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A CASE STUDY OF A RADIATION DETECTION EQUIPMENT PROGRAM: DO THE ADVOCACY COALITION FRAMEWORK AND THE ISSUE ATTENTION CYCLE INFORM CONGRESSIONAL BUDGET DECISIONS?

A DISSERTATION

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By

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A DISSERTATION APPROVED FOR THE
GRADUATE COLLEGE

BY

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DEDICATION

To Grandma June

ACKNOWLEDGEMENTS

As I worked my way through the Ph.D. process, I heard people say that I would eventually feel isolated. Sure, there were times when I really needed to come to my own conclusions, stay up late into the night, or shake my head at the mess I'd created. Yet, I was fortunate enough to recognize I was never alone at all, and that if I couldn't finish this process with all of the help I had, shame on me!

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ACRONYMS

ASP	Advanced Spectroscopic Portal
ACF	Advocacy Coalition Framework
CTR	Comprehensive Threat Reduction
CBP	Customs and Border Protection
CONUS	Continental United States of America
DNDO	Domestic Nuclear Detection Office
DOD	Department of Defense
DOE	Department of Energy
DHS	Department of Homeland Security
FSU	Former States of the Soviet Union
FY	Fiscal Year
GNDA	Global Nuclear Detection Architecture
GAO	Government Accountability Office
HEU	Highly-Enriched Uranium
HUMINT	Human Intelligence
IAC	Issue Attention Cycle
NGO	Non Governmental Organization
NNSA	National Nuclear Security Administration
POE	Point of Entry
PRD	Personal Radiation Detection
SNM	Special Nuclear Material
S&T	Science and Technology
DOS	U.S. Department of State
U.S.	United States
USG	United States Government
WMD	Weapons of Mass Destruction
WUNM	Weapons Usable Nuclear Material
9/11	Terrorist Events of September 11, 2001

ABSTRACT

The influence of policy knowledge and public interest upon the policy making process is described in this dissertation. The manner in which major policy change takes place, particularly as legislators gain technical understanding of an issue, is exhibited through this case study of a national security program. Specifically, this work concludes that steady increases in funding for the nuclear materials detection program were reversed as public interest waned and as legislators learned more about the limited efficacy of the program. These findings are consistent with hypotheses derived from the application of the Advocacy Coalition Framework (ACF) and the Issue Attention Cycle (IAC).

The ACF provides a basis for integrating factors external to the bureaucratic subsystem into analysis of policymaking processes. The research indicates that legislators applied the knowledge they gained through congressional hearings to a significant budget-related decision. At the same time, consistent with IAC, this work concludes that the timing of this major budget decision occurred alongside a significant decline in public attention. Combining the two theoretical frameworks, this dissertation offers a conclusion regarding how both policy-oriented learning and public issue attention influence policy change.

This case study is distinct because of the issue's complexity and the broad public interest and bipartisan support it received. These circumstances led to a context that allowed me to consider what makes learning possible as legislators must constantly absorb tremendous quantities of information on a variety of topics. The characteristics of this case also provided me with the opportunity to develop an analytical schema to process complete data sets representing both related newspaper coverage and congressional hearings in an objective manner.

This project is an integrative model that shows linkages, indicating that the convergence of public issue attention and legislator policy knowledge factors is significant enough to account for the major radiation detection equipment policy change that took place in 2008 and 2009. Data reveal that radiation detection program budget decreases did occur in conjunction with a gradual decline in public attention and enhanced Congressional policy-oriented learning, and that broad initial coalition support for robust nuclear detection equipment funding eventually shifted to support other approaches to deterring nuclear terrorism. This finding should encourage additional research using the ACF and IAC to explain both sources of policy change and policy-oriented learning.

Keywords: policy knowledge, policy-oriented learning, Issue Attention Cycle, Advocacy Coalition Framework, subsystems, coalitions, stages heuristic, policy core beliefs, secondary policy beliefs.

PROLOGUE

"In the optimistic American tradition, [such] a technological solution is initially assumed to be possible in the case of nearly every problem." Anthony Downs, The Issue Attention Cycle

**

"What instrument would you use to detect an atomic bomb hidden somewhere in a city?" Oppenheimer quipped, "A screwdriver (to open each and every crate or suitcase)." (1946 Senate testimony/Kai Bird and Martin J. Sherwin)

Anthony Downs (1972) defines phases of public interest in issues of national importance with the Issue Attention Cycle (IAC). In his introductory work, Downs applies the IAC to the emerging environmental movement. In subsequent work, Petersen (2009) endorses the IAC's application to other issues of national interest such as the terrorist attacks of September 11, 2001 (9/11). Sudden and intense public interest, coupled with calls for action define these issues. As constituents assess the magnitude of complex issues and press for solutions, the government typically reacts first by bolstering existing technical capabilities and then by allocating resources for new alternatives. Policy actions intended to address new and pressing problems typically result in increased resource investments.

In matters of defense and national security, the perception that bureaucrats are not good stewards of research and development funds persists. A cynical American people and brash media often claim that the government is complicit with the waste that results when ostensible solutions do not develop quickly and effectively. This case study addresses public perceptions and Congressional knowledge through observations of public attention to major issues and through analysis of Congressional decision-making. In particular, this research identifies the

manner in which public attention to an issue, alongside increases in Congressional knowledge, may influence the timing of policy change. This research accomplishes this objective through analysis of public and Congressional responses to the threat of domestic nuclear terrorism in the wake of 9/11. By analyzing the events associated with establishment of a Global Nuclear Detection Architecture (GNDA), data regarding public trends in interest and Congressional learning inform conclusions about the manner in which policy change occurs in this case, and develops a context for determining whether the skepticism many Americans feel regarding Congressional decisions is properly placed.

The initial unqualified support for the GNDA devolved as the challenges associated with the tasks of countering the nuclear threat—in terms of complexity and cost—became evident. The objective of the GNDA is to maximize the effectiveness of radiation detection equipment installations, intelligence information, and law enforcement capabilities through one strategic approach against nuclear terrorism. Unfortunately, GNDA initiatives led by the Department of Homeland Security's (DHS) Domestic Nuclear Detection Office (DNDO) did not succeed in coalescing the many independent capabilities associated with pre-existing assets and emergent assets. Years after initial robust political support and significant resource investment, the current detection equipment architecture bears little resemblance to its foundational expectations.

This study observes that hundreds of millions of dollars in resources allocated to the DNDO from 2003-2013 coincide with broad news coverage and increasing Congressional activity. The significant funding DHS received for the

GNDA came with substantial oversight—subsystem members associated with the mission provided testimony before homeland security committees from 2003-2013 on nearly 70 occasions. GAO expertise, alongside subject matter expert testimony, enhanced legislator policy knowledge. Meanwhile, the public reacted to the threat in a manner that clearly demonstrates the phases of the IAC. This study indicates that, at the time of increased legislator policy knowledge and decreased public issue attention, funding for DNDO's radiation detection equipment programs declined.

Ultimately, this study contributes to an understanding of what provokes the timing of smart and swift policy change. The research should provide improvement to the government's timing of cost-saving measures, ensuring that policy changes are informed by enhanced technical policy knowledge and in line with public interest. The outcome of this study is a conclusion that indicates some cynicism is unfounded. In this case, Congress did appreciate the value of enhanced technical information and policy knowledge and will implement policy change in conjunction with the public's desire for it. Together, the public and Congress should acknowledge that investments in both technical and non-technical solutions might result in initial failure. Responsiveness to technical information and an enhanced appreciation for issue complexity should lend naturally to Congressional decision making processes. In this case, as public attention to the nuclear threat waned and it became clear that radiation detection equipment would not meet initial performance expectations. Congress refined its guidance to DNDO by clarifying its oversight purview and providing specific instructions for strategic planning.

A case study of nuclear detection programs is largely unencumbered by divisive politics and not easily rendered to the ideological disputes that would certainly impact many polarized issue areas such as health care or climate change. Nuclear security presents a useful context for policy change research because Americans generally agree that something should be done to prevent nuclear terrorism. This case is interesting because of its technical nature, i.e. that the solution to the policy problem is a technical solution, such as more or better equipment (Kim, Y. personal communication, May 11, 2015). The case of U.S. deployment of radiation detection equipment is also an appropriate choice for the Advocacy Coalition Framework (ACF) because DHS and DNDO originated after the large-scale exogenous shock; this shock evoked public interest, setting forth an opportunity to determine whether considering and charting public attention throughout the phases of the IAC is efficacious. Finally, this case provides an opportunity to observe how a government initiative, initially unencumbered resource constraints and bolstered with bipartisan support, confronted strategic challenges.

Reasons

I began my career in government in 2001 at the Department of Energy's National Nuclear Security Administration (DOE, NNSA). At DOE, I worked as a project manager for export control, and later, radiation detection equipment programs. In 2005, I transferred to DHS, and joined DNDO as a nuclear policy specialist. During my career in these areas, I experienced the great excitement that emerged when post-9/11 initiatives were unveiled, and also the disappointment

when practical technical matters undermined political and public support for our efforts. I also observed the intense scrutiny and unmitigated pressure personnel in these offices endured as we worked tirelessly to develop and deploy the strategic vision for our national nuclear detection architecture. The pressure to perform equipment tests with threat materials, identify installation locations that would have the most likely chance to interdict threat material, the need to rapidly train inspectors and integrate the whole of government users felt like a race against the clock. The significant budget decrement in 2010 undermined morale, but also invigorated the efforts to get things right.

My perspective allows for both insider and outsider observations. Although I left the federal service in 2009, I maintained an interest in radiation detection equipment programs and gained perspective on the many dynamics that contribute to the nation's overall approach to national nuclear security. A case study of this particular policy change was therefore fitting for me.

CHAPTER ONE

Introduction

Statement of Purpose

The purpose of this dissertation is to utilize the Advocacy Coalition Framework (ACF) in conjunction with the Issue Attention Cycle (IAC) to make observations about how accumulation of policy knowledge and the cycle of public issue attention relate to policy change. The hypothesis for this study captures the influence of these factors upon the budget for the Domestic Nuclear Detection Office (DNDO). The research hypothesis incorporates budget as a dependent variable affected by the issue attention and policy knowledge factors: Radiation detection program budget decreases occur in conjunction with a gradual decline in public attention and enhanced Congressional policy-oriented learning.

Americans consistently report that reduction of the federal budget deficit should be a top issue for the President (Gallup: Politics, 2012; Gallup: Politics, 2016). Terrorism and national security are the other issues that are consistently of concern to Americans (Gallup: Politics, 2012) (Gallup: Politics, 2016). Despite these issues of tremendous importance, the government is ultimately constrained by the limited resources available after distribution of mandatory funding requirements. Herein lies the conundrum—what is the best approach for balancing the expectation of fiscal restraint against the allure of finding solutions to the world's most perplexing challenges? And, in the case of the nuclear threat, how does the public's desire to retain civil liberty balance against the government's need to screen people and cargo for nuclear material? In order to consider these questions, it is helpful for

the scholar to consider first how Congress changes the policy core attributes of government programs. If research reveals an inverse relationship between accrual of policy knowledge and decline of public interest, civil servants, subject matter experts and auditors may place greater emphasis on delivery of refined policy knowledge, particularly at times when constituent interest is most favorable to policy change due to waning issue attention. There are infamous examples of government excess, but the occasions in which Congress chooses to make budget reductions are often unheralded, and sometimes even greeted with backlash. Despite the public's insistence that deficit reduction is a top priority, its response to cutbacks is often unenthusiastic or hypercritical, making the timing of budget reductions an important consideration of policy change for legislators.[1]

Topic

This dissertation used an analysis of domestic radiation detection equipment program activities from 2003-2013 to make observations of policy change. The primary subjects of this project were the DHS's DNDO, legislators of the House and Senate Homeland Security Committees, and subsystem members who formed coalitions that participated in hearings before those committees from 2003-2013. Data drawn from this content was utilized to make observations about Congressional accrual of policy knowledge and the timing of policy change decision. The study also includes data drawn from three major newspapers, Google Trends, Gallup, and the Lexis-Nexis database. Data drawn from these sources

[1] (Montgomery & Goldstein, Democrats Assail Obama's Hit List, 2009) (Montgomery, 'Fiscal Cliff' Already Hurting Economy, Report Says, 2012).

informs observations about public attention to the issue during the same 2003-2013 timeframe.

DNDO enjoyed robust funding and bipartisan support when it was established in 2005. Just three years later, in 2008, legislators received discouraging reports regarding equipment capabilities. By 2009, newly-elected U.S. President Barack Obama presented his Fiscal Year (FY) 2010 budget, which included a proposal for a twenty-percent reduction of the DNDO's budget. An initial impression of this decision indicates a political decision—President Obama was not poised to support the program of his predecessor. This conclusion, however, undermines the influence of other factors on the policy making process prior to his election and the manner in which Congressional learning encouraged this dramatic change. The nuclear threat from al-Qaeda was no less significant in 2008 than it was previously, but two major changes were in play. First, the public's attention to the nuclear threat issue was in decline. Second, legislators experienced significant accrual of policy and technical knowledge related to radiation detection equipment performance by 2008-2009. Perhaps these factors contributed to bipartisan support of President Obama's aggressive policy revision and budget package.

Using these circumstances to build a case study, this project considers how the decision to reduce the FY 2010 budget by decelerating procurements of next-generation radiation detection equipment might be explained by an ACF policy change hypothesis, and particularly how ongoing accumulation of technical information and policy knowledge, along with a decline in public attention, may serve as an impetus for policy change. The methodology incorporates content

analysis to determine how policy knowledge accumulates in Congressional hearings, and analyzes the data alongside frequency counts of newspaper headlines to measure public issue attention from 2003-2013. A variety of graphical analyses provide insight into the behavior of the two independent variables (legislator policy knowledge and public issue attention) over time. When these longitudinal data are charted alongside the dependent variable, annual DNDO budget allocations, a relationship is inferred. Graphs of policy knowledge and public issue attention factors against annual budgets indicate a decline in public issue attention and a significant increase in policy knowledge activity in 2008. This inverse relationship may be a contributing factor to the timing of the 2008 DNDO budget decision, which became a prominent DNDO policy change during the decade of this study. Qualitative analysis highlighted the value of some regression analysis to determine if quantitative approaches might enhance understanding of relationships among the variables.

A variety of theoretical frameworks are available to enhance understanding of the policymaking process and, in particular, policy change as it may relate to policy knowledge and public issue attention. Throughout the 1970's and 1980's, the stages approach to the policy making process provided an unambiguous and over-simplified approach for aligning policy events to policy change effects. A predominant criticism of the stages approach is that it is limited because it fails to include the impact exogenous events and other factors outside of the bureaucracy have upon policymaker decisions. These inadequacies, among others, provoked

dissatisfaction among scholars who incorporated their criticisms into competing theoretical frameworks.

The ACF, when used in a case study, can inform understanding of policy outputs and policy change holistically by incorporating the effects of policy-oriented learning and the behavior of advocacy coalitions over time while accounting for other factors, such as changes in public issue attention. Although current ACF literature includes hundreds of case studies, few of these incorporate public issue attention. The ACF considers public opinion to be an exogenous factor that influences the policy subsystem. The subsystem associated with this case includes a range of political and technical coalitions representing a variety of departments. The U.S. Departments of Energy, State, Commerce, Defense and Homeland Security each participate in these partnerships and also coordinate the provision of technical tools and training for the purpose of interdicting nuclear material and weapons. Intelligence collection, diplomatic negotiations, and international regimes are also among approaches the U.S. and its foreign partners employ to promote nuclear security. Many of these programs pre-date the fall of the Soviet Union, and some were in place at the dawn of the U.S. nuclear age. Over the years, the changing global nuclear security environment, improvements in cooperation, and shared knowledge shaped the whole-of-government approach that is in place today. Additionally, the public's attention to nuclear security matters plays an important role in shaping the manner in which the programs provide national nuclear security activities.

The IAC is introduced as a tool for observing phases of public attention to a topic. The IAC is complementary to the ACF in terms of providing guidelines for applying public attention as an exogenous factor in an ACF policy change hypothesis. As a pair, the IAC and ACF are suitable for exploring whether fluctuations in public attention, coupled with ongoing Congressional policy-oriented learning, may generate policy change. This project is an integrative model that shows linkages: Were the convergence of issue attention and policy knowledge factors significant enough to create radiation detection equipment policy change? Ultimately, this study leverages the ACF and IAC data together to present conclusions about the role scientific information may play in nuclear policy change by charting the accrual of policy knowledge among legislators and the frequency of public issue attention along the course of budgetary decisions. Media inundated the public with detailed and disquieting information about Al Qaeda's nuclear ambitions in the aftermath of the 9/11 attacks. *The New York Times* published more than 14,000 stories about Al-Qaeda from 2003-2012; of these, more than 1,000 included mention of the organization's nuclear pursuits. Meanwhile, legislators sought options for defending against the countless schemes, plots and worst-case scenarios presented to them by their constituents and analysts.

Birkland (2004) described how legislators initially and eventually began to process information related to terrorism:

> Notwithstanding all the "change" rhetoric in the immediate aftermath of the attacks, it is difficult to find much evidence of instrumental learning (that is, learning about superior policy instruments) in Congress in the year after September 11. Rather, existing organized interests were accommodated, and preexisting calls for more stringent policies relating to aviation security, intelligence gathering and sharing, and immigration control were voiced,

> with rather greater force in the aftermath of the event but without any evidence of new ideas emerging that directly stemmed from the attacks. This is entirely consistent with Kingdon's notion of ideas bubbling up and being recycled through the "primordial soup" of policy ideas. There is, however, reason to believe that social or political learning has followed the attacks—that the attacks educated all of us about the nature of the terrorism problem, and made us better advocates for new solutions. But the volume and urgency of post-September 11 law-making were a more a function of the fact of the event itself than of any evidence that the event led to lessons about policy instruments. Political actors are reacting to the event using the same political and policy templates they use for similar events, such as military attacks on America, relief after natural disasters, and so on. The need for rapid reaction makes learning, in any systematic or ad hoc way, difficult to find. (Birkland, "The World Changed Today": Agenda-Setting and Policy Change in the Wake of the September 11 Terrorist Attacks, 2004, pp. 189-90).

The availability of tools such as the IAC for observing public issue attention and theories such as the ACF for charting policy change, along with this observation from Birkland, (2004) prompted the research hypothesis for this project. The meticulous data collection and coding technique developed for this study intends to address the challenge of observing learning, and the hypothesis contends that systematic learning did take place and did influence policy change decisions in the case of the domestic radiation detection equipment program.

Hypothesis

The IAC provides a tool for charting public issue attention, which is used in lieu of the public opinion factor described in the ACF hypothesis that follows. The project utilizes this hypothesis to include a focus upon the "Realizing the Cost of Significant Progress" phase of the IAC (Downs, 1972). Hypothesis Five is one of several policy change hypotheses included in the ACF, and indicates that, in addition to bureaucratic processes, exogenous factors such as changes in public opinion, must be present to instigate policy core change:

> **Hypothesis 5/Policy Change Hypothesis 2 (revised):** Significant perturbations external to the subsystem (e.g., changes in socioeconomic conditions, public opinion, system-wide governing coalitions, or policy outputs from other subsystems) *are a necessary, but not sufficient*, cause of change in the policy core attributes of a governmental program. (Sabatier & Jenkins-Smith, The Advocacy Coalition Framework, 1999).

By utilizing the IAC to form the following adapted hypothesis, longitudinal data related to public issue attention is organized into manageable phases that become essential to determining how legislators accumulate policy knowledge. This methodology also provided data for developing observations to determine if declining public issue attention and increased policy knowledge together relate to the policy change. With this foundation, the following hypothesis emerges:

> Radiation detection program budget decreases occur in conjunction with a gradual decline in public attention and Congressional policy-oriented learning.

Through utilization of the ACF and IAC, the study is designed to address several research questions related to the accumulation of policy knowledge and trends in public issue attention. The following research questions and tasks facilitate the collection of data needed to determine how these factors influenced policy change, and are formulated with the objective of narrowing a decade's worth of qualitative content into data representing a number of behaviors and influences.

Research Questions

1. Is there a relationship between Congressional policy knowledge, public interest and budget decisions?
2. Do the timing of increased Congressional policy knowledge and declining public interest coincide with decreased budget allocations?

3. Do other phenomena anticipated by the IAC and ACF emerge from these variables?
4. Can the IAC be validated as a tool for measuring public issue attention in this case?

Some sub-questions and tasks necessary for informing main research questions:

- In what years did budget decreases occur?
- When are Government Accountability Office (GAO) audits released?
- What comments regarding audits are made during testimonies? (Positive, negative, neutral?)
- Chart elite media coverage of radiation detection equipment as evidenced by stories in three major newspapers.

Summary Observations

First, in this case, Congress does reveal increased policy knowledge over time. Correspondent to this learning, major budget decisions are made. Second, Congressional activities coincide with public interest in this national security topic, as the hypothesis anticipates. Also in this case, congressional policy change occurs in conjunction with an increase in legislator policy knowledge and a decrease in public issue attention. However, this relationship cannot be isolated as causal. In addition, data portray the influence of coalitions, as described by the ACF, and also reflect the cycle of public attention as predicted by IAC independently of the research hypothesis. Therefore, in addition to the rejection of the null hypothesis, this research indicates exogenous factors such as public issue attention and internal factors such as policy knowledge influence policy change in this case study. The

analysis of data collected in the case study independent of hypothesis-related analysis provides additional evidence confirming the utility of ACF and IAC when considering policy-making factors. Finally, the IAC does generally reflect public issue attention as described by other trending tools.

CHAPTER TWO

Theoretical Frameworks and Literature Reviews

This chapter describes the Issue Attention Cycle (IAC) and provides further evidence regarding its appropriateness for application to this case study in conjunction with the Advocacy Coalition Framework (ACF). After a brief description of the project and the manner in which the IAC and ACF are utilized for this project, a brief history of the IAC is followed by a literature review that describes the current state of pertinent scholarly work. Next, is an account of the manner in which the ACF emerged as a popular heuristic for political scientists to describe the nature of the policy subsystem, and a literature review as it relates particularly to both policy change hypotheses and legislative content analysis.

A case study worthy of contribution to current ACF literature is most robust if it can be conducted by incorporating the variety of the factors presented in the framework. Longitudinal persistence over a decade or more, the emergence of coalitions from the subsystem, and the presence of an exogenous shock are just some of the conditions that make a policy event suitable for consideration within the ACF. The activities involved in radiation detection equipment procurements and deployments lend naturally to the ACF. Additionally, Sabatier and Jenkins-Smith assert that the ACF is quite suitable for application in technical cases. Incorporation of the concept of public attention to an issue as presented by the Downs IAC allows the ACF to benefit from further study and theoretical discourse. The IAC provides a tool for researchers to consider issue attention as an exogenous factor contributing to policy change. This study responds to Mintrom and Vergari's (1996) criticism of

the ACF, which suggests that it falls short of explaining when policy change will take place. This case study traces a policy change in which budget cuts occurred as public attention waned and Congressional knowledge increased. The study's observations imply that Congress is responsive to technical information and will refine their policy beliefs into decisions.

This dissertation utilizes details of the U.S.'s substantial post-9/11 radiation detection equipment investments targeted at deterring an act of domestic nuclear terrorism to form a case study. The ensuing project charts the accumulation of policy knowledge and trends in public issue attention to determine if these factors influenced budget allocations. These analytical products will contribute to testing this dissertation's hypothesis.

The Issue Attention Cycle

This section will describe the phases of the IAC and explain the manner in which the IAC is suitable for making observations regarding public issue attention in this particular case. In Anthony Downs' (1972) article, "Up and down with ecology—the Issue-Attention Cycle" he notes the American public attention rarely focuses upon a single domestic issue for longer than a brief moment. He observes public attention as a cycle. "Each of these problems suddenly leaps into prominence, remains there for a short time, and then—though still largely unresolved—gradually fades from the center of public attention" (Downs, 1972). The phases of the IAC may then be utilized to explain longitudinal changes in public issue attention. The IAC consists of the following five stages:

1. ***The Pre-Problem Stage****:* This stage "prevails when some highly undesirable social condition exists but has not yet captured much public attention."
2. ***Alarmed Discovery and Euphoric Enthusiasm****: "*As a result of some dramatic series of events or for other reasons, the public suddenly becomes both aware of and alarmed about the evils of a particular problem."
3. ***Realizing the cost of significant progress****:* This stage involves the gradual spreading of the realization that the cost of "solving" the problem is very high.
4. ***Gradual Decline of Intense Public Interest****:* The previous stage becomes imperceptibly transformed into a gradual decline in the intensity of public interest in the problem.
5. ***The Post-Problem Stage****:* The issue moves into prolonged limbo—a twilight realm of lesser attention or spasmodic recurrences of interest (Downs, 1972).

The qualitative historical data collected from hearings and from news items reveal the manner in which this issue transpired before the public, and how various events indicate these particular phases of the IAC.

There are three characteristics Downs observes among the problems that typically fall into this cycle. "First, the majority of persons in society are not suffering from the problem as nearly as much as some minority (a numerical minority, not necessarily an ethnic one). The likelihood that any particular American will directly be the victim of a terrorist attack is very small. "Looking at terrorism over the last 40 years — a period that includes not only the 9/11 attacks but also the 1995 bombing in Oklahoma City — an American's chance of perishing

at the hands of a terrorist in the United States are one in four million per year. For the period since 2001, the chances are one in 110 million. By contrast, the yearly chances an American will die from an automobile accident are one in 8,200, from a homicide one in 22,000, and from drowning in a bathtub one in 950,000" (Mueller & Stewart, Immense Fear over a Limited Threat to Americans, 2015).

Second, sufferings caused by the problem are generated by social arrangements that provide significant benefits to a majority or powerful minority of the population. Targeted cities such as New York City and Los Angles are massive metropolitan areas but are only a small part of the total U.S. population. Al-Qaeda's threats were generally directed at large metropolitan areas. Protecting these cities is extremely important and also symbolic, but they alone do not represent the entire needs of a secure United States. Powerful and vocal representatives of major metropolitan areas seek to secure resources and support for protecting these areas, but ultimately, the terrorist threat to these places may create a national economic problem, but the threat to the majority of Americans is small. Nonetheless, in the case of the nuclear threat, Americans maintained interest in the government's efforts to implement radiation detection equipment programs through 2008 despite a lack of specific information regarding targets or plots in progress. "Intelligence estimates in 2002 held that there were as many as 5,000 al Qaeda terrorists and supporters in the United States. However, a secret FBI report in 2005 wistfully noted that although the bureau had managed to arrest a few bad guys here and there after more than three years of intense and well-funded hunting, it had been unable to identify a single true al Qaeda sleeper cell anywhere in the country" (Mueller, Is

There Still a Terrorist Threat?: The Myth of the Omnipresent Enemy, 2006). Interest groups and legislators representing cities with substantial transportation and commerce infrastructure aggressively pursued national security resources. The media provided opportunities for each of these groups to share their concerns with the public through mainstream venues in prime airtime.

Third, IAC problems do not have, or no longer have, intrinsically exciting qualities. While the events of 9/11 were shocking and horrifying, public interest waned and reporting slowed after several months. A flurry of dramatic reports speculated about the nature of Al Qaeda's nuclear capability. Recommendations for public safety, awareness, and even descriptions of the symptoms a victim of a nuclear or radiological attack would face were described in detail. Then, just as quickly as it escalated, positive reporting of radiation detection equipment programs declined. The initial anticipation of DNDO and support for heavy research and development investments declined as a full appreciation for the complexity of the problem led to less favorable reporting. Stories describing test beds and promising technology were replaced by reports of cost overruns and poor performance trials.

The first two phases of the IAC occurred from 1992-2006. These events are described in the following section and provide a background of the case. Later, the Analysis Chapter delves into particulars of the IAC as they relate to policy change during the 2008-2009 timeframe. The following overview of the origination of the Domestic Nuclear Detection Office (DNDO) begins in the Pre-Problem Stage of the IAC in 1992 through the Alarmed Discovery and Euphoric Enthusiasm Stage that ended in 2006.

The Pre-Problem Stage: Approximately 1992-August 2001. This stage "prevails when some highly undesirable social condition exists but has not yet captured much public attention" (Downs, 1972).

The Pre-Problem Stage of the nuclear threat issue occurred after the fall of the Soviet Union. Security experts were abundantly concerned about the implications of post-Soviet military sprawl. Russia's initial lack of centralized control over nuclear material protection, control, and accountability presented a great concern. In a 1996 Pew Research Center survey, 72% of Americans acknowledged a chance that terrorists could use a weapon of mass destruction to attack the U.S. But even the bombing of the federal building in Oklahoma City a year prior did not significantly elevate a belief any terrorist attack was likely:

- Only 13% worry a great deal about a WMD attack and 27% are somewhat worried. 59% profess to be not worried about such dangers.
- Two out of three (66%) Americans said they are not much or not at all worried about terrorism in public places.
- 49% believe the greatest terrorist threat to the country comes from inside the country, while 39% see it originating outside (Pew Research Center, 1996).

