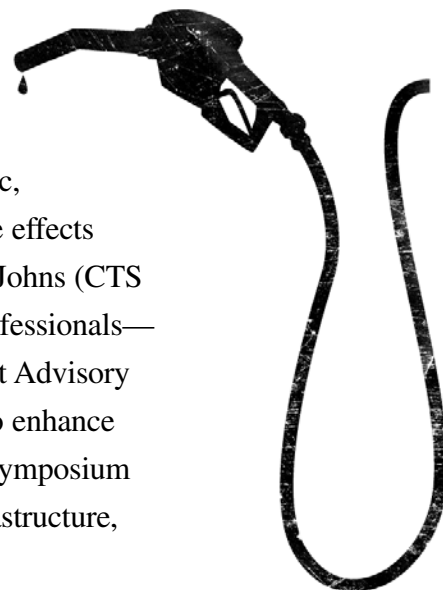


# Energy Uncertainties: Supply Chain Impacts in the Upper Midwest

December 5, 2008

A Summary Report

Fluctuating energy costs and economic uncertainties worldwide are disrupting Upper Midwest supply chains. While facing these challenges, participants throughout a supply chain need to consider sustainable energy practices. The 12<sup>th</sup> Annual Freight and Logistics Symposium brought together representatives from the public, private, and academic sectors to address uncertainties surrounding the effects of energy pricing and economic conditions on supply chains. Robert Johns (CTS director), Megan Duncan (Council of Supply Chain Management Professionals—Twin Cities Roundtable president), and Bill Goins (Minnesota Freight Advisory Committee member) opened the forum by acknowledging the need to enhance statewide competitiveness from the freight and logistics standpoint. Symposium topics included sustainable and renewable energy, transportation infrastructure, transportation policy, innovative logistics practices, and globalization.



## Next Generation Globalization

**Introduction:** Robert Johns, Director, Center for Transportation Studies, University of Minnesota

**Keynote speaker:** Craig Simon, President of Supply Chain Services for the Americas, FedEx

## Panel: Energy Impacts on the Supply Chain

**Moderator:** Dave Christianson, Member, Minnesota Freight Advisory Committee, and Manager, Freight Planning and Development, Mn/DOT

**Panelists:**

Aaron Jorgensen, Senior Director, Supply Chain Logistics Integration, Medtronic

Michael J. Tripp, Vice President of Supply Chain and Logistics, Christopher & Banks

Ron Dvorak, Account Manager, xpedx, an International Paper Company

## Panel: Future Energy Scenarios and Public Policy Alternatives

**Moderator:** Tim Henkel, Director, Modal Planning and Program Management Division, Mn/DOT

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# Next Generation Globalization

## Keynote Presentation

Introduction: **Robert Johns**, Director, Center for Transportation Studies

Keynote speaker: **Craig Simon**, President of Supply Chain Services for the Americas, FedEx



Craig Simon

In his keynote speech, Craig Simon, president of supply chain services for the Americas at FedEx, discussed how energy and sustainability initiatives are changing supply chains in the face of volatile energy pricing and economic environments. He gave a global perspective to more than 100 freight and logistics professionals, policymakers, and researchers.

Simon provided an overview of the FedEx global network before turning to the energy and sustainability strategies explored by the company. The Memphis-based carrier's network encompasses 220 countries and territories, 80,000 vehicles, and 672 aircraft, employing some 290,000 people, making the freight and package carrier a major energy user. The company has altered its training—for example, training drivers to reduce idling—and made other practical initiatives to reduce its carbon footprint. "These things are good for the environment, good for the business, and save us large amounts of cash," he said.

FedEx is already making strides to meet its 2020 goal of reducing CO<sub>2</sub> emissions on its aircraft by 20 percent and improve vehicle fuel efficiency by 20 percent. The company is experimenting with solar facilities and is expanding its worldwide fleet of 172 electric hybrid vehicles, which reduce emissions by 37 percent over regular vehicles, Simon said. "Hybrid is just a step toward an all-electric vehicle. I do expect to see all-electric fleets out there [at some point]," he told attendees.

