

# DEFINING AND IMPLEMENTING BEST PRACTICES IN NUCLEAR SECURITY

WILLIAM H. TOBEY



HARVARD Kennedy School

**BELFER CENTER** for Science and International Affairs

DECEMBER 2012

## **Discussion Paper #2012-13**

### **Belfer Center for Science and International Affairs**

John F. Kennedy School of Government

79 JFK Street

Cambridge, MA 02138

Fax: (617) 495-8963

Email: [belfer\\_center@harvard.edu](mailto:belfer_center@harvard.edu)

Website: <http://belfercenter.org>

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Cover image: Delay barriers at the U.S. National Nuclear Security Administration's Y-12 facility

Photo Credit: NNSA Production Office

This paper was commissioned by the Nuclear Threat Initiative (NTI) to inform discussions related to the Global Dialogue on Nuclear Security Priorities. The views expressed are solely those of the author and do not necessarily reflect those of participants in the Global Dialogue, NTI officers or staff, or the NTI Board of Directors or institutions with which they are associated.

# Defining and Implementing Best Practices in Nuclear Security

William Tobey

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**William Tobey** is a senior fellow at the Harvard Kennedy School's Belfer Center for Science and International Affairs. Prior to that, he was a deputy administrator of the National Nuclear Security Administration.

## Introduction

Like all jargon, the term *best practice* is overworked and underanalyzed. Best practices are derived from human experience and are distinct from standards, which tend to be logically formulated. The use of best practices evolved in part from peer review, which dates from the 17th-century work of London's Royal Society,<sup>1</sup> into a management consulting fad complete with more than 31 million Google hits. Narrowed to the field of nuclear security, this number falls to a mere 56,000.<sup>2</sup> Despite its mixed pedigree, the concept of best practices, together with guidelines and regulations, is an essential element of efforts to ensure that fissile material is not misused.

This paper analyzes the contribution that best practices can make to the field of nuclear security by doing the following:

- Defining what is meant by best practice
- Specifying a methodology for deriving it
- Understanding the resulting characteristics of the method
- Comparing its pros and cons to other methods contributing to security, such as guidelines and regulations

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<sup>1</sup> Roger Howsley, "International Nuclear Security Peer Review: An Essential Contribution to Effective Governance," (unpublished paper, Nuclear Threat Initiative, Washington, DC, 2012), 1.

<sup>2</sup> As of September 10, 2012.

## Defining Best Practice

The term *best practice* has application in many fields, and the literature surrounding it is well developed. Definitions of best practice abound, from the vague—a method generally accepted as successful<sup>3</sup>—to the painfully specific regarding particular fields of endeavor.<sup>4</sup> Some definitions include a moral or ethical dimension. This paper postulates that methodology matters and that an important characteristic of best practice is how it is derived. Best practice is different from a regulatory standard or a moral code. It is won in the school of hard knocks, not received from a lawgiver. Best practice is a method empirically proven to yield excellent results to accomplish a stated objective. Thus, deriving a best practice requires studying the work of others and selecting those techniques that are most successful.

Given the stakes involved in guarding fissile material, it may be tempting to think of best practice as the most rigorous or expensive approach, but that view misses the point. Best practices should identify methods that will provide the highest yield toward a stated goal for a given amount of money—or the cheapest way to provide a stated level of success. It is up to managers—under regulatory supervision—to make prudent and informed judgments about optimum spending levels. Of course, managers must make such judgments about minimum necessary levels of security in the context of the threat they face and the national and international regulations and standards under which they operate.<sup>5</sup>

## Specifying a Methodology of Best Practice

One distinguishing characteristic of best practice is the methodology used to derive it. In implementing strategies in pursuit of best practices, different organizations use diverse procedures. Nonetheless, in comparing even these diverse procedures, one must follow several

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<sup>3</sup> According to the Oxford online dictionary, best practices are “commercial or professional procedures that are accepted or prescribed as being correct or most effective.” See <http://oxforddictionaries.com/definition/english/best%2Bpractice>.

<sup>4</sup> Daniel L. Purich, *Enzyme Kinetics: Catalysis and Control, a Reference of Theory and Best Practice Methods* (London: Academic Press, 2010).

