CHAPTER 12

REFRAMING RENEWABLES AS ENHANCING ENERGY SECURITY

Energy security continues to be a dominant theme in the energy policy literature. Ever since in 1913 Winston Churchill deemed Britain's national security to be tied closely to energy security in terms of oil supplies from Iran and the Middle East, switching away from coal as fuel of choice in the Royal Navy, oil supply and energy security have been two closely intertwined concepts. In the wake of the OPEC oil embargo and the dramatic rise in price of oil in 1973, Western nations founded the International Energy Agency (IEA) as an adjunct to the OECD, essentially as a body responsible for keeping a watching brief over Western energy (oil) security. Security of oil supply (in terms of physical deliveries and maintenance of essential infrastructure) has been expanded conceptually to cover the issue of supply at a reasonable price. Despite the proliferation of competing dimensions in the definition of energy security, the notion remains wedded to issues of oil and fossil-fuel supply.[1]

The most recent round of discussion concerns energy (oil) security and claimed energy independence with the rise of hydraulic fracturing and 'alternative' fossil fuel supplies, such as coal seam gas and shale oil. Energy security issues have been emphasized by the oil majors in framing the prolonged debate over the extension of the Keystone oil supply pipeline to the US, from Canadian tar sands to US oil refineries on the Gulf coast. 'Energy independence' and enhancement of energy security were the watchwords in this debate.[2]

This framing of the debate over the future of a pipeline assumes that 'energy security' is a matter that concerns primarily continuing access to fossil fuel

1. See for example Sovacool and Brown 2010; or Cherp and Jewell 2011.

2. See for example 'The new politics of energy' by Daniel Yergin, *New York Times* magazine, 9 June 2012, available at: http://www.nytimes.com/2012/06/10/opinion/sunday/the-new-politics-of-energy.html?pagewanted=all and _r=0.

supplies. Yet a moment's reflection reveals that there can be a quite different construction of the concept of energy security. There exists an alternative means of securing energy, which is available to all – and that is through the manufacture of renewable energy devices and their utilization to tap renewable sources of energy. This provides security in the sense that manufacturing is available to all, and supplies of power from renewable sources do not involve geopolitical calculations and the global projection of armed might to protect long fossil fuel supply lines.

Much of the debate over renewables is framed as a debate over mitigation of carbon emissions and impact on global warming. A *reframing* of the debate around issues of energy security provides a fresh impetus for policies on renewable energy. If energy security (or reduction of insecurity) is the prime consideration – as it clearly is for many newly industrializing countries that turn to renewables as a means of avoiding power interruptions and the geopolitics associated with fossil fuels – then issues to do with continuity of manufacturing and trade, and the maintenance of competition, start to loom large. The contribution to mitigation of global warming can be viewed, from such a perspective, as a convenient side-effect. In this Chapter I explore the implications of such a switch in perspective.

ENERGY SECURITY AND FOSSIL FUEL GEOPOLITICS

Energy security is by definition a somewhat vague concept that nevertheless has clear geopolitical origins. It is not surprising that scholars have had difficulty in coming to grips with such a nebulous notion.[3] Their difficulty is understandable. If the focus is exclusively on security of fossil fuel supplies (as is normally the case) then the goal is actually impossible to achieve. There is no such thing as 'security' of oil supplies, given all the geopolitical complications in which they are embedded; the mitigation of energy 'insecurity' is the best that can be hoped for in the context of fossil fuel dependence. Fossil fuel dependence, and in particular dependence on oil imports, thus lies at the core of a complementary notion of 'energy insecurity'.[4]

3. See Kruyt et al. 2009.

4. Leung (2011) notes that China's concerns over energy security focus mainly on rising dependence on oil imports, while Boyd (2012) notes also that the concept of energy security has expanded in Chinese debates to cover matters of security of pricing of energy and reliable provision of electric power (such as guarding against blackouts).

Daniel Yergin, 'godfather' of oil business debates in the US, defines energy security as driven by the need 'to assure adequate, reliable supplies of energy at reasonable prices and in ways that do not jeopardize major national values and objectives' (Yergin 1988: 111). Yergin, like most commentators, has in mind here the role of oil as being central to a country's energy security. But if we turn things on their head, and reframe energy security in terms of the manufacture of renewables devices and their installation to capture freely available renewable energy sources, then interestingly enough the same definition applies. Renewables can be said to provide assurance to a country of 'adequate, reliable supplies of energy at reasonable prices and in ways that do not jeopardize national values and objectives'. Specifically, renewables uphold the social and economic structure of a country – consistent with its 'national values and objectives' – better than do fossil fuels, particularly when the fuels have to be imported. Renewables as manufactured items promise a revival for a national manufacturing centre in the US like Detroit, whereas continued reliance on fossil fuels (traditional or alternatives) promises only further decline for such centres.

