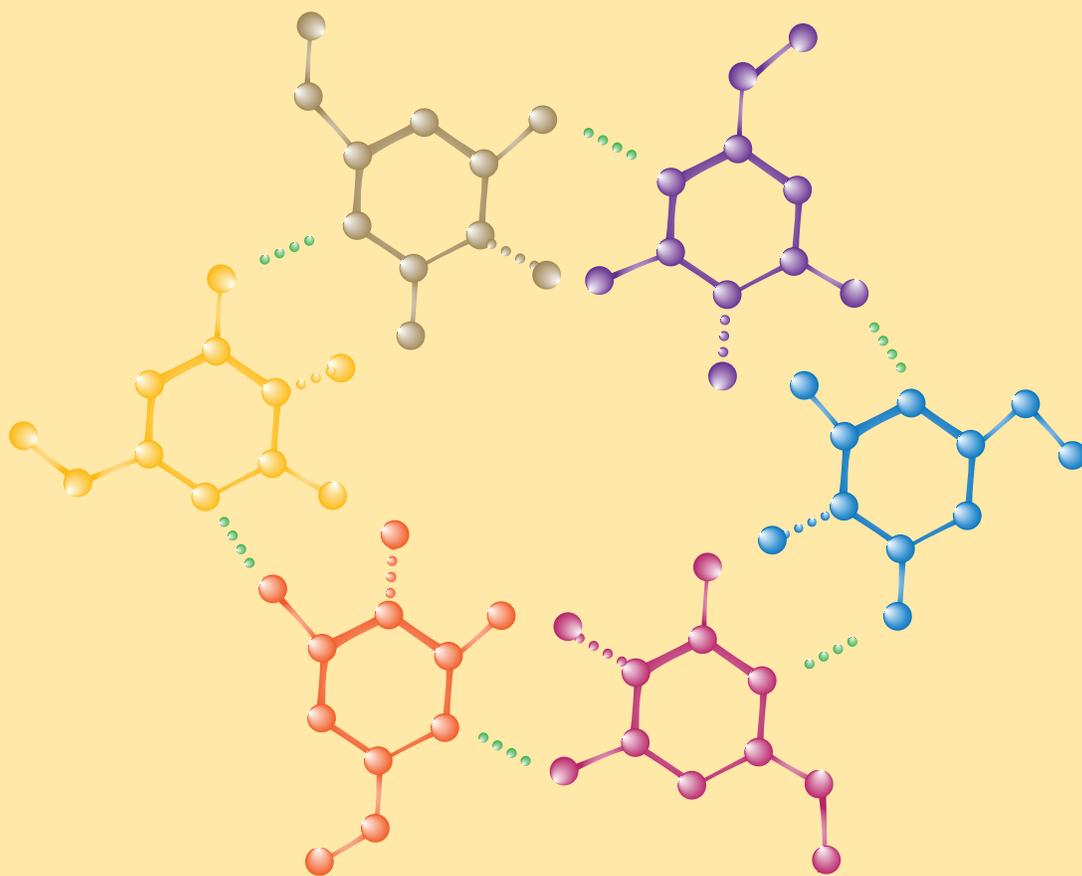


US EPA ARCHIVE DOCUMENT

New England Green Chemistry 2011/2012 Strategic Report



designing chemicals and processes that
reduce or eliminate hazardous substances

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Introduction

Green chemistry provides a framework for a sustainable future by adopting safer practices and using less hazardous and non-toxic chemicals. It is the design of chemical products and processes without compounds hazardous to human health and the environment, that eliminates the need to protect humans and the environment against these exposures and stops and/or reduces waste before it is generated. The principles as described by Paul Anastas and John Warner in “Green Chemistry: Theory and Practice” teach how to design safer chemicals and products in the first place. These principles go to the very heart of sustainability and will strengthen the economy through the development of new chemistry, protecting the planet from toxic and hazardous materials and protecting public health.

The New England Green Chemistry Challenge was launched in 2010 by U.S. EPA Region I with support from EPA’s Office of Research and Development. This Challenge is a collaborative effort with green chemistry leaders from New England State Governments, industry, academia and non-governmental organizations. The goal is to advance the knowledge and practice of green chemistry principles in business, education, and government. The Challenge is a catalyst to grow a sustainable economy through green chemistry in New England and beyond.

This Strategy Report presents ideas to consider in 2011-2012. These objectives and activities originate from the green chemistry stakeholders that took part in the Forum in December and in their continued work through the winter. The next step is to share these ideas and determine how, working collaboratively, we can begin implementation.

Background

Convening History

In the summer and fall of 2010, EPA Region 1 convened a Green Chemistry Coordinating Committee. The committee was comprised of true green chemistry advocates and practitioners from government, business, education (K-12 and colleges/universities), and non-governmental organizations (NGOs) and chaired by Curt Spalding, U.S. EPA, and John Warner, Warner Babcock Institute of Green Chemistry.

To advance the goals of the New England Green Chemistry, the Coordinating Committee identified six sector based strategic groups:

- Policy (Government)
- Production & Work (Business),
- Investment & Development (Venture/Investment),
- Education (K-12, Colleges & Universities),
- Advocacy & Demand (Non-Government Organizations), and
- Healthcare (Environmental Health Organizations)

The six strategic groups convened at the New England Green Chemistry Networking Forum that was held in December 2010. These groups continued their work during the winter of 2010-2011, prioritizing ideas for activities, projects, and initiatives to promote and advance green chemistry. The table below identifies the strategic groups and their co-chairs. Support was provided by U.S. EPA Region 1 staff and facilitators from the Consensus Building Institute.

The New England Green Chemistry Challenge will strive to:

- Increase awareness and understanding of green chemistry.
- Understand the interrelationship of green chemistry and sustainability.
- Build consensus among government, business, education and other interest groups to focus energy towards a safer, greener approach.
- Support a transformative dialogue about new ways to achieve a safe and green sustainable future.
- Foster a New England economy that is based on local resources, labor force, research capacity and expert knowledge.
- Stimulate the New England economy and increase employment through innovative, green approaches to manufacturing and investment in new green businesses.
- Catalyze the prosperity of New England businesses and ensuring their sustainability through green solutions.

Sectors & Participants

Government

Co-Chairs: R. Enander, RIDEM; T. Goldberg, NEWMOA; D. Peavey, U.S. EPA

Project Support: C. Hayek, U.S. EPA; R. Smith, NEWMOA; N. Starman, U.S. EPA

Committee Members: T. Balf, MassBio; E. Beach, Yale University; R. Bizzozero, MAOTA; J. Churchill, MEDEP; S. D'Agostino, NHDES; M. DiGiore, NJDEP; J. Ewalt, NJDEP; R. Gagnon, RIDEM; J. Gilheaney, RIMES; G. Gulka, VTDEC; L. Harriman, TURI; P. Hogan, Suffolk University; R. Kaliszewski, CTDEP; D. Knight, NYDEC; J. Leazer, EPA ORD Cincinnati; A. Leiby, U.S. EPA; P. Lockwood, NHDES; J. McCaughey, NBC; B. Meer, NYSDEC; S. Nejame, Promotum; M. Ochs, U.S. EPA; E. Park, URI; A. Potter, NYDEC; J. Tickner, Lowell Center for Sustainable Production; Y. Torrie, Lowell Center for Sustainable Production; C. Young, Corinne Young LLC; D. Young, EPA ORD

Education

Co-Chairs: Amy Cannon, Beyond Benign; Irv Levy, Gordon College; Edward Brush of Bridgewater State University

