the failure rate (of inserting the needle incorrectly on the first try) is as high as 38% and that complications (e.g., failure to place the catheter, arterial puncture, catheter malposition, and infection) ensue from manual insertion in 33% of the cases. HANDS has the potential to reduce the time necessary to insert a catheter to 1-2 minutes, reduce the skill level needed, reduce the infection risk.

Working with experts from Ben Gurion University in Israel, CCHMC has developed an initial prototype of HANDS. The proposal says that CCHMC and BGU have invested their own money in the development so far and it makes no reference to any other source of funds up to this point. The project for which funds are being sought now is development of a second-generation device, which can undergo preclinical testing prior to an FDA submission, and formation of a commercial enterprise.

The proposal addresses all of the criteria for the phase 1 TVSF and is recommended for funding.

Concerns which were not sufficient to preclude funding relate to the Project Plan where exactly what was to be accomplished was not well defined so judgment could not be rendered as to the ability to complete the plan in the requisite time, and the Budget is low on details, specifically as

regards engagement of outside services and consultants which is the majority of the proposed budget.

Proposal 14-502	University of Akron	<i>Rare-Earth-Material-Free Multiphase Electric Machine (FMEM) for Low Power Applications</i>
Amount Requested: \$50,000	Recommended: \$50,000	

Rationale: This applicant proposes further development and fabrication of a rare-earth-free beta prototype, which, if successful, will deliver improved reliability and longer life than existing electric machine architecture at a lower cost. The validation of the motor technology will demonstrate immediate applicability to automotive and aerospace markets. The applicants have made good use of their participation in the National Science Foundation I-Corps program to obtain a solid understanding of market needs and have appropriate performance targets to validate during the project.

The FMEM team will use the granted funds to hire two graduate students, prototype fabrication services, materials and supplies, and third party validation services. Independent validation will occur via either the Korea Electric Vehicle Leaders Association or Linestream Tech.

Upon successful validation, the team will form a start-up company, E-Motors US, to license the technology and further refine the design, develop business plans, and manufacturing plan.

The intellectual property is protected by two patents pending. The technology and path forward appear sound with a good chance of success, and a third party review of the project outcome is planned.

The proposal addresses all of the criteria for the phase 1 TVSF and is recommended for funding.

Proposal 14-503	University of Akron	<i>Integrated Imaging Goggles for Guiding Basal-cell Carcinoma Surgeries</i>
Amount Requested: \$50,000	Recommended: \$50,000	

Rationale: Applicant proposes further development of hands-free, wireless goggles that image near-infrared (NIR) fluorescence for real-time image-guided surgery. The goggles superimpose an image derived from the fluorescence of an injected dye on the normal visual field of the surgeon wearing the goggles. Certain dyes – the proposal mentions indocyanine green (ICG) and 5-aminolevulinic acid, both of which are FDA approved drugs – have the properties that they concentrate preferentially in cancerous tumors and that they fluoresce under NIR illumination. Thus, goggles fitted with suitable detectors can reveal the presence and extent of cancerous lesions, enabling the surgeon to excise cancerous tissue while sparing adjacent non-cancerous tissue.

A prototype goggle system has been built and tested to image cancers in animal models and in a limited human trial to image hepatocellular cancer. In the latter experiment, the system detected and displayed all primary tumors as well as a number of satellite tumors that were undetected by MRI, CT, visual inspection, or palpation. Thus, the system has many potential applications, but the applicants have settled for their initial product on a system designed to guide excision of basal-cell carcinomas (BCC). Such cancers are prevalent, said to be diagnosed in 2.8 million patients in the US each year, and they are potentially serious if not removed in their early stages. Excision of BCC is normally an office procedure, where the dermatologist removes not only the lesion but a margin of tissue surrounding the lesion. The excised material is examined by a pathologist to detect otherwise invisible infiltrations of the cancer beyond the margins of the original excision. If there are any, a second operation is performed. The new system is expected to guide initial surgery more accurately, diminishing the need for second operations.

The program envisioned by the applicants entails optimization of the system for BCC, animal testing, pilot testing in humans, preparation of a 510(k) application to the FDA, and finally full-scale human testing. The program addressed in this proposal concerns only the first two steps: \$40,000 for optimization and \$60,000 for animal testing.

The proposal addresses all of the criteria for the phase 1 TVSF and is recommended for funding.

Concerns which were not sufficient to preclude funding relate to a Path to Market and Market Opportunity. Applicants significantly overstated the costs by choosing one worst case scenario and basing 100% of all surgeries on that \$25,000 outlier¹. Typical costs for MOHS surgeries are on the order of \$3,000 to \$7,000^{2,3,4}. Even so, there appears to be a sufficient market size to support the technology, although estimated unit sales figures are absent. In addition, applicant needs \$2MM in future funding to get to market. The anticipated source of those funds is lacking.

Proposal 14-504	University of Akron	<i>Transparent Conductive Coating for Flexible Electronics</i>
Amount Requested: \$50,000	Recommended: \$50,000	

¹ http://en.wikipedia.org/wiki/Mohs_surgery#cite_note-NYTimes-61

² <http://www.epatientdave.com/2012/05/21/raw-numbers-for-treating-my-basal-cell-carcinoma-at-three-hospitals/>

³ http://www.medicinenet.com/mohs_surgery/page6.htm

⁴ http://en.wikipedia.org/wiki/Mohs_surgery

Rationale: Applicant proposes to use metallic nanowires as a lower cost and more robust replacement for Indium Tin Oxide (ITO) as the transparent conductor for flexible electronics (e.g. touch screens and solar cells). The technology is novel and has the potential to disrupt existing transparent conductor markets. For example, ITO has been increasing in price due to the relative scarcity of Indium, and ITO requires a glass substrate, which, as any cell phone user has discovered, is prone to cracking when dropped. The transparent coating under development is less brittle than ITO and can be overlaid on a polymer substrate.

Funds requested for this proposal are for: (1) Fabrication of 5.5 inch size optical grade transparent samples with low resistance by optimizing sample processing techniques already shown for smaller size substrates; (2) Lithographic fabrication of capacitive touch screen; necessary for its use in mobile applications, and development of (3) high volume manufacturing.

The proposal addresses all of the criteria for the phase 1 TVSF and is recommended for funding.

Concerns which were not sufficient to preclude funding relate to Proof and Plan. With a lean budget and a tight plan, the applicants may have underestimated the amount of effort and time to complete given the complexity proffered. In addition, the Proof lacks mention of wire stability and corrosion testing that the technical review deemed meaningful to success – the applicants make no reference to aging tests or stability tests which could impact performance, as oxidized metals can absorb light and reduce transparency. Should applicant progress to a Phase 2 proposal, those test results will need to be included for evaluation.

Proposal 14-505	University of Toledo	<i>Ring-closing metathesis approach for conversion of oleic acid to Nylon 11–13</i>
Amount Requested: \$50,000	Recommended: \$0	

Rationale: Applicant proposes to develop a Bio-Nylon derived from oleic acid that can be extracted from corn or algal sources using a ring-closing metathesis approach for conversion of oleic acid (or oleic acid methyl ester) to Nylon 11–13. Oleic acid is the major component of most vegetable oils – including soy and corn oils – abundantly available in Ohio. Oleic acid is also the major component of the oils in most microalgae. Applicants have developed a “pyrolytic fractionation” approach that enables solvent-free recovery of these oils as free fatty acids to be polymerized.

The proposal nicely leverages the well-established algae research center and human expertise at UT for this application.

The review team found significant concern related to Proof and Start up. The proposed Proof is to simply manufacture the already proven material on a slightly larger scale (35g), and to have a potential customer assess the physical properties of the resulting polymers. Although the first

step of oleic acid synthesis from biomass is reasonably efficient at a 15 gram scale, the final path towards large scale manufacturing Nylon is uncertain. Current development progress is too nascent. Efforts for a Phase 1 application of this nature should be concentrated on economical scale up, pending approval of the customer driven characteristics of the prototype materials instead of duplicating prior results since lab-scale chemistry may not translate smoothly into high volume manufacturing. The increase from 15 g to 35g appears to be still in the research phase rather than driving towards commercialization. Further, the primary indicated market path is to license the technology to another company, likely a start-up (Gen3Bio) that appears to be from Indiana, or an already well-established company (Eaton). This is not consistent with the intent of the program.

This proposal is not recommended for funding.

Concerns which were not sufficient to preclude funding relate to Path to Market. The overall costs of this alternative have not been addressed in the proposal, but are presumably higher than legacy petroleum based derivatives. An evaluation of the economics versus meaningful benefits of this alternative will be a necessary exercise toward ensuring commercial success.

Recommendations for Improvement: Should UT choose to reapply for TVSF funding, the applicants need to collaborate with a chemical engineer to assess and develop scale up processing in order to reach the goal of commercialization in less than three years. Presumably the quality of the nylon pre-cursors can be assessed using the existing 15g process, in which case this should be confirmed prior to resubmission so the applicants can focus their efforts on meeting the cost and quality performance targets of their end customers based on the evaluation of material performance. In addition, a cost/benefit analysis should be undertaken to guide marketing direction.

Proposal 14-506	University of Toledo	<i>Injectable Macroporous Bone Growth Substitute</i>
Amount Requested: \$50,000	Recommended: \$0	

Rationale: This application proposes development of a modified bone growth substitute (BGS) similar to several other bone substitutes studied at UT. The precise composition of the reagents is not disclosed in any of the proposals, but it is evidently a silicated compound of di-calcium phosphate anhydrous (DCPA), also known as Monelite. The silicated compound can be formed into different shapes and used as an implant to supplement or replace natural bone with a matrix into which natural bone will grow. According to the applicants, this compound is superior to other bone cements and substitutes on the market in that it is biocompatible and radiopaque, does not generate high temperatures during setting, and offers ideal resorption and bone

formation rates, that is, it gets resorbed at about the same rate that new bone can infiltrate the material.

The material in this proposal is modified by the addition of magnesium granules, which react with water to produce tiny bubbles throughout the medium. With due attention to amount of magnesium and the size of the granules, the size of these bubbles can be controlled in the range from 0.5-2.0 mm. Small bubbles do not appreciably weaken the hardened material or affect its injectability. But they do provide a means for delivering other materials such as growth factors (which may hasten formation of natural bone) or antibiotics (which may help treatment of osteomyelitis).

As proof of concept, the applicants have created and studied such compounds, demonstrating that they form DCPA as desired, that they maintain and injectable consistency, and that they form pores of suitable size in situ. The project addressed in this proposal is further development, characterization, optimization, and testing of the compound followed by *in vitro* testing and *in vivo* testing in rabbits.

The review team found significant concern related to Proof. This technology is too early in its life cycle and should be further developed prior to application to TVSF. Specifically, the first three milestones listed under the proof plan appear to be basic research and the various compositions proposed should already have been developed as proof of concept. This would allow work to be focused on refinement of initial compositions and validation through *in vitro* testing.

This proposal is not recommended for funding.

Concerns which were not sufficient to preclude funding relate to Path to Market and Startup. The applicant presumes that licensing the technology to nascent startup OsteoNovus is the best path forward for commercialization. This has yet to be proven. Further, \$1MM in funding is needed to bring to market with no identified sources of said capital.

Recommendations for Improvement: Should UT choose to reapply for TVSF funding, the applicants need to complete research milestones identified as 1 through 3 in the proposal prior to submission. Those results should be included for evaluation. In addition, the applicants need to further validate the relationship with OsteoNovus versus a stand-alone startup and identify potential capital sources for market entry.

Proposal 14-507	Kent State University	<i>Low-Cost Electrically Tunable Color Filter with Wide Tuning Range</i>
Amount Requested: \$50,000	Recommended: \$0	

Rationale: This application proposes to develop tunable optical filters using helically modulated cholesteric liquid crystals. The primary advantage of the proposed technology is a wide range of

wavelength tunability, controlled by the strength of the applied electrical field, which in turn could provide more cost-efficient production, and improved power consumption. This is potentially exciting technology once the appropriate materials development is successfully concluded. The necessary equipment to carry out the proposed characterization of devices is available at the applicant’s laboratory.

