

# The Trucking Industry: Transition from Diesel to Natural Gas Is on Deck

*The trucking industry looks set to enjoy three or four years of reasonable growth, according to Bruce Allen, professor emeritus of business economics and public policy at Wharton, and Dan Clark, president and general manager of transportation finance at GE Capital. But important challenges lie just ahead. Part 2 of this two-part podcast considers the looming transition in the fuel source from diesel to natural gas. This involves much higher costs for new equipment, but savings in fuel costs plus less environmental damage mean a relatively short payback period. By 2020 some 20% to 30% of the U.S. truck fleet may be running on some form of natural gas.*

*An edited transcript follows:*

**Knowledge@Wharton:** Another interesting and potentially huge issue is the idea of conversion from diesel to natural gas given the shale gas boom in the U.S. and all the talk of, relatively speaking, cheap natural gas and huge supplies and all of that. Naturally, thoughts go to making these big rigs run on natural gas rather than diesel. What are some of the implications? Is it practical? What's the payback period? And what are some of the benefits in addition to cheaper fuel? There's the advantage for the environment, for example.

**Dan Clark:** I'm personally very excited about it. Natural gas won't replace diesel, at least not in my lifetime. But, within the next five to eight years, it could easily support 20%-25% of the U.S. trucks. Some of the problems right now are just the pure cost factor. If you look at CNG, compressed natural gas, those trucks can cost anywhere from \$30,000 to \$60,000 more than a comparable diesel because of the tanks involved and the engines and so on. For LNG, liquefied natural gas, that same truck is probably a little bit cheaper from the tank perspective, but it's still \$20,000 to \$40,000 more. So, there's a big up-front cost difference. And while that is offset by the cost of fuel, the payback in the case of most of them is somewhere around... at 115,000 miles a year, we estimate the

pay back at somewhere around 18 months. And if they get up closer to 150,000 miles a year, which is really on the high extreme, it can be 12 to 14 months.

So, it's there. Natural gas is obviously very plentiful in the U.S. and it has to be one of those fuels that we move to. If you read back in the history of transportation back in the 1920s, 1930s and 1940s, everything was gasoline and when diesel came out there was a lot of discussion [about] whether diesel would take over. Diesel is a very, very efficient fuel and has served the industry well.

But I foresee natural gas getting into that 25%-30% range of the fleet in the not too distant future. Some of the problems you have are right now is you're in the early stages so the technology's kind of changing. Cummins is coming out with new engines and that's important. You've got infrastructure build-out, which is probably the biggest item right now for long haul. Most of the natural gas trucks being sold now are what we call shorter haul. They'll run 200-250 miles each way and come back. That way they don't have to depend on the infrastructure. But if you're going to have a national footprint, you're going to have to have a national foot print of stations to be able to fill up either CNG or LNG.

And then the final piece that has to come into play is what are we going to do with these units in the secondary market? Is there going to be a secondary market like there is for diesel — to be able sell them and move them on and get new trucks in there? So, there are a lot of unknowns but I'm very, very excited about the opportunity and the prospect for natural gas.

**Bruce Allen:** I share that also. From what I've seen, Dan, your estimates coincide with what Citigroup estimates. They estimate about 30% by 2020. But if you're T. Boone Pickens, he thinks it's going to be 70% by 2020. So, there are a lot of things that are making this happen or can make this happen. And the fuel cost differential is one of them. I read where UPS estimates savings of 30% to 40% by using liquefied natural gas, which seems to be, at least from a study in California, the preferred method over diesel.

And I've also heard ... that the payback period is in the one- to three-year range. So, I think there's a lot of great potential — probably going to be good for the environment also in terms of the cleaner burn. UPS has made a major commitment to get a lot of trucks in this regard. FedEx has too. And the consumers of their services are pressing them also to be clean and green — P&G, Walmart, for instance, have pressured the truckers to be better citizens, if you will.

