

**ECONOMIC AND EMPLOYMENT BENEFITS OF THE
CHEMICAL AND WATER SECURITY ACT OF 2009
(H.R. 2868)**

Prepared for

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EXECUTIVE SUMMARY

There are roughly 12,000 geographically dispersed facilities in the U.S. that manufacture, consume, or store significant amounts of hazardous substances.¹ These substances represent a significant risk to the population and environment if accidentally leaked into the air, and the industries affected by chemical security vulnerabilities range across the spectrum of U.S. industries. The companies and industries involved span the economy and include chemical manufacturers, fertilizer and pesticide facilities, food manufacturing, pulp and paper manufactures, storage and distribution facilities, utilities, refineries, and water and wastewater treatment facilities. Not only are these facilities subject to an accidental release of chemicals that threaten the health and life of millions of Americans, but those located in densely populated areas are now also recognized as being potential targets for terrorist actions.

The Department of Homeland Security (DHS) and the Environmental Protection Agency (EPA) have jurisdiction over hazardous substances and air and water quality, but do not have the power to require the reduction of these inherent risks to society to acceptable levels. A number of Congressional bills have been introduced over the last few years giving federal government agencies a leading role in protecting the public. The most recent is H.R. 2868, the Chemical and Water Security Act of 2009 which passed the House of Representatives November 6, 2009 and contains three Titles that direct DHS and EPA to formulate a new approach to chemical, water, and wastewater treatment facility security by providing operational funding and grant money to stimulate a greater private-sector response. This report summarizes the House-passed bill and the three Titles and estimates the economic and employment impacts of the bill on the U.S. economy for a ten year period.

There are a number of methods that have been used over the last decade to create safer facilities, and almost all of the changes that have occurred were based on sound business decisions that did not affect the company's bottom line. Hundreds of chemical facilities have already transitioned to safer, more secure alternatives on their own. In many cases, facility owners experienced cost-savings after switching because of a:

- Reduced requirement for physical security measures
- Reduced regulatory reporting burden
- Reduced liability and other insurance
- Increase in process efficiency
- Increase in production and product quality
- Decrease in worker-related health and safety costs

¹ There are 12,029 facilities according to EPA's Risk Management Program.

Economic and employment impacts in the U.S. will occur because of expenditures related to the Congressional bill and the stimulus that the bill provides to covered facilities to conduct process changes or any other method that reduces or eliminates the potential consequences of a terrorist attack. Here we examined each of the Titles in detail and estimated the likely expenditures forecast through 2020 – Table EX-1.

Table EX-1
Direct Annual Expenditures Attributable to H.R. 2868
(millions of dollars)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Title 1										
Conversion grants	100	75	50	50	50	50	50	50	50	50
DHS expenditures	225	225	225	233	233	233	233	233	233	233
Private matching and other expenditure	100	75	50	50	50	50	50	50	50	50
UMRA intergovernmental costs	-	-	-	-	-	-	-	-	-	-
UMRA private sector costs	-	-	-	-	-	-	-	-	-	-
Total	425	375	325	333						
Title 2										
EPA/State government expenditures	30	31	31	32	32	32	32	32	32	32
Conversion assistance	125	128	130	133	133	133	133	133	133	133
Training grants	160	164	167	172	172	172	172	172	172	172
Owner matching and other expenditure	25	25	25	25	25	25	25	25	25	25
UMRA intergovernmental costs	-	-	-	-	-	-	-	-	-	-
UMRA private sector costs	-	-	-	-	-	-	-	-	-	-
Total	340	347	354	362						
Title 3										
EPA/State government expenditures	-	-	-	-	-	-	-	-	-	-
Conversion grants	150	150	150	150	150	150	150	150	150	150
Assistance and training grants	50	50	50	50	50	50	50	50	50	50
Owner matching and other expenditure	25	25	25	25	25	25	25	25	25	25
UMRA intergovernmental costs	-	-	-	-	-	-	-	-	-	-
UMRA private sector costs	-	-	-	-	-	-	-	-	-	-
Total	225									
Programmatic Total	990	947	904	920						

Source: Management Information Services, Inc., 2010.

We estimated that, including the public-sector program and the private sector expenditures, the total chemical facilities program will cost an estimated \$990 million in 2011, decreasing to \$904 million in 2013, but then staying at a level of \$920 million from 2014 through 2020. Using the MISI input-output model, we estimated that H.R. 2868 will create a total gross sales impact of almost \$2 billion in the first year of 2011 and account for 8,000 jobs -- Table EX-2. The economic impact is projected to stay close to the \$1.9 to \$1.8 billion estimate over the period through 2020 as a combination of government programs and private-sector expenditures continue to transform the

facilities to safer configurations. The number of employees across the country working on these new economic activities (the gross employment impact) is forecast to remain at about 8,000 every year through 2020.

Gross sales are defined as the added activity in the U.S. economy that results from the initial expenditure. Comparing the resultant gross sales to the initial direct expenditure provides a measurement of the impact multiplier. In this case, the multiplier is around 2.0 every year, meaning that for every dollar spent, the direct and indirect impacts across the economy totaled almost two dollars. Because the initiative affects a diverse mix of sectors in the economy, the resultant 2.0-multiplier is close to the national average. For instance it can be compared to a low multiplier, when there is additional demand for the real estate industry of 1.5, to a higher multiplier of 2.4 when there is additional demand for output in the primary metals industry.

**Table EX-2
Economic and Employment Impacts Attributable to H.R. 2868**

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Gross sales impact (million dollars)	1,953	1,870	1,779	1,813	1,813	1,813	1,812	1,810	1,808	1,807
Gross employment impact (thousands)	8	8	8	8	8	8	8	8	8	8
Net employment impact (thousands)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Source: Management Information Services, Inc., 2010.

