



11/16/07

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Re: The Green Chemistry Initiative - Observations, Comments, and Recommendation

On behalf of the Chemical Industry Council of California* (CICC), I am pleased to submit our comments regarding the Green Chemistry Initiative (GCI) for your consideration. We complement you and the entire interagency staff for the excellent process employed thus far. You have gone to great lengths to be transparent and to invite comments from the broadest possible cross section of interests. We encourage you to maintain this steady and deliberate course.

Background: A Proactive Role in California's Green Chemistry Discussion

Chemical Industry Council of California has been a proactive participant in the policy discussions regarding "Green Chemistry" since the fall of 2005. We first contacted Dr. Michael P Wilson, Ph.D., Center for Occupational and Environmental Health (COEH) at the University of California at Berkeley as he was preparing to finalize his report to the Legislature on the subject of chemical management policy. CICC and Dr. Wilson were mutually interested in a dialogue regarding the chemical industry in California. Following the release of his report, *Green Chemistry in California: A Framework for Leadership in Chemicals Policy and Innovation*, CICC convened California's first industry forum for the purpose of critically examining the issues. During closing remarks at the forum, CICC called for a facilitated dialogue regarding issues raised in the report, and cautioned against premature legislation.

CICC recommended, in effect, going slow initially to develop consensus so we might go faster after achieving a convergence of thought. CICC emphasized the need for market driven forces to lead the way in the green chemistry revolution, rather than regulation. In a follow-up letter to John Balmes, MD, Director COEH, CICC wrote, ". . . there are aspects of the [Dr. Wilson's] report over which serious differences of opinion exist. . . . CICC propose[s] an alternative path forward in the form of a facilitated multi-stakeholder dialogue, apart from the traditional politics of Sacramento. . . ."

* *The Chemical Industry Council of California (CICC) is a 30-year old voluntary trade association comprised of large and small chemical manufacturers and distributors throughout California. CICC incorporated as a California 501(c) 4 non-profit mutual benefit corporation in 1981. CICC represents multiple facilities including: forty-three (43) manufacturing plants; five (5) research laboratories; and sixty-seven (67) sales, service, and distribution centers. California members account for annual sales well in excess of \$3,000,000,000 and directly employ more than 5700 workers, with combined annual payroll in excess of \$283,000,000. CICC's mission is to provide a means for sustainable and scientifically balanced approaches to the regulation of chemicals in California.*

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. . . Only through sustainable and scientifically balanced approaches can the state aspire to become a policy leader and innovator for the development and transfer of environmentally friendly chemical technologies and products. This is an enormous challenge but we feel the effort can be greatly enhanced by the active participation of your Center and the UC system.”

CICC echoed the above remarks to the California Legislature, but to our disappointment a rash of industry and product specific legislative proposals followed. As predicted, battle lines were drawn and substantive dialogue gave way to political maneuvering. CICC was pleased therefore with the 05/01/07 announcement of the Green Chemistry Initiative (GCI).

CICC and/or our members have spoken and offered positive suggestions at each of the three Green Chemistry Symposia, and have participated actively in each of the GCI stakeholder meetings. Our organization, to the extent resources and talents allow, is committed to proactive involvement in the effort to define and implement a new paradigm for green chemistry in California. As a Sacramento based state chemical industry association, however, CICC has limited expertise in matters regarding national and international science policy and trade (i.e. REACH, TSCA, and CEPA). In matters such as these it is appropriate for CICC to defer to the greater expertise and resources of national trade associations such as the American Chemistry Council (ACC), the National Association of Chemical Distributors (NACD) and others. CICC does, however, possess a wealth of practical experience and knowledge in matters affecting the chemical industry and its physical assets in California. It is in this regard that our comments are presented.

Hypothetical Exercise – Discovery, Commercialization, Continuous Improvement/ P2

In an effort to maximize its contribution to the GCI effort, CICC designed a three-part exercise to look at the “ground-level” impacts of implementing “high-level” policy changes. The exercise was designed to channel the expertise of our members toward topics relevant to their operations. Over a two-day period in mid-October 2007, CICC members worked through a multi-stage hypothetical scenario. In the scenario a widely used hypothetical chemical (AMBS) is linked to a serious disease and is subsequently slated for phase-out. With this as undisputed background, the focus of the exercise is to determine and test the practical implications (issues and opportunities) associated with Discovering and Commercializing an acceptable chemical substitute that can be used for a wide variety of applications. Concurrent with the activities of Discovery and Commercialization, participants were asked to consider what role, if any, Continuous Improvement/ Pollution Prevention should play during the period of time the substitute for AMBS is undergoing development and commercialization. In their book, *Cradle to Cradle*, William McDonough and Michael Braungart discuss, “Why Being ‘Less Bad’ is No Good.” The purpose of our exercise, however, was to address this very point in a very practical sense . . . hence the question, Is being ‘less bad’ always no good?