Participants: Marcy Vozzella, Northern Essex Community College; Bill Heineman, Northern Essex Community College; David Green, Gordon College; Ken Hallenbeck Gordon College; Dwight Tshudy Gordon College; Suzanne Pisano, GeoInsight, Inc.; Nancy Lee, Simmons College; Richard Gurney of Simmons College; David Hartleb, Northern Essex Community College; Ryan Bouldin, Umass Lowell; Brenton DeBoef, University of Rhode Island; George Ruger, NickPAK; Sheryl Rosner, U.S. EPA; Alexander Pancic, Odyssey High School; Fenna Hanes, New England Board of Higher Education; Nick Schepker, New England Board of Higher Education; Jimmy Hauri, Assumption College; Katherine Woodward U.S. EPA; Steve Theberge, Merrimack College; Margaret Kerr, Worcester State University; Denyce Wicht, Suffolk University; Meghna Dilip, Worcester State University; Yango Du, MIT; Beverly Migliore, RI DEM; Therese Natoli, STMHS; Ann Lambert, King Philip High School; Marina Goreau, Brandeis University; Karim Ahmed, UCON; Brenda Atchison, One Studio Alliance; Crystal Atchison, M.C.A.E.; Aida Potter NYS DEC; Deb Knight, NYS DEC; Elham Ghabbour, Northeastern University; Laura Goldin; Brandeis University; Robin Organ, Green Schools; Nikita Obidin; Beyond Benign; Laura Kilman, Boston College; Nicholas Anastas, UMASS Boston

Business/Industry

Co-Chairs: Michael McGee, Nypro; Michael Korzenski, ATMI; Berkeley W. Cue, Jr., PhD, BWC Pharma Consulting, LLC

Participants: Michael A. Buczynski, Church & Dwight Co.; Dana Buske, Tech Environmental; Albert Cabral, Hightower Cleaning; Melissa Coffin, LCSP; Al Cotton, Nypro Inc.; Linda Darveau U.S. EPA; Jeffrey Davis Hubbard-Hall Inc; Daniel Doe, ITW Plexus; Bill Dorogy, Warner Babcock; Michaela Duffy, Congressman John Tierney; Pam Eliason, Toxics Use Reduction Institute; Amy Essenfeld, Cytec Industries Inc; Bob Farrell, Hubbard-Hall Inc; Lisa Fitzpatrick, Kifor Development; Patrick Foley, Yale; Chris Ford, BAE; Scott Fortier, MA OTA; Andrea Glass, MD Stetson; Charles Harewood, EPA; Alice Hartley, MIT Sloan; Timothy F.

Sectors & Participants (cont.)

Havel, Energy Compression Inc; Robert Hilliger, EPA; Robert Howard, Weeset Advisors; Kathleen Hurley, Actio Software; Eric Kemp-Benedict, Stockholm Environment Institute; Reid Lavoie, Wheaton College; Ira W. Leighton EPA; Susan Leite, MIT; Lisa Lillelund, Mango Networks; John Marsella, Air Products; Robert McKay, SABIC Innovative Plastics; Martha Mittelstaedt, ITW Plexus; Gus Ogunbameru, MA OTA ; Calvin Patten ITW Devcon; Rose Perkins, The Dow Chemical Co.; Emily Peterson , Amgen; Adam Powell, Moxst Sergio Quadros Cleanergie; Rick Reibstein, MA OTA; Kim Reynolds Reid Gradient; Gene Ricciardelli, MD Stetson; Ruthann Rudel, Silent Spring Institute; Lynne Santos, Air Quality Association; Jim Shelmur, Szmanda & Shelmur LLC; Andy Simon, Union Street Brand Packaging, Charles Szmanda Szmanda & Shelmur LLC; Beth Termin US EPA, Office of Policy and Region I; Bethany Vasecka, Gradient; Vesela Veleva, Boston College; David Wawer ,MCTA; Michael Williams Nypro Inc.; Anahita Williamson NYSP2I; Martin Wolf , Seventh Generation; Sandra Wyman , Pollution Prevention Consulting; Beth Zonis, Eco Marketing LLC; William Bardosh, Terra Verdae

Venture/Investment

Co-Chairs: Robert Bettigole, Elm Street Ventures; Chesley Chen, Burma Road Ventures

Participants: Dan Gray, URI; Richard Liroff Investor Environmental Health Network; Michael Gonzalez US EPA – ORD; Patrick Kenney Green Harvest Technologies; Andrew Soare, Lux Research; Amy Perlmutter, Perlmutter Associates; Brenden Tong, Emmanuel College; Patrick Sheldon Beyond Benign; Barry Lewin Gottlieb, Rackman, Reisman; Alexander Raykhman Ultimo Management; Frank Lubrano, Ultimo Management; Ramaswamy Nagaraja, Umass, Lowell; Pete Myers, Environmental Health Sciences; Jonathan Rochford, Umass Boston

Advocacy

Co-Chairs: Ken Geiser, Lowell Center for Sustainable Production; Mark Rossi, Clean Production Action

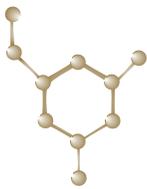
Participants: Cindy Luppi, Clean Water Action; Craig Slatin, Umass Lowell; Chris Beling, EPA; Mike Belliveau, Environmental Health Strategy Center

Health Care

Co-Chair: Bill Ravanese, Health Care Without Harm, Working Group

Participants: Janet Bowen EPA; Gary Cohen Health Care Without Harm, Working Group Co-Chair; Amy Collins, MetroWest Medical Center/Vanguard Health Systems; Dan Dancause, Beth Israel Deaconess Medical Center (BIDMC); Will Decanecs, BIDMC; Kristen Entwistle, Gordon College; Meredith Lee, BIDMC; Amy Lipman, BIDMC; Natalie Lowell, Beyond Benign; Janet Matlaw, BIDMC; Beth Rosenberg, Tufts University; Wei Shi, BIDMC; Katrina Thistle, Beyond Benign; Bob Walsh, Partners Health Care

Sector Reports



GREEN CHEMISTRY
for Health Care



GREEN CHEMISTRY
for Business



GREEN CHEMISTRY
for Government



GREEN CHEMISTRY
for Education



GREEN CHEMISTRY
for Investment



GREEN CHEMISTRY
for Advocacy

Government

Memorandum

Date: May 4, 2011

*To: Curt Spalding, Regional Administrator
EPA New England, Region 1*

From: Green Chemistry Government Programs and Strategies Workgroup

Subject: Final Recommendations for Regional Green Chemistry Government Initiatives

The Government Programs and Strategies Workgroup is herewith submitting a final, amended list of recommendations relating to government initiatives and strategies that can be used to advance green chemistry in the region. We are also forwarding a “summary table” of ongoing/recent past (1 to 5 years) green chemistry and green engineering-related activities reported by environmental agencies in the Northeast; data were collected through a comprehensive regional effort that employed a standard reporting template (sample template is available). The baseline information presented in the summary table (Table 1) contains both regulatory and non-regulatory initiatives and is arranged by frequency of activity across state programs.