We also conducted a *net* jobs analysis by examining a scenario where expenditures allocated in a normal pattern throughout the U.S. economy were reprogrammed to pay for the H.R. 2868 initiative, keeping government and private expenditures at a net-zero dollar level. In this case, the change in net employment across the economy was not large enough to measure. The impacts were less than a net loss or net gain of fewer than 500 jobs across the country. While the impacts of H.R. 2868 will affect many companies and as many as 8,000 jobs in various industries, the net, economy-wide job impact will likely be close to zero. Under H.R. 2868, productivity advancements will be made in the facilities included in this study and the demand for labor will continue to decline as it would under baseline economic growth without the legislation, and it will decline no more so than in other industries over the 2011-2020 period. After the facility conversions and upgrades, the industries affected will be in a more sustainable position and will be positioned to offer greater job security to their workforce.

Some of the more detailed results of this study include identifying key industries that will be positively affected more than others, both in terms of increased gross sales and employment. These industries include, in order of positive economic impact over the 2011-2020 period:

- Chemical products (about 14 percent of the economic impact)
- State and local government (9 percent)
- Federal government (9 percent)
- Miscellaneous professional, scientific, and technical services (6 percent)
- Water utilities (5 percent)
- Waste management and remediation services (5 percent)

I. INTRODUCTION

Across the U.S., roughly 12,000 facilities manufacture, consume, or store significant amounts of hazardous substances that represent a significant risk to the population and environment if accidentally leaked into the air according to EPA's Risk Management Program. The companies and industries involved span the economy and include chemical manufacturers, fertilizer and pesticide facilities, food manufacturing, pulp and paper manufactures, storage and distribution facilities, utilities, refineries, and water and wastewater treatment facilities. Not only are these facilities subject to an accidental release of chemicals that threaten the health and life of millions of Americans, but those in densely populated areas are now also recognized as being potential targets for terrorist actions.

The Department of Homeland Security (DHS) and the Environmental Protection Agency (EPA) have had jurisdiction over hazardous substances and air and water quality, but do not have the power to require the reduction of these inherent risks to society to acceptable levels. Because of the lack of resources and a strong charter to improve the Nation's safety, a number of Congressional bills have been introduced over the last few years giving federal government agencies a leading role in protecting the public. The most recent is H.R. 2868, the Chemical and Water Security Act of 2009, which passed the House of Representatives November 6, 2009 and contains three Titles that direct DHS and EPA to formulate a new approach to chemical, water, and wastewater treatment facility security by providing operational funding and grant money to stimulate a greater private-sector response.

This report provides a summary of the House-passed bill and the three Titles and then, using publicly available information, descriptions, and analyses, estimates the economic and employment impacts of the bill on the U.S. economy for a ten year period. The analysis focuses on identifying key industries affected both directly and in the supply chain.

II. TITLE I: CHEMICAL FACILITY SECURITY

Title I of H.R. 2868, The Chemical Facility Anti-Terrorism Act of 2009,² amends the Homeland Security Act of 2002, providing more regulation of security practices at chemical facilities and government monetary grants to owners for conversion of their facilities to inherently safer facilities.³

Some of the provisions of Title I that are most relevant to this assessment include those that:

- Authorize the Secretary of the Department of Homeland Security to designate substances of concern and establish chemical safety thresholds
- Direct the Secretary to maintain a list of chemical facilities segmented in four risk categories
- Establish standards and procedures for security assessments and plans and require them, and conformance to them, by facility owners
- Establish a program to award grants to eligible organizations to provide for training and education of employees and emergency responders
- Require the owner or operator of a covered chemical facility to include in the site security plan an assessment of methods to reduce the consequences (MRC) of a terrorist attack on that facility and where appropriate implement MRC
- Authorizes \$100 million in grants in the first year to offset the costs of implementing MRC
- Direct the Secretary to issue regulations to require covered chemical facilities to increase a wide range of personnel security measures
- Authorize the Secretary to carry out the Chemical Facilities Anti-Terrorism Standards until permanent rules take effect
- Authorize appropriations to fund these activities

²H.R. 2868, "Chemical and Water Security Act of 2009" was adopted by the House of Representatives November 6, 2009: a bill to amend the Homeland Security Act of 2002 to enhance security and protect against acts of terrorism against chemical facilities, to amend the Safe Drinking Water Act to enhance the security of public water systems, and to amend the Federal Water Pollution Control Act to enhance the security of wastewater treatment works, and for other purposes, introduced June 15, 2009 in the 111th Congress.

³Title I "amends the Homeland Security Act of 2002 to set forth provisions governing the regulation of security practices at chemical facilities."

III. TITLE II: DRINKING WATER SECURITY

Title II of H.R. 2868, the Drinking Water System Security Act of 2009, amends the Safe Drinking Water Act and expands the requirements for assessments by water systems covered under the act and their vulnerability to intentional acts of sabotage.⁴ "Covered water systems" are defined as community public systems that serve a population greater than 3,300 or that present a security risk.

Some of the provisions of Title II that are most relevant to this assessment include those that:

- Authorize the Administrator of the EPA to designate substances of concern in issuing water system security standards
- Direct the Administrator of the EPA to issue regulations to establish tiered, risk-based performance standards for the security of covered water systems and requirements for the systems to conduct vulnerability assessments; develop site security and emergency response plans
- Provide training to system and contractor employees and authorize \$160M per year in training grants
- Specify that EPA regulations must address the vulnerability of a water system to intentional acts and levels of risk; and require the Administrator to review and approve the vulnerability assessments and site security plans of covered water systems, including an assessment of MRC, and where appropriate, to implement MRC in partnership with local and state authorities
- Authorize the Administrator to award \$30M in grants to states in implementing new regulations under this Act and for assessing and implementing methods to reduce the consequences of a release
- Authorize \$125 million in the first year in grants to help fund the implementation of MRC.