After the collapse of the U.S.S.R., the U.S. developed strategic objectives and policies intended to improve global nuclear security. In collaboration with their Russian counterparts, the U.S. and its nuclear scientific community established programs designed to mutually improve nuclear materials protection, control and accountability. One such cooperative program began in the mid-1990s, when the Defense and State Departments (DOD, DOS) provided fixed and handheld radiation detection equipment to international partners. By 1994, the Energy Department joined Defense and State to increase the breadth of such nonproliferation efforts,

which became a hallmark of post-Cold War cooperation with the states of the Former Soviet Union (FSU). All of these efforts were considered imperative, as the detonation of a single nuclear weapon could bring catastrophic devastation.

U.S. Senators Richard Lugar (R-IN) and Sam Nunn (D-GA) served as legislative champions and nonproliferation advocates for these programs in Washington. These men were the early architects of many of the USG's initial efforts to integrate the DOD's Cooperative Threat Reduction (CTR) initiatives with outreach efforts to the FSU. Nunn-Lugar legislation encouraged a comprehensive approach to counter nuclear threats emanating from the FSU. In addition to the weapons of mass destruction (WMD) capabilities based at outposts in Russia, Kazakhstan and Ukraine also retained sizeable nuclear arsenals for several years after the dissolution of the U.S.S.R. The CTR programs offered multi-point activity, intending to address the entirety of the post-Soviet nuclear complex, ranging from its submarine fleet to its research reactors. CTR helped define and encourage export control processes, and other initiatives such as tailored physical and material security improvements, repurposing of equipment, and a shift of defense personnel to non-defense applications were a part of its comprehensive international mandate.

In addition to these efforts, programs were also directed at the intercept of suspect radioactive cargoes, including warheads or caches of Special Nuclear Material (SNM). Worldwide, the U.S. also provided material storage facilities with physical security reinforcements such as fences, locks and surveillance systems. Such upgrades were intended to discourage the movement of weapons or material,

and also promote a culture of accountability among professional staff. If material successfully moved beyond the facility, radiation detection systems are placed at key transit points to assist border security personnel with searches and seizures. As a result of the Nunn-Lugar CTR legislation, the U.S. provided personal radiation detectors, radioisotope identifiers, man-portable detection equipment, and radiation portal monitors. American companies produced many of the systems, but domestic installations were never pursued, and the U.S. focused only on international deployments. DOS partnered with more than 20 countries to install systems at nuclear storage sites and key border crossings along potential nuclear smuggling routes originating out of the FSU. The collapse of the U.S.S.R. created instability and greater opportunities for non-state actor access to nuclear materials, technology and knowledgeable personnel. In 1992, two employees of the State Research Institute, Scientific Production Association ("Luch") in Russia smuggled small quantities of Highly-Enriched Uranium (HEU) over a 5-month period. A chemical engineer associate, who was a long-time employee at Luch, ultimately collected 1.5kg of material. The engineer had no buyer, but kept the material at his apartment. When police suspected him of stealing equipment from Luch, they arrested him and discovered the material. The first successful interdiction of weapons-usable nuclear material was reported later in 1992, and other instances followed across Europe, in Germany, Bulgaria, and Georgia. Equipment is credited with initiating only one nuclear material interdiction among the 19 cases reported from 1992-2001, but was nonetheless a central part of the U.S. efforts to counter

illicit nuclear material movements from post-Soviet military industrial complexes (See Appendix Four, WUNM Seizures)

Use of equipment for secondary inspection and isotope confirmation post-seizure is common in the majority of interdiction cases. When available, customs, police, or in-country radiation safety personnel are able to confirm the presence of radioactivity and were sometimes able to make isotope identification. Despite the periphery role detection equipment played in these historical cases, investment in international equipment deployments remained a hallmark of U.S. nonproliferation strategy from 1994-2001. Smaller initiatives rounded out the strategy by incorporating search and seizure training, export control processes, physical security measures and staff professionalization into bilateral assistance packages and international workshops. Equipment-centric programs received generous funding through DOD's CTR program office and also through smaller initiatives managed by State, U.S. Customs Service (Customs) and Commerce. DOE's autonomous National Nuclear Security Administration (NNSA) leveraged its management role and long-standing partnerships with the national laboratories to support technical requirements and is responsible for the bulk of international equipment deployments.

Yet, this strategy was predominately focused upon rectifying security in the Former Soviet States, particularly with regard to material and weapons physical security. Equipment deployments and installation locations were generally intended to keep materials within confines of the Former Soviet States, to be intercepted by the Customs and Border Patrol officials of countries like Kazakhstan and

Lithuania—such countries were selected to receive equipment training and education provided by U.S. officials.

In the Pre-Problem Stage, U.S. officials did not yet appreciate the authenticity of the commitment Al-Qaeda had to real destruction of the United States. Cooperation with international partners beyond the FSU did not occur until after 9/1l, as intelligence indicators were compiled and reviewed to portray the whole grim picture. Then, the increased intensity of domestic and international attacks on Americans revealed Al-Qaeda's willingness to engage in highly unconventional attacks with no regard for collateral damage. Furthermore, their brazenness sparked concern that they might pursue a WMD capability that would cause mass casualties and incite worldwide panic. "As was revealed at the trial that took place in New York earlier this year [1993], a former member of Bin Laden's Al-Qaeda network began working with the United States government in 1996. That witness revealed that Bin Laden had a terrorist group, Al-Qaeda, which had privately declared war on America and was operating both on its own and as an umbrella for other terrorist groups. The witness[2] revealed that Al-Qaeda had a close working relationship with the aforementioned Egyptian terrorist group known as Egyptian Islamic Jihad. The witness recounted that Bin Laden and Al-Qaeda were seeking to obtain nuclear and chemical weapons and that the organization engaged in sophisticated training" (U.S. Senate Foreign Relations Committee, 2001).

Likewise, "By 1992, Al-Qaeda was already dabbling in the nuclear black market. Undaunted by a series of scams by hustlers and con men, Bin Laden and

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[2] Jamal Ahmad Al-Fadl was the witness in the 2001 federal trial.

Zawahiri remained alert to opportunities to buy, steal, or build a bomb. After al-Qaeda was expelled from Sudan in 1994, Ayman Zawahiri mysteriously dropped out of sight. For two years, the Egyptian doctor and two of his top lieutenants traveled extensively to Russia, Yemen, Malaysia, Singapore and China. The purpose of their travels has never been established, but Zawahiri's associations during his travels, and own statements suggest that he and his cohorts may have been hunting for WMD" (Wright, 2002). Zawahiri's activities, and Osama bin Laden's 1998 fatwa compounded USG concern regarding the possibility of an Al-Qaeda-backed nuclear attack. Bin Laden said:

> (On that basis,) and in compliance with God's order, we issue the following fatwa to all Muslims: The ruling to kill the Americans and their allies—civilians and military—is an individual duty for every Muslim who can do it in any country in which it is possible to do it, in order to liberate the al-Aqsa Mosque and the holy mosque [Mecca] from their grip, and in order for their armies to move out of all the lands of Islam, defeated and unable to threaten any Muslim. This is in accordance with the words of Almighty God, "and fight the pagans all together as they fight you all together," and "fight them until there is no more tumult or oppression, and there prevail justice and faith in God" (Bin Laden, 1998).

The fatwa drew international attention to Al-Qaeda for two very important reasons. First, Bin Laden established himself as the leader of Al-Qaeda in this fatwa. Second, he then used that leadership position to endorse the killing of Americans. *The 9/11 Commission Report* described another scheme:

> Business aides received word that a Sudanese military officer who had been a member of the previous government cabinet was offering to sell weapons-grade uranium. After a number of contacts were made through intermediaries, the officer set the price at $1.5 million, which did not deter Bin Laden….But while the effort failed, it shows what Bin Laden and his associates hoped to do. One of the Al-Qaeda representatives explained his mission: "it's easy to kill more people with uranium" (National Commission on Terrorist Attacks Upon the United States, 2004).

Al Qaeda's rumored pursuits of a nuclear capability were difficult to substantiate. Al Qaeda pronouncements and its leadership's travels only provided evidence of the intent to procure a nuclear weapon—the U.S. never confirmed warhead possession.

The historical review provided in this section now shifts to the next two phases of the IAC, which introduce a period of intense public and Congressional scrutiny alongside Congressional activities that encouraged accountability and understanding of the complexity and magnitude of the nuclear threat.

Alarmed Discovery and Euphoric Enthusiasm: September 11, 2001-2006

Despite the undesirable state of affairs presented by the post-Soviet Union, the American public remained generally indifferent to the prospect of domestic nuclear terrorism. The events of 9/11 moved the issue abruptly to the alarmed discovery phase of the IAC. Americans expressed intense concern about the possibility of nuclear terrorist attacks and mainstream media quickly saturated with terrorism coverage. Over time, a clearer picture emerged as elite understanding of technological solutions and deployment costs were recognized as limiting factors for detection equipment deployment plans.

Prior to 9/11, the U.S. national defense strategy against a nuclear attack presumed a state actor. Al Qaeda's attacks changed that, and the comfortable routine that marked the U.S.'s post-Cold War cooperation with Russia was no longer suitable for meeting the immediate demands that emerged from terrorist organizations. The American public suddenly became keenly aware of

shortcomings in domestic defense strategy and the nuclear threat was suddenly reframed into the context of a state or non-state actor as the perpetrator.

The 9/11 attacks greatly intensified interest in previous and ongoing reports from U.S. and international intelligence indicating that Al-Qaeda sought a nuclear capability. The legitimacy of the Al-Qaeda nuclear threat is important to explicate because national security (i.e., defense against an Al-Qaeda nuclear attack) is at the center of the deep core beliefs shared by subsystem members. Identification and observation of deep core beliefs are a necessary component of any research design utilizing the ACF. It is politically advantageous for American politicians to support U.S. national security interests, and this lends to the use of characterizing the support of it as a deep core belief.

Opinions regarding nonproliferation and border security programs coalesced after the terrorist attacks. Representatives sought to support programs dedicated to increasing national defenses to counter the nuclear threat. In a recurring *USA Today*/Gallup poll, 85 percent of Americans surveyed after 9/11 indicated additional terrorist acts might occur in the following weeks. More than two years passed before the perception of terrorism as an urgent threat subsided as a majority opinion. However, by mid-2003 and through 2011, roughly 40 percent of Americans still held the view that another attack was imminent (USA Today/ Gallup, 2011). This elevated constituency interest, coupled with tremendous costs associated with failing to prevent nuclear terrorism, kept Congress and the Executive Branch actively engaged. DOE, DOS and DOD, who each had pre-9/11 missions associated with the development of equipment that could intercept nuclear material, responded

to a multitude of Congressional requests for information about existing capabilities and expectations for future deployments. Darren Davis (2007) observed that Americans first reacted with overwhelming support for domestic security enhancements. Petersen (2009) explained some utility of the IAC is because it accounted for this expected reaction from the public by explaining that policymakers seek simple solutions, and that public supported such solutions. Petersen (2009) also indicated that media fail to provide meaningful coverage of intractable issues such as international terrorism because of these behaviors. Data compiled for this study exhibit a similarity with the data compiled by Li and Izzard (2003), which suggested the media reaction to the 9/11 attacks with deference and compliance as the government mobilized assets in response to terrorism (Davis, Negative Liberty: Public Opinon and the Terrorist Attacks on America, 2007).

On the heels of the attacks, government officials assembled details of each existing asset that could contribute to national defense against terrorism, with a particular focus upon capabilities that could enhance security without significant investments of time. In this case, the rapid deployment of commercially available radiation detection equipment provided the first simple tool for establishing a national nuclear interdiction capability. Public and private entities began installing radiation detection equipment for health and safety purposes at nuclear facilities long before 9/11. Using these installations as a basis for a domestic strategy, the U.S. initiated deployments of current-generation detection systems and undertook research and development projects as well as next-generation, transformational research & development initiatives. Seeking to avoid escalated attacks and

ameliorate public concern, lawmakers perked to the idea of leveraging the existing detection technologies at U.S. borders. On September 18, 2001, Congress passed the "2001 Emergency Supplemental Appropriations Act for Recovery from and Response to Terrorist Attacks on the United States, 107-38". This legislation provided funding for a variety of programs, including those related transportation security measures, such as detection equipment. Commitments to a national nuclear detection architecture shifted private sector production to security, rather than safety-focused detection equipment. Prior to the emergence of a domestic market, detection equipment companies produced small personal radiation detection devices sometimes called "pagers" for use by nuclear science professionals. These companies also produced the early generation "portal monitors" that were procured by DOE and DOD for deployment at nearly 70 sites across the FSU. These systems used plastic scintillator technology designed to alert the presence of gamma or neutrons. Although deployed at international cargo points of entry (POE) and at pedestrian crossings, false alarms sounded frequently and they often failed to alert in the presence of shielded nuclear material. Although it was a well-known conundrum that detection of weapons usable nuclear material such as HEU presented significant physics and engineering problems, many in the industry believed that an aggressive rush of investment would lead to solutions. For several years after this Emergency Supplemental, Congress continued to fund detection equipment at each of the managing departments.

By 2002, more than 4,200 Customs agents carried Personal Radiation Detectors (PRD's). Customs requested 4,000 more PRD's and 400 pedestrian and

vehicle radiation detection portal monitors in their fiscal year 2003 request (U.S. Government Accountability Office, 2002). This request indicated early support of an equipment-based approach to the nuclear threat but created fiscal and manpower demands among the law enforcement and port security sectors. In the midst of these concerns, Ms. Gary L. Jones, Director Natural Resources and Environment at the GAO indicated that while these efforts played an important role in the national strategy, countering the nuclear threat would require a more aggressive and coherent approach with regard to manpower and equipment:

> Our observations concerning the acquisition of radiation detection equipment have not changed from what we reported to you in August [2002]. Specifically, the Customs Service's primary radiation detection equipment—radiation pagers—have certain limitations and may be inappropriate for the task. Further, we remain concerned that no comprehensive plan is in place for installing and using radiation detection equipment at all U.S. border crossings and ports of entry. …
> Based on our work with Customs and DOE officials and our review of U.S. efforts to help other countries combat nuclear smuggling, we have concerns that Customs has not yet deployed the best available technologies for detecting radioactive and nuclear materials at U.S. border crossings and ports of entry. (U.S. Government Accountability Office, 2002)

The pressure to enhance the state-of-the-art escalated. Beliefs that additional Research and Development (R&D) investments would lead to improvements in spectra collection, reduction of threat material false-positives, and decreases in per-unit costs were widely held at this time. Substantial programmatic and fiscal resources were directed at countering the threat of nuclear terrorism. Meanwhile, Congress heard concerns such as those articulated by Ms. Jones and many more revealed by additional GAO reports. The DHS was established in 2003, and by 2004, the *9/11 Commission Report* called for 100% scanning of U.S.-bound cargo at major domestic and international POE's by 2012 (National Commission on

Terrorist Attacks Upon the United States, 2004). Several years after 9/11, the state of the art for nuclear detection equipment used either radiography or advanced spectroscopy, but neither provided the rapid, accurate and affordable platform desired for high-volume scans and resolution at busy U.S. POE. Spectroscopy systems were purchased for test-bed installations at a cost of more than $200,000 each, and their practicality in terms of handheld and transshipment inspections received mixed reviews. Transportation security managers expressed concern about adding interdiction and safety protocols for nuclear, chemical and biological WMD to the existing portfolios of front-line officers. Practical matters also influenced deployments. Inspectors requested revised specifications for more ergonomic equipment, reporting that the weight, handle placement, and docking were cumbersome. Fixed-lane detectors required full-time manning, so officers were shifted from other duties to mitigate each alarm. These challenges, along with the existing mission burdens assumed by the various departments, compelled some agencies to reconsider their programs and others to adjust their expectations. Despite the availability of other potential defenses and deterrents against nuclear terrorism threats, the U.S. remained committed to a GNDA at nearly any cost, and began incorporating pre-existing nuclear detection installations.

Lacking a single coordinator for nuclear detection equipment and response, the Executive Branch had no point of contact to provide oversight of domestic anti-nuclear terrorism projects. So, in 2005, the DNDO received tasking to lead the domestic detection enterprise.

> DNDO is the primary entity in the U.S. government for implementing domestic nuclear detection efforts for a managed and coordinated response

> to radiological and nuclear threats, as well as integration of federal nuclear forensics programs. Additionally, DNDO is charged with coordinating the development of the global nuclear detection and reporting architecture, with partners from federal, state, local, and international governments and the private sector (The Department of Homeland Security, 2015).

The President and Congress expected DNDO to take the lead, and billions followed (see Table 1, DNDO Budget Authority in Millions, USD). Millions of dollars in funding for purchase of additional basic Personal Radiation Detection (PRD) equipment and research and development investments in next-generation technology. From 2003-2009, the budget increased nearly 70 percent.

Table 1

DNDO Budget Authority in Millions, USD

FY 2005	123
FY 2006	315
FY 2007	481
FY 2008	485
FY 2009	514
FY 2010	384
FY 2011	342
FY 2012	290
FY 2013	290
FY 2014	291

Source: (The Department of Homeland Security, 2014).

DNDO's mission extends to international initiatives with national security implications. The DNDO organizational structure included procurement groups in the Research & Development and Transformational-Research & Development arenas. Adaptation of the strategy beyond international partnerships to begin deployments of basic radiation detection equipment within the continental United States (CONUS) became a cornerstone of the post-9/11 domestic response to the nuclear threat. New federal personnel were hired to manage the deployments of commercially available equipment and to oversee the research and development of

next-generation capabilities that might be suitable for rapid cargo scanning or passive, discreet inspection.

Detection equipment deployments enjoyed broad bipartisan support from 2001 through 2008, receiving hearty substantial budget increases during this time. The significant investments associated with detection equipment deployments indicated broad national support for nuclear security programs. Although detection equipment became a popular answer to the nuclear threat question, equipment critics cautioned against the perception of it serving as a silver bullet, reinforcing the importance of human intelligence operations overseas and the training and education law enforcement officers domestically. The support for a multi-front approach to interdiction is primarily because the equipment is limited in several ways. Detection equipment initially assisted with personnel safety by detecting and measuring radiation emissions at nuclear sites. When the national security mission emerged, private companies and the national laboratories sought to develop alternate platforms and designs for national security applications. However, equipment is simply a tool, and without advance information regarding networks and their shipments, law enforcement and intelligence personnel were unlikely to preemptively identify a single threat container amongst the millions flowing through streams of commerce each day. Detection equipment installations rely heavily on the accuracy of the stochastic model used by the USG to determine site locations.[3]

[3]"The interdictor's goal is to minimize the probability the smuggler evades detection. The performance of the detection equipment depends on the material being sensed, geometric attenuation, shielding, cargo and container type, background, time allotted for sensing and a number of other factors. Using a stochastic radiation transport code (MCNPX), we estimate detection probabilities for a specific set of such parameters, and inform the interdiction model with these estimates." For a full description of the U.S. stochastic approach to interdiction see, (Dimitrov, et al., 2009).

This approach to deployment is greatly enhanced by continuous updating of the factors that populate the model. DNDO endeavored to provide a holistic approach to deployments and includes detailees from federal law enforcement (FBI, Customs) and other departments with nuclear security missions (DOE, DOD)—but funding for alternate approaches to interdiction such as specialized training for customs and border control personnel, targeted human intelligence (HUMINT) operations, site security and export control regimes did not always receive support commensurate with the additional demands imposed by equipment installations.

The initial excitement surrounding the promise of detection equipment programs soon shifted, as public interest waned and the significant hurdles associated with successfully deploying a GNDA became entirely apparent. The data representing these events set the conditions that led to the policy change expected by the research hypothesis. Analysis of findings related to the next phases of the IAC are described in Chapter Four.

John Mueller's (2006) book described the manner in which the U.S. responded overwhelmingly to the 9/11 attacks, and believes that much, if not most of the money and effort spent on counterterrorism since 2001 is wasted (Mueller, Overblown: How Politicians and the Terrorism Industry Inflate National Security Threats, and Why We Believe Them, 2006, p. 5). Mueller also noted the low-tech approach Al Qaeda employed in the 9/11 attack, and stated that while the likelihood of such an attack is low, and if it did occur, Americans could recover from it. However, he also indicated that the destructive capacity of nuclear weapons warrants some policy responses (Mueller, Overblown: How Politicians and the

Terrorism Industry Inflate National Security Threats, and Why We Believe Them, 2006, p. 15).

The public's fascination and concern with the nuclear threat prevailed over the option of taking no significant actions in the years that followed the 9/11 attacks. Determining the manner in which the events of this case lend themselves to the IAC and progress through the cycle is an important component of the project. Content analyses of the news items and historical context gleaned from the Congressional Hearings shape the understanding of the events throughout the decade and how they reflect the phases of the IAC. Later, in the Analysis Chapter, the historical events are incorporated into the IAC by describing the context and specific events that occurred; anecdotal evidence is provided to support the assignment to each of the five phases.

Next, the IAC literature review describes how Birkland (2004) conducted a case study of the 9/11 terrorist events and the manner in which the IAC aptly aligned events to each phase, validating the efficacy of the cycle.

The Issue Attention Cycle: Literature Review

Since its initial presentation in 1972, Downs' model has provided context for a variety of case studies. Robert Entman (2003) described the relationship between public opinion and policy as 'cascading network activation'; Birkland (2004) argued that policy agenda setting is a process, and that often the media influence perception of what is most important on any given day (Petersen, 2009). Anthony Downs' approach is set apart from these. Like Entman and Birkland's approaches to public opinion and policy, the IAC enables a description of phenomena surrounding issues

of "crucial importance to society" by considering media, but does so with a model that indicates it is the public, not elite media, whose reaction to events determines media coverage (Downs, 1972, p. 38). Versions of this proposition exist and there is no consensus about who drives issues to the pinnacle of public attention. Jenkins-Smith and co-author Kuhika Gupta (2014) critically reviewed the IAC over the years and made the following observation:

> In other words, media attention is an important driver of public attention, but there is a feedback loop wherein public attention (or lack thereof) guides media attention. With respect to the latter, Downs argued that public attention orients governmental action by putting pressure on elected officials to "do something" about issues that have gone from dormant to highly salient in the minds of the American public. If and when the government attempts to do something, however, the public will realize that the problem is complicated and costly to solve. Thus, public attention drives government attention, but (again) there is a feedback loop wherein government attention may cause disillusion and ultimately a decline in public attention (Gupta & Jenkins-Smith, 2014, pp. 318-319).

Domestic security became a crucially important issue to society after the 9/11 attacks. The use of newspaper headlines to measure public interest and then chart the issue through the IAC reveal how the public responded prior to, and throughout, the government's policymaking process. This assertion is fundamental to the selection of headline counts as the public interest variable for this study.

Birkland's 2004 article used the IAC to trace the issues of 9/11 and international terrorism broadly. His evidence concluded that, as a topic, media coverage declined enough from 2001 to 2002 to move international terrorism attention from Stage 3 to Stage 4 (Birkland, The World Changed Today: Agenda-Setting and Policy change in the Wake of the September 11 Terrorist Attacks, 2004). Petersen's (2009) article indicated that the issue of international terrorism

will ceaselessly cycle through Downs' model due to a lack of deeper public understanding of core international relations issue. Referring to Downs' initial research, Petersen (2009) indicated that the public became personally connected to the global warming issue. This connection translated to greater support of pro-environmental policies. "While education about environmental issues has begun to shift public interest, and possibly, public policy, we cannot assume a similar trajectory with response to international terrorism or other key foreign policy issues. Only if sustained public attention to the issue leads to more depth of understanding can we expect he public to push for more nuanced (even more costly) policies to address the issue of international terrorism" (Petersen, 2009, p. 13).

Perhaps this is the case with the issue of nuclear terrorism. A nuclear weapon detonation promises to be the most traumatic and catastrophic attack type available to terrorists. The nuclear threat spans all demographics, and in a general sense, everyone fears a detonation and desires to proactively develop measures to counter it. This research traces the issue of radiation detection equipment through the IAC, and reveals details about the American public's interest in nuclear threat and any relationship to the USG's response to it.

The following section provides a review of the ACF's theoretical framework and literature pertinent to this case. The literature review specifically addresses studies that incorporate Congressional hearing content and the policy knowledge factor as well as subsystem behaviors.

The Advocacy Coalition Framework

The ACF contributes to modern understanding of the policymaking process, but it is pre-dated by top-down approaches to policymaking. Many students of political science use this classic approach to chart initiatives through the policy making process. The stages heuristic enables scholars extricate bureaucratic activities into distinct phases. The simplicity of the stages approach is highly appealing because it is easy to teach, applicable, and adaptable across many forms of government. Yet its explanatory power is undermined by these strengths, as it fails to address and incorporate the influence of additional variables evidenced as important over the past decades such as shocks exogenous to the policy subsystem, interest groups, and competing priorities.

In the mid-1970s, Hugh Heclo claimed that the stages heuristic inadequately described certain phenomena he witnessed in policymaking realms, particularly the influence of actors who were a part of issue networks but wielded no legislative powers. Although Heclo (1974) did not discount the existence of an "Iron Triangle" comprised of executive bureaus, congressional committees and interest groups, he did write about the limited explanatory power that the paradigm offers when related to different policymaking settings. "Looking for the closed triangles of control, we tend to miss the fairly open networks of people that increasingly impinge upon government." His alternate approach extended beyond outputs and decisions to "appreciate better the political process and its relationship to the collective social choices embedded in public policy" (Heclo, 1974).

Heclo sought to interest scholars of all types in a comparative approach to policy and program formulation. Heclo highlighted the influence of factors exogenous to the government in his heuristic, asserting that policy development occurred not only within the structure of bureaucracy, but as a result of influences beyond it. "Rather than trying to discover a comprehensive theory (of social causation or the ultimate sources of modern social policy), I shall look at proximate sources and causes. How have issues of social policy arisen; where have the substantive ideas about what to do come from; what is the process by which they have been politically accepted and changed through time—in short, how have governments come to do the specific things they do" (Heclo, 1974)? Heclo said that case studies of electoral processes, interest groups, internal workings of government, and socioeconomic changes (or in a broad sense, external factors) may be insightful, but such focused, empirical study would more likely generate questions than answers. He sought to approach his analysis without making conclusive observations regarding causation—he wrote, "The opposite of being definitive is not, however, to be arbitrary" (Heclo, 1974). Policy scholars accepted Heclo's criticisms and revisions of the stages approach and brought forth many alternatives—including Paul Sabatier and Hank Jenkins-Smith's ACF. Sabatier and Jenkins-Smith described and critiqued their framework in their book, *Policy Change and Learning: An Advocacy Coalition Approach* (1993).

The ACF alternative to the stages heuristic describes policymaking outcomes as a response to both internal and external variables, and incorporates the influence of policy subsystems upon policy outcomes. Scholars leveraged Heclo's

contributions regarding the influence of external factors in public policy formulation, and political scientists sought to address additional gaps in the stages heuristic with their framework. They broadened Heclo's observations regarding the influence of exogenous factors upon policy changes, but rejected his dismissal of empirical studies. Sabatier and Jenkins-Smith are among scholars who believed models should incorporate causal elements, while the stages heuristic lacks a vehicle for empirical testing. The ACF recognizes the contributions of the stages approach for describing policy change but then extends it with the addition of causal factors. Scholars applied the ACF in empirical case studies, and their work resulted in observations leading to additional ACF hypotheses and refinements of existing ones. These studies surpassed the quality of data drawn from studies and enabled greater exploratory power. In the subsequent literature review, several studies that employed similar approaches to this research are described. The ACF's inclusion of subsystems and its appreciation for the influence of policy knowledge extends the study of policy making from the confines of traditional bureaucratic bounds to include dynamics beyond them. The ACF's acknowledgement of subsystem actors allows researchers to flip the typical top-down approach to policymaking and incorporate the crucial influence of subsystems. The framework describes the policy process in the manner shown in Figure 1:

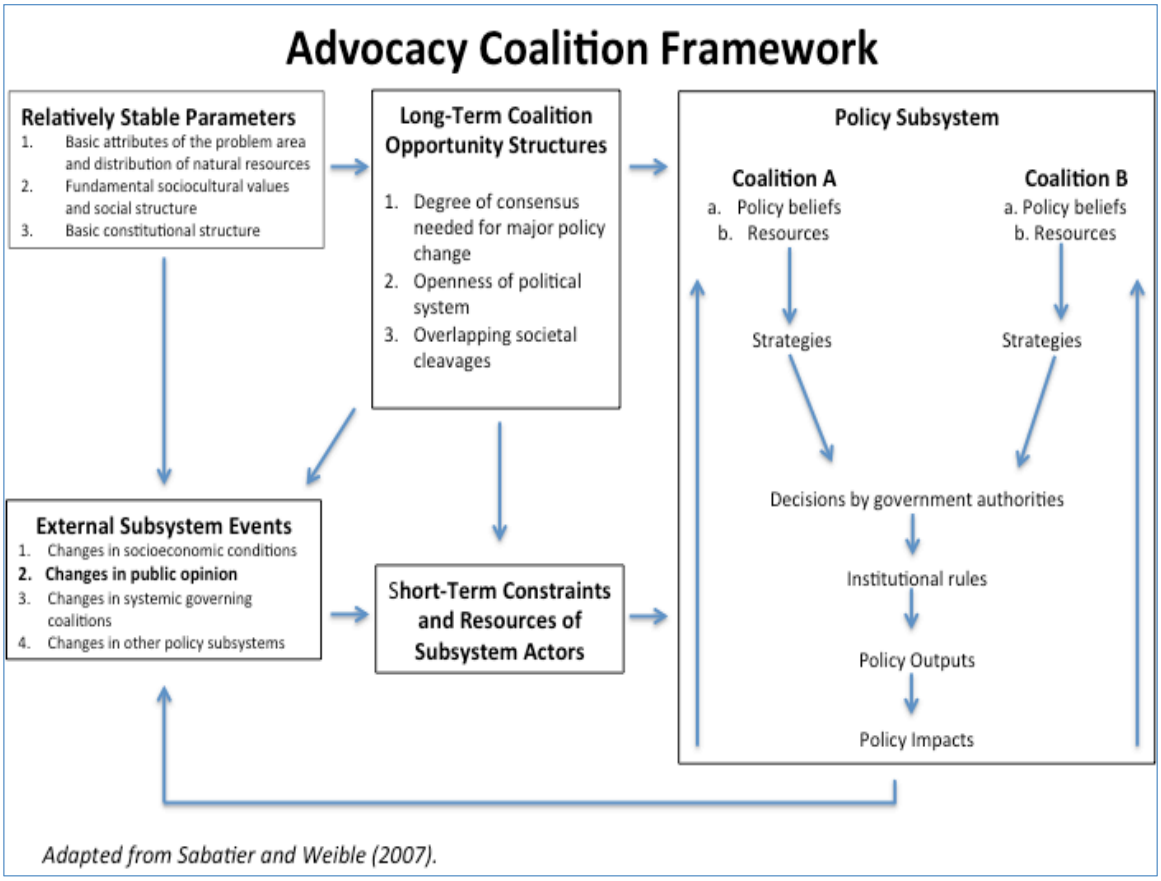


Figure 1: ACF Policy Process

In order to distinguish the ACF from other theories of the policy process, Sabatier and Jenkins-Smith established five central assertions: First, they recognize the influence of technical information. Legislators are becoming increasingly savvy users of technical information and frequently request analyses and information papers from subject matter experts, independent auditors, and program managers. This point is relevant to the research question: a query from Congress for a specific GAO investigation exhibits increased interest in a topic, reflecting intended learning among legislators. Such technical information concerns "The magnitude and facets of the problem, its causes, and the probable impact of various solutions" (Sabatier, 1978; Crandall and Lave, 1981; Mazur, 1981).

