



Taking the Long View in a Time of Great Uncertainty

Rehearsing Possible Futures

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In last quarter's column, I described how scenario planning, a strategic planning tool that is being implemented by many organizations, can be used to rehearse, and prepare for possible alternative futures in the context of the complex world we live in today. In particular, when we look across the geo-political landscape of the global security environment today¹, one can become quickly overwhelmed with many uncertainties, and lose sight of the big picture strategies that might be useful to prepare for alternative futures. When carefully identified, critical uncertainties, or combination of critical uncertainties, can provide insight into events or actions that might dramatically change the path to the future. If an organization has sufficient spheres of influence, such as the National Laboratories, or national or international organizations including the International Atomic Energy Agency (IAEA), or the United Nations itself, it may even be possible to change the direction that the world is headed if it is determined that the end point of any particular future path is undesirable.

Creating Scenarios of Interest to the Institute

The nuclear environment that the INMM works within has many interrelated complexities, lending itself to characterization using scenario techniques. The stories created of future worlds using these scenario techniques help stimulate strategic discussions that are different than those which take place during traditional strategic planning activities. These discussions might include, for example, the technical challenges of verification requirements under the Joint Comprehensive Plan of Action (JCPOA)², the policy challenges that lie ahead addressing the nuclear ambitions of North Korea, or the societal impact of the Fukushima recovery effort.

Many indicators point to these challenges, as described in the recent announcement by the Bulletin of Atomic Scientists, updating their "Doomsday Clock",³ and by former U.S. Secretary of Defense, William J. Perry who has suggested the risk of a nuclear catastrophe is greater today than at any time during the Cold War.⁴ One only has to look at

the monumental, decadal technical challenges facing Japan today in the aftermath of the Fukushima nuclear incident, to wonder "What if management had rehearsed an improbable seismic event and resulting unprecedented tsunami during the design of their facility plan? Could they have avoided or mitigated the event that occurred?"

This is the world of scenario planning — stretching the imagination of managers and leaders so they can discuss possible responses and solutions to "what if" questions about future events in a controlled environment, and by rehearsing those discussions, be better prepared for the unexpected.

Critical Uncertainties for Scenario Axes

In last quarter's column, I posited two current critical uncertainties that one could envision creating a set of future worlds in which strategic discussions pertinent to the future of the INMM could occur. Those future worlds would be created by the nexus of these two critical uncertainties on an orthogonal set of axes, where the extremes of each axis reflect end points of the critical uncertainty, representing on one end an ideal state and on the other end a troubling, undesirable, or even nightmarish state. Let's take the two critical uncertainties that we identified and examine them in more detail for possible end state descriptors:

This column is intended to serve as a forum to present and discuss current strategic issues impacting the Institute of Nuclear Materials Management in the furtherance of its mission. The views expressed by the author are not necessarily endorsed by the Institute, but are intended to stimulate and encourage JNMM readers to actively participate in strategic discussions. Please provide your thoughts and ideas to the Institute's leadership on these and other issues of importance. With your feedback we hope to create an environment of open dialogue, addressing the critical uncertainties that lie ahead for the world, and identify the possible paths to the future based on those uncertainties that can be influenced by the Institute. Jack Jekowski can be contacted at jjekowski@aol.com.



The Advancement and Control of Nuclear Technologies

- In a positive future world one might envision continuing breakthroughs in monitoring and security technologies that would allow treaty verification by national technical means, and verification of compliance requirements. The deployment of the world-wide seismic monitoring system by the Comprehensive Test Ban Treaty Organization (CTBTO)⁵ is an example of how technology can be used to further the confidence of the world in monitoring for clandestine nuclear tests. Similarly, technologies developed by the U.S. national laboratories and International agencies have been used effectively to implement remote monitoring and verify compliance to treaty requirements. Efforts for remote detection and characterization of clandestine activities have proven to be more difficult to achieve, as is the complex world of nuclear forensics as a method to deter the use of nuclear materials, or in the worst case scenario, to affix responsibility. However, breakthroughs in these technologies could dramatically change the dialogue for arms control treaties. New technologies can also be envisioned that will lead to an inherently safer and more prosperous future, such as the development of more secure and inherently-safe nuclear reactor concepts, such as the advancements promised by Small Modular Reactors⁶, mentioned in last quarter's column.
- In a negative future world, one might envision malevolent parties utilizing the technologies of the 21st

century to achieve their agendas, not the least of which would include the use of nuclear materials, or new paths for the acquisition of nuclear materials or the surreptitious manufacture of those materials⁷, as also mentioned in last quarter's column. The technologies of the 21st century might also lead to the use of cyber techniques to access restricted information or even disrupt physical operations of nuclear facilities. In fact, cyber intrusions for nefarious purposes have become a common headline in the media today, and has recently driven a new U.S. national security cyber strategy,⁸ as well as special Presidential attention, with multi-\$B increases in the U.S. Federal budget proposed for FY2017.⁹ In a nightmare scenario a small band of non-nation state actors might take control of a poorly-protected nuclear reactor resulting in a catastrophic event impacting a large population and shaking the confidence of the public, turning them further against "all things nuclear".¹⁰ This has led some to equate cyber activities to warfare, and even to draw an analogy to nuclear deterrence.¹¹

