

Interview

The Energy Value Chain

An Interview with Robert Catell, Chairman;
Yacov Shamash, Vice President for Economic Development; and
Jim Smith, Assistant Vice President, Economic Development,
Advanced Energy Research and Technology Center, Stony Brook University



The Advanced Energy Center
in the Research & Technology Park at Stony Brook University

EDITORS' NOTE Robert Catell was formerly the Chairman and Chief Executive Officer of KeySpan Corporation and KeySpan Energy Delivery, the former Brooklyn Union Gas. His career with Brooklyn Union Gas started in 1958. Following National Grid's acquisition of KeySpan Corporation, he became Chairman of National Grid, U.S. and Deputy Chairman of National Grid plc. He currently serves as Chairman of the Board of the New York State Smart Grid Consortium, Cristo Rey Brooklyn High School, and Futures in Education Endowment Fund. Catell received both his bachelor's and master's degrees in mechanical engineering from the City College of New York and is a registered professional engineer. He has attended Columbia University's Executive Development Program and the Advanced Management Program at the Harvard Business School.

In 1995, Dr. Yacov Shamash led SUNY's colleges of engineering to create the statewide Strategic Partnership for Industrial Resurgence (SPIR) program. From 1992 to 2015, Shamash served as Dean of the College of Engineering and Applied Sciences at Stony Brook University. Prior to joining SUNY Stony Brook in 1992, Shamash served as the Director of the School of Electrical Engineering and Computer Science at Washington State University. He received his undergraduate and graduate degrees from Imperial College of Science and Technology in London.

Previously V.P. and General Manager of Aeroflex Laboratories, Jim Smith most recently served as the President of PMC (Anorad), a division of Rockwell Automation. He earned a B.S. in electrical engineering from the University of Buffalo and an M.S. in industrial management from Stony Brook University.

COMPANY BRIEF The Advanced Energy Research and Technology Center (AERTC; aertc.org) is located in the Research & Development Park at Stony Brook University and is a true partnership of academic institutions, research institutions, energy providers, and industrial corporations. The Center's mission is innovative energy research, education, and technology deployment with a focus on efficiency, conservation, renewable energy, and nanotechnology applications for new and novel sources of energy.



Robert Catell



Yacov Shamash



Jim Smith

How has the vision for AERTC at Stony Brook evolved since its opening in 2006?

Catell: It was truly a combined vision between myself and Dr. Shamash. With all the changes going on in the energy sector, we felt there was a need for a research entity on Long Island connected to Stony Brook because of its strong foundation in engineering and science. Our hope was to do research to develop the new technologies that would be necessary to modernize the energy delivery system and that could be commercialized to create businesses and jobs.

Shamash: We have a number of companies that started out in technology here, and they're doing very well. The center is absolutely at capacity.

The vision is there; our biggest problem currently is space, and we're looking at getting additional funding to support an expansion of the center.

Catell: We've been able to get significant state and federal government funding to promote research. We've also seen companies that have started at the energy center raising private funds and moving forward. Some of these have already moved out of the energy center.

Will you touch on your funding and the activities it supports?

Smith: The facility is operationally funded by the New York Empire State Development Corporation. Our building is segmented into a few key areas: our incubator tenants – we physically only have room for seven of those – and our research laboratories. We have also been designated the Center for Excellence in Energy in New York State. With that designation comes a heavy responsibility to act as the central point for focusing energy research and incubation of new companies in the energy space for the entire state, which is challenging.

We recently ran an offshore wind event in Montauk that attracted speakers from multiple countries, as well as the leaders of all the major global wind developers. This is a major energy initiative for this region.

We also run the Advanced Energy Conference Series. We endeavor to engage the entire state, and several thousand people will be in attendance from all over the country, including those from the federal government and major energy industry leaders, as well as national researchers.

These events are keynoted by the leaders of the Department of Energy and the national energy laboratories. In addition, 38 different schools and universities participated in the most recent event. We are the Center of Excellence in energy for the entire state, and we encourage all the schools around the state in the energy space to get involved. This allows us to bring everyone together and foster synergy among all this talent.

