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By accident or by design? Pushing global governance of nuclear safety

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ABSTRACT

Nuclear safety governance should move towards a more robust regime including elements of international monitoring and verification. This is needed because nuclear energy production is likely to grow and new reactors will have different global dispersal, veering towards less experienced countries. In addition, there is growing interest in international and multilateral collaboration on disposal of mounting nuclear waste. Unlike existing improvements that came in response to nuclear disasters (*by accident*), it makes sense to implement all these elements at once (*by design*). While a comprehensive global governance regime must include elements of verification and enforcement, more transparent international oversight would also improve global nuclear safety through public pressure. The monitoring and enforcement of such a globally organized regime could be introduced at regional or otherwise supranational level. In this paper, we argue that a robust global nuclear safety regime is not only necessary but also feasible provided it manages to address the following potential hurdles: i) the tensions in international security politics, ii) the stickiness of national sovereignty and iii) industry resistance to additional restrictions and to issues of proprietary commercial information. These objections will be elaborately reviewed in the paper.

1. Introduction

Few other products of human ingenuity generate stronger demand for global governance than civilian nuclear technology. It is therefore reassuring to see that the present nuclear safety regime is relatively closely regulated. An elaborate set of institutions, regulations, and practices aim at safeguarding millions of tons of radioactive material and a vast number of nuclear facilities. Historically, after major nuclear disasters, safety improvements were always made concerning both reactor design and safety governance. The Chernobyl accident, for instance, led to many of the nuclear safety regulations and practices currently in place (Bunn and Heinonen, 2011). The Fukushima-Daiichi accidents gave rise to a number of preventive measures, in Japan and beyond, to improve the response to nuclear disasters and to further reinforce nuclear safety in nuclear reactors.[1]

While the evolution of nuclear safety mechanisms occurred incrementally (in response to accidents) it was always shaped by concerns of national sovereignty. Even though governments realize the urgency of strengthening international measures, for nuclear safety, they tend to rely predominantly on voluntary engagement. In this paper, we argue that the governance of nuclear safety should be turned into a more robust regime, including elements of international supervision, monitoring and verification. In other words, instead of working on a *by accident* approach (i.e. in response to accidents), we need to improve nuclear safety *by design*.

We shall argue that a cutting back of "sovereignty" is required so that nation states no longer have full autonomy and unlimited legal and technical control over technological systems. Following the model of "disaggregated sovereignty" (Krasner, 2001; Slaughter, 2004) with national agencies and technical bodies working across boundaries, the situation of being intimately linked to international conventions and coordinating organizations would be preferable. In a comprehensive global governance regime, states would thereby partly renounce their techno-sovereignty for the sake of common nuclear safety. It is important to observe that *national security* might be objected to when it comes to agreeing on international governance. Particularly in the case of nuclear security and

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[1] See http://ajw.asahi.com/article/0311disaster/fukushima/AJ201505290052. Consulted on July 12th, 2015.

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when states have military nuclear activities it seems unlikely that access will be given to international bodies regarding such activities. Our focus is, however, on the safety of civilian nuclear activities, particularly nuclear energy reactors, where national security concerns are largely irrelevant.[2]

To understand the argument presented in this paper, the difference between nuclear safety, security and safeguarding first needs to be highlighted. The International Atomic Energy Agency (IAEA) describes nuclear safety as "the protection of people and the environment against radiation risks, and the safety of facilities and activities that give rise to radiation risks." (IAEA et al., 2006, p. 5), while nuclear security relates to *intentional* malicious activities and to "[t]he prevention and detection of, and response to, theft, sabotage, unauthorized access, illegal transfer or other malicious acts involving nuclear material, other radioactive substances or their associated facilities" (IAEA, 2007, p. 133). Finally, nuclear safeguard helps deter nuclear weapon proliferation by detecting any possible redirecting of nuclear material that could conceivably be used to manufacture nuclear weapons from highly enriched uranium and plutonium. Though the argument in this paper is primarily concerned with nuclear safety, we shall draw comparisons with the governance structure of nuclear security and with safeguarding mechanisms.

The paper is organized as follows. Section 2 discusses changes in the nuclear landscape that urge us to reconsider the global governance of nuclear safety. The existing governance regime for nuclear safety will be reviewed in Section 3 while in Section 4 we shall compare the governance structure of nuclear safety with nuclear security and safeguarding to see what lessons can be learned from such regimes. Section 5 will assess the impact of enforcement while focusing on the regional (supranational) governance structuring of nuclear safety. While the global application of the *by design* approach with international verification and enforcement mechanisms presents the ideal solution, the best feasible approximation we can hope for in the short term is implementation at regional level. Section 6 reviews potential objections to a change in the *by design* approach, arguing that such a comprehensive approach is not only desirable but also feasible.

