U.S. Energy "Security" — Beware False Comfort

Reliance on a phony form of “energy security” locks the U.S. into a world of diminishing returns.

By John Mathews and Erik Reinert, March 20, 2014

The events in Crimea have caused the British Prime Minister to make a big push for shale gas, coal and nuclear. While becoming less dependent on Russian energy sources is certainly a valid strategic goal for Europe, just embarking on other fossil-fuel sources falls short of what Europe (and the United States) should aim for, both in an environmental and strategic perspective.

To be sure, “energy security” is the mantra in the United States right now – as is “energy independence.” But, there is a chorus claiming that energy security derives from declining U.S. dependence on Middle Eastern oil suppliers, replaced with increasing production of shale oil and gas in the United States.

It is certainly true that an increase in the domestic production of unconventional fossil fuels delivers national fossil fuel independence, insofar as it reduces oil imports.

But this is an extremely limited version of “energy security.” After all, it maintains dependence on a commodity that is retrieved by drilling and mining, which involves relentlessly rising fuel costs and environmental damage.

For all the soothsaying, one should note, that this approach is always subject to diminishing returns. Why? As the resource becomes more difficult to access, the costs of extraction tend to increase over time.

The contrast with producing power from renewable energy utilizing one’s own manufacturing systems could not be more pronounced.

**Historical increasing returns**

Wind turbines, solar PV cells or concentrated solar power systems (mirrors and lenses), or even heat pumps tapping differences in temperature underground, are all manufactured devices and operate under a combination of economies of scale and technological change.

Joseph Schumpeter alluded to this combination as “historical increasing returns.” The important point here is that these systems would utilize abundant energy supplies at costs that are not increasing with increased volume of production.

In this way, the manufacturing of energy systems – as opposed to the logic of the extraction of energy – delivers increasing returns and declining costs. The latter, essentially the absence of a factor of production being exhausted, have always
Reliance on “energy security” that still locks the United States into resource extraction has diminishing value.

Nuclear power stations are so complex they have to be built one by one, and so never achieve economies of scale.

Converting the US energy economy from extraction to systems manufacturing would be a major qualitative shift.

been the key to long-term wealth generation. This is what differentiates Silicon Valley technology from Klondike-type extraction.

The overall primacy of manufacturing over resource extraction as national development strategy was demonstrated decisively in the last few decades.

One East Asian country after another – starting with Japan and then Korea, Taiwan and now including China – lifted themselves out of poverty through reliance on export of manufactured products. Declining costs and learning curve effects were critical to this success.

The United States demonstrated just how pivotal these were. In the 19th century, vast manufacturing industries were built to complement the United States’ vast primary industries. As a package, that created an economic machine of awesome size and productivity.

The same bundling effect was demonstrated earlier still when Great Britain industrialized and thereby escaped the Malthusian trap. But even before Britain, this secret was discovered in European cities, particularly by the Italian theorists wondering how cities provided the key to wealth generation.

How cities and regions grow wealthy

Four hundred years ago, Mercantilist economist Antonio Serra, from his prison cell in Naples, was asking how some cities and regions grew wealthy. Why did the gold and silver flowing into Europe from the New World end up in cities like Amsterdam and Venice which owned no New World mines themselves?

In the resulting 1613 “Short Treatise” on trade balances, Antonio Serra found the answer to this puzzle in the processes of urban-based manufacturing. These processes allowed unit costs of goods produced to decline as the volume of production rose. Cities promoted specialization that, in turn, expanded their productivity and enlarged their market. This led to more specialization. And so the process would go round and round.

That process is now called circular and cumulative causation – or generating just plain “increasing returns.” The contrast with the diminishing returns found in agriculture and extractive industries (giving economics the name of a “dismal science”) is remarkable.

It also yields a much bigger lesson, which we must urgently take on board if we are to have a prosperous and sustainable energy future.

The 400-year old secret: increasing returns

This 400 year-old secret, which predates Adam Smith by 160 years, has always been the key to wealth generation. Now, it is about to be rediscovered all over again – in the field of energy.

By virtue of necessity, China has already discovered this secret. Faced with insufficient carbon resources and high pollution levels from out-dated power plants, China is striving to achieve its brand of real energy independence. It is creating world-class industries producing wind turbines, solar PV and CSP power systems.

These manufacturing systems are destined to expand and, as they do, they will drive down costs. This creates a virtuous circle of learning-curve effects and market expansion. Government intervention can hasten the process, both by driving down costs and expanding the market.
Unfortunately and largely because the United States as the world’s leading economy was too focused on the energy extraction narrative, the application of these ideas to the field of energy has been seriously delayed.

What can be done to accelerate it now? The first hurdle to get over is that energy security is being interpreted solely in terms of access to fossil fuels. Regrettably, that misconception is now being repeated all over again in the United States where the current contenders to achieve energy security are coal seam gas and shale oil.

**Resource extraction equals diminishing returns**

But reliance on such a phony form of “energy security” further locks the United States into resource extraction and its diminishing returns. Meanwhile, rivals like China pursue manufactured renewable energy systems that will drive their national development as well as real energy security.

The second hurdle to overcome is the idea that energy intensity, or density, is the most important goal of energy policy. Centralized power stations result in enhanced energy intensity. This wrong-headed approach is taken to an even higher level by gigawatt-scale nuclear power plants.

But this is not even a good goal for energy policy. Nuclear power stations are so large and complex that they have to be built one by one – and thereby never achieve economies of scale and never generate increasing returns.

Converting the energy economy from extraction – subject to diminishing returns – to one based on manufacturing – subject to increasing returns – would represent a major qualitative shift towards global sustainability.

Diminishing returns of extraction make economics a dismal science (also in terms of sustainability), while increasing returns give cause for optimism. This taps the virtually unlimited sources of natural energy around us and relies on the inexhaustible capacity we have for innovation.

Antonio Serra would not be surprised. He would only wonder why it took us so long to work out this elementary feature of energy systems and how the real sources of energy security are to be found in manufacturing rather than resource extraction.

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