

# Greening the Supply Chain: Environmental Innovations in Freight Transportation

## A Summary Report

Greening the supply chain means protecting environmental resources while planning for tomorrow. The 10th Annual Freight and Logistics Symposium brought together representatives from the public, private, and academic sectors to discuss innovations in supply chain management and transportation from the environmental perspective. Robert Johns (CTS director), Rebecca Jasper (Council of Supply Chain Management Professionals Twin Cities Roundtable president), and Ron Have (Minnesota Freight Advisory Council president) opened the forum by acknowledging the unique and diverse audience drawn from the shipper, carrier, government, and academic communities. Symposium topics included packaging, technology advancements in alternative fuels and vehicles, as well as future environmental scenarios. This report summarizes the three main sessions of the symposium.

### ***Greening the Supply Chain: Environmental Innovations in Packaging and Freight***

**Introduction:** Doug Differt, Deputy Commissioner, Minnesota Department of Transportation (Mn/DOT)

**Keynote Speaker:** Larry Lair, Vice President, Traffic Safety Systems Division, 3M

### ***Panel: Current Directions in Industry***

**Moderator:** John Hausladen, President, Minnesota Trucking Association

**Panelists:** Vince Sullivan, Midwest Sales Manager, Port of Tacoma; Roger Poyer, Manager, Hub and Facility Operations, BNSF; Buddy Polovick, Chief Shipper Coordinator, U.S. Environmental Protection Agency

### ***Panel: Freight and the Environment—Future Scenarios***

**Moderator:** Cecil Selness, Director, Office of Freight and Commercial Vehicle Operations, Minnesota Department of Transportation

**Panelists:** Bob Clarke, President, Truck Manufacturers Association; David Kittelson, Professor, Department of Mechanical Engineering, University of Minnesota; Alfred Marcus, Professor, Carlson School of Management, University of Minnesota; Jerry Nagel, President, Northern Great Plains, Inc.

### ***Concluding Observations***

Robert Johns, Director, Center for Transportation Studies

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# Greening the Supply Chain: Environmental Innovations in Packaging and Freight

## Keynote Presentation

Introduction: Doug Differt, Deputy Commissioner, Mn/DOT  
Keynote Speaker: Larry Lair, Vice President, Traffic Safety Systems Division, 3M



Larry Lair

In his keynote address to more than 80 freight and logistics professionals, policymakers, and researchers, 3M Traffic Safety Systems Division vice president Larry Lair outlined 3M's sweeping initiatives in packaging, manufacturing, and transportation aimed at reducing the global manufacturer's transportation costs while preserving the environment.

The initiatives include a new packaging program to reduce waste in the supply chain and continued use of recyclable, nonhazardous materials at 3M manufacturing plants and suppliers. Lair said the packaging initiative, in part, was sparked by a Wal-Mart program that will require global suppliers to reduce packaging by at least 5 percent over five years, starting in 2008. "It really amounts to a whole lot of small stuff. There's not just one silver bullet," Lair said, adding, "It's a lot of people working on it and you just have to keep after it."

"We recognize packaging opportunities are almost limitless," Lair explained, "and resources are not." In turn, the initiatives reduce waste while reducing costs associated with transportation, manufacturing, shipping, and storage. "When you talk about taking out one box liner or making it thinner, or changing the number of boxes you put on one pallet, it looks very small," he continued. "But when you talk about thousands and thousands of boxes and packages and pallets, pretty soon it adds up and the savings are very significant."

Under the initiative, 3M packaging engineers work closely with each 3M business unit to redesign existing packaging on key products and create improved packaging for new products. The process involves prioritizing desired outcomes, which may include increasing product volumes per pallet or reducing board material used to make a shipping box. Lair said 3M uses a Six Sigma tool called the Cause and Effect Matrix to devise changes to make the packaging more environmentally sustainable.

