2018 New York State Legislature Joint Budget Committee Hearing on Economic Development

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on behalf of New York State High Performance Computing Consortium (HPC^{NY})

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Chair members Young, Weinstein, Boyle and Schimminger; distinguished members of the Senate Finance and Assembly Ways and Means Committees; and distinguished members of the Senate Commerce and Economic Development Committee and members of the Assembly Economic Development Committee.

I am honored to represent the New York State High Performance Computing Consortium (HPC^{NY}), and thank you for the opportunity to testify to the immense contribution our program has on the state's economic development efforts and explain why we believe funding for this initiative should be restored to the 2009-16 levels of $1 million annually in this year's enacted budget.

HPC^{NY} is a consortium of universities led by University at Buffalo, RPI, and Stony Brook University, and joined by Mt. Sinai School of Medicine, Marist College and NYSERNET. Our program, for a relatively small cost, leverages existing substantial high performance computers located at these institutions to help NYS businesses use advanced computing and data analytics to improve existing technology, accelerate new product development, and enable data driven discovery and analysis. These efforts have been proven to lead to business growth, increased market share, and job creation and retention across New York State.

Let me explain how the remarkable impact HPC^{NY} has is possible from a relatively modest investment of public dollars.

Since 2015, the NYSTAR-funded HPC^{NY} program CREATED 80 new jobs, RETAINED 22 jobs, and helped companies achieve $66M in non-jobs impacts - with only a TOTAL NYS investment of $3M or $1M per year.

Non-jobs impacts refers to increased revenue, grants obtained, investment procured and cost savings achieved. Please note that these figures are self-reported directly by companies that benefit from our HPC^{NY} program.

The best way to identify the source of our success is to highlight some of the companies we have worked with and how they have benefitted from the program. While there are many good examples of companies served by my partner institutions, I will focus on two WNY examples that I am most familiar with.

SENTIENT SCIENCE

Sentient Science, which was founded in Idaho, was wooed by numerous universities when looking to relocate in 2011. The company selected UB and moved to Buffalo primarily because of UB's supercomputing capabilities, especially the industrial high-performance computing (HPC) cluster, which is a key asset in the NYS High Performance Computing Consortium. It is likely that without the ESD and NYSTAR support – through HPC^{NY} and the REDC – Sentient Science would not have moved to New York State.

Sentient Science specializes in the predictive failure of mechanical devices such as wind turbine gearboxes using computationally demanding computer simulations. Prior to this, the standard method for determining the lifetime of most mechanical devices was through time consuming and expensive physical testing. Sentient's computer models have proven accurate by NASA and manufacturers such as Boeing, GE and Honeywell - alleviating the need for physical testing in many cases.

Using UB's 3000+ processor industry based supercomputer (funded through a 2014 CFA award), Sentient Science is able to conduct predictive analysis of the lifetime of wind turbines, as well as provide recommendations to improve their operational efficiency. According to Sentient CEO Ward Thomas, by using our technology, companies can extend the lifespan of their wind turbines from about eight years to 30 years. "That extra 22 years is my value proposition," he said. Sentient's value proposition is well recognized by the wind turbine industry and reflected in the remarkable gains Sentient has made since coming to Buffalo - *from 800 wind turbines in the field that are modeled on UB's supercomputer to 22,000 turbines in 2017 and over 60,000 predicted by the end of 2018.* Indeed, one out of every ten wind turbines in the world is monitored by the company's proprietary software, which is run on UB's supercomputer**.**

UB, through its supercomputing center, the Center for Computational Research (CCR) has been crucial to the company's growth not only in terms of access to advanced computing resources but also through the expertise of HPC^{NY} supported staff. For example, HPC^{NY} computational scientists achieved a 16-fold increase in the efficiency of Sentient's computer simulations – meaning turbine data can be processed 16 times faster. A performance improvement that is critical as the company dramatically grows its portfolio of monitored wind turbines. According to company President and CEO Ward Thomas,

"We would not be able to commercialize our technology, especially at the rate and effectiveness we have, without UB's Center for Computational Research."