CICC was greatly assisted in this exercise by the presence of a number of exceptional guests experienced in government, academia, medical profession, environmental NGO, public policy advocacy, and non-chemical business and industry sectors. CICC participants brought with them literally hundreds of years of California experience in chemical manufacturing, research and development, distribution, sales and marketing. Collectively the backgrounds of all participants included a spectrum of undergraduate and advanced degrees in chemical engineering, chemistry, civil engineering, mining, business administration, public policy, law, medicine, public health, and toxicology. The three stated goals of the hypothetical exercise were: to provide an opportunity for information exchange and broadening of perspectives;

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to initiate a continuing dialogue to assist the advancement of the GCI; and to develop a set of CICC recommendations regarding GCI based upon multiple conversations over a two-day period between persons of diverse points of view.

CICC participants were divided into three *small groups* of 5-6 individuals while the guests were divided into three *resource teams* of 2 persons each. Separately, the small groups and resource teams rotated through the three stages of the exercise (see Attachment #1). Each *small group* and *resource team*, in order of their rotation, discussed the hypothetical AMBS phase-out scenario in the context of *Discovering* an acceptable substitute, *Commercializing* the substitute, and, as an interim measure, the role of *Pollution Prevention/ Continuous Improvement*. CICC is solely responsible for the following materials. The thoughts, ideas, and insights shared among the participants and reflected herein should not be presumed to be the position of the companies or organizations represented by those individuals. While efforts have been made to ***accurately present all points of view***, it must be clearly stated, however, ***this is not a consensus document***.

Observations and Recommendations:

1. CICC Hypothetical Exercise - Data and the Data Gap

As we've come to understand through the green chemistry symposia, stakeholder meetings and others – data and the lack or unavailability of same is a major issue to be resolved as part of the GCI process. This, however, was never more obvious to this writer than during the CICC hypothetical exercise. All aspects of the conversation were dominated by questions of how much data, how soon, on which chemicals, for which applications, who will have access to the data, and how will it be managed, etc, etc, etc. As one participant volunteered, “There will be a tension in the advancement of the GCI as it relates to the value of a company’s developmental data and the free flow of information.”

The current debate over data is at the heart of every aspect of GCI. All discussions ultimately come down to data. The following are but a few of the thoughts generated during CICC’s hypothetical exercise. We recommend them for your consideration as discussion items in future facilitated discussions:

- Data has great value to the developer, not only in terms of the dollars to generate the data, but in terms of the time element to generate the data. For instance, data generated by one company over a decade of research and development that might then be handed over to another company in an instant cannot be compensated by mere reimbursement for out-of-pocket cost. Time and the opportunity for market advantage far out-weigh the mere cost of the studies.
- Data is Intellectual Property (IP), it is market advantage. Confidential Business Information (CBI) must be protected. Those asking for CBI data must be identified and approved. If broader data sharing is enacted, then consequences need to be imposed for those who violate the provisions. This is ever so much more important when it comes to protections of Critical Infrastructure Information relative to Homeland Security.
- As long as mankind can think and invent, there will always be a data gap. The very nature of the iterative scientific method is to question. It is fool hearty to suggest filling the data gap on all

1. CICC Hypothetical Exercise- Data and the Data Gap (continued)

chemicals. There must be an acceptable way to prioritize chemicals for additional testing. Hazard traits are certainly one criterion, but it is only part of the story. GCI must not consider *hazard* at the exclusion of *exposure*. Were it so, there would be a misalignment of limited resources for marginal value. Mere competition for limited testing facilities would overburden same and could potentially impede important studies on new developmental chemical substitutes. An assessment of toxicology and environmental laboratory capacity to support aggressive testing would be well advised before such data testing requirements were imposed.

- Admittedly too much emphasis has been placed in prior year on reducing exposure (risk) and too little emphasis on reducing toxicity (hazard). The transition movement within the chemical industry, however, has begun. Emphasis on a transition to hazard reduction (i.e. green chemistry) is and will continue to build. However, GCI needs to forthrightly acknowledge that elimination of all toxicity through chemical substitution is not possible. At best there will always be trade-offs which will need to be evaluated via Life Cycle Analysis (LCA) methodology . . . a methodology which is itself a developing scientific discipline, unfamiliar to most individuals.
- “Product” is a term of many meanings, which for different people conjures up different images. For most people the word *product* is synonymous with package goods purchased at a retail store. For others in the chemical industry the word *product* implies a tank car, pipeline, storage tank, or drum loaded for shipment to an industrial customer for use as a reagent in yet another process. Interestingly enough, the same chemical molecule could be present in both the consumer product and the industrial product. Same molecule – same toxicity (hazard). Same molecule different uses (exposure). Same molecule -different risks // same molecule different data requirements? Understanding how the product is to be used and for which applications could be a key to making progress on data gap issues.
- The GCI should look at the current body of federal and international law when determining whether or not to superimpose yet another layer of regulation on an already heavily regulated industry.
- Substitute chemicals should be held to the same data requirements as the chemical(s) they are intended to replace. The Governor has recently signed a bill eliminating phthalates in infants’ toys - - - perhaps a long-term case study examining the consequences of this decision and the resultant substitutes or lack thereof would be appropriate and timely.
- Does natural mean safe? Does organic mean safe? Is a bio-derived chemical safer than the same synthetically derived molecule? Is a natural occurring toxic chemical less hazardous than the identical toxic chemical synthetically derived? Is a naturally occurring but unregulated chemical remedy safer than a synthetically derived FDA registered drug? To date there seem to be rebuttable presumptions that the answers to the above questions is *YES*, when in fact that may or may not be the case. CICC recommends that the GCI process level the playing field and strive for consistency across the board.

