American Chemical Society

Sustainable Chemistry- Understanding the Policy Drivers

Raymond Garant
Director, Public Policy
Office of Public Affairs
Office of the Secretary and General Counsel
r_garant@acs.org

History of Green Chemistry Policy

1990—*Pollution Prevention Act* becomes law and starts series of EPA voluntary programs, research activities, and cooperative agreements in "alternative synthetic pathways

1995—Presidential Green Chemistry Challenge Awards established

1997—GCI established (joined ACS in 2001) and OECD and IUPAC begin green chemistry discussions

2001—*Small Business Pollution Prevention Act* proposes incentives for greening of dry cleaning chemicals and Massachusetts considers tax incentives for green chemistry R&D

2004—multi-faceted *Green Chemistry R&D* legislation first introduced in Congress

2008—California establishes Green Chemistry Initiative

2010—Congress adopts green chemistry language in COMPETES

Sustainable Chemistry at the National Science Foundation

- Green chemistry language included in a S&T reauthorization law in 2010 (COMPETES)
- Science, Engineering, and Education for Sustainability (SEES) program funded at $23 in FY 2015
- Expected to sunset in 2017
- SEES Postdoctoral Fellows Program – discontinued
- Sustainable Chemistry, Engineering, and Materials (SusChEM) research program receives majority of funding leftover from SEES.

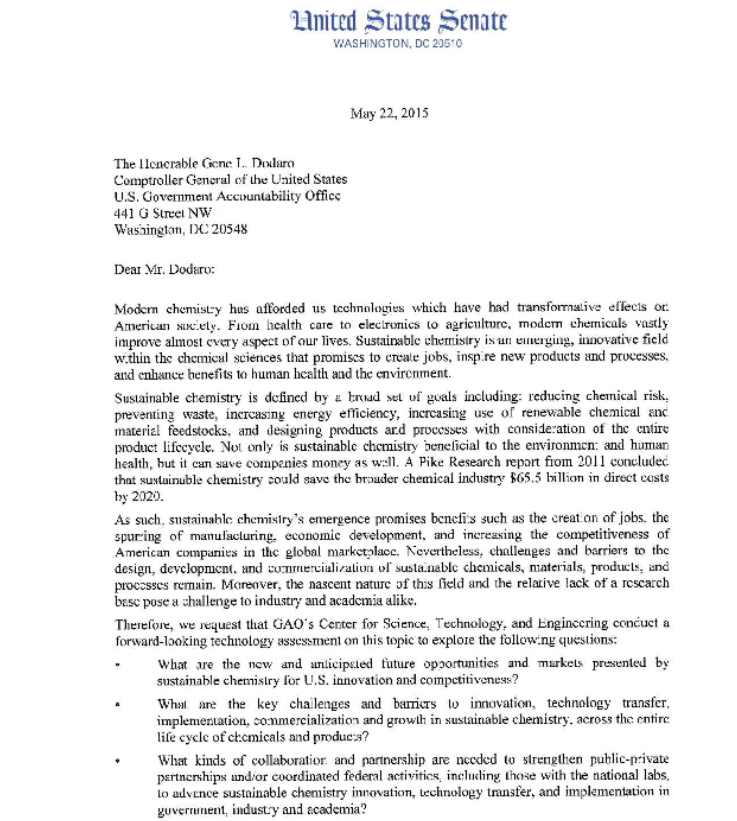
National Science Foundation
WHERE DISCOVERIES BEGIN

The Sustainable Chemistry R&D Act (S.1447)

- Expands support for green and sustainable chemistry within the federal government, including public private partnerships
- Creates a presidential council to coordinate research between federal agencies
- Requests a broad federal study of sustainable chemistry to needs and challenges
- Works toward a national strategy for advancing sustainable chemistry research

Government Accountability Office Study on Sustainable Chemistry

- Requested by Senators Chris Coons (D-DE), Susan Collins (R-ME), and Ed Markey (D-MA)
- Launched in late 2015
- Report expected in mid-2017
- Workshop on Sustainable Chemistry Technologies in May, 2016
- GAO study team reaching out to the community for feedback
- ACS is supporting this effort