The amended list of recommendations (below) builds upon and supersedes the previously submitted version; the list results from a final review and discussion of information reported by state programs. In addition to supplemental action items added to the first bullet, two major recommendations are made concerning the creation of an Industry Green Chemistry Challenge Program and Environmentally Preferable Purchasing Initiative. The Workgroup also identified what it considers to be the top three priorities. With this submission, the Government Workgroup believes that it has fulfilled the New England Green Chemistry Coordinating Committee’s charge to 1) develop a baseline inventory of green chemistry and green engineering-related activities, and 2) generate and prioritize ideas for new activities, projects, and initiatives to promote and advance green chemistry in the region. Members of the Workgroup look forward to EPA’s review and response to the recommendations submitted.

Project Recommendations to EPA Region 1 from the Northeast Green Chemistry Government Programs and Strategies Workgroup - May 4, 2011

The following recommendations focus on the design and application of new chemistries and processes—green chemistry—as well as the assessment and implementation of safer alternatives to chemistries of concern.

Support Integration of Green Chemistry and Green Engineering into Existing State Agency Capacity Across Appropriate Programs (Priority 1)

- Provide flexibility to allow funding—under new and existing programs—for green chemistry and green engineering to advance the implementation of green/sustainable materials, chemicals, products, and processes
- Allocate specific funds, where available, to states for green chemistry and green engineering activities (e.g., state assistance, research, and procurement programs)
- Partner with other federal agencies to advance green chemistry and identify additional funding opportunities
- Provide support for integration of green chemistry into state assistance programs, clean technology centers, and manufacturing extension partnerships (MEPs)
- Support informed substitution of safer alternatives and integrate into environmental media programs
- Specify targeted areas for green chemistry support based on potential to stimulate the economy and new ventures in sectors benefiting the Northeast
- Support at least one regional economic development activity around green chemistry development and application
- Reduce/eliminate barriers to green chemistry by reviewing and improving state regulatory frameworks
- Link Supplemental Environmental Projects to green chemistry initiatives to turn fines/enforcement into progress and innovation

Note: The NE State P2 and other assistance programs have working relationships with a variety of business and industry sectors seeking green solutions. State programs need to develop individual green chemistry capacity, which is jeopardized by current program funding.

Develop Northeast Green Chemistry and Green Engineering Awards and Industry Challenge Programs (Priority 2)

Awards Program

- Recognize and reward green chemistry and green engineering accomplishments in the region

- Integrate and expand the EPA Environmental Merit Awards Program to include broad and inclusive green chemistry and green engineering recognition categories, including state programs, industry, startups, non-profits, and educational programs
- Screen nominees to identify potential projects for the national Presidential Green Chemistry and Green Engineering Awards Program
- Connect awards categories to regional environmental and economic priorities
- Create a changing focus for awards
- Screen northeast award nominations, initially at the state level and have northeast state programs participate on the selection panel for the awards
- Market awards program through branding, labeling, and press releases

Industry Challenge Program

- Challenge the leadership of selected corporations, from priority industry sectors, to apply the 12 principles of green chemistry to their operations with periodic, quantitative reporting on advancements
- Create a regional green chemistry challenge for industry modeled after the successful EPA 33/50 Program; initiative should allow industry to determine chemical/process focus areas with public reporting and not set chemical specific targets
- Coordinate this program with the National Pollution Prevention Roundtable (NPPR) in order to be as consistent as possible with NPPR's proposed national toxic chemical reduction challenge
- Require participants in the challenge to publically report their accomplishments and create an online system to facilitate such reporting
- Select companies located in the Northeast for participation in the regional initiative, providing appropriate incentives (e.g., recognition, opportunities to partner with green chemistry institutes/ORD)

Notes: 1) The expansion of the NE Environmental Merit Awards Program could be a model for other regions and states. 2) The Green Chemistry Awards and Industry Challenge programs should be complimentary and synergistic. For reference, the EPA voluntary 33/50 Program targeted 17 priority chemicals for reduction in the late 1980s and 1990s. During this program, facilities "reduced releases and transfers of 33/50 chemicals by 50 percent from 1988 to 1995 and reported more source reduction activity (pollution prevention) for 33/50 chemicals than for other TRI chemicals." (www.epa.gov/opptintr/3350/33fin01.htm)

Regional Green Chemistry and Green Engineering Social Media/Topic Hub (Priority 3)

- Create a green chemistry and green engineering social media resource and portal to connect people using webinars, trainings, news items, and peer information exchange
- Focus on visibility and transferability of research and projects
- Include a help center, listing of available ORD grants/contracts, standardization/validation initiatives (see below), GC Awards, and Topic Hub
- Use social media resource to identify barriers, information, trainings, and other needs that EPA ORD could address through their programs and resources
- Provide a green chemistry and green engineering clearinghouse of state technical assistance capacities and efforts and link to needs in the region so as to create synergies in efforts

Support an ORD and Northeast Partnership in Green Chemistry and Green Engineering Research Initiative for the Development of Greener, Safer, and Sustainable Chemistries

- Create a vehicle for partnerships around particular green chemistry challenges that require further research and development, and application
- Tie to technical assistance and industry partnership activities in the states
- Give preference to green chemistry and green engineering needs in the northeast (e.g., green cleaners for hospitals, schools, and public agencies)
- Request proposals for current chemicals of concern (Northeast states could provide a list of targeted chemicals)
- Establish an expert panel/technical help unit from EPA, states, and the private sector that are willing to assist with green chemistry and green engineering answers and solutions, and promote through the social media platform

Establish an EPA—NE States Partnership for Collaboration, Standardization and Validation of Green Chemistry and Green Engineering Alternatives

- Help NE states verify green claims for chemistries and/or processes and coordinate among assistance providers
- Support alternatives assessments for chemicals of concern in the region
- Validate available green alternatives for chemicals listed by federal and state agencies
- Establish consistent approaches to consider life cycle impacts of alternative chemistries
- Establish criteria for validation of hazard analysis, life cycle assessment, and alternative safer, greener products and chemicals
- Standardize the evaluation of alternative green chemicals and establish a methodology-protocol verification program
- Create partnership with ASTM or other standard setting group
- Develop criteria to measure whether projects are moving towards green chemistry
- Develop tools to advance green chemistry and safer alternatives—assess and compare chemical hazards and define lower hazard or “safer”
- Establish consistent processes for alternatives assessment and green chemistry review, particularly design review for new chemistries

Environmentally Preferable Purchasing (EPP)

- Develop and share with federal/state agency and industry purchasing authorities model procurement guidance, fact sheets, green purchasing standards, and goals/planning for toxic and hazardous chemicals use reduction
- Transfer lessons learned on federal compliance with Executive Order 13423 (Strengthening Federal Environmental, Energy, and Transportation Management, March, 2007—Sections VII Acquisition and Green Product Designations and VIII Pollution Prevention and Management of Toxic and Hazardous Materials) to northeast state agencies
- Develop metrics for measuring regional state and federal progress in EPP

Green Chemistry and Green Engineering-Related Activities Reported by State Environmental Protection Agencies in the Northeast

