Oil, That Is

This provides a written transcript of the speech that goes with my PowerPoint presentation, "Oil, That Is", available at www.TransportPlanet.ca. You can run the presentation directly from my web site, or download it first to your computer. Use "Page Up" to move forward through the show, and "Page Down" to move back. Move one step forward every time you see "**Slide**" or "**Next**" in the transcript below. Please contact me through my web site if you have any comments or questions. I hope you enjoy the show!

Slide 1: Oil, That Is

Thanks for visiting my web site. This is my presentation about how we use energy, how that affects the climate, and what these issues mean in my field of transportation.

Slide 2: Which hat?

Let's begin with the disclaimer. I have a wonderful employer that will let me stand up in public and say just about anything I want …

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… as long as it's clear that I'm speaking on behalf of myself; not my employer. So, these are my own views.

Slide 3: Oil, That Is [agenda]

This is a presentation in three parts: oil, climate, and transportation.

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Starting with oil.

Slide 4: City of Burnaby report

My background is primarily in transportation but, as part of my work at the City of Burnaby, I was asked to write the first report on "peak oil" to be received by any government in Canada. This slide shows the front of that report. What Burnaby Council chose to do, in terms of raising awareness, was send the report to every municipal and regional government in the province of British Columbia.

Slide 5: Price of gasoline too high?

We hear a lot about the price of gasoline. Is it going up? Is it going down? Is it getting out of hand? Certainly there are a lot of people that argue it's too high, that it's getting to be a problem for people. So let's take a look at that.

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Here's a cup of Starbucks coffee.

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And that cup costs about $1.60.

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We take the same cup … and fill it with gasoline. [laughter]

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And that will run you about 39¢. Of course, one of these products is essential to society as we know it today. [laughter]

Slide 6: What's a barrel worth?

Now, let's compare that purchase price with what we get from it. What is the *value* of the energy contained in a barrel of oil? When you compare that energy to how you would achieve the same amount of work if you weren't using oil …

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… that barrel will produce the same amount of work as eight servants working full-time for one year. And so, when you think of what those servants would cost you, even at $70 or $80 a barrel, the price of a barrel of oil looks like a pretty good bargain.

Slide 7: Oil production

"Peak oil" is the concept that global oil production will reach a peak, and then go into permanent decline. When people talk about peak oil, one of the things they do is look at historical oil production. On this slide we have a chart showing global oil production for the last 70 years. With only one significant exception, it's a steady upward trend. But, there's a catch.

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"Anyone who believes exponential growth can go on forever in a finite world …

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… is either a madman or an economist." [laughter] That was said by an economist, so he's allowed to say that. The point is that just because we've seen exponential growth historically doesn't mean we can assume it will always be the case. We can't assume that that product will always be available, in a finite world.

Slide 8: Oil discoveries (conventional)

Now, we compare that *production* curve – how fast we're pulling it out of the ground and using it – to the *discovery* curve for conventional oil. ("Conventional" oil is the stuff that flows most easily out of the ground, and is the majority of what we consume today.) What you'll see is that, for the last 40 years, discoveries have been steadily declining at an average rate of about 5% every year. Discoveries have fallen to almost nothing.

And so, putting these two charts together, this is a very simplified explanation of why peak oil is inevitable. We're not finding oil as fast as we used to. Production can't continue to rise indefinitely. You have to reach a point where production peaks, and declines.

And, there's no particular debate about that. There's a great deal of debate about *when* that might occur.

Slide 9: When is peak oil?

Here are some of the dates that have been thrown out by various people that are in the "predictions" business. It's an incredibly complex question. You need to understand all the geology, and all of the things that we don't know about because they're hidden underground. But you also need to understand all the societal factors, and the political factors, and the technological factors.

There are so many things that come into play in determining the peak that, in my view, it's not realistic for anyone to actually pull out a number and say, "This is when the peak will occur."

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But, generally speaking, what you'll find is that the range of predictions falls somewhere between today and about 30 years out. So, there's a 30-year window, and most predictions would agree that somewhere in that range, we're going to hit the peak.

Slide 10: A growing consensus

Some of the uncertainty, and consensus, is expressed in this item from a website by Chevron. They've created a separate site from their corporate site, called www.willyoujoinus.com, and what they're doing is engaging the world in a discussion about energy.