3M is systematically applying the process in an ambitious packaging overhaul of its product lines with these strategies:

1. *Densification*: packing more into less through shipping container design, including the use of side-loading boxes (instead of top-loading boxes) to reduce board material. Applied to one popular product supplied to Wal-Mart alone, the change reduces shipment weight by 800,000 pounds annually.
2. *Reusability*: using green manufacturing processes. For example, 3M's industrial and retail tape products division uses 30 percent postconsumer materials in all folding cartons, moves supplies at tape manufacturing plants in reusable plastic totes instead of corrugated containers, and uses water-based coatings and glues in manufacturing.
3. *Reduction*: reducing packaging weight. For example, removing corrugated pads from each case lot of its Oxy Clean product reduced shipping content by more than three tons to Wal-Mart during a one-year period.

Lair said 3M is cognizant of recycling all waste products, including materials such as paperboard, ink, and press wash chemicals, which it sends to fuel plants for burning to produce energy. Products also are being changed to contain fewer or no solvents.

While Lair cited difficulties in getting 3M manufacturing plants to change habits, such as adopting the use of reusable plastic totes, he said plants and workers are responding to the call for environmental sustainability. He noted a sense of pride among workers toward bettering the environment. "You can take these concepts, talk to folks in the plant and say 'give us some more ideas' and you'll be surprised by what they can come up with."

Since the packaging initiative began in the second half of 2006, Lair estimates 3M has saved 25,000 gallons of diesel fuel, worth

about \$70,000. “That’s just fuel, not packaging supplies, which will run into the millions of dollars eventually as these volumes continue to build up over an annual basis.”

Other ongoing programs at 3M also have eased the company’s environmental impact. For instance, 3M uses lower grades of wood for packaging and strives to recycle wood pallets into products such as garden mulch, animal bedding, and boiler fuel. “We’re diligent about using recycled-paper mills,” Lair added, noting its abrasives and sponge packaging suppliers own mills that produce 100 percent recycled paper. “The majority of 3M corrugated boxes purchased from those suppliers are made with paper from these mills.”

In addition, 3M strives to locate plants close to the markets served. “You cannot make everything in the United States and then ship it all around the world. Why?” Lair emphasized. “It takes more fuel, and it also takes a lot more transportation of boxes around the world to make that happen. You want to get it close to the area you are selling it in so you can recycle those containers or get them back and reuse them.”

Lair concluded by noting consumers and buyers of its products are asking for environmental initiatives. “Now Wal-Mart is requiring it, and you see industry is starting to respond.” He suggested that one unseen

benefit of environmental sustainability in the supply chain is better products. For example, Lair said 3M’s reflecting sheeting products for traffic safety are brighter and of higher quality thanks to environmentally sound manufacturing. “State departments of transportation are asking us ‘What’s the impact on the environment when you make that product?’”

During a question-and-answer session following the presentation, one attendee asked about product damage in transit due to reduced packaging. Lair said despite extensive testing, 3M occasionally experiences increased product damage, which is usually offset by the savings.

Another attendee asked about environmentally related supply-chain challenges 3M faces in the global market. Lair cited Europe as a world leader in sustainability with regard to packaging and transportation systems. The European Union’s proposed program for regulating chemicals called REACH (Registration, Evaluation and Authorization of chemicals), aimed at phasing out harmful chemicals, is already causing changes at U.S. shippers like 3M, he noted. “You are responsible for that product or service from the day you make it until the day it finally goes into the incinerator—or whatever you do with it to reclaim it.”

**“We recognize packaging opportunities are almost limitless and resources are not.”**

—Larry Lair, 3M



(From left) Doug Differt, Robert Johns, and Larry Lair

# Current Directions in Industry

## A Panel Discussion

Moderator: John Hausladen, President, Minnesota Trucking Association

### Panelists:

Vince Sullivan, Midwest Sales Manager, Port of Tacoma

Roger Poyer, Manager, Hub and Facility Operations, BNSF

Buddy Polovick, Shipper Coordinator, U.S. Environmental Protection Agency



Vince Sullivan

Panelists expanded discussion to the environmental initiatives of transportation partners. Port authorities and railroads, for instance, are adopting new technologies and practices to reduce their environmental footprints. Similarly, the U.S. Environmental Protection Agency (EPA) has aligned with the transportation community to establish incentives for fuel efficiency improvements and greenhouse gas emission reductions.