### Long-term sustainability

Simon illustrated the volatility of energy prices: Oil reached a record high of more than \$147 per barrel in July 2008 but plunged to current lows not seen in a few years. Wildly fluctuating energy costs and six-week lag times of fuel surcharges are difficult to manage even for carriers like FedEx, he said, noting all parties in the supply chain are affected on some level, some resulting in pass-through costs to end users.

**"Companies used to make decisions across speed and cost and the cost-service tradeoff. Now the carbon footprint is coming into play as well."**

—Craig Simon, FedEx

Regardless of the current price of oil or its future price (which is impossible to predict accurately), FedEx takes a progressive, far-sighted approach to energy, Simon said. Fred Smith, FedEx chairman, co-chairs the Energy Security Leadership Council, a group whose aim is to influence U.S. government policy to reduce U.S. oil dependence and improve energy security. "Fifty-eight percent of our U.S. consumption of oil is imported from friendly and non-friendly countries," Simon said. "It's not only a matter of economics, it's also a matter of national security. We've been fortunate up until this point of not having major disruptions in oil supply, but it wouldn't take much for that to be disrupted by a country hostile to the United States."

Energy and sustainability issues permeate the thinking of FedEx and its customers, Simon said. "Companies used to make decisions across speed and cost and the cost-service tradeoff. Now the carbon footprint is coming into play as well." Wal-Mart has been exemplary, he said, in its sweeping initiative to reduce packaging across its vast supply chain by 5 percent, including putting strict requirements on all 60,000 suppliers to reduce packaging.

### Telling examples

Simon provided several examples of innovative supply chain practices FedEx participates in with its customers to reduce carbon footprints, showing how parties save by altering packaging, shipping, and distribution or warehousing strategies while improving reliability. One general trend, he said, is to

greatly reduce the amount of paper shipped on trucks to conferences by sending materials electronically to FedEx Office stores (formerly FedEx Kinko's) and having printouts produced for "final mile" delivery.

In an example of critical inventory logistics Simon cited Wincor Nixdorf, an ATM machine company. Stocking the most-frequently used parts in mini-warehouses within two hours driving time of a local market bypasses the need for flying in parts, thus saving energy and lowering emissions and costs.

In another example, involving cold-chain logistics serving the medical industry, Simon said special packaging containing dry ice or other materials replaces the overuse of packaging and the need for full refrigerated trucks. "By doing that, you are able to ship a lot more in a little space," he said, noting the cold chain is an example of a highly complex, dynamic shipping environment.

Manufacturing closer to the point of the consumption base often costs more money, especially within North American markets, Simon conceded, but the trade-off in energy savings and shorter transportation distances can be worth it. He noted the great complexity and long lead times these sourcing decisions require, which are often difficult in the face of fluctuating energy prices. "No one has predicted the cost of oil 12 months from now. Nobody."

All of these innovative practices in response to short-term volatility and longer-term sustainability goals require flexibility and innovation, Simon said, necessary for the viability of FedEx and the environment. "We have to make decisions that allow us to have flexible supply chains, allow us to meet the needs of global organizations, global customers and global markets, but also address the needs of local markets," he concluded.

**"Manufacturing closer to the point of the consumption base often costs more money, especially within North American markets, but the trade-off in energy savings and shorter transportation distances can be worth it."**

—Craig Simon, FedEx



# Energy Impacts on the Supply Chain

## A Panel Discussion

Moderator: **Dave Christianson**, Manager, Freight Planning and Development, Mn/DOT

Panelists:

**Aaron Jorgensen**, Senior Director, Supply Chain Logistics Integration, Medtronic

**Michael J. Tripp**, Vice President of Supply Chain and Logistics, Christopher & Banks

**Ron Dvorak**, Account Manager, xpedx, an International Paper Company



Aaron Jorgensen

Next, a panel discussion focused on energy impacts on supply chains from regional, national, and global perspectives, moderated by Dave Christianson, manager of freight planning and development for Mn/DOT.

“Energy is not just the fuel used in transportation. It’s the movement of raw materials to the manufacturing process, packaging, efficiency of how things are shipped, what the cube is in the box, container or truck, what the distances are and the distribution network,” Christianson said. “All these pieces affect how much energy is used, and the carbon footprint is tied directly to that.”