State		Connecticut	Maine	Massachusetts	MA OTA	MA DEP	TURI	New Hampshire	Rhode Island	Vermont	New Jersey	New York
Example Industry Sectors	Outreach/ Research Grants						✓					
	POTW Initiatives					✓			✓			
	Healthy Homes	✓					✓					
	Vocational/Technical School Initiatives				✓				✓			
	Toxics in Packaging	✓*						✓*	✓*			✓
	Consumer Outreach/Education	✓					✓	✓				✓
	P2 TUR Planning		✓		✓	✓*	✓				✓*	
	Chemical Specific/Industry/	✓*	✓*		✓		✓				✓*	
	NIST/MEP Assistance	✓	✓					✓	✓	✓		✓
	Recognition/Governor Award/Certification	✓	✓					✓	✓	✓		✓
	University-Based GC Initiatives	✓			✓		✓	✓	✓		✓	✓
	IMERC	✓*	✓*			✓*		✓*	✓*	✓*	✓*	✓*
	Interstate Chemical Clearinghouse-	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
	Publications/Websites	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
	Environmentally Preferable Purchasing	✓*		✓**	✓	✓	✓	✓	✓*	✓	✓/✓*	✓
	On-site Industry Assistance/Industry	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
	Autobody/Auto Repair	✓	✓		✓		✓	✓	✓	✓	✓	
	Green Hotels/Hospitality/	✓	✓					✓	✓	✓	✓	✓
	Dry Cleaners	✓	✓		✓	✓*	✓				✓	✓
Marinas	✓	✓	✓**				✓	✓	✓	✓	✓	
Golf Courses								✓	✓			
Hospitals/Health Care	✓						✓	✓				

- NOTES:**
- 1) NEWMOA is an integral part of many of the Northeast states initiatives listed in this Table including IMERC, IC2, conferences, workshops, publications, and website resources.
 - 2) The "Chemical Specific/Industry/Consumer Protection" column indicates a range of state reported activities targeted to specific chemicals used in industry or by consumers.
 - 3) EPP includes green cleaner and school-based initiatives.
- ✓ = Nonregulatory initiative
 ✓* = Regulatory initiative
 ✓** = Developed & implemented by different state agency

Education

December 22, 2010

Proposed Name: GCEDNet New England

The GCEDNet (Green Chemistry Education Network) is a group of stakeholders interested in advancing green chemistry education worldwide. The Network has a website dedicated to promoting and disseminating green chemistry educational resources through chat rooms, blogs and other web resources: <http://cmetim.ning.com/>. The GCEDNet New England can use existing GCEDNet resources as a launching point for a New England network of educators and stakeholders. GCEDNet New England will report back to the GCEDNet to ensure the dissemination of resources, and lessons learned. When appropriate, the New England group will leverage GCEDNet resources to enable or to help catalyze an event or activity.

Summary

This report is written as a summary about the Education Sub Group activities to date. The report outlines the core purpose of the education sub-group work, along with strategies for implementing green chemistry education in the New England region.

Core Purpose

The core purpose of GCEDNet New England is to develop a collaborative, multidisciplinary community of educators empowered with the knowledge and resources to educate a workforce grounded in the principles of green chemistry and sustainability in order to meet the needs of our global society.

The EPA has targeted region 1 to be a national leader in green chemistry and sustainability education, outreach and workforce preparation. The education subcommittee hopes to provide educators at all academic levels and disciplines in the New England Region with the ability to engage students and the public in green chemistry and sustainability education.

Six Strategic Themes

Six areas were identified as key strategic themes for implementation and dissemination of green chemistry in educational institutions throughout New England: Community, Assessment, Public Relations, Fundraising, Education (Primary, Secondary and Higher), and Level-Specific Educational Resources. It is envisioned that each of these six key themes will have one person to lead the efforts and to ensure progress to advance the theme. Each of the six themes has target objectives, which are outlined below. Optimally, the theme leader will champion an objective and recruit other leaders for each objective in their theme.

Community

The goal of this theme is to organize and sustain a multidisciplinary and highly collaborative community of educators and stakeholders around the topic of green chemistry education. The community will be empowered to adopt green chemistry practices and will be leveraged for further dissemination of green chemistry educational resources. The five main objectives of this theme are as follows:

- Maintain an inventory of community members – Collect and maintain contacts of community members in green chemistry education in New England
- Promotion, recruitment and conversion – Promote green chemistry education in New England, recruit and convert new community members through professional development training, awareness and PR initiatives

- Empower individuals with tools and resources – Provide access to tools and resources for educators at all levels to ensure easy adoption of green chemistry into classrooms and laboratories
- Foster professional development- – Provide professional development for educators of all levels and disciplines on the content and curriculum of green chemistry, in order to create and disseminate new resources, and recruit new members of the community.
- Create GC Regional Centers of Excellence - Create regional centers of excellence that can act as hubs for green chemistry information, training and dissemination. Each Center would be connected to local community members in their region.

Assessment

The goal of this theme is to ensure the assessment of educational practices and resources to measure the impact of green chemistry education on students and educators of all levels, and to use the assessment to effectively leverage the advancement of green chemistry education. The two main objectives of this theme are as follows:

- Develop methods for detailed and high level assessment – Design and implement means for assessing the impact of green chemistry education on students of all levels.
- Champion methods to encourage and accelerate innovation – Find ways to encourage innovative solutions for green chemistry education at all levels and ways to accelerate the innovation process and leverage resources.

Public Relations

The goal of this theme is to develop a public relations strategy to provide awareness of green chemistry through regional events and the effective marketing of activities within the group. The three main objectives of this theme are as follows:

- Organize and coordinate regional events for maximum awareness and PR – Plan regional events for the awareness and dissemination of green chemistry education. For example, hosting a green chemistry science fair, development of region 1 EPA green chemistry challenge awards, coordinating an event to coincide with Earth Day festivities or National Chemistry week, etc.
- Develop and continually refine marketing strategy – Develop, continuously refine and update a marketing strategy to effectively disseminate information about green chemistry educational events, curriculum, and resources and to a wide audience and ensure the most current information and strategies are being used.
- Develop media kit - Develop a media kit that can be used to promote the activities of the Education Sub-Group.

Fundraising

The goal of this theme is to create a fundraising initiative to support the green chemistry educational strategies and activities by maintaining an inventory of projects and matching the projects to funding opportunities. The three main objectives of this theme are as follows:

- Create mechanism to categorize and prioritize active projects – An accounting mechanism for prioritizing and categorizing projects, along with a tracking system for the projects, allowing to track current active projects, future projects and completed projects.

- Maintain inventory/calendar of Requests for Proposals (RFPs) – Inventorying calls for proposals and funding opportunities and keeping an up to date calendar of deadlines for funding opportunities.
- Actively match projects to opportunities – Using the list of community members, prioritized projects, and RFP inventory and calendar, match funding opportunities with projects in the community.

Education – Primary, Secondary and Higher

The goal of this theme is to advance green chemistry education through primary, secondary and higher education by providing the expertise, resources, opportunities, strategies and tools to educators at all levels and disciplines. The six main objectives of this theme are as follows:

- Evaluate, refine, advocate, and infuse GC in state standards and accreditations – Determine the best path forward for adoption and inclusion of green chemistry into state education standards and accreditations.
- Infuse textbooks – Work with educators whom are adopting and incorporating green chemistry into textbooks and work to infuse green chemistry into textbooks at all levels.
- Enable a green mentoring hierarchical system – Develop and disseminate a mentorship program for students at all academic levels, beginning with middle school students through professional scientists. Each level would ideally mentor the level preceding theirs (i.e., high school students would mentor middle school students, college undergraduate students mentor high school students, etc.)
- Involve students in green chemistry development, recruitment and advocacy – Engage and involve students in recruiting other students, developing mentoring programs, coordinating advocacy programs, and other programs that allow for the advancement and dissemination of green chemistry.
- Service learning – Create green chemistry service learning projects as part of a student’s learning to create a sense of service, to give back to the surrounding community, and to help to inform and educate community members about green chemistry.
- Undergraduate research – Engage undergraduate students at all levels and disciplines in research and creative projects on green chemistry and sustainability topics, with the goals to impact student learning, multidisciplinary collaboration, resource development, teacher and professional training, and federal and private funding.
- Workforce development – Incorporate green chemistry and sustainable science practices into workforce development training and educational programs in order to train a workforce that can provide well-trained workers for jobs in a growing green chemistry industrial market.