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As part of the advertising for this site, they have a letter from their CEO, which opens with the following words: "Energy will be one of the defining issues of this century. One thing is clear: the era of easy oil is over. What we all do next will determine how well we meet the energy needs of the entire world in this century and beyond." This is a significant issue for our society, and the outcome very much depends on the choices we make in the immediate future.

Slide 11: Perspectives on oil production

Here are a few perspectives on oil production, based on images by Bryn Davidson at http://dynamiccities.squarespace.com.

First we see the Wall Street perspective: looking at the last couple of months and trying to predict what's going to happen in the next few days or weeks or months.

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Then you have the economists' perspective: looking at the longer trend, the pattern over history, and how the production of oil has continued to grow.

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You have the geologists' perspective: that oil is a finite resource. At some point it must peak and go into decline

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And finally the cultural anthropologists' perspective, which is that we are presently operating within a very narrow window in human history where our society is run on oil.

Slide 12: What will the impacts be?

From that arise the questions, "What will peak oil mean for our society? What will it mean to me?" And this links back to my work in transportation planning and modelling, which is all about gazing into the crystal ball and trying to understand what our future's going to be like, so we can prepare for it.

In thinking about that, it helps to look at how we're using oil today. These are U.S. numbers, but also give a sense of the Canadian conditions.

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2% of our oil is being used to generate electricity.

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6% is for the heating of our buildings: homes, offices, industries.

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25% is used in the making of things: anything from plastics to food.

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67% is used for transportation. This is where my interest comes in. Clearly, when we get into a situation where oil production is declining, it's going to have a massive impact on transportation. It is the single biggest use of oil, by far, in North America today.

Slide 13: Oil, That Is [agenda]

This is the second part of my presentation, talking about climate.

Slide 14: Home

Here we are. No place like home. Nice planets are hard to find.

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The ring that's appearing around the edge is the atmosphere, drawn to scale. It is this tiny, tiny, thin little shell. And that is what distinguishes this place from the moon.

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Let's take a closer look at that thin little shell, and see what it's made of.

Slide 15: [untitled, close-up of atmosphere]

This goes back to high school. What are the gases in our atmosphere?

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Nitrogen: 78%. Not a greenhouse gas.

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Next up, oxygen: 21%. Not a greenhouse gas. Anyone remember the next one?

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Argon: 1%. Not a greenhouse gas.

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What we're doing, as a society, is messing with the *trace gases*. The tiny, tiny fraction of gases that are greenhouse gases. And it's because they're so tiny, and yet so important, that the efforts of humanity have been able to have a significant effect. If we were dealing with nitrogen, it would be a lot harder for us to alter the nitrogen levels in the atmosphere, but in terms of the greenhouse gases, it's easier because they make up such a small portion of the total.

Slide 16: Mystery creature

Let's look at what global warming means, in terms of some of the impacts we might experience locally here in British Columbia. This mystery creature is … any guesses?

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The mountain pine beetle. It is devastating large sections of the forests in British Columbia, and is aiming for Alberta. Colder winters used to help control the spread of this beetle, but not any more. There's clearly a significant impact for an economy such as ours that has a substantial forestry sector.

Slide 17: Forest fires

As we get into drier summers, we can expect more scenes like this from the Kelowna area in 2003.

Slide 18: Weather forecasts

More recently, and closer to home, we have the windstorms that devastated Stanley Park in late 2006. While no particular storm can be directly linked to global warming, the probability of high-energy storms will continue to increase.

Slide 19: Weather forecasts

We've reached a point where what used to be of only passing interest to us is now a major concern. What's the weather doing in the Gulf of Mexico? Our interest was heightened by the 2005 hurricane season, which had dramatic impacts in the storm's path, but also noticeable impacts on the entire North American energy market.

All those little sprinkles you see on the map, surrounded by the blue ring, represent the oil and natural gas infrastructure in the Gulf. Those are oil platforms and refineries and everything else.

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Along comes Hurricane Katrina, tracking across the Gulf, and then blasting up through New Orleans.

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Soon thereafter, Hurricane Rita takes another swipe, rather ironically, through all of that greenhouse-gas-producing infrastructure … and brings us scenes on the evening news like this drilling platform.

Slide 20: Larsen B

A little further away, but no less significant, we have this from the Larsen B ice shelf in Antarctica. The dashed line shows the edge

of that ice shelf as it existed several years ago, at the start of 2002.

