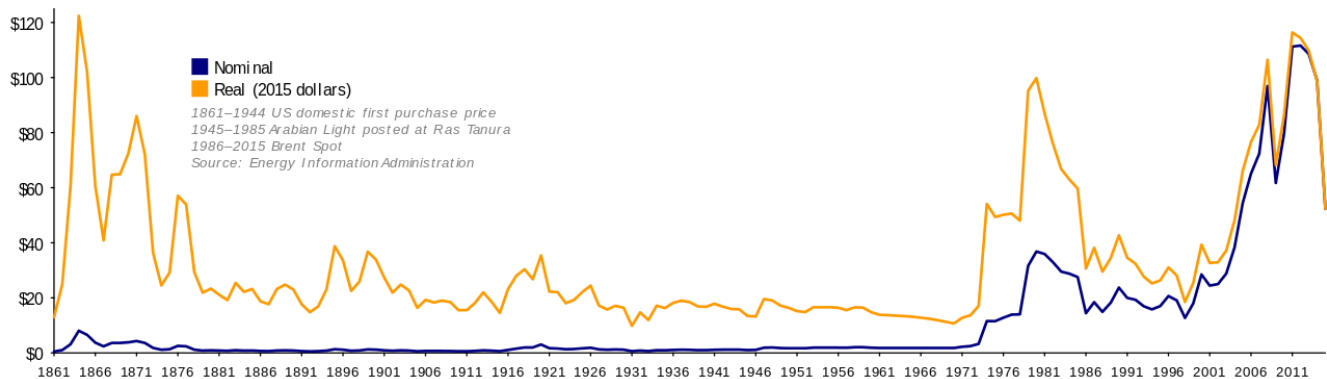


What Happens When Energy Shortages Lead to Energy Rationing?

By Chris Aikman
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Source: https://en.wikipedia.org/wiki/1973_oil_crisis

A lot of people will be too young to remember the energy crisis that began in 1973. I remember it well, because in June of that year I was driving home from San Francisco to Vancouver with my family. When we crossed the state line into Oregon, all the gas stations were closed. Not totally closed: they would open around 7 am in the morning for about an hour, and sell each customer in line a few gallons or liters (yes, some US States sold gasoline by the liter at that time!) of fuel, enough to drive for about 2 hours. Before those two hours were up, we'd have to find a motel and stay there until next morning, when we could repeat the cycle, and drive two hours further down the road. It was a great relief to get home.

The energy price spike that began that summer of 1973 left a deep mark on the American psyche. One could argue it has defined all U.S. presidential elections in the four decades since that time. If there's an energy shortage, public attitudes can become nasty. The bottom line is this: don't ever get caught without the energy to complete whatever it is you are doing. People have gone to war over this, unfortunately many times. Remind me again how many countries the U.S.A. is actively fighting at present?

We need to keep all this in mind as we look forward to a carbon-free energy future. That's the thing we love about fossil fuels: they're always there when you need them (except when they aren't). The sun is always there, except at night. The wind is sometimes there. Hydro can store energy for when sun and wind come up short of market demand.

So what happens if we all do the 'right thing' for the climate and ditch our gas-powered cars for electric ones? When will electric vehicles become the standard?

Here are the dates that European countries are planning to ban sales of gas & diesel automobiles, according to recent news:
Netherlands by 2025, Norway before 2030, India by 2030 (partial ban), in UK and France by 2040.

Paris and the Netherlands will have all fossil powered vehicles off the streets by 2030:
<http://www.businessinsider.com/countries-banning-gas-cars-2017-10/#norway-will-only-sell-electric-and-hybrid-vehicles-starting-in-2030-1>

But what about North America?

If NAFTA is trashed, as appears increasingly likely, free trade in automobile parts between US & Canada which we've enjoyed since 1965, will be over. Both countries will have to

rebuild separate supply industries. Electric vehicles (EV) contain far fewer parts than those with internal-combustion engines (ICE). The logistics of supply will probably dictate a huge surge to electric vehicle manufacturing in Canada, and perhaps even also in the United States. Such a market surge is already a certainty for Europe, as indicated by their policies above. In the resultant market, it is possible or likely that retail prices of electric vehicles could fall below that of internal combustion engine vehicles. Over their life cycle, they are already price-competitive. Electric vehicles could retail even cheaper than gasoline-powered ones, and if and when that happens, the market for gas-powered cars will collapse completely.