Global Nuclear Security Threats

- In a positive future world, the efforts of the current U.S. administration to rally world leaders through commitments made at the four Nuclear Security Summits leads to the enhanced protection of nuclear materials and facilities.¹² The completion and demonstration of the CTBTO seismic network and enhanced atmospheric monitoring technologies, as well as breakthroughs in nuclear forensics and related monitoring and

verification techniques provide world governments with the confidence they need to proceed with multi-lateral nuclear agreements and treaties. Combined with efforts by non-governmental organizations (NGOs), public interest in a "new world" is raised, and helps to drive policymakers to establish new goals to the elusive concept of "global zero," which for now, at least, seems farther away than ever.¹³

- In a negative future world, the geopolitical and religious conflicts that are shaking the world intensify, and a new Cold War emerges, this time with more nuclear players, as the "dominoes fall"¹⁴ and more nations join the "nuclear club."¹⁵ The once optimistic future that the end of the Cold War offered suffers setbacks as every Nuclear Weapons State pursues modernization efforts for their stockpiles and delivery systems¹⁶, and as once-tempered political rhetoric has been overtaken by frightening words of nuclear confrontations.¹⁷ The divisions of the major powers into ideologies that become more and more incompatible create a backdrop for uncontrolled conflicts that ultimately triggers a global conflict, with nations teetering on the brink of nuclear war. One can envision any one of several nuclear "tipping points" leading to a nuclear exchange, from the Middle East to East Asia. The spread of extremist terrorism events grow exponentially as the world is unable to address the indoctrination of new generations into those doctrines, and the global community is wracked with a "hundred-year" war.



The Advancement and Control of Nuclear Technology

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| <p>(-)</p> <ul style="list-style-type: none">• New technologies allow for fabrication of weapons components by non-state entities• Cyber intrusions proliferate including attacks on physical infrastructure• Classified information is routinely disclosed | <ul style="list-style-type: none">• New techniques emerge for treaty verification• CTBTO completes network and demonstrates effectiveness• National Technical Means emerge that can be used for “stand-off” analysis of surreptitious weapons tests• Nuclear forensics techniques are enhanced and widely publicized• New safe, secure nuclear power technologies are deployed and replace older installations | <p>(+)</p> |
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Global Nuclear Security Threats

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| <p>(-)</p> <ul style="list-style-type: none">• Nuclear materials are stolen• Nuclear states proliferate• Terrorists detonate a dirty bomb in a large Western city• Nuclear tensions rise amid modernization efforts• New generation of international terrorists expand world wide | <ul style="list-style-type: none">• Nuclear Security Summits lead to protection of nuclear materials• NGOs help with disseminating the success of the new technologies and sway public opinion• UN and other international efforts stem the rise of international terrorism• Economic stability reduces the impact of political divisiveness• Global Zero initiatives take hold as the NPT Section VI goals are actively worked | <p>(+)</p> |
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The selection of the proper set of critical uncertainties for each axis is very important to the development of robust scenarios that challenge the mindset of leadership, yet are not so outrageous that discussions are shut down because of the implausibility of the future worlds that are created. Often, the process becomes one of trial and error, where engaged participants walk through discussions of future worlds, and realize that the axes are not truly orthogonal, or that a previously unidentified critical uncertainty might lend itself to richer, more impactful discussions. This sometimes repetitive process is not wasted, for each attempt will routinely raise new perspectives, drive the need for additional research, and further strengthen the confidence of the leadership involved that they are developing a sense for handling any eventuality. It is not uncommon for major organizations to engage

science fiction writers to help with the development of stories of these future worlds, so that the imagination of the organization is captured in the strategic discussions.

Development of Scenario Axes

From the discussion above, we can create two potential axes that might lead to future worlds that challenge the mindset of the Institute’s membership. These are portrayed below, with end point descriptors.