<sup>5</sup> *Making Security Efficient: A WINS International Best Practice Guide* (Vienna: World Institute for Nuclear Security, 2012), 3–5.

steps, regardless of the desired objective:

- State a goal.
- Survey known efforts in pursuit of that goal.
- Identify a method yielding exceptionally successful results in achieving that goal, as well as other universal criteria such as efficiency.
- Document specific means to success.
- Attempt to test the conclusions in an objective manner.<sup>6</sup>

For example, the premise of a golf school I once attended relied on videotaping and studying the swings of the most successful golfers in the world, identifying their common characteristics, and modifying the amateurs' swings to adopt those techniques. The results were very different from classic golf instruction, which relied on theory and aesthetics to construct an ideal swing. As different players moved up or down the earnings list, new model swings were taught. Success in tournament play was the sole criterion for selecting model swings. This method demonstrates instruction through best practice.

### **Characteristics of Best Practices**

The definition and methodology cited in the previous section imply several important characteristics of best practice. These characteristics yield both advantages and disadvantages; the former should be exploited to the utmost extent, and the latter require complementary measures such as standards and regulations.

#### ***Empirical***

Best practice is built on experience. The advantage of this characteristic is that it is practical, adaptable, and derived from actual operations. This practical application of experience explains the tremendous success of the Institute of Nuclear Power Operations, which has greatly enhanced both reactor safety and operating efficiency. The disadvantage of this trait is that

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<sup>6</sup>Shilpa Dani, Jenny A. Harding, Keith Case, R. I. M. Young, Sean Cochrane, James Gao, and David Baxter, "A Methodology for Best Practice Knowledge Management," *Journal of Engineering Manufacture* 220 (2006): 1719.



sometimes experience is insufficient to judge or prevent risk; imagination and analysis are also necessary. This is not to say that operators never think imaginatively or analytically about the problems they might confront, but rather that experience can be a limiting factor. In the most extreme example, experience was insufficient preparation to defeat the attacks of September 11, 2001.

### ***Inductive***

Related to best practice's empirical nature is an inductive method. Known efforts are surveyed and success is assessed while allowing for probabilistic judgments. This method does not entail the certainty of deductive logic. Thus, best practices are inferred through observation, not received as logical requirements of an ideal. Because a given technique has worked in many circumstances, it is probable, but not guaranteed, that the technique will work in other conditions. This characteristic should instill an element of humility among operators implementing best practices.

### ***Relative***

Pursuit of best practice enables judgments about which methods are superior to others in use, but it may not reveal which ones are good enough to meet the goal, especially if that goal is to protect against an intelligent, determined adversary. This approach is practical but can lead to vulnerabilities. It may be that none of the operators surveyed is following a technique that should be implemented; if so, that technique would not be included in the resulting best practices. For example, continuous chest compression cardiopulmonary resuscitation is now an accepted best practice, but it was widely adopted only four years ago. Best practice efforts can offer judgments on which current methods are most effective, but not on how those methods match up against an absolute level of security. The implementation of best practices may improve security, but not necessarily achieve it an absolute sense.

### ***Dynamic***

Because practices evolve over time, a best practice is defined by its temporal context. This

characteristic is especially useful when countering an evolving threat or using improved technologies. Best practice also relies on a sustained quest for excellence. If practices are continually evolving and an organization aspires to implement the best ones, the organization must constantly strive to improve. This characteristic stands in sharp contrast to inflexible, relatively unchanging regulations generally intended to compel compliance and provide a predictable operating environment. A leading industry expert in both nuclear safety and security observed, “No one ever wrote a book titled *Regulate Your Way to Excellence*.” Thus, although regulations are necessary to enforce a minimum standard of security and principles are necessary to envision an ideal outcome, best practices aspire to create an optimum method.

### ***Tacit***

Best practice captures tacit knowledge that is based on experience. Sometimes such knowledge is impossible or cumbersome to specify. Tacit knowledge stands in contrast to explicit knowledge, which manifests itself in guidelines or regulations. For example, a written driver’s license test examines explicit knowledge: Does the student understand road signs? The road test measures tacit knowledge: Can the student parallel park? Tacit knowledge and best practices are based on know-how, rather than “know what.”<sup>7</sup> Of course, it is possible to overstate the distinction. Written best practices guides are produced by the World Institute for Nuclear Security (WINS), and most standards assume some level of expertise. With best practices, the method is mostly to describe; with standards, the goal is primarily to prescribe.