Shamash: The State of New York has 10 Centers of Excellence, designated by the legislature and by the governor, all in different focus areas. At Stony Brook, we have two of them: one is in the area of advanced energy research and technology and right next to it is the Center of Excellence in Wireless and IT.

When it comes to the concept of the smart grid, the smartness comes through software, so having the two centers so close together, and working in tandem, enables us to innovate in ways it would be difficult to do otherwise.

How broad is the Center's focus?

Catell: We focus on the entire energy value chain starting with generation. Right now, most of our focus is on renewable generation, such as solar and wind.

We also have an area that looks at the production of biofuels – biogas and liquids, which represents our efforts on the energy production side.

Moving down the chain, we have Esther Takeuchi, the premier researcher in battery technology, at our energy center. She is doing important research in this space. With new types of generation like wind and solar, batteries are needed to store and supply that energy when the wind doesn't blow and the sun doesn't shine.

Then we take it from there to a focus on the grid and the elements that are going to be important regarding both the gas and electric energy delivery grids.

Finally, we go down to the customer level. We're developing products – like a gas-fired heat pump and a demand management system that go directly into the customer space to help the customer use energy more efficiently.

Smith: Nanotechnology has impacted virtually every aspect of the energy space. We have a great linkage in this field to the Brookhaven National Laboratory Center for Functional Nanomaterials.

Our projects span the broad horizon of energy from generation through to the customer. For example, we've done thermal barrier coatings for blade turbines for General Electric and Pratt & Whitney. We are increasing the thermodynamic efficiency of turbines used in electric power generation.

We have also provided analytic studies for the Long Island and New York Power Authorities to optimize their ability to adjust the electric grid for stability at a rapid rate. We are advancing this as we develop new intelligent devices that enable putting billions of sensor devices on our electric and gas grid at the home level, the distribution level, and the transmission level.

In terms of major programs and, in conjunction with the Department of Energy and the Long Island Power Authority, we installed thousands of smart meters at both industrial and residential sites on Long Island. This includes major upgrades to three 69 KV distribution centers putting in phasor measurement units. These provide a way to look at the stability of the grid as we start adding intermittent and distributed resources, like solar and wind, at large penetrations. We work on these from all levels from generation, to transmission, to distribution, as well as at the consumer level. We're providing assistance to incubator companies coming out with new products and creating new jobs in the region. For example, we support a demand management start-up where we can help with more intelligent control of the energy the consumer uses while also looking at how this feeds back and impacts the grid. It enables the consumer, both industrial and residential, to be connected directly to the utility through a smart meter so they can look at the current price of power and make a decision if they want to consume more or time shift that consumption to a period when energy is cheaper. We're seeing a new generation of appliances that enhance the ability to make these intelligent decisions. For example, why make ice cubes during peak power times when electricity is more available and cheaper at night?

A very important piece of what we do is education. We have the Advanced Energy Center Training Institute. These new complex devices, like the energy center itself, have 53 programmable computers controlling it. It's very advanced, and we found that we had to train a large contingent of technicians to service, operate, and tune these unique systems that control lighting, heating, and ventilation with our energy systems at the Center. The key is to provide training in parallel with these new jobs that are created because they're so new that they haven't been done before.

At our facility, we currently have a roster of 140 people that have access to the laboratories and rooms in this building.

Competitively, we win New York State funding from various agencies but we don't count that in our reports since we are a New York State funded group. We only take credit for attracting federal money to the State of New York to create new high-tech jobs with the state.

Since 2012, when our building opened, we have competitively won more than \$40 million, and it has come primarily from three groups: the Department of Energy, the Advanced Research Projects Agency of the Department of Energy, and the National Science Foundation. We have smaller (but important) amounts for biofuels from the Department of Agriculture and the National Institute of Standards and Technology. Many other federal groups also provide us some level of funding to do advanced energy research for them.

The laboratories at AERTC cover a wide range of technologies. We also have a substantial investment in attracting the top researchers, the top post-doctoral students, and the doctoral students here to help aid in that research.

