



Bankrolling the winds of change

As we search for solutions to the current energy crisis, there are lessons to be learned from events at the turn of the 20th century

The world hates change, yet it is the only thing that has brought progress.

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Can public policies positively influence the deployment of innovation and intellectual property to correct economic or social anomalies? Consider the following: a century ago, New York City newspapers pondered the dilemma of the success of urban civilisation—namely that the streets of Gotham would soon be paved with several feet of horse manure. It was the modern parable to the Augean stables with no Hercules in sight. But this was the progressive era of American politics. Government, both state and federal, was seen as an instrument of the public good with the Herculean power and duty to develop regulations and incentives to promote the public health and welfare. What the policy wonks of 1900 failed to see was the advent of an emerging technology – the automobile – that would obviate the need for legions of street sweepers and mountains of compost. In the 1880s, automobiles introduced the internal combustion engine to the market and put the horse – several of them actually – into a small box. In the early 20th century this “horse in a box” would eat the heretofore useless and volatile byproduct of petroleum distillation known as liquid naphtha (aka gasoline). Twenty years later, Henry Ford virtually guaranteed the American transportation revolution by ignoring the iron law of wages and paying factory workers a wage rate that assured automotive consumption by a mass market.

In hindsight, this symmetry of useful technology, cheap energy and a burst of purchasing power seemed like a perfectly executed summer blockbuster straight from Hollywood. But, of course, in 1900 there was no script for the automobile. And by 1973, its success had helped to precipitate a new dilemma, an energy crisis: or, to be more accurate, a petroleum crisis. The

response to this oil shortage was manifold, but in the end it was largely solved by four developments: the failure of the oil cartel to behave as a monopoly; the discovery of new oil reserves; technical enhancements to oil production on proven reserves; and nominal improvements to vehicular fuel efficiencies. Of these, fuel efficiency standards (also known as CAFE) were government sponsored. Its effect, in terms of the early 1900s, would be to substitute Shetland ponies for Clydesdales. The problem would be alleviated by lowered manure emissions per horse. But the manure would remain.

From an intellectual asset point of view, the public policy energy solutions implemented in the 1970s and 1980s embraced the current technology paradigm, internal combustion, and focused on extending the timeline for its use. By this measure, US public policy might be deemed a success for the past 30 years. Economically, it has led to emulation by the Indian and Chinese proto-superpowers. But, more precisely, it has also served to exacerbate our global energy dilemma. We are ever more an oil-based global economy which can only dissipate this fundamentally finite resource at an ever greater rate. One of the best history lessons we can learn is when not to perpetuate it. A century later, are there any such lessons in the automotive revolution?

One may be the counter-intuitive behaviour of innovation. The 1886 Benz automobile was invented at the veritable peak of the Steam Age. Internal combustion was an oxymoron to the steam cycle's external combustion. To be successful, internal combustion required a fuel source that was completely out of synch with the economics of coal. Analogously, such an innovation shift today would seek to replace the compact and thermally efficient BTUs of internal combustion petrol-fuels with an energy resource that was diffuse and erratic in its energy content and which required a large physical structure for work conversion. Something like wind energy, for example. So how counter-intuitive is wind technology in today's economic climate? Here are some of the interesting findings about wind:

- Wind turbines generate electricity which is more difficult to store and transport than petrol-fuels.

- From 1971 to 2004, over 700 wind energy related patents were issued and actively maintained in the United States.
- Statistically, the issued wind patents seem to fall onto one of three innovation waves, which suggests a lifecycle of between seven and eight years for new wind energy technologies.
- In the US, sites for the best wind production of electricity are inversely correlated to large population centres. In other words, high winds do not encourage residency.
- US wind-based patent filings weakly correlate ($R=0.36$) with changes in crude oil pricing on a constant dollar basis. The second innovation wave (1990-97) actually commenced during the period's greatest decline in inflation adjusted crude oil prices.
- Wind energy patent ownership is very fragmented. Hitachi, Canon and General Electric are among the largest patent holders in the searched fields and each holds less than 2% of all identified patents.
- US patentees account for 48% of US patents, followed by Japan (21%), Germany (4%), Canada (4%) and France (4%).
- New commercial wind turbines have increased in size from 20-50 kW in the early 1980s to 1-3 Mw today.
- The cost of wind electricity generation is about 80% fixed cost-based while fossil fuel generator costs are 80% fuel based.

Wind energy may not be the cure to the energy crisis, but if we do not want to wait 20 years to develop technology solutions to social needs, we might want to stimulate and not discourage counter-intuitive intellectual asset creation. The good news is that the US has provided green tax credits to eco-sensitive technologies, some of which, like wind turbines, are contrarian approaches to conventional practices.

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