In 2017, the company focused its commercial efforts on the wind, aerospace, and rail industries globally, and will soon expand to additional markets. Sentient has received $22.5M in private investment to expand into the rail and aerospace markets. Sentient Science has also received substantial funding through the federal SBIR program ($2M) and is a TIBBETS award winner, which is the highest award given by U.S. government to honor outstanding technical and commercial achievements of small businesses under the SBIR program. Sentient's customers include General Electric, NextEra, Acciona Energy, Duke Energy, Boeing, Sikorsky and Union Pacific.

Impact on Buffalo: Sentient Science came to Buffalo in 2012 with 4 employees and now employees over 50 in Buffalo, with an average salary of $98,200.

VOICEITT

Winners of Buffalo's 43 North business competition in 2015, VoiceItt is an Israeli based startup company committed to revolutionizing the way people who have speech disabilities due to motor, speech and language disabilities communicate, enabling them to use the most natural means there is: their own voice. Through a smart phone app or a wearable product, people with speech disabilities will be able to communicate with whomever they wish - Voiceitt technology will provide the "translation" of their speech pattern to one that is understandable to the person they are speaking with. We expect these products to be game-changers for the nation's $4 billion outpatient speech therapy market because they will allow millions of people with speech disabilities to communicate verbally using *their own* voices.

How does HPC^{NY} help make this a reality? Voiceitt's research and development efforts are at the intersection of "big data" and "smart medicine" - with a "big" database of 50,000+ samples of impaired speech that continues to grow daily. All this data must be organized, processed, and run through complex machine learning programs running on state-of-the-art supercomputers in order to lead to the final product - a robust automatic speech recognition program for people with speech disabilities, that will run on the user's smartphone or wearable device.

Working with HPC^{NY} personnel who have expertise in machine learning and running on UB's supercomputing resources which are optimized for machine learning simulations will greatly accelerate the Voiceitt's R&D process required for developing the robust automatic speech recognition algorithm. This in turn will allow Voiceitt to dramatically reduce the time to market for their 2nd and 3rd generation products and ensure that the company establishes a strong presence in this emerging and increasingly competitive market. **Ten+ new hi-tech and administrative hires in the Buffalo offices are expected to result from this project**.

Many tech hotbeds, including Denver or Austin, could easily attract a company like Voiceitt through an abundance of financial investments. However, through the unique confluence of compute resources and expertise, HPC^{NY} is poised develop a strong long-term relationship with Voiceitt.

In closing, Sentient Science and VOICEITT are great success stories that can continue to get stronger through HPC^{NY}. And with your help, we can ensure that HPC^{NY} has the funding it needs to continue this work throughout NYS.

Thank you for your time and patience and I would be pleased to answer any questions you have.

Attachments:

