United States House of Representatives
Select Committee on Energy Independence and Global Warming
Edward J. Markey, Chairman

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Select Committee Hearing on New Energy Technologies

Testimony of Frank Smith, principal of SCS Energy LLC and PurGen One LLC

Mr. Chairman and Members of the Committee:

My name is Frank Smith. I am a principal in SCS Energy, LLC, and in an affiliated company, PurGen One, LLC. It is my pleasure to have the opportunity to appear this morning to testify about the new technologies and private initiatives that promise to meet our Nation's energy and climate challenges.

At the outset, Mr. Chairman, I want to thank you and your colleagues for your leadership on H.R. 2454, the "American Clean Energy and Security Act." Your bill and supporting energy policies will, if enacted, prompt a transformation of our Nation's energy platform as sweeping, potentially, as the information revolution spurred by the Telecommunications Act of 1996.

Our company, SCS Energy, develops electric generating plants, so we know the strengths and failings of the electricity system, and the implications of that system for global climate. We do large, complicated capital projects. The first phase of our last project, a combined-cycle natural gas plant in Astoria, Queens, New York, was financed at over $1 billion. The second phase of the project has brought the total financing to over $2 billion. The Astoria Energy plant raised the bar for plants of that type nationally,

while creating new power generation to improve reliability and stabilize prices in the New York City metropolitan area market.

That project has been quite successful. The PurGen One project, located in Linden, New Jersey promises to be even more so. Both projects demonstrate that innovative companies can respond to the needs of our environment while meeting the needs of electricity consumers.

Recognizing that this Committee has been immersed in a national debate over the impact of climate policy on jobs and economic growth in our communities, I want to focus my testimony today on five core messages about carbon constraints and the state of technology.

- First, using *today's technology*, we can produce electricity and other energy commodities at market prices while sequestering 90 percent of our CO_2 using off-the-shelf carbon capture technology and a proven sequestration method.
- Second, by using an innovative business model, we can accomplish that profitably and through private initiative and capital.
- Third, we can do all of that using domestic resources -- resources that include not only coal and natural gas, but the domestic resource that our offshore geology provides for sequestration and the domestic labor resource illustrated by the 1500 skilled union laborers who will build our plant.
- Fourth, first-movers in carbon capture and sequestration (CCS) need help in overcoming the headwinds presented by the current market crisis and resulting credit crunch. Congress needs to act to make financing possible for otherwise

sound projects by expanding current incentives and making them permanent for first movers.

- Fifth, Congress must ensure that federal policy promotes the use of our offshore geologic resources for CCS.

I. SCS Energy's Background and Experience.

SCS has a record of successfully developing and financing large capital projects in the energy industry that meet market need and set new standards for environmental performance.

SCS Energy's most recent development project, Astoria Energy, is a 1,000 MW combined cycle natural gas-fired, air-cooled facility located in the Astoria section of Queens, New York. SCS Energy initiated the project in 1999 and was the lead developer and manager of the project through development, financing, construction, and initial operations. With Credit Suisse First Boston, SCS brought in $285 million in private equity participation and approximately $800 million in debt financing. SCS negotiated a Power Purchase Agreement (PPA) with Consolidated Edison Company of New York, Inc. to support the Phase I financing. SCS Energy negotiated an engineering, procurement and construction contract with Stone & Webster to construct Phase I consistent with the demands of the Con Ed PPA and the New York independent system operator (ISO). SCS Energy completed construction of Phase I on budget and on schedule, a highly unusual event for any kind of construction in New York City. Astoria Energy was a recipient of the 2006 New York Industrial Project of the Year Award and the 2007 Pacesetter Plant Award.

From a business perspective, Astoria Energy was significant because it was the first independently developed electric generating station to be built start to finish following the collapse of the project finance markets for power plant projects as a result of the Enron failure. From a construction perspective, Astoria Energy was significant because SCS completed the project and put it into service on time and on budget, despite the challenges of building a new plant in one of the most densely populated urban communities in the world.

From an energy perspective, Astoria Energy was significant because it delivered 1,000 MW of electricity in a load pocket where new generation was desperately needed to address the ISO's reliability and congestion concerns, and to reduce attendant price volatility.