Level Specific Educational Resources

The goal of this theme is to create and disseminate green chemistry educational resources to allow for the adoption of green chemistry practices in classrooms and laboratories at all educational levels. The four main objectives of this theme are as follows:

- Inventory and assess gaps in current resources – Assess needs for each educational level to determine the current state of resources and the gaps that need to be filled.
- Create new, level specific educational resources – Address knowledge gaps and create new, level

specific educational resources to be provided to educators

- Disseminate and train educators (professional development) – Provide level specific training to educators on green chemistry content and resources.
- Facilitate publication of educational resources for professional development while enabling dissemination – Facilitate the creation and dissemination of educational resources, while also providing a mechanism for educators to publish the new educational resources in peer reviewed journals to enable professional development

Next Steps

The education sub group will identify six theme leaders to champion each key strategic theme. Each theme leader will choose one objective within their theme to champion and will recruit a “theme team” with one leader for each objective in their group. Each theme team will work to identify the first tactic, measure and target for each objective to bring the strategic theme into action. The tactics will be mapped onto a calendar and a timeline will be created for the first year of the strategic plan. Representatives of each region 1 state will be recruited to participate.

Green Chemistry Education Network - New England

Core Purpose: Prepare a workforce grounded in the principles of green chemistry in order to meet the needs of the populace.

Positioning Statement: The EPA has targeted region 1 to be a national leader in green chemistry and sustainability education, outreach and workforce preparation. We are members of a regional taskforce charged with identifying, developing and supporting a stakeholders group focused on meeting the needs of society today without compromising the resources of tomorrow.

Community: Build a vibrant self-sustaining green educational community

- C-1 Maintain an Inventory of community members
- C-2 Promotion, Recruitment & Conversion
- C-3 Empower Individuals with Tools & Resources
- C-4 Foster Professional Development
- C-5 Create GC Regional Centers of Excellence

Public Relations: Promotion, Awareness and Outreach

- PR-1 Plan Events to Organize & Coordinate Regional Events for Awareness and PR
- PR-2 Develop and Continually Refine Marketing Strategy
- PR-3 Develop Media Kit

Fundraising

- F-1 Create Mechanism to Categorize & Prioritize Active Projects
- F-2 Maintain an Inventory and Calendar of Request for Proposals
- F-3 Actively Match Projects to Opportunities

Assessment: Measure and leverage impact

- A-1 Develop Methods for Detailed and High Level Assessment
- A-2 Champion methods to encourage and accelerate innovation

Level Specific Educational Resources

- LSER-1 Involve Students in GC Development, Recruitment, and Advocacy
- LSER-2 Create new, level specific educational resources.
- LSER-3 Disseminate and train educators (professional development)
- LSER-4 Facilitate Publication of Educational Resources for Professional Development While Enabling Dissemination

Education – Primary, Secondary and Higher - provide resources, opportunities, strategies and tools to educators at all levels

- E-1 Evaluate, Refine, Advocate, & Infuse GC in State Standards & Accreditation
- E-2 Enable a green mentoring hierarchical system
- E-3 Infuse Textbooks
- E-4 Service Learning
- E-5 Undergraduate Research
- E-6 Involve Students in GC Development, Recruitment, and Advocacy

Business & Industry

The green chemistry business and industry group will advance the knowledge and practice of Green Chemistry principles in business as a catalyst to grow a sustainable economy in New England and beyond and facilitate the alignment of key social, environmental and economic drivers. Through this effort we will provide green chemistry education, showcase technologies and case studies, and become a network for promoting green chemistry in business.

Key Themes/Areas of Focus

At the New England Green Chemistry Forum held in December 2010, the Business and Industry Strategic Group brainstormed ideas that would help to advance green chemistry in small, medium, and large-sized businesses throughout New England. These ideas were further developed through subsequent outreach calls with business stakeholders. The ideas generated by business and industry stakeholders reflect a perceived need for better systems for sharing information on green chemistry applications, resources, and success stories. Business stakeholders noted the need for continuous engagement with other businesses, government agencies, investors, and non-governmental organizations around green chemistry opportunities, funding, governance, and applications. Specific strategies include:

Communications and Information Sharing

Case studies: Research concrete success stories from small, medium, and large New England-businesses about how green chemistry made “business sense” (for example, how it saved money or gained value for customers). Make the case studies available to interested business stakeholders who are interested in learning more about green chemistry applications or are looking for materials to “make the case” for green chemistry in their business.

Clearinghouse: Develop an up-to-date web-based source for success stories, funding sources, bibliographies, handbook links, other, for business and industry stakeholders to access. Currently there is no single, organized online source for green chemistry information that is geared toward business and industry stakeholders.

Webinars: Offer webinars for business and industry groups on green chemistry issues of interest, such as case studies of successful businesses using green chemistry, new applications of green chemistry, funding or other technical resources, or ongoing regulatory action.

Problem pool: Develop a “problem pool” where industry actors can share common problems and connect to university or researchers for assistance to solve those problems. Many business stakeholders felt that they have ideas for applying green chemistry principles in their operations, yet they need technical assistance to implement those ideas. A problem pool would facilitate better connections between businesses, especially small businesses without extensive research and development budgets, and researchers.

Speaker bureau: Create a speaker bureau of green chemistry advocates who can talk knowledgeably about business and the opportunities for green chemistry in business in New England. There are currently several New England-based experts on green chemistry, and a speakers’ bureau would help businesses to gain access to those experts and to advance green chemistry in their sectors, businesses, or communities of practice.

Funding/networking workshop: Conduct a funding workshop for innovators to connect with multiple sources of funding (venture capital, government grants, even foundations).

Technical assistance network: Create a network of affordable, capable third-party evaluation and patent and intellectual property assistance for small businesses. Currently businesses without large-in house technical teams do not know where to find reliable and affordable green chemistry technical assistance.

Tools and Research

Evaluation tools: Identify and/or create, and disseminate simple to use tools to measure green chemistry products and processes. Several businesses identified a need for a green chemistry evaluation tool that can be used in the lab to evaluate if/how a proposed process meets green chemistry principles. This tool could be combined with other general sustainability tools.

Market research: Identify the aggregate size of the potential market and industry sectors in New England with the greatest opportunity for green chemistry. Background market research on the potential market for green chemistry in New England would help businesses to “make the case” and target resources and investments.

University intern program: Establish a stronger program/approach to university interns, studying both management and science. To create a future generation of scientists and business managers who support green chemistry, there is a need to connect students and businesses through internships and hands-on experience.

Government Support

Government support: Pass a Green Chemistry Act to lower interest rates for loans to small industries innovating in green chemistry and reduce or streamline certain regulatory hurdles. Review and improve regulatory frameworks in states in New England to advance Green Chemistry and reduce barriers

Supplemental environmental projects: Offer SEP ideas for EPA and other state SEP banks

Venture/Investment

The green chemistry venture capital and investment group will advance the knowledge of green chemistry among investors and the practice of Green Chemistry principles business investments as a catalyst to grow a sustainable economy in New England and beyond. Through this effort we will provide green chemistry education, showcase business opportunities and case studies, and become a network for promoting green chemistry in the investment and business communities.