In future columns I will explore the development of other critical uncertainty axes, and then use them to develop “future world stories” that will allow us to better understand the role the Institute can play in this very complicated world. As always, I would welcome thoughts and ideas that can help shape those future world stories.

Endnotes

- 1 See “Terrorism and Terraforming”, Aviation Week and Space Technology, January 4-17, 2016, pp. 46-48.
- 2 See “Nuclear Inspectors Have Snazzy New Tools to Catch Iran Cheating”, http://foreignpolicy.com/2016/02/04/nuclear-inspectors-have-snazzy-new-tools-to-catch-iran-cheating/?utm_source=Saithru&utm_medium=email&utm_campaign=New%20Campaign&utm_term=%2ASituation%20Report
- 3 See <http://thebulletin.org/it-still-three-minutes-midnight9107> and <http://thebulletin.org/sites/default/files/2016%20doomsday%20clock%20statement%20-%20final%5B5%5D.pdf> for the final report for this year.



- 4 See http://www.huffingtonpost.com/william-jperry/nuclear-catastrophe-risk_b_9019558.html and <http://www.wjperryproject.org/>
- 5 See <https://www.ctbto.org/>
- 6 See <http://www.energy.gov/ne/nuclear-reactor-technologies/small-modular-nuclear-reactors> for more information on the U.S. Department of Energy's programs to stimulate the development of these new energy sources.
- 7 See NNSA Report "Prevent, Counter and Respond – A Strategic Plan to Reduce Global Nuclear Threats", [https://nnsa.energy.gov/sites/default/files/NPCR%20Report_FINAL_\(with%20signatures\)_3-18-15.pdf](https://nnsa.energy.gov/sites/default/files/NPCR%20Report_FINAL_(with%20signatures)_3-18-15.pdf)
- 8 See https://www.whitehouse.gov/sites/whitehouse.gov/files/documents/2016_Federal_Cybersecurity_Research_and_Development_Strategic_Plan.pdf
- 9 See <https://www.whitehouse.gov/the-press-office/2016/02/09/fact-sheet-cybersecurity-national-action-plan><https://www.whitehouse.gov/the-press-office/2016/02/09/fact-sheet-cybersecurity-national-action-plan>
- 10 For an interesting perspective on where the "Cyber War" may be headed, see <http://thehill.com/policy/national-security/269594-us-said-to-have-had-detailed-cyberattack-plan-for-iran> and <http://www.nytimes.com/2016/02/17/world/middleeast/us-had-cyberattack-planned-if-iran-nuclear-negotiations-failed.html>
- 11 See "The flawed analogy between nuclear and cyber deterrence," <http://thebulletin.org/flawed-analogy-between-nuclear-and-cyber-deterrence9179>
- 12 See <https://www.whitehouse.gov/blog/2015/08/05/announcement-nuclear-security-summit-2016> for information on the fourth Nuclear Security Summit that will be held in Washington, D.C., March 31-April 1, 2016.
- 13 See "Today's Nuclear Dilemma" by Eric Schlosser, <http://thebulletin.org/2015/november/todays-nuclear-dilemma8839>
- 14 See "Taking the Long View: Sometimes Life Seems to be too Complicated," Journal of Nuclear Materials Management, Vol. 44 No.2, for a discussion of how an earlier scenario development created by the author utilized a term coined by Dr. Sig Hecker to describe a world in which more and more nuclear armed states emerge.
- 15 The term "Nuclear Club" is term often used in the media to refer to countries that are deemed to have a nuclear weapons capability – typically the five Nuclear Weapons States (the U.S., U.K, France, Russia and China), and Pakistan, India, Israel and North Korea (although the latter could be deemed not to have a "weaponized" or deliverable weapon at this time). See <http://www.usatoday.com/story/news/world/2016/01/06/nine-nations-possess-nuclear-weapons/78350588/> for a recent article in *USA Today* using that terminology in the aftermath of the announcement by the DPRK (North Korea) that it had tested a Hydrogen bomb. North Korea withdrew from the NPT on January 10, 2003, but at that time indicated "it had no intention of producing nuclear weapons."
- 16 See "Disarm and Modernize," <http://foreignpolicy.com/2015/03/24/disarm-and-modernize-nuclear-weapons-warheads/>
- 17 See "A New Arms Race Threatens to Bring the U.S. and Russia Back to the Nuclear Brink," http://www.huffingtonpost.com/joe-cirincione/arms-race-us-russia-nuclear_b_8557526.html, and "North Korea Threatens U.S. Nuclear Attack", <http://www.washingtontimes.com/news/2015/sep/15/l-todd-wood-north-korea-threatens-us-nuclear-attack/>