Many developing countries are now starting to use the language of energy security in building their renewable energy systems. Take the case of Malaysia, and in particular its Sarawak Corridor of Renewable Energy (SCORE) project, which involves construction of 20GW of hydroelectric power along a 320-km riverine corridor, and calling for investment of US$105 billion by 2030. SCORE is viewed by Malaysia's planners as a developmental project of the highest priority, an important component of both the 9th and 10th Malaysia Plan (respectively covering the years 2006–2010 and 2011–2015).[5] One of the key drivers of the SCORE development is energy security, namely to get Sarawak off its current near 100 per cent dependence on fossil fuels (gas and oil) and move instead to a portfolio of energy sources, with hydropower anticipated to rise from a 10 per cent share in 2006 to more than a 70 per cent share by 2030. Part of the energy security aspect of SCORE is reliability of power supplies. The point of this example is that it demonstrates that developing countries can enhance their energy security by making intelligent use of renewable energy sources and focusing on the multiple developmental advantages that such sources offer.[6]

5. A specific development agency has been created for SCORE: the Regional Corridor Development Authority (RECODA), which is vested with responsibility for attracting and coordinating the investment. For the latest developments, see the project's website at: http://www.recoda.com.my/.

6. In their analysis of SCORE, Sovacool and Bulan (2012) identify four features or national goals that are met by the project – industrialization, energy security, inclusive development and spillover effects. Mitigation of climate change is viewed then as an ancillary (albeit convenient) effect – not the central goal.

ENERGY SECURITY BASED ON MANUFACTURING OF RENEWABLES

The argument so far has avoided the issue as to whether renewables can provide 100 per cent of our energy needs. There is of course great debate over this very issue. Some scholars are dubious. The IPCC itself has gone on the record to state that by 2050 up to 80 per cent of global energy supplies could be coming from renewables (IPCC 2011).

The attraction of formulating energy security as a matter of manufacturing power devices rather than fossil fuel extraction is that we don't have to reach a judgment on the question as to whether renewables can adequately generate power sufficient for the needs of an industrialized society.[7] All that matters is that we reframe the consideration of the renewables option, from one that is burdened with the resolution of the entire global warming problem, to one that is concerned much more narrowly with securing reliable and economic power supplies. If renewables cannot provide the entire power needs of a country (and few countries would be able to boast that they could, as of now) then fossil fuels will perforce have to continue in use – with all their associated insecurities (political, economic, environmental, social). From the perspective of energy security, and amelioration of electrical blackouts, most countries with access to their own domestic renewable sources of energy would see their levels of energy insecurity fall insofar as they resort to manufacturing (or importing) of renewable power devices.

I propose that the notion of energy security be reframed as one that is tied not exclusively to fossil fuels' accessibility but more broadly to availability of renewable sources of power.[8] This is a perspective that views energy security as emanating from a country's capacity to generate power through accessing renewable resources, utilizing manufactured equipment (wind turbines, solar PV cells, CSP lenses and mirrors etc.) that is either produced in the country concerned, or is imported from another manufacturing country. This alternative perspective is closely linked to the notion of declining costs for manufactured products, as embodied in the learning curve. Predictability of

7. Some scholars (e.g., Jacobson and Delucchi 2011) have argued that a renewables programme based solely on water, wind and solar could be powering large industrial countries by the year 2030.

8. The IEA has been engaging in studies of renewable energy systems from the perspective of energy security ever since the landmark report of 2007 (IEA 2007). It is anticipated that the 2016 edition of the IEA's flagship *World Energy Outlook* will be focused on the role to be played by renewables in the coming energy transition.

costs (and their decline) and hence of prices, is central to any notion of energy security through manufacturing.

Indeed we can extend this line of argument. Yergin (2006) develops a framework of five principles that he argues provide the setting for any discussion of energy security. These are: 1) diversification of supply; 2) resilience (maintaining a 'security margin'); 3) recognition of the reality of (economic) integration; 4) information (to facilitate rapid market adjustments); and 5) globalization of the energy security system with the need for military protection along global supply pathways. While clearly framed by Yergin to provide a setting for fossil fuel (principally oil) security, nevertheless it is interesting that we may frame our notion of 'security through renewables manufacturing' in exactly the same terms. Let me demonstrate.

Diversification: Renewable energies (REs) are typically discussed as a portfolio of sources, including wind power, solar PV, concentrated solar power (CSP), direct water heating, as well as geothermal and bioenergy. No country aware of energy security would put all its eggs in a single RE basket. Diversity is integral to renewables generation and diffusion.