United States Senate
WASHINGTON, DC 20510

May 22, 2015

The Honorable Gene L. Dodaro
Comptroller General of the United States
U.S. Government Accountability Office
441 G Street NW
Washington, DC 20548

Dear Mr. Dodaro:

Modern chemistry has afforded us technologies which have had transformative effects on American society. From health care to electronics to agriculture, modern chemicals vastly improve almost every aspect of our lives. Sustainable chemistry is an emerging, innovative field within the chemical sciences that promises to create jobs, inspire new products and processes, and enhance benefits to human health and the environment.

Sustainable chemistry is defined by a broad set of goals including: reducing chemical risk, preventing waste, increasing energy efficiency, increasing use of renewable chemical and material feedstocks, and designing products and processes with consideration of the entire product lifecycle. Not only is sustainable chemistry beneficial to the environment and human health, but it can save companies money as well. A Pike Research report from 2011 concluded that sustainable chemistry could save the broader chemical industry $65.5 billion in direct costs by 2020.

As such, sustainable chemistry's emergence promises benefits such as the creation of jobs, the spurring of manufacturing, economic development, and increasing the competitiveness of American companies in the global marketplace. Nevertheless, challenges and barriers to the design, development, and commercialization of sustainable chemicals, materials, products, and processes remain. Moreover, the nascent nature of this field and the relative lack of a research base pose a challenge to industry and academia alike.

Therefore, we request that GAO's Center for Science, Technology, and Engineering conduct a forward-looking technology assessment on this topic to explore the following questions:

- What are the new and anticipated future opportunities and markets presented by sustainable chemistry for U.S. innovation and competitiveness?
- What are the key challenges and barriers to innovation, technology transfer, implementation, commercialization and growth in sustainable chemistry, across the entire life cycle of chemicals and products?
- What kinds of collaboration and partnership are needed to strengthen public-private partnerships and/or coordinated federal activities, including those with the national labs, to advance sustainable chemistry innovation, technology transfer, and implementation in government, industry and academia?

COMMENT

TSCA reform and changing our practice of chemistry

ANTHONY NOCE, CHAIR, ACS COMMITTEE ON ENVIRONMENTAL IMPROVEMENT

The vision of the ACS Committee on Environmental Improvement (CEI) is "a sustainable world enabled through the sustainable practice and use of chemistry." We work to accomplish this through our mission to "advance sustainability thinking and practice across ACS and society for the benefit of Earth and its people." At this time, I can think of no more important focus for our efforts to achieve a sustainable chemical enterprise than the effective implementation of an amended Toxic Substances Control Act (TSCA).

The state of science has outstripped the original TSCA passed 40 years ago. An amended TSCA has not yet been enacted into law as this commentary went to press, but all signs point to agreement on TSCA reauthorization this year. This is good, as a great deal is riding on Congress getting TSCA right.

At its heart, TSCA reform is all about good business practices and harnessing industry's ability to develop data to provide the Environmental Protection Agency and the public with the information needed to make informed decisions about chemical safety. It recognizes the promise of moving from our current animal-based testing approach to a more informative and efficient Toxicology in the 21st Century (Tox21)-based approach. Tox21 is a collaboration among several federal agencies to develop better toxicity assessment methods to quickly and efficiently test whether certain chemical compounds have the potential to disrupt processes in the human body that may lead to negative health effects. The transition to a Tox21-based approach will take place over time as the technology evolves and is shown to be as good as, or better than, the current approach and confidence is gained that the technology can be safely applied.

There is a focus on EPA stipulating outcomes, time frames, and other measures of success, as well as holding the agency accountable for implementation, but TSCA has major implications and benefits for all associated with the chemical enterprise. The proposed provisions will have major impacts on the research, funding, and work of various government agencies, universities, industries, and nongovernmental organizations (NGOs). Much needs to be done across the chemical enterprise. Chemists need to be involved if we are to develop, evaluate, and apply the tools, techniques, and assessment approaches necessary to realize the promise of a modernized TSCA that provides for an efficient and informative "fit for purpose" chemical safety program.

