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100% Renewable Energy for the Planet- A MAHB Dialogue with Planetary Scientist, Mark Jacobson

Geoffrey Holland

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This is an ongoing Q&A blog series focused on the need to embrace our common planetary citizenship.

One of the world's leading authorities on energy on the 21st Century looks at climate change, and the status of clean renewable technologies as the much needed gamechanger.

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Geoffrey Holland- Please talk about anthropogenic climate change. Is it real? If so, why are so many in denial?

Mark Jacobson- Yes, global warming, which is the increase in the Earth's average temperature above that caused by the natural greenhouse effect, is real and caused almost exclusively by humans. The near-surface air temperature rise in the past 150 years has been over 1 degree Celsius. The denialism is caused primarily by the fossil fuel industry, which has profited by selling oil, coal, gas, and its products. This industry has spread misinformation and campaigned to sow doubt. They have also paid politicians to vote against changes. As a result, the issue has

been categorized as a right versus left issue, thus a political issue, rather than a factual issue, making it difficult for many people to even listen to what scientists are saying.

GH-You led a global study of the Earth's wind resources. What were the findings of your survey?

MJ- There is enough wind to power the world's all-purpose energy needs seven times over.

GH- How does the current economics of wind technology compare to the cost of continuing our long-standing dependence on fossil fuels?

MJ- Right now, onshore wind in the United States is the lowest-cost form of new electric power across the country. Utility scale solar photovoltaics (PV) are second. Natural gas is third.

GH-Talk about the current state of solar energy technology. Have the economics become so competitive that our dependence on long entrenched fossil fuel and nuclear energy systems can no longer be justified?

MJ-Yes, the cost of solar PV in particular has dropped tremendously so that it is less expensive, at the utility scale, than the cost of new gas plants, new nuclear plants, or new coal plants. As such, moving forward, new solar should dominate over new fossil fuel sources of electricity.

GH- How much of an impact can improved efficiency have in reshaping the energy playing field over the next decade or two?

MJ-The potential for efficiency gains is enormous, particularly in buildings. People can change appliances and lightbulbs and weatherize their homes at relatively low cost compared with the benefits.

GH- Talk about geothermal, tidal, and other clean, renewable energy options that are on line or that soon will come on line. When these emerging options are fully developed and combined with wind and solar, is there any reason why any brand of polluting energy should remain part of the mix?

MJ- No, we believe the world can technically and cost-effectively be transitioned to 100% clean, renewable energy for all purposes.

GH-Some people still see a role for nuclear power. Given its high cost, inherit danger, and potential as a deadly target for terrorism, is there still a need for nuclear power?

MJ- No. Further, nuclear power is not being built in liberalized markets. The U.S. is building only one plant now, and that may not be completed. South Africa just pulled out of building any plants. Most of Europe is reducing the number of nuclear plants they have.

GH- The National Academy of Sciences recently released a report stating of all the warm-blooded mammalian bio-mass now on Earth, 60% is livestock raised for human consumption, 36% is human biomass, and only 4% is spread among all the wild mammalian species. Of all the birds remaining in Earth, 70% are poultry raised for consumption. Is a change in diet a simple way for every citizen to contribute to the fight against climate change?

MJ- Partly, but that is not enough. We need massive changes in every area of the energy infrastructure in addition to conservation and reducing energy demand.

GH- EV (electric) vehicles are emerging fast. In the Scandinavian, and other European countries, EVs are already very popular, and in some places are outselling gasoline powered vehicles. Do you see a tipping point coming for electric vehicles? If so, when?

MJ- Yes. Ultimately, all vehicles will be EV or hydrogen-fuel-cell-EV hybrids. I don't know when the tipping point will be, but when people begin to realize that their fueling cost goes down by a factor of 4 with an EV, they will never buy another fossil fuel car.

GH- Hydrogen is nature's answer as an energy carrier and a medium for storage on demand. The cost of hydrogen fuel cell technology is becoming increasingly competitive. Does hydrogen made from water electrolysis have a significant role in the world's clean energy mix?

Hydrogen will play a role primarily in transportation because, although hydrogen fuel cell vehicles are less efficient than electric vehicles, they are more efficient than gasoline vehicles. Hydrogen won't play so large of a role in stationary electric power because it is relatively wasteful to produce hydrogen from electricity then reproduce electricity from hydrogen

relative to, for example, storing electricity in a battery. However, the economics are changing quickly.

GH-California recently committed to go 100% renewable by 2045. Around the world, cities, and even some nations are making similar commitments. Given the increasing economic advantage of renewable technologies, will achieving 100% renewable take that long?

MJ-It doesn't have to if society puts its mind to it. We have 95% of the technologies in place. What is needed is a desire to change rapidly.

GH-What can each of us do as individuals to be the change we wish for?

MJ- Individuals can change appliances in their own homes, make their homes more energy efficient, reduce their energy use, and support policymakers who support clean, renewable energy. The key in a home is to eliminate gas and replace it with electricity provided by, for example, rooftop solar PV. Efficient electric appliances needed include heat pumps for air and water heating and air cooling, induction cooktop stoves, LED lights, and electric cars. Having a couple batteries in the home is also helpful.

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The MAHB Blog is a venture of the Millennium Alliance for Humanity and the Biosphere. Questions should be directed to joan@mahbonline.org