2. CICC Hypothetical Exercise - Discovery and Commercialization

- Many of the points of discussion from the CICC facilitated sessions regarding Discovery and Commercialization of substitutes have already been included in the comments and recommendations above. A summary of key discussion points is contained in Attachments #2, page 10 and #3, page 16. Attachment #2a, page 15 also highlights the same material from a different point of view. Both presentations, we believe, are accurate but emphasize different points. CICC once again recommends continued dialogue as the only way to capture and harmonize these legitimate points of view.
- The chemical industry's Research & Development laboratory and pilot plant capabilities in California (exclusive of biotech and stem cell research) have been diminishing for more than two decades. Chemical manufacturing operations have followed suit. Chemical R&D facilities which do exist are, for the most part, engaged in applied process research as opposed to basic or discovery research. In short, new green chemical molecules have a greater likelihood of being discovered in private laboratories outside of California, or within the laboratories of the state's university system. Despite its unrivaled accomplishments at discovery research, however, universities are not in the business of seriously commercializing their discoveries. Discoveries are licensed to firms which are often small(er) companies. These companies take on the tasks of piloting, demonstrating, marketing and selling product or services. CICC recommends that DTSC in conjunction with other state agencies conduct a base-line review of physical and intellectual capabilities to support and nurture the green chemistry R&D initiative. Additionally, CICC recommends that public private arrangements between universities and private industry be encouraged, particularly as it relates to green chemistry solutions.
- In a command and control regulatory environment, private industry can only proceed as quickly as regulators can regulate. Time-to-market is critical in any new product launch. Delays and uncertainties increase the financial risks and reduce the initiative. DTSC must ascertain its capability to manage whatever regulatory structure might be envisioned and begin making adjustments accordingly.
- For additional information, please refer to Attachments # 2 and #3, pages 10 thru 19

3. CICC Hypothetical Exercise - Continuous Improvement/ Pollution Prevention

- Current regulations impede pollution prevention. DTSC's earlier refusal to fully adopt RCRA rules places a burden on California industry and results in the generation of waste which under other circumstance could be recycled. One must ask, why a company that can design, engineer, construct and operate a world class \$500 million facility anywhere in world cannot perform elemental neutralization within California? There are numerous opportunities to reclaim process streams that may require refining (i.e. distillation, filtration, etc) prior to recycling the material back into the same process. The Chemical Industry Council and the DTSC have embarked on a partnership to promote voluntary pollution prevention and reduce waste. CICC is eager to work with DTSC to implement regulations allowing more flexibility for generators to reclaim streams onsite without having to go through tiered permitting or Part B Permit. CICC recommends that we work collaboratively with the Department to fix this problem and reduce waste generation.

- Ten economic and tax incentive ideas are suggested in Appendix #4, pages 21 and 22. These suggestions include: investment tax credits, public private partnership grants, low interest revolving fund loan, personal property tax exemption for laboratory equipment, preferred tax treatment for equity fund investment in California's GCI movement. CICC encourages DTSC to conduct a feasibility review to identify the political resolve for one or more of these ideas. CICC also encourages DTSC to host a Green Chemistry Symposium IV dedicated entirely to technology transfer, start-up funds, equity funding, and possible CalPERS investment in California companies with homegrown technology that solve California environmental problems.

Corollary to these points, we further recommend:

- a. That program funding within DTSC's Science Pollution Prevention and Technology Development group be reestablished in order for the Technology Development staff to review and validate the green chemistry/ green engineering performance claims made by companies seeking economic incentives in the form of grants, low interest revolving loans, and preferred equity funding. The program we envision would be short of certification. CICC also believes there are useful lessons to be learned from US EPA's Design for the Environment program which might be incorporated.
 - b. CICC also recommends that DTSC begin an immediate effort to ramp-up its Life Cycle Analysis (LCA) capability. Unquestionably, one cannot envision competency in Cradle to Cradle techniques without enhanced in-house LCA capability.
- CICC should like to call your attention to the strong emphasis on educational outreach to both industry and the public regarding pollution prevention. California is fortunate to already have a mature and critically recognized educational outreach program at UC Berkeley. Dr. Herb Their, Lawrence Hall of Science, UC Berkeley began a program some 20 years ago known then as the Chemical Education Public Understand Project (CEPUP). Over the years with the success of the program, the name changed to SEPUP, the Science Education Public Understanding Project. CICC was an early supporter of Dr. Their and CEPUP. We recommend DTSC consider how this program might accelerate outreach and conversely how green chemistry concepts might be incorporated into the teaching modules. (See additional material Attachment #4, pages 22-23)

General Observations and Recommendations:

1. Green Chemistry Initiative - Development Process is Key

The transparent process which DTSC has embarked upon to define the Green Chemistry Initiative has thus far set a new standard for public policy development in California. It is, in and of itself, a new paradigm. CICC is an unwavering proponent of facilitated dialogue and consensus building in advance of regulation or legislation. However, the facilitated sessions to date, while helpful in terms of networking have tried to cover but too many topics in too little time with mismatched expertise. They have also been relatively superficial leading one to ask – what's next? CICC is concerned that pressures external to the Department will grow impatient with the course which has been set, and DTSC will revert to a more traditional regulatory development method.