Key Themes/Areas of Focus

At the New England Green Chemistry Forum held in December 2010, the Venture Capital and Investment Strategic Group brainstormed ideas that would help to advance green chemistry by investment stakeholders (venture capital firms, angel investors, and other third-party investors) throughout New England. These ideas were further developed through subsequent strategic group conference calls and one-on-one conversations with investment stakeholders. The ideas generated by investment stakeholders reflect a perceived need for better systems for sharing information on and “making the case” for green chemistry investments. Investment stakeholders noted the need for continuous engagement with other investors to share green chemistry investment opportunities, resources, and strategies. Specific strategies include:

Define Green Chemistry Investment Space

Objective: To clarify the types of investments, trends, and opportunities in the green chemistry space in New England. Strategic group members noted a need to clearly articulate and share what the green chemistry investment space looks like, what the opportunities are, what makes this investment space different than other spaces, and why investors should invest in green chemistry. Possible Strategies:

Webinars: Offer webinars for investors on green chemistry issues of interest, such as case studies of successful businesses using green chemistry, new applications of green chemistry, investment opportunities, market analysis for green chemistry.

Case studies: Research concrete success stories from small, medium, and large New England-businesses about how green chemistry made “business sense” (for example, how it saved money or gained value for customers). Make the case studies available to interested business stakeholders who are interested in learning more about green chemistry applications or are looking for materials to “make the case” for green chemistry in their business.

Investment Profile: Identify strategies that will support entrepreneurship in the sector and increase the impact of investments, including for small, medium, and large sized businesses working on a range of scales and technologies.

Educate Investors

Objective: Educate investors on what green chemistry is, what it is not, what the investment space looks like. Strategic Group members noted that while investors are aware of “clean tech” investment opportunities, many are not aware of green chemistry or potential opportunities for investing in green chemistry. Possible Strategies:

Webinars: Offer webinars for investors on green chemistry issues of interest, such as case studies of successful businesses using green chemistry, new applications of green chemistry, investment opportunities, market analysis for green chemistry.

Presentations to investor groups: Develop an investor-g geared presentation on green chemistry to be delivered at existing investor group meetings/forums, such as Boston Angel Investors meetings, New England Venture Capital Association meetings, etc.

Connect and Collaborate

Objective: Advance investment in green chemistry by fostering collaboration and networking among businesses and investors. Strategic Group members noted that there are opportunities to connect investors with green chemistry businesses and stakeholders on an ongoing basis. Possible Strategies:

Clearinghouse: Develop an up-to-date web-based source for success stories, funding sources, bibliographies, handbook links, other, for business and industry stakeholders to access. Currently there is no single, organized online source for green chemistry information that is geared toward business and investment stakeholders.

Green Chemistry Investors Event: Convene investors and businesses at a networking and information sharing event targeted toward green chemistry investment in New England. The event might include presentations or panels by businesses showcasing “success stories” along with opportunities to connect businesses with investors.

Green Chemistry Business Roundtable: Convene investors and businesses on a periodic basis to discuss current issues related to green chemistry.

Advocacy/NGO

February, 2011

In order to more fully develop green chemistry and promote the adoption of green chemistry solutions across the economy, the NGO (non-government organizations) Workgroup of the New England Green Chemistry Initiative propose an integrated, three year Green Chemistry Strategy.

This strategy is intended to coordinate and integrate the activities of a broad array of NGO organizations dedicated to the advancement of green chemistry. The strategy grows out of pioneering work begun over twenty years ago to raise awareness of the risks of toxic and hazardous chemicals in industrial production, consumer products and health care services. It has advanced this past decade with successful campaigns in the market, the adoption of new chemicals policies at the state level, and a national campaign to reform federal chemicals policy.

The mission of this NGO Green Chemistry Strategy is to develop an integrated array of practical projects that can, in a reasonably short time, advance critical next steps in promoting green chemistry. The strategy is guided by three strategic objectives:

- Educate health-affected constituencies and health professionals on the best available science linking toxic chemicals exposure with health threats;
- Encourage critical economic sectors that rely on toxic chemicals in production and use to invest in green chemistry solutions;
- Advocate policies that seek to replace unnecessary toxic chemicals with safer alternatives and create incentives to bring greener chemicals to market.

Advance Awareness of the Scientific Links Between Chemicals and Health

The NGO Strategy is to work through environmental health information and training services to bring to industrial leaders, health sector professionals and government policy makers the most advanced knowledge and understanding of the adverse effects of hazardous chemicals on human health and the environment. This strategy relies on the following important sources of information:

The **Collaborative on Health and the Environment** (CHE) (www.healthandenvironment.org) was created to summarize the latest environmental health science and bring it to health-impacted constituencies and health providers and researchers focused on that disease group and to bring together communities of learning on each disease cluster.

The **Silent Spring Institute** (www.silentspring.org) was created to research and document the latest science linking chemical exposure with breast cancer.

Mt. Sinai School of Medicine's Children's Environmental Health Center (www.mountsinai.org) and **Columbia University's Center for Children's Environmental Health** (www.cumc.columbia.edu/dept/mailman/ccceh) have conducted groundbreaking research documenting low dose chemical exposure and impacts on developing children.

Health Care Without Harm (www.noharm.org) and **Physicians for Social Responsibility** (www.psr.org) have been central players in educating health professionals on the latest environmental health science while HCWH has been instrumental in challenging the healthcare sector to address its own environmental footprint. These and other projects have been instrumental in providing the scientific basis for a broad set of NGO initiatives and campaigns focused on toxic chemical exposures.

The **Endocrine Disruption Exchange**, launched by scientific pioneer Theo Colborn, has valuable scientific information about the latest data linking toxic chemicals to endocrine disruption and chronic health impacts. (www.endocrinedisruption.com)

Promote Market Campaigns to Reduce the Use of Toxic Chemicals in Products

The NGO strategy is to focus on and work with industrial sectors whose companies do not have an inherent business interest in using toxic chemicals, but can be provided the business incentive to address chemicals of concern and replace these chemicals with greener and safer alternatives.

Health Care Without Harm (www.noharm.org), basing its advocacy on the Hippocratic Oath of health professionals to “do no harm”, has been focused in building a powerful network of hospitals, Group Purchasing Organizations and supply chain companies that can signal the market demand for safer chemicals and products and drive the supply chain toward green chemistry.

The **Healthy Building Network** (www.healthybuilding.net) has been focused on developing the tools (www.pharos.org) to assist the architectural and building sector to learn about the toxic chemicals in building products and specify safer alternatives.

The **Electronics Take Back Campaign** (www.electronicstakeback.com)) has been instrumental in highlighting toxins in electronics as well as the public health dimension of e-waste and then working with electronics firms to design out toxic chemicals and implement extended producer responsibility programs.

The **Safe Cosmetics Campaign** (www.safecosmetics.org) has documented more than 5,000 synthetic chemicals used in personal care products and sought commitments from cosmetics companies to reformulate their products to use safer alternatives. Over 1,500 companies have responded, signing voluntary agreements to replace potentially toxic ingredients in their products with safer substitutes, in turn stimulating the demand for a new generation of green chemistry preservatives and other key ingredients.

The **Healthy Schools Campaign** (www.chej.org) has focused on toxic chemical threats in school settings and provided tools to educators to detox the school environment. Several organizations also provided important frameworks, tools and business networks to share strategies for eliminating toxic chemicals from production and products.