The second assertion regarding the ACF is that it should be applied to longitudinal data drawn from a time perspective of a decade or more. This allows scholars to incorporate policymaking cycles and to chart influences over time. Using data for a longer span also permits scholars to tease out the subsystems, coalitions, and relationships that emerge around deep and policy core beliefs. In the late 1970's Weiss convinced many scholars that short-term consideration of decision-making underestimates the influence of policy analysis. Cohen and Lindblom (1979) indicated that the cumulative effect of learning from many sources coupled with inherent ordinary knowledge influence policy most significantly (Sabatier P. A., Policy Change Over a Decade or More, 1993).

Third, subsystems are a key feature of the ACF—the framework incorporates interaction of actors from different institutions who follow and seek to influence governmental decisions in a policy arena. This departure from institution-specific study of policymaking is particular to the ACF and has since been incorporated into additional policymaking models. Subsystems identified in this case study include representatives of private sector port authorities, transportation security officials, national laboratory personnel, GAO auditors and radiation detection equipment program managers.

Fourth, the ACF incorporates elements beyond the bureaucracy. Sabatier and Jenkins-Smith suggest that such analyses limit the conception of policy by excluding those who evaluate and disseminate information as a broader collection of other actors in government. This proposition allows for consideration of a breadth of policy change causes. Here, the influence of subsystems outside of government,

including private sector and academia, allow a researcher to extend the search for causal relationships beyond the bureaucracy. In this case, the inclusion of another factor outside of the iron triangle, issue attention, furthers the quality of the analysis.

The final assertion of the ACF is that "public policies or programs can be conceptualized in the same manner as belief systems, i.e. as sets of value priorities and casual assumptions about how to realize them" (Sabatier & Jenkins-Smith, The Advocacy Coalition Framework, 1999). This fifth premise is crucial to the process of charting actors over time, and facilitates the ability to observe learning of technical information and its potential relationship to policy changes (Sabatier & Jenkins-Smith, The Advocacy Coalition Framework, 1999). The products of this study include observations about the way in which members of the nuclear security subsystem shifted into, and out of pro-detection equipment coalitions. The expectation was that, as these groups acquired technical understanding, accrued policy knowledge, and validated assumptions about the manner in which detection systems would work, they would shift their beliefs accordingly. Deep core beliefs reflect shared belief systems and are normative. Policy core beliefs represent "normative commitments and causal perceptions across an entire policy domain or subsystem," and secondary beliefs are far more narrow (Sabatier & Jenkins-Smith, The Advocacy Coalition Framework, 1999). The primary focus of this study is upon the secondary beliefs of members of the nuclear security subsystem as related to strategic implementation of radiation detection equipment, particularly the way in which pro-detector coalitions received information that eventually impacted the

level of broad support they placed in emerging technological answers to the nuclear terrorism threat.

Today's legislators must thrive in a dynamic environment that includes lobbyists who attempt to influence decisions. Sabatier describes the importance of being attentive to the value of technical information and policy knowledge throughout the policy process, and asserted its importance to the understanding of policy change. The ACF describes policy change as the result of various processes.

> The first process relates to the interaction of competing advocacy coalitions within a policy subsystem. The second addresses changes external to the subsystem in socio-economic conditions, system-wide governing coalitions, and output from other subsystems that provide opportunities and obstacles to competing coalitions. A third relates to the effects of stable system parameters such as social structure and constitutional rules—on the constraints and resources of the various subsystem actors (Sabatier & Jenkins-Smith, Policy Change and Learning: An Advocacy Coalition Approach, 1993).

Weible and Nohrstedt noted the importance of simplifying these various subsystems by aggregating actors into one or more coalitions (Weible C. M.-S., 2011). In this case, many actors assimilated into broad coalitions that played a role in the deliberations. Laboratory personnel assigned to federal headquarters educated policymakers about technology and explained and promoted options for a global nuclear detection architecture. These experts also facilitated the planning and execution of equipment test series. Private industry corporations provided research and development initiatives as well as prototype equipment for field use. Existing public-private partnerships continued among those who were deploying equipment prior to the terrorist attacks. Congressmen advocated for slices of massive emergency supplemental funds to come to their states and districts. Media,

nongovernmental organizations, and think tanks provided assessments and opinions. Their testimony and products were provided to Congress and helped influence Congressional decision-making. Newspaper stories details programmatic progress and setbacks, oftentimes in great detail. In this study, subsystems are competing for resources toward the same end—different military, law enforcement and border security entities are seeking some combination of intelligence, tools and training to disrupt a nuclear attack. Although initially there was no polarized, vigorous opposition to investment in nuclear detection equipment, longitudinal analysis indicates that the manner in which these coalitions participated in hearings to pursue solutions changed dramatically. Also during the subject decade, GAO served as gatekeeper for sorting out how the equipment did or did not perform to meet the threshold for threat material identification. Technical reports from equipment test and evaluations played a crucial role in determining whether equipment could eventually meet expectations. Yet, ultimately, the program plans for 2016 bear only a minor resemblance to the robust expectations set in 2003.

In order to make observations about how these factors did or did not contribute to policy change, the hypothesis for this project was derived from an ACF policy change hypothesis. Sabatier and Jenkins-Smith's earliest models of the ACF incorporated the public opinion factor in the policymaking process, and iterations of the ACF highlight the impact of public interest with even greater priority, parsing it as an independent external influence. ACF incorporates public interest among external events labeled broadly as "changes in socioeconomic conditions". This progressive approach to explaining the process of policy change

later expanded to include a greater variety of exogenous influences in a more specific manner. Today's ACF reflects that emphasis, "The basic argument is that although public opinion is seldom knowledgeable enough to affect policy specifics, it can certainly alter general spending priorities and the perceived seriousness of various problems" (Sabatier & Jenkins-Smith, The Advocacy Coalition Framework: An Assessment, 1999).

Figure 1 indicates changes in public opinion might serve as an external factor that influences policy outputs. Capturing public opinion as issue attention is possible using the IAC, as well as data from other resources such as Lexis-Nexis, Gallup Polling data, and Google Trends. Marrying these concepts into one longitudinal view enhanced the ability to accurately identify certain crucial moments in the case study.

Advocacy Coalition Framework: Literature Review

Scholars continued to broaden their perspectives regarding policy change by considering how factors beyond bureaucratic actors might impact policy over time. Using legislative content analyses, longitudinal ACF studies of policy change helped to shape a more inclusive approach to understanding policy dynamics. The origins of U.S. nuclear detection capabilities and the sources and causes of associated policies can be addressed with the ACF because researchers are able to incorporate subsystems into the understanding of the nuclear security policy and program development processes. One of the primary benefits the ACF offers is its ability to use the framework to focus on belief systems of advocacy coalitions.

> A belief system guides coalition members concerning the problems that should receive the highest priority, the causal factor that needs to be examined most closely, and the governmental institutions most likely to be favorably disposed to the coalition's point of view. (Sabatier & Jenkins-Smith, Policy Change and Learning: An Advocacy Coalition Approach, 1993)

Observations of subsystem actors may be made through their participation in professional forums such as Congressional hearings and panel discussions. A common approach to charting the strategies and activities of advocacy coalitions is through the review of such testimonies over time. This technique may expose how coalitions adapt or alter their beliefs and potentially lead to policy changes such as negotiations, acquiescence, or other shifts, particularly when an exogenous factor influences the process. According to the ACF, scientific information influences coalition beliefs. Montpetit (2011) represented recent scholarship that essentially reversed the causal direction of these influences by saying that controversy generates scientific uncertainty rather than the contrary. This point that remains

debated by ACF scholars. Readers should also recognize that Montpetit's (2011) ACF application did not include the measurement of coalitions, learning, or policy change; that is, he emphasized a different theoretical terrain (Weible C. M.-S., 2011).

Several ACF case studies consider policy learning and the process of issue familiarization as factors leading to policy change as reflected by a shift in beliefs. Sabatier and Anne M. Brasher (1993) found evidence of this phenomena in "Environmental Policy at Lake Tahoe, 1964-1985". They observed negative significant relationship between environmental priorities and regional planning early in the study that switched to positive (and significant) after 1973. "This finding suggests that as Tahoe elites gained experience with regional planning and environmental policy, they increasingly realized that intergovernmental relations and substantive value priorities were related" (Sabatier & Brasher, From Vague Consensus to Clearly Differentiated Coalitions: Enviornmental Policy at Lake Tahoe, 1964-1985, 1993). This observation affirms the design of the ACF to include contributions of coalitions beyond those who traditionally participate in a policymaking subsystem. The Tahoe case study (1993) revealed the importance of relationship building between city planners and environmental activists. Likewise, national nuclear defense requires broad coordination and cooperation among subsystem members beyond the traditional defense realm—the input of shipping companies, ports authorities and international corporations helped to inform the national strategy.

Pierce (2011), Nohrstedt (2011), and Albright (2011) conducted studies using legislative content analysis to address their research questions. In his longitudinal study "Coalition Stability and Belief Change: Advocacy Coalitions in U.S. Foreign Policy and the Creation of Israel, 1922-1944", Jonathan J. Pierce reviewed U.S. foreign policy data from legislative hearings using coding of core beliefs over a two decade span. Pierce sought to determine if deep core and policy core beliefs held stable over time. He bound his study by drawing only from hearing data that specifically related to the question of the British Mandate of Palestine. Pierce based his use of congressional hearings upon the technique used by Jenkins-Smith & St. Clair in their 1993 article, "The Politics of Offshore Energy". Although Pierce is one of a handful of scholars who utilized longitudinal content analysis, he still cited reliance on legislative testimony as one of the limitations to his methodology. This study emulates the approach used by Jenkins-Smith and St. Clair.

Nohrstedt's article, "Do Advocacy Coalitions Matter? Crisis and Change in Swedish Nuclear Energy Policy" (2009) reviewed the course of developments in Swedish nuclear energy policy in the 1970s and 80s. Nohrstedt sought to avoid Sabatier and Jenkins-Smith's concerns about reliability and validity of the documentation of policy coalitions. They observed that without systematic gathering of data, researchers could not truly confirm that members shared policy core beliefs. (Sabatier & Jenkins-Smith, The Advocacy Coalition Framework: An Assessment, 1999) To address this matter, Nohrstedt utilized a systematic approach to charting coalition members. "To not only remedy these problems (of relativity

and validity in documentation) but also to increase comparability with previous systematic ACF studies, this study is based on a systematic documentation of the Swedish nuclear energy policy subsystem" (Nohrstedt, Do Advoacy Coalitions Matter? Crisis and Change in Swedish Nuclear Energy Policy, 2009). Like Pierce, Nohrstedt analyzed testimonies using a coding scheme.

This systematic documentation research design is emulated in this dissertation. This study also considers Nohrstedt's observation: "ACF theory postulates that various external shocks and crises can disrupt otherwise stable subsystems. Disruption takes place when new actors enter policymaking, when actors change position from one coalition to another, or when policy resources are redistributed." Nohrstedt observed fluctuations in patterns of participation in accordance with crises, and applied the ACF "as a theoretical basis for understanding the development and effects of policy conflicts in crisis resolution." Nohrstedt's (2013) article "Advocacy Coalitions in Crisis Resolution: Understanding Policy Dispute in the European Volcanic Ash Cloud Crisis" touches on the role of technical information. "Crisis resolution thus requires public managers and leaders to digest and respond to complex information about social and natural phenomena. In some cases, crises reinforce pre-existing controversies among stakeholders and actors involved in or affected by crisis response operations" (Nohrstedt, Advocacy Coalitions in Crisis Resolution: Understanding Policy Dispute in the European Volcanic Ash Cloud Crisis, 2013, p. 965). Such cases include high-stake events in which stakeholders have strong incentives to use technical information in an advocacy fashion as a basis for legitimizing actions

supporting organizational agendas and normative policy beliefs (Sabatier P. , 1987; Comfort, 2007). "Gauging theoretical approaches to grasp the evolution of policy disputes in the context of high-stake crises is thus a legitimate concern for researchers as well as practitioners" (Nohrstedt, Advocacy Coalitions in Crisis Resolution: Understanding Policy Dispute in the European Volcanic Ash Cloud Crisis, 2013). He delineates scientific information into two categories:

> Scientific information was used for both instrumental and political purposes. Instrumental use of information refers to the use of expert-based information to solve policy problems and thus has a direct impact on policymaking. The volcanic ash crisis provides additional insight into how stakeholders mobilize scientific information to counter arguments by their opponents (political use of information) (Nohrstedt, Advocacy Coalitions in Crisis Resolution: Understanding Policy Dispute in the European Volcanic Ash Cloud Crisis, 2013).

His case also illustrated that, "Specifically, it (the case) shows that scientific information can accumulate rapidly and serve as the basis for policy change under conditions of threat, urgency, and uncertainty" (Nohrstedt, Advocacy Coalitions in Crisis Resolution: Understanding Policy Dispute in the European Volcanic Ash Cloud Crisis, 2013). The data collected in this study reflect this phenomenon.

Another characterization of scientific information is as "policy knowledge." This terminology is introduced in the article "Policy Knowledge, Policy Formulation, and Change: Revisiting a Foundational Question" by Thomas E. James and Paul D. Jorgensen. Policy Knowledge transcends scientific information by incorporating phases of analysis and evaluation into understanding of policy change. These scholars indicate that policy theories including the ACF will benefit from an understanding of "how and which information decision makers use." They believe this will clarify and facilitate concepts associated with policy knowledge, process,

and change (James & Jorgensen, 2009). Policy knowledge plays an important role in policy making because it may be strategically exploited—"In return, researchers and other policy experts are important allies in the policy process since they provide the competence required for interpreting and framing technically complex problems" (Sabatier & Weible, 2007). The GAO is among the key players in this case study; it provides Congress thorough investigative audit products of government programs in a manner that clarifies issues and seeks ground truth for Congress by providing recommendations for action. Their testimonies, along with the informed statements of witnesses called before House and Senate Homeland Security Committees, contributed to legislator accrual of policy knowledge.

In consideration of (2009) Jorgensen's observations, this dissertation provides a tool for tracking instances of policy knowledge accrual, and in conjunction with the analysis and evaluation provided by various subsystems (auditors, the scientific community, the DNDO) renders observations about how policy knowledge and issue attention might be responsible for dramatic changes in DNDO programs by charting these variables over time and their impact on the DNDO budget. Perhaps this study can contribute to an area of policy theory James and Jorgensen saw as lacking: "There is little systematic investigation into why, when, and how decisions makers utilize policy knowledge, especially regarding which policy knowledge actors use" (James & Jorgensen, 2009). These authors recommended research that utilizes policy knowledge as an independent variable affecting the policy process. This project is designed accordingly, emphasizing the

role of scientific information and issue attention as independent variables affecting fiscal year budget decisions.

The following Methodology Chapter includes study design, an explanation of variables, and a full explanation of the study design.

CHAPTER THREE

Methodology

Overview

After a brief review of the case, this section of the dissertation will describe the components of the case study and the manner in which it is conducted. The research questions, datasets, details of data identification and collection techniques are explained in this chapter. The code word list, coding sheets and coalition assignments and description of the data reliability process are also mentioned in this Methodology chapter and referred to in the Codebook Samples found Appendix 2 and Terminology section of Appendix 3.

This case study chronicles the emergence of a domestic national nuclear detection equipment capability from 2003-2013. The enthusiasm and broad support for nuclear detection equipment that marked the 2003-2005 timeframe changed dramatically when cost and performance issues emerged, particularly in 2008, when a dramatic policy change occurred. This study incorporates the IAC and the ACF to make observations about that particular policy change by utilizing longitudinal data drawn from Congressional hearings and news stories. With appreciation for the multi-factor analysis capabilities the ACF provides, and with understanding that the IAC infers a mechanistic view of public attention, the case study is designed to maximize the exploratory power each offers (H. Jenkins-Smith, personal communication, May 13, 2016). The ideal outcome of this methodology results in analytical products that reflect the manner in which technical information and policy

knowledge impacted decision-making; it also incorporates the public opinion behavior and its influence upon policy decision processes.

The basis of this project's hypothesis is derived from one of several ACF hypotheses related to policy change:

> (Alternative) Hypothesis 5/Policy Change Hypothesis 2 (revised): Significant perturbations external to the subsystem (e.g., changes in socioeconomic conditions, public opinion, system wide governing coalitions, or policy outputs form other subsystems) are a *necessary; but not sufficient,* cause of change in the *policy core* attributes of a governmental program (Sabatier & Jenkins-Smith, Policy Change and Learning: An Advocacy Coalition Approach, 1993).

Upon developing the adapted hypothesis, "Radiation detection program budget decreases occurred in conjunction with a gradual decline in public attention and enhanced Congressional policy-oriented learning," the following research questions took form:

Research Questions

1. Is there a relationship between Congressional policy knowledge, public interest and budget decisions?
2. Does the timing of increased Congressional policy knowledge and declining public interest coincide with decreased budget allocations?
3. Do other phenomena anticipated by the IAC and ACF emerge from these variables?
4. Can the IAC be validated as a tool for measuring public issue attention in this case?

Annual fiscal year budget allocations to the DNDO serve as the dependent variable representing policy change. Budget changes that occur in conjunction with

declining constituent issue attention and increasing Congressional policy knowledge confirm the influence of exogenous factors as the ACF suggests and the presence of Heclo's traditional bureaucratic politics upon policymaker decisions. In this case, budget allocations reflect the policy core beliefs of the subsystems: budget increases from Congress are evidence of support of radiation detection equipment as a significant part of U.S. nuclear threat deterrence, while decrements are indicative of declining support of radiation detection programs. Below is an overview of each component:

Unit of Analysis: This project uses annual **Fiscal Year budgets for radiation detection programs (FY)** as the unit of analysis. This study is limited to decisions associated with the expansion and contraction of the DHS DNDO budgets from 2003-2013.

Dependent Variable: *Policy Change*, as reflected by annual FY budget allocations for nuclear detection programs (USD $)

Independent Variables: *Policy Knowledge* reflects the accrual of policy technical knowledge by legislators. *Public Issue Attention* reflects public attention measured by single story counts of articles related to domestic nuclear detection equipment and is corroborated by other measures drawn from Gallup Pooling Data and Google Trends Data. Table 2 describes these variables in greater detail.

Table 2

Independent Variable Streams of Evidence

Public Issue Attention: This variable reflects public attention measured by single story counts of articles related to domestic nuclear detection equipment. Gallup Pooling Data and Google Trends Data drawn from the same timeframe corroborate measurement validity.

NEWS ARTICLES	GALLUP	GOOGLE	LEXIS-NEXIS
The New York Times (64) *The San Jose Mercury News (11)* *The Washington Post (63)*	Gallup's polling data archives include a variety of national-security related surveys posed to the public.	Google Trends data illustrate public search engine web queries of "domestic radiation detection".	Total "domestic radiation detection" news items from U.S. papers.

Data: Using Lexis-Nexis, headlines from stories including terms "domestic radiation detection" are listed in the codebook. (*For a sample from the codebook, See Appendix Two*). These headlines are listed by item title, date, headline, and byline. Coders then assigned positive or negative sentiment for each story.

Gallup data were selected from the archive of terrorism-related polling surveys conducted from 2003-2013. The selected question represents the most applicable question.

The Google Trends website provides rescaled graphical depictions of search queries. The terms "domestic radiation detection" are also utilized for producing this graph.

Policy Knowledge: This variable reflects the accrual of policy technical knowledge by legislators.

HEARINGS	GAO REPORTS
This variable is measured through the frequency of statements and question and answer bundles in 65 Congressional House and Senate Homeland Security hearings from the 108th-113th Congresses.	This variable is measured through the frequency of statements provided in GAO reports submitted to Congress from 2003-2013 related to radiation detection equipment programs.

Data: 1,043 individual statement or question and answer bundles from 65 pertinent Congressional homeland security hearings are populated in the database with hearing date, title, committee, witnesses, speaker name, speaker affiliation and questioner, and statement or question and answer identifiers. The coder then determined whether the item has a political or technical theme, and if that item provokes a positive or negative sentiment.

There are many factors that influence policy change. The ACF provides a process for directly incorporating such factors into a single approach. This study acknowledges causal factors and recognizes that some remain unknown and unaddressed, while others are acknowledged but accounted for as residual by this

design. Often times, as in the case in this experiment, I encountered a small sample size. Including more samples is the best remedy for addressing the conservative bias that often occurs with small samples (that is, the presumption that there is no relationship, or that the relationship is not strong). Given the confines of this particular study, the whole population of pertinent hearings is still a small size, n= 65. The population of pertinent news items amount to 193. This does not mean the research is not worth conducting—it simply means that a good experimental design addresses this threat to validity and, if sample size cannot be increased, I was prepared to address it otherwise. "One of the most pervasive threats to the validity of the statistical conclusions reached in the behavioral sciences is low power. It is critical in planning experiments and evaluating results to consider the likelihood that a given design would detect and effect of a given size in the population" (Cohen J. , 1988). Therefore, while this project produces substantial amounts of data, the n is small, so standard statistical analysis of the data was unlikely to be very useful. Instead, the primary analysis was a visual analysis of graphs of key variables, lending to a less quantitative, soft interpretation of the data. Certainly, in the case of a policy change, no researcher can expect to account for each factor that might influence a decision. Of this challenge Cohen writes, "We can hope to manipulate or measure only a small number of likely factors of any event. The remainder we either fail to recognize or recognize but do not account for in our model" (Cohen J. , 1988). In this case, some of the recognized, but not accounted for, factors include: competing budget priorities, the persistence of Al-Qaeda's nuclear intentions and

ability to commit resources thereto, and the success or failure of other government programs.

In order to provide the robust longitudinal data the ACF utilizes for making observations about causes of policy change, both data sets are drawn from the 2003-2013 timeframe. Observations are compiled and considered in conjunction with dependent variable data representing program budgets for the same time period. If data reveal that policy knowledge instances elicit negative reactions from legislators, and those instances occur in conjunction with instances of negative media coverage, the timing and effect is notable. While not necessarily indicative of causation, this outcome suggests an observable correlation. In this study, the ACF and IAC propositions may not be isolated as the causation for budget decrements, but evidence of their effect upon the budget dependent variable is notable. Additionally, a lack of pattern would have, of course, undermine both the IAC and the ACF, as the hypothesis is logically deduced from those theories. The next section describes these variables in greater detail and reviews how the data collection process took place.

Data Collection and Variables

As aforementioned, one substantial challenge of this study is the demonstration of measurement reliability. In the following variable sections, arguments are made to support each measure. Also in each section, content is provided to describe deliberations associated with the development of a measure for each variable.

Jenkins-Smith and Sabatier's 1993 revision of the ACF suggests that "Scholars have largely neglected a potential gold mine for examining changes in elite beliefs over time: the content analysis of public hearings, other government documents and interest-group publications…has numerous advantages" (Sabatier & Jenkins-Smith, Policy Change and Learning: An Advocacy Coalition Approach, 1993). Although there are limitations to the analysis that can be provided by the observations drawn from hearings alone, this project does provide analysis beyond partisan politics—it does provide longitudinal analysis of beliefs over time, and it does include content from representatives of the public, private and academic subsystems (see Appendix 1, Organizational Affiliations).

First, a strategy for identifying and compiling copies of each pertinent hearing was compiled. "A hearing is a meeting or session of a Senate, House, joint, or special committee of Congress, usually open to the public, to obtain information and opinions on proposed legislation, conduct an investigation, or evaluate/oversee the activities of a government department or the implementation of a Federal law. In addition, hearings may also be purely exploratory in nature, providing testimony and data about topics of current interest. Most congressional hearings are published two months to two years after they are held" (Government Printing Office). Congressional hearings are one of five types, either exploratory, legislative, visibility, oversight or complaint. Table 3 shows a list of committees with jurisdiction to call hearings related to national nuclear defense. This study limited searches to the most common venues for discussion of radiation detection

equipment programs: the House Homeland Security Committee and the Senate Homeland Security and Governmental Affairs Committees.

Table 3

Congressional Committees

Congressional Committees	
Senate	**House**
Appropriations	Appropriations
Armed Services	Armed Services
Budget	Budget
Commerce, Science and Transportation	Energy and Commerce
Energy and Natural Resources	Foreign Affairs
Finance	Homeland Security
Foreign Relations	Intelligence
Homeland Security and Governmental Affairs	Science, Space and Technology
Intelligence	Transportation and Infrastructure

Limiting the study to the Homeland Security hearings enabled me to focus on retaining the same sample of participants in a static venue, thus clarifying observations of learning over time. Congress called many hearings to review issues such as the status of the nuclear terrorism threat, nonproliferation activities, and the nation's strategic objectives for deterrence. Hearings provide a structured environment for the social sciences researcher; it is therefore fitting to leverage the opportunity to make observations. Testimony directly related to this research question was accessed through Library of Congress's Congressional Record database searches, which accesses the U.S. Government Publishing Office Federal

Digital System (GPO FDsys) database. A variety of various test keyword runs were experimented with before I identified the words that pulled the targeted sample of hearings. Searches using the words "nuclear" or "radiation" or "equipment" or "nuclear security" identified a wide collection of hearings whose subjects included medical treatments, energy and the state of the U.S. nuclear arsenal. Refining the search to employ more specific keywords produced successful searches that collected the targeted data.

- The combination of "Domestic Nuclear Detection" and "radiation detection equipment" keyword searches nets hundreds of items prior to filtering. Each of the searches begins with the 2003 date range in order to capture the initial DHS discussions of radiation detection equipment programs. Filters were enabled to then draw the lists of House and Senate Homeland Security and Homeland Security and Governmental Affairs Committees, as well as associated Select and Subcommittee hearings. This produced a population of 37 hearings, 31 of these were held by the House Committee and the Senate Committee held 6.

- Keyword searches using "GAO" and "Domestic Nuclear Detection Office" were likewise run, producing 61 House hearings and 20 Senate hearings.

After printing the information screen of each of these hearings, I reviewed them individually for relevance. Duplicate listings were purged. Hearings in which any of the unique keywords ("Domestic Nuclear Detection Office", "radiation detection equipment", "Government Accountability Office") are mentioned in an isolated or passing manner are purged if their mention lacked proper context with regard to this study. For example, the single entire mention of the keyword that hit in one purged hearing read as follows: "DHS would need to standardize purchases of explosive, metal, and radiation detection equipment." While this statement is noteworthy to taxpayers and became an action item for DHS, the equipment is simply part of a generic list and its mention did not develop into a broader, specific discussion of

this equipment. Upon completion of this task, 65 hearings remained (See Appendix Five, "Hearings List"). This search produced 65 hearings equating to several thousand pages of material from the 108th-112th Congresses. In total, I read nearly 4,000 pages from the 65 hearing transcripts. From these, 1046 Statement or Question and Answer items were identified and coded as the screenshot from the codebook displays (see Appendix 2). Hearings and reports are selected because of their pertinence to radiation detection equipment. Keyword searches were initially employed to select the hearings to be coded, and these hearings were then read line by line. Portions of the hearing related to the study were highlighted and then coded into the schema. Included among these 65 hearings are the instances of GAO reports to Congress because these reports are submitted for the record in their entirety and therefore easily available for integration to the coded data pool. Furthermore, the collection of GAO items provides the most reliable representation of the types of technical knowledge provided to Congress.

