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Select Committee on Energy Independence and Global Warming
"Renewing America's Future: Energy Visions of Tomorrow, Today"
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Mr. Chairman and Members of the Select Committee:
Thank you for the opportunity to testify before your Committee about "Solutions to the Energy and Climate Crisis."

I am Ari Patrinos, the president of Synthetic Genomics Inc. a company dedicated to developing new genomic-driven bioenergy, environmental, and biochemical solutions. I joined Synthetic Genomics Inc. in February 2006 after serving for many years in the Department of Energy (DOE) as the director for biological and environmental research in the Office of Science.

Our nation and the world stand at an important crossroads. Decisions we make during the next few years will affect the trajectory of human civilization well into the next century.

We face daunting energy and environmental challenges:

- energy supply
- energy security
- climate change
- environmental degradation

There are many reasons for these challenges. For example:

The U.S. imported over 600 million tons of crude oil last year, most of it from politically unstable parts of the world.

Energy demand in the developing world, and especially China and India, is growing at a rate approaching 10% per year.

The 2007 report of the Intergovernmental Panel on Climate Change (IPCC) tells us that:

World carbon dioxide emissions from the burning of fossil fuels now exceed 28 billion tons per year. Carbon dioxide emissions from land-use changes are adding as much as 9 billion tons per year.

The global atmospheric concentration of carbon dioxide has increased from a pre-industrial value of about 280 parts per million to above 380 parts per million today.

Warming of our climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level.

Recent events and developments

This month the leaders of the Group of Eight industrial nations (G-8) gathered in Japan and agreed to halve greenhouse gas emissions by 2050. This was a "first" for the Bush Administration.

Also this month, the Environment Protection Agency (EPA) issued a report stating that climate change will pose "substantial" threats to human health in the coming decades.

The National Academy of Sciences is completing a study on America's Energy Future (AEF) to provide the incoming Administration with data and analyses that will help shape energy policies. Energy security and climate change are the two most important drivers of this study.

The Path Forward

It is imperative that we significantly change the ways we produce and use energy. We need to stabilize the concentrations of greenhouse gases in the atmosphere, and for that we will have to accomplish zero "net" carbon emission into the atmosphere in the not-too-distant future.

Zero "net" carbon emission does not mean the end of fossil fuel burning. However, it will require the capture and permanent storage

of emitted carbon away from the atmosphere, or the conversion of the emitted carbon into renewable products (biofuels and biochemicals).

For the U.S., we also need to develop homegrown and renewable sources of energy, to eliminate or significantly reduce our dependence on foreign oil.

This Committee understands there is no "silver bullet" solution to our energy and environmental problems. Instead, we need a "silver buckshot" approach, one that includes the full spectrum of energy and environmental technologies, including enhanced energy efficiency and conservation.

Synthetic Genomics, the Disruptive Technology

Even if we make significant improvements in the traditional energy technologies (fossil fuels, nuclear, hydro, solar, geothermal, and wind), and even if we achieve advances in carbon capture and geological storage, it is difficult to see how we will be able to remove approximately 100 billion tons of carbon (367 billion tons of carbon dioxide) from the world's economy over this century.

Advances in genomics and specifically synthetic genomics are the real "game-changers" that can help us reach the goal. The company I represent, Synthetic Genomics Inc., (SGI) was founded by Dr. J. Craig Venter nearly three years ago to translate genomics advances into viable solutions to some of our most pressing energy and environmental problems. Our first goal is to put our vast knowledge and experience in the field of synthetic genomics to work in helping to solve the energy crisis.

The genome sequencing breakthroughs that Dr. Venter and his teams accomplished over the last two decades have propelled advances in biology from concepts to implementation by giving science the tools to effect change. These breakthroughs have instilled rigor into a discipline that previously was merely descriptive.

Dr. Venter and his team are pioneering the new field of synthetic genomics. This new technology will lead to the design and synthesis of microbial cells with far more superior capabilities in converting feedstock into fuels than even the most successful among the genetically modified natural cells. Vast new opportunities will emerge for optimizing cellular pathways in these "special purpose" organisms.

