

The Future of Energy

An Interview with Robert B. Catell,
Chairman, Advanced Energy Research and Technology Center at Stony Brook University
and Chairman, National Offshore Wind Research and Development Consortium

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, Catell became Chairman of National Grid U.S. and Deputy Chairman of National Grid plc. He currently serves as Chairman of the Advanced Energy Research and Technology Center, National Offshore Wind Research and Development Consortium, and Cristo Rey Brooklyn High School. 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.



Robert B. Catell

INSTITUTION BRIEFS Advanced Energy Research and Technology Center (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.

National Offshore Wind Research and Development Consortium (nationaloffshorewind.org) is a nationally focused, not-for-profit organization that seeks to produce innovations that directly respond to the technical and supply chain barriers faced by offshore wind project developers in the U.S., build strong networks connecting technology innovators, investors, and industry, and increase U.S. content and job opportunities.

You serve as chair of the National Offshore Wind Research and Development Consortium. Will you highlight the mission of the Consortium?

The National Offshore Wind Research and Development Consortium is a nationally focused, not-for-profit organization collaborating with industry to fund prioritized research and development activities to accelerate the deployment of offshore wind energy in the U.S., address challenges and obstacles

facing the offshore wind industry, and maximize economic and social benefits, and to fund research to develop new technologies to reduce the levelized cost of offshore wind in the United States.

It is jointly funded by the Department of Energy (DOE) and the New York State Energy Research and Development Authority (NYSERDA). A pool of \$40 million has been provided to fund research projects through a competitive process managed by the National Offshore Wind Research

and Development Consortium, Research & Development Committee.

Since its inception in 2018, it has funded 48 research projects consistent with a Research & Development Roadmap which was developed with input from all of its stakeholders.

While the primary focus is research, it has supported the development of the supply chain and workforce development, with a focus on inclusion and equity in the workplace.

How much global electricity demand is met by wind energy?

Wind and solar generated over a tenth (10.3 percent) of global electricity for the first time in 2021, rising from 9.3 percent in 2020 and twice the share compared to 2015 when the Paris Climate Agreement was signed (4.6 percent). Of this mix, wind contributed 6 percent and solar 4 percent. Combined clean electricity sources generated 38 percent of the world's electricity in 2021, more than coal (36 percent).

What are some potential future wind technologies other than turbines?

The main development in wind energy is primarily the size of the turbines, reaching 15MW in capacity. A threefold increase from the 6MW turbines installed by Deep Water Wind, now owned by Ørsted. This first U.S. offshore wind installation of 30MW offshore Block Island, Rhode Island, is the entire production of offshore wind in the U.S. We are anticipating 9GW in the very near future, just from the Northeast, and there will be more. We are on a trajectory of unprecedented growth if we get this right.

The future technologies will focus on the integration of wind energy into the electric transmission and distribution system. This will require more efficient transmission lines coupled with utility scale storage.

What are the challenges of using wind energy?

The real challenge to using more renewables is going to be consumer acceptance. The consumer wants reliable energy at a manageable cost. We are developing the technologies today that will assure renewable power can be a stable and reliable energy source and be available at a cost manageable to the consumer. We watched the public reaction when gasoline approached \$5.00 per gallon in an election year. It drove interest in electric vehicles, and it was clear the public does not have unlimited capacity for energy costs.

The technical challenges of using wind energy are primarily related to its intermittency. While the wind, particularly in the offshore environment, blows all of the time, it blows with different intensities affecting the amount of power produced. The electric system requires a constant flow of electricity to maintain a reliable source of power to businesses and residences.

In order to make up for the intermittency of wind, there will be a need to provide storage of utility scale with combined cycle gas fired generation to meet the peaks and fill the gaps.

What do you envision for the future of solar energy in regard to its cost effectiveness and ability to compete with conventional fuels?