Coding of the content of each legislative hearing results in data that reflects the attitudes of members over time. Each member's opening statements and pursuits of a topic during their allotted question and answer time in a hearing is a reflection of their pursuit of additional information. The most straightforward way to measure the accrual of policy knowledge is with a frequency count. For example, if a member returns their time to the chair or does not use the full five minutes, it can be presumed that the member is satisfied with the details provided by the witness or has nothing further to explore. When a member inquires for further details during their opening statement or vigorously pursues a line of questions with a witness, it is

reasonable to conclude that the member is in the process of gaining more knowledge through the responses and details provided in the venue from both witnesses *and* other members.

The purpose here is to make observations about the sense of Congress and subsystems regarding the detectors as a solution to dealing with the threat of nuclear terrorism. Changes in the sense of Congress and the subsystem provide us with that—it is not necessary to conduct more minute analysis to glean that impression. Three decisions were made during the course of coding an item. First, is the item presented as a statement or a question and answer bundle? Second, is the item technical or political? Third, is the item positive or negative? For example, in the case of the bundles, it is possible for a Congressman to ask a "negative sentiment" technical question and get a "positive sentiment" response. The purpose is to identify the overall sentiment of the bundle *as the exchange occurred*, and whether the outcome ultimately reflected positively or negatively upon the topic. Instructions indicated that opening remarks are coded as individual items. Questions by members of Congress and answers by a witness are coded together as a bundle. Coders considered whether the information presented in the hearings by witnesses and other members elicited a generally positive or generally negative sentiment. Coders made these determinations with the following philosophy in mind: Comments casting doubt upon the viability of the program are characterized as *negative*. Comments primarily supportive of the program are characterized as *positive*.

To aid in graphical analysis, each item could be coded as one of the following:

- Political Negative Statement
- Political Positive Statement
- Technical Negative Statement
- Technical Positive Statement
- Political Negative Question & Answer
- Political Positive Question & Answer
- Technical Negative Question & Answer
- Technical Positive Question & Answer

Speaker names and professional titles are compiled to aid my analysis, but speaker affiliations were the significant pieces of data in terms of the research questions for this study.[4] The coding activity was designed to identify instances of policy knowledge accumulation, and these instances were subjectively derived. The detailed statements, specific questions, and other nuanced exchanges occurred in each hearing venue and are highlighted from the body of the transcript. After fully reading each hearing and identifying each instance, the instances were coded. Then individual hearing sentiment tallies are counted and logged. As an example, if an exploratory hearing has 5 statements and 30 question and answer bundles, a total of 35 items are counted. These 35 items are distributed and assigned to the either the positive or negative sentiment category. All hearing data is populated into the mutually exclusive and comprehensive categories. In instances where an item could be assigned to more than one category, the coder determined which emerged most prominently, and assigned a category according to that determination. A second coder provided positive and negative sentiment assignments to a random sample of

[4]*Another study might consider if there are any notable frequency and sentiment differences among exchanges between House and Senate members during these hearings.*

news and congressional hearing items. This secondary coder insured intercoder reliability.[5]

Nearly all in-depth, exploratory hearings dedicated to the issue of radiation detection equipment programs occurred in the House and Senate Homeland Security Committees, so this study draws from those bodies. Other mentions of nuclear detection occurred in committee hearings related to broad topics such as terrorism—these typically include a single or limited number of exchanges and lack the depth necessary to make an observation about policy knowledge. It would be inadequate to code the various types of hearings as equally weighted, because the depth and are be coded as statement level or as question and answer bundles. For example, radiation detection equipment programs occurred in other venues, (such as Budget sessions) these mentions (typically made by the DHS Secretary) only refer to mission requirements, whereas the committees dedicated to the Homeland Security

[5] After I completed initial coding of all news and hearing items, a second, independent individual with general knowledge of radiation detection equipment programs received coding instructions. This coder then coded a random sample of a quarter of the newspaper articles and a third of the coded hearing items. Upon assigning positive or negative sentiment to each item, I confirmed reliability. Of the sample of 22 coded news items, the secondary coder matched my sentiment assignment 20 times, indicating that approximately 91% of the time, my coded assignment could be validated. Congressional Hearing data initially failed to match in 16 percent of the time—the secondary coder followed the same procedure and assigned positive or negative sentiment to 241 items. I reviewed the instances with the secondary coder and observed that sentiment assignments did not match in 48 instances. Together, we determined that, of these, we considered 15 squarely equivocal. Because the coding instructions indicate that the assignment must be either positive or negative, this difference indicates that there are occasions in which the coders did not make the same choice, and brings intercoder reliability to approximately 87 percent. It is notable that in the majority of these instances, the written records both coders indicate some sort of note to this effect (such as a "?" indicating uncertainty or a note, "Could be either?". Of the remaining 33, I noticed several that were incorrectly logged, and the rest are considered a difference of opinion altogether. It is also notable that the bulk of the conflicting sentiment assignments occur in one particular hearing involving the GAO and DNDO leadership. The coders discussed this and think this is possibly because, in their role as auditors for Congress, their feedback can be helpful for identifying and correcting issues in government programs. Such criticisms might be considered positive, as they should ultimately lead to positive change and improvement. On the other hand, critical assessments from GAO may also result in budget cuts, management changes, strategic redirection, etc., all of which are unfavorable, negative circumstances.

mission delve into greater detail and provide a more accurate reflection of Congressional policy knowledge. Although this manner for determining overall sentiment is seemingly laborious, it is the most effective and efficient way for honing in on the status of these issues in a way that is befitting of a longitudinal study. The purpose of this level of coding is to chart Congressional exposure to information and whether scientific information informs policy change. Thematic coding is a superior means for coding hearing data because it allows a "single assertion about some subject" (Holsti, 1969).

Congressional staffers, specifically legislative affairs professionals, play a critical role in forming and guiding member statements and expertise. These individuals formulate reading packets, briefs, and hearing materials, including lists of questions and requests from witnesses. Members leverage the expertise of another member's staff by listening intently during a hearing or holding information sessions outside of chambers to learn more about a topic. It is appropriate to include statements made to the body by members as well as those from invited witnesses for this reason. The hearing provides an opportunity for members to hear from witnesses, but also from each other, thus enhancing the accumulation of knowledge not only by way of the witnesses testifying, but through the collective experience the legislators have over time.

Because few members and witnesses testify repeatedly, proper names are noted in the coding records, but the emphasis is upon noting who is a part of the hearing process, either as Congressional committee members or as representatives of government agencies, NGOs, or interest groups over the course of two or more

years. Ultimately, as Barke explains, "Operationally, we look for policy learning in explicit or consistent changes in behavior that make outcomes more congruent with stated or inferred goals. The relevant learning may be about procedures that make goal attainment more likely, or it can be about the substance of policies, such as empirical facts, causal relationships, political necessities, and so on" (Barke, 1993). The collection of coded data allowed me to observe this learning over time. The coding guide reflects instances of technical versus political exchanges as well as the sentiment of these exchanges.

Another reason why the hearings provide valuable information is because they are conducted under the guidelines of Parliamentary Procedure. Due to this, all attendees are afforded similar opportunities to present questions and exchange their viewpoints in a participatory manner. The committee chairperson is obliged to ensure that participants are allocated such opportunities. Parliamentary procedure therefore promotes structure and order that in turn promote testimonial data that is suitable for recording, coding and measuring as policy knowledge data as described in this study design. The use of parliamentary procedure promotes a rigor that decreases threats to external validity presented by measuring learning in alternate manner. In the representative government of the U.S., the pool of Congressional members participating in any given Homeland Security hearing may include medical professionals, attorneys, businesspeople and career politicians. Their range of knowledge on any given topic may span novice to expert. This design accounts for that by collecting longitudinal observations of the Committee bodies over time, not of individual members. The learning concept is applied to the body of decision-

makers, not on the individual level. Because resource decisions are made with a majority vote by the body, learning experiences are observed accordingly. Limiting the study to House and Senate Homeland Security hearings also generally promotes participant consistency.

The same code words were then employed to search for related news items via Lexis-Nexis. In this portion of the content analysis, I used newspaper headlines as a measure to chart public issue attention as either "positive" or "negative" by reviewing the lead segment of the article as pulled. This initiative drew data from three select papers. This longitudinal article pull resulted in the collection of a total of 138 news stories. The coding method employed for this research is designed to identify trends in the news coverage of radiation detection equipment programs, thus reflecting the public's attention and exposure to the issue. This method provides us with longitudinal public sentiment data reported by these three media sources using the same positive or negative sentiment characterizations as employed in the coding of hearings. Analysis of this data considers the positive/negative aspects of the coverage and, separately, the total amount of coverage as an indicator of public issue attention. Determining if the reporting provokes a positive or negative sentiment from a reader, I am also able to compare this sentiment against the sense of Congress as revealed by the coding of hearings.

This overview provided the basis for the study and described data collection techniques. The next three sections describe the rationale for each variable selection—budget as a dependent variable, and policy knowledge and public issue attention as independent variables.

Budget as the Dependent Variable

Budget changes influence policy because the breadth and depth of programs is contingent upon the funding support received through FY allocations. Budgetary allocations also indicate where programs comparatively stand in the realm of Congressional priorities each year. Domestic radiation detection equipment programs received funding before the DNDO was established in 2005. In 2003, a detection test bed project at the Port Authority of New York and New Jersey transitioned from DOE to the Science and Technology Directorate (S&T) of DHS. S&T's role at DHS is to lead national science and technology research. S&T's mandate allows for their coordination and partnership with private companies, institutes, universities, and laboratories. Within the S&T portfolio, the Weapons and Mass Destruction Incident Management Division initially provided management and support for the mission. Throughout 2004, S&T managed the development and deployment testing of portal monitors. In 2005, the DNDO was authorized: "There shall be established in the Department a Domestic Nuclear Detection Office (referred to in this subchapter as the "Office"). The Secretary may request that the Secretary of Defense, the Secretary of Energy, the Secretary of State, the Attorney General, the Nuclear Regulatory Commission, and the directors of other Federal agencies, including elements of the Intelligence Community, provide for the reimbursable detail of personnel with relevant expertise to the Office. The Office shall be responsible for coordinating Federal efforts to detect and protect against the unauthorized importation, possession, storage, transportation, development, or use of a nuclear explosive device, fissile material, or

radiological material in the United States, and to protect against attack using such devices or materials against the people, territory, or interests of the United States" (U.S. Government, 2005). Federal civilians, military officers, national laboratory experts, and other individuals with appropriate skill sets were recruited to join the existing DHS staff. Robust funding ensured DNDO could pursue research and development projects, deploy test beds, conduct exercises, and continue to invest in improving existing equipment and operations.

For the purpose of this research, budget figure data is most informative in the context of the federal budget cycle. Rather than a singular focus upon the total amount of FY authority, a retrospective assists in an understanding of what policy knowledge and issue attention events were occurring when fiscal decisions were made. The formulation of the President's budget occurs roughly 19 months before the Fiscal Year. That budget is transmitted to Congress, who, over the course of the next ten months, take appropriation action by September 30 of the prior FY (barring a Continuing Resolution). Congress makes appropriations decisions are throughout the 10 months leading up to the October 1 start of the FY. Therefore, the decision to authorize a significant decrease in the FY 2010 budget emerged at or around April 2008.

Public Issue Attention as an Independent Variable

Measuring public interest presented a challenging task. I pursued a variety of methods for identifying trends in public support of nuclear security programs and determined that major newspapers are the most useful indirect measure of public issue attention. Newspaper headlines are archived and available for longitudinal

studies, and major newspaper editorial boards are generally consistent with their approach to weighting the topics, and with how they consider what is newsworthy or notable to consumers on any given day. News items are pulled from reputable, long-standing media outlets with electronic archives—in this case, from *The New York Times, The Washington Post and the San Jose Mercury News*. The electronic repositories of these papers allow for headline and story searches over the timeframe. The conclusion is that the public maintains a generally persistent interest in the topic of nuclear terrorism, but this interest is akin to other subjects that provoke periodic, generalized fear (such as a flurry of news coverage addressing natural disasters, diseases, cyber attacks, financial catastrophes). The relationship between exposure to news stories that is actually measured in this variable is deemed the most likely reflection of public interest in domestic nuclear detection at the time because there is no other historical longitudinal measure that can reflect robust face validity desired to most accurately measure issue attention. In this case, it was determined that the best way to measure public interest is by measuring how much exposure (and therefore, how often the public was reminded of) the nuclear terrorism issue. Headlines provide data for exposure frequency, but also allows for a sample that can be coded as either positive or negative coverage. Special news reports, investigative reports, panel discussions, and in-depth print features detail the threat of nuclear terrorism.

However, because these articles provide an indirect reflection of public issue attention to chart through the IAC, two alternate tools were utilized to validate the data provided by the newspaper coding technique. Google Trends data and Gallup

Pooling data supply repositories of historical information that, when considered in conjunction with the data collected per this methodology, ultimately confirmed the predictions of the IAC as evident in this case. Each of the three—the newspaper coding done for this project, and the Google Trends and Gallup Pooling data indicated the similar public issue attention behaviors from 2003-2013. Confirmation of the efficacy of the IAC allowed the research plan to continue using the data according to its phases.

The Washington Post and The New York Times are widely circulated and popular among members of Congress and their staffs. *The San Jose Mercury News* is distributed out of the West Coast and has the sixth widest circulation among dailies in the United States.[6] These three papers were selected to reflect some of news material Americans and members of Congress are likely to encounter. *The New York Times* published more than 14,000 stories about Al-Qaeda from 2003-2012; of these, more than 1,000 included mention of the organization's nuclear pursuits. Sixty-four of these stories are pertinent to radiation detection equipment over the course of this study's timeframe.

Gallup Polling questions related to nuclear terrorism are not thematically consistent during the 2003-2013 timeframe; this forced me to make a subjective decision regarding the intent of each poll and the spirit in which the respondent answered the question. For example, a direct question: "Does the prospect of a

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[6] *The New York Times* and *The Washington Post* are two of the most widely read newspapers in Washington, D.C., and are also considerably circulated nationwide. The third paper selected for this project is *The San Jose Mercury News*. This paper was selected because it is the most widely circulated newspaper in the west, with the exception of *The Los Angeles Times*. (Daily circulation in print: *The New York Times 1,897,890; The Washington Post 431,521; The San Jose Mercury News 546,282* (Alliance for Audited Media, 2013*)*. Searchable archives for these newspapers are available through Lexis-Nexis.

nuclear terrorism attack frighten you?" would certainly evoke an affirmative response. But an indirect question, "How concerned are you that a nuclear terrorist attack could affect you or someone you love?" would not elicit the same absolute reply. Ultimately, making comparable observations over time using polling data, despite the robustness provided by the scientific rigor employed by organizations such as Gallup, was not possible for this niche issue area. Instead, I utilized a Gallup poll that reflects American perception of terrorism as degrees of likelihood over time. This trend line provides a useful benchmark for making comparisons of it to the Google Trend and IAC tools.

Likewise, Google Web Trends using the keyword searches "domestic nuclear detection" produces graphs of rescaled search queries from 2003-2013. With the exception of a minor uptick in 2011 that relates to a surge of interest in the Iranian nuclear program, the Google Trends data fit nicely against the other frequency charts.

Independently, these graphs do not relate to the hypothesis for confirmation of association. When they are overlaid with budget data, an association is exhibited if the two graphs alternative hypothesis cannot be rejected; support for the null hypothesis indicates no correlation between exogenous variables and policy change.

Policy Knowledge as an Independent Variable

There is significant debate among scholars as to what constitutes policy knowledge. A most effective way to observe policy knowledge is through policy core changes. For example, major budget decrements indicate that legislators have accumulated knowledge that informs their belief that a program is not performing as

expected. Legislators allocate significant resources to a program with the impression that a solution is available or that an investment will produce an operational solution.

In this study, data for the policy knowledge independent variable is drawn from Congressional hearings data, including that derived from GAO participation in the hearings. Hearings are a suitable medium for pursuing an understanding of Congressional policy knowledge and the progress of policy knowledge is because they provide an environment that provokes analytical debate. "The task, then, is to identify the conditions under which a productive analytic debate between members of different advocacy coalitions is likely to occur. The indicator of such a debate is that one or both coalitions are led to alter policy core aspects of their belief system—or at least very important secondary aspects—as a result of an observed dialogue rather than a change in external conditions" (Jenkins-Smith & St. Clair, The Politics of Offshore Energy: Empirically Testing the Advocacy Coaltion Framework, 1993). Congressional hearings over time revealed many instances when factors (such as exchanges of technical information) draw coalitions away from their policy core beliefs through debate, statements, and question and answer sessions.

Because no incidents of domestic terrorism occurred during the course of this longitudinal study, Committee members ultimately remained unsettled by additional exogenous shocks that may have otherwise influenced their shared deep core commitment to U.S. national security. The influence of technical information and new knowledge contributes to shifts in policy core beliefs and eventually leads

to declining resource support. The legislator's advancement of their collective policy knowledge, and the influence of constituent interest (or lack thereof) are isolated as factors potentially contributing to the domestic nuclear detection policy shift. The frequency of statements and question answer bundles in hearings over time provides data, but the rich insights are drawn from what those exchanges do or do not include, what events surrounded the exchanges, their tone, and who spoke. Numerous scholars describe the importance of these exchanges and the manner in which they contribute to decision-making.

The ACF considers policy change beyond legislative bodies and includes subsystems. In this case study, the hearings provide a rich data set for a number of reasons. There are instances in which a hearing may call for bicameral participation, allowing both House and Senate members to share the venue and benefit from witness and member exchanges as a legislative whole. Developing a coding schema to capture participant data and determine organizational affiliations was crucial in terms of the ACF. This coding allowed me to acknowledge the role of affiliations in this theoretical framework by charting their shifts among coalitions as beliefs change over time. For this project, the broad nuclear security policy subsystem includes national laboratory personnel, port authorities, legislators, nonprofit advocates, and program managers from the DOE, DOS, DOD, DHS and the Executive Branch as represented by department secretaries. Auditors from the GAO are also among consistent participants in the hearings. Their testimonies were grouped into six organizational affiliations. Each of these entities (and a few others) presented testimonies regarding nuclear detection equipment to Congress during the

timeframe 2003-2013. (For a list of Organizational Affiliations, see Appendix One). All together, this subsystem shared a core commitment to domestic security and initially also shared policy core beliefs that supported defense against a nuclear or radiological terrorist attack with radiation detection equipment deployments at international seaports, airports and border crossings. Other subsystem members including legislators, program managers, interest groups and private sector businesspeople participated together in hearings. Coded testimony revealed shifts in affiliations and policy core beliefs over time. First, beliefs centered around core U.S. national security interests, and later with differing secondary policy beliefs regarding the manner in which the national security mission could be addressed with radiation detection equipment.

The relevance of GAO's contributions to the subsystem is also essential to the policy knowledge component of this research. GAO, in support of Congressional oversight, provides the following services to Legislators:

- Auditing agency operations to determine whether federal funds are being spent efficiently and effectively;
- Investigating allegations of illegal and improper activities;
- Reporting on how well government programs and policies are meeting their objectives;
- Performing policy analyses and outlining options for congressional consideration; and
- Issuing legal decisions and opinions, such as bid protest rulings and reports on agency rules (Government Accountability Office, 2016).

Each of these is essential to Congress's decision making. Performance assessments and other evaluations of program performance are based upon detailed independent reviews, and all options are developed by GAO subject matter experts and based upon findings drawn from interviews, source documents and other

products they encounter during an inquiry. The technical information they provide in their testimony is intended to inform legislators by addressing critical strengths and weaknesses. "We provide Congress with timely information that is objective, fact-based, nonpartisan, non-ideological, fair, and balanced" (Government Accountability Office, 2016). Their service is of critical importance to the policy knowledge required by Congress to make decisions. Based on GAO data and other accrued policy knowledge, legislators determine if the information indicates a program is not producing intended results. Legislators may then determine whether they should re-scope a program, adjust the funding for the program, or make another core change reflective of their new knowledge.

Replication

Replication of this study is possible with identification of another policy change event exhibiting the factors suitable for testing within the ACF: longitudinal pertinence, presence of subsystems, influence of exogenous events, etc. There are countless initiatives undertaken by the U.S. that generate multi-year resource allocations as well as ongoing media coverage. The conclusions of this particular case may be generalizable to future studies of policy change. This case was exceptionally well-suited for consideration in the context of ACF and IAC because of its technicality and the lack of political polarization surrounding the deep core beliefs.

Replication requires selection of a policy change event influenced by events occurring throughout a decade or more. A researcher's design should address the ability to access content pertinent to the policymaking process, either through open

source news reporting, federal documents, legislative testimonies, interviews, or another resource for the dataset before proceeding, ensuring that a decade or more timeframe is accessible. The researcher will then require a coding schema for organization of data, particularly to show technical information exchanges or other policy knowledge accrual over the course of the select time period. This data provides the basis for the researcher's observations of the factors contributing to the policy change. This study focuses upon a policy change that was evidenced by a significant budget decrease. However, the dependent variable does not have to be reflected in this manner.

Methodology Summary

In order to consider the influence issue attention and policy knowledge may have upon policymaker budget decisions, I conducted a qualitative analysis of source documents. The ACF provided a testable hypothesis for incorporating accumulation of policy knowledge within the longitudinal timeframe, while the IAC provided a context for structuring longitudinal public issue attention by organizing analytical products into phases. Headlines drawn from three select newspapers are coded and organized according to the phases of the cycle, thus providing details of the public's interest in the issue overtime. A relational content analysis of select hearings from the 108th-112th Congresses by the House Committee on Homeland Security and the Senate Committee on Homeland Security and Governmental Affairs (2003-2013) provided the compilation of data needed to test the policy knowledge factor of the hypothesis. In the next chapter, graphical depictions of policy-oriented learning and public interest as dependent variables are presented in a

variety of ways to display their relationship with budget policy changes. I sought to determine whether there is a correlation among nuclear detection policy changes, policy knowledge, and public issue attention. Using content analysis by coding, I identified, listed, counted, and determined sentiment of newspaper headlines for the public issue attention variable as an exogenous factor influencing policy change. I then identified, listed, counted, and determined sentiment for the second variable, policy knowledge, as reflected by statements and question and answer exchanges in House and Senate Homeland Security hearings. This data was compiled using Excel's sort, search, chart, graph, and statistical functions.

Various charts and graphs were compiled to aid analysis. Among them, a graph of political and technical knowledge instances, depicted in conjunction with newspaper headline frequency, is presented longitudinally against a FY budget backdrop. Another reflects the persistence of newspaper reporting on the issue of nuclear detection equipment. Others show coalition participation. There are a variety of additional graphical analyses that could be compiled with this data, including political party over time, department representation over time, and other displays of coalition participation in terms of broad and individual categories. The analytical products presented here are intended to relate directly to the hypothesis and research question. The data collection and analysis undertaken in this study further confirms the presence of the ACF and IAC's exploratory power for this case—while not reflective of causation, the analysis chapter will detail a variety of instances in which the ACF and IAC are suitable for application to this case.

CHAPTER FOUR

Analysis

Introduction

After an overview of answers to the research questions, this Analysis Chapter first presents data from Google and Gallup that confirm the efficacy of the IAC as a tool for making general predictions about public attention behaviors. Then, the chapter presents a variety of analytical products that indicate the precise manner in which public issue attention and Congressional policy learning factors support the research hypothesis. This chapter provides analytical products and conclusions based upon qualitative analysis of data and collective observations derived from content identified per the methodological plan described in Chapter Three. The objective of these analyses is to draw conclusions regarding the usefulness of the IAC as a tool for consistently predicting the behaviors of the public as related to an issue receiving national attention. Next, an explanation for the rejection of the null hypothesis in this case is provided, and support for the alternative hypothesis is detailed. This objective is completed in the context of the ACF policy subsystem, with particular attention to public issue attention as a factor external to the subsystem and policy knowledge accumulation as a factor influencing bureaucratic actors internal to the subsystem.

This Analysis Chapter is arranged to provide a historical account and analytical products in terms of the IAC phases as described in Figure 6. The IAC provides a vehicle for organizing data, observations and findings in a longitudinal way. In each phase, pertinent data and analysis reflecting the phase are presented

both in terms of their place in the context of the IAC and the ACF. First, the Research Questions are answered.

Research Questions, Answered

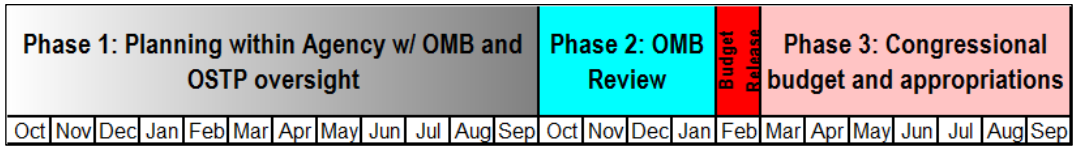
1. Can the IAC be validated as a tool for measuring public issue attention in this case? Yes, Google Trends and Gallup data, as secondary and tertiary sources of issue attention provide supporting evidence of the phases of public issue attention as described by Downs (Downs, 1972).
2. Is there a relationship between Congressional policy knowledge, public interest and budget decisions? In addition to the rejection of the null hypothesis, this research indicates exogenous factors such as public issue attention and internal factors such as policy knowledge influence policy change in this case study. According to the hypothesis derived from the ACF and in conjunction with the IAC, I expected to find radiation detector program policy changes occurred when Congressional policy knowledge accumulated while a decline in public issue attention was underway. Although I did not isolate causation with this project, I did observe that the significant adjustments made to the FY 2010 DNDO budget occurred in 2008. The federal budget process begins 18 months prior to the budget release. In this case, the 20 percent reduction of the FY 2010 DNDO budget was determined by decisions made in 2008 and

2009.[7] The two independent variables over time are shown with no other extraneous information, broadly supporting the essence of the research hypothesis, that is—major policy change in 2008 is associated with a decline in public issue attention and increase in policy knowledge.

3. Does the timing of increased Congressional policy knowledge and declining public interest coincide with decreased budget allocations? Yes, legislators accrued radiation detection equipment-related policy knowledge over time, and in 2008, a significant number of technical exchanges occurred. This heightened Congressional inquiry coincided with a decline in public issue attention, as indicated by a decline in news reporting and search engine queries. Together, these factors may indicate a relationship with the 2008-09 Congressional votes which significantly reduced the FY 2010 DNDO budget.
4. Do other phenomena anticipated by the IAC and the ACF emerge from these variables? Research verifying the validity of the IAC as a tool for anticipating public attention phases to major domestic issues is provided. A general observation about the nature of advocacy coalitions can be made, particularly in terms of the behavior of the Law Enforcement and Private Sector coalitions. In this case, these coalitions initially invested time and resources into sharing their positions regarding radiation

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(Hourihan, 2014).

detection equipment. These coalitions' core commitments to border security remained aligned to the subsystem, but their secondary policy core beliefs did not. After a variety of challenges, these coalitions shifted their emphasis. The emergence of divergent secondary policy beliefs dominated testimony much of the 2008-2009 timeframe.

Research Question #1: Can the IAC be validated as a tool for measuring public issue attention in this case?

Prior to conducting analysis directly related to the research hypothesis, news item data related to the IAC factor presented the following frequency data. Figure 2 depicts the number of radiation detection equipment-related news stories that the three newspapers published each year, and provided a baseline for comparing the research data to other public issue attention measure tools. Of the 138 news stories from these three sources, seventy-one of the stories are coded as positive and sixty-seven of these stories are coded as negative. This indicates a balance in reporting from 2003-2013, but the analysis section will delve into the particulars of this data, which show that the majority of the negative reporting occurred in the later half of the longitudinal timeframe. This study design considered that story counts do not directly measure public issue attention. Due to this, additional data sets from Gallup, Lexis-Nexis and Google present additional information to bolster the data provided by this study's measure. These data indicate that the public's overall interest through queries (see Figure 4, Google Web Search) and news exposure (see Figures 2 and 3) and perception of the threat (see Figure 5) all follow the same general pattern as predicted by the IAC.