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Here we have, in time lapse, the rapid disintegration of that ice shelf in only 5 weeks. That's 3,200 square kilometres of ice shelf gone – converted to ice cubes.

Slide 21: Getting our feet wet

One of the things that can happen if we get enough ice melting in Antarctica or (more likely) Greenland is that sea levels will rise, globally. If either the West Antarctic ice sheet melts or the Greenland ice sheet melts, we get a global rise of about 6 to 7 metres in sea level.

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This is what that would look like, here in Greater Vancouver, according to a May 2006 analysis by the BC Chapter of the Sierra Club of Canada (http://www.sierraclub.ca/bc/). Almost all of the City of Richmond disappears, along with most of Delta. The airport is gone.

Slide 22: Carbon capture & storage

One of the useful concepts that has been discussed from a greenhouse gas point of view is the idea of "carbon capture and storage". Let's say you have a source of carbon dioxide emissions, in this case a coal-powered electric generating station.

You can *capture* the carbon dioxide and *sequester* it in a number of locations, whether it's underground or at the bottom of the ocean. And there's potential for this to work. All of the building blocks for this are already in place and in use on a small scale. There's the potential to take that and ramp it up. No guarantees, but it might work well enough to make a difference.

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Of course, there's the problem of *mobile* sources of carbon dioxide, where it would be far more costly and impractical to do carbon capture.

Slide 23: Cap and trade

If we look at some of the things that we can do, as a society, one of the key actions that a government can implement is the idea of a national cap on carbon emissions. Here we have a chart representing a bunch of different consumers, each with different levels of emissions.

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If the government creates a cap on emissions, then you have a situation like this, where some users are emitting more than the cap and some are emitting less.

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You then create a market, where high-emission consumers would need to acquire the right to continue emitting at that higher rate, from someone who is emitting at a rate below the cap.

This creates an overall cap for the nation, but uses the market mechanism to work out who does the emitting and who gets compensated for it. People can make money by coming up with ways of doing business, or living, that create fewer emissions.

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Then, of course, the cap gets pulled down further and further each year, until we've reached a total emission level that is sustainable and suitable for the planet.

Slide 24: We need to change

The purpose of this slide is to give a sense of the *size* of the challenge that we're facing. Much of the literature indicates that

we need to stabilize global temperatures at not more than 2º Celsius above pre-industrial levels.

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Unfortunately, a third of that is already gone. We've already used up the first third, during the last hundred years or so.

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The next third is going to be hard to avoid because we've already put all these gases up in the atmosphere. Even if we stop today, the gases that are already up there will continue to warm the planet.

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And so we have a buffer of about two-thirds of a degree Celsius in which to start changing the way we do business.

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In order to achieve that temperature goal, if this tall bar represents our total annual emissions today …

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… then the target we need to meet is somewhere in the range of an 80% to 90% reduction in greenhouse gases emitted annually, for an industrialized country like Canada. And I don't want to argue about the exact amount. The point is, it's not 10%. This is not simply a matter of putting in compact florescent light bulbs and you're happy; you're done. There's a lot of work that needs to be done to reach this large reduction target.

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Most commentators suggest that we need to reach that target by about 2050 if we want to prevent "runaway" global warming. That's global warming that feeds back on itself and accelerates.

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Some people have suggested that we need to reach our targets even sooner than that, perhaps closer to 2040 or even 2030. This is a tight time frame for achieving this very substantial reduction in greenhouse gas emissions.

Slide 25: The fringe goes mainstream

It used to be that if you were walking around carrying a sign that said, "The end is near," [laughter] you'd be considered a little bit out there, a little bit on the fringe. But not anymore.

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According to this headline from the Vancouver Sun, the *world will end* in just two or three generations if we don't take *quick and drastic action* to curb global warming. That's the view of an astonishing *72%* of British Columbians.

This illustrates that there's an enormous amount of anxiety in our society today because we are not coming to terms with this issue. We are not grappling well with this. We need to get off our butts and start doing something about it. And we're starting to see some of that concern reflected in federal politics recently, where the government has been able to pass most of the legislation it wants, but got stopped when it attempted to bring in a feeble, do-nothing response to global warming.

Slide 26: Oil, That Is [agenda]

Here's the third and final section of this presentation: on transportation. Given that we've got these issues about oil and about climate change, what does this mean for transportation? What sorts of responses can we make in the field of transportation?