Do we have enough electricity to power all our passenger vehicles?

According to StatsCan, fuel sales by province are given here:

<https://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/trade37c-eng.htm>

In 2016 in British Columbia, gasoline sales were 5,770 million litres (1528 million US gallons), diesel sales 1,747 million litres (460 million US gals). To convert these to energy units of gigawatt-hours (GWH):

https://en.wikipedia.org/wiki/Gasoline_gallon_equivalent

..which gives us values of 51,000 GWH for gasoline sales, 17,500 GWH for diesel, for a total of 68,500 GWH. It took that much energy to power passenger vehicles in BC in 2016.

According to BC Hydro, total 2016 domestic sales of electricity were 57,300 GWH:

<https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/accountability-reports/financial-reports/annual-reports/bchydro-2016-17-annual-service-plan-report.pdf>

In other words, it would take MORE electricity than BC hydro presently sells in British Columbia to power our passenger vehicle fleet if it were all electric, and if the efficiency of petrol-powered and electric powered vehicles was the same. On this basis we'd have to double our electrical generation to provide for electric vehicles.

Fortunately, there is a huge efficiency advantage for electric vehicles. Electric motors are very efficient, converting over 90% of electrical power supplied into motion. This compares with a conversion efficiency of 25-30% for gasoline engines, and somewhat better for diesel. Anyone who tells you that the efficiency of internal combustion engines will greatly improve hasn't heard about the Second Law of Thermodynamics. So basically, electrical motors are about 3 times more efficient than internal combustion motors. On that basis, we'd need an additional 23,000 GWH to power an all-electric vehicle fleet the size of today's fleet. That's 40% of BC Hydro's current energy market. And we can expect the size of that vehicle fleet will increase. So it's probably more realistic to say we need an increase of 50% in electrical production, in other words about 29,000 GWH more than now available.

There are other factors to consider as well: transmission losses if the electricity comes from afar, load factors if it comes from intermittent sources like solar and wind.

Whatever the numbers may be, there is no doubt that we will require a lot more electrical supply. Most of this new energy will surely come from solarPV and wind generation. But there will have to be assurance of supply for this transition to actually occur. You wouldn't buy an electric vehicle if you knew that at any moment you might not be able to fuel it. That means we must increase our stored hydro capacity in order that energy will be available at all times, night and day, for whenever it is needed.

There is lots of stored hydro energy already behind WAC Bennett dam:

[https://en.wikipedia.org/wiki/W. A. C. Bennett Dam](https://en.wikipedia.org/wiki/W._A._C._Bennett_Dam)

Assuming it holds >2 years of water flow, Williston Reservoir holds >26,200 GWH. The rate of discharge of this energy is limited by the fact that Dinosaur Lake above the Peace Canyon Dam at site B only holds 2 days of river flow; any huge discharge of water into it will cause downstream flooding. The Site C reservoir will hold ~22 days of river flow. That would permit rapid discharge of the two upper reservoirs on any time scale from minutes to months. To take advantage of this capacity to power surge at times, extra generation capacity would have to be added as needed at the Bennett Dam and Peace Canyon Dam, of course. The whole system could be incredibly versatile. It can be optimized for power production as well as environmental protection, right down to the Athabaska Delta on Athabaska Lake.

It's really hard to achieve this amount of power and this amount of supply flexibility any other way than with a multi-reservoir system. That's why I believe Site C is an essential part of our goal to replace fossil energy with a combination of solar and wind and hydro, while still ensuring the security of supply we have come to enjoy with fossil fuels.

The surest way to have a working free-market supply of energy is for a million or more British Columbia households to become energy suppliers. That can happen quickly with rooftop and community solar panel installations across the province. The BC Hydro system can act as real-time energy banker. Low energy prices come from an abundant, assured supply.

Conversely, the surest way to drive energy prices up is to limit supply. Remember 1973?

Germany already has over a million homeowners who generate and supply electricity to the nation. It works.

Or, would you prefer to let the fossil-fuel cartel control your life, your energy, and your money forever?

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