



Workshop Summary

TechMagination was a day-long workshop hosted by Pacific Northwest National Laboratory. The purpose of the event was to bring together the region's clean technology leaders and stakeholders to imagine demonstration and development of clean technologies in the Pacific Northwest. Focus was put on the Tri Cities Research District (TCRD), which is competing for one of the State's Innovation Partnership Zone (IPZ) designations and funding.

The workshop drew more than 80 participants from industry, government, local elected officials, non-governmental organizations, research interests and the community. Together, the audience learned from experience, listened to their peers, engaged each other, and generated project ideas for demonstrating clean technologies that solve mutual business problems and open doors to business opportunities.

TechMagination was covered by TVW (Washington State's equivalent to C-SPAN), KNDU, KVEW, Tri-City Herald, Tri-Cities Area Journal of Business and InsideEnergy. All media reports can be found online.

Open & Introductions

PNNL's Mike Schwenk served as master of ceremonies for the workshop. He opened the day by explaining the relevance of the day's agenda. Clean energy and sustainability technology dominate the news today as one of the most pressing needs that affect businesses and citizens alike. Schwenk encouraged the audience to think globally so we can act locally; to collaborate and partner and to think about the possibilities; and to build on a foundation and research resources that already exist. He explained that part of the day's output would become part of the TCRD's proposal for an IPZ designation, and called the participants to be an active part of the day's dialog and solutions for the future.

Congressman Doc Hastings then thanked the audience for attending TechMagination, an event that was timely and important. Hastings went on to express his opinion that the federal government has an important role in furthering the clean technology agenda. He expressed a preference for incentives as a solution and way of encouraging entrepreneurial spirit needed in our economy, citing the Governor's Innovation Partnership Zone (IPZ) legislation. Hastings stated that our region, with its strengths in agriculture and

resourcefulness, is well-poised to lead this discussion even at a national level and that he looked forward to hearing about the ideas generated from TechMagination. He closed by introducing the keynote speaker.

Keynote Address

John Plaza, founder and president of Imperium Renewables and Seattle Biodiesel, served as the keynote speaker. His company operates the largest biofuel refinery, which produces 100 million gallons of biofuel each year. Plaza explained that biodiesel is a renewable fuel made from vegetable oils, waste oils or fats that is compatible with existing fueling infrastructure and diesel vehicles. He founded his company with the idea of fundamentally changing the economics of making this fuel so that it could serve as an alternative to petroleum-based fuel, relieving U.S. dependence on foreign oil, reducing emissions, and supporting local economies.

Plaza shared his story as an “average person” with a good idea. Prior to founding the company, John was a commercial airline pilot for more than 20 years, most recently with Northwest Airlines. John became interested in alternative fuels in the late 1990s and explored many different technologies. After much R&D, convinced he had found a better, more economical way to make biodiesel, John founded Seattle Biodiesel in 2004 as a means to produce clean, renewable fuel. The company is focused on building production facilities, recently opening the nation’s largest facility in Grays Harbor, Washington. This facility is the first of four planned facilities.

His address to TechMagination served as inspiration for the audience to think big in terms of the possibilities. He encouraged everyone to find different ways to do things better. Plaza closed his address by taking many questions from the audience.

Panel Discussion

Mike Schwenk led the panel discussion. The five panelists represented the five industry sectors organized for the workshop:

- Agriculture - Don Sleight, General Manager, AgriNorthwest
- Chemical Processing & Manufacturing - W. Densmore (Denny) Hunter, VP Technology Cellulose Fibers, Paper and Packaging, Weyerhaeuser
- Clean Energy - Brian Moreno, Chief Marketing Officer, Gen-X Energy
- Environmental Services, Jeffrey E. Surma, President & CEO, Integrated Environmental Technologies, LLC
- Food Processing - Eric Leber, Director of Research & Development, FruitSmart

Question #1 – What sustainability challenges has your company faced and how did you address them?

Abbreviated responses:

Hunter – Sustainability issues have always been at the core of Weyerhaeuser's business since their products are mostly derived from a renewable source.

Initially, one of their challenges was to convince the public that the company was not anti-environmental. Part of overcoming that challenge was finding ways to use the waste generated in the manufacture of their products.

Surma – Sustainability is the company's business. They bring environmental technology solutions to sustainability challenges. Their role in the process is different than those who need solutions.

Moreno – As a solution provider, their challenge was to understand the market needs first, then to develop technologies and get them to the companies who need them.

Sleight – Much of the challenges in agriculture have to do with efficiencies and workforce. Sustaining soil quality year to year has been a challenge that they continue to work on.