⁴Title II "amends the Safe Drinking Water Act to revise and expand requirements for assessments by covered water systems of their vulnerability to intentional acts of sabotage."

IV. TITLE III: WASTEWATER TREATMENT WORKS SECURITY

Title III of H.R. 2868, The Wastewater Treatment Works Security Act of 2009 amends the Federal Water Pollution Control Act (Clean Water Act) requiring owners or operators of a wastewater treatment facilities that have a treatment capacity of at least 2.5 million gallons per day or, at the discretion of the EPA Administrator, that presents a security risk to conduct and update a vulnerability assessment; develop and implement a site security plan; and develop an emergency response plan for the wastewater treatment works.⁵

Some of the provisions of Title III that are most relevant to this assessment include those that:

- Authorize the Administrator of the EPA to designate substances of concern in issuing wastewater treatment system security standards
- Direct the Administrator of EPA to issue regulations by December 31, 2010 establishing risk-based standards for the security of the systems; and submissions of facility vulnerability assessments and implementation of site security plans, emergency response plans, and provisions of annual training to employees of the treatment facilities
- Require the Administrator to provide a classification of four risk-based tiers of facilities, taking into consideration the facility size, neighboring population, and the potential impact of intentional acts on the environment, infrastructure, and public health and safety; assign each covered facilities to one of such tiers; establish risk-based standards for site security plans and emergency response plans that reflect the level of risk associated with the risk-based tier assignment
- Require a facility that possesses a chemical of concern in sufficient quantities to include an assessment of methods to reduce the consequences of an intentional chemical release (MRC), and where appropriate to implement the MRC in partnership with local and state authorities
- Authorize the Administrator to provide grants to individual or multiple state or local government organizations to conduct a vulnerability assessment of a publicly owned facility, and to provide for security-related training of employees and emergency response related training
- Authorizes \$200 million a year in grants to enhance security at local facilities, including MRC.

⁵Title III “amends the Federal Water Pollution Control Act (commonly known as the Clean Water Act) to require each owner or operator of a treatment works that has a treatment capacity of at least 2.5 million gallons per day or, in the discretion of the Administrator, that presents a security risk making coverage appropriate, to: (1) conduct and update a vulnerability assessment of its treatment works; (2) develop, periodically update, and implement a site security plan; and (3) develop and revise an emergency response plan for the treatment works.”

V. ESTIMATED EXPENDITURES

The industries affected by chemical security vulnerabilities range across the spectrum of U.S. industries. In 2008, the Center for American Progress (CAP) identified 101 highest-hazard facilities in the U.S. and identified commercially available, safer and more secure alternatives for nearly all of them.⁶ Table 1 breaks down these facilities by industry and North American Industry Classification System (NAICS) code. The first group in the table represents the 101 highest-hazard facilities. In addition, CAP identified a number of other industries of concern due to their use of chlorine, sulfur dioxide, and anhydrous ammonia, and those 23 facilities are classified at the bottom of Table 1.

Table 1
Dispersion of High-Hazard Facilities in the U.S. Economy

Top 101	Facilities	NAICS	Industry Title
Drinking water & wastewater treatment	15	221	Utilities
Pulp and paper manufacturing	1	322	Paper manufacturing
Petroleum refining	8	324	Petroleum & coal products manufacturing
Bleach manufacturing	30	325	Chemical manufacturing
Fertilizer manufacturing	1	325	Chemical manufacturing
Other chemical manufacturing	37	325	Chemical manufacturing
Rail transportation storage	2	482	Rail transportation
Chemical transportation (road)	3	484	Truck transportation
Chemical terminals (marine)	2	488	Support activities for transportation
Hazardous waste incinerators	2	562	Waste management & remediation services
Others of Concern			
Power plants	13	221	Utilities
Food processors	5	311	Food manufacturing
Secondary aluminum smelters	5	331	Primary metal manufacturing

Source: Center for American Progress, 2008 and Source: Management Information Services, Inc., 2010.

Not only are the industries wide-ranging, but they are also geographically dispersed, and their locations range from California and Washington to New York and Florida.

Identifying Critical Facilities

When assessing the most critical facilities that need to evolve into safer facilities, it is important to triage the list. Each of H.R. 2868 Title's have their own method for classifying dangerous plants, but most would rely on the number of persons affected by a catastrophe.

⁶Paul Orum, *Chemical Security 101: What You Don't Have Can't Leak, or Be Blown Up by Terrorists*, Center for American Progress, November 2008.

There are clear guidelines for Title I regulated facilities, since they are classified in tiers. MISI's best current estimates, based on Department of Homeland Security classifications of "Final Tiering" and "Awaiting Final Tiering" facilities, are that there will be:

- 229 facilities classified as Tier 1 facilities
- 575 facilities classified as Tier 2
- 1,276 facilities classified as Tier 3
- 3,739 facilities classified as Tier 4

H.R. 2868 would also add 400 to 600 port facilities currently regulated under the Maritime Transportation Security Act and likely to be contained in EPA's Risk Management Plan data base. It is not known which risk tier these facilities would be assigned to but some will eventually be classified as Tier 1 and Tier 2 facilities.

According to current EPA sources, there are only 1,554 drinking water facilities out of 9,000 medium and large sized community water systems that may be required to assess MRC. These Title II Tier 1 and 2 facilities will likely be classified based on the affected population. For our analysis, we anticipate that the population number is fixed at 100,000, which results in 45 facilities classified as Tier 1 and Tier 2.