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CICC therefore encourages DTSC to pay as much attention to the *process design* by which the final GCI policy will be determined, as it might otherwise pay to the final outcome itself.

Corollary to this point, we encourage the Department:

- To assure sufficient funding is available to conduct the necessary process steps that lie ahead;
- To avoid the temptation to shortcut the process for political expedience (It would be most unfortunate to attempt to create a new regulatory paradigm via the conventional process);
- To ramp-up the sophistication and relevance of the facilitated dialogue;
- To consider moving to concurrent dialogue sessions with representatives of stakeholder groups whose talents align with the relevant issue – not everyone is cross-trained to be equally conversant with all subject matter under consideration.

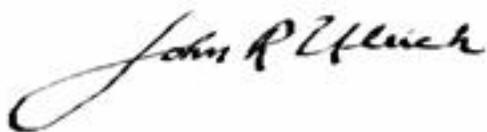
2. Green Chemistry Initiative – Must be Rooted in Science

The Green Chemistry Initiative must have at its core a strong science foundation. Evolving to a new chemical management paradigm for California should transcend this Administration and this Legislature. It should set in motion a sustainable long-term process and not get bogged down in the short-term political tactics. DTSC, to the extent possible, should seek to de-politicize the process by which the GCI is developed.

In conclusion, CICC wishes to echo remarks from our presentation at Green Chemistry Symposium I. The scientific discovery process is a never ending cycle of experimentation, observation, learning and renewed experimentation. There are no absolutes! The pursuit of “Green Chemistry” is a journey - not a destination. Important elements of GCI should: protect proprietary technology and intellectual property, avoid unnecessary legislation and regulation which might impede discovery, avoid the false hope of continuous *breakthrough* discovery, and properly value and promote continuous improvement –pollution prevention.

We appreciate this opportunity to comment.

Sincerely,



John R. Ulrich

Executive Director
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Attachment # 1

Green Chemistry Initiative (GCI) – 3-Part Interactive Exercise

Three CICC *Work Groups* of 5 or 6 persons each will work with three *Resource Groups*, each comprised of 2 guests. There will be 3 facilitators, 3 work periods and two plenary sessions. CICC Work groups will rotate through the 3-part exercise. Resource groups will likewise rotate through the exercise, but in the reverse order. Facilitators will not rotate. A plenary at the start will explain the exercise and the central themes. A plenary near the end of the exercise will allow presentation including Q and A. Mid-course corrections and a walk-about will keep the activity relevant and on-track. Mini-poster session will take place during the cocktail hour before dinner.

The Scenario:

A chemical named *α-methyl bad stuff* (AMBS) is found in myriad of essential products manufactured, distributed and used in California. Unfortunately the AMBS, which has been manufactured and perfected over two decades, has been linked directly and indirectly to the deadly *Gotcha Disease*. The disease mysteriously, but disproportionately, affects a subpopulation of Californians approaching retirement age. A leading senior citizen advocacy group has been successful in calling attention to the linkage between AMBS and *Gotcha*, and has lead the fight for the development of a non-toxic substitute for AMBS followed by a complete regulatory phase-out of AMBS as a substitute becomes commercially available. Unfortunately, AMBS is the stuff upon which literally millions of people and billions of dollars of commerce depend. Due to the multitude of applications for AMBS, some have suggested a single substitute may not perform equally well in every application. The possibility exists that more than one substitute may be necessary before AMBS can be completely eliminated.

The 3-Part Exercise:

- 1) What steps lie on the "critical path" for DISCOVERING a suitable non-toxic, green chemical substitute?
 - What impediments (proper or improper) litter the critical path for discovery in California?
 - What actions would be most effective in removing impediments and empowering discovery in CA?
 - If California could take three actions to advance the GCI commercialization process to the greatest extent, what would they be?

Tom Jacob (DuPont) - Facilitator

- 2) What steps lie on the "critical path" for COMMERCIALIZING a newly discovered and allegedly non-toxic, green chemical substitute?
 - What impediments (proper or improper) litter the critical path of commercializing substitutes in
 - What actions would be most effective in removing impediments to commercialization in CA?
 - If California could take three actions to advance the GCI commercialization process to the greatest extent, what would they be?

John Ulrich (CICC) - Facilitator

Attachment # 1

Green Chemistry Initiative (GCI) – 3-Part Interactive Exercise

(continued)

- 3) As the long-term strategic search for suitable substitutes continues in the laboratory and pilot scale plants, what should be done in the near-term? Is CONTINUOUS IMPROVEMENT – POLLUTION PREVENTION measures legitimate interim strategies to mitigate harmful effects of *a-methyl bad stuff* and advance the GCI?
- Is “less bad” always – “no good”?
 - What can California do to encourage a "proper" near-term action plan?
 - If California could take three actions to advance the GCI pollution prevention process to the greatest extent, what would they be?