Christianson reminded attendees of the inextricable link between freight transportation and petroleum, whether diesel or gasoline. “Even with FedEx’s electric hybrid vehicles, which are the wave of the future, that is such a small percentage that we can’t count on it at this moment, but it is the wave of the future.”

### **Critical, dynamic, complex supply chain**

Aaron Jorgensen, senior director of supply chain logistics integration at Medtronic, outlined the global medical manufacturer’s supply chain. The Fridley, Minnesota-based company ships some six million packages annually, often of very high value with time and temperature sensitivity. The company sources and manufactures products in many countries, managing between 30,000 and 40,000 suppliers.

Energy-saving moves and the need for

Energy-saving moves and the need for reliable deliveries are causing Medtronic to partner more closely with customers to keep inventory closer to point of need.

— Aaron Jorgensen, Medtronic

reliable deliveries are causing Medtronic to partner more closely with customers to keep inventory closer to point of need. Operating in a highly-regulated environment, Medtronic has made numerous changes to its shipping and distribution practices because of the urgent, life-saving nature of its products, Jorgensen said. Some of these changes have been in direct reaction to supply chain disruptions involving carrier reductions in service—in particular, service cutbacks among air carriers and world events such as 9/11.

“Everything is tracked from cradle to grave, and quite literally that adds complexity to the supply chain. The product must be available when you need it,” Jorgensen said, noting that the convergence of the medical device and pharmaceutical industries adds complexity. Echoing Simon’s comments on replacing expensive air service with local inventory and ground transport, Jorgensen described many innovative practices at Medtronic to ensure product and delivery reliability. Notably, the company is establishing a network to replace “trunk stock,” which is stored in disparate locations across a market, with the warehousing of selected product at FedEx Office locations. “Having things at hand is really critical, but a forward stocking location helps in assisting some of our efforts as well.”

“Security is becoming a greater concern,” Jorgensen said, adding that initiatives around homeland and global security have resulted in more contingency planning. Increased cargo screening requirements by the Transportation Security Administration for all modes of transportation, particularly cargo placed aboard passenger-carrying planes, have caused Medtronic to rethink its supply chain activities to avoid delivery delays and product spoilage, he said.

**Christopher & Banks considers the carbon footprint of nearly every supply chain activity, including the impacts of its partners and suppliers.**

— Michael Tripp, Christopher & Banks

Jorgensen said Medtronic continues to evaluate sustainable programs and, to that end, partners more closely with its transportation and logistics partners.

#### **Fashion and supply chains evolve with the times**

Michael Tripp, vice president of supply chain and logistics at integrated retailer Christopher & Banks, headquartered in Plymouth, Minnesota, outlined changes in the company's sourcing, purchasing, transportation, and distribution strategies as a result of energy fluctuations and initiatives to reduce its carbon footprint. The company considers the carbon footprint of nearly every supply chain activity, including the impacts of its partners and suppliers.

"We design, manufacture, source, import, and distribute all of our products within our supply chain," Tripp said, noting the company doesn't operate its own fleet but relies on commercial carriers, which it has recently consolidated and partners with closely. The company views supply chain and logistics as a way to surpass customer expectation and optimize profits, not solely as a cost center, he said.

Tripp provided an overview of many changes in business practices at the retailer, many due to the high cost of energy, sustainability initiatives, and the ongoing quest to reduce costs while improving quality.

Initiatives include using rail (versus trucking) on inbound transportation, shipment consolidation, recycling programs for cardboard and trash at distribution centers, and vendor compliance programs. Compliance of its partners and suppliers is also considered.

Tripp emphasized that total landed cost is essential when considering supply chain changes, such as shifts in sourcing locations to realize lower labor or other costs. "We're looking at alternative methods of sourcing where the costing can be better, but that also creates other challenges. Typically if you can get better costing in other locations throughout the world, the infrastructure isn't there to move it through, so you have to look at a landed-cost analysis as opposed to a first-cost analysis," he said.

Tripp called for translating inside-industry transportation and supply chain terminology to bottom-line terms that are meaningful to others whether executives, managers, or those in the public and academic sectors. "We have to take our metrics that are standard in our industries and transform them. We need to be more bilingual," he told attendees. "We want to be able to talk to the CEO, CFO, and chief merchandising officer in ways that are meaningful to them."