Finally, according to EPA sources, the universe of eligible Title III wastewater treatment facilities will include 1,800 systems with a capacity of over 2.5 million gallons a day, but only 871 of them may be required to assess MRC. Tier I and II facilities will likely be classified based on the affected population. For our analysis, we anticipate that the population number is fixed at 100,000, which results in 28 facilities classified as Tier 1 and Tier 2.

Risk Reduction Methods

There are a number of methods that have been used over the last decade to create safer facilities. Hundreds of facilities have already made this move, particularly since 2001. Almost all of the changes that have occurred were based on sound business decisions that did not affect the company's bottom line. Given the time, companies typically waited for the next round of plant upgrades or other corporate planned events to also incorporate safety-related changes. There have been a number of options employed thus far and each facility and company had unique circumstances that led them to choose the best technique for reducing chemical hazards. These choices included:

- Raw material changes where other substances are used, or solids and liquid forms used in place of gaseous versions
- Process changes so that high-technology solutions reduce or replace the need for chemical inputs
- Just-in-time delivery or just-in-time on-site creation of chemicals, so that hazardous inventories are reduced

- Hardened and more secure storage
- Combining plants so that only one facility needs to be secured or moving plants to less densely populated areas

It must be noted that the last option of combining facilities or moving them to other locations is not necessarily a preferred solution. Because of the continuing nature of the risk presented, this may not be an eligible option that can be employed in the future.

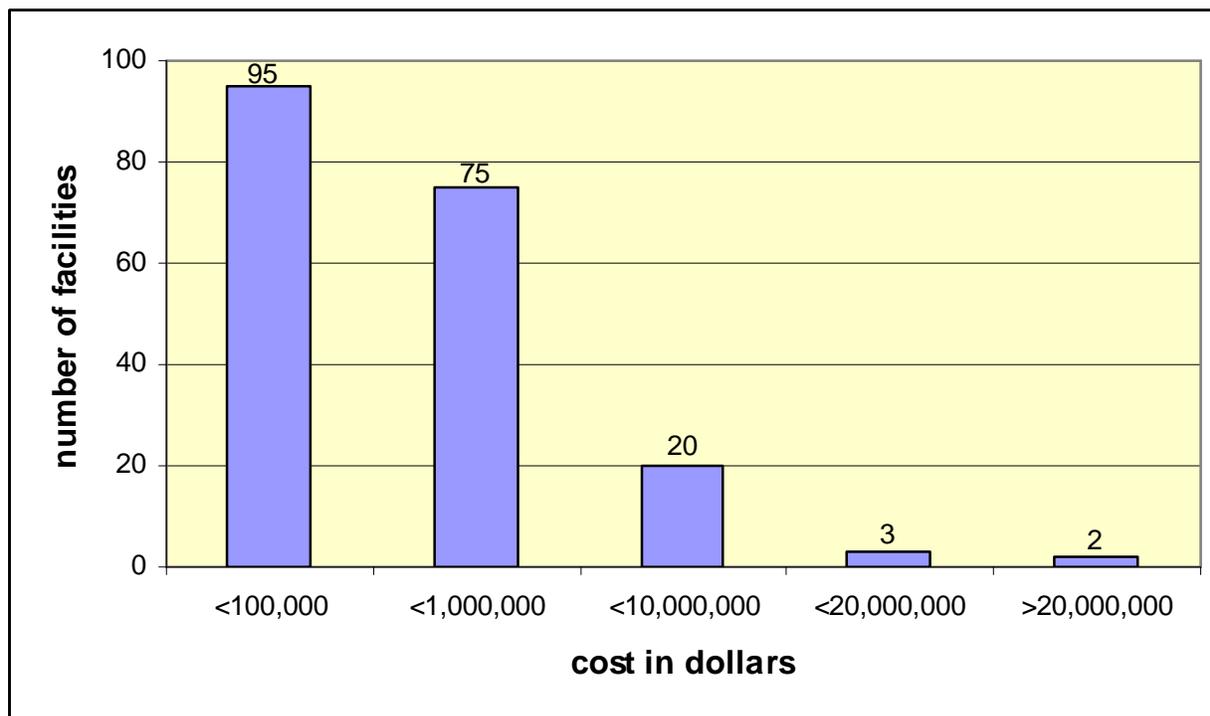
Conversion Costs

Hundreds of facilities no longer represent a threat because of a switch to less hazardous substances or a change in the process. Almost all these conversions were made voluntarily by companies. CAP documented 284 of these transitions in their 2006 survey and report.⁷ On the survey question of final costs, the results were mixed and almost neutral. Out of the 226 respondents: 34 percent of the companies reported that they expected cost savings or improved profitability, 45 percent responded they did not expect cost savings, and just over one-fifth expected little change in costs.

On another survey question, 195 facilities reported their cost of switching to less hazardous substances or a change in the process, and responses were provided in five ranges of dollars spent to implement the change. These are represented in Figure 1 and show that 95 facilities reported spending less than \$100,000, 75 additional facilities reported spending up to \$1 million, 20 additional facilities reported spending up to \$10 million, three additional facilities reported spending up to \$20 million, and finally, two reported spending over \$20 million. While this is not an unbiased sample because it represents not only past volunteer organizational actions but also volunteer responses to the survey, it nonetheless provides an idea of typical conversion costs in a spectrum of industries. Of these self-reported actions, 87 percent cost less than \$1 million. Making some assumptions about the distribution of the costs, we can estimate that the median conversion cost for this group of facilities was roughly around \$125,000. Making another heroic assumption about the two very expensive outliers, we can also estimate that the average cost of the changes to these facilities might have been around \$1.25 million. These estimates are fraught with caveats, but without actual, definitive reported, and verifiable information, they give us an idea of what relative magnitude future conversions may cost.