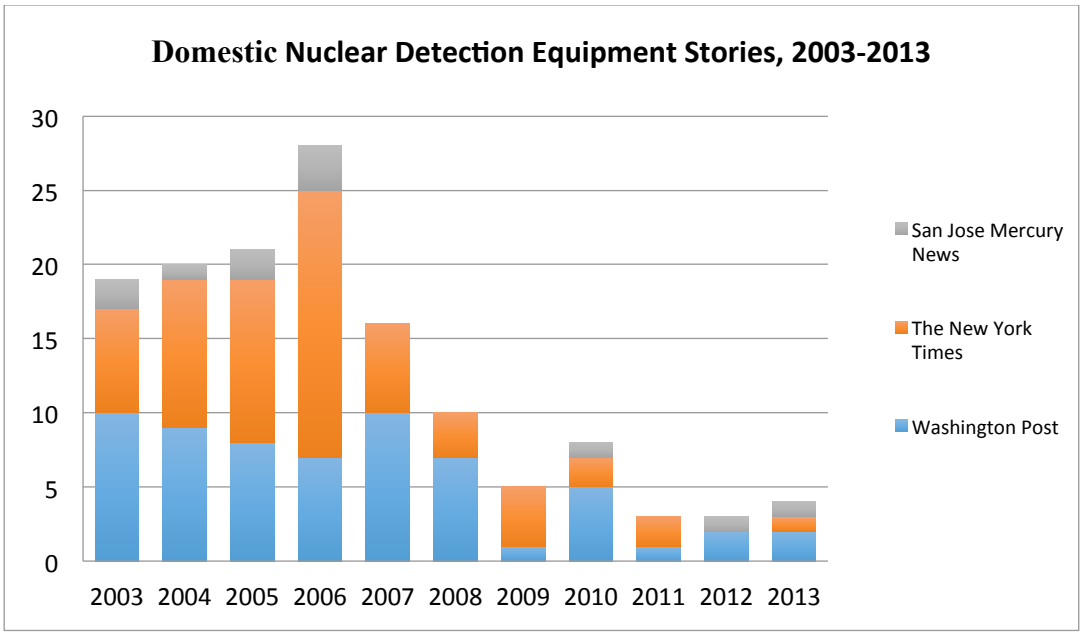


Figure 2: Domestic Nuclear Detection Equipment Stories, 2003-2013

Next, Figures 3-5 exhibit the three metrics intended to confirm that the IAC could logically support public issue attention behaviors. After determining the manner in which the data could be represented by the phases of the cycle, it became possible to compare IAC phases to trends recorded by Google and Gallup. The following two sections exhibit the Google and Gallup data as related to the "domestic nuclear detection" search terms.

Search Engine Trend Data as a Reflection of the IAC

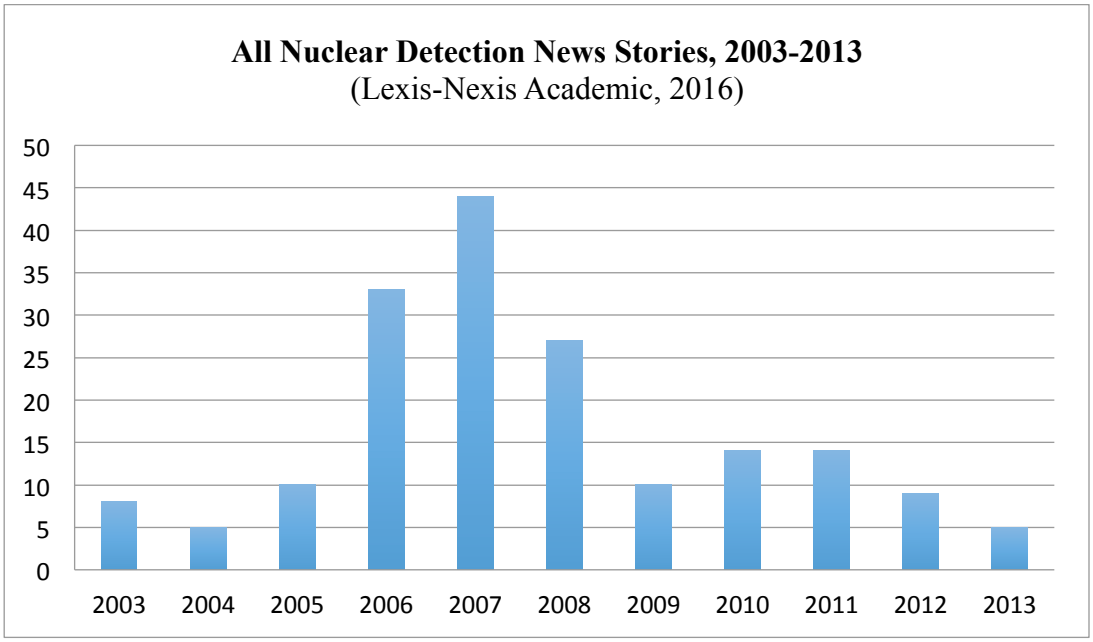


Figure 3: All Nuclear Detection News Stories, 2003-2013

Figure 3 shows the frequency of searches for the terms "domestic nuclear detection" using the Lexis-Nexis search feature. Despite the snapshot, the graph still portrays similar cycles of attention as that of the news data collected for this study, including a rapid decline in public interest leading into 2009 and the minor resurgence of interest as budget cuts and a redefined DNDO mission are announced. This graph must be considered with the additional understanding that in 2010 and 2011, three additional events led to surges in reporting: the Nuclear Security Summit, Iran's nuclear program, and the earthquake that caused the Fukushima nuclear disaster. Each of these three major news events specifically detailed efforts to utilize radiation detection equipment for safety and security purposes, making isolation of news items specific to this case study particularly challenging in the search. Therefore, the sources of these peaks in this timeframe are at least partially

unrelated to this project. Unlike the data pulled and sorted specifically for this project, Google Trends draws all stories containing these keywords. Corrected for these instances, the chart would reflect the ongoing gradual decline of public interest phase that began in 2008. The following headlines are among those readers saw in 2010 and 2011: from *The Washington Post* in 2010, "No Plan Formed to Keep Bomb Materials From Crossing Borders" and from *The New York Times* in 2011: "Nuclear-Detection Effort Is Halted as Ineffective".

Figure 4 is a snapshot of output from Google Trends, displaying a rescaled trend line reflecting Google user queries of the terms "domestic nuclear detection" from late 2004-2013 (Google Trends, 2016):

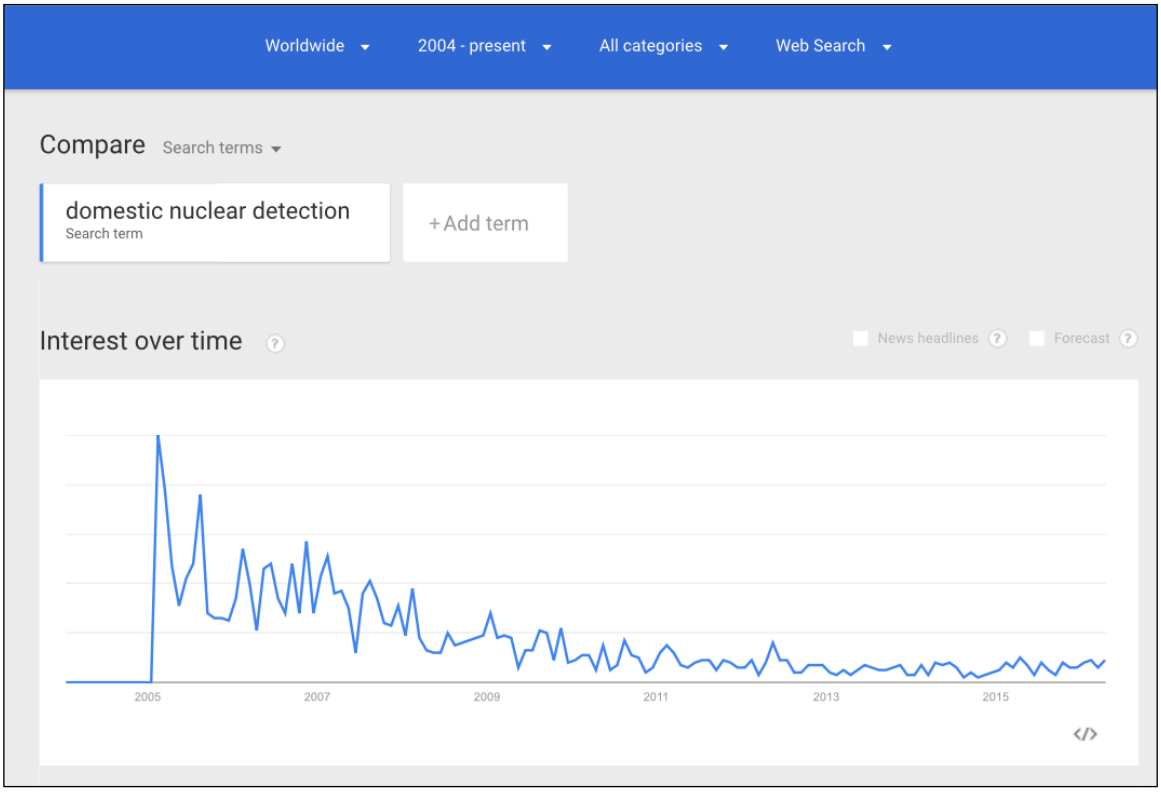
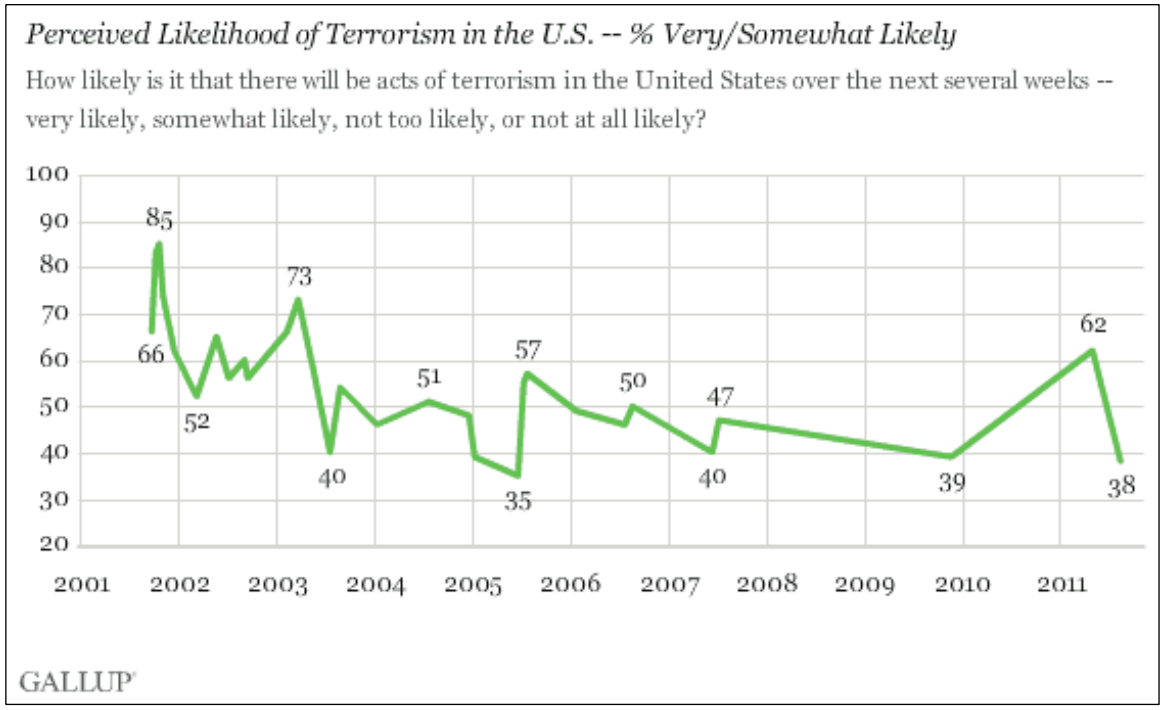


Figure 4: Google Web Search, "Domestic Nuclear Detection"

The 2005 establishment of DNDO is observed, as is the gradual decline observed from 2006-2008, which reflects waning public interest. Figure 4 corroborates the data collected through the public interest measure in this study. Encouraged by the general similarity of Google Trends alongside the research news data, Gallup data was then considered for its ability to validate the IAC measure developed for this project.

Gallup Trend Data as a Reflection of the IAC

Analysis of the following Gallup polling data also reflects IAC phases—9/11's profound effect upon Americans, their sustained interest and concern about terrorism, and eventually, a plateau reflecting a gradual decline of concern. Although Figure 5 shows a seven-percentage point decline in the likelihood of terrorism from month 2006 to August 2006, a Gallup poll conducted in August 2006 indicated that forty-seven percent of Americans polled believed it to be "likely" that a terrorist would set off a bomb containing nuclear or biological material (Gallup, 2006). Integrating this observation into the assessment of public issue attention over this same timeframe, this graph lends to a conclusion that Americans shifted their attention to other issues as the significant post-9/11 preoccupation with the terrorist threat steadied after 2003. By 2008, concerns about impending terrorist attacks plateaued, reaching a near low in 2010.



(Saad, 2011)

Figure 5: Gallup Perception of Likelihood of Terrorism

In summary, in terms of the hypothesis for this dissertation, I am able to validate that the measure developed for this study can be applied to the IAC in this case. Internet search engine trends and Gallup polling data alongside data collected for this project corroborate the value of the IAC in terms of this case study. The graphical depictions of public issue attention indicate each of the phases of the IAC as expected. The comparisons reflect similar cycles of public issue attention as news data collected in this study reflect, and indicate that Downs' impression that the public drive media coverage. From this, I am able to validate the efficacy of using the data I collected for charting public issue attention during the time of the study, which then contributes to analysis using the ACF to describe the subsequent policy change. I aimed to contribute a case study that ties the IAC and the ACF

together to make observations about policy change as longitudinal data catalyzes into a major shift of policy core beliefs.

Research Question #1 Findings

Informed by analysis of the data derived from the coding activities included in the dissertation design, historical documents, personal knowledge and along with the additional information derived from other sources of public attention, (Google Search Trend and Gallup Polling Data), support the IAC for this case study in the following phases shown in Figure 6:

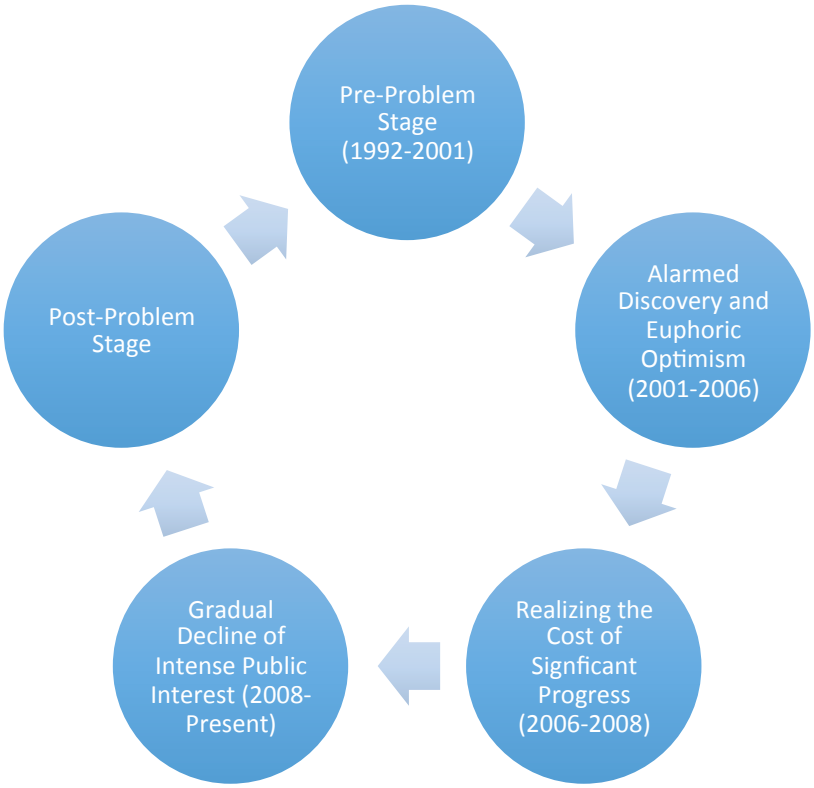


Figure 6: IAC Phases

Upon confirming the relevance of the IAC as a suitable model for considering the events of this case, data from the policy knowledge variable is incorporated into the analysis.

The hearing data collected for the policy knowledge variable reveal how members of the nuclear security subsystem participated in coalitions, and also how these coalition core, policy core and secondary policy beliefs shifted throughout the course of the longitudinal timeframe. The influence of new knowledge and other internal and external factors upon subsystem members is explained by the ACF. This subsystem engagement (May, Sapotichne and Workman, 2009) reflects how policymakers attend to learning and seek additional policy knowledge when a widespread policy disruption such as terrorism occurs. In this case study, the need for a keen understanding of the mechanics of radiation detection equipment as well as the possibilities of future generation equipment became imperative to legislators. Congress sought to make immediate and effective decisions regarding the safety of American seaports and metropolitan areas that might be targeted in a nuclear terrorism event, but few had any reason to understand the science of nuclear material detection prior to the 9/11 terrorist attacks. The emergence of advocacy coalitions occurred in an interesting way. Initially, all parties indicated support of detection equipment resources and there was very little dissent among members of Congress. Core beliefs centered upon a strong commitment to domestic security. The broad consensus that an Al-Qaeda nuclear threat did indeed present a legitimate concern to U.S. domestic security, coupled with an understanding that domestic points-of-entry presented the most significant vulnerability guided discussions in the

early years. As time passed, the blanket support of detection programs began to diminish by individuals who retained the same core commitment to national security began to fragment into advocacy coalitions with differing secondary policy core beliefs. The identification of persistent coalition members at the individual and entity levels helps researchers recognize and track policy and core policy beliefs. Collecting and reviewing longitudinal data aided me in identification of policy evolutions where they might otherwise be imperceptible.

Table 4

Beliefs Applied to Case Study

Deep Core (Normative) Beliefs: The broadest and most stable among the beliefs and are predominately normative	**Policy Core Beliefs:** Moderate scope and span substantive and geographic breadth of a policy subsystem. Subsystem specificity makes them ideal for forming coalitions; resistant to change but likely to adjust with new information	**Secondary Policy Beliefs:** Secondary beliefs are more substantively and geographically narrow in scope, and more empirically based; most likely to change over time
Broadly bipartisan and subsystem-wide support for homeland defense	• Pro-Radiation Detection Equipment • Pro-Law Enforcement and Human Intelligence	• DHS management of detection equipment programs • Department-specific management of nuclear interdiction assets

(Weible, Sabatier, & McQueen, 2009, pp. 122-123)

Munro credits Sabatier and confirms in his "California Waste Water" article that, as the dominant policy core is challenged, minority coalitions emerge with significant powerbases (Murno, 1993). In this case study, I observe the emergence of a pro-detector coalition made up of members from the national laboratories and the Department of Energy, and eventually the Department of Homeland Security,

whom successfully marketed current and future-generation radiation detection equipment as a solution to the threat of nuclear terrorism. From the start of the U.S.-based detection deployment initiatives through 2013, the coalition advocating detector deployments shifted from highly supportive (large funding and resource allocations) to less supportive (fewer funding and resource allocations). Despite acquiescence to reduced funding in fiscal year 2010, this pro-detector coalition persisted with a secondary belief centered upon technical interdiction as its strategic foundation. Equipment performance shortcomings led to the identification of alternate technologies and further investment into research and development.

The dashed black line in Figure 7 shows the sudden withdraw of the law enforcement coalition after 2006, which could be indicative of their determination that detection tools were just a small part of the suite of requirements front-line officers required to adequately promote secure borders. Also at this time, there is a significant decrease in the level of participation among Private Sector Coalition members. The initial participation of port authorities and representatives of shipping organizations waned once they advocated according to their requirements as equipment end users. These early sessions provided the law enforcement, customs, and shipping industry with the opportunity to describe their roles and responsibilities to Congress. The spike in 2005 includes such instances, as well as occasions when, as DNDO emerged with its mission, Coalitions advocated for the manner in which they would interface with DNDO. These occasions also allowed for feedback regarding equipment use in the field to date. The law enforcement and private sector coalition supported DNDO and also lobbied for radiation detection

equipment funding from 2003-2013. Yet, as the detectors failed to meet expectations, significant changes to DNDO's initial strategic domestic nuclear security architecture became necessary. The strategic vision for port and border security shared in 2003 became untenable. Thus, the energetic support that the law enforcement personnel conferred upon the pro-detector coalition from 2003 through mid-2006 dwindled. At this time, law enforcement, as well as private sector participants returned to their policy core beliefs, focused primarily upon advance intelligence and human element interdiction. If available, radiation detection equipment integrated into these existing law enforcement operations. By 2008, public interest in national security issues subsided significantly, and the accumulation of policy-relevant knowledge among Congressmen and other subject matter experts began to influence secondary and tertiary beliefs regarding further investment in the equipment.

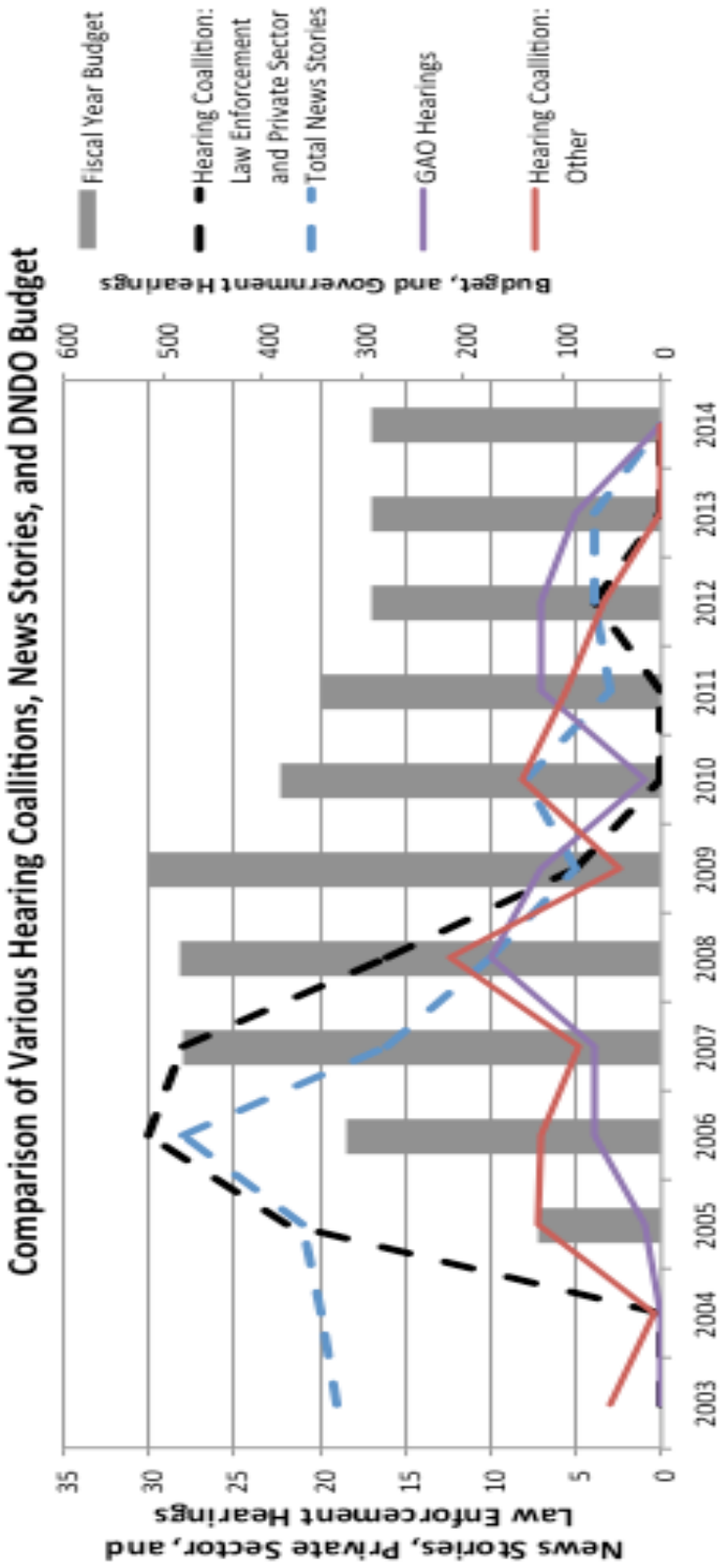


Figure 7: Comparison of Hearing Coalitions

After making a strong case initially for resources and support, CBP scaled back their optimism regarding the impact of equipment alone. In 2005, CBP Commissioner Stephen Flynn indicated that the Euphoric Optimism once expressed by Customs and the American public was being undermined by a variety of practical issues in the field. In a hearing that year, he said:

> Commander Flynn. Mr. Chairman, if I can on that issue, one of the biggest problems is the disconnect between radiation portal monitors and gamma scanning and whether or not detection can happen. CBP may have good equipment, but when they are not used together, the central problem is this. Radiation portals won't help you with shielded weapon, which would be a loose nuke. It won't help you with a shielded RDD, a dirty bomb. And it won't help you with highly enriched uranium because it doesn't give off enough of a signature vis-a-vis the background. So to rely primarily on a radiation portal technology, it is not helping us with the scariest problem set. But when you have a radiation portal, it forces the shielding because they know you could detect it for the dirty bomb problem, particularly. Then your imaging would say there is a big cylinder object or whatever here in the middle of a shipment of sneakers. That is a problem. So part of the issue is DOE has been marching off deploying radiation portals entirely isolated from DHS's effort. DHS only uses the gamma for a very small population, because that is all they have the resources to do. They ask other countries to apply it in the same way. And these two worlds haven't come together. So it is not the technology itself is a problem, it is how we integrate the technology, how we integrate it with data.
>
> And I will just highlight another issue, keeping the information.
> We are not storing the information after we get these images. Storage is cheap, but CBP is tossing it away. CBP is basically throwing away a forensic tool if something went wrong, or even a tool that CBP can learn from over time. I don't understand why that is happening, but for stuff coming across the Canadian border, as soon as the image is taken, within a day or so, the image is gone. CBP dumps it. It makes no sense that CBP is not storing this and trying to learn from it, as well. So it is the technology has limits, but it is more about how we integrate it, how we interface with software, how we use human judgment as a part of the process.

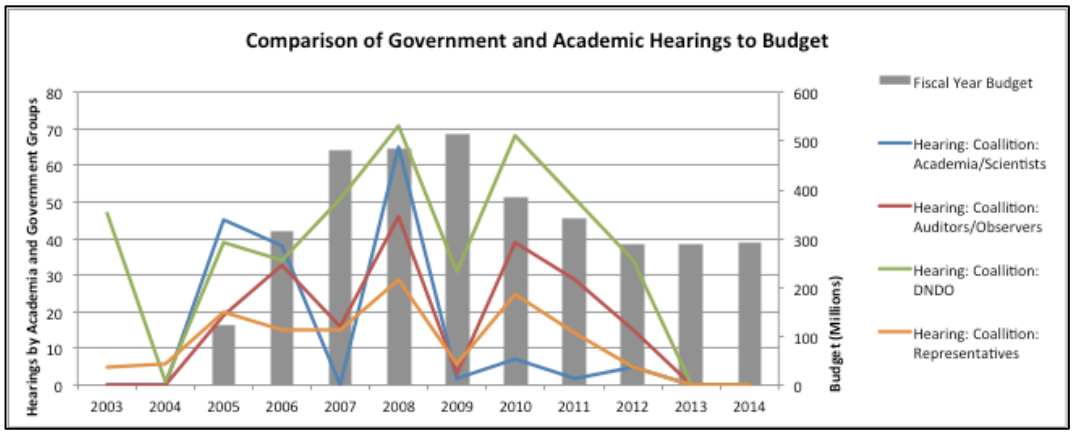


Figure 8: Comparison of Government and Academic Hearings

The law enforcement community is the primary user of radiation detection equipment. However, the rapid withdraw of this coalition from the hearing process did not greatly impact the future of the program, as DNDO and its coalition continued to pursue the GNDA. This seems to suggest that although the law enforcement coalition shared the same core policy beliefs with DNDO and advocated for radiation equipment capability, they only felt obliged to contribute actively in the early stages. Upon articulating their concerns and receiving assurance that they would be addressed, they decreased their participation in hearings.

In the meantime, there is observable coalescing between DNDO and the scientific coalitions who begin to participate with tandem frequency in hearings as the Committee called them together to state their cases. A tit-for-tat tempo emerged; DNDO, backed by national laboratories, testified in support of a positive future for radiation detection programs, seeking to counter some of the critical testimony offered by GAO and members of the law enforcement coalition, who gradually pulled representatives to a less favorable opinion of the equipment.

Research Question #2: Is there a relationship between Congressional policy knowledge, public interest and budget decisions?

In addition to the rejection of the null hypothesis, this research indicates exogenous factors such as public issue attention and internal factors such as policy knowledge influence policy change. In this case study, Congress does reveal increased policy knowledge over time, and correspondent to this learning, decisions that reflect that learning are made. Furthermore, major policy change coincided with a decline in public interest in this national security topic as the hypothesis anticipates. Congressional policy change did occur in conjunction with their increased policy knowledge and decreased public issue attention; however, this relationship cannot be isolated as causal. Data portray the influence of coalitions, as described ACF, and also reflect the cycle of public attention as predicted by IAC.