The review team found significant concern related to Proof. The first six months of the project will be spent identifying materials which can work in a lower temperature range of 10°C to 40°C versus the 91°C to 96°C range, for which they have identified materials. The review team does not think this is a trivial task, and it would appear the applicants agree given the amount of time they are dedicating to it. Failure to identify a monomer which can broaden the operational temperature range will, at best, require addition of a competent synthetic chemist to the plan, and even then there may be unfavorable temperature dependencies of bend and twist elastics. Therefore, the review team will need to see proof of concept at the broader temperature range prior to resubmission of the application, as we see this first critical task as basic research and not a validation activity.

This proposal is not recommended for funding.

Concerns which were not sufficient to preclude funding relate to Path to Market is undefined and the Project Plan does not address whether a material capable of displaying desirable electro-optic phenomenon near normal operating temperatures can be developed in one year.

Recommendations for Improvement: Should KSU choose to reapply for TVSF funding, the applicants need to complete the first three milestones (temperature range expansion, helical structure search, and stabilization potential) identified in the proposal prior to resubmission, as these material selection activities are viewed by the review team to be basic research in nature. Those results should be included for evaluation. In addition, the applicants need to propose a Path to Market and include estimation of resources needed for operation temperature reduction.

Proposal 14-508	Case Western Reserve University	<i>NeuroRadVision™: Decision Support Toolkit to reduce unnecessary surgical interventions for brain tumors</i>
Amount Requested: \$50,000	Recommended: \$0	

Rationale: Applicant proposes further development of specialized software for computer-aided diagnosis, designed for use by neuroradiologists and neurosurgeons in managing treatment of brain tumors, which typically involves surgical excision of the tumor followed by therapeutic radiation. A major problem in this routine is distinguishing tumor regrowth from radiation necrosis (tissue damage caused by radiation) or other confounding factors. Tumor regrowth usually entails additional surgery, while other factors do not. The standard method for detecting

brain tumors and evaluating therapy is magnetic resonance imaging (MRI), which offers a variety of techniques, each of which emphasizes some characteristic of the tissues under examination that may indicate the state of the tissue – in the case at hand, whether the tissue is new tumor or necrotic old tissue. The software under development makes various measurements on MRI images made using various techniques and integrates these into a score that distinguishes tumor regrowth from other confounding conditions, such as radiation necrosis, that mimic regrowth.

The applicants have developed the software in question and have evaluated it in a pilot study, demonstrating that it does improve the ability of neuroradiologists and neurosurgeons to distinguish tumor regrowth from radiation necrosis more reliably than they can without computer-aided diagnostic software (CAD). Based on experience with 42 patients from University Hospitals, the improvement, while significant, is not overwhelming – the applicants say that their CAD is 80% accurate (true positive plus true negatives divided by the total number of patients) compared to 60-65% for unaided readings and shows that 25% of patients thought to have tumor regrowth actually had radiation necrosis (false positives) and therefore did not need further surgery. Applicants aim to improve accuracy with a larger data set across multiple institutions. It should be noted that this may decrease accuracy by increasing the variability of the images, as would be expected when collecting data from different machines/technologies operating under differing conditions.

The applicants outline a full-scale program taking three years and costing \$2.75 million, which will comprise three phases:

- I. Multi-site data procurement, algorithm validation, and refinement, and evaluation against performance of experts from multi-sites (\$250,000).
- II. Begin building commercial algorithm and stand-alone prototype, and evaluate system in a clinical setting (\$500,000).
- III. Begin FDA approval process and schedule entry to market (\$2.0 million).

The funds sought in this proposal (\$100,000) will be supplemented by money identified as Coulter Phase I and Phase II awards, already in hand. These TVSF funds and the Coulter funds will be used to carry out Phase I.

The review team found significant concerns related to Path to Market which is not well defined, and lacks even directional business assumptions such as an insurance reimbursement strategy, potential pricing, sales and distribution possibilities, etc. IP Protection does not exist as only an invention disclosure is in place for the technology under development – the other patents cited in the application do not appear to apply to this specific technology even though they are related. The project budget on the application form of \$100,000 is only a subset of the \$250,000 needed to complete phase 1 work, and the budget table in the application specifies \$150,000 in personnel funding required. Inconsistencies aside, and even assuming the entire \$250,000 is in hand, the lack of budget narrative does not allow the review team to understand how the state's money would be spent or why it is needed. This technology is too early in its life cycle in that

Proof point 6c for example is considered by the review team to be research in nature versus validation. Therefore, the technology should be further developed prior to application to TVSF.

This proposal is not recommended for funding.

Concerns which were not sufficient to preclude funding relate to Market Opportunity. The savings is overestimated by relying on 100% surgery utilization of the technology. The opportunity is further complicated by numerous competitors in the market space. Their potential advantages have not been addressed in the proposal.

Recommendations for Improvement: Should CWRU choose to reapply for TVSF funding, the applicants need to further develop the technology by creating the proof of concept software algorithm and requisite software. Those results should be included for evaluation. IP protection should be filed prior to submission as well. In addition, the applicants need to propose a clear budget with objectives directly related to the funding of this program.

Proposal 14-509	Kent State University	<i>Polarizing Waveguide Plate for Liquid Crystal Displays</i>
Amount Requested: \$50,000	Recommended: \$50,000	

Rationale: Applicant proposes to improve the light usage efficiency of liquid crystal displays (LCDs), eliminating the need for standard polarizers by using a waveguide plate to convert unpolarized light generated by edgelights into polarized light. This clever approach would enable making displays brighter (perhaps as much as 30 percent improvement) with even lower power light sources. This will translate into better battery usage life for watches, cell phones and laptops. If successful, it will remove one of the primary shortcomings of LCD technology which uses light inefficiently. The business plan and the milestones for commercialization are very well developed and are realizable in one year period.

The proposal addresses all of the criteria for the phase 1 TVSF and is recommended for funding.

Concerns which were not sufficient to preclude funding relate to Path to Market, and Startup. The need for a startup is dampened by the existence of Kent Optronics. Further, \$2MM in funding is needed to bring to market with no identified sources of said capital.

Proposal 14-510	University of Akron	<i>Additively Manufactured Prosthetic Socket Cooling System</i>
Amount Requested: \$50,000	Recommended: \$50,000	

Rationale: This proposal is a resubmission of 13-511 which was not recommended for funding due to concern regarding the lack of an integrated cooling system. This revised submission addresses our previous concerns.

Applicant proposes development of a prosthetic socket containing channels by which it can be cooled using circulating air. The key to fabricating such a prosthesis is additive manufacture (AM), also known as 3D-printing. The idea is to build up material under computer control layer by layer using a polymer material that hardens soon after deposition but still bonds tightly to underlying layers. Such a technique makes it possible to create intricate shapes without complicated machining steps. It also lends itself to fabrication of unique items such as a prosthesis fitted to an individual patient.

A problem with current prostheses, particularly leg prostheses fitted to a femoral or tibial stump, is that for active wearers the stump within the prosthesis and the prosthesis itself become hot, leading not only to pain but also to skin breakdown, a condition called maceration, which takes long times to cure and in any case limits the wearer's activity. The problem is aggravated by the fact that, when hot, the stump may swell, increasing pressure on it. There are said to be in the US some 1.5 million patients with leg amputations above or below the knee, and of these some 40%, or 600,000 lead active lives and might benefit from a prosthesis that could be cooled.

The applicants propose in this project to develop and test such a prosthesis utilizing the technique of AM, which will make it possible to include in the prosthesis itself a channel through which air can be circulated. The current proposal includes prosthesis cooling by circulating ambient air provided by a battery-driven pump attached on the wearer's body or to the prosthesis.

The proposal addresses all of the criteria for the phase 1 TVSF and is recommended for funding.

The only remaining concern which is not sufficient to preclude funding is the generation of a meaningful proof point, as durability and material creep are critical unknowns, and essential to a licensing event.

Proposal 14-511	University of Akron	<i>Active clamp injection technology for health-monitoring of electric conducting cables</i>
Amount Requested: \$50,000	Recommended: \$0	

Rationale: Applicant proposes further development of devices that enable the use of Active Clamp Injection Technology (ACIT) as a sensor based approach to real time health monitoring of power lines. Such lines are physically characterized by their high frequency impedance and thus their health condition may be evaluated by measuring this impedance. The current techniques in use to monitor cable health are destructive, intrusive or invasive, all undesirable for critical

power systems. The ACIT is a non-invasive technique using magnetic coupling that injects a high frequency signal into a section of power line and at the other section of power line a blocking signal is injected. By varying the amplitude and phase of another injected signal and finding the best blocking signal characteristics a measurement of impedance can be made. This technique has been demonstrated in the university laboratory and has shown that the technology successfully identifies deteriorated underground cables and overhead power lines. The university has applied for a provisional patent for this. The device tested to date has used lab equipment and a more realistic field device needs to be developed for the next phase.

A four phase plan to commercialization is shown in the proposal and three industrial partners are identified and will actively participate. The total cost for the four phases is \$469,000 of which \$100,000 is requested from TVSF. Most of the \$100K goes for personnel services with \$9K going for supplies. The first two phases have been generated to show device capabilities in an actual field test with representative underground power cables. The \$100K would be used to augment existing funding for these phases. If the demonstration is successful and proof of concept is obtained, the technology will be licensed to Exacter, Inc., a Columbus Ohio firm that provides outage avoidance technology and services to the electric utility industry. They have provided seed funding to develop the validation plan.

The review team found significant concern related to Budget. The review team cannot ascertain what the TVSF funding would be utilized for in the budget presented. It is also clear from the proposal that this project is progressing with or without TVSF funds. Work is already underway, and while Phase 2 of the project plan matches the requested budget of \$100K for the project, the review team is unable to determine whether the activities listed are supported by TVSF funds or not, as no narrative was provided in that regard.

This proposal is not recommended for funding.

Concerns which were not sufficient to preclude funding relate to Proof, IP Protection, Startup, and Market Opportunity. The Proof point that Ohio is funding is not clear. The Market is not well defined in terms of miles addressable and number of sales units resultant therefrom. The age of the company (2006) as well as significant revenue (\$1MM/yr.) puts the company status as a startup in question. Further, a collaborator has filed their own IP protection around the institution's invention. This may be a better fit as a Phase 2 application if the above concerns can be addressed by the applicants. However, it should be noted that subsequent justification rationale may further demonstrate that these potential gaps are sufficient to preclude recommendation.

Recommendations for Improvement: Should UA choose to reapply for TVSF funding, the applicants need to clearly define a budget for TVSF funds use and delineate why State funding is essential for project progression. In addition, a Proof plan that follows said budget, a business model defining sales expectations, and justification for startup status should be included.

Further clarity on the IP relationship between the University and the Collaborator would also be helpful in the evaluation.

Proposal 14-512	Kent State University	<i>Bistable Light Modulator for Light Extraction in OLED Device Applications</i>
Amount Requested: \$50,000	Recommended: \$50,000	

Rationale: Applicant proposes to optimize cholesteric bistable liquid crystal films for efficient extraction of light generated in organic light emitting diode (OLED) devices. The main problem with the current generation of OLED devices is the loss of light generated at the p-n junction, a basic element of LEDs and critical to its conductivity, owing to unfavorable optical component geometry. The PI has considerable expertise and established track record in developing cholesteric LCD, so there is reason to believe the proposed improvements can be achieved.

The proposal addresses all of the criteria for the phase 1 TVSF and is recommended for funding.

Concerns which were not sufficient to preclude funding relate to Team, Market Path, and Startup. The lack of commercial focus within the narrative made the proposal extremely difficult to parse. In addition, the Path to Market is assumed to be a license arrangement. However, the applicants did not promulgate the future roles of LG and SCI and thus said path remains vague. Finally Startup necessity is questionable given the substantial involvement of the aforementioned SCI and LG. The PI's work with OLED has been funded by LG, a major OLED display manufacturer. Thus, it was not clear why this work would not be simply licensed by LG as opposed to creation of a new Ohio based company.