⁷Paul Orum, *Preventing Toxic Terrorism: How Some Chemical Facilities are Removing Danger to American Communities*, Center for American Progress, April 2006.

Figure 1
Costs to Convert to Safer Facility



Source: Center for American Progress, 2006 and Management Information Services, Inc., 2010.

Clearly, typical costs will vary by chemical, industry, facility size, conversion option chosen, etc. For instance, the conversion costs for a petroleum refinery to switch from hydrofluoric acid to the less dangerous sulfuric acid may be between \$20 and \$30 million according to one estimate and between \$7 and \$30 million according to the U.S. PIRG.⁸ (A majority of 98 refineries already use safer alternatives, but as many as 50 still use the most hazardous form of hydrofluoric acid.) Other processes can be changed to safer alternatives for less than \$100,000.

Annual Expenditures

Economic and employment impacts in the U.S. will occur because of direct expenditures related to the Congressional bill and the stimulus that the bill provides to organizations with covered facilities to conduct process changes or implement other methods to reduce or eliminate the potential consequences of a terrorist attack.

For this analysis, each of the Titles was examined in detail and direct expenditures documented or estimated -- see Table 2.

⁸ See *Washington Monthly* article, "The Next Attack", by David Flynn, July 3, 2007 and U.S. PIRG Education Fund (2005).

Table 2
Direct Annual Expenditures Attributable to H.R. 2868⁹
(millions of dollars)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Title 1										
Conversion grants	100	75	50	50	50	50	50	50	50	50
DHS expenditures	225	225	225	233	233	233	233	233	233	233
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UMRA private sector costs	-	-	-	-	-	-	-	-	-	-
Total	425	375	325	333						
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EPA/State government expenditures	30	31	31	32	32	32	32	32	32	32
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Training grants	160	164	167	172	172	172	172	172	172	172
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UMRA private sector costs	-	-	-	-	-	-	-	-	-	-
Total	340	347	354	362						
Title 3										
EPA/State government expenditures	-	-	-	-	-	-	-	-	-	-
Conversion grants	150	150	150	150	150	150	150	150	150	150
Assistance and training grants	50	50	50	50	50	50	50	50	50	50
Owner matching and other expenditure	25	25	25	25	25	25	25	25	25	25
UMRA intergovernmental costs	-	-	-	-	-	-	-	-	-	-
UMRA private sector costs	-	-	-	-	-	-	-	-	-	-
Total	225									
Programmatic Total	990	947	904	920						

Source: Management Information Services, Inc., 2010.

Title I expenditures will include \$100 million in grants to facilities to fund conversions to safer technologies in 2011, \$75 million in 2012, and \$50 million in 2013 through 2020. These levels include \$3 million for designated farm suppliers. The remainder of the appropriated budget will be used by DHS for internal programs and to conduct facility employee and first-responder training. This level is at \$225 million until 2014 when the anticipated level rises to \$233 million, remaining at that level through 2020. Our assumption is that DHS will provide a grant program that includes a dollar-

⁹Note that the years listed are fiscal years due to federal government budget conventions and are Budget Authorized levels. The dollar expenditures for 2011-2014 are in current dollars due to federal government budget conventions. The dollar expenditures for 2015-2020 but are in constant FY 2014 dollars for economic modeling and projection purposes. Because most of the government-supplied budget expenditures levels are straight-lined during 2011-2014 and a negligible level of annual inflation is expected by CBO, the error inherent in comparing the 2011-2014 dollar values with future values is minimal.

matching program and that facility owners will contribute to continued facility conversions without government subsidy. We assume here that private funds will equal the level of the grant money available in 2011-2014 and that, based on the results of the conversion cost study expenditures will remain at 2014 levels through 2020. To account for that, private funding is forecast to continue at a level of \$50 million per year until 2020.

Two other expenditure categories remain: The impact on intergovernmental and private-sector organizations covered under the Unfunded Mandates Reform Act (UMRA). The Congressional Budget Office (CBO) determined that because the cost of some of the mandates would depend on future regulatory actions, the impacts could not be estimated and that, therefore, CBO could not determine whether the costs would exceed the annual thresholds established in UMRA: \$69 million for intergovernmental organizations and \$139 million for private sector organizations in 2009.¹⁰ In keeping with this CBO finding, here we made no estimates for those costs.

Title II expenditures in 2011 will include \$30 million programmatic expenditures for EPA for state governments, \$125 million to fund conversions to safer technologies, and \$160 million for training, to prepare assessments and security plans, and implement security enhancements. These levels would increase every year, from \$315 million in 2011 to \$328 million in 2014. For this analysis, we assumed that these expenditures would continue at the 2014 funding level through 2020. Taking into consideration that most of the conversions will be less expensive compared to Title I facility changes, and that there may only be around 45 Tier 1 and Tier 2 facilities, we estimate that between cost-sharing programs and other conversions performed voluntarily that as much as \$25 million will be spent by organizations every year over the period. Again, the CBO choose not to estimate the UMRA-related costs, so they are not estimated here.

Title III expenditures will include \$200 million each year for 2011 through 2014 and organizations are expecting that to include \$150 million for conversion grants and \$50 million for grants to support assessments, worker training, and other security enhancements. It is also assumed that these expenditures continue out to 2020. Taking into consideration that most of the conversions will be moderately to less expensive compared to Title I facility changes, and that there may only be around 28 Tier 1 and Tier 2 facilities, we estimate that between cost-sharing programs and other conversions performed voluntarily that as much as \$25 million will be spent by organizations every year over the period. Again, the CBO choose not to estimate the UMRA-related costs, so they are not estimated here.