Leber – A lot of energy is consumed in processing food and the cost of energy is climbing rapidly. So they are always looking for ways to be more energy efficient. The other challenge has been in the area of waste. They have figured out there is some value in some of the waste. For example, winery waste has nitrogen and grape seeds. Leber's company has been able to figure out how to extract some value from winery waste, for example, oils from the grape seeds and gasification of the grape hulls for energy.

Question #2 – What sustainability challenges do you see on the horizon for your industry?

Hunter – The future holds continued challenges in managing public perception of cutting down trees. The company will continue to address those concerns while carefully managing the balance between new tree growth and cutting down trees for high-value products. The second part of the future challenges has to do with innovation, continuing to find new products and markets with this sustainable resource.

Surma – If energy prices stay high or if incentives are in place it will spawn the development of next generation technologies and technology adoption. When prices are low it's hard to convince the market to adopt anything new even when it will benefit them in the long term.

Moreno – In the area of biodiesel, the challenge will continue to be helping people understand the attributes and benefits of this kind of energy.

Sleight – For agriculture a growing challenge has to do with an economic imbalance. There are incentives in place for producing ethanol-generating crops for obvious reasons, but not for the food crops we need. And for an area like Washington, we are not the place to grow a lot of corn. What is driving the type of crops grown is really what you can do with the byproducts from the process; and so industry and technology growth is aligning itself with plants in the places where corn is a common crop. So the challenge is the economics of basic supply and demand for specific crops. Another challenge

is finding ways to grow crops with less water, fewer nutrients and faster; this is an area where genetic engineering will continue to play a role for the future. Leber – Availability of feedstock and raw material to work with. Also think we need to have more dialog about waste and find valuable uses for it. Envision a need for more analysis and separations technologies to extract value from waste. For analysis most of those technologies are outside of our region even though we have the abilities here.

Mike Schwenk then summarized the comments and compiled the discussion into common themes to help guide some of the remaining discussion and the afternoon breakout sessions:

- Public opinion is crucial to what we do; education is fundamental.
- Legislation and regulatory issues are front and center and will impact what we do.
- Innovation and technology is central to all industries; we all need to think broader and look for synergies industry to industry.
- Economic issues are common in every case. We must balance ROI with what it takes to get started and be successful as a small business.
- Unintended consequences should not be far from our thinking. We must consider how what we do today impacts things down the road.

The panel discussion concluded with several additional questions from the audience to specific panelists.

Luncheon Speaker

Andy Mangan, founder and executive director of the U.S. Business Council for Sustainable Development, served as luncheon speaker. The organization facilitates synergistic projects between companies, helping them turn byproducts into high-value business propositions that help the environment, the economy and society in general.

Mangan praised the audience for its participation in the morning session and its interest in finding common ground in the area of sustainability technologies. He then explained how the Council came to be with a project developed between two companies; the concept has since been applied to groups of companies who share information and look for ways to synergize the processes in their businesses (i.e. one company's waste can be put to good use by another).

Byproducts synergy is taking hold all over North America and around the world. Mangan shared several examples, including one in Chicago involving 27 companies and 7 city departments who came together to work on 45 different synergies. In the Pacific Northwest, there is a byproducts synergy network forming in the Puget Sound area. The group has the potential to involve more than 20 companies on both sides of the Cascades.

Mangan closed his talk acknowledging that there are many reasons or barriers for companies not to consider this approach. However, he encouraged the audience to consider the opportunities and get a dialog started in the Tri Cities so everyone can benefit.

Breakout Session Summaries

Agriculture

The Agriculture Breakout Group of the TechMagination workshop identified four ideas with the highest potential for sustainable technology demonstrations in the region:

- Operating a large, agricultural test plot for evaluating and demonstrating technology-based, high-production, sustainable farming practices
- Operating joint feedlot and biofuel production facilities
- Converting cellulose byproducts from local tree-farming operations into ethanol
- Demonstrating renewable energy for powering irrigation.

Participants included:

- Holly Cushman, Washington State Department of Ecology
- Graham Evans, Washington Technology Center and Washington Clean Technology Alliance
- Ken Grimm, Pollution Prevention Resource Center
- Dennis Houghton, Icetrain
- Pat Tucker, Sandpiper Farms, Inc.

Steve Slate facilitated and Andrea McMakin served as scribe.