HPC^{NY} Cumulative Impact 2015-2017

	Economic Impact Category*						
Company	Federal Funds	Non-Govt Funds	Increased Revenues	Cost Savings	Capital Exp.	New Jobs	Retained Jobds
ACTASYS	$125,000	$0	$25,000	$100,000	$100,000	0	0
AHRM, Inc.	$0	$0	$343,000	$32,000	$0	2	11
BlackRidge Technology	$0	$3,300,000	$0	$131,328	$166,000	7	0
Buffalo BioBlower	$0	$0	$21,000	$3,000	$0	0	0
Buffalo Media Works	$0	$0	$0	$2,000	$0	0	0
Buffalo Sewer Authority	$0	$347,440	$0	$6,752	$3,741	3.33	0
Coqui 3D	$0	$500,000	$0	$0	$0	0.5	0
CUBRC	$0	$0	$0	$180,000	$0	1	0
Econoburn	$0	$0	$0	$282,201	$0	0	0
Eiden Systems, Inc.	$0	$0	$0	$5,000	$0	0	0
EOS Energy Storage	$0	$0	$0	$500,000	$0	2	0
Garwood Medical	$0	$3,600,000	$0	$60,794	$0	3	0.2
Greystone Environmental Management	$0	$22,000	$12,000	$9,000	$0	0.4	0.2
Hydronic Speciality Supply, LLC	$0	$0	$0	$25,000	$0	0	0
IBM	$0	$0	$0	$500,000	$0	0	0
Innoveering	$2,114,351	$65,000	$375,000	$250,000	$15,000	5.5	4.5
Janus Systems (Tech-X)	$750,000	$47,000	$219,000	$60,000	$8,000	2	3
ParaLab Computing	$0	$10,000	$0	$200,000	$0	0	0
Pliant Energy Systems, LLC	$1,468,800	$0	$0	$0	$0	0	4
Praxair Corporation	$0	$0	$0	$46,924	$6,331	2	0
Reaction Engineering, Inc.	$150,000	$10,000	$0	$13,364	$0	1	1
Sentient Science	$2,179,082	$34,999,968	$5,348,948	$1,701,479	$149,565	47	0
Serometrix	$0	$0	$0	$82,380	$0	0	0
Simmetrix, Inc.	$2,370,000	$0	$0	$0	$0	0	0
TheoretiK	$132,000	$60,000	$0	$0	$0	0	0
Thermo-Control, Inc.	$0	$0	$0	$49,113	$0	0	0
ThermoLift, Inc.	$0	$2,575,000	$0	$40,000	$0	2	0
Vader Systems	$0	$10,000	$0	$72,955	$0	0	0
ValueCentric	$0	$0	$0	$14,850	$0	0	0
Xerox Research Center	$0	$0	$0	$13,384	$0	0	0
Voiceitt	$0	$0	$0	$5,000	$1,200	1	0
Total	$9,289,233	$45,546,408	$6,343,948	$4,386,524	$449,837	80	24
Grand Total	$66,015,950					103.63	

* Economic Impact Category includes federal funds received, non-government revenues raised, increased revenues realized, cost savings realized and capital expenditures made. Data in table are self-reported by partner companies as part of a comprehensive, annual survey process for HPC^{NY}.

Garwood Medical Devices

Garwood Medical Devices, based in downtown Buffalo, is a semi-finalist of Buffalo's 43 North business competition and a member of the StartUp NY program. The company is focused on the development of medical devices for the treatment of chronic wounds and implant infections, a market that is projected to reach $3.5 billion by 2021. Their EnerAid™ Active™ bandage aims to increase the rate at which ulcers, surgical and other wounds heal. The company is also developing a novel orthopedic infection control technology and device that addresses the challenge of eradicating bacterial biofilms that adhere to the surface of joints in orthopedic and other implants, and which are a primary cause for remedial surgeries. These maladies affect more than 7 million patients per year in the US and are particularly burdensome to the Nation's seniors and veterans.

The optimal design of Garwood's medical devices requires high-fidelity computer simulations of biological systems interacting with electrical currents and magnetic fields. Such multi-physics simulations are too complex for desktop computers to perform, and are beyond the technological capability of Garwood's staff. Leveraging HPC^{NY}'s computing resources and expertise in developing these complex models has enabled Garwood to dramatically accelerate the research and development (R&D). Since 2016 and with the aid of UB's expertise and resources, the company has performed more than 600,000 hours of computing on UB's supercomputer. Simply put, without access to the HPC^{NY} program, Garwood would not be able to bring their promising products to market. This highlights the important function of the HPC^{NY} program as an essential aid to economic development and innovation in New York State. With their patented technologies Garwood is poised to lead in the emerging field of "smart" wound care and their collaboration with HPC^{NY} makes it possible for them to do so from their headquarters in Buffalo, NY.