Recent research by Dr. Venter and others have uncovered an incredibly diverse microbial world that was heretofore unknown. We have discovered organisms – extremophiles, we call them -- that thrive in extremes of temperature and pressure and can survive levels of radiation that are instantaneously lethal to us.

The study of these organisms has given us significant new insights into the molecular machinery of life, which in turn provide ways to quickly and efficiently convert various feedstocks into fuels. These include the conversion of coal into methane that when burned has a smaller global warming impact than coal. Our company SGI has partnered with petroleum giant BP to employ the tools of synthetic genomics to increase the production of methane from coal bed mines.

SGI is also aggressively pursuing the conversion of plant feedstocks (sugar and cellulose) into a wide range of next generation fuels that are superior to traditional biofuels (ethanol and biodiesel), more adapted to the existing infra-structure and compete successfully with gasoline and other fossil fuels.

Genomics-driven technology will not only help us produce fuels from renewable feedstocks (biofuels) but also will accomplish more effective carbon capture and carbon storage. In both cases specially modified micro-organisms enable the conversion of feedstocks into renewable products (biofuels and biochemicals) and the sequestration of carbon away from the atmosphere.

For the production of biofuels we should move away from feedstocks like corn that compete with food production. The food-versus-fuel controversy is unfortunately energized by corn-based ethanol

production in the U.S. There are many plants that are not foodstuff (jatropha, for example) and grow on marginal lands that could be used for the production of biofuels. SGI has joined forces with the Malaysian company Genting Asiatic to use synthetic genomic advances to increase the yield of jatropha plantations.

The genetic engineering of plants that are to be used as feedstocks for biofuels and biochemicals will enable significant increases in the yields of sugar and oils that constitute the raw material for the biofuels. Other genomic advances, such as the study of soil microbes in the root zones of plants, can also assist in improvements of plant properties, reduce the use of fertilizers or chemical pesticides, and enhance the disease resistance of plants.

But one of the ultimate and disruptive technological goals of our synthetic genomics research is the use of carbon dioxide as a feedstock for the production of biofuels and biochemicals. Imagine that: carbon dioxide as a feedstock. This would be the “holy grail” of bioenergy production: the transformation of a fossil fuel into a renewable resource. At SGI we are working on such a solution, using multiple processes that employ micro-algae and other microbial cultures.

We recognize the challenges of scaling up the production of biofuels to match the current supply and infrastructure of the fossil fuel industry -- for example the infrastructure that enables the consumption of 20.7 million barrels of petroleum in the U.S. every day and more than 2 trillion cubic feet of natural gas every month.

Nevertheless, we are optimistic we can pilot our liquid biofuels within two years and embark on large-scale production within five years. We are convinced that by using the biofuels we are pursuing we could successfully meet and beat the recently adopted standard of reducing gasoline consumption by 20% in ten years.

We are also confident that the technological approaches using carbon dioxide as a feedstock for our biofuels will go a long way toward accomplishing the zero net emission of carbon into the atmosphere

and enable the stabilization of the concentration of carbon dioxide in the atmosphere much below 550 parts per million.

However, to be successful we will need the support of the Administration and Congress to level the playing field in our competition with the fossil fuel industry by openly communicating the risks of continued reliance on imported fossil fuels and the dangers to our climate system from the burning of fossil fuels. We must quickly reach agreement on placing a value on emitted carbon. We also need to free the market for alternatives to fossil fuels from distortion by eliminating the tariffs on imported sugar and ethanol as well as the subsidies for corn-based ethanol.

We are also advocating sensible regulations for the emerging field of synthetic biology and for the new biofuels it will enable. Dr. Venter and his teams have since the earliest experiments in this field, been leading the public dialogue and education efforts about this new science. We along with those in academia, government and outside institutions have come together to discuss the potential associated risks and concerns and have demonstrated the appropriate measures that can safeguard against potential dangers. Finally, we encourage increases in the public funding of the associated basic research as well as for projects that can demonstrate the scaling-up of biofuels production.

President Kennedy said that “There are risks and costs to a program of action. But they are far less than the long-range risks and costs of comfortable inaction. Mr. Chairman and members of the Committee, the time has come for us to act by embracing and using the advances from biology and genomics to tackle our energy and environmental challenges.

Thank you for your time today. I’m happy to answer your questions.