And from an environmental perspective, Astoria Energy was significant because it was the first plant of its type to be built using air cooling of the power block rather than water cooling from a raw water intake from the East River or another sensitive or scarce water source. This made it impossible for power plant developers to continue to fight environmental regulators seeking to protect fisheries and other water resources from the impacts of raw water cooling.

Prior to Astoria Energy, SCS Energy had built Marcus Hook, a 750 MW combined cycle natural gas-fired power plant located in Marcus Hook, Pennsylvania. The plant, which began operation in 2005, is currently owned by FPL Energy. SCS Energy also was the initial developer and an initial owner of Newington Energy, a 500 MW combined cycle natural gas-fired power plant located in Newington New Hampshire.

By industry standards, SCS is a small development company. SCS is especially able to take on blockbuster projects with success because we boast a project team that brings more than 175 years of industry experience to every challenge, and because our small size gives us the nimbleness to move and adapt quickly to rapidly changing conditions in the relevant markets and to the evolution of public policy as it affects energy project development.

II. PurGen One and the Promise of IGCC with CCS

After completing Astoria Energy, SCS recognized the inevitability of carbon regulation, and saw that the first firms to develop a fossil fuel plant with CCS could capture significant market value. Accordingly, SCS began a survey of both the technological options and the preferred location for a plant incorporating CCS into a fossil fuel electric generating platform.

A. Siting and Technology

The northern New Jersey electricity market presents many of the attributes needed for such a project to succeed: a significant deficit of generation (the region imports more than a third of its electricity, most of which comes from inadequately controlled coal-fired plants out-of-state and upwind that contribute to the area's noncompliance with public health standards for soot and smog); high electricity prices and price volatility; reliability and congestion concerns by the independent system operator, PJM; and a policy and regulatory context that includes carbon regulation through the Regional Greenhouse Gas Initiative (RGGI).

The region presented one further attribute that was critical to the feasibility of CCS for PurGen One: proximity to a thoroughly characterized geologic formation in federal waters seventy miles off the New Jersey coast that is perfectly suited to perpetual and safe storage of carbon dioxide, with capacity to store all of the carbon from PurGen One as well as every other fossil fuel plant in the northeast for thousands of years. SCS Energy came to appreciate this attribute through the work of Dr. Daniel Schrag, a geochemist and CCS expert who is the director of Harvard University's Center for the Environment and is who one of President Barack Obama's appointees to the President's Council of Advisors on Science and Technology (PCAST). Dr. Schrag serves as PurGen One's consulting scientist.

Reviewing technology options, SCS settled upon an Integrated Gasification Combined Cycle (IGCC) process. In PurGen One's IGCC plant, coal is used as a feedstock and is chemically converted to a synthetic gas (syngas) rather than burned. Pollutants, including nearly all of the sulfur and mercury that make coal combustion problematic using any other process, are then removed from the syngas prior to combustion, leaving mostly hydrogen and CO_2. A two-phased shift reaction removes more than ninety percent of CO_2 from the syngas, so that by the end of the process the syngas is nearly pure hydrogen. Then, as in a typical IGCC plant, the hydrogen can be used in a highly efficient combined cycle gas-fired power block, nearly identical to that in a combined cycle natural gas plant with the exception that hydrogen requires turbines designed for higher temperature combustion. The carbon dioxide stream is then dried and compressed at ambient temperature, and transported in a 24-inch carbon steel

pipeline to a rock formation seventy miles off the coast and nearly one and a half miles below the ocean floor.

PurGen One has identified and secured an ideal site for this plant. PurGen One has entered a purchase and sale agreement for a 108-acre industrial property in Linden, New Jersey that is the former site of an E.I. Dupont de Nemours chemical manufacturing facility. In terms of electricity, the site is at a critical point in the regional grid where high demand and high price volatility result from the area's generation deficit. In terms of infrastructure, the site presents nearby electric and natural gas transmission lines, service by two rail lines, a wharf for ocean transport, and a local wastewater treatment plant whose effluent can be recycled for use in the PurGen One plant. In terms of local land use, this brownfield site previously has been permitted for use as an electric generating station, and the local mayor has welcomed the proposed PurGen One Plant. In terms of sequestration sites, a 100 mile pipeline will take PurGen's CO_2. stream to one of the best sequestration sites in the world, seventy miles off New Jersey's coast.

