Laboratório Nacional de Ciência e Tecnologia do Bioetanol

CNPEM Centro Nacional de Pesquisa em Energia e Materiais

PALESTRA

Scaling Up Bioenergy: Sustainably and Soon

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Human well-being, or "prosperity", is strongly dependent on the rate at which we use energy (our power consumption). Currently about 85% of energy consumed world-wide is from non-renewable fossil sources: petroleum, natural gas and coal. When these finite and polluting fossil resources disappear, the prosperity derived from using them will also disappear. We have only a few decades to scale up renewable, sustainable energy to the tens of terawatts scale.

This sustainable energy transition is an enormous challenge that simply is not being taken seriously enough by most individuals, governments, corporations and research organizations.

Bioenergy, that is, solar energy captured through photosynthesis, is an essential part of the sustainability transition. Very large scale bioenergy is not optional if we are to enjoy sustainable long-term prosperity.

This presentation will provide a background for understanding the relationship between energy and prosperity. Historic growth rates of energy production systems will be analyzed to get a sense of the scale renewable energy systems must achieve within the next few decades.

Most bioenergy captured by photosynthesis is in the form of lignocellulosic materials. Hence converting cellulosic materials into modern energy carriers, electricity and mobility fuels, is critical. Over the past decade or two, several billions of dollars have been invested to learn how to convert cellulosic biomass to liquid fuels, with very limited success (to put it mildly). In contrast, biogas has shown rapid growth in the U. S., Italy and Germany.

The highly sustainable Italian biogas production model will be explored and comparisons will made with the liquid cellulosic biofuels systems being pursued in the U. S. and elsewhere. Biogas and biomethane can provide stored, dispatchable electricity to compensate for the intermittent and variable nature of solar and wind power, thereby helping solar and wind energy systems grow more rapidly. In addition, biomethane (as renewable compressed natural gas or RNG) can provide many mobility services.

If we are to achieve rapid growth rates for liquid cellulosic biofuels, the production models must change. What we are doing (at least in the U.S.) is not working and is unlikely to work as it must to quickly achieve the terawatt scale. Real, beneficial integration of bioenergy with agriculture must occur, and the food versus fuel conflict must be decisively resolved.

Logistics challenges for cellulosic biomass must also be resolved. Specifically, biomass is bulky, perishable, and difficult to store, handle and transport. These limitations must be overcome if liquid cellulosic biofuels are to scale rapidly. The potential role of the ammonia fiber expansion (AFEX™ process in overcoming these logistics and other roadblocks for liquid cellulosic biofuels will be explored.

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