Turning the vision of a reformed TSCA into reality as a more practical and efficient regulatory model will require sustained funding for efforts across the entire chemical enterprise to create the capacity to implement the law effectively. This will require developing the means to target our testing and safety evaluation on the information needed using human-focused, predictive tests rather than a check-box list of largely uninformative animal tests. Once this new system is in place, there will be huge savings in testing costs that will more than justify the up-front costs needed to develop the capability to conduct informative and efficient testing.

As chair of CEI, I would ask that ACS members engage at a variety of levels to help move toward a more sustainable practice and use of chemistry. One way to do this is to regularly engage with your government leaders and elected representatives on scientific issues, particularly in light of the newly formed Congressional Chemistry Caucus. All too often there is a huge gap between scientists and policy-makers, and it takes more than an occasional briefing to be viewed as a resource—and even more than that to get the commitment of policy-makers. Ongoing dialogue focused on the issues in simple direct terms is required to convey how science can best be used to implement TSCA and why sustained funding for the implementation of a modernized TSCA, particularly with regard to chemical screening and follow-up testing, is important for public health, the environment, and our economy. Useful benchmarks need to be created against which progress can be measured to show that the investments in research and development have paid off in terms of a more efficient and informative chemical management regulatory program.

We need to convey that even though science is essential to a better future, efforts proceed at different time frames. It is important to set reasonable expectations for EPA and others to avoid setting them up for failure. Working in concert with other stakeholders with different goals and priorities such as the National Institutes of Health, the Food & Drug Administration, universities, NGOs, and the private sector, EPA has made great progress in realizing the vision for toxicity testing in the 21st century. Identifying chemicals that may be of concern and what testing is needed to see if those concerns are real requires a continuing commitment from all to screening chemicals on the TSCA inventory for biological activity and interpreting that activity to empower more effective and rational chemical management.

Developing the means to use state-of-the-art approaches to inform regulatory decisions will take time and require much higher confidence in the approaches than currently exists. EPA will need to work with its current scientific partners and also expand its efforts to address the social, economic, and legal communities in lockstep with the science. It is reasonable to expect that this will take time and that it will involve setbacks. ACS members can help the agency stay the course by recognizing this reality and helping to support and communicate the progress toward a more sustainable testing approach while creatively engaging others to overcome the obstacles to full implementation. Let's take this opportunity to change our practice of chemistry for the better.

Views expressed on this page are those of the author and not necessarily those of ACS.

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The Frank R. Lautenberg Chemical Safety Act (TSCA Reauthorization)

- Repairs a law that has been flawed since its introduction in 1976
- Revises EPA threshold for regulating chemical substances to only consider “unreasonable risk” to human health and environment
  - Limits cost/benefit to risk management decisions
- Requires EPA to make a determination for all new chemicals prior to introduction with same “unreasonable risk” standard
- Expands EPA’s ability to compel testing
- Directs EPA to prioritize chemicals for review and management and establishes deadlines
  - 3 year review window and required risk management rule if “unreasonable risk” standard is met
- Partial pre-emption of state chemical-regulatory action
  - All state actions prior to April 22, 2016 are not pre-empted.

Policy Drivers

- Regulation
- Research support
- Manufacturing centers
- Scale-up support
- Voluntary programs
- Standards
- Incentives (e.g., tax, regulatory)
- Workforce
- Coordination
- Data Collection
- Awards and Prizes
- Alternatives development
- Preferential purchasing

ACS Policy Statements

- Risk Assessment and Regulatory Decision Making
- Sustainability in the Chemistry Enterprise
- Regulation of Laboratory Waste
- Inherently Safer Technology
- Biomonitoring
- Endocrine Disruption
- Water Treatment

Policy Issues

- Green chemistry v. Sustainable chemistry
- Regulation (Toxic Use Reduction) v. Technology (Innovation)
- Mandatory v. Voluntary
- Federal v. State (v. International)
- Banning certain chemical use v. Alternatives development
- Burden of Proof and changes in chemicals testing (toxicology)

Discussion

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