Energy Quarterly

News and analysis on materials solutions to energy challenges
www.mrs.org/energy-quarterly

Inside:

EDITORIAL
Realizing true energy impact

ENERGY SECTOR ANALYSIS
Born in the lab: Hydrocarbon fuels ditch their fossil origins

ENERGY SECTOR ANALYSIS
Deep decarbonization faces deep challenges

"Born in the lab: Hydrocarbon fuels ditch their fossil origins"
Credit: Creative Commons Zero.

"Deep decarbonization faces deep challenges"
Credit: Stuart Williams, Flickr Creative Commons.

To suggest ideas for Energy Quarterly, to get involved, or for information on sponsorship, send email to **Bulletin@mrs.org**.

MRS Bulletin

Realizing true energy impact

To achieve energy sustainability by 2050, we need a radical shift in the process and goals of research. Under the 2016 Paris Agreement, 95 countries agreed to pursue efforts to limit the temperature increase to 1.5˚C above preindustrial levels. However, recent explorations of clean energy technologies highlight their inability to achieve such ambitious mitigation objectives. The most common questions often revolve around political drivers, rates of deployment, and scientific and economic viability of current technologies, spurring debate in the scientific community. Bill Gates's recent announcement of Breakthrough Energy Ventures speaks highly of the need for "investing in [scientific breakthroughs] and moving them from the lab to the market."

At the 2017 MRS Spring Meeting, a panel on *Materials Needs for Energy Sustainability by 2050* rallied around accelerating the transition from idea to implementation. While discussions centered on *what* research is needed (tailored catalysts; high energy density, low-cost storage; self-healing materials; thermoelectrics), more sparks flew when considering *how* research should be conducted. Ultimately, the concept that *researchers must think differently* yielded two key recommendations:

1. Researchers should think differently about the *goals* of research. As David Cahen, editor of *MRS Energy & Sustainability*, provoked in his panel introduction: "Let's assume that everything [the science] will work out.… You may be able to publish 20 papers in *Science* and *Nature* … but what then?" Similarly, Cherry Murray, Harvard University, said, "Industry will not fund applied fundamental science, which is somewhat curiosity driven."

As scientists, we are often driven by curiosity. In fact, science begets innovation due to its curious and exploratory nature. But what inspires that curiosity, and can it be channeled toward solving immediate challenges, rather than fundamental discovery?

Ellen Williams, drawing from her experience at BP and the US Department of Energy's Advanced Research Projects Agency-Energy (ARPA-E), suggested that a researcher consider how to "generate market and social pull for changing technologies." In the context of materials research, this can mean better performance at a lower cost or new functionality. Achieving this goal requires a shift in the research process, bringing us to the second recommendation.

2. Researchers should think differently about the *process* of research. Fundamental science is the basis by which we can do anything applied, but the timeline from development to deployment in materials science can take 10 to 20 years. New tool development, new partnerships, and new visions are critical to implementing new processes.

First, the computational and materials design tools that have gained traction in the last decade require more consistent implementation in research practices. Increased merging of state-of-the-art computer science, materials synthesis, and characterization with rapid prototyping and new manufacturing techniques is still needed.

Second, increased cross-disciplinary engagement in scientific, engineering, and manufacturing fields leads to more targeted and relevant innovations. As George Crabtree, University of Illinois at Chicago and Argonne National Laboratory, indicated, "We love to play in the lab. It's great without realizing … that you can't scale it. We're beginning to take that into account."

The relationship between materials development and social impact has brought energy to the forefront of the MRS community. When we consider how and why we conduct research in our respective areas of interest, we can rapidly advance toward our goals.

Kristen Brown

https://doi.org/10.1557/mrs.2017.189 Published online by Cambridge University Press