Proposal 14-513	Ohio University	<i>Intelligence for Diabetes Support System (I4DSS)</i>
Amount Requested: \$50,000	Recommended: \$0	

Rationale: This proposal is a resubmission of 14-408 which was not recommended for funding due to concerns regarding Proof, 3rd Party Review, Path to Market, and IP protection. This submission addresses some but not all of the previous concerns. The proposed relationships with potential partners Tidepool and Medtronic are better described, as are the tasks to be accomplished during the project period.

Applicant proposes to use case-based reasoning, a form of artificial intelligence, to analyze data from patients with type I diabetes and make recommendations regarding improvements in treatment. The data would include glucose levels, insulin infusion amounts and timing and the occurrence of life events likely to affect glucose levels (such as exercise, stress, sleep patterns and missed meals). The review team agrees, based on the information presented, that the

described algorithms can be refined to deliver meaningful output if all the appropriate data inputs can be obtained in a consistent, predictable way. What is still unclear is how that will occur. The applicants cite ‘insulin pumps, glucose sensors, and physiologic monitors’ as sources for this data. That would account for insulin administration data and glucose levels, but leaves open the question of whether patients would have to have a specialized monitor to analyze stress, sleep and exercise, for example. At its core, this technology has proof of concept in a well-controlled academic setting while the question of relevance and accuracy in less controlled settings is a complete unknown. If the algorithms work well only as a part of a very well-integrated and complex system of physiologic monitors the product could be a long way from market, or could greatly limit the market potential for those patients able to afford such a complex and expensive system.

The review team still finds significant concern related to Proof and Market Path. The Proof plan continues to focus on validation of the operation of the software and precludes clinical validity assessment, and while there are some improvements in understanding data sources, an improved application must clarify the practicality of the approach. For example, there is no mention of how factors that would impact the results, such as sleep, stress, and exercise, would be monitored. Marketing the product in a convincing way to encourage users to outlay \$50/month without understanding the value proposition or how the system works is unlikely.

This proposal is not recommended for funding.

Recommendations for Improvement: Should Ohio University choose to reapply for TVSF funding, the grant application should delineate a robust Proof plan with tangible outcomes, placing emphasis and focus on clinical validation versus operational infrastructure. Further, a marketing value proposition should be developed.

Proposal 14-514	The Cleveland Clinic Foundation	<i>Bronchial Stent</i>
Amount Requested: \$30,000	Recommended: \$0	

Rationale: Applicant proposes further development of a system to manufacture bronchial stents customized for a particular patient using 3D printing. Stents are tubular structures inserted in a passageway – in this case the bronchial airway – to support the walls of a passageway blocked by injury, tumor, or other obstruction or distortion. Such stents are usually placed using a bronchoscope. The shape and size of airways varies from patient to patient, depending on age, sex, body type, and the nature of the blockage. For this reason, there is a need for stents that are customized for each patient. Because standard (non-customized) stents are hard to fit and place, only about 7,000 are placed in the US each year. Worldwide, the number is thought to be around 150,000.

The technical concept envisions creating from computed tomography (CT) data a 3D description of each patient's airways. Such renderings are now standard in modern CT machines. These data will then be converted into data to drive a 3D printer to produce a mold for the stent. Such printers are commercially available. The mold will then be filled with a human-grade silicone material, which, after curing, will provide a stent that conforms to a specific patient's anatomy. Using prototype software, the applicants have actually produced at least two custom-designed stents, which they declared failures because the silicone did not cure properly and because the wall thickness that they achieved was thought to be excessively thick.

The review team found significant concerns related to Proof, Project Plan, 3rd Party Review, and IP Protection. This technology is too early in its life cycle and should be further developed prior to application to TVSF as shown by the lack of a working prototype and no identified proof milestones in the proposal. There is no timeline projected for the project plan. No 3rd party review is proffered. Finally IP protection does not exist.

This proposal is not recommended for funding.

Additional concerns which were not sufficient to preclude funding relate to Path to Market and Market Opportunity. \$2.5MM in funding is needed to bring to market with no identified sources of said capital. In addition the market is relatively small.

Proposal 14-515	University of Akron	<i>Akron Fast Fourier Transform (FFT)</i>
Amount Requested: \$50,000	Recommended: \$50,000	

Rationale: This proposal is a resubmission of 12-475 which was not recommended for funding due to concerns regarding Team, Business Model, and Market Opportunity. The applicants have refocused their application from the medical field to computers. In the process, they have addressed all previous concerns.

The applicant proposes use the Fast Fourier Transform (FFT) algorithm developed at the University of Akron to increase the speed of calculations carried out by graphics processing units (GPUs) in computers. They have discussed the possibility of licensing the algorithm with the staff at NVIDIA, a leading developer and manufacturer of GPUs. That company's staff has stated that a 10% increase in speed over that of the algorithm NVIDIA currently uses would be useful and has already provided a GPU to the submitters for use in porting the Akron algorithm.

Project funds will be used for personnel to achieve the following three objectives:

- 1) Complete programming for 1D and 2D software applications of the FFT;
- 2) Perform internal alpha testing and a beta test of 1D and 2D programs with Akron Software and target customer NVIDIA;

3) License the technology to Akron Software for commercialization.

The review team found no concerns with this current proposal.

The proposal addresses all of the criteria for the phase 1 TVSF and is recommended for funding.

Proposal 14-516	The Cleveland Clinic Foundation	<i>Autism Spectrum Disorder</i>
Amount Requested: \$50,000	Recommended: \$50,000	

Rationale: This proposal is a resubmission of 14-410 which was not recommended for funding due to concerns regarding Path to Market, Proof, 3rd Party Review, and IP protection. This current application addresses those concerns.

Applicant proposes development and validation of a system to aid in screening children for autism spectrum disorder (ASD), and providing several scores that would support diagnosis and prognosis and provide a means to evaluate treatment. The concept is based on findings that children with ASD have social attention deficits that are revealed by eye-tracking – for example, frequently shifting gaze from a person talking to them or fixating on some non-social object in a scene where most viewers would focus on the people. Eye-tracking in psychological research is now commonplace and a number of companies offer such devices. The proposal here is focused on developing and validating software (christened Autism EYES) that would use eye-tracking data as the input to derive objective scores reflective of a subject’s position along the autism spectrum (screening and diagnosis), anticipated development (prognosis of ASD trajectories) and changes over time (evaluating treatments).

In the current proposal the applicants say that they believe no FDA approval will be required because the system will not claim to be diagnostic but only a screening and diagnostic aid when interpreted by a professional; they now plan to test two age groups: 18-36 months, and 37-72 months; they cite established reimbursement codes that deal with medical and psychological testing; and they say that they will undertake development using an eye-tracking system from SensoMotoric Instruments (SMI), with whom they have “partnered.” The current proposal removes all the prior concerns regarding technical and commercial feasibility of the project except its aggressive development schedule.

Additional concerns which were not sufficient to preclude funding relate to Plan and IP Protection. A significant volume of effort is projected for the one year time frame. In addition, copyright/ trade secret are less robust than other forms of IP protection.

The proposal addresses all of the criteria for the phase 1 TVSF and is recommended for funding.

Proposal 14-517	The Cleveland Clinic Foundation	<i>Sleep Apnea</i>
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Amount Requested: \$50,000	Recommended: \$0	
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Rationale: This proposal is a resubmission of 14-413 which was not recommended for funding due to concern regarding Path to Market pressures from further advanced global competition. This proposal does not address this previous concern.

The applicant proposes development of an implantable neurostimulating device to alleviate sleep apnea caused by relaxation of the upper airway. The device would be permanently implanted and powered by an externally rechargeable battery. It would stimulate specific tongue muscles, having the effect of pulling the rearward tongue segment forward, thus opening the airway above the larynx and epiglottis.

Moderate to severe obstructive sleep apnea (OSA) is said to affect as many as 15 million Americans. There are many treatments, including head scarves, surgical removal of the uvula, and continuous positive airway pressure (CPAP). The last is effective, but it entails sleeping with a face mask connected to a hose that delivers mildly compressed air, and many who use it find that it disturbs normal sleep.

The device in question here, being fully implanted, would not have the drawbacks of CPAP. It has been designed, and studies on cadavers have explored electrode design and minimally invasive placement technique. The proposal seeks funding for prototype development and pre-clinical proof of concept in animals.

Competitors – Inspire and ImThera – also have developed neurostimulating devices to treat sleep apnea and further have secured CE Mark approval in Europe and one of them – Inspire – received FDA approval in the US in May 2014. The limitations of these competitive devices, according to the applicants, are that they contain an implantable pulse generator (IPG) that stimulates only one side of the neck. In addition, the batteries in the competitive systems, instead of being externally rechargeable, must be surgically replaced when they expire.

The review team found significant concerns related to Path to Market and IP Protection. The fact that there is advanced competition in this market is a serious impediment for the planned new start-up, and while the benefits of the product are clearly explained in the application, a follow-on technology with the investment and risk profile of a sophisticated medical device must have clear and protectable superiority to attract capital and reach the market. The applicants have reasserted the perceived advantages of their technology in this revised application, and the review team does not question whether the advantages exist. Rather, the concern is whether established competitors, one of whom recently raised \$40 million and who are generating revenue from existing products would be able to make improvements to their technologies in the three to five years the applicants expect it will take to gain market clearance in Europe and the US, respectively. Further, IP protection of some features may not be granted as rechargeable batteries may be deemed ‘obvious to one skilled in the art’ of similar medical devices such as

pacemakers. There is also a reasonable likelihood that competitors will work to improve their products while working around this IP or with new developments.

The proposal is not recommended for funding.

Recommendations for Improvement: Should Cleveland Clinic Foundation choose to reapply for TVSF funding, the grant application should better address the competitive landscape. A positive recommendation cannot be made without a clear vision of how this product will differentiate itself in the market, in a protectable way by the anticipated launch timing.

Proposal 14-518	The Ohio State University	<i>KAir Battery</i>
Amount Requested: \$50,000	Recommended: \$50,000	

Rationale: This proposal is a resubmission of 14-404 which was not recommended for funding due to concern regarding Path to Market. This proposal has refocused the target market and thus addresses the previous concerns.

Applicant proposes further development of potassium-air batteries (KAir). Preliminary prototypes of have shown promising results, with over 95% energy efficiency and low cost. The KAir team has applied for this grant in order to fabricate a 12-cell prototype pack that will be thoroughly tested and optimized and additionally tested and verified by a third party (Oak Ridge National Labs). The validation of the battery pack prototype and its subsequent retrofit onto a bike/scooter will demonstrate immediate applicability to the electric bike market.

The KAir Battery team will use the granted funds for hiring a graduate student researcher, materials characterization services and lab fees, supplies and components to produce the battery pack prototype, and equipment to produce the battery pack prototype.

At the end of the 1-year Phase 1 project stage, the team has arranged for the validation of the performance of the prototype batteries at the on-campus Center for Automotive Research lab as well as Oak Ridge National Laboratories. The team and technology has already attracted a number of other awards and grants and has a series of inventions to back up the intellectual property.

The technology and path forward appear sound with a reasonable chance of success once the technology is proven.

Concerns which were not sufficient to preclude funding relate to Project Plan and Market Opportunity. As material design choice is not yet frozen, this could extend the project in an iterative fashion or increase costs, especially since nanomaterials will be explored. Further, although the eBike market was defined, the battery portion was not delineated.

The proposal addresses all of the criteria for the phase 1 TVSF and is recommended for funding.