The **Lowell Center for Sustainable Production** (www.sustainableproduction.org) has been central in educating businesses about the effectiveness of moving toward detoxifying their supply chain and implementing greener chemistry and has created a network called the Green Chemistry Council to help businesses learn from each other as they innovate.

Clean Production Action (www.cleanproduction.org) has been a key technical assistance organization in developing the Green Screen and Plastics Scorecard to evaluate chemicals in products, as well as in organizing the Business-NGO Working Group on Safer Chemicals and Sustainable Materials as a forum where NGOs and supply chain companies can learn from each other on the journey toward greener chemicals.

The **Investor Environmental Health Network** (www.iehn.org) has focused on highlighting the investor risk connected to companies reliant on toxic chemicals in products and educating investors regarding the coming technological business opportunity in green chemistry.

Promote the Adoption of Policies Advancing Green Chemistry

Ten years ago the NGO community decided to develop health-based coalitions in selected states and advance policy initiatives that focused on restricting the worst toxic chemicals and create incentives and programs on green chemistry. Three of the most active and successful safer chemicals coalitions are based in Region 1 states:

- Alliance for a Clean and Healthy **Maine** (www.cleanandhealthyme.org) which is staffed by the Environmental Health Strategy Center (www.preventharm.org);
- Alliance for a Healthy Tomorrow (www.healthytomorrow.org) in **Massachusetts**; and
- Coalition for a Safe and Healthy **Connecticut** (www.safehealthycct.org), both of which are staffed by New England Clean Water Fund (www.cleanwateraction.org).

These coalitions and related activities in more than fifteen states are coordinated under the auspices of the SAFER States network (www.saferstates.org). Each of these policy campaigns focused on specific chemical phase-outs (e.g. mercury, phthalates, PBDE flame retardants, BPA, lead and cadmium) in consumer products, especially children's products.

A handful of states have broadened the frame to include more comprehensive chemical policy reform.

The Kid Safe Products Act passed in Maine in 2008 established a first-in-the-nation state chemical management program through a campaign led by the Environmental Health Strategy Center. Under the Maine chemical policy, 1700 Chemicals of High Concern have been named, and the State has begun to identify priority chemicals (such as BPA and nonylphenol) and require chemical use reporting and safer alternatives to priority chemicals in consumer products that may expose a child or developing fetus. (See <http://www.maine.gov/dep/oc/safechem/index.htm>). Similar comprehensive chemical laws have since been enacted in Washington state, California and Minnesota. Related bills are advancing in Massachusetts, Connecticut, Michigan and Oregon. In the absence of federal policy leadership, the states are filling the gap toward fixing our broken chemical safety system.

At the national level, the **Safer Chemicals Healthy Families Campaign** (www.saferchemicals.org) is a 250 organizational member coalition focused on winning federal reform of the Toxic Substances Control Act (TSCA), the 34-year-old law that has failed to protect the health of Americans from toxic chemical exposure. This national coalition is a roll up of all the market and policy campaigns and health-based constituencies that have been activated over the last fifteen years.

This entire infrastructure and scaffolding provides the foundation for the next stage of work within the parameters of the EPA Region 1 Green Chemistry Initiative.

Projects To Advance Green Chemistry

The following strategic projects build off the momentum and investments made to advance market and policy transformation toward green chemistry and will provide the region with strong positive case examples and market signals to transition the economy away from its reliance on toxic chemicals toward green chemistry. These projects are summarized below. A more complete description of each project is available on request.

1. **Maine Potatoes to Plastics Initiative:** For the last three years, a consortium of Maine manufacturers, agricultural business interests, university researchers and NGOs have been working to research, develop and eventually commercialize the production of non-toxic, petroleum-free bioplastics from Maine potato waste and other biomass. The aim is to expand the use and production of polylactic acid (PLA), the bioplastic currently made in the U.S. from Midwestern corn. To date, about \$2 million has been raised from government, foundation and business sources to support technology development research at the University of Maine and at private companies, and to further develop the cluster of companies and supporting organizations that make up the emerging bioplastics sector in Maine. The next phase of the work includes partnering with a biotechnology company to help advance the yeast fermentation process to cost-effectively produce lactic acid from potato starch and wood sugars at scale, and enhancing the technical properties of PLA for final product applications (e.g. durability, heat resistance, etc.) through novel melt blends with other bio-based materials such as nano-cellulose. Among the advisors under contract to the consortium are John Warner from Warner-Babcock Institute for Green Chemistry, Jim Lunt formerly of NatureWorks, which pioneered PLA production from corn, and Daniel Schmidt from the Plastics Engineering Department at the University of Massachusetts at Lowell.
2. **Business-NGO Green Chemistry Roundtable:** There are several business networks focused on creating communities of learning among downstream businesses interested in making the transition to green chemistry in their supply chain. These include the American Sustainable Business Council (www.asb-council.org), the Green Chemistry and Commerce Council (GC3) run by the Lowell Center for Sustainable Production at the University of Massachusetts Lowell (www.greenchemistryandcommerce.org) and the Business-NGO Working Group on Safer Chemicals and Sustainable Materials, run by Clean Production Action (www.bizngo.org). These networks, which have a cooperative working relationship with one another, propose to organize a series of Business-NGO Green Chemistry Roundtables throughout Region 1 as a way to increase engagement of businesses in green chemistry. Through a combination of public recognition, case studies, business-to-business networking and examination of market and policy drivers, the number of New England companies engaged and the quality of their investment in green chemistry will be enhanced.

3. Green Chemistry R&D Benefits Report: Throughout Region 1, state and federal funding has been invested in technology research and development to boost the innovation economy. Many of the grant recipients are private companies and state university systems whose R&D funding is also advancing significant green chemistry progress. However, little attention has been paid to these hidden investments in green chemistry, nor the environmental health benefits that result. The Environmental Health Strategy Center, an NGO with significant analytical capacity and track record in managing R&D funding for green chemistry, proposes to research and produce a public report that documents the significance of green chemistry-related funding in Region 1. The report will be used to educate the public about the importance of R&D investment as engine for both economic development and green chemistry progress.
4. Green Chemistry Policy Analysis: Clean Water Fund plans to conduct an assessment of in-region policy models that directly stimulate green chemistry R&D. Scope of research will include investigation of tax incentives, loan and grant programs, technical assistance programs, product stewardship initiatives, broader clean tech initiatives, and chemical policy reforms. The goal of the assessment is to build momentum and create awareness for green chemistry by highlighting existing leadership, best practices and policy innovations.

Strategy Scheduling

The Projects of the NGO Green Chemistry Strategy would be coordinated in terms of both resources and timing over a three year period. The IC2 expansion would only require a year. The Sustainable Plastics Assessment could begin in the Fall of 2011 with a report that would feed into the Business/ NGO Green Chemistry Roundtable in 2013. The R&D benefits study could also be timed to make its presentation at the Roundtable. The policy research could be designed from the results of the Roundtable and present a report in 2014. The two economic sector projects would take some planning time but could run in parallel up through 2015.

Planning = P

Implementation = I

Report Drafting = R

	F-2011	S-2012	F-2012	S-2013	F-2013	S-2014	F-2014	S-2015
1. Maine Potatoes to Plastics Initiative			P	P	I	I	I	R
2. Bus/NGO Green Chemistry Roundtable		P	P	I	R			
3. Green Chemistry R&D Benefits Study		P	I	I	R			
4. Green Chemistry Policy Analysis				P	I	I	R	

Healthcare

Toxic Reduction and Substitution Program for Research Labs at BIDMC

—Establishing a Green and Sustainable Research Practice for Academic Institutions

Abstract

More and more concerns have been placed on the use of toxic chemicals in biomedical research labs as concepts of green life and sustainability are being widely accepted. With the development of Green Chemistry in the last twenty years, knowledge and technologies have been developed to a stage that can make a research lab become green one. Seeking green alternatives for toxic chemicals are being done in many academic institutions and companies. EPA has been issuing annual Presidential Challenge Green Chemistry Awards for those excellent works since 1996.