Solar energy will play an increasing role in meeting the renewable goals in producing electricity. The cost of solar panels has been reduced dramatically over the past few years. The reduction in cost, coupled with the increased efficiency of the solar cells, will allow solar energy to compete very effectively with conventional fuels.

What opportunities and challenges face the solar industry as solar is integrated into the grid?

The solar industry has a great opportunity to increase the amount integrated into the grid based on its reduced cost and increased efficiency of solar cells. More solar energy will be necessary to reach the goal of reduced reliance on fossil fuels. While the sun shines on the hottest day, the challenge the solar industry faces is its intermittency, as the sun doesn't shine all of the time, and of course does not shine at night. As with wind, this will require the development of utility scale storage at levels not seen in the past, as well as back up generation.



Rendering of an offshore wind farm

In addition, large scale solar projects require significant space to produce megawatts of electricity. Finding locations to site these solar projects without negatively affecting the environment will be challenging.

The other challenges are related to the supply chain and the production of solar panels from countries outside the U.S., increasing its cost and the uncertainty of this important renewable source.

What is the status of hydrogen energy and how can hydrogen energy reduce carbon emissions?

The production and distribution of hydrogen provides a great opportunity to reduce carbon emission since hydrogen is not a fossil fuel and burns while producing no carbon emissions. Production of hydrogen is a well-developed technology in the petrochemical industry, but not as a fuel to be distributed to businesses and residences.

A great deal of emphasis is being placed on hydrogen produced from natural gas or by the electrolysis of water in a cost-effective manner. At the same time, research is being done on the transmission and distribution of hydrogen as a replacement for natural gas in the marketplace. This is being combined with the study of the use of hydrogen as a power source in turbines and as a fuel for business and industry.

The federal government has provided billions of dollars to establish a number of hydrogen hubs to install hydrogen as a reliable replacement for fossil fuels.

What are the keys to meeting America's demand for electricity while also addressing the need to protect the planet?

The key to meeting America's demand for electricity while addressing the need to protect the planet will require a plan to incorporate renewables into the energy mix in an economic fashion while maintaining reliability of the electric system. This will require research dollars and demonstration projects to develop and demonstrate the technologies necessary to produce and distribute clean energy to the businesses and residences which rely on energy to meet their needs.

There have been great advances in energy efficiency to reduce energy demand, but that is being outpaced by the advances in heat pumps and electric space heating and, of course, the transportation sector. Every car manufacturer is in the electric vehicle game now and many models are sold out to 2024.

That is precisely why we have to advance offshore wind at this pace. The market is moving, the climate is demanding attention, and we have the means to make this all work.

Will you provide an overview of the Advanced Energy Research and Technology Center (AERTC) at Stony Brook University how you define its mission?

The Advanced Energy Research and Technology Center at Stony Brook University has as its mission to do the research in collaboration with industry to develop the innovative technologies to produce and distribute energy while reducing carbon emissions. This will require a focus on those technologies which can provide the most benefits to the energy

consumer at a reasonable cost. Emphasis will be placed on energy efficiency and renewable energy with a need to provide education and workforce development so these benefits can be accessed by all members of society.

What do you see as the biggest challenges facing the energy industry in the future?

The biggest challenges facing the energy industry in the future, in addition to the development of the new technologies, will be to provide leadership and a trained workforce to install and maintain the new technologies. This will require changes in college curriculum as well as technical workforce training, all of which must be accomplished while providing opportunity to a diverse workforce.

You spent your career in the energy industry. What made the industry so special for you and what do you tell young people about the type of career the energy industry offers?

I was very fortunate to get a great and affordable college education at the City College of New York. My mechanical engineering degree allowed me to enter the energy utility industry at an entry level with a good future and opportunity to learn and grow. I found the energy utility industry particularly satisfying because it provided an essential product to the community and was a great partner of the community, supporting it in many ways.

Today's energy industry offers that same career opportunity to young people with the ability to incorporate exciting new technologies into the energy mix and the ability to provide a cleaner environment for the future and quality of life to all members of the community. ●