We have state-of-the-art laboratories in battery development, biofuels, low carbon energy sources, and advanced combustion in addition to general project laboratories, all of which can be utilized at a very reasonable cost.

Will you elaborate on the quality of the funding you get?

Shamash: We have won a substantial amount that we have competed for. The State of New York has other Centers for Advanced Technology, and they help fund the universities for work with companies in a particular area.

We have three such Centers: one is focused on medical biotechnology, one is focused on sensor systems, and a third is focused on integrating renewables into the grid. Those centers are focused on utilizing existing laboratories and facilities on campus to work in particular industry sectors.

Stony Brook now has three of the 15 CAT centers in New York State.

Smith: Another center is our Manufacturing Extension Partnership. In addition to covering the breadth of all the technologies from generation to the customer in the energy space, we have the tools to help just about anybody that is a manufacturer in the energy space. We have the capability in the energy center to work with manufacturers in the sensor area and in the smart grid area.

Shamash: In terms of the missions for the centers of excellence, this particular center has more than leveraged those resources. Without the facility we have here, these centers would have never come to Stony Brook.

Will you discuss the leadership throughout the university that has been so focused on moving forward in this area?

Shamash: The University is very supportive of economic development. A position was created 17 years ago to try to make sure resources would be available at the university to leverage each of these resources to help companies. We have multiple programs whose mission at the university is to support startups and economic development in general. This is strongly supported by the President of the University and senior academic leaders.

We also have incubators. Our largest one was established in 1992 and is called the Long Island High Tech Incubator. It has about 100,000 square feet of space. At any time, we probably have 30 companies there.

Then we have another incubator in Calverton, which is next to Brookhaven. The focus there is more on the environment and agriculture. That one is about 24,000 square feet.

Catell: The University's success has a lot to do with Yacov and his outreach outside of Stony Brook to the greater Long Island community, and his interaction with the business community because outreach to the business community is one of the important functions of this energy center at Stony Brook. Yacov has led the approach that Stony Brook is a place that is business friendly. Its focus is as an academic institution with all that entails, but it's also an academic institution that has a business-friendly image and as one that is looking to find ways to get things done in an environmentally sensitive manner.

This culture starts at the top with the University's President and with people like Yacov going out and working in the community and getting people to understand that Stony Brook is a place where the business community feels it can get things done.

Bob, you often talk about the impact that energy plays within economic development. Can the Center play a role in getting the message out about the critical role the energy sector plays?

Catell: The energy industry needs to do a better job in educating the public. The energy industry is not looked on favorably because most people think about it as one with polluting power plants or high bills. However, the reason we have one of the greatest qualities of life in this country is because most people have access to electricity and natural gas.

Unfortunately, when the industry speaks, they're suspect, so it's the role of institutions like the energy center and others to assist in getting the word out.

We also have an entity called the New York Energy Policy Institute that focuses on how to develop long-term plans to have sustainable energy at a reasonable cost.

One of the governor's goals in New York State is to get 50 percent of the state's energy from renewables by 2030. That means a lot more solar and a lot more wind, with most of the wind energy from offshore Long Island.

One of the roles the energy center is now looking at is how to best integrate wind into the energy delivery system by forming a Center for Offshore Wind.

We held a symposium recently at Montauk, and we had people go out to visit the Deepwater Wind Installation, which is the first offshore wind project in the U.S. connected to Rhode Island and Block Island. The second one approved by the Long Island Power Authority will be off Long Island.

Smith: When it comes to achieving renewable energy, we operate under two main methods – long term and short term. We have tactical approaches for supporting and making sure offshore wind, biofuels, and solar are continually improved and optimized.

Strategically, we're focused on new developments to drive the cost of batteries down and the performance up using unique technologies like nanomaterials and enabling these advances by attracting top researchers post docs. Energy storage is the holy grail in pulling solar, wind, and bio together. We're on the precipice of an integrated and efficient grid structure, and we're going as fast as we can to make that happen. Tomorrow is not soon enough as the delicate ecosystem of the earth is at stake. ●