**Knowledge@Wharton:** Do either of you know what the advantages are when it comes to the carbon footprint? How much is eliminated?

**Clark:** From studies I've read, they estimate somewhere in the neighborhood of a reduction of 20%.

**Knowledge@Wharton:** And that's pretty significant since diesel engines have gotten a lot cleaner in the last 10 or 15 years, but they're still considered — they still put out more [particulates] than gasoline engines I believe.

**Clark:** And that's what's good about — really when you look at natural gas, you're right. Diesel today needs to have after-treatment and a lot of

attachments put onto the engines to have them burn as clean as they do. So, natural gas is just pure. Natural gas in, natural gas out. There's no after-treatment that needs to be provided, which is a real benefit as well.

**Knowledge@Wharton:** What is the state of competitive play in the inter-modal market right now? What are the trends and the more successful business models?

**Allen:** Inter-modal uses more than one form of transportation. So, there's literally everything you can think of. There's truck and rail, which is piggy-back. There's truck and water, which is fishy-back. And there's truck and air, which is birdy-back and so on. In our context, what we're talking about is basically truck and rail, and that's been the growing segment.... It's still pretty small if you look at the Commodity Transportation Survey — a census of transportation that occurs every five years [that's conducted by the Bureau of Transportation Statistics, part of the U.S. Department of Transportation] — the last one was in 2012 and we have some preliminary results. In terms of the ton-miles, it's up to 6.5% of the ton-miles. And it was 5.9% in 2007. With the exception of basically pure truck, nobody else has grown over that period of time, not even pure rail has grown....

The trend is going in the direction of inter-modal in terms of truck to rail. We have two major truckers — Schneider National and also JB Hunt — that have basically gone to, maybe not a 100% model, but a significant percent of their traffic is now going inter-modal, which means that they provide relatively short or regional hauls on both the origin and the destination side, but the rail does the major line haul. Think about this, because ... a truck ... requires one guy for each trailer. The whole train can require as few as two individuals. Now you need people at the origin and destination and so on, but in terms of that labor, you're saving all that. You're saving fuel. The downside is you have some terminal time and terminal times are always bad. But

these trains generally run with priority so they eliminate intermediate yardings, which is where the huge problem occurs in the rail. So Schneider and JB Hunt seem to be doing pretty well. UPS is also a significant user of inter-modal services.

I'm very optimistic about this particular market too. The only thing that can happen is the rail can drop the ball. And that's what rail historically has done. But I think the new railroads are the modern railroads and they're much more capable of delivering the goods than railroads before — but they're by no means perfect.

**Clark:** I agree 100%. In the first quarter of this year alone, approximately 2.3 million containers and/or trailers were moved via rail. So that just gives you an idea of the magnitude of what we're talking about. And that's up almost 4% year over year. So, inter-modal is a very big part of the industry and it's growing. And it serves a very good need for the long haul part of it. As the professor's talked about, the challenges are at both the loading section and the taking the trailers and containers off at the other end. There can be congestion and problems at that point for just-on-time delivery. But the railroads are working much better at that than what they were even three years ago. And as they continue to evolve, I think that those problems will disappear.

**Knowledge@Wharton:** What's the state of play regarding regulation of the trucking industry today?

**Clark:** Regulation in the trucking industry is... to some degree, you could say it's almost out of control. There's just a lot. And as you look at it, sure, there's a need for it. But I always use the story that it's easy for everybody to get mad at trucks so it's easy to pass regulation on it. But some of them are very good. If you look at, say, electronic on-board logging, which logs the driver's hours, that is very important because nobody wants to have a driver that is over-worked and [has] been in the truck too long. So, some of those are very important. And it puts the industry kind of on a level playing field.

But then you get other ones, such as the CSA, which is the Compliance Safety and Accountability program. It's basically a unit to measure all the different fleets against each other from a safety and accountability standpoint. While it sounds good on the surface, the implementation is really very difficult. As a matter of fact ... [some suggest] it doesn't even have a predictive relationship to crashes. So, while the regulations are important and needed, at times they probably over reach and don't accomplish their ultimate goals.