Slide 27: Engineering 101

So … a class project. Engineering 101.

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The challenge: design the world's most *inefficient* form of transportation. If you were asked to perform this task, could you possibly surpass …

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… something that looks like this? [laughter] Unless, of course, it was …

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… something like this. [laughter]

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It's horrendously inefficient, whether that's in terms of:

- The cost to the user, the enormous cost of acquiring such a device;
- The time you spend focused only on transportation, whereas on a bus you could be reading or on a bike you could be improving your fitness at the same time;
- The amount of space it takes up in our cities;
- The amount of pollution and greenhouse gases that it emits; or
- The energy that it consumes.

Slide 28: It's the law

But, we have a law. It's called a zoning bylaw. We do a lot of good things here in Greater Vancouver with higher density and town centres and mixed uses. But, even here, much of our city consists of single-use zoning, where the homes are over *here* and the stores are over *there*.

And therefore, chances are, if you're going out shopping …

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… this is probably how you're going to get there.

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As a result, you're going to be using 1% of the energy to move your groceries …

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… and 99% to move your vehicle.

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"Everybody can't have two tons of metal to get a loaf of bread," in the words of Professor Larry Frank at the University of British Columbia. And yet, we require this. This is what our zoning bylaws lead us to.

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It would be like having a policy in the freight business requiring that only one car be used on every train, and the rest of the train be hauled empty. That's the level of inefficiency that we force on people.

Slide 29: Transportation Jeopardy

Let's play one round of Transportation Jeopardy.

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"Answer: they haven't changed in 600 years." Anybody? So much has changed in this field: technologies, speeds, distances. What is it that hasn't changed in 600 years?

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"Question: how long have commuting times remained constant?" [laughter] As we develop fancier technologies and the ability to travel faster … we just move farther out. We're not really accomplishing anything here.

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This is reflected in, for example, this study that was done in California. A 1% increase in transportation *supply* (that is, the capacity of the road network) leads to a 0.9% increase in the

demand for the use of that network. This leaves only 0.1% for the originally-advertised purpose of reducing congestion and delay, which is used to justify most road construction projects. The concept is called "induced traffic"; traffic that wasn't there until you built more capacity.

Slide 30: Transportation Plan "A"

With that in mind, we can talk about Transportation Plan "A". And a lot of the things in Transportation Plan "A" are things that we're already doing in Greater Vancouver, and can be doing more of.

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For example, we have the Livable Region Strategic Plan. This regional planning document sets out a vision for the region as a whole, that all the member municipalities are expected to abide by and work within. It's a plan based on mixed-use, higher-density, transit-oriented development; coupled with a deliberate slowing of road expansion.

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Did anyone go to the World Urban Forum in the summer of 2006? It was here in Vancouver, and it was a huge conference put on by the United Nations. And it was looking at cities around the world. What can we be doing better?

In going to the conference, and hearing from people from all over the world, it was amazing the number of them that said, "We're doing that. We're doing the Livable Region Strategic Plan." Not in those exact words, but more like, "We're going with higher density; we're going with mixed uses; we're going with a focus on transit." We know what the answers are.

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We can do things with transit. We can provide priority for buses so that they get through congestion. We can provide better bus stops, where it's more comfortable to be: bus stops with benches, shelters, newspaper boxes, schedule information, and so on.

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Here in Greater Vancouver, the "U-Pass" fare system means that all university students have access to unlimited transit. It's being adapted to a Community Pass that applies to, for example, purchasers of new condominiums. Ultimately, we could have city bylaws that say, "For every new home, the developer must include two year-long transit passes," instead of the existing, "For every new home, the developer must provide two parking spaces."

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Completing the pedestrian network; making it feasible to walk in places where it is unsafe today.

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Quality urban spaces: places that beg to be explored on foot, because that's the only way you can fully experience and enjoy them.

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Completing the cycling network; making it easier and safer to make mid-range and longer trips by bicycle.

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Using more home delivery. In my house, we get organic food delivered by SPUD (www.spud.ca), and that's a much more energy-efficient way to get things to your home than by driving them yourself.

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So there's lots of good ideas; lots of things that we already know how to do, and can be doing more of. But there's a problem.

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It takes a long time. Most of these things that we're talking about here are things that happen gradually over a period of years or decades. It's the reshaping and rebuilding of a city. From what we know about peak oil and climate change, we probably don't have time to rely on this gradual, incremental change.