### Greening the supply chain

Vince Sullivan, Midwest sales manager for the Port of Tacoma, outlined ongoing efforts to clean up the port and described how technologies adopted by its operators help the environment. In 2005, the port handled 2.2 million TEUs (ton equivalent units). Most of the port's freight volumes originate or terminate in the Midwest, moving primarily by rail. Remediation efforts began more than a decade ago on the port's 2.5-mile Hylebos Waterway. "The job is now 95 percent complete," Sullivan said. "It was one of the worst polluted areas on the Pacific coast."

The Port of Tacoma, which now tests all its waterways on a weekly basis, is also overseeing the cleanup of the former Kaiser aluminum smelter plant, which spans 95 acres of the 2,400-acre port. In July 2006, the big stack was taken down after almost 350 tons of polluted materials were scrapped out. At present, the port is in the process of removing 72 buildings, each loaded with contaminants. According to Sullivan, the Kaiser remediation will take years before the port can expand its terminals and capacity.

Modifications made to the port's many giant straddle carriers, which transfer con-

tainers between rail and ships, are bringing results, too. Since early 2005, they've reduced particulate matter and emissions from these straddle carriers by about 50 percent. That has been accomplished by installing oxidating catalysts on all straddle carriers and switching from regular diesel to ultra-low sulfur diesel (ULSD). In 2006, the port also began experimenting with biodiesel fuel on some of its straddle carriers, which is expected to further reduce emissions.

**"The port business is a noisy, loud, and sometimes smelly business. There's a lot of clanging, banging, and reverse beepers going off constantly. We have to be considerate of ... our residential neighbors on these issues."**

—Vince Sullivan, Port of Tacoma

Sullivan noted many ship lines serving the port have made great strides in cleaning up their own buildings and infrastructure as well as adopting lower-emission fuels. Evergreen Marine, for example, operates some of its container ships and a port terminal on ULSD, which runs much cleaner than regular diesel. Other carriers and operators serving the port are converting from regular diesel to propane, biodiesel (derived from sources including vegetable oil, animal fat, and recycled oil), or ULSD.

Sullivan said the port has also reduced noise and light at the port. "The port business is a noisy, loud, and sometimes smelly business. There's a lot of clanging, banging, and reverse beepers going off constantly," he said. "We have to be considerate of those people and we actually run focus groups with our residential neighbors on these issues."

### Efficiency drive helps environment

Next, Roger Poyer, manager of hub and facility operations at BNSF's intermodal facility in St. Paul, discussed the railroad's efforts to reduce costs and increase operating efficiencies and velocity, which have ultimately helped the environment by reducing emissions and fuel consumption.

Lift volumes continue to grow at BNSF in St. Paul, Poyer continued, mostly from increased volumes between West Coast ports, which have added capacity in recent years. In fact, railroad volumes will likely grow to 240,000 lift units this year alone, compared with 180,000 lifts in 2003.

Throughout the BNSF network, too, the rail line is shedding older locomotives and introducing clean-burning locomotives such as Railpower's hybrid locomotives. These feature diesel gensets (generator setups) with battery power that reduces emissions by up to 90 percent over conventional locomotives.

BNSF's central strategy to achieve its efficiency and velocity goals is essentially to put more freight on longer trains. Train lengths have increased from up to 4,500 feet to upwards of 7,000 feet. "Instead of running five to six trains per week, we'll run three to four trains per week," Poyer said. "[With an additional 50 containers per train] over a five-train period, you've saved one train origination."

Increasing slot utilization by putting more containers on each train also benefits BNSF by reducing staffing needs and benefits the public by reducing the risk for accidents. In addition, savvy loading of freight on rails has increased capacity using less fuel and labor. "Our flat-on-deck loading initiatives have also improved efficiencies," Poyer noted. "Earlier this year, we reduced flat-on-deck loading where you take a container that should be in a well car and put it on a TOFC [trailer on flatcar]. So the flat-on-deck

slot utilization leads to more units per train, or what we call UTP." He added that use of dual-purpose cars allowing for trailers or containers has also increased capacity.

Since paving its roads several years ago, the St. Paul BNSF yard has continued to examine safety and environmental concerns. Partly in reaction to a fatal accident at a checkpoint building in its St. Paul facility,

**"The win-win effect [of safety and environmental improvements] is we improve our capacity and our railroad is able to handle all these volumes to continue to grow and grow."**

—Roger Poyer, BNSF

Poyer said, BNSF introduced better lighting and improved its processes. For example, it enforces a no-idling policy in St. Paul, which helps reduce emissions and improves safety. BNSF also conducts focus groups and meetings with nearby residents.