Martha Murray (Ampac) - Facilitator

Attachment #2

Discovery Process-Search for Green Substitutes – Tom Jacob Facilitator

DATA (Toxicity/Hazard)

In order to begin the process of Discovery for a substitute chemical it is imperative to understand the inherent characteristics or traits of the chemical for which the substitute is being designed. Where do you start define specifically what's "bad" about the original chemical? How do we know AMBS (the hypothetical chemical of concern) is the cause of the alleged problems that led to its legislative phase-out? Where is the bar in terms of moving from suspicion/evidence of chemical linkage to actual action?)

- Do we have enough information on substitutes (is there a data gap on substitutes that must be part of the substitution equation?) Where are exposure routes (what are the "gradations of bad")?
- Examine what makes AMBS (the hypothetical chemical of concern) work effectively (what is its value in use?) Substitute should possess the good properties of the bad chemical, but not the bad properties.
- Need chemicals that are reactive (they must do the job) but are less toxic
- There is a need to push state of science (particularly in emerging areas of subtle effects, multiple exposures, etc.)
- What [information] do we need to reduce unforeseen risks/consequences of substitute (how do we deal with the potential for latent effects, interactive effects, etc, for which we do not yet have scientific agreement on parameters or methodologies)
- In the health field, identification of a medical condition triggers a specific known and highly developed process
 - That is not so highly developed for "environmental ills"
 - Product uses must be understood and considered (dispersive, etc.)
 - We don't have standardized metrics for determining "problem"
 - We don't always have direct knowledge of the problematic exposure (either manufacturers or regulators)
- Must consider how to address immediate (AMBS - the hypothetical chemical of concern) problem vs. establishment of a process to enable such sorting through all chemicals (prioritization process?)
- How much data is enough (and how are we generating it)
- Need to define universe of information that leads to robust decisions
- Not realistic to answer all Questions for all chemicals
- Comprehensive info on every molecule not possible
 1. Must be "good enough" that we won't be targeting the substitute chem next year

Attachment #2

Discovery Process-Search for Green Substitutes – Tom Jacob Facilitator

DATA (Toxicity/Hazard)

(Continued)

- [The existence of a] data gap can't be a rationale for doing nothing [failure to take action until all data is gathered]
- Must define scope of "sufficient" for hazard and exposure to enable innovation
 1. Must be predictable and manageable
 2. Must meet market needs
- Hazard, yes; but exposure is also relevant
- Need to understand exposure/use more fully to effectively target actions
- Uncertainty re uses (exposure)
 1. Needs reporting on potential uses?
 2. Down value chain – what are proper uses
 3. We don't always have direct knowledge of the problematic exposure (either manufacturers or regulators)
- End product should be the concern
 1. Does it pose potential new hazard
 2. Does it pose potential reduction in hazard v its constituent chemicals (hazard of end product may not equate to sum of hazard of constituent chemicals)
- What uses may be associated with what endpoints of concern (primary/secondary/ultimate fate)
- Hazardous constituents can be necessary/desirable in discovery/engineering of substitutes (can't write prohibitions/restrictions so broadly they impede innovation)
- Must consider both hazard & use

Applications (Use) / Performance/ Supply Chain

- Examine what makes AMBS (the hypothetical chemical of concern) work effectively (what is its value in use?)
 1. Substitute should possess the good properties of the bad chemical, but not the bad properties.
 2. Customers must feedback into marketplace (what change is needed/of value)
 3. Information in marketplace is key

Attachment #2

Discovery Process-Search for Green Substitutes – Tom Jacob Facilitator

Applications (Use) / Performance/ Supply Chain

(Continued)

- Info is out there, but it is not getting into system (CBI may be issue in public data, but the necessary knowledge may exist anyway - within the value-chain)
- Supply chain communication is a driver of discovery – stimulates suppliers to better meet customer needs and better insulate customers from risks
- What uses may be associated with what endpoints of concern (primary/secondary/ultimate fate)
- Must have ability to demonstrate appropriateness/suitability
- What mechanisms can facilitate information getting to market place?
 1. Is there a process for differentiating in the market (certification? – gov't or 3rd party)
 2. State/national/international?
- Need chemicals that are reactive (to do the job) but are less toxic
- End product should be the concern
 1. Does it pose potential new hazard
 2. Does it pose potential reduction in hazard v its constituent chemicals (hazard of end product may not equate to sum of hazard of constituent chemicals)

How do you judge “sustainable” (where do we draw the circle of relevant considerations – is it just the specific hazard in question or does it extend to broader considerations via Life Cycle Analysis or LCA, consideration of societal benefit trade-offs, etc.)

Regulation

- ID of “problem” chemicals is key to stimulating R&D
- Must consider how to address immediate AMBS - problem vs. establishment of a process for to enable such sorting through all chemicals (prioritization process?)
 1. Make problems more transparent
 2. Provide for specific use exemptions for problem chemicals where there is no reason to anticipate risk
- How do you “regulate” against improper use? What are responsibilities along the value chain?

