World Nuclear Industry Status Report 2015
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Foreword

By Jonathon Porritt

There's been no diminution in the intensity of the debate about the role of nuclear power in tomorrow's low-carbon world. Indeed, it seems to become more intense by the day. Articles of historical faith seem to matter much more to protagonists on both sides of that debate than strictly dispassionate analysis. And that's precisely why the World Nuclear Industry Status Report (WNISR) plays such a critical role in informing both experts and lay people, updating a longitudinal dataset with scrupulous care and attention to detail every year.

As we know, however, people read the same data in very different ways, leading to very different conclusions. So I can only give you mine, without any attempt at spurious neutrality! And my headline conclusion is a simple one: the impressively resilient hopes that many people still have of a global nuclear renaissance are being trumped by a real-time revolution in efficiency-plus-renewables-plus- storage, delivering more and more solutions on the ground every year.

One of the least understood aspects of today's nuclear debate is pace of change: just how fast is R&D converting into prototype and early-investment prospects; just how fast is innovation of that kind converting into near-commercial or fully-commercial projects; and just how fast are those projects converting into scalable roll-out programmes with substantive measurable outcomes.

Every year that passes reveals a widening gap between what is happening with the nuclear industry (forensically laid bare by successive Status Reports) and how so-called alternatives become a new paradigm (based on efficiency, renewables, energy storage and distribution), as portrayed by a wide range of commentators in the energy debate – from the International Energy Agency and mainstream investment banks through to entrepreneurs and NGOs. It's an extraordinary story that emerges from this analytical approach to the relative pace of change in both competing paradigms.

Simply by presenting year-on-year data as to the operational status of nuclear power programmes all around the world, WNISR remorselessly lays bare the gap between the promise of innovation in the nuclear industry and its delivered results.

For instance, back in the 1990s, there was huge enthusiasm for a potential "nuclear renaissance" through what were called Generation III reactors – designed to address the huge problems then confronting the industry in terms of safety, cost and

construction complexity. These promises (which were themselves reminiscent of some of the earliest claims made on behalf of nuclear power back in the 1950s and 1960s) were instrumental in persuading both George Bush and Tony Blair in recommitting to nuclear power programmes in the USA and UK respectively.

Twenty years on, not one of the Generation III reactor designs is yet in service. And the kind of reduced costs that were being talked about at that time have been proved entirely illusory: by 2013, the projected costs of Generation III designs had increased eightfold. As the WNISR authors put it:

“By May 2015, there were 18 reactors of designs claimed to meet Generation III+ criteria under construction. Only two were still on time, and the rest were two to nine years late. So on the face of it, the claims that these designs would be easier to build appear no better based than the cost claims.”

Undaunted by this grinding reality, the nuclear industry is now increasingly active in talking up the prospects for Generation IV reactor designs, which will (we are told) address all the same problems that Generation III designs were supposed to address. Right now, for instance, there’s an outspoken lobby making the case for Small Modular Reactors – an idea which is readily badged as Generation IV but actually goes back to the 1960s. Then the 1980s. Then the 1990s. Then the early 2000s! As the International Energy Agency commented in 2002, in an era when it was rather more bullish about

nuclear power: “The main reason for this stalemate is that we, in all our doings, continue to rely on nuclear technology developed in the 1950s, which had its roots in military applications which cannot exclude absolutely the possibility of a severe accident and which has reached its limits from an economic point of view.

For those who’ve now somewhat given up on Small Modular Reactors and other so-called “advanced nuclear reactors”, there’s always the promise of an entirely new nuclear value chain based not on uranium but on thorium – another proposition that has been around for more than 50 years. And what’s remarkable here is that even the keenest advocates of thorium acknowledge that it couldn’t possibly make a substantive, cost-effective contribution to the world’s need for low-carbon energy for at least another 20 years.

The consistent history of innovation in the nuclear industry is one of periodic spasms of enthusiasm for putative breakthrough technologies, leading to the commitment of untold billions of investment dollars, followed by a slow, unfolding story of disappointment caused by intractable design and cost issues. Purely from an innovation perspective, it’s hard to imagine a sorrier, costlier and more selfindulgent story of serial failure.

This is not the place to develop a full comparison with what I’ve called “the alternative paradigm”, but in each of those four core elements (efficiency,

renewables, storage and grids) the pace of change is breathtaking, dramatic, and potentially disruptive on a scale that dwarfs anything the nuclear industry would ever dare to suggest these days after 60 years of perennially depressed expectations.

The best the nuclear industry offers the world today, as we focus more and more relentlessly on accelerated decarbonisation, is providing no more than the same amount of relatively low-carbon electricity in 2050 as it provides today – roughly 10% of global demand. And that's primarily because the current rate of new build (with 62 reactors under construction as of mid-2015—more than a third of which are in China—with at least 47 suffering delays of varying degrees of severity) will struggle to keep up with the rate of decommissioning as nuclear fleets age all around the world and life extension programmes become both more expensive and more controversial.

Such modest expectations sound increasingly forlorn when set against the emerging prospects of a secure, efficient, distributed energy economy, powered primarily by renewables and smart storage technologies.

This increasingly stark contrast between two very different innovation paradigms is not restricted to today's understandably partisan advocates of renewable energy. A number of key players are busy transitioning from one paradigm to the next, with two major European utilities leading the way. In December 2014, Germany's biggest utility, E.ON, announced that it would split in two, retaining the E.ON brand in a company focussing on renewables, networks and "customer solutions", whilst leaving its "legacy assets" (including nuclear and coal-fired power stations) in a new company called Uniper. And in April 2015, GDF Suez (now Engie) issued the following statement of intent: "We have one conviction: the energy model of tomorrow will be in 3D: Decarbonized, thanks to the development of renewable energies; Digitized, by deploying intelligent networks; and Decentralized."

The authors of WNISR have been tracking the contrast between nuclear and renewables for a number of years, and provide a very timely update. The astonishing changes in the solar industry epitomise the general direction of travel:

There now seems to be a general recognition that the fall in production costs of renewable energy technologies, particularly solar photovoltaics (PV), coupled with the expected falling costs of electricity storage, will accelerate the transformation of the power sector. UBS, in a report published in June 2015, stated: "We believe solar will eventually replace nuclear and coal, and be established as the default technology of the future to generate and supply electricity." An important driver is the realization that solar PV will increasingly be deployed without subsidy, unlike the technology cost curves for nuclear power.

So how long will it take before those seemingly inextinguishable hopes in the promise of nuclear will be finally overwhelmed by the delivered realities of an alternative model that gains momentum not just year on year but month by month?

From an innovation standpoint, the answer is absolutely clear: it's already happened. The static, top-heavy, monstrously expensive world of nuclear power has less and less to deploy against today's increasingly agile, dynamic, cost-effective alternatives. The sole remaining issue is that not everyone sees it that way—as yet.