**Allen:** I think the regulation that we're going to have is going to be safety regulation. One of the big difficulties is there really are a lot of poor vehicles out on the road. And the problem is just simply enforcement, the people power to make those enforcements. So, you read the stories about when they pull trucks over, a number of them that have faulty brakes and so on....

So, safety regulations, where we have the vehicles are one, the driver is the other. And another reason there's such movement for trucking safety is — you are out there driving your Smart Car and you look in your rear view mirror and you see this 18 wheeler, this 80,000 pound behemoth two inches off your bumper, Indianapolis style....

**Allen:** By, by the way, may I make two other statements? One is that trucking and inter-modal have grown in the two commodity surveys from 2007 and 2012. So trucking is still going strong. In terms of the value of goods moved, trucking [is] somewhere in the neighborhood of 80% of all the value — maybe 75%.... But the other one to me that is so interesting is the courier express and parcel market, which basically are just UPS, FedEx and the postal service. And the postal service, as we all know, isn't doing very well but they do participate in this market, but not a heck of a lot.

But that type of business is right now at about 12% of the value of goods that move around.... It's how a lot of the pharmaceuticals and the

computers and the parts and stuff like that move. So, it's an extremely important market. And that does not account for the regular trucking business of FedEx, which is the biggest LTL trucker out there, nor the regular trucking business at UPS, which is the fourth-biggest trucker that's out there.

So, these guys are juggernauts in the market place. And so, here's one where the DOJ would get in. If UPS and FedEx — and they're worlds apart — ever considered a merger — no way that's ever going to happen — these guys are just dominant. And in the courier, express and parcel market, you can see they drove out DHL.

**Knowledge@Wharton:** But perhaps with all of the issues in the market, between the investments that might be needed for natural gas and the driver issues and all that, it sounds like it might be ripe for some consolidation — for some of the bigger fleets to take on some acquisitions and grow even more at the expense of some of smaller ones.

**Clark:** I don't believe there's any question — we've seen consolidation and we're going to continue to see it. The bigger ones are going to get bigger. And it's more and more difficult for the small operator — the professor talked about the owner-operator — they're going away by the day because they just can't afford to operate on their own. They don't get the discounts on the fuel. They don't get the other discounts on insurance. The economics just don't work. And as you get the small- and medium-size fleet — say 25 to 250 trucks — the kind of scale just isn't there that the JB Hunts and the Schneiders and the U.S. Expresses and the Swifts have.

So, you're going to continue to see consolidation, while I do think there's always going to be a

need for some of the smaller guys because they provide a different level of service potentially for some shippers. But the consolidation is something that's here to stay.

**Allen:** I definitely agree. The truck load side is interesting because the market shares are so small, usually so small that the Justice Department wouldn't even look at them. They don't even get anywhere near the ... criteria that the Justice Department has for mergers. The ... truck load guys on the other hand, there you already have guys with big market shares and not very many players. Whereas the truck load industry has a gazillion players in it still. But even those guys — Swift has gotten bigger because they've eaten up other carriers out there. So, I think it's going to be interesting as it occurs. But relatively speaking, that truck load industry is phenomenally unconcentrated.

**Knowledge@Wharton:** Well, thanks to both of you for speaking with us today. And we really appreciate it.

#### **Takeaways:**

- Within five to eight years, a quarter of the U.S. tractor-trailer fleet will likely be running on natural gas rather than diesel.
- While natural gas engines cost more than diesel engines, the estimated payback period is one to three years, after which net savings are considerable.
- The lack of convenient fueling stations is a constraint on the switch to natural gas, so expect initial uses to favor short-haul fleets like much of UPS, buses, utility company trucks and the like.
- Intermodal transportation is growing solidly with a trend towards more truck-to-rail intermodal transportation underway.