2. The new global nuclear landscape

Major emerging trends in nuclear energy production and waste management make it pressing to rethink the global governance of nuclear safety. While a state like Germany is cutting back, many new nuclear energy reactors are being built or proposed in many other countries. At present, 59 reactors are under construction while 168 are in the planning phase.[3] These numbers are perhaps surprising given the initial responses to Fukushima. Some experts remain skeptical arguing that many aspiring states lack crucial factors such as proper governance, suitable grids and the available finance (Findlay, 2011). According to the WNA and the 2014 *Word Energy Outlook*, nuclear power's share in the world's energy mix will not rapidly increase (IEA, 2014). In absolute terms though global nuclear energy production is continuing and perhaps even slightly growing.[4]

It is not, however, the number of additional reactors but rather the shifting global dispersal that is relevant. Alongside the thirty existing nuclear energy countries, at least another eighteen may join in the next decades; an even larger number of countries (45 including the earlier-mentioned eighteen) are, in principle, interested in developing nuclear energy.[5] Table 1 shows that most new reactors will be built outside OECD countries where, today, roughly 74 percent of all power plants are operable. The landscape will tilt towards non-OECD countries, and especially towards Asia where 69 percent of all new reactors are under construction and where as many as 62 percent of those in the planning phase are located. As China is likely to have the largest percentage of new reactors, the newcomer's share may rise to 18 percent. Among the newcomers are countries with very different levels of capacity. Up to 53 percent of the reactors under construction and 57 percent of those being planned will be located in low GDP countries, including Bangladesh, Jordan, Vietnam, and Algeria. While some have experienced delays in their programs, one may question whether and, if so, when other countries wanting nuclear energy can join, bearing in mind their limited experience and expertise, governance capacities and financial resources (Schneider et al., 2014, p. 7).

Certain developments lead us to think that at least some of these newcomers will eventually have nuclear energy reactors in their grid, because a new mechanism offered by Russia will purportedly ameliorate important potential hurdles for such newcomers. Under the acronym BOO – Build, Own, Operate – the Russian company Rosatom offers to finance, construct and operate a nuclear power plant that will last for sixty years.[6] In the words of Jong Kyun Park, the IAEA Director of the Nuclear Power Division, this unique approach "solves two of the biggest challenges that newcomers face: [a lack of] financing and experienced operators"[7] For Rosatom, the package is intended "to win business from developing countries".[8] The first country that will receive the BOO comprehensive package is Turkey which has contracted four reactors (Pekar, 2014). Rosatom is also negotiating with Algeria, Argentina, Bangladesh, Jordan and many more countries.

Similarly, the merger of two Chinese state nuclear companies has created global corporation that is geared to supplying reactors inside and outside China.[9] As potential obstacles disappear it seems likely that more newcomers from the Global South will join in the next couple of years. This, then, creates a wealth of national versus transnational safety governance challenges, particularly since according to the Russian proposal Rosatom will continue to operate its newly built plants. Among these challenges are also concerns related to *stranded facilities* those where, sometime in the future, an agreement breaks down for political reasons or a supplier withdraws or goes bankrupt. These scenarios emphasize the need to consider such bilateral collaborations within the broader international context.

Finally, the supply and demand sides are not only changing with

[2] It should be noted that ensuring the safety of several civilian installations, such as research reactors that use Highly Enriched Uranium, might be sensitive from a national security point of view. The same goes for dual use nuclear technologies such as reprocessing facilities that are used both for military and civilian purposes. In countries that have these kinds of nuclear installations, national security might constitute an objection to globalizing nuclear safety, but there are very few countries that have access to such dual use technologies.

[3] http://www.world-nuclear.org/information-library/facts-and-figures/world-nuclear-power-reactors-and-uranium-requireme.aspx Consulted on September 1st, 2016.

[4] Some of the new reactors will simply replace the older ones built in the 1960s.

[5] See http://www.world-nuclear.org/info/Country-Profiles/Others/Emerging-Nuclear-Energy-Countries/.

[6] See http://uk.reuters.com/article/2013/05/13/uk-rosatom-nuclear-russia-idUKBRE94C09G20130513.

[7] Quoted from the website of The Communications Network for Nuclear Energy and Ionizing Radiation: http://www.nucnet.org/all-the-news/2013/11/18/turkey-has-made-important-progress-in-nuclear-power-programme-says-iaea Consulted on May 11th, 2015.

[8] Quoted from Reuters http://uk.reuters.com/article/2013/05/13/uk-rosatom-nuclear-russia-idUKBRE94C09G20130513 Consulted on May 11th, 2015.

[9] See: http://www.reuters.com/article/2015/02/04/china-nuclear-ma-idUSL4N0VE05Q20150204.