Attachment #2

Discovery Process-Search for Green Substitutes – Tom Jacob Facilitator

Regulation

(Continued)

- Should establish “safe harbor” tests to enable certification (3rd party verification of product safety per our current state of understanding)
- Should establish limits on liability w/in range of “best practices” (as is the case for medicine), to recognize evolution of science (enable innovation within our current understanding of science – note that this leads again to question of “what’s in the circle?”)
- Need incentives to advance substitutes – need to define what is acceptable (needs to be standardized and predictable to demonstrate suitability)
- The bottleneck of gov’t approvals can be significant impediment to delivering innovation to the marketplace
- Need to consider specifically incentives to locate in CA not just to sell into CA
- Must rationalize regulatory process (especially CEQA process delays)
- Uncertainty regarding future regulation can be a [negative] issue in stimulating R&D/innovation
- Regulators should define what is “suitable”, non toxic, etc.
- DTSC should develop a list – perhaps look to tax incentives where DTSC determines need to find greener alternative
- Regulatory pressures can stimulate customer demand

Research and Development in California

- Who will do work to actually deliver research, innovation, etc. (gov’t, industry, combination?)
- Must have resources sufficient to enable discovery (including facility permits, etc.)
 1. Existing CA regulatory structure can be impediment
 2. Workforce, regulatory (including time) and financial dimensions are all hurdles in discovery/innovation.
 3. Skilled workforce needs unmet
 4. Need modification of CEQA (especially time delays) to better enable responsive R&D
 5. Must rationalize regulatory process (especially CEQA process delays)
- Must anticipate sufficient return on investment to justify R&D (data compensation issues – should be mechanism to insure that company investing in R&D, testing, etc. should, be compensated for that investment if it succeeds and other companies piggyback on the information – systems are already in place in pharma and pesticide arenas)

Attachment #2

Discovery Process-Search for Green Substitutes – Tom Jacob Facilitator

Research and Development in California

(Continued)

- Need lab scale alternatives that can be tested by customers, etc in interactive process to ensure both safety and efficacy in use

Financial Incentives

- Funding R&D could also aid
- Be conscious of differing approaches needed to be proactive vs. reactive
- Provide financial incentive/regulatory relief for “greening” product/application
- Need to consider specifically incentives to locate in CA not just to sell into CA
- Uncertainty regarding future regulation can be a [negative] issue in stimulating R&D/innovation
- Need incentives to advance substitutes – need to define what is acceptable (needs to be standardized and predictable to demonstrate suitability)
- State investment support – could it extend to allowing private sector R&D personnel under PERS as incentive to bring R&D to CA?)
- What is the role of CA Dept of Trade & Commerce in facilitating green chemistry (inc provision of info on regs, etc)

Attachment #2a

Discovery Process-Search for Green Substitutes – Tom Jacob Facilitator Alternative Approach for Discussion

'Critical path' for DISCOVERING a suitable non-toxic green chemical substitute?

1. What impediments, proper or improper, litter the critical path for discovery in CA?
 - a. What constitutes toxic/not-toxic?
 - i. Certain endpoints
 - ii. To people but not polar bears?
 - iii. Where do we place the bar on standard of evidence; what level of uncertainty is acceptable?
 - b. What constitutes suitable alternatives?
 - i. Depends on which outcomes are acceptable
 - ii. Where we draw the bounds of the hazard/benefit analysis
 - c. IMPEDIMENTS
 - i. Risk/hazard information is **not** transparent so don't know how to motivate process of improvement
 - ii. Confidential Business Information (CBI): insufficient data compensation
 1. blocks feedback process between producer and consumer: producer...distribute/down use...consumer
 2. blocks which can otherwise drive discovery
 - iii. based now in a reactive not proactive system
 - iv. Disaster, occupational exposure is alert but may be business liability?
2. What actions would be most effective in removing impediments and empowering discovery in CA?
 - a. Standardize definitions:
 - i. What data is necessary to make robust decisions
 - ii. What constitutes good enough data
 - iii. Establish criteria for suitable substitutes
 - iv. Make these standardized and predictable
 - b. Establish a list of priority substances-inject science into process to:
 - i. Reduce liability to public?
 - ii. Reduce business uncertainty
 - c. Get the market signals right and incentives to develop one DTSC-certified alternate to establish a list of priority substances
 - d. Sufficient return to justify R&D for incentives to locate solutions in CA
 - e. Once chemical is tagged for phase out, devise a pre-established cooperative process for making an EXIT STRATEGY:
 - i. Identify problem
 - ii. Identify associated industry/business
 - iii. Collaborative process bringing industry, academia and state together to develop alternatives, identify exceptions
 - f. Need a SAFE HARBOR: develop a body of 'best practices' that will protect companies who have been doing due diligence from endless liability
3. If CA could take these actions to advance the GCI commercialization process to the greatest extent, what would they be