With nearly 500,000 annual truck moves in and out of the St. Paul yard, and more growth ahead, Poyer said BNSF is striving for additional safety improvements. "The win-win effect is we improve our capacity and our railroad to be able to handle all these volumes to be able to continue to grow and grow."

### Smarter choices for U.S. transportation partners

SmartWay, a voluntary partnership between the EPA's Office of Transportation and Air Quality and shippers, trucking lines, and other freight industry partners, is helping to reduce fuel consumption and emissions. Buddy Polovick, shipper coordinator with the EPA SmartWay program, outlined its impetus:

- U.S. transportation accounts for two-thirds of oil consumption and one-third of total carbon dioxide emissions.



Roger Poyer



Buddy Polovick

- In recent years, every major U.S. economic sector, including agriculture, industrial, and construction (residential and consumer), has managed to decrease or at least maintain levels of greenhouse gas emissions—except for the transportation sector, which contributes increasing amounts of emissions.
- U.S. ground freight transportation accounts for more than one-half of the nitrogen oxide pollution and one-third of particulate pollution.
- Significant climate changes are tied to harmful emissions.

SmartWay provides to its partners incentives and tools that help pave the way toward transportation efficiency, fuel economy improvements, and other savings. Trucking industry partners are encouraged to adopt new technologies in truck-stop electrification, HVAC systems, auxiliary power units, single-wide tires, and aluminum wheels, as well as trailer and van aerodynamics.

Polovick added that industry is accepting the EPA's new low-emission diesel engine mandate, with some even embracing it. "In the long run," he said, "we're confident

**"We ask corporate citizens to consider their transportation footprint. What is the total economic, environmental, and societal impact of your freight transportation activities?"**

—Buddy Polovick, EPA SmartWay

these initiatives will be beneficial."

The SmartWay program launched in February 2004 with 15 corporate partners. Since then, they've added carriers, shippers, logistics companies, and other affiliate partners. The partnership now boasts of more than 470 partners, driving about 400,000 trucks nationwide for a total of 16 billion miles per year—which puts them on track to save more than 335 million gallons of diesel fuel per year. What's more, estimates show SmartWay partners will reduce harmful carbon dioxide emissions by more than 3.9 million tons per year starting in 2007.

"We ask corporate citizens to consider their transportation footprint," Polovick explained. "What is the total economic, environmental, and societal impact of your freight transportation activities?"

SmartWay requires that member partners commit to measuring and improving their freight operation using EPA-developed tools



(From left) Buddy Polovick, Vince Sullivan, and Roger Poyer

to help quantify the benefits of fuel-saving strategies. SmartWay helps partners assess which technologies and strategies are best for them based on their own unique fleet characteristics, and actually projects their return on investment and savings.

Overall, Polovick said SmartWay, which encourages intermodal shipping to reduce trucking activity, is an opportunity for many to enhance the performance of freight operations and improve supply-chain performance. In addition, the SmartWay Grow & Go program encourages the use of alternative fuels, such as biodiesel and Ethanol 85. Polovick added that light-duty operators are also showing interest in alternative fuels, as are public-sector groups like state transportation departments for their heavy-duty fleets. The EPA plans to apply similar SmartWay concepts to rail, ocean, and drayage trucks.

### What's ahead

Questions from attendees centered around the SmartWay program. With regard to truck-stop electrification, Polovick clarified that SmartWay partners include manufacturers such as Idle Aire, which supplies power systems to truck stops, but the program encourages all suppliers to compete.

“SmartWay is open to new technologies,” he said. “We work with a range of partners on cutting-edge technologies, sharing data, and providing technical expertise.”

Another attendee stated marine operators generally oppose cold ironing practices (no steam from boilers, which requires use of electrical power). Sullivan noted many carriers don't have the capability for it, while other ports in other regions may rely on it more. He said fuel scrubbing is another alternative being explored by the Port of Tacoma. Polovick added that the labor, retrofit, and cost demands of cold ironing make it less attractive to operators.