### ***Distributed***

As is illustrated by the WINS compendium,<sup>8</sup> best practices form an interlocking network. Thus, best practice in risk management is one element of best practice in nuclear security. This point

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<sup>7</sup> Elizabeth A. Smith, “The Role of Tacit and Explicit Knowledge in the Workplace,” *Journal of Knowledge Management* 5, no. 4 (2001): 314.

<sup>8</sup> *Security the Future: A Compendium of Best Practices for Nuclear Security Management* (Vienna: World Institute for Nuclear Security, 2012). The compendium outlines 25 separate best practices necessary for good nuclear security and has since been expanded.

is particularly important to recognize, because responsibility for nuclear security is distributed far beyond a security manager's office. Various parts of a nuclear enterprise—leadership and management, personnel, operations, information technology, and guard forces—must work to achieve effective security and, therefore, be committed to implementing best practices.

### **Best Practices and Other Objectives in Nuclear Operations**

In implementing best nuclear security practices, operators must also strive to achieve other objectives. WINS explicitly recognizes that custodians of nuclear materials face an optimization problem. WINS's criteria for the development of best practice guides include the following:

- **Impact and effectiveness.** The practice has demonstrated impact, applicability, and benefits to the nuclear security program.
- **Efficiency.** The practice has demonstrated cost and resource efficiency where the expense is appropriate to the benefits.
- **Sustainability.** The practice has demonstrated sustainable benefits or is sustainable within nuclear and related organizations.
- **Collaboration and integration.** The practice builds effective partnerships among various organizations and integrates nuclear security with other functions such as nuclear safety, emergency planning, and design.<sup>9</sup>

### **Best Practices and Standards for Nuclear Security**

National laws and regulations establish specific security requirements for nuclear operators. Those laws and regulations are decidedly not best practices. They are mandatory and rigid, and, whether sufficient or not, they set standards, either by specifying actions to be taken or objectives to be met. If the former, the laws cannot evolve as best practices do. If the latter, the laws do not detail what method should be used to accomplish the objective. Best practices are also influenced by international obligations and standards, such as the Convention on

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<sup>9</sup> Roger Howsley, "Best Practices: How Are They Defined?" (paper, World Institute for Nuclear Security, Vienna, 2010).



Physical Protection of Nuclear Material (CPPNM), and International Atomic Energy Agency (IAEA) Information Circular 225, “Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities” (INFCIRC/225/Revision 5), as well as United Nations Security Council Resolution (UNSCR) 1540, which requires, among other things, that states establish “appropriate effective” security over nuclear material on their territory.

Neither UNSCR 1540 nor the CPPNM pretends to establish best practices. Rather, both establish minimum international standards that are binding on parties to the United Nations Charter (all states) or the CPPNM (145 states, 57 as amended). These standards in many ways carry the opposite characteristics of best practices. They serve important purposes by placing states under legal obligation to provide nuclear security. Those obligations are widely seen as legitimate because of the political processes behind them, but the negotiators did not conduct a detailed assessment of what would be the most effective way to formulate the obligations, and the requirements themselves may be vague.

INFCIRC/225 is one of the IAEA’s recommendations that, according to the IAEA, “present best practices that should be adopted by Member States in the application of the Nuclear Security Fundamentals [another IAEA publication].”<sup>10</sup> Is INFCIRC/225 really a guide to best practices?

The methodology used to create the fifth revision of INFCIRC/225 began with the previous version, to which a panel of experts suggested revisions. Government officials then reviewed the new draft by unanimous consensus. Although the experts and government representatives undoubtedly drew on their experiences in nuclear security, the result depended on earlier versions of the document, as modified by negotiation. This approach is far different from the methodology for establishing best practices outlined earlier. Expert opinion replaced a survey of practice and identification of keys to exceptional success. Moreover, the document is more about the “what” than the “how” of nuclear security. It is based more on explicit knowledge than on tacit knowledge. It is also far less detailed than would be necessary to implement effective methods. In short, INFCIRC/225 is *the best extant international guideline for nuclear*

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<sup>10</sup> See the preface of INFCIRC/225/Revision 5, *Nuclear Security Recommendations on Physical Protection of Nuclear Materials and Facilities* (Vienna: IAEA, 2011).