#### **Outstate Minnesota transportation at crossroads**

Ron Dvorak, account manager with xpedx, broadly outlined the needs and challenges of small- to medium-sized resource-based suppliers in the agriculture, mining, and forest industries as well as many manufacturers in northern Minnesota. He said energy fluctuations have compounded the cost pressure these companies face against the backdrop of an underdeveloped infrastructure and lack of proximity to their markets. "They find themselves in a lot of cases in a margin squeeze.



Michael Tripp



Ron Dvorak

Because of this and as the freight costs were escalating, they were very concerned they would have to relocate closer to their individual markets,” Dvorak said.

While such moves in the short term are impractical, Dvorak also provided insights into the challenges these rural companies face, such as pressure by customers not to raise prices in light of mounting costs associated with petroleum-based packaging, fuel, and other costs.

A strong customer focus means these companies have had to be highly adaptive, Dvorak said. “Suddenly you find yourself in a situation where you’ve committed to deliver to a customer within 10 days and you may not have the ability to fill out a truckload. You may find yourself having to ship LTL (less than truckload) or some other form of transportation instead to meet customer need.”

Dvorak proposed solutions such as shipping goods not fully assembled for final assembly closer to market, increasing volumes of inbound supply orders, developing regional assembly and distribution centers, and establishing truck-only lanes. Some solutions present drawbacks, such as weight restrictions on road systems and other limits to infrastructure, he said. “The downside tends to be pushing up against weight limits on highways in many cases.”

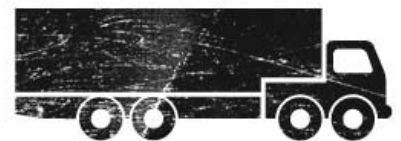
Dvorak also called for further development

**Larger inbound supply orders and regional assembly and distribution centers are possible responses to today’s energy uncertainty. “The downside tends to be pushing up against weight limits on highways in many cases.”**

— Ron Dvorak, Xpedx

and promotion of Great Lakes inland shipping, citing the success of the transportation of oversized wind-energy equipment through the Port of Duluth.

Following the presentations, the speakers fielded questions from the audience. A common theme was the need for private-public partnerships to develop infrastructure and facilities and otherwise improve the Upper Midwest transportation network. Dvorak called for more-consistent weight limits across the U.S. road system. Jorgensen said many discussions will rest in the hands of elected public officials, including those concerning the ability to charge additional user fees. Christianson noted that private-public partnerships will require a new mindset from both sectors as well as greater communication, such as the discussions at this annual symposium.



# Future Energy Scenarios and Public Policy Alternatives

## A Panel Discussion

Moderator: **Tim Henkel**, Director, Modal Planning and Program Management Division, Mn/DOT

### Panelists:

**Saif Benjaafar**, Director, Center for Supply Chain Research, University of Minnesota  
**C. Ford Runge**, Professor, Department of Applied Economics, University of Minnesota  
**Dan Murray**, Vice President of Research, American Transportation Research Institute

A second panel, moderated by Tim Henkel, director of modal planning and program management at Mn/DOT, explored future energy scenarios and public policy alternatives.

From the state perspective, Henkel said Mn/DOT is considering alternative energy scenarios and their implications for transportation policy.

### Green thinking with business innovation

Saif Benjaafar, director of the Center for Supply Chain Research at the University of Minnesota, gave an overview of the characteristics of lean supply chains versus green ones. While lean thinking emphasizes variety, mass customization with low-cost sourcing, and frequent deliveries, green thinking encourages consolidation of shipments, increased inventory in lieu of transportation, local suppliers, and regionalized supply chains.

“Green thinking is really putting the brakes on some of these (lean) principles by trading inventory for transportation,” Benjaafar said. “We’ve all been brainwashed with this thinking that inventory is something really bad for supply chain. In fact, it can be used to mitigate energy use [and] carbon emissions.”

Benjaafar said the transition from lean to green thinking is driven by energy costs and broader environmental concerns about carbon emissions, as well as from the business perspective of regulation. “We know that the incoming administration is talking about instituting a system of capping emissions.” In addition, consumers are demanding low-carbon products, and in response, companies are labeling their products based on carbon content.