Moderator John Haslauden, president of the Minnesota Trucking Association, noted initiatives aimed at protecting the environment. “Anything that the government can do to help industry bring down the cost of these new technologies is very significant,” he said, citing low-interest loans and tax incentives as important ways to encourage the adoption of new technologies. “All of the modes should be applauded. I do think there are challenges that remain, and that's why we're here today to push these forward.”



David Christianson

# Freight and the Environment—Future Scenarios

## A Panel Discussion

Moderator: Cecil Selness, Director, Office of Freight and Commercial Vehicle Operations, Minnesota Department of Transportation

### Panelists:

Bob Clarke, President, Truck Manufacturers Association

David Kittelson, Professor, Department of Mechanical Engineering, University of Minnesota

Alfred Marcus, Professor, Carlson School of Management, University of Minnesota

Jerry Nagel, President, Northern Great Plains, Inc.



Bob Clarke



David Kittelson

The second panel focused on future scenarios in relation to transportation and fuel sources. New federal mandates involving truck emissions are rapidly changing the trucking industry. In decades ahead, today's alternative fuels such as ultra-low sulfur diesel (ULSD) will likely be joined by a range of other renewable fuels for the trucking industry. Likewise, the production of renewable fuels in the Midwest region will force change. For these innovations to take place, a stabilization in policy environment and energy prices is needed.

### Clean diesel fuel

Bob Clarke, president of the Truck Manufacturers Association, provided an overview of the nation's trucking market before commenting on the effects of the 2007 low-emission diesel engine requirements mandated by the EPA.

According to Clarke, about 5.5 million medium- and heavy-duty trucks share the road with about 235 million passenger vehicles. While many large trucking carriers have thousands of trucks in their fleets, a vast number of small independent carriers and businesses—up to 600,000—operate far smaller fleets. Clarke described the various classes and applications of trucks, from familiar 18-wheelers to light-duty trucks for local deliveries and refuse trucks. “Trucks are essentially capital pieces of equipment on wheels that essentially run up and down the highway,” he said.

The EPA's low-emission specifications are already forcing tremendous changes in the trucking market. The new require-

ments continue to bring advancements in the development of cleaner-burning fuels and engines. Major engineering changes to combustion technology are required to manufacture engines that can efficiently run diesel fuels, such as ULSD and biodiesel. Exhaust after-treatment systems are also needed to retrofit older vehicles. “We are on the eve of some historic changes in the way trucks and engines are built and sold in this country,” Clarke said.

**“When we get out to 2010, the vehicles that we design, build, and sell will be 98 percent or less polluting than vehicles sold in the mid 1990s. Assuming we can get enough of these vehicles on the road, the days of black-belching trucks will be over.”**

—Bob Clarke, Truck Manufacturers Association

Clarke praised the research efforts of academia in conjunction with the U.S. Department of Energy (DOE) in bringing about technological advancements to support lowered emissions. “Truck manufacturing,” he said, “is a custom-built business with products tailored to the vocations of our customers. The engineering work required to get vehicles to this state has been nothing short of monumental.”

In October 2006, the widespread availability of ULSD took effect as mandated by the EPA. “In January 2007, we will start selling trucks in this country that have much lower particulate matter emissions compared to where they have been. And we will be ramping toward 2010 for nitrogen oxide (NOx) emissions in lower levels,” Clarke noted. “When we get out to 2010, the vehicles that



we design, build, and sell will be 98 percent or less polluting than vehicles sold in the mid 1990s. Assuming we can get enough of these vehicles on the road, the days of black-belching trucks will be over.”

### **Toward renewable fuels**

David Kittelson, distinguished professor of mechanical engineering at the University of Minnesota and director of the University’s Center for Diesel Research, discussed renewable fuels and their future.

“The clear winner by far is producing DME [dimethyl ether]. If you look at other solutions, these can take 25 percent more renewable energy to produce than DME. Ethanol and conventional biodiesel fuels don’t stack up very well compared to these second-generation renewable fuels.”

—David Kittelson, Department of Mechanical Engineering, University of Minnesota

Biodiesel, Kittelson said, is one of the most widely used non-petroleum fuels used by trucks. Minnesota is a large producer of biodiesel and mandates that all diesel sold in the state contains at least 2 percent biodiesel (B2), much of which comes from soybean oil. The Metro Transit Authority, for example, uses a mix containing 5 percent to 20 percent biodiesel to fuel its buses. Metro Transit also operates a few diesel-electric hybrid buses.