The group discussed a number of ideas and ranked them according to the designated criteria, which led to the top four:

Test agricultural plot. A multi-acre test plot would be used to evaluate new or emerging technologies for high-production, sustainable farming. It could draw on the capabilities of local stakeholders--WSU, Columbia Basin College, and PNNL and other technology providers, and agricultural interests--to conduct extensive agricultural modeling and analysis of sensor and other data to maximize the value of the experimentation. The test plot also could benefit organic farming, a sustainable approach that is increasingly being adopted locally. WSU could bring expertise from its Center for Precision Agricultural Systems, its Prosser Irrigated Agriculture Research & Extension Center (whose mission is to optimize agriculture yield while conserving energy, soil, and water), and its relationships with the USDA Agricultural Research Service and the Washington State Department of Agriculture. PNNL could bring its extensive instrumentation, modeling, data analysis, and data visualization capabilities. Other providers could bring technologies to evaluate in the test plot.

Joint feedlot and biofuel operations. This project would evaluate the feasibility of jointly operating a feedlot and biofuel operation. Corn would be used to make biofuel, the residue would be used to supplement the cattle feed, and the feedlot wastes would be used to make methane which would be burned to heat the biofuel process. A 500-acre

feedlot that holds up to 30,000 cattle, Simplot Feeders Limited, already exists in Burbank and is located next to a Tyson meat packing operation. A co-op of corn-growers and other stakeholders could be formed as a potential funding source. Two limitations are that the project could require corn from the Midwest as a feed source and that the conversion process may generate high-salt water as a byproduct.

Ethanol from cellulose byproducts. California-based Pacific Ethanol, which produces and markets low-carbon renewable fuels in the Western United States, is building a 35-mil-gal/yr ethanol production facility in Boardman and is looking at Plymouth as a potential site. Bill Gates invested \$84 million in the company. The company also is working to develop new renewable fuel technologies such as cellulose-based ethanol. The principal cellulose source would be local poplar tree farms, though cellulose can be derived from other low-cost sources like urban garbage and crop wastes. Technology development and demonstration are needed to improve the economics of the enzyme-based conversion process. Enzymes break down cellulose material for fermentation into alcohol. PNNL could contribute its enzyme expertise.

Renewable energy for farm irrigation. This project combines renewable energy, which has substantial political support on West side of the state, with the need for water, which is a great concern on the East side. Because irrigation is one of the largest energy users in agriculture, farmers are motivated to find lower-cost ways to irrigate their crops. Wind or solar energy could be evaluated for their ability to reduce energy use on farms, thus contributing to sustainability in two ways: renewable energy and water conservation. The most direct means for doing this would be to connect the renewable systems to the grid and use net metering. However, there may be some additional benefits for using the renewable energy for pumping water into reservoirs for storage. PNNL could determine the water and energy footprint for Eastern Washington agriculture and identify ways to increase the efficiency of water and energy use.

Clean Energy

The Clean Energy breakout group discussed 10 ideas with the highest potential for sustainable technology demonstrations in the region. The top three were presented to the general audience:

- Integrated thermal/electrical production (Solar/Wind)
- Net zero footprint community
- Higher energy density from biofuels

Participants included:

- Ed Carroll, Agilis Solutions
- Troy Green, J-U-B Engineers, Inc.
- Debra Taevs, Pollution Prevention Resource Center
- Darroll Clark, Franklin PUD
- Steffee Knudsen, TVA Architects
- John Fox, Richland City Council
- Mike Knapp
- Eloisa Sanchez, Solaris Group
- Jessica Blankenship, Solaris Group
- Peter Brehm, Infinia Corporation
- Don Bouchey, Mid Columbia Engineering

- Suzanne Mitchell, Washington Technology Center
- David Tilton, Green IT Alliance, MindShare Consulting
- Jim Campbell, Pacific Northwest National Laboratory
- Neil Schmitt
- Gary Knudson, F&F Biofuels
- Jeffrey Sharp, AgraSharp
- Bob Wegeng – Pacific Northwest National Laboratory

Gary Spanner facilitated and Jonni Dron served as scribe.

The group discussed a number of ideas and ranked them according to the designated criteria, which led to the top three:

Integrated thermal/electrical production (Solar/Wind). Involves integrating electrical and thermal production or combining solar and wind power as a demonstration project. The idea consists of creating a self-sustaining electrical source through the use of both solar panels and wind turbines to supply the electrical needs of a building. Both technologies are commercially available and could easily be implemented. Solar and wind are both clean and renewable and therefore an ideal clean technology demonstration project.