Slide 31: Commitment problems

To illustrate that, let's discuss our commitment problem. This is about climate change.

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Canada made its first commitment on greenhouse gases in 1990. And the red line represents what that commitment was. We said we'd stabilize back at the 1990 level within 10 years. How'd we do?

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The blue line shows our actual emissions during that period, a steady increase.

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A few years go by and we sign the Kyoto Protocol in 1998. We promised that by the year 2012, our emission would be 6% below there 1990 levels. Again, the red line represents what we committed to. This would have been an excellent time to start reducing greenhouse gas emissions. Here's how we did.

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Not making much progress yet.

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A few more years go by, and we *ratify* the Kyoto Protocol in 2002. Now it's not just the Prime Minister; it's the Parliament of Canada making this commitment. Clearly, it would have been an excellent time to start reducing our greenhouse gases. Our task would have been a little harder, because we waited a few years, but still a great time to start. How'd we do?

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Not so good. Emissions are still going up.

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A few more years go by, and the Kyoto Protocol *comes into force* in 2005. Now it's been ratified by enough countries to become a legally binding document.

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And then, of course, in October 2006, this is what the Conservatives announced, that got everybody upset. They issued a political statement of their "intention", not even legislation, to reduce emissions 45% to 65% below the already-elevated 2003 levels, but only by 2050, and only after first allowing them to continue rising for many more years.

This is what allowed them to say, "Yes, we're going to meet our Kyoto targets; just not the date!" [laughter] And sure enough, they missed the date by about 40 years! [laughter]

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Meanwhile, here's what the science is saying. We need to start now, and we need to achieve deep reductions by 2050. There's a certain sense of urgency.

Slide 32: Momentum

Similarly, there are time pressures from peak oil. Yes, we *might* have up to 30 years until the peak, but change takes time. Changing our infrastructure; changing the way we run our society. It all takes time.

Here's a study done for the US Department of Energy and it said, "If we start preparing at maximum priority, comparable to getting ready for World War Two, and we start doing that *20 years before the peak*, then we'll be able to keep up. We'll be able to pull through this okay." The black line across the top represents how we *want* to be consuming oil on current trends, and the triangle represents the change we'll have to go through in terms of more efficient widgets and developing other energy sources.

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If, on the other hand, we wait until only *10 years* before the peak, then the mitigation isn't going to be enough, and we're going to have a shortfall. There's going to be some challenges in terms of how we adapt to that.

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Of course, if we wait for the peak to actually *arrive*, then the mitigation will be that much less effective and the shortfall will be that much greater. Now, I don't know of too many governments that have started on a crash program of *anything* 20 ahead of the crisis, so I don't have a whole lot of faith that we're going to be on that first graph. I think we're going to be a lot closer to the final graph, in a world where we need to play catch-up and make some rapid changes.

So, it begs the question:

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What do we do when the manure hits the wind farm? [laughter]

Slide 33: The big question

Or, to phrase it a little more delicately, here's one of the best questions I've ever heard. "How do you change the world …

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… using only the resources you already have available?" And that's what the remaining part of this presentation is about.

Slide 34: What are our resources?

What are the resources that we already have available? We have:

- running shoes,
- buses,
- bikes,
- computers,
- roads – a lot of roads,
- lots of cars, and
- cans of paint. [laughter]

So let's see what we can do with our transportation system, with just the resources we already have available. Let's talk about …

Slide 35: Transportation: Plan "B"

… Transportation, Plan "B".

Slide 36: Being creative

And this is about being creative – thinking outside the box a little bit – and coming up with some ideas that we perhaps haven't considered before. They might not look *exactly* like this car or dog [laughter] but here's a real one.

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This is from Cuba. This is a truck that's been converted into a bus that can haul 200 people. It's a very high-capacity bus.

Slide 37: Change

Let's talk about change. Remember these guys (Enron)?

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And remember what they did to these guys (California)? California was in a position where they had to rapidly reduce their consumption of electricity. They did a lot of things to get there …

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… but a big part of it was a marketing campaign that took the message out to their citizens and said, "This is the problem. We're only going to get through this if we all help – if we all change? And here are the specific things that you can do, to make a difference."

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As a result, peak electricity consumption declined by 14% in *one* year. A very dramatic change.