PROPOSAL RECOMMENDATIONS - PHASE 2 SUMMARY MATRIX

PROPOSAL #	Licensing Institution	Lead Applicant	PROJECT TITLE	Proof	Project Plan (one year)	Likelihood of Additional Funds at project end	Team	Business Model	Company Backing	IP Protection	Opportunity / Mkt. Size	Budget / Use of Funds	Start-up in Ohio	License with Ohio Institution
14-519	Cleveland Clinic Foundation	Intellirod Spine	Wireless Spine Load Sensor	Yellow	Green	Green	Green	Yellow	Green	Yellow	Yellow	Red	Red	Yellow
14-520	Case Western Reserve University	Mirach Medical Innovation, Inc.	Novel, Cost-effective, Smart Feeding Tubes	Green	Green	Green	Yellow	Green	Green	Green	Yellow	Green	Green	Green
14-521	Kent State University	iRxReminder LLC	iRx: Interoperating Medication Container for mHealth Management of Chronic Illnesses	Green	Green	Green	Green	Yellow	Green	Green	Green	Green	Green	Green
14-522	University of Akron	Akron Ascent Innovations LLC	Bio-Inspired Reusable Adhesives Using Scalable Electrospinning Techniques	Green	Green	Green	Green	Yellow	Green	Green	Yellow	Green	Green	Green
14-523	University of Akron	Cratus, LLC	Ultra High Energy Density Nanocomposite Capacitor	Red	Green	Green	Red	Red	Green	Green	Green	Green	Green	Yellow
14-524	Ohio State University	QuTel, Inc.	Quantum Tunneling Electronics for Ultra-Low Power Electronics	Yellow	Green	Green	Yellow	Green	Yellow	Green	Green	Green	Green	Green
14-525	University of Toledo	OsteoNovus, Inc.	Improving Bone Graft Technology	Green	Green	Green	Green	Yellow	Green	Green	Green	Yellow	Green	Green
14-526	Cleveland Clinic Foundation	SportSafe, LLC	Intelligent Mouthguards for concussion monitoring and injury prevention in youth and adult contact sports	Red	Yellow	Green	Red	Red	Green	Green	Green	Red	Green	Green
14-527	The Ohio State University	Rekovo, LLC	Synaptic Arts	Green	Green	Green	Yellow	Green	Green	Green	Green	Green	Green	Green
14-528	University of Cincinnati	Xanhostat Diagnostics, Inc.	Bilistat™ Clinical Trial	Red	Green	Green	Red	Red	Green	Green	Green	Green	Yellow	Green

DEFINITION OF COLUMNS:

Proposal # – A unique OTF number for each proposal

Lead Applicant – The Ohio start-up company that is requesting funds

Project Title – The Project Title for the Request for Proposals Application Page

Proof to Raise Additional Funds – The proposed proof needed to raise additional funds for commercialization

Project Plan – Proposed proof needed to move the technology can be generated during the one year project period with the proposed resources

Likelihood of Additional Funds at Project End – Likelihood of being able to raise additional funds for commercialization at the end of the project

Team – Experience and commitment of the team members in the commercializing new technology

Business Model – Realism and achievability of the proposed business model

Company Backing – Stability and backing of company, must have demonstrated backing and support independent of the university

IP Protection – Degree to which the intellectual property is protected relative to both the technology and the proposed business model

Opportunity/Market Size – Potential opportunity for the start-up in regards to the potential market size and competition

Budget Narrative/Use of Funds -- description of how the entity proposes to use the funding if received

Start-up in Ohio – Company plans to stay in Ohio

License with Ohio Institution – Company will execute a license with the Ohio institute of higher education within nine months of the date of the application

DETAILS OF PHASE 2 RECOMMENDATIONS

Proposal 14-519	Intellirod Spine	<i>Wireless Spine Load Sensor</i>
Amount Requested: \$100,000	Recommended: \$0	

Rationale: This proposal from a company called Intellirod Spine in Akron, Ohio, seeks funding for further development of a wireless spine load sensor for use with pedicle screw systems (PSS). When the spine becomes distorted through injury or degeneration, severe pain and loss of motion can occur because of pinching of spinal nerves either within the spinal column or in the spaces where nerves leave the column. Often surgical intervention to fuse adjacent vertebrae provides relief. Keeping the vertebrae nearly motionless with respect to one another so that they can fuse is accomplished with a system of rods and screws. The screws are secured to the two pedicles (protuberances) of each vertebra and two rods secure the upper vertebra to the lower one. Applicants note that symptomatic non-fusion occurs in 8% of the 450,000 spinal fusion surgeries undertaken each year in the US, requiring re-operation to assess the actual state of the spine and to repair failures. A principal cause of non-fusion is failure of the screws and rods, or failure of the bone that supports the screws, all due to excessive forces in the set-up.

Intellirod is developing a strain gauge sensor whose output can be read by a wand passed near the spine at the time of surgery or afterward in a doctor's office or even at home without the need for batteries in the sensor itself. There are two versions of the sensor: a disposable one intended for use during surgery so that the surgeon has a measured indication of the extent to which he or she is stressing the spine when the rods are adjusted, and a permanently implanted one intended to detect excessive stresses should they develop. The former is expected to sell for about \$500 and the latter for \$1500. The total US market is said to be about \$300 million for the disposable version and \$1 billion for the implantable version. According to the company, the worldwide market for spinal fusion implants is \$4.5 billion.

Since 2008, the company has raised \$4.6 million, including \$1.6 million in debt financing from Ohio Third Frontier. The proposal says that the company expects to commence sales of the disposable sensor (which can more quickly gain FDA approval because it is not permanently implanted and is used under the guidance of a surgeon) in Q1 of 2015 and to have \$400,000 in revenue that year. The implantable version will require animal studies to establish its tissue compatibility and longer-term reliability.

The company has been in discussions with an (unnamed) Ohio supplier of pedicle screw systems, who will supply PSS fitted with the disposable sensor. Later on, this company may market their PSS with the sensor, or Intellirod may license others to market their PSSs with sensors.

The project for which funds from TVSF are being sought is a first-in-human trial of the disposable version.

The review team had significant concern regarding the company’s status as a start-up and use of funds. Of primary concern is that this proposal is not a good fit for the TVSF program due to the maturity of the company and current state of funding. In particular, having raised several million dollars over the last six years and participating in an OTF loan program would indicate that they are further developed than a fresh start up needing TVSF assistance. And, because the company is fairly mature, there are seven full-time employees already on their payroll. The review team sees a fundamental mismatch with this application and the intent of the TVSF program. As a result of these issues, the proposal is not recommended for funding.

Several other areas of concern which were not sufficient to preclude funding by themselves are related to Proof not being well defined, Business Model not well-articulated, IP protection having been secured for a decade in this field and this IP seems only to be procured in order to bolster existing company IP, versus commercialization of a new technology; Capturable Market Opportunity is not defined; and Institutional License still under negotiation – the fact that the company has been able to gain significant momentum prior to licensing the technology from Cleveland Clinic reinforces the perception that the IP in question is an adjunct to the core technology and not the primary focus of the company.

Recommendations for Improvement: Intellirod should continue to pursue funding more suitable to the maturity of the company.

Proposal 14-520	Miach Medical Innovation, Inc.	<i>Novel, Cost-effective, Smart Feeding Tubes</i>
Amount Requested: \$100,000	Recommended: \$100,000	

Rationale: This proposal is a resubmission of 13-539 which was not recommended for funding due to concerns regarding the lack of a well-defined Business Model. This submission addresses those prior concerns.

This application envisions commercializing a nasogastric feeding tube with pressure sensors that will enable a physician or other caregiver to detect errors in placement and subsequent problems. The idea is to place multiple carbon nanotubes (which are piezo-resistive, that is, their resistance changes when they are deformed) along the length of the feeding tube to detect kinks, strictures and blockages. A bedside display would show any points where stresses were abnormally high. The team believes the technology has the potential to form a platform of bio medical carbon nanotube device products such as endotracheal tubes and catheters with sensors. The requested grant funding would support the nanotube prototype, biocompatibility analysis and delineation of the regulatory pathway. The current application has shifted focus from endotracheal tubes as the initial market to more fiscally attractive nasogastric feeding tubes. Although fewer feeding tubes than endotracheal tubes (the focus of the previous submission) are placed annually in the US, (4 million vs. 20 million respectively) the consequences of misplacement are much more severe if nutrients are deposited in the lungs. This reportedly results in nearly 6,000 deaths annually in the US.

Two competitive devices are on the market, but have deficiencies with respect to higher cost, a steeper training curve, and the lack of continuous monitoring capability for subsequent tube displacement. Technological placement confirmation protocols are displacing legacy techniques and should provide market growth.

Feeding tubes are more or less commodities and are not expensive – around \$7 each. However, ascertaining that they are properly placed is more expensive, requiring a chest X-Ray as the Gold Standard confirmation, which costs payers around \$450 or the less effective competing technologies at \$100-200 per use. Therefore the applicants believe that their device, priced at around \$40, will have a convincing value proposition when brought to market.

Concerns which were not sufficient to preclude funding relate to Team and Opportunity. The Team needs to develop a thorough succession plan with the inclusion of seasoned professionals with additional business acumen. Opportunity is overstated with the assumption that all placements incur X-Ray costs versus divergent institutional protocols that only utilize X-Rays for at risk patients.

The proposal is recommended for funding.

Proposal 14-521	iRxReminder LLC	<i>iLidRx: Interoperating Medication Container for Health Management of Chronic Illnesses</i>
Amount Requested: \$100,000	Recommended: \$100,000	

Rationale: This proposal is a resubmission of 13-533 and 14-421 which were not recommended for funding due to concern regarding Budget and Business Model respectively. In the later submission, the targeted consumer market was bypassing a more ready source of revenue in the CRO drug trial market. This submission addresses those previous concerns.

Applicant received Phase 1 funding in March of 2012 for “a monitored, interoperating medication cabinet”...”using low-cost smart phone system to deliver real time monitoring by reporting to the health care team via EMR (electronic medical records).” The target market has shifted, and now solidly resides on the CRO trial market, with the support of the management team and their investors.

This Phase 2 proposal is for a self-management system which consists of three components: the pill dispensing pod, the smart phone application, and the control center. The latter will be cloud based and have license and monitoring fees. The system will later integrate the iLidRx Box to integrate multiple pods for complex pharmaceutical management. The value-adds are a reduced dropout rate of participants (by at least 33% and up to 80% or more) and increased adherence, reducing costs and improving treatment outcomes respectively. The desired funding would cover completion of the iLidRx pod prototyping (20 units), software updates, validation of the system with two research drug studies and FDA class 1 clearance. Successful completion of the above goals will be met with an additional \$250K from their investors.

An additional concern which was not sufficient to preclude funding relates to Business Model in that long term modeling is vague, but the company is sustainable with only the pod/CRO market, giving confidence that the lack of certainty in the Business Model will not jeopardize the company in the near-term.

This proposal is recommended for funding.

Proposal 14-522	Akron Ascent Innovations LLC	<i>Bio-Inspired Reusable Adhesives Using Scalable Electrospinning Techniques</i>
Amount Requested: \$100,000	Recommended: \$100,000	

Rationale: The applicant proposes further development of aligned nanofibers in a range of polymeric materials for their use in fabricating re-usable adhesives. The tailored adhesive can be used on wide variety of surfaces such as metal, glass, plastics etc. The product is instantly usable and re-usable with high shear strength and low peel strength. The overall goal is to capture a share of 300 million dollar market for reversible adhesives. At this stage of development, the estimated cost of adhesive materials is about \$50-100/Sq. M. with projected high volume costs decreasing by an order of magnitude. The technology was developed at University of Akron, who will award exclusive license to the applicant if they are able to secure TVSF funding.

The company has developed a business plan that includes a primary target market of Consumer/ DIY via partnerships with Elmer's and DAP. Upstream market segments would be addressed towards direct users such as Goodyear, BASF, and Delphi. Some of these potential customers have committed 'in kind' support for this technology. By year 5, they expect to have 10 million in revenue and employ 50 high wage employees in Akron area.

The proposed use of funds would allow production optimization and product tailoring to meet already provided customer specifications.

Concerns which were not sufficient to preclude funding relate to Business Plan and Opportunity. The proposal itself lacked details of the Business Plan financials, but the applicant was readily able to provide those in the interview. Opportunity is also a minor concern as a result of not reconnecting with the customer in the last few months. Competitive pressures may also be presented by the selfsame customer, who has recently introduced their own reusable style adhesive, even though it has some inferior characteristics.

This proposal is recommended for funding.