Net zero footprint community. Creating a net zero community with no energy and no environmental footprints using a systems approach. An example of what could be done to accomplish this included net metering. The general idea is to design the infrastructure and individual buildings to be completely self-sustaining, using renewable or non-carbon emitting resources to supply the energy needs for the community as well as finding ways to recycle/reuse as many resources as possible. This idea involves combining several technologies such as wind turbines, biofuels, gray water reuse, solar, rain water collection, and many others to create a community that emits no carbon into the atmosphere and is able to continually sustain its energy needs.

Higher energy density from biofuels. This idea involves supporting research being done by PNNL and WSU to increase the amount of energy produced through the use of biofuels. The driver for this idea is that the U.S. Navy is seeking higher energy-dense biofuels and plans to spend significant R&D funding in the effort.

Additional ideas discussed by this breakout session included: using waste heat from IT facilities, formal byproducts synergy network, fuel cell powered buildings, distributed generation, water reuse, clean energy master plan, and low-cost anaerobic digestion.

Environmental Services

The Environmental Services breakout group discussed 10 ideas with the highest potential for sustainable technology demonstrations in the region. The top three were presented to the general audience:

- Regional Testing Facility/Service Center
- Water Utilization Testbed
- Regional Waste-to-Fuels Facility

Participants included:

- Jeff Surma, Integrated Environmental Technologies
- Diahann Howard, Port of Benton
- Robert Grott, Northwest Environmental Business Council
- Mary Rose, Network for Business Innovation & Sustainability
- Michael Butterworth, Parsons
- Andy Mangan, U.S. Business Council for Sustainable Development

Linda Fassbender facilitated and Robin Conger served as scribe.

The group discussed a number of ideas and ranked them according to the designated criteria, which led to the top three:

Regional Testing Facility/Service Center. This facility could expand on existing PNNL capabilities to provide additional environmental analyses and testing services beyond what is currently required by Hanford Site activities. This service could utilize much of the existing expertise and equipment at the Lab and could also utilize students from WSU to assist in operations. It might also function as a service similar to EPA's Environmental Technology Verification service.

Water Utilization Testbed. This facility could focus on efficient use and reuse of water in all applications and could leverage existing agricultural technologies (i.e. efficient applications of herbicides, pesticides, and water) for residential use.

Regional Waste-to-Fuels Facility. This facility could be either stand-alone or in partnership with WSU and could demonstrate opportunities to convert a wide variety of wastes to fuels (e.g., wastes from agriculture, food processing, chemical processing, wine making, municipal waste, sewage). The decision on a specific waste-to-fuel concept should be determined via the community round-table discussions.

Food Processing

The Food Processing breakout group discussed five ideas with the highest potential for sustainable technology demonstrations and solutions in the region. None of the breakout team members were processors, which made idea generation and discussion challenging. The top three discussion points were presented to the general audience:

- Better information flow/transfer for food processors
- Low-cost transport for waste or mobile unit
- Waste water recovery system

Participants included:

- Stephen Gerritson, EnterpriseSeattle
- Tom Young, Young Electric
- Mary Rose Holtz, Barghausen Consulting Engineers
- John Holtz, Hartford Steam Boiler
- Chris Wiley, Pollution Prevention Resource Center
- Kathy Muller, Pollution Prevention Resource Center
- Karl Ostrom, Network for Business Innovation & Sustainability
- Rich Chapas, Pacific Northwest National Laboratory

Karis Alderson facilitated and Lisa Teske and Jodi Amaya served as scribes.

The group discussed a number of ideas and ranked them according to the designated criteria, which led to the top three:

Better information flow/transfer for food processors. The group identified a potential need for better information sharing so that food processors and re-processors could communicate the waste they have and its value (e.g., vineyard example) to people and organizations that have the need for waste and the ability to extract value from it. One idea was a website where people could broker their waste or search for it. The same site could be used for other resources such as events, available technologies, and financing information. It was thought that an organization like the Northwest Food Processors Association out of Portland should be a catalyst for something like this.

Low-cost transport for or processing of waste. Transportation distance is a large factor in economic viability for many smaller processors. There was discussion about developing some kind of a mobile unit that could move around and process waste at its source location. Another idea was some kind of service to transport waste so that processors wouldn't bear the cost of capital investment into transport equipment.

Waste water recovery system. Kent Valley uses steam to process meat or vegetables. All of the waste cannot be re-used. There is a need to send material through reprocessing to try to get it as clean as possible before it goes to waste water. There is a need to recover waste. Heat takes fuel to get to the appropriate temperature needed for sterilization. In addition, the cost of energy is high. Waste water often has value-added properties. For example, the waste from fruit has nutrients that can be used for energy production.

Additional ideas that were suggested included technologies for developing sustainable-materials based packaging and biodiesel production from animal fat.