Resilience: REs are by their very nature diffuse and decentralized, favouring local supply over centralized generation. For this reason they are resilient, and a country's optimal means of guarding against blackouts and other supply disruptions. REs are by their very nature resilient.

Economic integration: Renewables devices such as wind turbines and solar PV cells are manufactured products, and traded internationally. They are becoming important components of the globally integrated business system – while some countries, such as China, see them becoming a pillar industry, contributing more and more to national wealth generation.[9]

Information access: RE devices and systems are heavily traded products and as such, their prices and costs are available for all to see. There is no source of information insecurity such as government suppression of oil supplies and reserves data (still practised as national policy by Saudi Arabia). As RE devices are increasingly integrated into grids, so the demand for 'smartening' grids through IT will make information more and more accessible.

9. China is focused on building a set of renewable energy and environmental industries that would become a 'pillar' of the economy by 2015 – and be expected to grow at a rate of 15 per cent per year (twice the level of the economy overall) and provide an export platform for the future.

Globalization: Fossil fuels are undoubtedly a global economic phenomenon, with pipelines and shipping lanes spanning the globe – but this creates a global problem for countries looking to reduce the insecurity of these global supply lines. By contrast, RE systems are globally manufactured and traded in a peaceful manner, without the need for overt military protection.

Thus renewables contribute directly to promotion of energy security (or rather reduction of insecurity) even when evaluated in terms devised to discuss security in terms of fossil fuel supplies. Accordingly, renewables may be considered fundamentally as a source of energy security – in that they are associated with manufacturing activities that generate increasing returns and declining costs. As recognized over centuries, manufacturing activities are superior in terms of wealth generation to agricultural and extractive activities because they embody increasing returns, as opposed to diminishing returns for activities that are dependent on land as a resource.[10]

By contrast with the fossil fuel focus of energy security, and its emphasis on diversity of fossil fuel supplies and their economic feasibility, the emphasis in energy security through manufacturing (ESM) is on ensuring the viability of manufacturing value chains and the prosperity of manufacturing firms, where competition will ensure that prices are reasonably predictable. This is a perspective that focuses on the real advantages of renewables, as manufactured products. The processes of creating manufacturing value chains will build on each other, creating multiple interconnections and increasing returns as they do so. This may be described as a chain reaction of value creation that can benefit all countries that have some level of renewable energy resources. The contrast with the prospect of diminishing returns from extractive activities is striking.

FROM OIL SECURITY TO ENERGY SECURITY

The reduction of energy insecurity through the addition of renewables to an energy portfolio does not call for the overnight replacement of a fossil fuel system with one based on renewables. It calls instead for evaluation of energy options at the margin, where choices are being made. Seen from the

10. Erik Reinert has made this point forcefully in many writings; see his book Reinert (2007) for a summary exposition.

perspective outlined in this book, renewables offer energy security along several dimensions – economic, environmental, and social – which lend themselves to new policy formulation, irrespective of climate change effects.

Renewables that are manufactured offer economic security in that the costs of devices (turbines, PV cells, lenses, mirrors) can be expected to fall, continuously, while the efficiency of power generating systems (wind farms, solar PV farms, CSP plants) can be expected to improve. This is a dynamic that is fundamental to renewables, contrasted with the essential insecurity associated with both availability of fossil fuels (even new sources such as coal seam gas and shale oil) and their cost.[11]

Renewables offer environmental security in terms of their ability to generate power without associated pollution, either in terms of particulates associated with the burning of fossil fuels (coal, diesel, gasoline, aviation fuel) or in terms of carbon emissions now associated with climate change and global warming. While some aspects of manufacturing renewables devices are associated with use of toxic materials (e.g., use of cadmium in Cd-Te solar PV cells), these are amenable to control through existing laws and regulations. In any case, countries moving towards the use of solar PV as primary energy source would be expected to be looking beyond cadmium-tellurium cells towards less toxic alternatives.

Renewables offer potential social security in terms of the resilience of renewable power generating systems. They offer security in social terms through their diffuse character, providing rural employment and the potential to revive declining manufacturing regions. Energy policies aimed at enhancing these different aspects of energy security – economic, environmental and social – clearly need to register the contribution to be made by renewable energy systems even if expanding power requirements also call for continued use of fossil fuels. The conclusion to this argument is that energy security in driving industrialization is to be found in the manufacture of energy devices (such as wind turbines or solar cells) rather than in extracting fossil fuels from the earth in increasingly dangerous, inhospitable and inaccessible parts of the world.

11. This point that renewables generate energy self-sufficiency is emphasized by Seth Shonkoff and colleagues in correspondence with *Nature*, 540 (15 December 2016): 341.