The offshore geology from Long Island to the Maryland coast has been subject to extensive characterization over the years by the Minerals Management Service (MMS) of the Department of the Interior as well as by private companies and independent scientists looking primarily for oil and gas deposits. That work has been essential to Dr. Schrag and to PurGen One's team in identifying two cretaceous sandstone formations that do not have oil and gas deposits, but that do present the requisite porosity, capacity, and reliability for long-term geologic storage of CO_2. These formations contain ancient seawater rather than oil or gas or the heavy brines and metals present in some onshore saline aquifers. They are overlain by a thick cap rock that ensures containment of the

CO_2, a cap rock that is sufficiently plastic to reseal and contain the carbon dioxide reservoir even in the highly unlikely event of a major seismic event.

These characteristics are important because they allow PurGen One to benefit from the longest continuing and largest successful demonstration of carbon sequestration at commercial scale in the world: the Sleipner field in the North Sea off of Norway. Sleipner has successfully sequestered over 1 million tons of CO_2 per year for over 12 years. The only substantial difference between the Sleipner field and the PurGen One field is that, with Dr. Schrag's help, we have identified formations – well-explored formations – that are approximately twice as deep and under a cap rock structure that is substantially thicker than those at Sleipner. Combined, these features make the PurGen One field more dependable than the most proven sequestration field in the world for long-term storage of carbon dioxide. And the capacity of the field is vast, presenting even with highly conservative assumptions permanent storage capacity for no less than a trillion tons of carbon dioxide.

B. Changing the Business Model for CCS

Having found the perfect site and suitable technology, SCS Energy had the further challenge of developing a business model that would allow an IGCC plant with CCS profitably to cover the higher capital costs associated with gasification, carbon capture, and the pipeline.

In a sense, this challenge pervades the electric generating industry in one form or another because traditional, single purpose power plants operate for large periods of time at breakeven or worse, generating profits only at times of peak electricity demand. This prevailing industry model uses capital inefficiently, because with the exception of those

peak periods most of the industry's very expensive capital stock is unutilized or underutilized most of the time. This means that for every two dollars of capital paid for by ratepayers, only about a dollar being used at any given time.

PurGen One solves this problem through a co-production model, in which the hydrogen produced by the plant for the power block is alternately used in a plant that produces urea fertilizer and other commodities. The coal gasifier operates at full capacity to produce hydrogen twenty-four hours a day, seven days a week, but the use of the hydrogen is shifted between production of electricity and production of other hydrogen based commodities – primarily urea fertilizer – as market prices and consumer demand dictate. This both optimizes the revenues and uses the plant's capital stock more efficiently. With the hydrogen plant this is relatively easy to do.

Thus, the capital stock of the PurGen One plant will generate revenue-producing commodities around the clock using full-time production of hydrogen, even though electricity generation from the facility is likely to be at peak only thirty percent of the time. In developing this model, we benefited from the work on co-production undertaken by Robert H. Williams, Senior Research Scientist and head of the Carbon Capture Group of the Carbon Mitigation Initiative of Princeton University's Environmental Institute.[1]

The second change that PurGen One brings to the business model for IGCC with CCS is to make the sequestration pipeline a business rather than a mere cost of production. By over sizing the pipeline so that it can transport 5.3 million tons of carbon dioxide per year from other industrial sources in addition to the 4.7 million tons per year

[1] *See, e.g.,* Robert H. Williams, *What is to be Done with Coal Power?*, Invited Testimony before the New Jersey Clean Air Council (April 1, 2009).

that the PurGen One facility will generate as the pipeline's anchor tenant, PurGen One transforms sequestration into a marketable product rather than just a cost of producing electricity.

This aspect of PurGen's model is made possible by two major policy developments. The $20 per ton carbon sequestration tax credit in the Emergency Economic Stabilization Act of 2008, Pub. L. 110-343 (Oct. 3, 2008)(EESA), and the anticipated development of a market for carbon dioxide sequestration under H.R. 2454, the "American Clean Energy and Security Act" (ACES). As discussed below, more needs to be done and we need to see final passage of the ACES legislation, but the PurGen One presents appealing returns as long as the EESA tax credit remains in place and reliable.