Finding: Rejection of the Null Hypothesis

This research design does not isolate effects upon the budget (independent variable) in a manner that affirms that the two factors—public issue attention and policy knowledge—were alone the cause of policy change. While the accrual and effect of policy knowledge is evidenced by the coded hearing data, the influence of public issue attention upon the process of Congressional decision-making is not isolated with this study design. However, in light of additional confounding factors, (including shifts in political power, macro-level federal budget demands, perception of a diminished Al-Qaeda threat, and other pressing policy challenges) it is clear that radiation detection equipment programs are undoubtedly influenced by exogenous factors and increased knowledge, and thus, the null hypothesis is

rejected. Specifically, this research shows the direct influence of ten GAO reports to Congress describing equipment performance failures, cost overruns and other limitations throughout the subject timeframe. See Appendix Six, GAO Reports Related to Nuclear Detection, 2005-2013. The remainder of this Chapter will describe the evidence in this case.

Finding: An Inverse Relationship Between Hearings and News at the Time of Major Policy Change

According to the hypothesis derived from the ACF and in conjunction with the IAC, I expected to find radiation detector program policy changes occurred when Congressional policy knowledge accumulated while a decline in public issue attention was underway. Although I did not isolate causation with this project, I did observe that the significant adjustments made to the DNDO FY 2010 budget occurred in 2008. Figure 9 exhibits this relationship. The two independent variables over time are shown with no other extraneous information, broadly supporting the essence of the research hypothesis, that is—major policy change in 2008 is

associated with a decline in public issue attention and increase in policy knowledge.

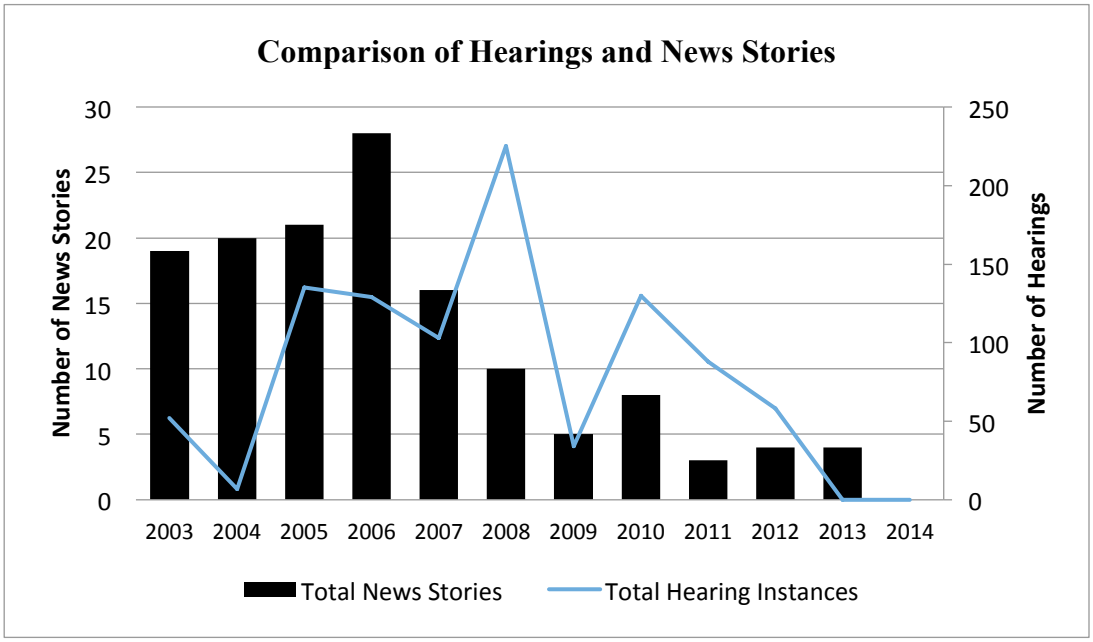


Figure 7: Comparison of Hearings and News Stories

The 1046 coded items drawn from 65 Congressional hearings, and the 193 items drawn from three major newspapers reveal that the most significant policy change associated with DNDO took place between 2008-2009. At this time, Congress authorized a 20 percent decrease in DNDO's FY2010 budget, and that this policy change could be the result of declining public attention and increasing legislator policy knowledge. This general observation can now be pursued in terms of the research hypothesis as it unfolds through the lens of the IAC.

The data displayed in Figure 9 inform a variety of conclusions. The predominant value of this chart is in its depiction of the IAC, particularly as it relates to national public attention transitions, and the inverse response from Congress. Although there is no indication of a direct causal relationship, the public's shift from the Alarmed Discovery and Euphoric Optimism (2001-06) phase

to the Realizing the Cost of Significant Progress phase (2006-07) of the IAC occurred as Congress intensified scrutiny of DNDO's efforts during this time.

Research Question #3: Does the timing of increased Congressional policy knowledge and declining public interest coincide with decreased budget allocations?

Increased Congressional policy knowledge and declining public interest do coincide with decreased budget allocations, specifically in terms of the 2008-09 votes that determined the FY2010 DNDO budget. The following analysis delves into this conclusion. These findings longitudinally trace how Congressional knowledge surged from 2006-08, as public issue attention declined, marking the "Realizing the Cost of Significant Progress" and "Gradual Decline of Intense Public Interest" phases of the IAC. This stage involves the gradual acknowledgement that the cost of "solving" the problem is very high. However, in order to address the research hypothesis most accurately, the events leading up to the policy change in terms of both public issue attention and the anticipated subsystem behavior per the ACF are presented in these contexts. The next section describes the events that occurred prior to the major policy change. This analysis validates the manner in which Congressional knowledge accrued alongside decreasing public attention. These events generated the conditions necessary to create the research hypothesis episode.

Realizing the Cost of Significant Progress, 2006-2008

Only three years after its start, DNDO began to receive mixed reviews regarding its lack of strategic vision and eagerness to deploy expensive, untested

equipment. Furthermore, the planning and execution of performance tests received heavy criticism from vendors, scientists, and again, the GAO. In 2006, GAO released a report, "Combating Nuclear Smuggling: DHS's Cost-Benefit Analysis to Support the Purchase of New Radiation Detection Portal Monitors Was Not Based on Available Performance Data and Did Not Fully Evaluate All the Monitors' Costs and Benefits." This report was the first specifically targeted at DNDO's management of the radiation detection equipment mission, and one of 45 total GAO reports that eventually touched directly or indirectly addressed DNDO activities.

To identify the specific drivers for the uptick in hearings that occurred in contrast to a rapid decline issue attention, a list of pertinent GAO report releases aids in analysis. This chart displays the release of GAO reports alongside hearings and news stories, reflecting the increasing intensity of interest in DNDO as Congress began to appreciate the formidable challenges facing the program. This research indicated that GAO's issuance of multiple reports in response to Congressional requests for information about DNDO activities contributed to the increase in hearings in 2008, as indicated by Figure 10..

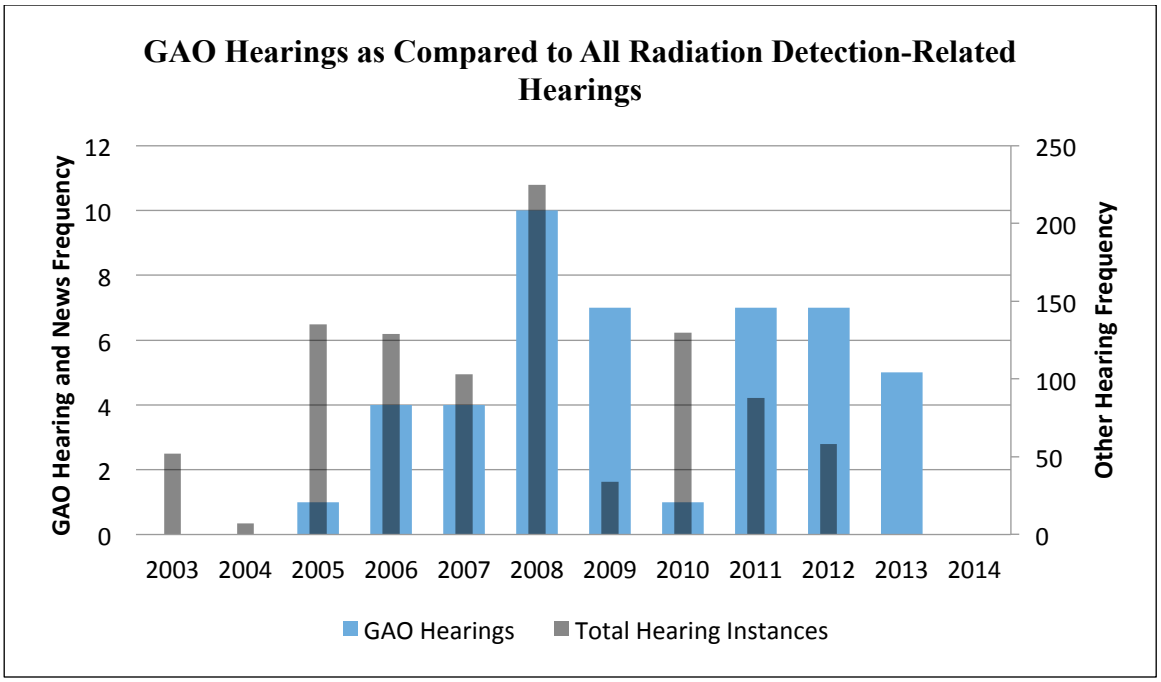


Figure 10: GAO Hearings as Compared to All Radiation Detection-Related Hearings

These figures reflect the shifting of policy beliefs that occurred in 2008. The GAO conducted 46 audits related or closely related to DNDO from 2005-2013. Ten of these 46 were released in 2008. These audits are the driving force behind many of the technical exchanges that took place in coded hearings. This research highlights the impact of GAO hearings upon Congressional learning—it must be recognized as a crucial part of Congress's policy learning process. These observations led to specific investigation of any significant policy decisions occurred in 2008 and pursue the case study according to these events—as discussed, this led to the identification of the 2008-09 decision to reduce the DNDO budget. Because the 2008 events so greatly informed Congressional understanding of the detection programs, data specifically to this timeframe is considered in greater detail in the following policy knowledge discussion.

Policy Knowledge Data as a Subsystem Factor

Policy Knowledge Accrual (Learning)

Congress took particular interest in the nuclear terrorism issue in 2008. The in-depth hearings held throughout 2008 result in 222 coded statements and bundles of the 972 total items coded for the longitudinal timeframe. This indicates that nearly 23% of the scientific information accrued over the 2003-2013 timeframe emerged in 2008. This intensified policy knowledge accrual, in conjunction with waning public issue attention, occurred with a decision to decrease the fiscal year 2010 DNDO budget. DNDO received a variety of for-action requests from both GAO and Congress as a result of the 2008 hearings. Legislators received testimonies from GAO. Technical insights and feedback accrued during hearings raised Congressional awareness of equipment shortcomings.

In 2008, Congress chose to dramatically shift resources away from DNDO. I observe evidence of Nohrstedt's conclusion: "Specifically, it (the case) shows that scientific information can accumulate rapidly and serve as the basis for policy change under conditions of threat, urgency, and uncertainty" (Nohrstedt, Advocacy Coalitions in Crisis Resolution: Understanding Policy Dispute in the European Volcanic Ash Cloud Crisis, 2013). In this case study, the accumulation of very specific technical knowledge associated with the performance of detectors and the determination of true costs in 2008 provoked a shift from the initial commitment to aggressive detection equipment deployments to a far more cautious strategy. The convergence of GAO audits and uptick in Congressional hearings, along with a decline in news coverage may be the cause of the significant shifts in secondary

policy beliefs. The decline in interest is marked by a dearth of hearings in 2009 and then in 2010, the major budget reduction.

Figure 11 reflects a detailed look at the distribution of coded items across the various categories. This analysis also indicates a sharp decline in political-positive hearing statements in 2008. At this time, the majority of coalitions still actively supported DNDO and its mission to develop and deploy next-generation radiation detection equipment. As representatives received negative technical information, they continued to make politically positive (e.g., "supportive") statements regarding the program, indicating that their core beliefs had not changed, but a shift of secondary policy beliefs was certainly underway. The high volume of politically positive statements reflect the deep core commitment legislators maintained to domestic nuclear defense in spite of the troubling reports about equipment performance. The number of technically negative statements is proportionate to the politically positive statements, indicating that while Legislators heard criticisms, they maintained a supportive tone. The impact of 2008's negativity may be observed by the plunge of all positive measures in 2009. The planning of the federal budget is initiated approximately 18 months prior to the start of the fiscal year. The fiscal year 2010 budget is a reflection of the persistent political-negative and technical-negative statements made in 2008. By 2010, hearings are marked by an abundance of political-negative and technical-negative statements. The abundance of technical exchanges, particularly technically negative statements supports the aforementioned conclusion made by Nohrstedt, that a rapid accumulation of scientific information serves as a basis for policy change.

Furthermore, this circumstance suggests that the compounding of discouraging technical information impacts political support. These happenings, in conjunction with a significant decline in issue attention as indicated by the previous analysis, led to a decision to make major DNDO programmatic adjustments without incurring political capital losses.

With respect to James and Jorgensen's characterizations of policy knowledge and learning, this study provides several revelations about its relationship to policy change. In particular, with underperforming programs, the knowledge gathered by program evaluators does not necessarily provoke instantaneous change, but there is adequate evidence of gradual shift. In this case, the chart indicates that political positivity of 2005 outweighed the negative question and answer bundles—at this early time, legislators were sufficiently motivated to accept some concern about equipment performance in order to press ahead with the vision for a Global Nuclear Detection Architecture. The significance of conducting a longitudinal study is affirmed. This chart is particularly interesting because in addition to exhibiting the longitudinal sentiment associated with legislator policy knowledge accrual, the political-positive line (the top line in the stack) mirrors much of the behavior of the public's issue attention as described by the IAC. GAO is able to present its findings through its reports and accompanying testimonies, and over time, its resources become a dominant source for Congressional policy knowledge.

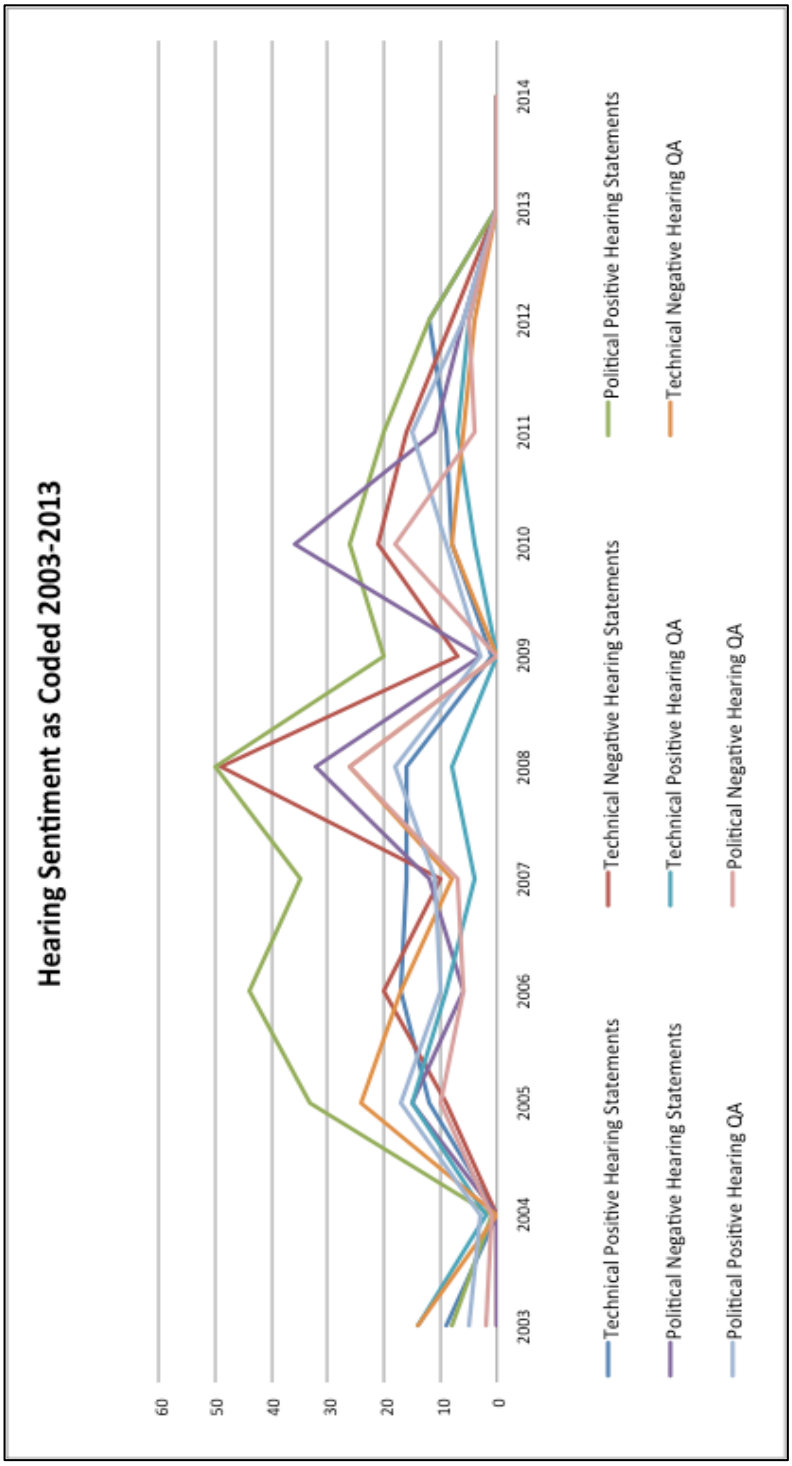


Figure 11: Hearing Sentiment

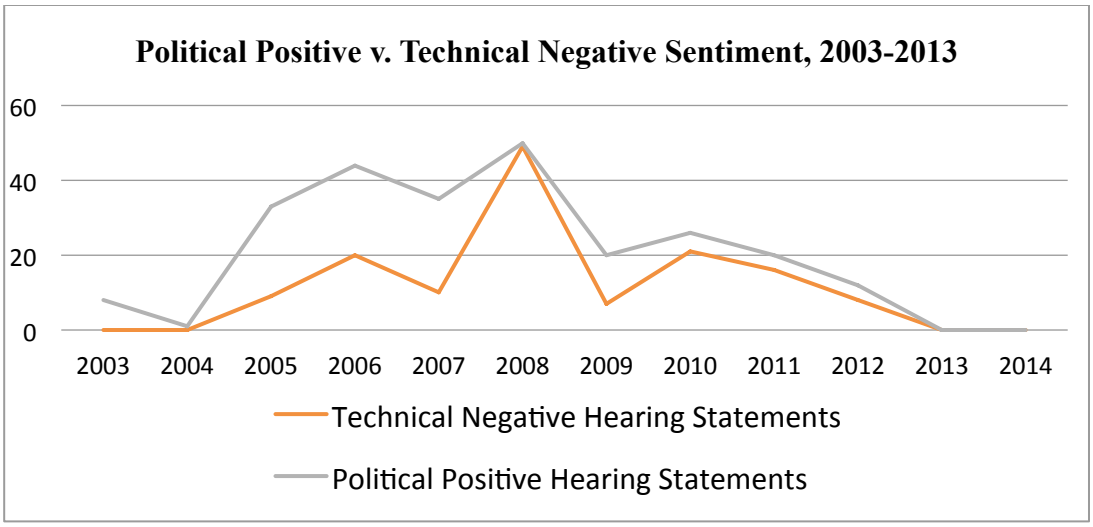


Figure 12: Political Positive v. Technical Negative Sentiment, 2003-2013

Longitudinal analysis of hearings showcases learning over time, as legislators evolved from use of non-technical to technically specific terminology. The legislators are passionate, articulate, and concerned in each example. However, the use of precise language to describe the threat materials and the means available for detecting them evolves in such a dramatic fashion that it becomes evident that the legislators develop informed opinions based on a depth of technical understanding that manifested in the hearing rooms over several years. In 2003, representatives expressed a general understanding of the current state of the art in equipment. Eventually, their interactions in hearings shifted from broad and generic political support to specific and technical inquiry, as shown in Figure 12 and in the following excerpts:

> The other thing that I want to say is that Mr. Weldon's comments about detection and prevention, I would love you to be able to come down a little more in support of what Mr. Nunn and Mr. Lugar are trying to do. And that leads me to this question in your statement. You say that all frontline Bureau of Customs and Border Protection inspectors across the country receive personal radiation detectors to alert them to the presence of radioactive material. I would say to you that that equipment they use is almost useless.

> It doesn't allow you to know about enriched uranium, it doesn't allow you to know about plutonium. And I am curious to know what it allows you to do, but it doesn't get at what Mr. Weldon knows we need to get at (Select Committee on Homeland Security, 2003).

By 2012, the vernacular became accurate and descriptive:

> In your testimony, you mentioned two programs where CBP spent significant sums and then canceled the programs with little to show in the way of achievements. You specifically note that the DHS spent $200 million developing a new advanced spectroscopic portal (ASP), but then canceled the program before updating their cost-benefit analysis. In addition, DHS spent $113 million on the cargo advanced automated radiography system (CAARS) and then canceled the program (Committee on Homeland Security, 2012).

In response to heightened Congressional scrutiny, news reports about DNDO's attempts to develop the GNDA soon became predominantly negative. Leading up to 2006, there were 42 positive news stories and 18 negative news stories. This balanced approach to news coverage is replaced by critical reporting in 2006 that persisted through 2012. From 2006-2013, there were 49 negative news stories and only 29 positive stories (see Appendix 2 for Codebook Samples).

Table 5

News Stories

Radiation Detection Equipment-Related News Stories as Coded for Sentiment, 2003-2013				
Year	**Positive News Stories**	**Negative News Stories**	**Total News Stories**	**Percentage Negative**
2003	15	4	19	21%
2004	16	4	20	20%
2005	11	10	21	48%
2006	11	17	28	61%
2007	7	9	16	56%
2008	1	9	10	90%
2009	1	4	5	80%
2010	4	4	8	50%
2011	0	3	3	100%
2012	2	2	4	50%
2013	3	1	4	25%

Story frequency and sentiment of reporting from 2003-2013 are displayed in Figure 13. Beginning in 2003, after the Alarmed Discovery Phase of the IAC is well underway. Broad endorsement and eagerness to pursue the GNDA especially from 2003-2006 (during the Alarmed Discovery and Euphoric Optimism phases of the IAC) shifted to intensified scrutiny as persistent equipment limitations and struggles to develop a convincing strategic plan took center stage—then, after an abundance of critical reporting, public attention shifted to the Realizing the Cost of Significant Progress phase in 2006. The chart further reflects the positive and negative sentiment of news items during this time—the "percentage news negative" trend line clearly indicates the manner in which the public soon received fewer, and mostly negative reports beginning in 2008.

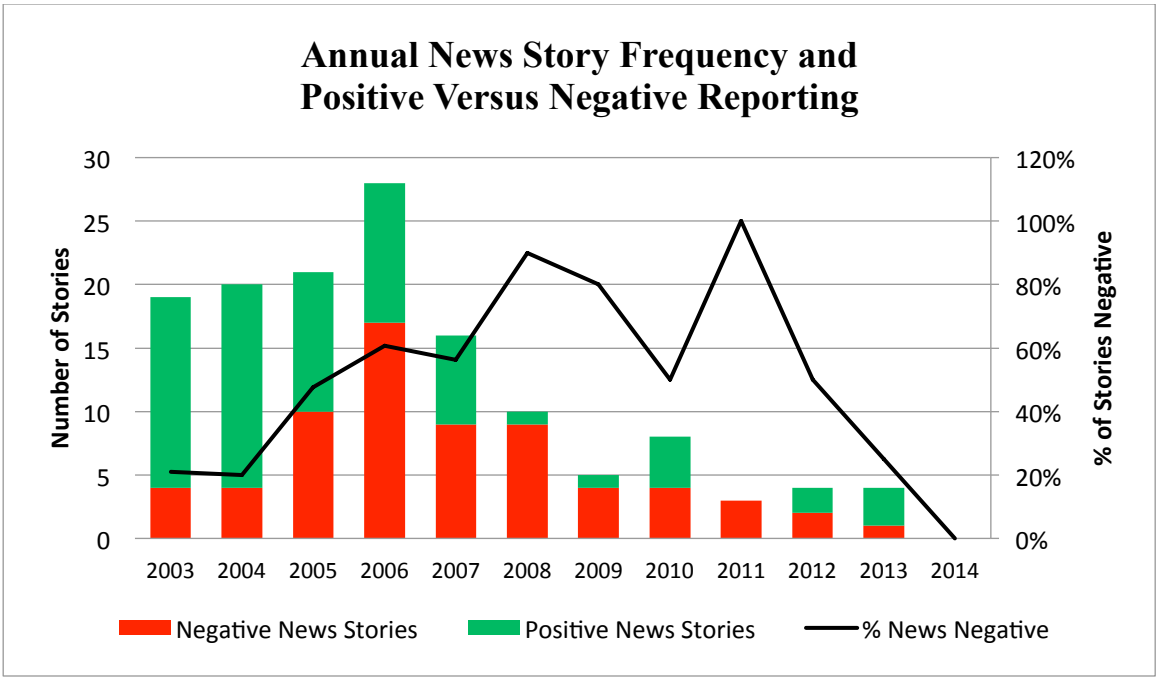


Figure 13: Annual News Story Frequency and Positive Versus Negative Reporting

Graphical representations of elite media coverage as reflected by news stories pertinent to the nuclear detection program provide data to chart against the IAC. This data is useful to compare against budgetary decisions and policy knowledge observed through content analysis of legislative hearings. The previous chart shows how, in 2006, the public shifts into a gradual decline in interest.

Complementing this news reporting frequency and sentiment chart is a policy knowledge frequency and sentiment chart. This displays the fluctuation of positive and negative support of detection programs as coded. After 2008's close inspection of DNDO activities, the tempo dropped significantly, and of the two pertinent hearings in 2009, only one of them was directly related to DNDO activities. The major budget reductions incurred in FY2010 were supplemented with additional scrutiny, such as one hearing titled, "The Domestic Nuclear Detection Office: Can it Overcome Past Problems and Chart a New Direction?"

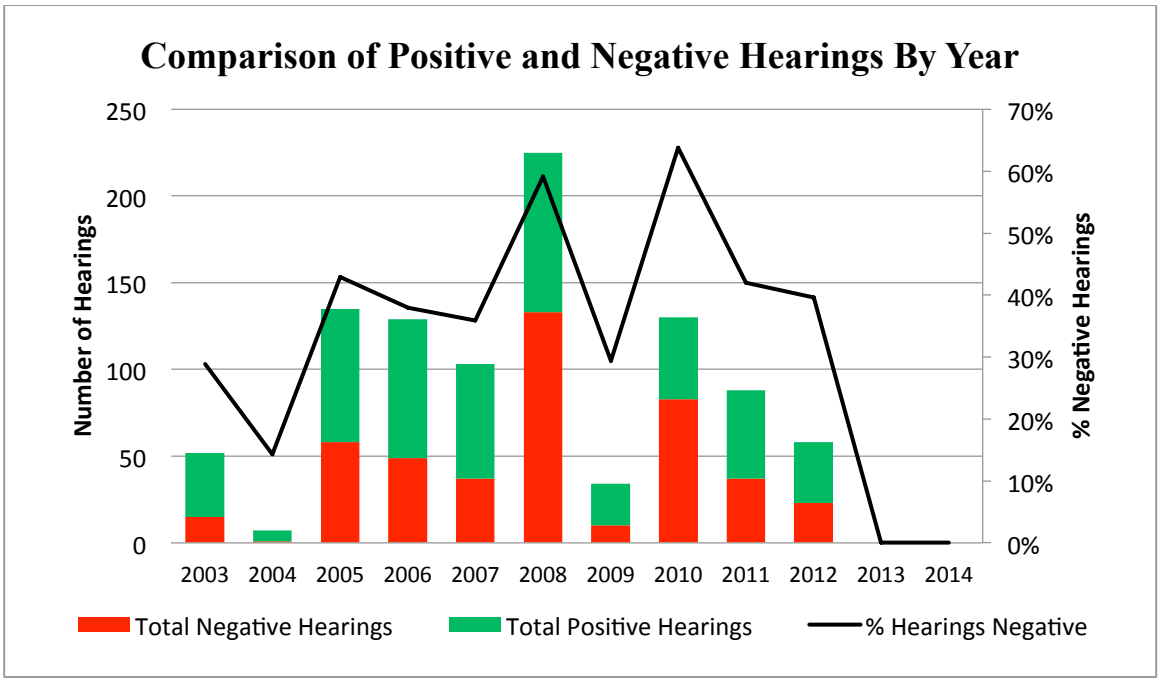


Figure 14: Comparison of Positive and Negative Hearings by Year

Senate Homeland Security and Governmental Affairs Chairman Joe Lieberman, (I-CT), summarizes the Realizing the Cost of Significant Progress stage by describing the state of U.S. nuclear detection efforts as he introduced the DNDO Director in a 2008 hearing dedicated to the topic of nuclear terrorism:

> As we will hear from our witnesses, the responsibilities of the DNDO are daunting. Its first job was to perform an inventory of the 74 different Federal programs spread over the Department of Energy, the Department of Defense, and the Department of State and to try to create from these a unified system where all the different agencies were working together to protect America. The reach of these programs is wide and layered, including efforts abroad, efforts at the border, and, of course, activities within our homeland. Many of these programs predate the establishment of the DNDO. This is a significant effort, certainly as measured in dollars spent. During the last fiscal year, these programs cost a total of $2.8 billion—$1.1 billion to combat smuggling and secure nuclear materials held abroad, $220 million to detect materials at the border, $900 million for detection efforts within the United States, and $575 million for cross-cutting activities that support many of the other programs, like research and development, into detection technologies. The goal of a layered system, as I understand it, is that each point of the system will offer another opportunity to detect and thwart terrorists before they can acquire a nuclear weapon or to stop them before it can be smuggled

> into the United States. But the system we have in place now, I conclude, is incomplete. As we are going to hear today, our global nuclear detection architecture—this ''system of systems,'' as one of our witnesses calls it—may have both needless redundancies and/or dangerous gaps, which I suppose in this case is the worst of both worlds. Even if each program was working precisely as planned, holes apparently exist in this layered security net that could allow determined terrorists to get their hands on weapons grade nuclear material and bring it into the United States.
>
> DNDO's job is to help find and plug those gaps. But that job is made significantly more difficult by the fact that DNDO is just a coordinating agency and has no effective power to order or implement desired changes (Committee on Homeland Security and Governmental Affairs, 2008).