Attachment #3

Critical Path to Commercialization -- John Ulrich, Facilitator

Testing, Evaluation and Data

- There is significant overlap w/ R&D during the commercialization of a chemical (product)
- In the case of a substitution product, the same customers one had with the original material have a stake in the success of the developing substitute. There is likely to be considerable collaboration between manufacturer and customer. Regarding – green substitute: There is no guarantee it will work equally well in every application for which it is a substitute. Lots of test data would need to be generated to demonstrate it is a successful substitute from an effectiveness stand point.
- Recognized that a new body of data will be necessary on the new substitute material. One suggestion was that there be a std. set of data requirements to demonstrate that the substitute is safer than the original. Question was posed - should the new data screen be based upon volume or toxicity (hazard)? What about the risk of exposure?
- Significant data is generated and evaluated at each stage – they include:
 1. Acute and chronic toxicology
 2. Use & Acceptance data
 3. Physical data
 4. Efficacy & Performance
 5. Engineering data (scale-up)
 6. Enviro fate & transport
 7. Regulatory requirements
 8. Economics, Cost, ROI, Insurability,
 9. Liability
 10. Interactions & Physiology
 11. Validate end-of-life assumptions

Question Exists: How much data is enough data and who decides? No data no market sounds good but theres’s more to it. However, a manufacturer cannot anticipate every conceivable use for the chemical (product)

- Some thought the data needed to be generated and reviewed prior to commercialization (no data - no market). Others wondered if there could be a “no risk” demonstration. The question came of who decides. It was clear that some favored disclosure of toxicity testing data before commercialization and others after the material entered the stream of commerce.
- Data is a competitive advantage. Data is Intellectual Property (IP). Data (physical and toxicological) is a competitive advantage in process to bring a substitute product to market. Data = proprietary intellectual property = value (monetary and time element).
 1. Time is valuable in process
 2. Cost of studies in an important factor, but time element could be more so.
 3. Regulatory certainty – how much and who says?
- Avoid letting “experience” be a burden to new directions – find new directions

Attachment #3

Critical Path to Commercialization -- John Ulrich, Facilitator

Testing, Evaluation and Data

(Continued)

- Data drives choices – but different needs exist at different levels. Some type of scaled data requirement might be in order including up-graded MSDS and labeling. How much data is necessary at different stage of development?
-
- Testing is integral to new commercial product development, information sharing needed
 1. MSDS, labeling
 2. 3rd Parties
 3. There must be a balance. There will be a tension in the advancement of the GCI as it relates to the value of a company's developmental data and the free flow of information
 4. Staged data requirements driven by -
 - Stages of commercialization
 - uses of the product (Amount and type of data collection driven by end use/).
 -
- Consideration of a 3rd Party testing/evaluation/ certification i.e. Green Seal, C2C, UL, SAE, ASTM and others
- Information Gaps – require up-front data preparation.

Regulation & Registration

- Regulation should not become the bottleneck – Industry can only move as quickly as regulators can regulate
- Regulation is reactive and confining rather than proactive and enabling (empowering)
- New process for commercialization might include a trade-off (less regulation for more up-front data)
- Process of commercialization involves or is likely to involve labeling requirements and or registration. (Data requirements are implicit)
- Knowledge outpaces regulation – need fewer regs. and more data
- Conversely, there is a need to appropriately speed the regulatory approval process. (Recall above, the regulated can only move as quickly as the regulator can regulate). This point is not in conflict with the above, because there process of expediting a product to market need not involve shoddy or incomplete review.

Attachment #3

Critical Path to Commercialization -- John Ulrich, Facilitator

Regulation & Registration

(Continued)

- Reg. review, EH&S, environmental fate considerations begin during the laboratory stage and continue into and beyond the pilot plant stage. Similarly, the pilot plant stage involves an array of permits which could include, TSCA, FIFRA, local air permit possible CEQA review and others.
- FIFRA Re-registration process
- There is a balance between the right to move a product to market and society's need (right) to know
- Regulations are reactive and preventative vs. proactive and enabling – the way to fewer regs. is through greater testing and data transparency (sharing)
- Rather than approaching a challenge from a position of “how we used to do something” perhaps it would be better to look at “Here's today's accepted body of knowledge – now let's go forward”

Financial Incentives

- Incentives: Carrot vs. Stick
 1. Green product label
 - Product liability safe harbor (belief this would work against speeding product to market – would require careful regulatory review which would slow the process of commercializing the chemical or product.
 - Replacement ingredient – need to get to market quickly
 - [Fully fund SPPDT's product and technology development office to screen products and technologies for their claims and to enable them for developmental grant \$\$.]
- No one size fits all process
 1. Determine the products uses
 2. Determine the hazard and risk assessments
- Suggestion to fund SPPTD evaluation program screen and grant enable

Attachment # 4

Continuous Improvement/ Pollution Prevention – Martha Murray, Facilitator

Is Being “Less Bad” always “No good?”

POLLUTION PREVENTION measures legitimate interim strategies to mitigate harmful effects of ABMS and advance the GCI?

- Continuous Improvement / Pollution Prevention of a “bad process” can be an excellent interim measure in the transition to an environmentally sustainable Cradle-to-Cradle process. P2, however, will ultimately have diminishing returns and should not be a reason to stall
- Reformulating the product and process to reduce toxicity and volume of waste as long as continuous improvement is not used as a reason to stall the process of alternative development
- Prioritize reuse/recycling of byproduct streams, thereby transforming the “waste “ fate for beneficial reuse (life cycle)
- Continuous improvement is good if less toxic in the product

Regulatory

What can California do to encourage proper ‘near-term’ action plan?