¹⁰See Congressional Budget Office, "Cost Estimate of H.R. 2868 Chemical Facility Anti-Terrorism Act of 2009, as ordered reported by the House Committee on Homeland Security on June 23, 2009," July 9, 2009; Congressional Budget Office, "Cost Estimate of H.R. 2868 Chemical Facility Anti-Terrorism Act of 2009 as ordered reported by the House Committee on Energy and Commerce on October 22, 2009, October 23, 2009.

Combining the public-sectors programs and the private sector expenditures, the total chemical facilities program will cost an estimated \$990 million in 2011, decreasing to \$904 million in 2013, but then staying at a level of \$920 million from 2014 through 2020.

VI. ECONOMIC AND EMPLOYMENT IMPACTS

The expenditures estimated and detailed in Table 2, were classified into industry-level expenditures and applied to the MISI 70-order input-output model which translates direct expenditures into per unit output requirements from 70 supporting industries in the economy.¹¹ The model is based on extensive proprietary and non-proprietary databases, including those from the Bureau of the Census, Department of Labor, the Bureau of Economic Analysis, and economic forecasting databases for the U.S and most states. The national and regional versions of the MISI input-output model have been used for numerous studies of energy and environmental projects, economic initiatives, proposed legislation and numerous government programs (NASA, DOD, DOE, etc.) and has been validated over three decades of use. This application of assessing the industrial-level economic and employment impacts of federal legislation represents one of the classic and best uses of the input-output model.

Applying the model over the 2011–2020 period, we estimate that H.R. 2868 will create a total gross sales impact of almost \$2 billion in the first year of 2011 and account for about 8,000 jobs – Table 3. The economic impact is projected to stay close to the \$1.9 to \$1.8 billion estimate over the entire period as a combination of government programs and private-sector expenditures continue to transform the facilities to safer environments. The gross jobs impact attributable to the legislative initiative is forecast to stay at around 8,000 every year through 2020.

Gross sales are defined as the added activity in the U.S. economy that results from the initial expenditure. Comparing the resultant gross sales to the initial direct expenditure provides a measurement of the impact multiplier. In this case, the multiplier is around 2.0 every year, meaning that for every dollar spent, the direct and indirect impacts across the economy totaled almost two dollars. Because the initiative affects a diverse mix of sectors in the economy, the resultant 2.0-multiplier is close to the national average. For instance it can be compared to a low multiplier, when there is additional demand for the real estate industry of 1.5, to a higher multiplier of 2.4 when there is additional demand for output in the primary metals industry.

Table 3
Economic and Employment Impacts Attributable to H.R. 2868

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Gross sales impact (million dollars)	1,953	1,870	1,779	1,813	1,813	1,813	1,812	1,810	1,808	1,807
Gross employment impact (thousands)	8	8	8	8	8	8	8	8	8	8
Net employment impact (thousands)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Source: Management Information Services, Inc., 2010.

¹¹See the Appendix for a full description of the model and other applications for its use at ASES (2009) and Bezdek and Wendling (2005).

During the course of the research we also projected a *net* jobs analysis. Here, we examined a scenario where expenditures allocated in a normal pattern throughout the economy were reprogrammed to pay for the H.R. 2868 initiative, keeping government and private expenditures at a net-zero dollar level. In this case, the change in net employment across the economy was not large enough to measure. The impacts were less than a net loss or net gain of 500 employees across the country. While the implications of H.R. 2868 will affect many companies and as many as 8,000 jobs in various industries, the net impact is close to zero. What we **do** expect to see under H.R. 2868 is that productivity advancements will be made in the facilities included in this study and the demand for labor will continue to decline, but no more so than in other industries. After the facility conversions and upgrades, the industries affected will be in a more sustainable position and will be positioned to offer greater job security to their workforce.

Some of the more detailed results of this study include identifying key industries that will be positively affected more than others, both in terms of contributions to increased gross sales and to employment. These industries include, in order of positive impact over the 2011-2020 period:

- Chemical products (about 14 percent of the economic impact)
- State and local government (9 percent)
- Federal government (9 percent)
- Miscellaneous professional, scientific, and technical services (6 percent)
- Water utilities (5 percent)
- Waste management and remediation services (5 percent)

In summary, the analysis suggests that H.R. 2868 will have a slight positive impact on the U.S. economy and a small increase in net employment nationwide. In addition, the legislation will place thousands of employees and millions of U.S. residents in a vastly safer environment.