Perhaps Senator Lieberman's comments foreshadowed the impending decline of public interest and ushered in indifference to the topic that prevailed thereafter, as the Gradual Decline of Public Interest phase emerged.

The following section describes how Congressional and public interest rapidly declined with the exception of a flurry of renewed interest as the major policy change decision became evident in FY 2010.

Gradual Decline of Intense Public Interest: 2008-present

As criticisms mounted, Congress scaled back the budget significantly, specifically approving a zeroed out DNDO's FY 2010 Systems Acquisition budget that topped $120 million previously. This contributed to a $130 million budget decrease from FY 2009 to FY 2010. It is unclear whether DNDO was advised that any request for additional acquisition would be declined or if they came to this conclusion independent of Congressional insight:

> Senator Akaka: In 2008 and 2009, the Government Accountability Office reported that the Domestic Nuclear Detection Office (DNDO) is operating without up-to-date strategic plans or its critical investments in nuclear detection technologies at our borders or for its overarching nuclear detection efforts.

> What is the status of your nuclear detection strategic plans? How will you ensure that funds requested for DNDO will be spent effectively without up-to-date strategic plans?
>
> Secretary Napolitano: Well, we have obviously a strategic plan always underway, particularly in that very important area/. But you might be interested in knowing, Senator, that we did not request funds for DNDO to purchase new technology this year, and the reason is because we were not persuaded that the technology—neither the plan but particularly the capacity of the technology—we needed was actually there that we wanted new money for. We have enough back-funded money to continue current operations through fiscal year 2010, but before we come to Congress and as for money for new technology we needed to see something better from the science community and from the vendors for what we need.
>
> So we have gone back into that community on that basis, and it is my hope that moving forward, working with this Committee, we will have some credibility when we actually come forward and say we need this for this new thing, that we do not do that lightly, that we actually have a solid basis for that. (Committee on Homeland Security and Governmental Affairs, 2009)

As the research hypothesis suggests, this drastic policy change might be the result of Congressional learning in conjunction with constituent indifference. It certainly reflects a stark contrast to the early commitments to, and expectations of, DNDO. After several years of intense coverage, the issue of domestic nuclear terrorism shifted out of both public and Congressional spotlights.

The Post-Problem Stage

The issue moves into prolonged limbo—a twilight realm of lesser attention or spasmodic recurrences of interest (Downs, 1972). The observations made through historical consideration of events in the context of the IAC, production of analytical products, and the significant content analysis conducted by reading the 65 Congressional hearings provided a suitable context for producing a case-specific version of the ACF.

Implications for the Advocacy Coalition Framework

This study validated the use of the IAC as a tool for measuring longitudinal public opinion behaviors. By conducting a case study of a radiation detection equipment program at DHS DNDO, public issue attention as a factor contributing to policy change in conjunction with accrued Congressional policy knowledge is traced through the ACF theory of the policy process. This study indicates that the research hypothesis is exhibited in this case: Radiation detection program budget decreases occurred in conjunction with a gradual decline in public attention and enhanced Congressional policy-oriented learning.

The five phases of the IAC are apparent in the case, and alternate measures of public issue attention, including Gallup polling data and Google Trends data also confirm the cycle of public attention as Downs describes. As the data relate to the ACF, the exogenous public issue attention factor folded into the policy subsystem also exhibits some association in terms of the timing of the major FY 2010 budget decision. Although the association is not exhibited causally, a relationship between the decline of public attention and the accrual of Congressional policy knowledge occur in conjunction with the major budget decision.

The ACF, as described by Sabatier and Jenkins-Smith (Figure 15):

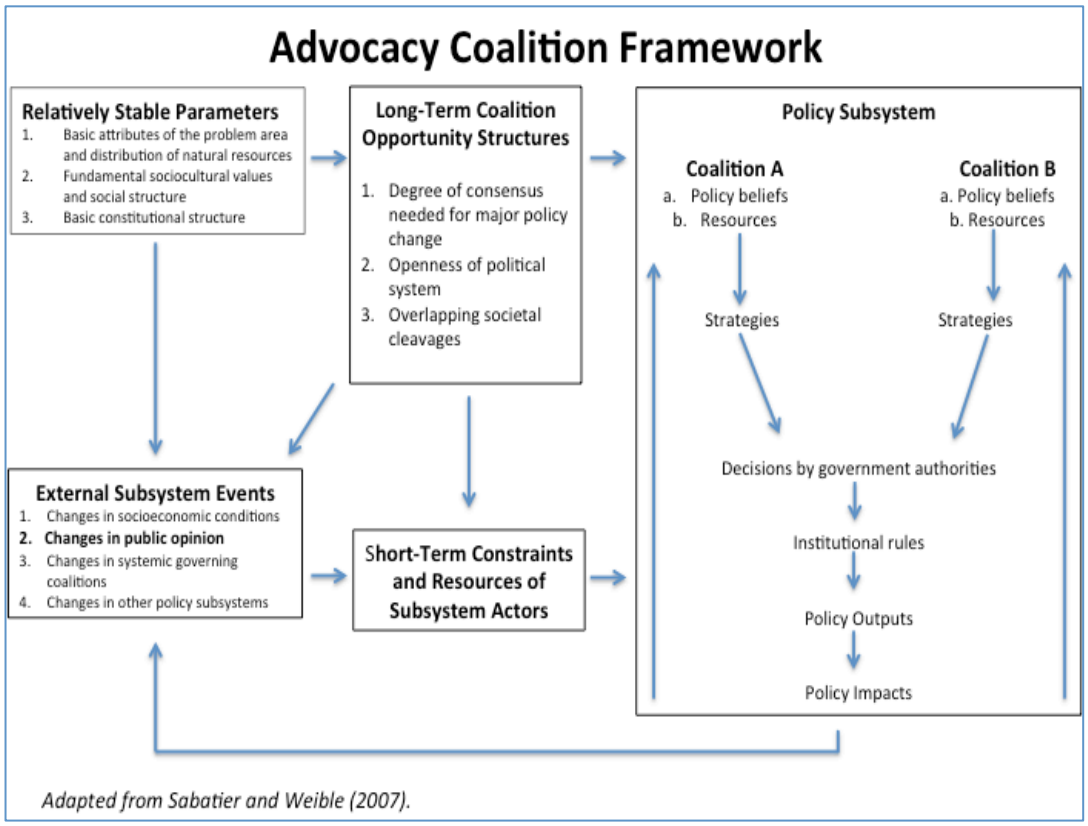


Figure 15: ACF Policy Process

Next, the ACF is adapted to the events of this case study. Of note are several key events, which, as predicted by the hypotheses of the ACF, influence policy change, particularly in 2008. These events include the frustrating outcome of research and development testbeds, negative reporting from the field regarding the performance of equipment, declining public attention, and a massive federal budget impasse that resulted in a Continuing Resolution. The depoliticized environment that Sabatier describes may be responsible for the bipartisan support of incremental policy shift that occurred after the variety of apolitical GAO testimonies and other testimonies indicated that the physics problems associated with passive radiation detection were not sorting out, in spite of massive research and development commitments.

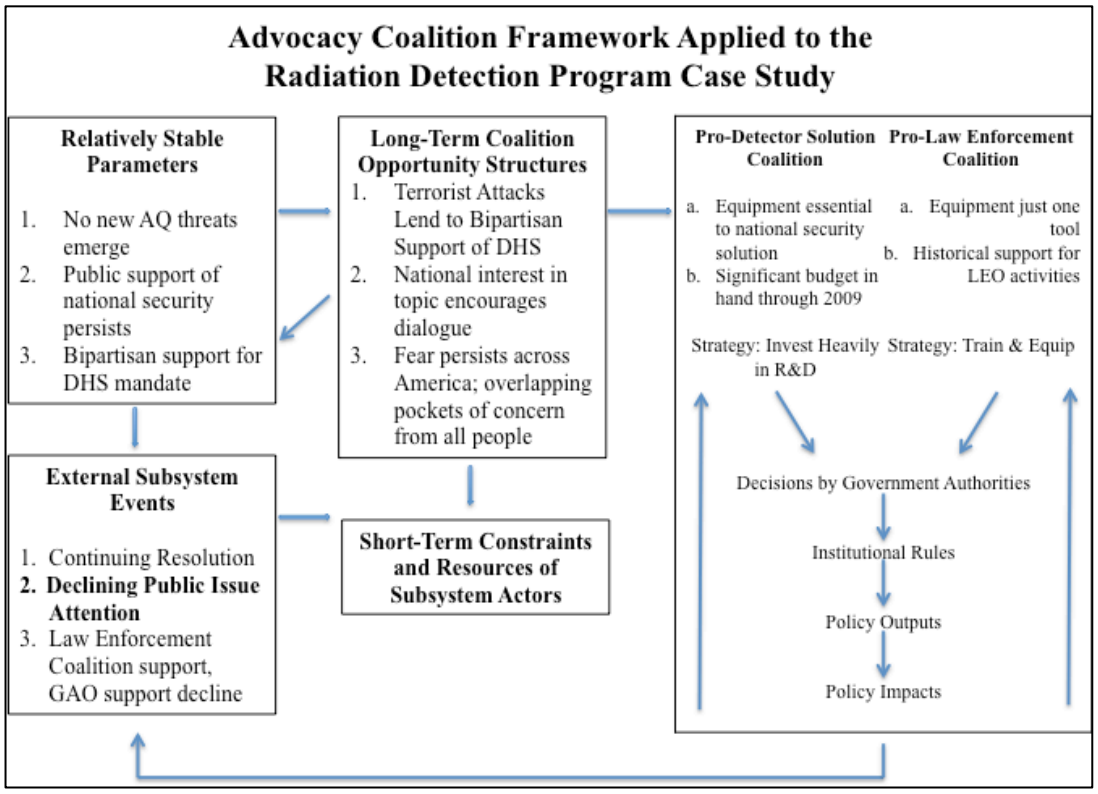


Figure 16: The ACF Adapted to this Case Study

In terms of policy knowledge accrual, this research also indicates that the ACF is a suitable theoretical framework for describing the policy change in conjunction with public issue attention as an exogenous factor influencing policy change. In addition to the behaviors exhibited in public issue attention, I observed, over a decade time period, the influence of technical information, as well as the manner in which advocacy coalitions and actors affect change beyond the traditional bureaucratic iron triangle. This observation discounts the null hypothesis, which in this case, suggests that exogenous factors such as policy technical knowledge accrual or public interest do not influence policy change. Instead, this research exhibits confirms the presence and potential influence of factors external to the subsystem throughout the policy making process. In particular, the role of technical

information and the transition of public issue attention into the gradual decline of interest phase of the IAC emerge as factors potentially catalyzing policy change in 2008.

Another central assertion of ACF, which is the role of belief systems, is also clearly imparted by this case study. This study happens to consider a case in which nearly the entirety of the subsystem shares the same core belief that the U.S. should utilize resources to defend against nuclear terrorism. The policy core beliefs of subsystem members typically resist change. Change in policy core beliefs is usually in response to "verification and refutation from new experiences and information" (Weible, Sabatier, & McQueen, 2009, p. 123). This study supports this observation.

Three distinct changes in core policy beliefs are identified. The first shift in policy core beliefs occurred in 2003, then when DHS received its mandate to centralize national security matters into one federal department. At this time, a pro-detector coalition emerged. The private sector, academia and scientific communities shared secondary core support of radiation detection equipment prior to the 9/11 terrorist attacks. This periphery appreciation of the value of these systems is most evident in consideration of deployments as a part of nuclear safety, nonproliferation initiatives with Russia, and law enforcement use of personal radiation detectors. When the systems were presented as a part of a domestic nuclear detection and interdiction strategy, coalitions who typically resonated with law enforcement-centric policy core beliefs shifted, readily emphasizing the use of equipment, rather than intelligence and officers as primary deterrents. The second significant shift occurred in 2005 when DNDO was established. This shift affected

secondary beliefs. The establishment of DNDO occurred to clarify roles and responsibilities regarding research and development and acquisition of equipment and resolution of alarms. The third shift in policy core beliefs resulted in 2008 when broad consensual support of DNDO degraded, leading to significant reductions in its scope of work and budget. This third significant policy shift became central focus of the analytical component of this dissertation, and observations of it comprise the bulk of the analyses that follow. At this time, temporary members of the pro-detector coalition returned to their policy core beliefs, particularly those which placed emphasis upon the use of human intelligence and law enforcement as primary tools for interdictions.

Declining public interest, coupled with the substantial advancement of policy knowledge observed in 2008 further reflect the hypothesis. Policy changes were made in 2008 and are reflected by the notable FY 2010 budget reductions. Negative reporting began its upward trend in 2004, and by 2006, the public transitioned into the "Realizing the Cost of Significant Progress" phase of the IAC. This phase was dominated by reports of equipment failures and struggles within the DNDO organization to define a strategic path forward. The dearth of positive reporting after 2008, along with intensified scrutiny of challenges facing DNDO frames a useful reference when considering the additional, more detailed charts that follow.

The coding process exposes the emergence of policy-oriented learning, and reading hearings over time shows how the coalition members became educated about the nuclear threat. Over time, members began to appreciate the challenges

associated with nuclear material detection. Ultimately, the shared deep core commitment to domestic security held fast among all members, even as secondary policy beliefs emerged. David A. Baldwin describes policy-relevant knowledge as "what policy makers need to know in order to choose among alternative courses of action" (Baldwin, 2000). In this case study, we understand that, in the end, Congress decided to greatly reduce the initial scope of radiation detection equipment programs at a time when the public's attention was elsewhere.

Other Findings

The chart below is of particular interest because the data it displays reveal an observable lag relationship. Statistically, there is a .89 correlation between the frequency of total positive and negative sentiment news stories and the federal budget when a 3-year lag is applied. The data suggest a legislative response to public interest in radiation detection equipment programs occurred roughly three years after an initial spike in public interest. Public issue attention peaked at this time, and in 2005, more radiation detection equipment news stories were published than at any other time during this longitudinal study. Once DNDO encountered Congressional engagement after 2005, legislator accrual of policy technical knowledge began to accrue. For two years thereafter, this accrual of policy knowledge regarding equipment capabilities, including reports to legislators regarding the challenges of field application, mixed reviews from acquisition tests, and higher than expected costs, began to shape out-year fiscal commitments. After 2005, positive news stories were replaced with fewer news stories, most of which were negative, as indicated in Table 3.

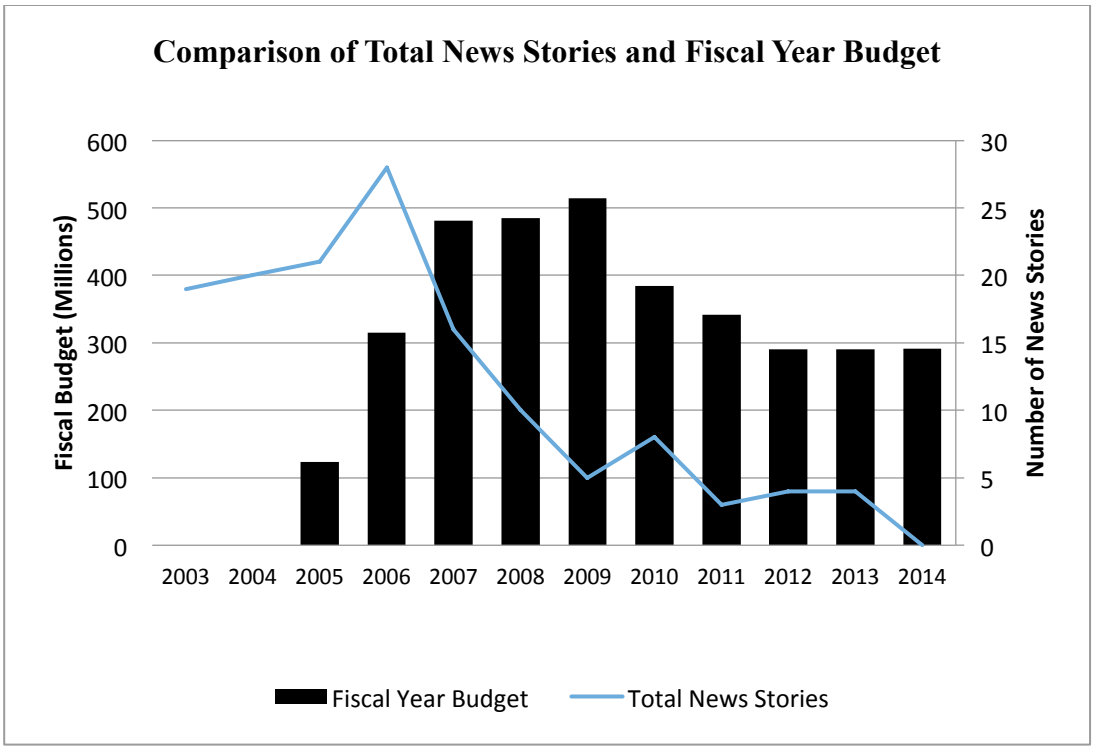


Figure 17: News Stories and Budget

Discussion

Using this policy change circumstance with distinct technical, political, and public interest characteristics, I found indications of policy-oriented learning and shifts in coalition policy core beliefs. These characteristics provide an opportunity to isolate the impact of public issue attention and policy knowledge upon the policymaking subsystem. Because these characteristics are rather uncommon in today's policymaking environment, these findings may not be readily generalizable across issues. However, the methodological approach is generalizable, and similar data sets can be drawn to apply the ACF and IAC. The concepts of policy knowledge and public issue attention also warrant thorough definitional exploration in future research. Corroborating the results derived from this methodological

approach with cases that share the same features would continue to discern the way in which policy knowledge plays an important role in policy change.

Final Observations and Implications

The establishment of DHS was just one product of the new policy core beliefs that emerged in the wake of 9/11. The national tragedy launched domestic security the top of the national agenda, coalescing a wide variety of actors around the single core belief that the nation's security was at risk and a major effort to develop a unified approach to protecting it was needed. The product of these beliefs is the Department of Homeland Security, established in 2003. In addition to creating a new mission, the scope and tasks of many existing government programs were also refined at this time to reflect a domestic mission. Secondary policy beliefs were reflected specific national security positions as defined by various coalitions. Support of the domestic nuclear detection system deployments immediately appealed to lawmakers. By shifting the focus from international to domestic deployments, lawmakers could tout one way in which America could enhance point of entry security with what they believed to be an existing capability that could be enhanced for a national security purpose. The sense of urgency provoked by the 9/11 attacks led to rapid decision-making with regard to the WMD threat posed by Al-Qaeda. Urgency forced a variety of decisions, some of which were made with incomplete information. Over time, it became clear that while necessary, some of the early strategic paths, such as the pursuit of the Global Nuclear Detection Architecture, required revision. Concerns leveled against detection programs became persistent as technical audits indicated a variety of

equipment limitations, ambitious plans were replaced by tempered expectations. For example, early indicators that the cost of Advanced Spectroscopic Portal installations could reach nearly half a million dollars did not provoke detractors. However, the practical and technical inefficiencies reported by the Law Enforcement and Private Sector Coalitions did alarm lawmakers and gradually undermine support. These shifts reflect informed evolution of secondary policy beliefs—Congress remained committed to national defense against nuclear terrorism, but began to have misgivings about dedicating the majority of resources to this area. Congressional hearings reveal specific concerns with the equipment and deployments; legislators responded by requesting audits and analyses of radiation detection programs. GAO then testified in conjunction with program managers and experts to establish the state of affairs for the various paths forward. Despite the resource support, DNDO's Advanced Spectroscopic Portal monitor and passive radiography R&D projects eventually suffered ongoing technical and practical challenges. DNDO struggled to proactively respond to GAO criticism of the Office's program management and lack of strategic vision, and in from FY 2010 to present, DNDO's budget authorization leveled at approximately $300 million.

There are hundreds of thoughtful, articulate, and sometimes frightening statements made by members and witnesses in these hearings. Committee Chairmen set the tone for these sessions and even moderate member discussions throughout the hearing. Of the thousands of pages of testimonies I read, two statements made by Sen. Lieberman reflect the dilemma our nation faces most

dramatically and accurately. Sen. Lieberman, Senate Homeland Security and Governmental Affairs 2008 "Nuclear Terrorism" hearing:

> The programs administered by DNDO are a mission where failure is, quite literally, not an option because the danger of terrorists acquiring a nuclear weapon, we know from previous hearings that we have held on this subject, is real and present. Between 1993 and 2006 there were 1,080 confirmed incidents of illicit trafficking in nuclear materials, with 18 of these cases involving weapons-grade materials and another 124 involving material capable of making a so-called ''dirty bomb'' that would use conventional explosives to spread nuclear material. This is serious stuff. ASP and CAARS were supposed to work in tandem, scanning all cargo coming by air, sea, and land for nuclear material. ASP was designed to detect unshielded nuclear materials with greater accuracy and fewer false alarms than the portal monitors now in use. CAARS was designed to complement the ASP system by detecting high-density materials that terrorists could use to shield radiation from nuclear materials from ASP detection.
>
> These programs looked very promising when announced just a few years ago, but it now seems that neither is likely to live up to expectations, which does leave our Nation at risk, especially the unprotected areas that lay outside of the established land, air, and sea ports of entry. Let me start by saying a little more about ASP. According to a tough and disturbing report from the Government Accountability Office (GAO), that we will hear about this morning, the price of ASP has ballooned from an estimated $1.2 billion 2 years ago to as much as $3.8 billion today and apparently no less than $3.1 billion. It is also behind schedule and, apparently, will not be deployed as aggressively as initially planned. For instance, it will not be used to screen rail cars and extra-wide trucks, leaving dangerous gaps that can be exploited by terrorists that, apparently at this point, DNDO does not know how to fill (Committee on Homeland Security and Governmental Affairs, 2008).

The nuclear threat poses a real and dangerous threat to the U.S. However, like many of the world's greatest challenges, even the most passionate political support and robust budgets do not always lead to practical solutions. This study indicates that policy knowledge does have an influence upon policy change, particularly when the public's issue attention is directed elsewhere. This being the case, the research further highlights the impact witnesses may have when providing

Congressional testimony and promotes the political value of keeping appraised of public interest and sentiment regarding issues facing the nation.

The manner in which advocacy coalitions coalesced as new scientific information emerged regarding the viability of radiation detection equipment, coupled with the public's interest in a nuclear detection solution are determined to be important considerations in terms of policy change.

Future Research

Interviews of Congressional participants, GAO auditors, and program managers would make a rich contribution to this project. In particular, discovering through interviews how hearing participants prepared for testimonies and which sources of information they relied upon would provide further insight into policy learning. A survey of participants ranking the value they place upon various sources of information may reveal whether participants are more likely to be influenced by independent auditors, media, technical journals, or other sources of information. This work would facilitate greater understanding of the manner in which knowledge is collected and applied in the hearing venues. Additionally, analysis of the data with regard to partisanship would reveal party-line relationships among executive branch representatives and their fellow partisans in the legislature.

Regarding this particular case, the following observation was unexpected—reading thousands of pages of hearing in sequential order revealed that many of our legislators on both sides of the aisle are deeply committed to seeking the most accurate information available to inform their important decisions. They do follow issues and exhibit long-term advancement of knowledge. Before I embarked upon

the research, I suspected that the data gathered in this project would intensify my cynicism. Instead, it encouraged me. I was pleased to see that it seems like the majority of legislators and their staffs come to sessions prepared to learn, prepared to provide thoughtful recommendations, and prepared to do their best to represent the best interests of the American people. It is my opinion that much of the knowledge accumulated in the 2008 hearings as well as many others was available prior to 2008. The highly technical nature of this issue—as with so many issues of national concern—indicates that Members of Congress and their professional staffers could benefit from "crash courses" on emerging issues. This is because staffers provide another overlooked stream of knowledge for a Congressperson. They are often the first to raise the issue to a member, identifying issues arising prior to mainstream political events forcing them onto the Hill. They provide briefing materials, research and advice throughout the legislator's tenure.

Broadly, additional research efforts directed at drawing conclusions about the manner in which legislators accumulate policy-oriented knowledge and how the public responds to policy changes made as a result of informed decision making is essential to understanding of the policy process. Informed by a proper appreciation of the learning process, all members in the policymaking process can endeavor to ensure that mistakes are not repeated. Given these findings, the ACF and IAC are substantiated as logical and explicit theoretical approaches that account for the importance of including exogenous factors into any analysis of the policy process.

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APPENDICES

APPENDIX ONE

Organizational Affiliations

Academia, Scientists
AAAS
Academia
Council on Foreign Relations
DOE
LANL
LLNL
National Academy of Science
National Laboratory
NGO

Auditors and Observers
9/11 Commission
CRS
Defense Science Board
GAO
National Commission on Terrorism
State Government
Voices of 9/11

Law Enforcement
DHS, Customs
DHS, Coast Guard
DOJ
DTRA
FBI
Local Law Enforcement (LEO)

DNDO
DHS, Leadership
DHS, DNDO
DHS, S&T
Domestic Preparedness

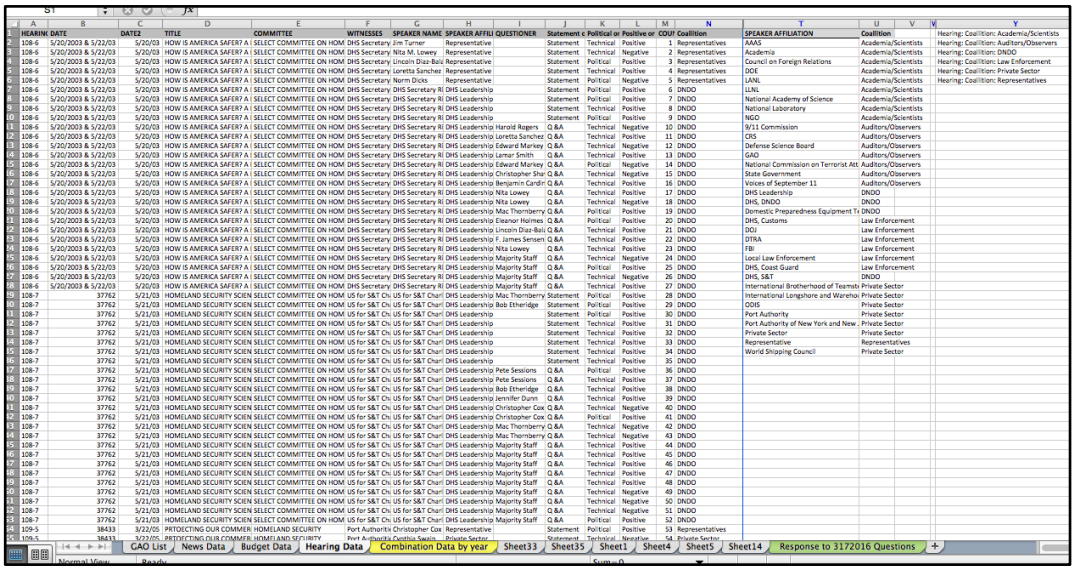
Private Sector
International Brotherhood
International Longshoremen
ODIS
Port Authority
Port Authority of New York
Private Sector
World Customs Organization

Representatives
Representatives

APPENDIX TWO

Codebook Samples

Sample from Congressional Hearing Coding Schema



Hearing: The Congressional Record number for the particular hearing

Date: Date or dates of Congressional Hearing

Date2: Formatting requirement for statistic runs

Title: Refers to the Title of the Hearing as published in the Congressional Record

Committee: Full name of Committee in either House or Senate

Witness: Name of the key individual called before the Committee

Speaker Affiliation: Name of the Department or entity the Witness represents; also may include additional descriptive information such as "Leadership"

Questioner: Always a member of Congress, indicates the examiner of a particular witness for a Question and Answer bundle

Statement or Q&A: Indicates whether the coded item is a statement or a Question and Answer bundle

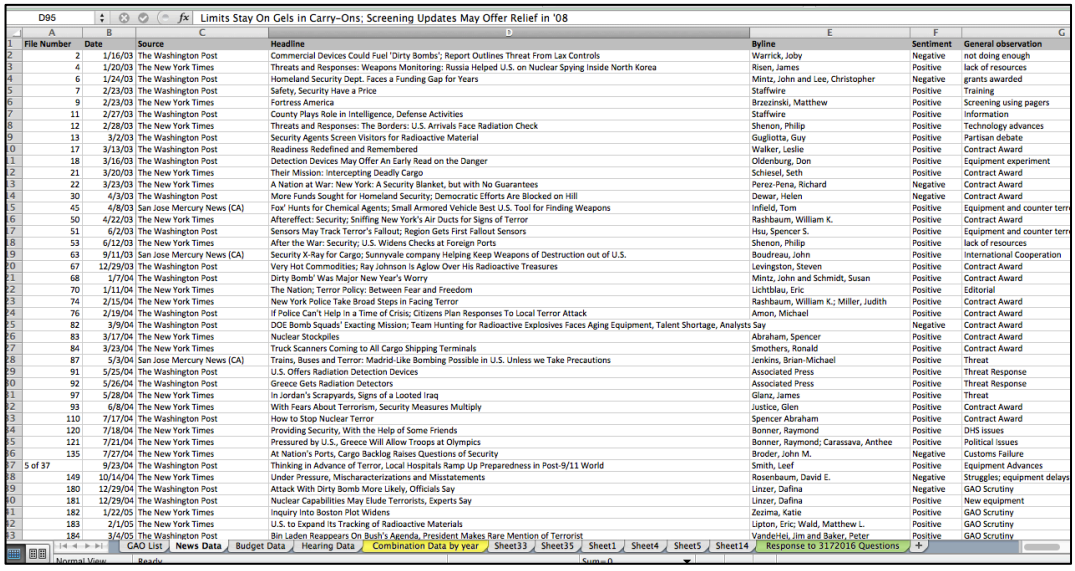
Political or Technical: Indicates the theme of the Statement or Q&A bundle

Positive or Negative: Indicates the coder's sentiment assignment for the Statement or Q&A bundle. This item is the subjective decision that is made by the primary coder and the reliability coder.