Slide 38: Least-cost planning

It's an example of least-cost planning, which is one of the principles behind BC Hydro's Power Smart Program (www.bchydro.com).

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If you look at the *next* kilowatt-hour of additional electricity, if BC Hydro was going to buy that externally, or expand their own capacity to generate another kilowatt-hour, it would cost them about 7 cents.

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But to persuade and help us consumers to avoid using that same kilowatt-hour costs only 2 cents. It's enormously cost-effective to look at the *demand* side of the equation rather than saying that we can only consider *supply*-side solutions.

Let's see how that applies to the world of transportation. Here are some ideas.

Slide 39: Just say "home"

We've been hearing about telecommuting for years, and it's gradually been growing. It's been getting easier and easier all the time, as the technology gets better. But there are plenty of people for whom it will just never work, because their physical presence is required: nurses, carpenters, chefs, and so on. However, there are still lots of people that could be taking advantage of this, that aren't today.

Slide 40: Trip-based costs

We can start looking at travel costs that are determined at the trip level. Right now, you purchase a car, and that's the big part of your transportation cost, whether or not you ever drive it anywhere. The actual *use* of the car is a much smaller cost. And so, you've got so much up-front cost sunk into the thing that you might as well get out there and use it.

But now we have car-sharing organizations like this one, the Cooperative Auto Network (www.cooperativeauto.net), where you become a member and then share in a pool of cars owned by the organization. You only pay for the amount of transportation that you actually use on a trip-by-trip, kilometre-by-kilometre basis. Your trip cost includes the costs of gasoline, *plus* your proportionate share of insurance and maintenance, *plus* your share of the initial purchase cost. It's all included, in your trip-based cost.

This allows you to decide, on an individual trip basis, "How will I travel today for this particular trip?"

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What municipalities can do to help out is provide places where the cars can be parked, between users, so that members of the cooperative know where to pick up the vehicle.

Slide 41: Trip lengths

Let's look at trip lengths. Here's a typical chart, showing the frequency of various trip lengths for commuting. There are a huge number of trips that are relatively short, and a diminishing number of trips that are quite long.

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If we draw a line at a trip length of five kilometres, what we find is that about 30% of the trips are less than five kilometres. These are ideal for travel by bicycle or, in some cases, on foot.

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Now that's still only 8% of the vehicle-*kilometres* – the total amount of travel happening – so it doesn't make a huge difference in terms of the total emissions or the total amount of oil consumed. But still, it's a significant step forward. And it's something that we already have the resources to do.

Slide 42: Garage search

I'm amazed when I talk to people, including people that obviously haven't been on a bicycle in years, who still say, "Oh yeah, I've still got that old ten-speed sitting in the back of the garage. I should get it out sometime." There are a lot of under-utilized bicycles sitting around our country: 57% of Canadian adults own bicycles.

Slide 43: Bus search

We're going to need more buses. But, if we wait until the situation is desperate, every other city in North America is going to be trying to get buses at the same time as we are. The factories won't be able to keep up.

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But we can still look at under-utilized buses that are already out there – in private hands or school district hands or whoever it turns out to be – that aren't being used fully at times of the day when we need additional bus capacity.

Slide 44: "Make" more buses

Another way to "make" more buses, and this is where the can of paint comes in, is by …

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… designating lanes on our existing roads – reserving them for buses – so that buses get through faster. It means the bus can get to its destination faster, and get back to carry another load of people. It also means the service is better, so more people will choose it.

Slide 45: Transit: it's about time

Here's a chart that shows how the demand for travel varies over the course of the day. We've got a peak in the morning, the morning commute. And then, a larger peak in the afternoon.

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The first lesson here is: let's work with the *off-peak* trips. We've got a lot of transit capacity available in the midday that's being under-utilized. If we can look at those trips that are happening midday, and encourage more of those people to get on transit, we've already got the capacity available to serve them. The climate doesn't care what time of day we reduce our emissions.

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What I've now drawn across the lower part of the chart is simply 50% of the top curve. It's half the demand at any given time of day.

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This is to illustrate that we can take some of the demand and shift it earlier in the day, and some of the demand and shift it later in the day.

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Then, when we add them back up again, we get a curve that looks more like this "shifted" one. The peaks are not so pronounced, and what we've done is shave 15% off the highest peak. We've provided ourselves with 15% of additional transit capacity.