Kittelson outlined the effects of biodiesel on emissions. Compared with petroleum diesel emissions, biodiesel produces 60 percent or less particulate matter and carbon (soot) but increases NOx emissions because it burns hotter. New, advanced diesel engines, however, are equipped to handle biodiesel without creating additional NOx. “The technology that is going to be used for NOx emission control is still up in the

air,” Kittelson explained. “That actually is a tougher problem than the particle problem.”

Toward this end, Kittelson’s research group is working with the DOE and Honeywell, among others, to test sensors that better manage engines to avoid producing pollutants. He expects even greater challenges to come in 2010 when the requirement tightens for NOx emissions on heavy-duty truck emission systems.

Also looking toward the future, Kittelson noted that dimethyl ether (DME), a syn-

thetic fuel made from biomass gasification, shows great promise. “The clear winner by far is producing DME,” he said. “If you look at other solutions, these can take 25 percent more renewable energy to produce than DME. Ethanol and conventional biodiesel fuels don’t stack up very well compared to these

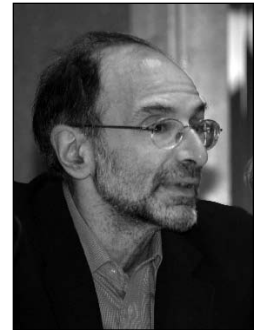
second-generation renewable fuels.”

Similar to biodiesel, DME produces minimal particulate matter, so future research efforts may focus on NOx reduction.

### **Challenges ahead**

Next, Alfred Marcus, professor of strategic management and organization at the University of Minnesota’s Carlson School of Management, emphasized the need for stabilization in long-term energy prices and supply reliability to support environmental advancements. Marcus also looked beyond research into emissions and fuels, pointing to other developing innovations, such as those involving improvements in vehicle weights or logistics, where, for example, the number of trips could be reduced.

Referring to the new EPA mandates for cleaner-burning truck engines, Marcus said the technology already exists. “The ques-



Alfred Marcus

tion is,” he asked, “are people going to buy the better mousetrap, at what rate, and how quickly?”

Unfortunately, Marcus said, interest in advancing innovative fuel and energy technologies diminishes when petroleum fuel prices decline as a result of increases in oil reserves. “We need to have good policy direction for the transition to occur,” he said. “It’s in the interest of business and trucks for this transition so planning can take place.”

Marcus said large-fleet operators, whether trucking companies or retailers like Wal-Mart, face the most economic disruption from these mandates but can take an active role in helping advance new technologies. “We have to make a very rapid transition,” Marcus concluded. “The question is whether the incentives and the policies are in place for that transition to occur, and will it occur rapidly enough given the challenges we face?”

### **Great Plains: future unknown**

Looking toward the future, Jerry Nagel, president of Northern Great Plains, Inc. (NGP), described a number of issues concerning renewable fuel production in the region, which includes Minnesota, Iowa, Nebraska, North Dakota, and South Dakota.

“The question is whether the incentives and the policies are in place for that transition to occur, and will it occur rapidly enough, given the challenges we face?”

—Alfred Marcus, Carlson School of Management, University of Minnesota

NGP, a nonprofit organization that studies the future as it relates particularly to the region, is in the midst of a two-year project to create regional scenarios.

“We’re hearing that biofuels are going to be the most disruptive thing to happen in agriculture since the opening of global markets in the 1970s,” Nagel said, suggesting renewable biofuels made from feedstocks like corn and soybeans may serve to significantly raise food and land prices. He reported on efforts by NGP to reach out to communities in the region to proactively create a better future.

“When you work on scenarios, you look at key trends and critical uncertainties,” Nagel said, noting the most likely scenarios can be predicted up to 10 years out. Among a few critical uncertainties noted, he suggested energy was a wild card.

For example, food prices could rise as demands are put on agricultural systems for the development of renewable biofuels like ethanol. “We’re talking about 300 to 400 bushels per acre (of production),” Nagel continued, “and potentially pushing it to 1,000 bushels an acre for corn.”