- Identifying goals: Prioritize substances for risk reduction
 1. Define nature of exposure
 2. Define the use of the material (How is the material used, what is its purpose, and the applications are what? Exposure is critical factor – cannot ignore risk assessment)
 3. Define actions to take to move forward
- Need to reduce the barriers to innovation (CEQA permitting and in-process recycling are burdensome, costly, time consuming and the outcomes are uncertain)
- Ban [phase-out] the use of a chemical in a (specific) product – but do **not prohibit the outright use of the material as** a raw material or substance for a different application

DATA and Tracking

- Concerns:
 1. Sharing of expensive H&S toxicity data [must be compensated]
 2. Homeland security
- Statewide electronic reporting on CUPA for chemical use mapping (track whose looking)
- Chemicals and products sold in California (track whose looking)
- Safe harbor provisions - No trial lawyers or regulators

Attachment # 4

Continuous Improvement/ Pollution Prevention – Martha Murray, Facilitator

Incentives

If California could take 3 actions to advance the GCI pollution prevention process to the greatest extent, what would they be?

- Regulatory Incentive
 1. Address regulatory burden of recycle/recovery on site for treatment of process streams within a ‘management unit’ or facility
 - Improve flexibility
 - Need to change how the state looks at hazardous waste in manufacturing process
 2. Streamline permit/regulatory process for changes - all permit categories
 - Air/water/waste
 - Building/fire/etc
 - “Permit-by-Rule” (PBR) does not work – it is user not friendly and is no less difficult than RCRA permit
 3. Provide regulatory relief of some sort
 4. Need to have legal process limitations to prevent lawsuits
 - *CEQA limits growth and improvements- consider mandatory expedited mediation step for contested projects in the Negative Declaration and Mitigated Negative Declaration categories. Arbitration for contested EIR projects*

- Financial incentives:
 1. Impose “sin” tax for failure to implement commercial alternatives, i.e., alternatives to CFCs
 2. CalPERS [investment fund] money to California companies for [sustainable] “green” technology solutions and products to solve California problems
 3. California increase Tax Credit for Research & Development investments (5 yr “sweetener for GCI approved green chemistry and engineering solutions.)
 4. Grant Programs to public /private partnerships to pilot **and evaluate** approved “green” technologies and products.” Relaxation of bidding requirements for unique and approved green chemistry technologies and products – requires a follow up project evaluation of the performance.
 5. State revolving fund for low interest loans (matching funds) to small California business enterprises for transfer of green technologies and products from lab bench to full commercialization. Enterprise must have a California nexus to be eligible for loan.

Attachment # 4

Continuous Improvement/ Pollution Prevention – Martha Murray, Facilitator

Incentives

(Continued)

6. Favorable tax treatment for California private equity and investment funds that invest in small to medium sized California business enterprises for transfer of green technologies and products from lab bench to full commercialization. Must have a California nexus to be eligible for loan. Concept is one of California investment firms investing in California companies to develop California green technologies to solve California problems.
 7. Sales tax exemption for Pollution Prevention and GCI [approved green chemistry/ engineering equipment and services]
 8. Develop a 'cap and trade' system [CO₂ equivalent reductions]
 9. State and local property tax abatement on real property for a prescribed number of years as incentives [tax abatements on green chemistry/ green engineering capital investment projects]
 10. Personal property tax exemption on research laboratory equipment dedicated to discovery research related to green chemistry or applied research for pollution prevention.
- Education I - Develop clearinghouse for best practices for Industry
 1. Work with universities
 2. Safe harbor provisions for participants
 3. Disseminate info
 - Education II: communicate Pollution Prevention expectation to the public
 1. Manage the expectations
 2. Communicate that there is no 'drop in' replacement
 3. Develop a Green Chemistry school at the University level
 - Like Mass.
 - CICC could drive
 4. Educate grade school children on labels, and the reading and understanding of them so that they can make better choices
 - CMTA led program entitled, " GetREAL" or *Relevance in Education and Learning – Career Technical Training*, SB 675 (Torlakson) Technology Integration Curriculum Plan]
 - [UC Berkeley Lawrence Hall of Science award winning *Science Education Public Understanding Project* (SEPUP)]

Attachment # 4

Continuous Improvement/ Pollution Prevention – Martha Murray, Facilitator

Incentives (Continued)

5. Federal support on redevelopment funds
6. Educate people on cost of 'risk free' [UC Berkeley Lawrence Hall of Science award winning *Science Education Public Understanding Project* (SEPUP)]
7. Address risk and benefit together-'relevancy to 'me'' [UC Berkeley Lawrence Hall of Science award winning *Science Education Public Understanding Project* (SEPUP)]
 - Voluntary and involuntary risks
 - Need to explain to industry and to the public
 - Have a market-driven approach to replacements
8. Need to increase public awareness in order to encourage market forces to act

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