Slide 46: Dynamic ridesharing

We can also look at things like ride-sharing. Jack Bell said, "Why can't we put more people in one car?" You won't hear a transportation professional coming up with crap like that, but he

was a farmer, and as a farmer he could say things like that and get away with it. [laughter]

He started the Jack Bell Foundation (www.ride-share.com), which helps people form carpools for commuting. The only weakness is that it's a fairly fixed kind of thing. It's for people who are making the same trip everyday: same time, same origin, same destination.

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What we're starting to see now is various agencies experimenting with something that's more dynamic. I want to travel from my home to a given place. Today. Starting in about an hour. We can use the Internet to make connections with other people that are making similar trips. Here's a sample of the output that you get from one website. It has information about you, your riders, where you need to pick them up, and at what times.

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There are even attempts to access this type of system using cell phones. You could be standing on a downtown street, because you've just come out of a meeting. You're ready to go back to your office. You punch your information into the cell phone, and hook up with other people that are making a similar trip.

Again, it's moving towards a system that is much more dynamic and operating in real time. In the process, it becomes useful to many more people, for many more types of trips.

Slide 47: Slug Lines

A very low tech – but still very effective – way of doing this has been operating in Washington D.C. for many years now. They call it "Slug Lines". Here's how it works.

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They have about 20 pickup points, scattered around the city, as represented on the map by stars. These are much like bus exchanges, except that they also serve cars. They're situated to take advantage of the carpool lanes in the Washington area.

Someone who has a car can go to one of these points and pick up people who are headed for similar destinations. From each pickup point, there's anywhere from two to about ten destinations served. If you're heading to the Pentagon, for example, you go to the appropriate pickup point for that destination.

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To make it even easier, a driver can go to their Web site and print a destination sign to stick in their car's front window. When they show up at the pickup point, everybody that's waiting there knows exactly where that car is going.

Slide 48: [untitled, aerial view of parking lot]

If we take the principles from the past few slides, and expand them and integrate them, we can start to see something like this. We have an existing rapid transit station with a bus loop beside it.

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We can add a cycling hub adjacent to that …

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… and then a Slug Line hub in the same location. Now you have a multi-modal transportation station that provides you with options. You can get there by bicycle, on foot, or by local bus. Then, for the main part of your trip, if the bus is there and it's got space, you can get on the bus. If you've just missed the bus, you can go over to the Slug Line and get a ride that way. You can make your choices on a day-to-day, trip-by-trip basis.

Slide 49: Shifting modes

What would it mean if we started applying these ideas? Here's how we use our transportation modes for commuting today (numbers are for USA). Three-quarters of the trips are made by people driving alone in their cars.

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But if we implement some of those principles we just saw, we can increase the transit mode share from what it was.

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We can increase the "other" (pedestrian and cycling) mode share from what it was.

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The telecommuting can also be increased.

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But if we're really going to cut down on the driving-alone trips …

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… we have to realize that where we really have the surplus capacity in the system is in all those cars that can be converted to carpooling. We can start putting people in all the empty seats that are being driven around our cities.

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As an energy bonus, the road network becomes less congested. Thus, those cars that are out there are doing less accelerating and decelerating. You can also pick the most efficient vehicle for every trip. If you know that it's commuting time and you think you're going to get a lot of riders, you take the minivan and fill it with people. There's no need for a carpool to be just two people.

Slide 50: The wallet

In terms of the wallet, what would this cost to implement in, for example, Greater Vancouver?

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Well, we actually need to talk about the *savings*. $7 *billion* of transportation infrastructure that we are presently building or designing in Greater Vancouver, that wouldn't be necessary if we were aggressively pursuing these other alternatives.

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We already have all the transportation capacity we will ever need, but we're spending *$7 billion* to avoid carpooling. And we're not even having a discussion about whether or not that's a wise use of $7 billion.

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Plus, of course, the *$8 billion* in operating costs that we'll rack up in doing all of that driving. So there's a direct personal economic benefit as well.

Slide 51: A finite world

We are living on a finite world.

Tightening oil supplies and global warming are two good reasons to reduce oil consumption.

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Whether it's due to a shortage of oil or some sort of carbon quota system, or a carbon tax, oil consumption *will* decline.

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Time is of the essence. Clearly, the sooner we start, the better the outcome.

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It's about the choices that we make as individuals, and as governments.

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Start now.

Thank you very much for your time.