Benjaafar said recent efforts to reduce carbon footprints have been driven by technological innovations. This is seen in the development of fuel-efficient vehicles and alternative energy sources, which require significant long-term investment. He lauded efforts such as the State of Minnesota’s mandate to reduce carbon (15 percent by 2015, 30 percent by 2025, and 80 percent by 2050 compared with 2005). A 2008 University of Minnesota study led by CTS—“Reducing Greenhouse Gas Emissions from Transportation Sources in Minnesota” (<http://www.cts.umn.edu/Research/Featured/GreenhouseGas/>)—made a number of recommendations such as increasing the use of high-quality low-carbon fuel for passenger and transportation vehicles as well as developing the infrastructure to shift the long-distance transport of freight and passengers to more efficient modes such as rail.

Achieving greater, more dramatic reductions in energy usage will require changes in business practices, particularly supply chain activities around sourcing, manufacturing, distribution, and transportation, Benjaafar said. For example, collaborative and consolidated production and ordering across a supply chain can save energy. Innovative programs like virtual carbon trading mar-

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— Saif Benjaafar, Center for Supply Chain Research, University of Minnesota



Saif Benjaafar



C. Ford Runge

kets can be used across a supply chain.

For greater energy savings, Benjaafar also proposed shifting energy-saving measures from unit processes to product-specific processes. He gave an example in the dairy industry, noting the United Kingdom will require most of its milk products to be shelf-stable by 2020, thereby reducing spoilage and packaging while averting the need for refrigeration.

Green thinking also requires a change in thinking from the funding perspective, Benjaafar said, noting the private sector must spread cost and responsibility for green initiatives to all parties in a particular supply chain. He said it will be necessary for the private sector to do more full-cost accounting in order to shift incentives toward all parties in the supply chain, not just on an individual, company-by-company basis.

From the policy perspective, incentives and investments need to address technology and business process innovation, supporting green supply chain practices, Benjaafar said. “Infrastructure investment needs a greater focus on sea and rail transport, supporting regionalization of the supply chain, such as regional manufacturing-distribution hubs and local sourcing.”

#### **Warehouses on roads**

C. Ford Runge, Distinguished McKnight University Professor with the Department of Applied Economics at the University of Minnesota, discussed the economics of infrastructure and its relationship to just-in-time (JIT) inventory management. The private sector has greatly benefited from the last 50

**“Public infrastructure is important to the economy not simply because it’s useful from the point of view of the public, but because the private sector is likely to underinvest in it, yet these public investments substantially raise private rates of return over time.”**

—C. Ford Runge, Department of Applied Economics,  
University of Minnesota

years of development of roads, bridges, and utilities, he said. “The major federal spending on infrastructure has been a bedrock for the development of the U.S. economy.”

Runge drew an analogy to how individuals and firms benefit by the development of the Internet, aided by various funding. Likewise, he said the highly developed U.S. infrastructure has allowed the private sector to benefit because the burden of inventory-carrying costs is shifted away from the private sector, essentially putting stock onto roads. “Public infrastructure is important to the economy not simply because it’s useful from the point of view of the public, but because the private sector is likely to underinvest in it,” Runge said, “yet these public investments substantially raise private rates of return over time.” He cited 2003 government data that found U.S. businesses and individuals derived more than \$788 billion in direct economic benefits from highways and public transportation, primarily in the form of lower costs and higher productivity.

Runge said JIT deliveries, the hallmark of which are small, frequent deliveries, have evolved based on the vast U.S. network of roads. As a result, consumers have benefited by the cornucopia of perishable choices in groceries, unthinkable 50 years ago. “Rolling stock becomes warehouses in transit... Only



**“It’s going to be very problematic to redirect, certainly in the short term, any sort of energy paradigms that exist in freight transportation.”**

—Dan Murray, American Transportation Research Institute

in the last 20 years have supermarkets begun to fully integrate automated store ordering in their perishable offerings.” One European study found perishable product sales are 50 percent higher than that of non-perishable products. Large retailers like Wal-Mart and Target have benefited from JIT deliveries and other supply chain management innovations facilitated by the U.S. infrastructure.