Coalition: Each participant is assigned to any of the six Coalitions. List of Coalition breakout is available in the Appendix, "Coalition Lineup"

Columns T, U and Y are not a part of the data set and for reference and organizational purposes only.

Sample from Newspaper Headline Coding Schema



File Number	Date	Source	Headline	Byline	Sentiment	General observation
2	1/16/03	The Washington Post	Commercial Devices Could Fuel 'Dirty Bombs'; Report Outlines Threat From Lax Controls	Warrick, Joby	Negative	not doing enough
4	1/20/03	The New York Times	Threats and Responses: Weapons Monitoring: Russia Helped U.S. on Nuclear Spying Inside North Korea	Risen, James	Positive	lack of resources
6	1/24/03	The Washington Post	Homeland Security Dept. Faces a Funding Gap for Years	Mintz, John and Lee, Christopher	Negative	grants awarded
7	2/23/03	The Washington Post	Safety, Security Have a Price	Staffwire	Positive	Training
9	2/23/03	The New York Times	Fortress America	Brzezinski, Matthew	Positive	Screening using pagers
11	2/27/03	The Washington Post	County Plays Role in Intelligence, Defense Activities	Staffwire	Positive	Information
12	2/28/03	The New York Times	Threats and Responses: The Borders: U.S. Arrivals Face Radiation Check	Shenon, Philip	Positive	Technology advances
13	3/2/03	The Washington Post	Security Agents Screen Visitors for Radioactive Material	Gugliotta, Guy	Positive	Partisan debate
17	3/13/03	The Washington Post	Readiness Redefined and Remembered	Walker, Leslie	Positive	Contract Award
18	3/16/03	The Washington Post	Detection Devices May Offer An Early Read on the Danger	Oldenburg, Don	Positive	Equipment experiment
21	3/20/03	The New York Times	Their Mission: Intercepting Deadly Cargo	Schiesel, Seth	Positive	Contract Award
22	3/23/03	The New York Times	A Nation at War: New York: A Security Blanket, but with No Guarantees	Perez-Pena, Richard	Negative	Contract Award
30	4/3/03	The Washington Post	More Funds Sought for Homeland Security; Democratic Efforts Are Blocked on Hill	Dewar, Helen	Negative	Contract Award
45	4/8/03	San Jose Mercury News (CA)	Fox' Hunts for Chemical Agents; Small Armored Vehicle Best U.S. Tool for Finding Weapons	Infield, Tom	Positive	Equipment and counter terr
50	4/22/03	The New York Times	Aftereffect: Security; Sniffing New York's Air Ducts for Signs of Terror	Rashbaum, William K.	Positive	Contract Award
51	6/2/03	The Washington Post	Sensors May Track Terror's Fallout; Region Gets First Fallout Sensors	Hsu, Spencer S.	Positive	Equipment and counter terr
53	6/12/03	The New York Times	After the War: Security; U.S. Widens Checks at Foreign Ports	Shenon, Philip	Positive	lack of resources
63	9/11/03	San Jose Mercury News (CA)	Security X-Ray for Cargo; Sunnyvale company Helping Keep Weapons of Destruction out of U.S.	Boudreau, John	Positive	International Cooperation
67	12/29/03	The Washington Post	Very Hot Commodities; Ray Johnson Is Aglow Over His Radioactive Treasures	Levingston, Steven	Positive	Contract Award
68	1/7/04	The Washington Post	Dirty Bomb' Was Major New Year's Worry	Mintz, John and Schmidt, Susan	Positive	Contract Award
70	1/11/04	The New York Times	The Nation; Terror Policy: Between Fear and Freedom	Lichtblau, Eric	Positive	Editorial
74	2/15/04	The New York Times	New York Police Take Broad Steps in Facing Terror	Rashbaum, William K.; Miller, Judith	Positive	Contract Award
76	2/19/04	The Washington Post	If Police Can't Help In a Time of Crisis; Citizens Plan Responses To Local Terror Attack	Amon, Michael	Positive	Contract Award
82	3/9/04	The Washington Post	DOE Bomb Squads' Exacting Mission; Team Hunting for Radioactive Explosives Faces Aging Equipment, Talent Shortage, Analysts Say		Negative	Contract Award
83	3/17/04	The New York Times	Nuclear Stockpiles	Abraham, Spencer	Positive	Contract Award
84	3/23/04	The New York Times	Truck Scanners Coming to All Cargo Shipping Terminals	Smothers, Ronald	Positive	Contract Award
87	5/3/04	San Jose Mercury News (CA)	Trains, Buses and Terror: Madrid-Like Bombing Possible in U.S. Unless we Take Precautions	Jenkins, Brian-Michael	Positive	Threat
91	5/25/04	The Washington Post	U.S. Offers Radiation Detection Devices	Associated Press	Positive	Threat Response
92	5/26/04	The Washington Post	Greece Gets Radiation Detectors	Associated Press	Positive	Threat Response
97	5/28/04	The New York Times	In Jordan's Scrapyards, Signs of a Looted Iraq	Glanz, James	Positive	Threat
93	6/8/04	The New York Times	With Fears About Terrorism, Security Measures Multiply	Justice, Glen	Positive	Contract Award
110	7/17/04	The Washington Post	How to Stop Nuclear Terror	Spencer Abraham	Positive	Contract Award
120	7/18/04	The New York Times	Providing Security, With the Help of Some Friends	Bonner, Raymond	Positive	DHS issues
121	7/21/04	The New York Times	Pressured by U.S., Greece Will Allow Troops at Olympics	Bonner, Raymond; Carassava, Anthee	Positive	Political Issues
135	7/27/04	The New York Times	At Nation's Ports, Cargo Backlog Raises Questions of Security	Broder, John M.	Negative	Customs Failure
5 of 37	9/23/04	The Washington Post	Thinking in Advance of Terror, Local Hospitals Ramp Up Preparedness in Post-9/11 World	Smith, Leef	Positive	Equipment Advances
149	10/14/04	The New York Times	Under Pressure, Mischaracterizations and Misstatements	Rosenbaum, David E.	Negative	Struggles; equipment delays
180	12/29/04	The Washington Post	Attack With Dirty Bomb More Likely, Officials Say	Linzer, Dafina	Negative	GAO Scrutiny
181	12/29/04	The Washington Post	Nuclear Capabilities May Elude Terrorists, Experts Say	Linzer, Dafina	Positive	New equipment
182	1/22/05	The New York Times	Inquiry Into Boston Plot Widens	Zezima, Katie	Positive	GAO Scrutiny
183	2/1/05	The New York Times	U.S. to Expand Its Tracking of Radioactive Materials	Lipton, Eric; Wald, Matthew L.	Positive	GAO Scrutiny
184	3/4/05	The Washington Post	Bin Laden Reappears On Bush's Agenda, President Makes Rare Mention of Terrorist	VandeHei, Jim and Baker, Peter	Positive	GAO Scrutiny

File Number: This is a number assigned to represent a unique article.

Date: Date news item ran in print

Source: Name of newspaper

Headline: Headline

Byline: Journalist proper name

Sentiment: Positive or Negative

General Observation: Used for reference, not a part of analyzed data set.

APPENDIX THREE

Terminology

ACF studies are best conducted when they include *longitudinal* data of a decade or more. In this dissertation, the period of study begins in 2003 and ends in 2013, thus providing an adequate timespan for an ACF approach to understanding policy change. *Subsystems* in this study include Representatives and Senators of the U.S. Congress, but also government program leadership, academics, private sector employees, and NGO spokespeople. These members' participation throughout the longitudinal study allows the ACF to account for various sources of influence and information upon the policy process. Manifestations of subsystem member participation are seen through the progression of scientific knowledge over time. The knowledge progression influences the belief systems of members.

Policy core beliefs are distinguished by their resistance to change; *secondary aspects of policy beliefs* are more likely to be altered by learning, as evidenced in this case study.

Policy knowledge is a broad reference to the "political process where people compete over the authoritative allocation of values and over the ability to use the instruments of government—including coercion—in their behalf" (Easton, 1965) (Lowi, 1964). Along with other descriptive detail such as dates and titles, subsystem membership and the positive or negative sentiment of exchanges are coded to observe the accumulation of policy knowledge. Charts of the statements, questions and answers exchanged over the course of many years among many experts provide the data picture

that informs greater understanding of policy learning. "In a world of scarce resources, those who do not learn are at a competitive disadvantage in realizing their goals" (Sabatier & Jenkins-Smith, Policy Change and Learning: An Advocacy Coalition Approach, 1993). Coalitions emerge as members of the subsystem solidify and pursue their core and policy core beliefs. As coalitions, they pursue their agendas according to these beliefs.

APPENDIX FOUR

Nuclear Smuggling Incidents Involving Weapons Usable Material, 1992-2001 (U.S. Government Accountability Office, 2002)

Date	Source	Seizure	Material/Quantity	Discovery
May-92	Russia	Russia	1.5kg HEU	Police investigation
May-93	Russia	Lithuania	.1kg 50% HEU	Police investigation
Jul-93	Russia	Russia	1.8kg 36% HEU	Police Investigation
Nov-93	Russia	Russia	4.5kg 20% HEU	Police investigation
Mar-94	Russia	Russia	3.05kg 90% HEU	Police investigation
May-94	Unspecified	Germany	.006kg PU-239	Police investigation
Jun-94	Russia	Germany	.0008kg 87.8% HEU	Police investigation
Jul-94	Russia	Germany	.00024kg Pu	Police investigation
Aug-94	Russia	Germany	.4Kg of Pu	Police investigation
Dec-94	Russia	Czech Republic	2.7kg 87.7% HEU	Police investigation
Jun-95	Russia	Czech Republic	.0004gr 87.7% HEU	Police investigation
Jun-95	Russia	Czech Republic	.017kg 21% HEU	Police investigation
Jun-95	Russia	Russia	1.7kg 21% HEU	Police investigation
May-99	Russia	Bulgaria	.004 kg HEU	Customs interdiction[1]
Oct-99	Unspecified	Kyrgyzstan	.0015kg Pu	Police investigation
Apr-00	***Unspecified***	***Georgia***	***.9kg 30% HEU***	***Detection equipment/police investigation***
Sep-00	Russia or Ukraine	Georgia	.004kg Pu	Police investigation
Jan-01	Unspecified	Greece	.003kg Pu	Police investigation
Jul-01	Unspecified	France	.005kg 80% HEU	Police investigation

APPENDIX FIVE
Hearings List

	No.	Date	Title	Committee	Witnesses
1	108-6	5/20/2003 & 5/22/2003	How is American Safer? A Progress Report on the DHS	Select Committee on Homeland Security	DHS Secretary Ridge
2	108-7	5/21/2003	Homeland Security Science and Technology: Preparing for the Future	Select Committee on Homeland Security	Undersecretary for S&T Charles McQueary
3	109-5	3/22/2005	Protecting Our Commerce: Port and Waterway Security	Homeland Security	Port Authorities
4	109-7	4/13/2004	The DHS: Promoting Risk-Based Prioritization and Management	Homeland Security	DHS Secretary Chertoff
5	109-8	4/14/2005	Grant Reform: The Faster and Smarter Funding for First Responders	Homeland Security	First Responders
6	109-10	4/19/2005 & 4/20/2005	DHS Coordination of Nuclear Detection Efforts Part I & II	Homeland Security	NGO's, DNDO Director Oxford
7	109-17	5/26/05	Building a Nuclear Bomb: Identifying Early Indicators of Terrorist Activities	Homeland Security	Assistant Secretary Albright
8	109-23	6/21/2005	Detecting Nuclear Weapons and Radiological Materials: How Effective is Available Technology	Homeland Security	GAO (Aloise); DNDO Director Oxford
9	109-26	6/28/2005	Pathways to the Bomb: Security of Fissile Materials Abroad	Homeland Security	Assistant Secretary Albright
10	109-32	7/14/2005 & 7/25/2005	The Secretary's Second Stage Review: Rethinking the DHS's Organization and Policy Direction Part I & II	Homeland Security	DHS Secretary Chertoff
11	109-41	9/22/2005	Trends in Illicit Movement of Nuclear Materials	Homeland Security	Rens Lee; LLNL Rep
12	109-50	10/27/2005	Nuclear Incident Response Teams	Homeland Security	DOE, FBI
13	109-69	3/16/2006	HR 4954 The Safe Port Act	Homeland Security	Asst. Comm. CBP Ahern; Shipping Companies

	No.	Date	Title	Committee	Witnesses
14	109-71	4/4/2006	HR 4954 The Safe Port Act	Homeland Security	DepSec DHS; Shipping Companies
15	109-81	5/25/2006	Enlisting Foreign Cooperation in U.S. Efforts to Prevent Nuclear Smuggling	Homeland Security	DHS, State, DOE, DNDO Director Oxford
16	109-87	6/22/2006	Reducing Nuclear and Biological Threats at the Source	Homeland Security	NNSA, State
17	109-98	9/7/2006	DHS's Science and Technology Directorate: Is it Structured for Success?	Homeland Security	DHS S&T
18	109-103	9/14/2006	The Science of Prevention	Homeland Security	Scientists
19	109-106	9/26/2007	The Department of Homeland Security Major Initiatives 2007 and Beyond	Homeland Security	DHS Secretary Chertoff
20	109-186	5/26/2006	The CSI and the CT-PAT: Securing the Global Supply Chain or Trojan Horse?	Homeland Security and Governmental Affairs	DHS Sr. Officials
21	109-395S	7/14/2005	U.S. DHS: Second Stage Review	Homeland Security and Governmental Affairs	DHS Secretary Chertoff
22	109-548S	3/28/2006 & 3/30/2006	Neutralizing the Nuclear and Radiological Threat: Securing the Global Supply Chain	Homeland Security and Governmental Affairs	GAO Mr. Aloise; DNDO Director Oxford
23	109-877S	4/5/06	The Future of Port Security: The Greenlane Maritime Cargo Security Act	Homeland Security and Governmental Affairs	DHS Sr. Officials
24	109-976S	9/12/2006	Homeland Security: The Next 5 Years	Homeland Security and Governmental Affairs	DHS Sr. Officials
25	110-2	2/7/2007	An Overview of Issues and Challenges Facing the DHS	Homeland Security	Inspector General
26	110-4	2/13/2007 & 3/8/2007	Border Security: Infrastructure, Technology and the Human Element Part I of II	Homeland Security	DHS Sr. Officials
27	110-14	3/14/2007	Countering the Nuclear Threat to the Homeland	Homeland Security	GAO Mr. Aloise; DNDO Director

	No.	Date	Title	Committee	Witnesses
			Part I of II		Oxford
28	110-31	4/26/2007	The Safe Port Act: A Six Month Review	Homeland Security	GAO; Port Authorities
29	110-50	6/19/2007	Keeping the Border Secure: Examining Potential Threats Posed by Cross-Border Trucking	Homeland Security	Trucking Companies
30	110-67	9/5/2007	Holding the Department of Homeland Security Accountable for Security Gaps	Homeland Security	DHS Secretary Chertoff
31	110-80	10/20/2007	The Safe Port Act: Status of Completion One Year Later	Homeland Security	GAO; DNDO Director Oxford
32	110-99	3/5/2008	Nuclear Smuggling Detection: Recent Tests of Advanced Spectroscopic Portal Monitors	Homeland Security	DNDO Director Oxford
33	110-111	5/7/2008	Assessing the Resiliency of the Nation's Supply Chain	Homeland Security	Port Inspectors, CBP
34	110-118	5/22/2008	The Border Security Challenge: Recent Developments and Legislative Proposals	Homeland Security	DHS Sr. Officials
35	110-323	11/15/2007	Not a Matter of "If" but "When": The Status of the U.S. Response Following an RDD Attack	Homeland Security and Governmental Affairs	GAO Mr. Aloise
36	110-676	10/16/2007	One Year Later: A Progress Report on the Security and Accountability for Every (SAFE) Port Act	Homeland Security and Governmental Affairs	Port Authorities, GAO
37	110-1038	2/13/2008 & 9/25/2008	Nuclear Terrorism	Homeland Security and Governmental Affairs	GAO Mr. Aloise; DNDO Director Oxford
38	111-34	9/14/2009	Status Report on Federal and Local Efforts to Secure Radiological Sources	Homeland Security	GAO Mr. Aloise
39	111-40	10/22/2009	Cargo Security at Land ports of Entry: Are We Meeting the Challenge?	Homeland Security	DHS Sr. Officials
40	111-54	3/3/2010	The Department of Homeland Security's Science and Technology Directorate	Homeland Security	DHS Sr. Officals
41	111-1096	6/30/2010 & 9/15/2010	Nuclear Terrorism: Strengthening Our Domestic Defenses	Homeland Security and Governmental	GAO Mr. Aloise

	No.	Date	Title	Committee	Witnesses
				Affairs	
42	111-84	9/30/2010	The Domestic Nuclear Detection Office: Can it Overcome Past Problems and Chart a New Direction?	Homeland Security	DNDO Director Stern
43	112-39	7/15/2011	Homeland Security Contracting: Does the Department Effectively Leverage Emerging Technologies?	Homeland Security	GAO, S&T
44	112-40	7/26/2011	The Last Line of Defense: Federal, State and Local Efforts to Prevent Nuclear and Radiological Terrorism within the United States	Homeland Security	DNDO Director Stern, GAO
45	112-42	9/8/2011	The Attacks of September 11: Where are We Today?	Homeland Security	9/11 Commission Members
46	112-65	2/7/2012	Balancing Maritime Security and Trade Facilitation: Protecting Our Ports, Increasing Commerce and Security the Supply Chain	Homeland Security	CBP, GAO
47	112-84	4/19/2012	DHS and DOE National Labs: Finding Efficiencies and Optimizing Outputs in Homeland Security Research and Development	Homeland Security	DNDO Deputy Director Gowadia, Labs, CRS
48	112-110	7/26/2012	Preventing Nuclear Terrorism: Does DHS Have an Effective and Efficient Nuclear Detection Strategy?	Homeland Security	DNDO Director Gowadia, GAO, PNNL (Oxford)
49	113-45	11/19/2013	What Does a Secure Maritime Border Look Like?	Homeland Security	Port Inspectors, CBP
BUDGET HEARINGS					
50	109-1	2/10/2005	The Proposed Fiscal Year 2006 Budget	Homeland Security	Asst. Secretary Albright
51	109-3	3/2/2005	Fiscal Year 2006 Budget	Homeland Security	DHS Sr. Officials
52	109-8S	3/9/2005	DHS Budget Submission for Fiscal Year 2006	Homeland Security and Governmental Affairs	DHS Secretary Chertoff
53	109-65	2/16/2006	President's Proposed FY 2007 Budget for DHS	Homeland Security	DHS Secretary Chertoff

	No.	Date	Title	Committee	Witnesses
54	109-849S	3/1/2006	DHS Budget Submission for Fiscal Year 2007	Homeland Security and Governmental Affairs	DHS Secretary Chertoff
55	110-3	2/9/2007	An Examination of the President's Fiscal Year 2008 Budget Request for the DHS	Homeland Security	DHS Secretary Chertoff
56	110-633	2/13/2007	Homeland Security Department's Budget Submission for 2008	Homeland Security and Governmental Affairs	DHS Secretary Chertoff
57	110-93	2/13/2008	The President's FY 2009 Budget for the DHS	Homeland Security	DHS Secretary Chertoff
58	110-996S	2/14/2008	The Homeland Security Department's Budget Submission for FY 2009	Homeland Security and Governmental Affairs	DHS Secretary Chertoff
59	111-980	5/12/2009	The Homeland Security Department's Budget Submission for FY 2010	Homeland Security and Governmental Affairs	DHS Secretary Napolitano
60	111-19	5/13/2009	The President's FY 2010 Budget Request for the DHS	Homeland Security	DHS Secretary Napolitano
61	111-22	6/9/2009	FY 2010 Budget for the Directorate of S&T for the Office of Heath Affairs and the DNDO	Homeland Security	DNDO Director Gallaway
62	111-53	2/25/2010	The President's FY 2011 Budget Request for the DHS	Homeland Security	DHS Secretary Napolitano
63	111-54	3/3/2010	The DHS's Science and Technology Directorate	Homeland Security	US for S&T O'Toole
64	111-1019S	2/24/2010	The Homeland Security Department's Budget Submission for FY 2011	Homeland Security and Governmental Affairs	DHS Secretary Napolitano
65	111-980S	5/12/2009	The Homeland Security Department's Budget Submission for Fiscal Year 2010	Homeland Security and Governmental Affairs	DHS Secretary Napolitano
66	112-6	3/3/2011	The President's FY 2012 Budget Request for the DHS	Homeland Security	DHS Secretary Napolitano
67	112-196S	2/17/11	The Homeland Security Department's Budget Submission for FY 2012	Homeland Security and Governmental	DHS Secretary Napolitano

	No.	Date	Title	Committee	Witnesses
				Affairs	
68	112-67	2/15/2012	An Examination of the President's FY 2013 Budget Request for the DHS	Homeland Security	DHS Secretary Napolitano
69	112-545S	3/21/2012	The Homeland Security Department's Budget Submission for FY 2013	Homeland Security and Governmental Affairs	DHS Secretary Napolitano

APPENDIX SIX

GAO Reports Related to Nuclear Detection, 2005-2013

1	**2005**	Transportation Security Administration: More Clarity on the Authority of Federal Security Directors Is Needed
2	**2006**	Combating Nuclear Smuggling: DHS Has Made Progress Deploying Radiation Detection Equipment at U.S. Ports-of-Entry, but Concerns Remain
3	**2006**	Interagency Contracting: Improved Guidance, Planning, and Oversight Would Enable the Department of Homeland Security to Address Risks
4	**2006**	Combating Nuclear Smuggling: DHS's Cost-Benefit Analysis to Support the Purchase of New Radiation Detection Portal Monitors Was Not Based on Available Performance Data and Did Not Fully Evaluate All the Monitors' Costs and Benefits
5	**2006**	Homeland Security: Opportunities Exist to Enhance Collaboration at 24/7 Operations Centers Staffed by Multiple DHS Agencies
6	**2007**	Combating Nuclear Smuggling: DNDO Has Not Yet Collected Most of the National Laboratories' Test Results on Radiation Portal Monitors in Support of DNDO's Testing and Development Program
7	**2007**	Homeland Security: Department-wide Integrated Financial Management Systems Remain a Challenge
8	**2007**	Homeland Security: DHS's Actions to Recruit and Retain Staff and Comply with the Vacancies Reform Act
9	**2007**	Department of Homeland Security: Progress Report on Implementation of Mission and Management Functions
10	**2008**	Homeland Security: Enhanced National Guard Readiness for Civil Support Missions May Depend on DOD's Implementation of the 2008 National Defense Authorization Act
11	**2008**	Homeland Security: First Responders' Ability to Detect and Model Hazardous Releases in Urban Areas Is Significantly Limited
12	**2008**	Emergency Management: GAO Responses to Post-hearing Questions for the Record
13	**2008**	Transportation Security: TSA Has Developed a Risk-Based Covert Testing Program, but Could Better Mitigate Aviation Security Vulnerabilities Identified Through Covert Tests
14	**2008**	Combating Nuclear Smuggling: DHS's Program to Procure and Deploy Advanced Radiation Detection Portal Monitors Is Likely to Exceed the Department's Previous Cost Estimates
15	**2008**	Department of Homeland Security: Improvements Could Further Enhance Ability to Acquire Innovative Technologies Using Other Transaction Authority
16	**2008**	Combating Nuclear Smuggling: DHS's Phase 3 Test Report on Advanced Portal Monitors Does Not Fully Disclose the Limitations of the Test

		Results
17	**2008**	Department of Homeland Security: Billions Invested in Major Programs Lack Appropriate Oversight
18	**2008**	Northern Border Security: DHS's Report Could Better Inform Congress by Identifying Actions, Resources, and Time Frames Needed to Address Vulnerabilities
19	**2008**	Homeland Security: U.S. Visitor and Immigrant Status Indicator Technology Program Planning and Execution Improvements Needed
20	**2009**	Nuclear Detection: Domestic Nuclear Detection Office Should Improve Planning to Better Address Gaps and Vulnerabilities
21	**2009**	Nuclear Forensics: Comprehensive Interagency Plan Needed to Address Human Capital Issues
22	**2009**	Combating Nuclear Smuggling: DHS Improved Testing of Advanced Radiation Detection Portal Monitors, but Preliminary Results Show Limits of the New Technology
23	**2009**	Equal Employment Opportunity: DHS Has Opportunities to Better Identify and Address Barriers to EEO in Its Workforce
24	**2009**	Supply Chain Security: Feasibility and Cost-Benefit Analysis Would Assist DHS and Congress in Assessing and Implementing the Requirement to Scan 100 Percent of U.S.-Bound Containers
25	**2009**	Department of Homeland Security: Actions Taken Toward Management Integration, but a Comprehensive Strategy Is Still Needed
26	**2009**	Financial Management Systems: DHS Faces Challenges to Successfully Consolidating Its Existing Disparate Systems
27	**2010**	Maritime Security: Responses to Questions for the Record
28	**2011**	DHS Science and Technology: Additional Steps Needed to Ensure Test and Evaluation Requirements Are Met
29	**2011**	Federal Protective Service: Progress Made but Improved Schedule and Cost Estimate Needed to Complete Transition
29	**2011**	Information Technology: DHS Needs to Improve Its Independent Acquisition Reviews
30	**2011**	Department of Homeland Security: Progress Made and Work Remaining in Implementing Homeland Security Missions 10 Years after 9/11
31	**2011**	Data Mining: DHS Needs to Improve Executive Oversight of Systems Supporting Counterterrorism
32	**2011**	Quadrennial Homeland Security Review: Enhanced Stakeholder Consultation and Use of Risk Information Could Strengthen Future Reviews
33	**2011**	Technology Assessment: Neutron Detectors: Alternatives to Using Helium-3
34	**2012**	DHS Human Capital: Senior Leadership Vacancy Rates Generally Declined, but Components' Rates Vary
35	**2012**	Department of Homeland Security: Further Action Needed to Improve Management of Special Acquisition Authority

36	**2012**	Department of Homeland Security: Oversight and Coordination of Research and Development Should Be Strengthened
37	**2012**	Homeland Security: DHS Requires More Disciplined Investment Management to Help Meet Mission Needs
38	**2012**	Information Technology: DHS Needs to Enhance Management of Cost and Schedule for Major Investments
39	**2012**	Department of Homeland Security: Efforts to Assess Realignment of Its Field Office Structure
40	**2012**	Combating Nuclear Smuggling: Megaports Initiative Faces Funding and Sustainability Challenges
41	**2013**	Combating Nuclear Smuggling: Lessons Learned from Cancelled Radiation Portal Monitor Program Could Help Future Acquisitions Department of Homeland Security: Opportunities Exist to Better Evaluate and Coordinate Border and Maritime Research and Development
42	**2013**	DHS Financial Management: Additional Efforts Needed to Resolve Deficiencies in Internal Controls and Financial Management Systems
43	**2013**	Maritime Security: DHS Could Benefit from Tracking Progress in Implementing the Small Vessel Security Strategy
44	**2013**	DHS Management and Administration Spending: Reliable Data Could Help DHS Better Estimate Resource Requests