In turn, increased biofuel production will put additional demand on the water supply and soil quality. Increases in land prices and the cost of ownership are likely to follow, as well. Moreover, Nagel said, globalization may produce uncertainties in how decisions are made, shifting from current methods that rely on partner-



(From left) Alfred Marcus, David Kittelson, Bob Clarke, Cecil Selness, and Jerry Nagel

ships between governments and the private sector, toward the private sector and non-governmental organizations (NGOs).

Nagel proposed that the Midwest and other regions could benefit by examining how food systems have evolved toward globalization.

Farmers, for instance, are not waiting for the government to make changes to food safety. “They’re forming a harmonized system of production protocols,” he said, “so the food system is managed from field to store shelf by those that are dealing with the food.”

Nagel also described a future where young people will stay in cities and rural populations, consisting of primarily older people, will diminish further. In conclusion, Nagel called for more proactive strategic thinking and action aimed at creating a better future.

### Next steps

A number of questions posed to the second panel focused on renewable fuels. In response to a question on grain-based fuels, Nagel warned that the nation is unprepared. “There is no strategic thinking going on now about the implications of massive, large-scale biofuels development in the region,” he said. “We’re completely unprepared for the disruption and don’t understand it.”

One attendee noted that seed prices have increased 40 percent because 15 to 20 percent of soy and corn feedstock production in Nebraska, Iowa, and Minnesota is currently going into fuels. Discussion turned to cellulose and other synthetic materials as a replacement for the use of feedstock in fuels. Panelists supported continued diversity in the development of energy sources. “There are some positives to having variety because it creates more resiliency,” Marcus said, later adding that diversity helps the transportation community create an insurance policy of sorts for the future.

**“There is no strategic thinking going on now about the implications of massive, large-scale biofuels development in the region. We’re completely unprepared for the disruption and don’t understand it.”**

—Jerry Nagel, Northern Great Plains, Inc.



Jerry Nagel

Kittelson, citing the benefits of diversity in fuels under development, added that fuel produced from prairie grass is attractive because it requires less energy to produce. He noted compromises come with each type of fuel development.

Clarke, addressing the benefits of continued reductions in allowable truck emissions, observed that diesel trucks are as good or better for the environment than gasoline engines. Europe, he pointed out, is much farther along in its use of diesel overall, though use of diesel-electric hybrid engines has increased in U.S. delivery vehicles.

Though there are tax incentives for adopting the use of light-duty hybrid vehicles, Clarke later noted, groups are working to get incentives in place for other truck types. Marcus added that because U.S. refineries aren’t equipped to produce diesel, it will continue to be imported.

“Dieselization, in general, across the spectrum of motor vehicles, is a very attractive alternative for the near term,” Clarke said, “and diesel hybrids could be the stop-gap vehicles for the immediate to near term.”

Overall, panelists agreed upon the value of diversity in fuel sources, even discussing diesel-electric hybrid engines for light-duty vehicles. But Clarke stressed that all the disparity in fuel types makes it difficult to bring market-viable technologies into widespread use. And, panelists agreed, incentives are important, but difficult to secure. “It’s about getting enough volumes,” Clarke concluded, “to bring the costs down where people will pay for them.”

# Small improvements can have a big impact

## Concluding Observations

Robert Johns, Director, Center for Transportation Studies

CTS director Robert Johns closed the symposium by remarking on the innovations presented by panelists. “These small changes are making a big impact,” Johns said, citing a multiplier effect of the actions of all parties in the supply chain. “All panelists echoed the need to do something.”

In summarizing current actions taken by those in the supply chain, Johns credited the Port of Tacoma for making the environment a large part of its mission. He also credited 3M and BNSF, who are finding market advantages in taking actions that benefit the environment. “The SmartWay program is a great example of the power of government to partner with industry,” Johns said. “It’s not always about mandates but incentives, rewards, and consciousness raising.”

Johns concluded the symposium by noting the difference each attendee makes. “As part of a research university, CTS helps cre-



Robert Johns

ate knowledge,” Johns said. “We bring that knowledge to bear through events such as this symposium—knowledge for each of you to share with others, as well as to help you deal with the challenges presented here.”

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