Proposal 14-523	Cratus, LLC	<i>Ultra High Energy Density Nanocomposite Capacitor</i>
Amount Requested: \$100,000	Recommended: \$0	

Rationale: Applicant proposes development of material technology that would be disruptive to the super-capacitor and energy storage markets. The proposal repeatedly touts past performance of parent company Powdermet's commercialization achievements as evidence of the likely success of this current effort. This effort has already received over \$1M from other funding sources.

The proposal is scant on the details of the technology that would allow a robust evaluation. In addition, details are lacking about what the grant money would be used for to further the technology.

The review team does not see the necessity for a spin out or start-up to market existing technology from the parent company, Powdermet. This is not the purpose of the TVSF program and alone precludes a recommendation for funding. Further issues are related to: the Proof being quite vague, the Team consisting of the principals of the parent company, and the proposal lacking a cogent Business Model.

An additional concern which was not sufficient to preclude funding relates to the lack of mention of any IP licensing from University of Akron in the proposal, except a vague reference in the

institution's letter of support. As such, it was unclear how that IP would complement Powdermet's extant IP.

Recommendations for Improvement: Should Cratus choose to reapply for TVSF funding, the grant application should provide a clear rationale for the creation of a start-up to license and commercialize institutional IP versus its own.

Proposal 14-524	QuTel, Inc.	<i>Quantum Tunneling Electronics for Ultra-Low Power Electronics</i>
Amount Requested: \$100,000	Recommended: \$100,000	

Rationale: This proposal is a resubmission of 13-024, 13-541, and 14-428 which were not recommended for funding due to concern regarding Proof, Likelihood of Additional Funds, and Company backing. 13-541 was conditionally recommended pending significant funding commitments to attain the additional required proof point. The main crux of concern was a lack of demonstrable external interest in the technology by investors or customers.

The applicant has developed a technology which allows for ultra-low power operation for semiconductor devices, enabling a dramatic drop in power consumption over current CMOS (Complementary Metal Oxide Semiconductor) technologies, as well as a substantial reduction in die size. Lower power has become the driving force of the majority of semiconductor products. Markets that are fundamentally sensitive to semiconductor power include all mobile devices, all devices used in data centers, and many embedded devices such as those in appliances, automobiles, etc. and all semiconductor markets are subject to cost pressures. The addressable market is the ~\$300B worldwide annual semiconductor market that is CMOS and is sensitive to power and die size.

Applicant's devices have been developed that can now be directly inserted seamlessly into current CMOS production lines using their existing infrastructure. This is in contrast to previous work on tunneling, which was not compatible with CMOS. The initial device is the Resonant Interband Tunneling Diode (RITD) and the follow-on device is the Tunneling Field Effect Transistor (TFET).

There is no guarantee that a significant number of jobs would result from this project for the State of Ohio. However, the technology is a platform and the applicant desires to continue future product developments and engineering locally.

The IP Position appears quite robust. The QuTel founder has acquired six germane patents pertaining to this new Tunneling Technology, all of which are owned by Ohio State University (OSU). The license has now been executed under favorable terms.

The applicant has provided Trade Secret information germane to a prospective customer that provides the rationale for the absence of the memory array proof point as superfluous to their needs due to industry confidence in the use of alternate development tools that more closely align with the customer's goals. Applicant has provided additional Trade Secret information to the review team's satisfaction that pending successful outcome of the proof point in this proposal that sales and follow on funding will materialize.

Several minor concerns remain which do not preclude a favorable funding recommendation. The applicants believe the proof point is easily achieved, but little corroborating evidence exists to support the assertion. The team consists of the inventor and a business partner, and while that pairing is adequate in the near term additional resources and skill sets will be required to advance the opportunity. Finally, while there is now sufficient evidence to indicate customer interest, the company has received minimal support to date which is confounding for an opportunity of this magnitude.

Based on the above assertions negating the memory array prototype necessity, the earlier conditional recommendation restriction is removed.

The proposal is now recommended for funding as it stands.

Proposal 14-525	OsteoNovus, Inc.	<i>Improving Bone Graft Technology</i>
Amount Requested: \$100,000	Recommended: \$100,000	

Rationale: This proposal is a resubmission of 13-544 which was not recommended for funding due to an undefined Proof and inadequately enumerated Business Model, and 14-432 which was not recommended for funding due to concern regarding Proof and Business Model. The Proof milestones were not focused on the grant funded studies. The Business Model detailed the financials for another product that was not the focus of the proposal. This proposal addresses those prior concerns and is now consistently focused on the lumbar animal study. Preceding these, there were two Phase 1 proposals, the first of which (12-419) was not recommended for funding and the second of which was.

OsteoNovus's product is a novel compound christened Novogro, which is not only cement, but also a Bone Growth Substitute (BGS). Its composition is not clearly described in the proposal, but it is evidently a silicated compound of di-calcium phosphate anhydrous (DCPA), also known as Monelite. The silicated compound can be formed into different shapes and used as an implant to supplement or replace natural bone with a matrix into which natural bone will grow. According to the applicants, Novogro is superior to other bone cements on the market in that it is biocompatible and radiopaque, does not generate high temperatures during setting, and offers ideal resorption and bone formation rates (half the time v. competition), that is, it gets resorbed

at about the same rate that new bone can infiltrate the material. This platform technology is said to be applicable for a range of orthopedic procedures.

The applicants have raised significant resources since their last application with a distribution partner in Asia. The team has increased personal time commitments as full time participants.

The proposed TVSF funding will be utilized for the linchpin animal study that enables regulatory approvals going forward for all of the platform products.

This proposal is recommended for funding.

The additional concerns which were not sufficient to preclude funding relate to Business Model and Use of Funds: The financial forecast seems fairly aggressive, but should be sustainable even if revenue targets are not met, due to large margins. Use of Funds is a minor concern in that all is for outsourced work overseas; albeit, with the foremost expert in the type of work required.

Proposal 14-526	SportSafe LLC	<i>Intelligent Mouthguards for concussion monitoring and injury prevention in youth and adult contact sports.</i>
Amount Requested: \$100,000	Recommended: \$0	

Rationale: This proposal is a resubmission of 14-420 which was not recommended for funding due to concern regarding the Business Model lacking market segment focus due to a divergence of opinion by the principals.

Applicant proposes development of an intelligent mouthguard (IMG) biomedical device intended to provide indication of concussion in contact sports. It achieves this by measuring linear and rotational forces of head impact in all athletic activities in real time. The small size is accomplished thru the use of newer microelectromechanical (MEMS) gyroscopes and linear accelerometers; or just accelerometers, coupled with a data compression scheme and a transmitting device for sideline monitoring. The transmitted data can then be processed using patented algorithms to assess injury risk. The proposal is sponsored by SportSafe LLC who developed this device based on Cleveland Clinic enabling intellectual property (IP). There are 3 versions of the device planned that will now utilize the same hardware with customized output: V1, will be a simplified \$150 'hit counter'; V2 will be an injection molded mouthguard for retail sales and cost about \$37; V3 is the high end version marketed to professional teams with the full suite of diagnostic output.

Sportsafe has already done considerable marketing and fundraising and is requesting \$100k of OTF funds to augment other capital so to accelerate manufacturing of V1 units and deliver these beta units to National Football League (NFL) and to National Collegiate Athletic Association (NCAA) football programs. The proposal shows 5 tasks, each of which OTF funds will support but

will be augmented by other sources. The tasks focus on the V1 development effort. Successful completion of this effort and distribution of beta products will enable additional funding to initiate sales to V1 market and continue development of V2 and V3 products. All organizations involved are Ohio based and manufacturing will be located in state.

The review team found significant concerns related to the Business Model, Team and Budget: Even though the Proof plan has changed from the prior application, the budget remains dollar for dollar as previously presented. This shows a lack of understanding with respect to what it will take to further develop the technology into a commercial product. Further, the budget includes \$10K for travel which is excluded from TVSF funding per the RFP criteria. During the in-person interview the applicants could not articulate the Business Model from a financial perspective. The pro-forma was only recently developed, and that by a third party. This shows a marked deficiency in the business acumen represented by the Team. Without Team augmentation by a seasoned business professional’s perspective, the review team does not envision sustainability. These concerns preclude recommendation for funding.

An additional concern which remains but was not sufficient to preclude funding relates to the one year plan. The market needs are not fully understood; therefore the proof needed is not refined.

Recommendations for Improvement: Should SportSafe choose to reapply for TVSF funding, the grant application should provide a well understood commercial strategy. The management team must include members with the ability to articulate business model assumptions and strategy.

Proposal 14-527	Rekovo, LLC	<i>Synaptic Arts</i>
Amount Requested: \$100,000	Recommended: \$100,000	

Rationale: This proposal is a resubmission of 14-430 which was not recommended for funding due to concerns related to the Proof, Business Model, and Additional Funds. Particularly in that business assumptions did not match industry norms and the budget was too lean to absorb variations in the assumptions and remain sustainable. This application has addressed all of the prior concerns.

The applicant proposes to provide therapy to patients with balance and movement difficulties. Their product includes software and a feedback monitor that reinforce proper movement on the patient’s part by creating an abstract art pattern. A preliminary study showed a decrease in the time required to improve patients’ balance and positive responses to the system from both patients and therapists. The product will be a cloud based Software as a Service with a

\$14.95/month/ therapist subscription. The first market is skilled therapists in care facilities. The second target will be home healthcare. A final future target will be consumer oriented. Sales are expected to start after six months.

The concern which was not sufficient to preclude funding relates to Team, in that the budget remains sufficiently lean that the team recommends assistance from seasoned business professionals with the ability to validate the operational assumptions towards ensuring sufficient bandwidth in the business plan to accommodate uncertainty.

This proposal is recommended for Funding.

Proposal 14-528	Xanhostat Diagnostics, Inc.	<i>Bilistat™ I Clinical Trial</i>
Amount Requested: \$100,000	Recommended: \$0	

Rationale: This proposal is a resubmission of 14-427 which was not recommended for funding due to concern regarding Use of Funds due to the fact that budgeted cost share was not committed and Proof Plan was based upon dated market insights. Minor concerns related to Team and Ohio Startup were also noted.

The applicant proposes further development of a spectrophotometric device to measure the level of bilirubin in cerebrospinal fluid (CSF). The presence of bilirubin in the CSF of a patient who presents with a severe headache is diagnostic for subarachnoid hemorrhage (SAH). Use of the device is a potential replacement for sending the CSF sample from an emergency room or urgent care center to a laboratory for bilirubin analysis.

This company has been around since approximately 2005, working in iterations to bring this technology to market. Although the initial NIH funded prototype algorithm worked, early software compliance issues caused a restart of development a few years ago

The product will be a simple clinician accessible analysis device with a lower market entry price than competing technologies and provide point of care test results in approximately five minutes. An independent market study has demonstrated customer interest and informed the price structure. Project funding will build three current units for clinical trial testing and feedback at three hospitals. The expectation is for positive testimonials to drive further funding.

The review team found significant concerns related to Team and Business Model. Based upon the income statement submitted, the business is not sustainable with the current version of the device, and does not become profitable until after the introduction of the next generation device which is no longer within the scope of this proposal. Earlier concerns with

respect to the Team being the right mix to drive this technology to commercialization were only intensified by interaction during this re-application. The applicant was unprepared to discuss the financial details of the proposal and showed frustration when asked basic queries into the Business Model. In particular the review team became concerned that the Proof plan was significantly changed from the prior proposal, with no changes in the financial forecast. Because the applicants stated that the next-generation device would be essential to scalability due to ease of manufacture, the lack of impact to the financial forecast (and, in fact, insistence that there would be no meaningful impact) with a one-year delay in development of that device was confounding. These major concerns preclude recommendation for funding.

Further concerns which were not sufficient to preclude funding relate to Additional Funds and Ohio Start up. The applicant has failed to secure commitment for the additional funds needed to bring the technology fully to market. One principal is a member of Queen City Angels. Even so, that group has requested further proof that customers will purchase the device prior to additional investment. This implies less than full surety of future funding. Should the applicant fall short of funding needs, they have stated a prospective move to Kentucky for additional funding opportunities and tax advantages. This jeopardizes their continuance as an Ohio entity. Finally, the age of the company, at nearly a decade, brings into question their status as a Start Up.