Factoring energy conservation into supply chain practices will require improvements to private efficiencies in the delivery and availability of consumer goods, Runge said. He agreed with Benjaafar’s comment that green thinking will require changes to distribution and inventory management strategies, among other improvements to supply chains. “To change these systems will require new thinking about the way in which the nodes of the supply chain [are] organized.”

Runge said an issue is the relationship between a more-efficient transfer of goods and energy savings. “One of the key questions concerns how efficient supply chains and systems of inventory, especially in the food industry, can use less energy while continuing to maintain a wide opportunity set of consumer choices.” He raised the notion of the codependence of the private sector on public infrastructure, suggesting the private sector might have to bear the burden of paying more for infrastructure use. “The jury is still out,” he concluded.

### **Trucking industry innovations**

Dan Murray, vice president of research with the American Transportation Research Institute, closed the panel with a comprehensive overview of sustainable energy and green initiatives by the trucking industry. Given that oil constitutes about 40 percent of the world’s energy, and 96 percent of all transportation energy is petroleum based, Murray said major challenges remain.

“It’s going to be very problematic to redirect, certainly in the short term, any sort of energy paradigms that exist in freight transportation.”

The impacts of fluctuating energy pricing and the pressure to reduce emissions on the trucking industry are severe, Murray said. July 2008 saw diesel go to a record high of \$4.76 per gallon, worsening the razor-thin margins of carriers, he said, and many can’t pass on costs to customers. Some carriers have been forced out of business by bankruptcy. Volatility of fuel pricing continues in the face of an estimated 20 percent to 30 percent increase in truck tonnage over the next 12 years. Less-than-truckload and TL shipments present few options for alternative modes, Murray said, noting intermodalism remains a very small percentage of freight moves because it’s only viable for 500-mile to 1500-mile segments.

Murray reported on a number of industry initiatives to reduce fuel consumption and emissions, supported by industry groups such as the American Trucking Association (ATA) and SmartWay, a voluntary partnership by the EPA Office of Transportation and Air Quality with carriers, shippers, and freight industry partners. He said the trucking industry has made strides in reducing carbon emissions, such as mandates imposed on all new Class 8 tractor-trailers. In addition, energy-saving practices such as reduced



Dan Murray



Robert Johns

idling have reduced consumption. Wal-Mart, for example, achieves 10 MPG on its fleet, up from 6 MPG, the industry average. Cost implications to go green are an industry burden, Murray said. Technological emission requirements add \$5,000 to \$11,000 to the cost of a \$112,00 tractor.

Murray outlined a few energy alternatives for trucks, including ethanol, hybrid electric, and fuel cell vehicles. Hydrogen fuel is promising a long-term solution requiring significant research and investment.

Energy reduction solutions include congestion pricing and highway improvements, Murray said. More-productive truck combinations and allowing heavier trucks on roads are also solutions; however, inconsistencies across the U.S. road network restrict such practices. Truck-only networks are another solution, but they could shift revenue from the Highway Trust Fund, he said; alternatives include additional taxes paid by users of heavy vehicles. Last, Murray said one controversial solution proposed by ATA is the restriction of truck speeds to 65 MPH.

In the discussion that followed the panel presentations, questions were raised about the cost burden of incorporating energy-saving initiatives into the supply chain, who pays, and the need for expanding the dialog between the public and private sectors. Benjaafar, among others, said there's a need to embed energy costs into total (landed) costs. "We need to broaden our models to

include the environmental impact, which can be captured in a variety of ways," he said. Moderator Henkel closed the discussion by raising a question: How do we take a more comprehensive look at planning and investing in light of energy issues?

### **Concluding remarks**

Robert Johns then gave concluding observations about the symposium. He noted how the keynote speaker, Craig Simon, presented a big-picture look at energy and sustainability initiatives; the first panel, with executives representing three very different companies, emphasized the importance of the supply chain to the bottom line; and the second panel, with three researchers, put forth scenarios for the future and their implications for the public sector.

"We leave with a lot of new ideas and a lot of sharing of experiences," Johns said. "Of course, we also have questions, and that's why you're here at a U of M event. We have plenty to think about."





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