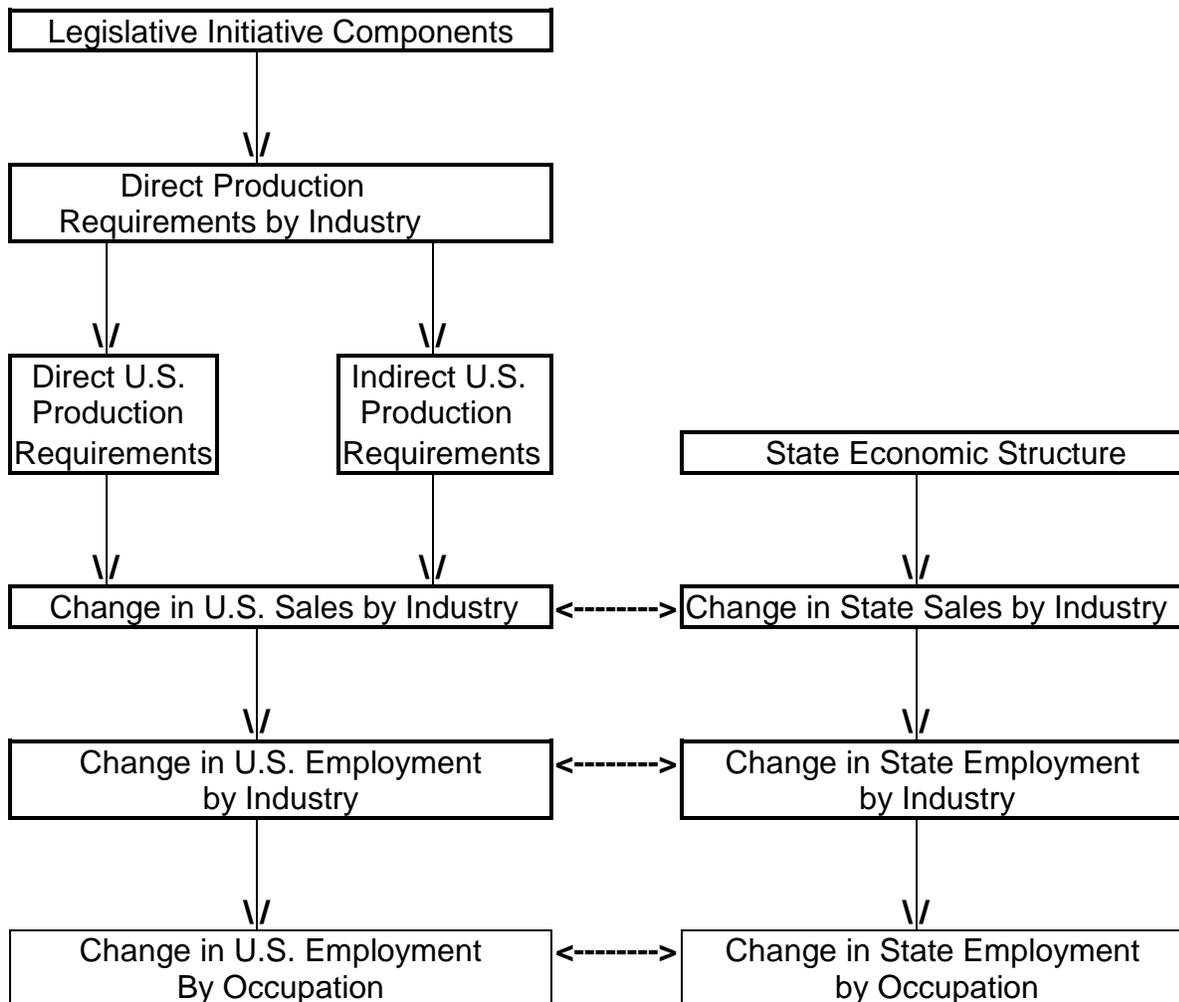
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**APPENDIX
THE MISI MODEL**

The economic and employment effects of H.R. 2868 were estimated using the Management Information Services, Inc. model, data base, and information system. A simplified version of the MISI model as applied in this study is shown below.

Use of the MISI Model to Estimate Economic and Employment Impacts



Source: Management Information Services, Inc., 2010.

The first step in the MISI model involves the estimation of the direct requirements of the government initiative including grants, subsidies, and expenditures by other government programs. Additional direct requirements are included based upon estimates of industry investments.

The MISI model translates the direct expenditures into per unit output requirements from every supporting industry in the economy. While the MISI model contains 490 commodities and industries, in the work conducted here a 70-order industry scheme is used -- the 70-order industries are listed below

Second, the direct output requirements of every supporting industry affected as a result of the government initiative are estimated, and they reflect the production and technology requirements implied by the initiative. These direct requirements show, proportionately, how much an industry must purchase from every other industry to produce one unit of output. Direct requirements, however, give rise to subsequent rounds of indirect and induced requirements as additional purchases are made by industries and consumers.

The sum of the direct, indirect, and induced requirements represents the total output requirements from an industry necessary to produce one unit of output based on the government initiative. Economic input-output (I-O) techniques allow the computation of the direct as well as the indirect production requirements, and these total requirements are represented by the "inverse" equations in the model. The ratio of the total requirements to the direct requirements is called the input-output multiplier.

Thus, in the third step in the modeling sequence the direct industry output requirements are converted into total output requirements from every industry by means of the input-output inverse equations. These equations show not only the direct requirements, but also the second, third, fourth, nth round indirect industry and service sector requirements resulting from the government initiatives and the private-sector investment.

Next, the total output requirements from each industry are used to compute sales volumes, value added (including profits and taxes) for each industry. Then, using data on manhours, labor requirements, and productivity, employment requirements within each industry are estimated. This allows computation of the total number of jobs created within each industry.

U.S. Input-Output Industry Codes and Titles, 70-Order

Industry Code	Industry Title	NAICS Code
111CA	Farms	111,112
113FF	Forestry, fishing, and related activities	113-115
211	Oil and gas extraction	211
212	Mining, except oil and gas	212
213	Support activities for mining	213
22	Utilities	22
23	Construction	23
311FT	Food and beverage and tobacco products	311, 312
313TT	Textile mills and textile product mills	313, 314
315AL	Apparel and leather and allied products	315, 316
321	Wood products	321
322	Paper products	322
323	Printing and related support activities	323
324	Petroleum and coal products	324
325	Chemical products	325
326	Plastics and rubber products	326
327	Nonmetallic mineral products	327
331	Primary metals	331
332	Fabricated metal products	332
333	Machinery	333
334	Computer and electronic products	334
335	Electrical equipment, appliances, and components	335
3361MV	Motor vehicles, bodies and trailers, and parts	3361-3363
3364OT	Other transportation equipment	3364-3369
337	Furniture and related products	337
339	Miscellaneous manufacturing	339
42	Wholesale trade	42
44RT	Retail trade	44, 45
481	Air transportation	481
482	Rail transportation	482
483	Water transportation	483
484	Truck transportation	484
485	Transit and ground passenger transportation	485
486	Pipeline transportation	486
487OS	Other transportation and support activities	487-492
493	Warehousing and storage	493