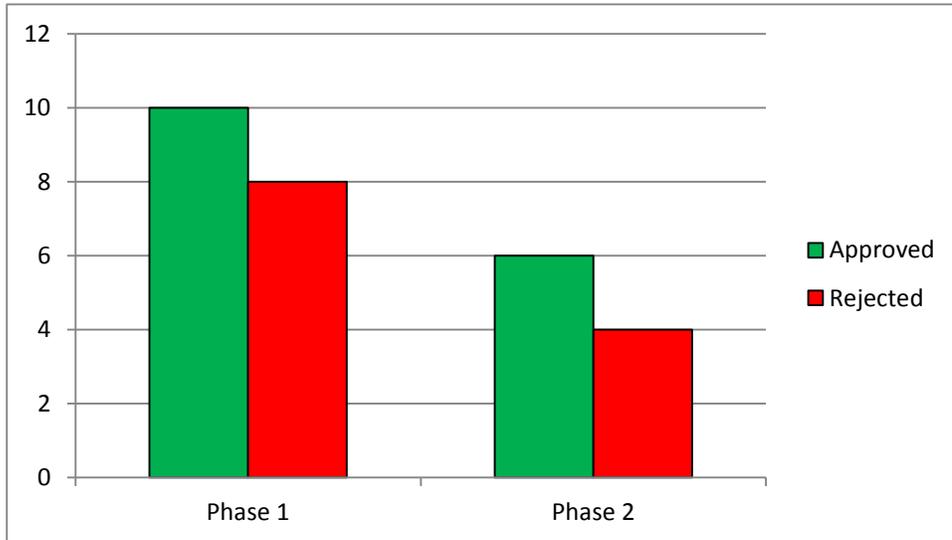
Recommendations for Improvement: Should Xanthostat Diagnostics choose to reapply for TVSF funding, the grant application should provide a compelling commercial strategy executed by an efficacious team that pushes the technology over the finish line. Finally, a persuasive narrative that supports the company's classification as an Ohio Start Up would be needed.

FINAL SUMMARY

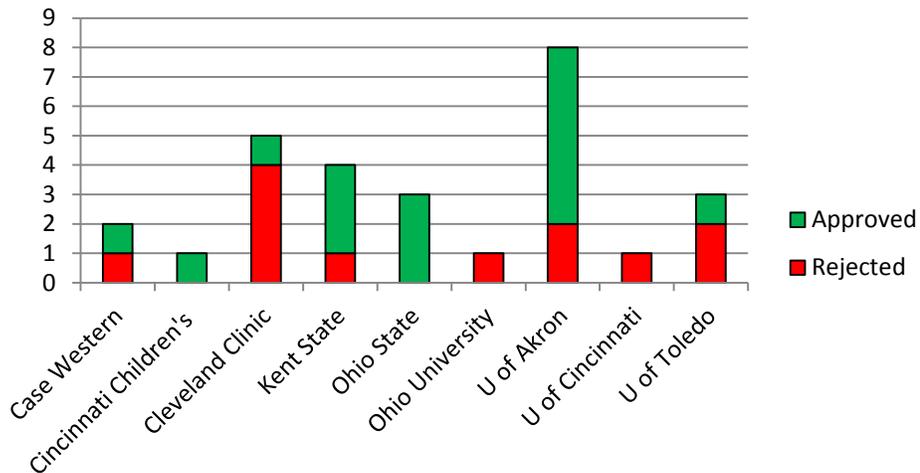
The Review Team is recommending 16 of the 28 grants submitted for review (57%). The previous low was 30% in Round 4, and the high was 52% for Round 2. For this current round, 10 of the 18 Phase 1 proposals are recommended for funding (56%). For Phase 2, 6 of the 10 submitted grants are recommended for funding (60%). With the Ohio Third Frontier accepting grants on an approximate quarterly basis, the Review Team expects that many of the grants will be revised to address the concerns of the review team.

For both Phase 1 and Phase 2, grants which were recommended for funding did not have a "fatal flaw" in the proposal. The "fatal flaw" is described in the reviewers' comments in the previous sections and readily identified as red in the charts at the beginning of the each of the phase reviews.

PHASE 1 AND 2 RECOMMENDATIONS CHART



COMBINED APPROVED/REJECTED CHART BY INSTITUTION



If any applicant desires feedback or further clarification on the above recommendations a review session can be arranged through the Ohio Development Services Agency.

APPENDIX A-TEAM MEMBERS

TECHNICAL REVIEWERS' CREDENTIALS

John Banisaukas (Advanced Materials)

Summary:

An independent consultant specializing in Government Contracts Program Management and Administration, as well as a technical consultant to the carbon fibers advanced composites industry. Has a broad background and over forty years' experience in advanced composite materials.

Core Competencies/Field of Expertise:

Carbon Fiber

Advanced Composites

UCC's Parma, OH Research Center

Carbon Fiber Research and Development Engineer

UCC / BPA Carbon Fiber & Advanced Composites facility, Greenville, SC 21 years

Chairman of the Suppliers of Advanced Composite Materials Association (SACMA) Technical Affairs

Steering Committee

Marshall Heard (Aero Propulsion and Power Management)

Summary:

Expert joined the Florida Aerospace Alliance in 1999 after a 34-year career with the Boeing Company. He served as both Vice Chairman of the Alliance and Executive Director prior to becoming Chairman. While with Boeing, he divided his efforts between engineering, marketing/business development, and project management. As a Vice President he directed the Tandem Rotors Programs (CH-46 and CH-47), the Comanche Program (RAH-66), and served as the Deputy Program manager of the V-22 Joint Program Office. He was also Vice President of marketing/business development for Boeing's passenger, cargo, and tanker military aircraft programs and was Boeing Aerospace's senior executive in their Washington, D.C. office.

Expert has served on numerous Cabinet-level panels and commissions (including the Defense Science Board and the Commercial Space Transportation Advisory Committee). He has been a frequent witness before both the U.S. Congress and foreign legislative bodies on the subjects of strategic deterrence, battlefield mobility, and the role of technology in national defense policy. In addition to his role with the Florida Aviation Aerospace Alliance he also serves on the boards of Enterprise Florida, Inc., the National Aerospace Technical Advisory Committee and several other organizations. He has a keen interest in promoting science, technology, engineering and math (STEM) and serves on the Florida Coalition for the Improvement of Math and Science (CIMS), the Florida Center for Advanced Aero-Propulsion and is an Executive Committee member of the Aerospace Resources Center (ARC), the state's first BANNER center. Expert has an active aerospace related consulting practice specializing in business development and the integration of large scale systems.

Education:

A graduate of the U.S. Naval Academy, he also holds advanced degrees in engineering and business management from the University of Illinois and the Massachusetts Institute of Technology

James Mellentine (Fuel Cell and Energy Storage)

Summary:

A Project Management Professional (PMP) and LEED Green Associate, combining years of fast-paced business consulting experience with renewable energy & energy storage technology, economics, and policy research. Directed the analysis, design, quality assurance, deployment, and training activities for complex system implementations and business transformations. Recommended logistics process transformations and performance management solutions based on industry best practices customized for client needs. Conducted broad energy systems and policy research.

Core Competencies:

Project Management
Business Consulting
Renewable Energy
Energy Storage
Flow Batteries
Energy Systems Analysis
Project Financial Analysis
Energy Project Feasibility
Life Cycle Assessment
Sustainable Building

Education & Certifications:

University of Iceland/University of Akureyri, Master of Science, Renewable Energy Systems & Policy
University of Michigan, Bachelor of Engineering, Mechanical Engineering
University of Michigan, Bachelor of Engineering, Aerospace Engineering
Project Management Professional (PMP), Project Management Institute
LEED Green Associate, Green Building Certification Council

Phil Drew (Medical Technology)

Summary:

Expert provides data and analysis to users and manufacturers of medical imaging equipment. For hospitals and radiologists, the Expert provides strategic planning services, program and space planning studies, studies of financial and organizational feasibility, and related assistance. For manufacturers and others interested in the commercial aspects of medical imaging he provides technological and market forecasts based on analysis of technical, clinical, operational and competition-related factors, as well as assistance in strategic planning, product planning and acquisition studies.

Experience:

Mallinckrodt Institute of Radiology
Department of Radiology for the State University of New York at Stony Brook
Cardiovascular Division of the Washington University School of Medicine
Arthur D. Little, Inc.

Core Competencies/Field of Expertise:

Electrical engineering
Mechanical engineering
Health care
Medical imaging

Hospital operations

Education:

Harvard University, Degree: Ph.D. Electrical engineering

Harvard University, Degree: M.S. Applied Mathematics

Carnegie-Mellon University, Degree: B.S. Mechanical Engineering

John McClure (Business Reviewer)

Summary:

Over 20 years of management experience. Expert builds shareholder and customer value through the development and implementation of creative business strategies and new product/service offerings for existing and new markets. Demonstrates the ability to successfully start up technology business ventures, including hardware, software, Internet, e-Commerce, and telecommunications solutions.

Experience

Sicuro-China LLC. - President & Chief Executive Officer

Comm South Companies, Inc. - President & Chief Executive Officer

ADVAL Communications, Inc. – 2001 - Chief Operating Officer & General Manager

Wintegrity, Inc. – President & Chief Executive Officer

Electronic Data Systems Corporation (EDS) – Business Unit Vice President, Strategic Global Opportunities

Core Competencies/Field of Expertise:

Bankruptcy

Mergers and acquisitions including due diligence

Operations management

Financial support including public and private fund raising

Support of the development and presentation of client business plans

Education:

University of Iowa & Roosevelt University, Accounting

Joel Studebaker (Software Applications)

Summary:

Over 30 years of experience in project management and in all phases of the software development life cycle for pharmaceuticals, biotechnology, blood banking, and other industries. Experience in drug discovery, high-throughput genotyping, and analysis of medical and pharmacy claims.

Experience

Integrated eCare Solutions – Director of Data Analysis

CareAdvantage – Senior Data Manager

Orchid BioSciences – AD of Informatics

IBM – Advisory Engineer, Senior Industry Specialist

Core Competencies/Field of Expertise:

Project Management

Oracle 10g

Informatica 8.1

Erwin Data Modeling
SQL
Clinical Risk Grouper
SAS
Toad

Education:

Harvard University, Degree: Ph.D. Chemical Physics
Stanford University, Degree: B.S. Chemistry

Thomas Jones (Sensing and Automation Technologies)

Summary:

Over 25 years technical management and engineering analysis experience with the system engineering and integration of Electro Optical and Spectral remote sensing collection systems. Excellent communicator who provides briefings to all levels of corporate and government organizations, as well as technical and program management. Functional oversight and administrative management of group of lead senior remote sensing technologists.

Experience:

System Engineering Consultant
Lockheed Martin:

Management lead and technical oversight for multiple year remote sensing modeling corporate research & development effort. Resulting models used in proposals, studies and contracts and instrumental in acquiring new business.

Technical management coordinator of system integration support to government sensor technology research and technology customers. Provided technical oversight consultation of government contactors including technical roadmap development. Technology manager of senior remote sensor system analysts and technologist group.

Core Competencies:

System engineering for electro optical remote sensing collection systems including spectral analysis and requirements development/ system operations support/ sensor system modeling and simulations/ mission analysis / operations concepts/ technology roadmaps/ functional management/ project management/ research & development technical oversight and management / proposal and new business development

Education & Certifications:

BEE Villanova university 1964
MSEE Drexel University 1969
Multi-year System Engineering Course General Electric Co. 1970-72
Numerous Sensor engineering courses Lockheed Martin Co.
Numerous Proposal/Marketing courses Lockheed martin Co.

Margaret Ryan (Sensing and Automation Technologies)

Summary:

Chemistry Expert with broad range of Research, Consulting and Academic experience

Core Competencies/Field of Expertise:

Chemical sensors

Jet Propulsion Laboratory

Principal Member of the Engineering Staff, Power and SENSOR Systems Section,

Chemical sensors

Alternative SENSORS include an all silicon carbide sensor for identification of hydrocarbons and hydrocarbon mixtures for automotive applications, colorimetric oxidation sensors, and electronically conducting molecularly imprinted polymer sensors for identification of organic compounds in water.