Coupled with PurGen One's technology choices, this changed business model allows us to disprove the persistent and axiomatic claims this Committee has heard that carbon constraints will destroy rather than create jobs, and that CCS is technologically and economically risky, unproven, and twenty years from being ready for commercial deployment. PurGen One will create 1500 skilled union construction jobs, and every component of this plant has been proven at commercial scale.

There are further economic benefits to the PurGen One model that warrant discussion. Most importantly, PurGen One will be a price taker in electricity and other commodity markets, thereby stabilizing prices for consumers by bringing additional supply where it is most needed.

That price stabilization is relevant not just to energy security, but also to food security. As Ranking Member F. James Sensenbrenner, Jr. has stated before this Select

Committee, for our farmers currently "there is no substitute for natural gas in nitrogen production."[2] PurGen One will be a domestic manufacturer of virtually carbon-free nitrogen fertilizer that will be tied to the highly stable price of our domestic coal feedstock, rather than the highly volatile natural gas price, thereby helping America's farmers to avoid devastating price swings in the global nitrogen fertilizer market.

III. PurGen One and "Around the Corner" Technologies.

The Select Committee has convened this hearing largely to look at "around the corner" technologies. I find myself in the odd position of testifying that as far as technology is concerned, PurGen One will achieve virtually carbon-free power from domestic coal using a platform in which every facet of the plant uses off-the-shelf technology that has been proven for years at commercial scale.

The new technology in PurGen One is truly in the business model. We set out to solve the challenges of sequestration, and along the way we solved a fundamental problem in our domestic electricity production system. But while our plant itself uses currently existing and proven technology, the innovation in the PurGen One business model will have significant benefits for the next generation of technologies that will address global warming while enhancing America's energy security.

Our PurGen One site lies in a heavily industrial corridor along New York and New Jersey's Arthur Kill, with a conventional gas-fired power plant as a neighbor on one

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[2] Statement of Ranking Member F. James Sensenbrenner, Jr., Hearing Before the Select Committee on Energy Independence and Global Warming, United States House of Representatives, 110th Cong. (June 18, 2009)(discussing testimony of Ford West, President of the Fertilizer Institute).

end and a major refinery as a neighbor at the other. We anticipate that over the next several years there will be breakthrough advances in post-combustion CCS technologies, making it both technically possible and economically practicable to retrofit existing fossil fuel electric generating stations and other industrial facilities, including PurGen One's immediate neighbors, to capture their carbon for storage. By building a pipeline that can handle twice as much CO_2 as the PurGen One plant itself will produce, our plant will facilitate and bring down the cost of post-combustion CCS as the technology matures.

In addition, we note that one of the significant barriers to the use of fuel cells and the development of liquid fuels using a hydrogen feedstock has been the limited supply and high price of hydrogen. By creating a manufacturing platform that can produce hydrogen in vast quantities and at a very low price, the PurGen One model can be replicated to accelerate our transition to energy sources and even liquid fuel derived from hydrogen without significant adverse effects on prices. To give the Committee an encouraging glimpse of those possibilities, I would note that the energy content and price components of the hydrogen produced by our PurGen One plant compare favorably, when converted to liquid fuel equivalents, to two dollar per gallon gasoline.

IV. Support Needed from the Congress

In PurGen One, SCS Energy is developing a plant that produces virtually carbon free electricity and other commodities at market prices using well-proven technology. This plant produces appealing returns for investors, but Congress still needs to act if PurGen One and other first movers in CCS are to succeed.

First, as discussed above, PurGen One is profitable without any direct government grants or other incentives, but our pro forma does assume and the project does rely on the $20 per ton carbon sequestration tax credit as enacted in the EESA.