*security*; it is a valuable standard, but it is not a description of best practices.

## **Conclusions, Observations, and Recommendations**

***1. Best practices and international standards and obligations are complementary, serving different purposes, and both are necessary for an effective international nuclear security regime.***

International standards and obligations have inherently different characteristics than best practices. They are sufficiently broad to remain relevant over time without change. Standards apply to a wide range of countries with very different capabilities, threat levels, and nuclear assets. They are intended to identify basic features that must be implemented at the national level, rather than to describe them. Best practices can be the mortar that fills the chinks between the strong building blocks of national and international laws, regulations, and guidelines such as the CPPNM, UNSCR 1540, and INFCIRC/225.

***2. Those states and facilities with the greatest responsibilities should be most concerned with implementing best practices.***

Possession of fissile material—plutonium or highly enriched uranium—especially in quantities sufficient to make a nuclear weapon, imposes special responsibilities on its custodians. Although adherence to minimum standards may be sufficient for those with material that poses a minimal threat, those in possession of weapons-grade material must constantly strive to maintain and improve security against an evolving threat. *This effort requires the use of best practices.*

***3. In the safety realm, the sharing of best practices revolutionized operations.***

In the aftermaths of the Three Mile Island and Chernobyl disasters, the nuclear industry became adept at sharing best practices. Bad safety practice is inefficient; it leads to downtime in plant and equipment with high capital costs. The enormous strides in efficiency (which allow the U.S. nuclear industry to provide roughly the same percentage of American electricity as it

did before Three Mile Island, despite a much larger economy and no new nuclear plants) also reflect improved nuclear safety. The sharing of best practices accounts for much of the gains in efficiency and safety.

***4. Sharing and implementation of best practices is inherently more difficult in the security realm than in the field of nuclear safety.***

National governments often classify specific nuclear security details as secret. This secrecy challenges the development of effective peer review. Nevertheless, there is a lot that could be peer reviewed without compromising sensitive information. Initially, safety exchanges were also dogged by suspicions that the information was too sensitive and could not be shared among peers. Moreover, because safety and efficiency are closely linked (as plant operators seek to avoid downtime), there are financial incentives to improve safety in operations. Security incidents are rarer, so the link to avoiding idle plant and equipment is more tenuous and the financial incentives for improving security are less immediately compelling. Yet over the long term, unmet security deficiencies can fatally threaten an enterprise, as they may well in the case of the Y-12 National Security Complex management contract.

Measuring the performance of security best practices is also more difficult than measuring safety improvements. Downtime is not an available marker. Expert judgments can be misleading; the Y-12 facility was once thought to be best in class in performing force-on-force exercises. Constructing realistic and accurate tests of best practices is also difficult, and probably an area for more work by WINS and others.

***5. Governments and industry must foster efforts to share best practices in nuclear security if barriers are to be overcome.***

Nascent efforts to improve the sharing of best practices or to provide advisory services on the basis of international guidelines, through WINS and the IAEA's International Physical Protection Advisory Service, are important and necessary, but they cannot succeed without widespread political, financial, and persuasive support from national governments. Only governments can

make clear that the sharing of best practices complements—and does not contradict—regulatory efforts. Industry then must take up the burden of supporting the development and implementation of best practices in nuclear security.

***6. Best practice development and implementation can be more rigorous.***

As noted above, the sharing of information and peer review are more difficult in the context of nuclear security, which must be cognizant of the lines related to sensitive and classified information. Nonetheless, security dialogues and exchanges of best practices need not venture into these territories to be useful. These difficulties have impeded efforts to survey best practices and to test conclusions about those practices that provide excellent results. Although it is unlikely that either WINS or the IAEA can transcend such barriers, they can work incrementally to improve both functions. Governments, of course, are well placed to facilitate this effort. Moreover, developers of best practices can place more emphasis on testing the results of the recommended practice to ensure that it attains a necessary level of absolute performance.



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Harvard Kennedy School

79 JFK Street

Cambridge, MA 02138

Fax: (617) 495-8963

Email: [belfer\\_center@harvard.edu](mailto:belfer_center@harvard.edu)

Website: <http://belfercenter.org>

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