Education:

PhD in Physical Chemistry from the University of Massachusetts

Walter Gist (Situational Awareness and Surveillance Systems)

Summary:

Successfully created and operates a consulting firm specializing in military aircraft avionics, advanced situational awareness, and weaponization. Several years of experience assisting foreign companies successfully market airborne equipment to the US military market. Organized and participated in proposal development, review and vetting. Has 41 years' experience in marketing to the large US military OEMs like Boeing, Lockheed-Martin, Northrop Grumman, and BAE Systems. Understands the process by which foreign companies obtain access to International Trade in Arms Regulations (ITAR) controlled information and the rules and guidelines for doing so. He has also assisted in the merger and acquisition process.

Experience:

BAE SYSTEMS - Director, Business Development

GEC-Marconi/Plessey, Plc - Marketing and Sales Manager

Simmonds Precision - Aerospace Regional Manager

Core Competencies/Field of Expertise:

Mechanical Engineer by trade

New Business Development

Customer Relations

Marketing and Sales

Business Development Process

Education:

Business Administration, Pepperdine University Graziadio School of Business, Los Angeles CA

Timothy Newbound (Solar Photovoltaics)

Summary:

Organometallic synthesis of highly air- and moisture-sensitive compounds. Analytical evaluations using multi-nuclear NMR, FTIR, UV-vis, ESR, GC, x-ray structures and other methods to describe novel compounds described in peer-reviewed publications. Oil and Gas industry root-cause materials failure analysis for gas-oil separation plants (GOSPs), Water Injection Pump Stations (WIPS), pipeline systems (sour gas collection and Sales gas), Gas Plants (Amine sweetening and sulfur removal), natural gas and NGL fuel conditioning, dew-point control and light hydrocarbon separations. Research project management, project proposals, economic and technical feasibility studies and corporate strategic

research assessments from industry-wide due diligence. Semiconductor materials development (Group IVA) and process scale-up for manufacturing of hydrocarbon functionalized nanocrystalline silicon free of surface oxides. Developed novel architectures using these materials in solar PV and Li-ion secondary batteries. Patent processing and intellectual property evaluation. Multiple international publications including ASME/IGTI O&G Division Best Paper Award, 2004.

Core Competencies:

Natural gas conditioning, dew-point control, dehydration, heavy-ends composition, (CGTs)

Natural gas corrosion inhibitors (US patent # 6,920,802, July 26, 2005)

Cross-functional team industrial applied research project management

Analytical materials identification and root-cause failure determination

Technical reporting and presentations preparation and delivery

Organic, inorganic and organometallic synthesis and characterization

Semiconductor (Group IVA) nanomaterials manufacturing process development

Education & Certifications:

Ph.D., Inorganic Chemistry, University of Utah

Thesis: "Substitution Effects and Reaction Chemistry of Metal-Pentadienyl Complexes"

B.S., Chemistry, Eastern Michigan University

YourEncore Senior Manager-Robert Worden

Robert has held a variety of sales, marketing and business development roles over a 20-year career, both as an individual contributor and as a manager. He has extensive work experience across the globe, with a concentration in Latin America. His core competencies include sales, marketing, business development, general management, and Six Sigma (certified Black Belt). He earned his MBA from the University of Virginia.

YourEncore Senior Manager-Camille Rechel, Director, Consumer Practice.

In addition to being a degreed chemist, Camille has over 25 years of Business Management experience. She holds several pioneering patents for polymeric coatings for optical fibers. She brings experience from the chemical industry and industrial electronics industry. Her core competencies include customer service and business development.

YourEncore Project Manager-David Young

David Young is a Project Manager with YourEncore and has led projects in numerous industries. He also assists with business development, rule harvesting and analysis, and Engagement Management. His core competencies include Project Management, Program Management, business rule definition and analysis,

and process definition. If a proposal fell outside the technical experts' core capabilities, the Project Manager engaged an Expert from YourEncore's network with deep expertise in the proposal's specific technical area.

YourEncore Expert – Gregory L Workman II

Greg has a Master of Business Administration (MBA), BS Chemistry (ACS), is a Six Sigma Master Black Belt, and Certified Quality Manager, he has 25 years of industrial experience in Food/Pharma, Chemical Manufacturing, Electronics, Logistics, and Construction Services. Included in this experience are extensive Project Management and Business Process Design. He currently leverages this experience as a YourEncore expert to Create Business Processes and Implement Process Improvements to existing methodologies for firms of all sizes (Startups to Fortune 500) in diverse industries (Food, Medical Devices, Packaging, Cosmetics, etc.)

He utilizes his Project Management skills to lead the TVSF review process; and Business Evaluation skills to review the individual proposals for merit.

Number of YourEncore Experts per Technology Area

- *Advanced Materials: 63*
- *Aero Propulsion and Power Management: 19*
- *Fuel Cells and Energy Storage: 80*
- *Medical Technology: 86*
- *Software Applications: 109*
- *Sensing and Automation Technologies: 28*
- *Situational Awareness and Surveillance Systems: 31*
- *Solar Photovoltaic and Photovoltaic: 31*

APPENDIX B-OVERVIEW TECHNOLOGY VALIDATION AND START-UP FUND

DEVELOPMENT'S PURPOSE FOR FUND

Ohio's Third Frontier (OTF) created the Technology Validation and Startup Fund (TVSF) to accelerate economic growth in Ohio through helping Ohio-based entrepreneurial companies commercialize technologies developed by Ohio institutions of higher education. The TVSF will accomplish this through:

1. **Validating Technologies:** Enhancing the commercial viability of protected technologies developed by Ohio institutions of higher education by supporting validation activities such as developing prototypes, demonstrations, and/or assessments. These validation activities will help generate the proof needed to either license the technology to an Ohio entrepreneurial firm or deem the technology unfeasible. The purpose of Phase 1 is to verify a milestone for licensing, not funding for basic research.

2. **Funding Startups:** Providing Ohio-based entrepreneurial firms the funding needed to accelerate the commercialization of licensed technologies from Ohio institutions of higher education. The goal is to enable these companies to 1) generate the proof needed to acquire additional outside funding to support commercialization or 2) support the commercialization of these licensed technologies. The purpose of Phase 2 is to establish start-up companies, independent of the university.

OFT has divided the Fund into 2 distinct Phases:

	Phase 1: Technology Validation	Phase 2: Startup Fund
Objective	<i>Evaluate the commercial viability of protected technology developed by Ohio institutions of higher education</i>	<i>Determine whether a company has the resources, acumen, and market opportunity to successfully commercialize licensed IP</i>
Activities	<ol style="list-style-type: none"> 1. Assess protected technologies from higher education institutions 2. Suggest technology development alterations to improve feasibility 3. Provide funding recommendations 	<ol style="list-style-type: none"> 1. Assess companies' plan for commercializing licensed technologies 2. Discuss improvement programs to unfunded Applicants 3. Interview strong candidates 4. Recommend funding candidates

Assumptions	<ul style="list-style-type: none"> ▪ Submissions Per Year: <ul style="list-style-type: none"> - 2012: 50-80 - 2013: 100-160 ▪ 6 Page Grant Form ▪ Grant Size: \$50K ▪ Available Funds: \$3M 	<ul style="list-style-type: none"> ▪ Submissions Per Year: <ul style="list-style-type: none"> - 2012: 20-40 - 2013: 40-80 ▪ 6 Page Grant Form ▪ Grant Size: \$100K ▪ Available Funds: \$3M
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Due to the technical nature of the Phase I / Phase II Proposals, OTF required the selected reviewing contractor to have subject matter expertise in the following technical areas:

- *Advanced Materials*
- *Aero Propulsion and Power Management*
- *Fuel Cells and Energy Storage*
- *Medical Technology*
- *Software Applications*
- *Sensing and Automation Technologies*
- *Situational Awareness and Surveillance Systems*
- *Solar Photovoltaic and Photovoltaic*

APPENDIX C-EVALUATION CONTRACTOR-YOURENCORE, INC.

CORPORATE BACKGROUND

YourEncore is a company of veteran scientific, engineering and technical Experts that provides clients with solutions based on a lifetime of proven expertise. YourEncore deploys its expertise against capability, capacity, and technical challenges in a confidential environment to help clients develop products essential to healthier, safer and richer lives. Given its diversity of expertise and flexible resourcing deployment model, YourEncore offers unique flexibility to swap in and out the right expertise or team size to meet the needs of client demands.

YourEncore Expert Network Profile:

- 7,000+ Experts
- Avg. 25+ years' Experience
- 67% have advanced degrees
- Representing 1000+ different companies

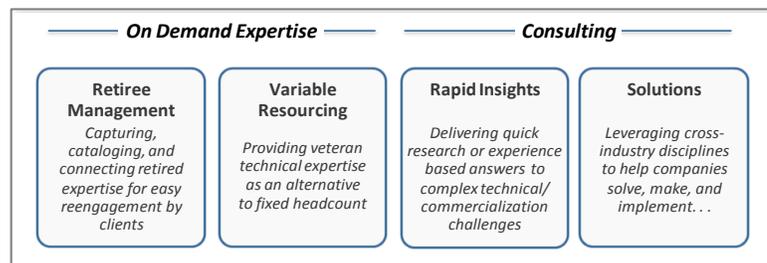
YourEncore understands the unique needs and challenges startups face since, 8 years ago, it was one. YourEncore was founded in 2003 by John Barnard of Barnard Associates. Barnard Associates is composed of a cross-functional team of highly experienced executive leaders, who advise start-ups on launching and growing businesses. Tim Tichenor, formerly the Director of the Business Development Center for Indiana University and Director of Business Advisory Services for Barnard Associates, is YourEncore's CFO.

Today, YourEncore has over 75 employees and is a recognized leader in Expert advisory services. YourEncore has over 7,000 Experts in its network, and serves over 70 companies, including 9 of the top 12 pharmaceutical companies and 5 of the top 9 global consumer companies. YourEncore was awarded a top 100 "Most Brilliant Company" by Entrepreneur Magazine in 2011 and P&G's "External Enabler of the Year" Award in 2009.

SERVICES & EXPERIENCE

YourEncore deploys its Expertise in two ways: On-Demand Expertise, contracting of specialized Expertise to address short-term resource gaps, and consulting. Within Consulting, technology assessment and due diligence are core offerings. YourEncore performs assessments for over 50% of its 70+ clients, the majority of which are global leaders in their industries.