The EESA sequestration tax credit is currently capped at 75 million tons, whereas the PurGen One project alone has the potential to sequester 200 million tons annually over the course of its 20-year financing. Attracting private equity to PurGen One in the face of the current financial crisis will require certainty for investors that they can rely on the availability of the tax credit. Congress needs to raise the cap, and to ensure that the tax credit is available for the life of the project – at least for the first movers in this sector. The need to make the EESA tax credit permanent and reliable for first movers has been made more important, in some sense, by this Committee's decision in the ACES legislation to adopt an allocation scheme for carbon allowances that will dampen the initial price-per-ton of carbon.

Second, the current state of the financial markets and the resulting chill in commercial lending requires Congress to address debt financing of PurGen One and other IGCC projects with CCS that are first movers. Debt financing of a new electric generating facility is tough even in the best of times and for the most conventional projects. For first movers in the current debt markets, IGCC with CCS confronts many of the same headwinds that new nuclear power projects face: huge capital costs, lack of an established track record, policy risk, and lender risk aversion. Just as Congress has recognized the need for loan guarantees and direct loans to "kick start" a new generation of nuclear plants, Congress will need to expand the Department of Energy's authority to

provide loan guarantees or direct loans to first movers of IGCC projects with CCS that are otherwise sound from a business and risk perspective.

Third, Congress needs to make sure that use of sub-seabed geologic formations offshore and in federal waters for CO_2 sequestration is not merely permitted, but is a national priority. In discussing energy policy, we often refer to the importance of using domestic resources such as coal and natural gas but rarely acknowledge that the formations suitable for sequestration are as much a resource for our energy future as the formations that may contain oil or gas deposits. We are especially concerned about proposals that would limit the leasing of certain offshore lands exclusively to renewable energy projects. In our initial pre-application meetings with MMS and other federal agencies under President Obama's Administration, we have been encouraged that there appear to be no current statutory or regulatory impediments to sub-seabed sequestration. We need Congress to ensure that this remains the case, particularly as broader policies to "zone' the ocean for specific uses are developed.

Finally, Congress must achieve final passage of the ACES legislation and ensure a long-term market price for carbon that is reasonably commensurate on a per-ton basis with the costs associated with CCS. Once PurGen is built, we will have put in place the infrastructure for broader deployment of CCS technologies, but that broader deployment – and the jobs and other economic benefits it will generate – depend over the long term on enforceable limits and progressive reductions in this Nation's emissions of carbon dioxide and other greenhouse gases.

V. Conclusion

PurGen One, which has begun the permit application process for a 2011 construction start, illustrates that private initiative and an innovative business model make it possible to develop a virtually carbon free facility to produce electricity and other hydrogen based products using off-the-shelf technology and a model for sub-seabed sequestration that has been proven at commercial scale for more than a decade.

PurGen One and other first movers in IGCC will create the infrastructure – carbon pipelines and vastly expanded hydrogen production capacity -- that will support the next generation of energy technologies to solve the climate crisis, create jobs, and stabilize energy prices domestically. For that to happen, Congress must ensure that the incentives needed for first movers in the current financial climate are expanded and made permanent.

Respectfully submitted,

Attachments

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Frank Smith is a founder and principal of SCS Energy LLC where he has worked for the past ten years. In that time, SCS has successfully developed three major electrical generating facilities. The most recent facility was the Astoria Energy facility located at the end of Steinway Street in Queens, NY. Astoria is a 500 MW facility. It is the newest and one of the cleanest facilities in the system, providing much needed generating capacity to the largest load pocket in the system.

Prior to starting SCS, Frank was with Yankee Energy Services Co (Yankee Energy) where he was Vice President of Sales responsible for co-generation project development for "inside the fence" transactions.

Before that, Frank was the Marketing Director at Commonwealth Sprague Capacitor, Inc. and reported to the President of the company. In this role, Frank was responsible for the development of a new line of low-voltage harmonic filters for the power quality marketplace. This line of products has important application in developing countries where power quality problems are more severe than in the U.S.

Frank spent his first ten years in the business world in a variety of marketing and general management jobs at Norton Company, primarily in the coated abrasives division. Before leaving Norton, Frank became General Manager of a $12 million non-woven abrasives business with manufacturing locations in Troy, NY and Reynosa, Mexico.

Frank received a BA degree from Princeton University and holds an MBA from Harvard Business School.