As an important teaching & research hospital of Harvard Medical School, BIDMC is establishing an alternative & efficient program which aims to reduce usage of toxic, carcinogenic, corrosive and expensive chemicals and find their benign alternatives.

The toxic chemicals inventory has been compiled and the evaluation for the toxicity scale was set up. Along with the consumption amount for each toxic chemical, a toxicity levels (0 to 4) was created. Chemicals in levels 3 to 4 are major target chemicals.

The major steps of this program include: 1) through experimental design and optimization to reduce the amount of reagents consumed; 2) based on the results of step 1 and from their particular roles and functionalities in the processes to seek green alternatives for toxic/carcinogenic/corrosive/expensive chemicals that are used in research labs; 3) finding green instrument & equipment to substitute those consuming great amount of energy, water with exposing radiation, noise ones. These are the steps towards establishing a green and sustainable research community.

This program is hoping to obtain both staffing and knowledge cooperation from research labs at BIDMC and support from outside Green Chemistry professional institutions.

I. Bio-Plastics Pilot Research Project for Healthcare Sector

Summary: Health Care Without Harm, Warner Babcock Institute and Green Harvest Technologies propose a joint project to research and introduce bio-polymers into the healthcare market for a variety of durable and semi-durable applications.

Partners Healthcare in Boston, the region's largest healthcare system, has agreed to be a beta site for piloting bio-polymers in specific applications that are a direct result of research conducted by Warner Babcock over the next six months. Partners has also expressed high interest in becoming a national champion for green chemistry alternatives in their institution and is already communicating to a number of vendors about their interest in moving to bio-based plastics. This project is a component of the Healthier Hospitals Initiative, a project to accelerate the adoption of sustainability and environmental health into the healthcare sector.

Technology Opportunity: Warner Babcock Institute for Green Chemistry is one of the premier labs in the world focused on green chemistry. They have developed eighteen green chemistry projects in the last three years with a variety of large businesses and developed multiple patents and now have six products on the market. They are confident that they will develop intellectual property that will result in patents based on a six month research project to evaluate the efficacy of various bio-polymers for application in the healthcare market. Green Harvest Technologies is a bio-based startup company that has developed a patent on a process technology to extend the heat resistance of a bio-polymer called poly-lactic acid (PLA), allowing the material to be used for more durable and semi-durable applications than previously utilized. GHT also has strong business relationships in the supply chain to quickly move from prototype to full production.

Market Opportunity: Health Care Without Harm and its membership arm Practice Greenhealth (www.practicegreenhealth.org) has helped to organize a major sector of the hospital market to support sustainability and environmental health through the Healthier Hospitals Initiative (HHI). This initiative includes over 275 hospitals and some of the largest and most influential healthcare systems in the country, including Partners Healthcare, Kaiser Permanente, Catholic Healthcare West, Advocate Healthcare, MedStar, Hospital Corporation of America, Inova and Bon Secours. HHI is organized around the implementation of the HHI Agenda, a comprehensive sustainability roadmap for the healthcare sector which includes a commitment to safer chemicals and environmentally preferable purchasing practices.

If some prototypes can be developed for Partners Healthcare that meets their price point and performance specifications, not only will Partners buy these sustainable bio-based products, but so will the other hospital systems in HHI, thus accelerating the validation and market penetration of these products into the healthcare sector. In addition to these systems, Practice Greenhealth has an additional 800 hospital members that are implementing various sustainability initiatives and could be buyers for these new products.

Two other related purchasing initiatives dramatically improve these market opportunities. Health Care Without Harm and Practice Greenhealth are working with the eight major healthcare systems in HHI to develop an environmental purchasing scorecard that will ask chemical disclosure question for products in the supply chain and begin to prioritize products that do not contain "chemicals of concern." Kaiser is already using this Scorecard and its current GPO has agreed to utilize it, representing \$24 billion in purchasing power. This Scorecard is likely to become the standard in the industry, which represents over 17% of the entire economy. HCWH is already in communication with the other large Group Purchasing Organizations to adopt this Scorecard, who together control \$100 billion of the healthcare market.

Practice Greenhealth will build off of the Purchasing Scorecard and roll out an EPP database in the Spring, 2011 that will help advance green chemistry alternatives in the healthcare sector. The database will include model specifications language for green chemistry alternatives and through relationships with all the major Group Purchasing Organizations, will establish standard RFI and RFP language for safer chemicals in the healthcare sector.

Taken together, the education, technical assistance and advocacy efforts of HCWH and PGH will create enormous alignment in the sector to adopt sustainable, bio-based plastics that are developed out of this Project.

Political Opportunity

There are a number of political forces which strengthen the timing and location of this project:

- The EPA has made green chemistry a signature initiative and Region 1 (New England) is the lead region in promoting green chemistry as a green economic engine for the region.
- The EPA has identified both BPA and phthalates as chemicals of concern and are driving political and technical processes to identify appropriate substitutes for these chemicals, both which are used as additives to petro-plastics.
- In February, 2011, the European Union identified three phthalates for restriction under the new REACH legislation. In addition to being used in personal care products, DEHP is used as a softener for PVC plastics. Policy change in Europe will inevitably create momentum for green chemistry alternatives to petro-plastics.
- The Safer Chemicals, Healthy Families Campaign has organized a 280 organizational member coalition to reform the nation's federal chemical policies. There has not been this amount of political pressure to update the law in over 30 years. Developing a green chemistry project in a wedge sector of the economy will help validate the market transition to safer and green chemistry.
- In the absence of federal policy change, major US corporations are developing their own chemical procurement screens and eliminating problematic chemicals from their products. These companies include: Apple, WalMart, Perkins and Will, SC Johnson, Whole Foods, HP, BD, Johnson and Johnson and many others. Both PVC and polycarbonate plastics are high on the list for company level restrictions.
- The US government has developed model environmental specifications that favor both bio-based materials and recyclability, potentially opening up another market for sustainable bio-based healthcare products. The Veterans Administration, a PGH member, has over 140 hospitals in their network. This does not include the Department of Defense facilities and procurement.

Timeline

The Bio-based Plastics project will be organized in phases. The first phase will involve research on biopolymers at Warner Babcock to identify a variety of performance criteria for different bio polymers and then matching these characteristics with specific product needs in the hospital. During this same phase, Green Harvest Technologies will solidify relationships in the supply chain to produce bio-plastics once performance metrics and technical specifications have been solidified.

Phase Two will involve initial prototype development, performance testing for the applications selected for the bio polymer, and beta testing in one of Partners' hospitals in the Boston area to see if the polymer performs to the specifications required.

Phase Three will involve commercial production once the bio-polymers have been accepted for broad application.

Funding request

Funding is required for Phase One. The funding requested is \$500,000. A detailed budget will be provided upon request.



LinkedIn is a social media tool available to help continue the conversation on green chemistry in New England. Please join the LinkedIn "New England Green Chemistry Networking Forum" Group.

For more information about green chemistry in New England:
www.epa.gov/region1/greenchemistry