Figure 1: YourEncore's Services



SUMMARY OF QUALIFICATIONS

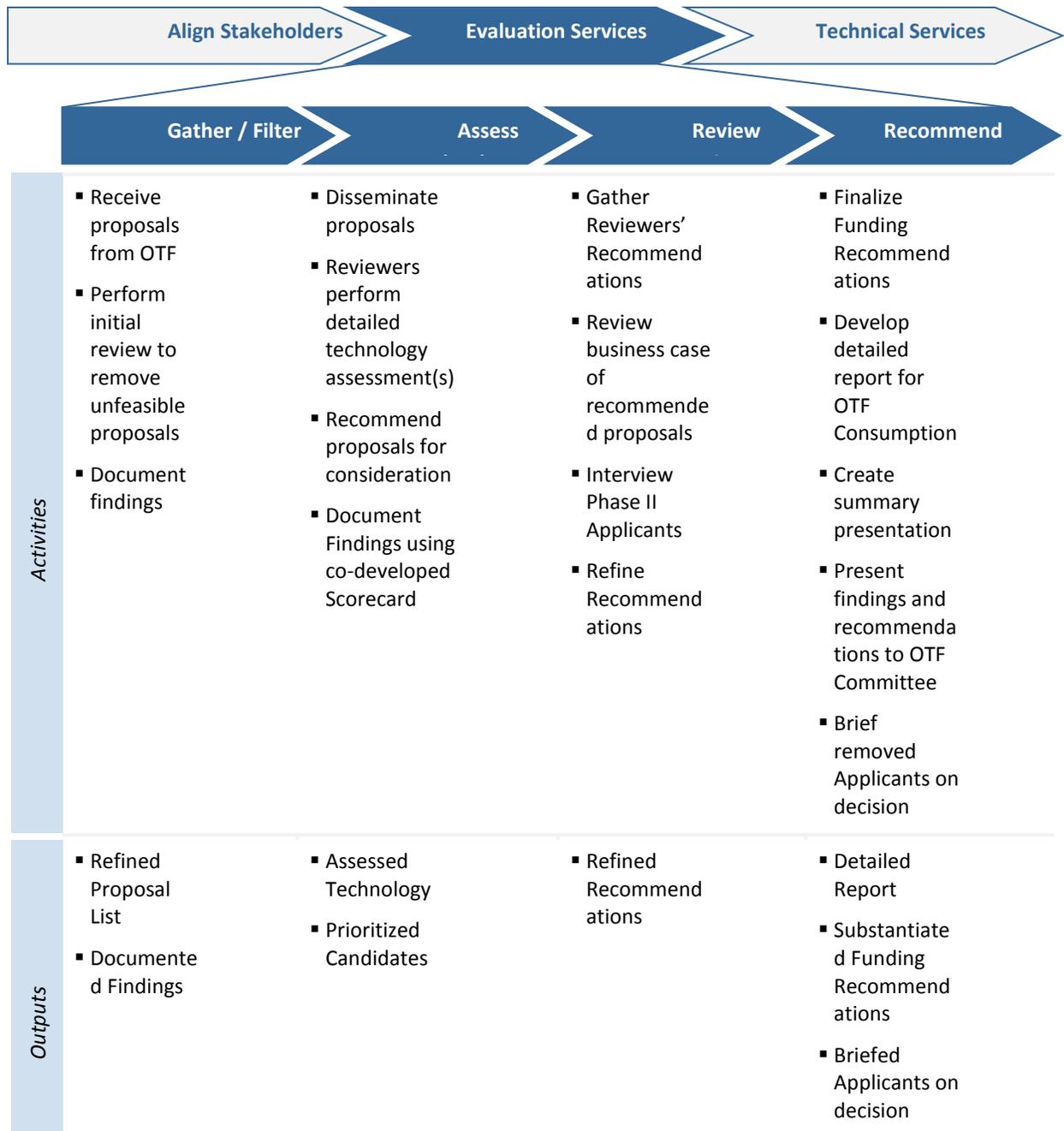
1. Unparalleled Expertise	2. Recognized Leader	3. Flexible Resource Model
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APPENDIX D-EVALUATION PROCESS

APPROACH AND MANAGEMENT PLAN

YourEncore engaged an Expert team comprised of a Project Manager, Business Reviewer, and eight Technical (i.e., Subject Matter) Reviewers along with 2 of its senior managers to most efficiently and accurately assess all Phase I / Phase II proposals. Prior to implementing a robust Phase I and Phase II RFP evaluation process, YourEncore conducted a grounding session to align stakeholders around common objectives and finalize the expertise requirements.

After the stakeholders were aligned, YourEncore deployed a comprehensive Proposal Evaluation process that initially gathered and filtered all submissions, engaged subject matter experts to assess technologies/firms, and provided substantiated funding recommendations. Finally, to ensure a robust review, YourEncore senior managers reviewed for consistency and quality.



Align Stakeholders

Shortly after selection, YourEncore held a half-day grounding session with YourEncore's stakeholders (i.e., Account Director, Project Manager, and Senior Managers) and OTF's desired stakeholders. This session assured alignment around common success criteria (i.e., funding goals, success metrics, and timelines), scoped the program's expertise requirements to ensure the right subject matter experts were engaged, and reviewed the evaluation scorecard. This scorecard included the following information:

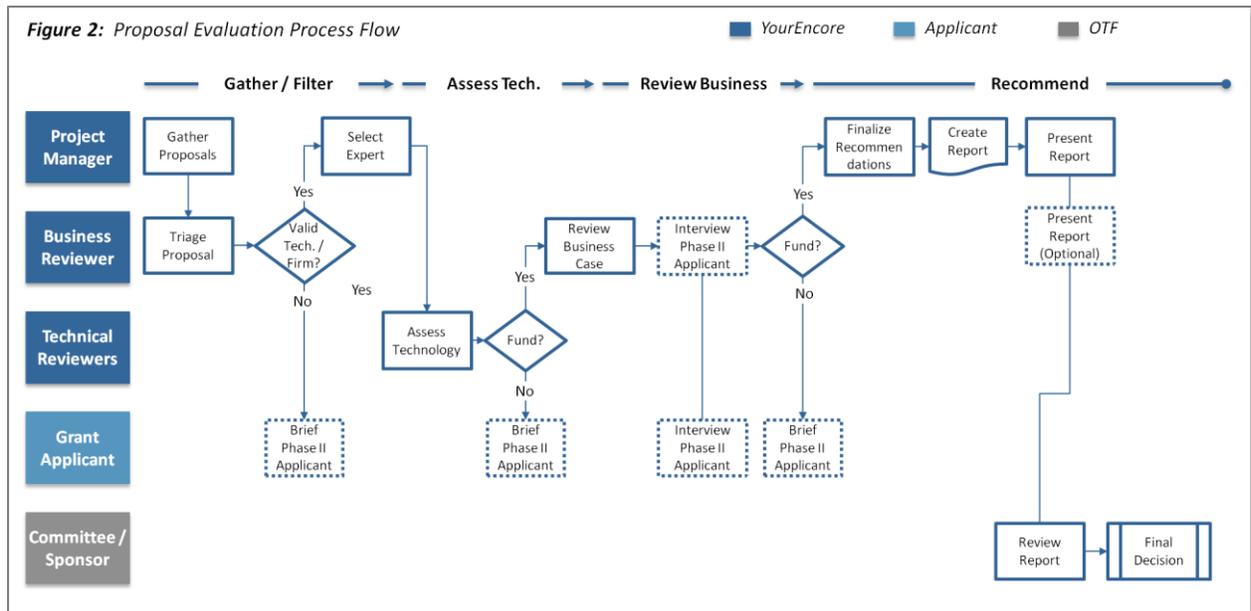
Key Evaluation Scorecard Components

- *Alignment and quality of response to the TSVF's RFP requirements*
- *Demonstrated proof to move technology / business to a next major milestone*
- *Evidence that milestone can be obtained during the one-year period and with the proposed resources*
- *Validation / proof process will be overseen by independent 3rd party*
- *Achievability of the proposed technical application and/or business model*
- *Demonstrated support/ stable backing that is independent from the university. (Phase II only)*
- *Strength of Intellectual Property (IP) protection*
- *Likelihood project will lead to the creation and/or success of a Ohio-based entrepreneurial company*

In addition, YourEncore conducted a grounding session with all technical reviewers to assure they were aligned on the criteria and they judged each grant submission in a uniform manner.

Evaluation Services

To assure a robust decision for each Phase I and Phase II Proposal YourEncore instituted a four part approach that encompassed gathering / filtering submissions, assessing the technical feasibility, reviewing the business case, and recommending funding prospects.



Gather and Filter Submissions: After gathering the Proposals from OTF the Project Manager collaborated with the Senior YourEncore Managers to remove all submissions deemed unfeasible, document findings, and brief Phase II applicants as required. For those submissions deemed feasible, the Project Manager then identified an Expert with the necessary technical background to perform an in-depth assessment.

Assess Technology: Upon receiving the proposal, the YourEncore Technical Reviewers’ leveraged the co-developed evaluation scorecard to perform assessments for the Phase I / Phase II submissions they were provided. Upon completion of the assessment the Technical Reviewers documented their recommendations.

Review Business Case: The Project Manager compiled the technical assessments and disseminated recommended Proposals to the Business Plan Reviewer. The Business Reviewer then reviewed the business case and analyzed the market potential of each recommended proposal. For all recommended Phase II applicants, the Business Reviewer, the Project Manager and YourEncore Senior Managers conducted a short on-site interview to further determine the company’s feasibility.

Recommend Funding Decision: After determining the final recommendations, the Project Manager and Senior YourEncore Managers developed this detailed report and summary presentation to share the assessments’ findings and the final funding recommendations, including dollar amount, with the OTF Committee. The OTF Committee will then use the final recommendations to distribute the funding as they deem appropriate.

TEAM STRUCTURE AND QUALIFICATIONS

To successfully execute YourEncore's proposal a clear team structure (See Figure 3) with defined roles and responsibilities was required.

DEVELOPMENT COMMITTEE

OTF has an established Committee to provide overall program sponsorship, guidance, and support to ensure the program's success.

DEVELOPMENT SPONSOR

YourEncore worked with Dr. Andrew Hansen from Development to help set the direction for the team, review progress on a monthly basis, and work with YourEncore's Project Manager to resolve any issues. Furthermore, Dr. Hansen previewed the final outputs prior to Development Committee presentation and support implementation of improvement initiatives.

PROJECT MANAGER

The YourEncore Project Manager managed the day-to-day operations of the program including ensuring all assessments are completed on-time. This individual established and managed the program's processes, assured process / scorecard compliance, and engaged / managed Technical Reviewers to ensure on-time completion of assessments. Furthermore, this individual leveraged YourEncore's internal Project Management system to track each proposal's submission, expert assignment, timelines, budget, and documented outputs.

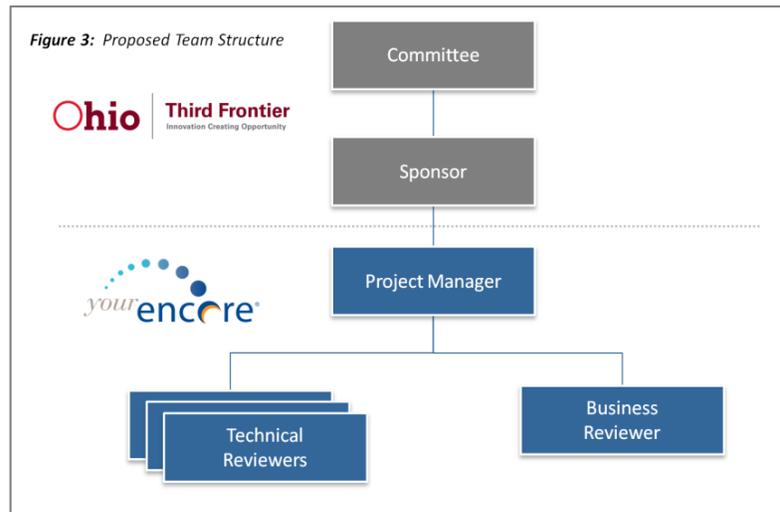
BUSINESS REVIEWER

To validate the Experts' recommendations YourEncore engaged a strategic business development, entrepreneurial expert to perform review of all Proposals. Furthermore, this individual participated in all Phase II onsite interviews.

TECHNICAL REVIEWERS

YourEncore identified and selected a team of nine subject matter experts to perform detailed technical assessments on Phase I and Phase II proposals, complete co-developed scorecard and document recommendations. Reviewers had expertise in each of the following areas.

- *Advanced Materials*
- *Aero Propulsion and Power Management*



- *Fuel Cells and Energy Storage*
- *Medical Technology*
- *Software Applications*
- *Sensing and Automation Technologies*
- *Situational Awareness and Surveillance Systems*
- *Solar Photovoltaic and Photovoltaic*

SYSTEM INFRASTRUCTURE AND UTILIZATION

YourEncore leveraged its internal Project Management System, DelTek Vision, as the central system of record for the program. This system houses all information for thousands of YourEncore projects and has the capacity to handle all of OTF's Phase I / Phase II proposal information.

YourEncore believes this is the best solution due to the program's robust document repository, project management tools (i.e., timelines, budgets, experts engaged), reporting, and activity audit trail capabilities. By leveraging this system all Reviewers will utilize one system to house and track all the activities, scheduling, and documents associated with this program. Furthermore, this system will enable YourEncore to create reports on a regular basis to report on progress, budget utilization, and identify / reconcile issues.