U.S. Input-Output Industry Codes and Titles, 70-Order (continued)

Industry Code	Industry Title	NAICS Code
511	Publishing industries (includes software)	511
512	Motion picture and sound recording industries	512
513	Broadcasting and telecommunications	513
514	Information and data processing services	514
521CI	Federal Reserve banks, credit intermediation, and related activities	521, 522
523	Securities, commodity contracts, and investments	523
524	Insurance carriers and related activities	524
525	Funds, trusts, and other financial vehicles	525
531	Real estate	531
532RL	Rental and leasing services and lessors of intangible assets	532, 533
5411	Legal services	5411
5412OP	Miscellaneous professional, scientific and technical services	5412-5414, 5416-5419
5415	Computer systems design and related services	5415
55	Management of companies and enterprises	55
561	Administrative and support services	561
562	Waste management and remediation services	562
61	Educational services	61
621	Ambulatory health care services	621
622HO	Hospitals and nursing and residential care facilities	622, 623
624	Social assistance	624
711AS	Performing arts, spectator sports, museums, and related activities	711, 712
713	Amusements, gambling, and recreation industries	713
721	Accommodation	721
722	Food services and drinking places	722
81	Other services, except government	81
GFE	Federal government enterprises	n/a
GFG	Federal general government	n/a
GSLE	State and local government enterprises	n/a
GSLG	State and local general government	n/a
S004	Inventory valuation adjustment	n/a

Notes: n/a - Not applicable

Source: Management Information Services, Inc. and U.S. Department of Commerce, Bureau of Economic Analysis, 2010.

Utilizing the modeling approach outlined above, the MISI model allows estimation of the effects on employment, personal income, corporate sales and profits, and government tax revenues in the U.S. and in each state. Estimates can then be developed for detailed industries and occupations.

The MISI model and data base permit economic impacts to be estimated for any region composed of one or more counties and for any industry in the national I-O table. MISI can estimate the impacts of project and program expenditures by industry on regional output (gross receipts or sales), earnings (the sum of wages and salaries, proprietors' income, and other labor income, less employer contributions to private pension and welfare funds), and employment.

For the MSAs there may be further interest in estimating the impact on requirements for specific occupations. This can be accomplished using the MISI occupation-by-industry matrix, the coefficients of which show the percent distribution of occupational employment among all industries. The 500-by-800 matrix was developed from the *Current Population Survey*, and was modified to conform to the available data.

The methodology employed is state-of-the-art and credible, and has been used by MISI over past three decades in many studies of energy and environmental projects, economic initiatives, proposed legislation, government programs, etc.

Databases and Data Sources

MISI maintains extensive proprietary and nonproprietary databases on the U.S. economy, the state economies, on the Metropolitan Statistical Areas within the states, and on counties in the states. The major public sources of the nonproprietary data include:

- The Bureau of Economic Analysis of the U.S. Commerce Department
- The Bureau of the Census of the U.S. Commerce Department
- The Bureau of Labor Statistics of the U.S. Labor Department
- The Energy Information Administration of the U.S. Energy Department

In addition:

- MISI has proprietary economic forecasting databases for the U.S. and for most states, developed and utilized over the past three decades.
- MISI staff has developed extensive technology-, program-, environmental-, and state-specific economic and statistical databases and satellite models.

Thus, the direct, indirect, and effects of the original government program on the national and state economies can be disaggregated into the impact on:

- Industry sales (490 4-digit NAICS industries)
- Jobs (800 occupations and skills)
- Corporate profits
- Federal, state, and local government tax revenues
- Employment and unemployment (by industry and occupation)
- Net growth or displacement of new businesses
- Major economic, technological, social, and environmental parameters and externalities

MISI derives these estimates using quantitative models and databases it has on-line and which have been used by MISI in many other analogous disaggregate regional, economic, technological, and environmental studies. These models and data are unique and proprietary and give MISI substantial estimation capabilities in this area. These models include:

- The U.S. Commerce Department's national input-output model
- A modified version of the Commerce Department's regional econometric forecasting model.
- A modified version of the Regional Input-Output Modeling System (RIMS) supplemented with the Census Bureau/BLS industry-occupation matrix -- adapted to state and sub-state economies by MISI.
- A modified version of the Energy Externalities Simulation (EES) model developed by MISI.

Use of these proprietary models and the associated databases permitted MISI to develop estimates of the economic, employment, and occupational impacts of various programs or technology development scenarios.

MANAGEMENT INFORMATION SERVICES, INC.

Management Information Services, Inc. is an economic research and management consulting firm with expertise on a wide range of complex issues, including energy, electricity, and the environment. The MISI staff offers expertise in economics, employment, engineering, and finance, and includes former senior officials from private industry, federal and state government, and academia. Over the past two decades MISI has conducted extensive proprietary research, and since 1985 has assisted hundreds of clients, including Fortune 500 companies, nonprofit organizations and foundations, academic and research institutions, and state and federal government agencies including the White House, the National Academy of Sciences, the U.S. Department of Energy, the U.S. Environmental Protection Agency, the Energy Information Administration, the Department of Defense, NASA, and the U.S. General Services Administration.

For more information, please visit the MISI web site at <http://www.misi-net.com>.