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## The Threat of Terrorism to Power Grids: Effects of Electromagnetic Pulses to the United States

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## The Threat of Terrorism to Power Grids: Effects of Electromagnetic Pulses to the United States

### Cover Page Footnote

[1]Jonathan White. *Terrorism and Homeland Security*. (Boston, MA: Cengage Learning, 2017) 9. [2]Larry Gaines and Roger Miller. *Criminal Justice in Action with Effective Writing in Criminal Justice Module*. (Mason, OH: Cengage Learning, 2013) 539. [3]Jonathan White. *Terrorism and Homeland Security*. (Boston, MA: Cengage Learning, 2017) 102.

## Introduction

The United States heavily depends on technology to run and power its modern-day society. However, a weapon exists that could disable or destroy a majority of America's electrical capabilities. This nuclear-based weapon is known as an EMP. Throughout this paper the workings of this weapon will be presented. The destructive capabilities of an EMP will be identified along with the catastrophe it can leave behind. A nation's access to transportation including personal vehicles, rail travel, air travel, emergency response services would be rendered useless. A majority of telecommunications, access to finances, medical care and records, and supply chains would be greatly disrupted. Precautionary measures must be identified; however, the United States has failed to address this existential threat.

## What is Terrorism?

Terrorism's origin in the modern world can be traced back to the 1700s during the French Revolution. Since the French Revolution, terrorism has been recognized as actions taken by governmental entities and constituent resistances.<sup>1</sup> Terrorism has been accepted and utilized by differing people groups and political affiliations. Right-wing extremists, left-wing extremists, single-issue extremists, socialists, anarchists, and communists all have a history of utilizing terrorism and violence to promote their viewpoints. Terrorism has roots across the globe with the establishment of the People's Will in Russia, the Irish Republican Army (IRA) in Ireland, and the Liberation Tigers of Tamil Eelam (LTTE) in Sri Lanka.<sup>2</sup> Extremists have called for terrorists to utilize guerilla warfare, urban terrorism, and selective terrorism techniques to achieve their aspirations. Selective terrorism is a tactic in which a terrorist group specifically chooses their targets such as military installations or law enforcement entities.<sup>3</sup>

Terrorism is difficult to define as it is different for every attacker and has ramifications for the definer. As Gaines and Miller conclude, "...one person's terrorist is another person's freedom fighter. Because it means different things to different people in different situations[.]...politicians, academics, and legal experts...have struggled to determine which acts of violence qualify as terrorism..."<sup>4</sup> The ideology behind a specific attack, usually violence for political change, is the deciding factor when labeling an act of violence as terrorism. The FBI and multiple scholars accept the following definition of terrorism: terrorism is the use or threatened use of violence against innocent victims for political purposes.

## Electromagnetic Pulse

Terrorism can be conducted through multiple methods dependent upon the attacker. Passenger airliners were used as suicide bombers on the morning of September 11, 2001; a pressure cooker at the finish line of the Boston Marathon; and a fiberglass boat loaded with two

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<sup>1</sup>Jonathan White. *Terrorism and Homeland Security*. (Boston, MA: Cengage Learning, 2017) 9.

<sup>2</sup>Ibid., 11, 127, 139.

<sup>3</sup>Ibid., 4, 21-22.

<sup>4</sup>Larry Gaines and Roger Miller. *Criminal Justice in Action with Effective Writing in Criminal Justice Module*. (Mason, OH: Cengage Learning, 2013) 539.

suicide bombers and explosives, were able to maneuver alongside the U.S.S. Cole, detonate the explosives, and murder 17 United States Navy personnel. While terrorist tactics continue to evolve, author Jonathan White has identified the most commonly utilized attack methods: bombings, hijackings, arson, assault, kidnappings, and hostage taking.<sup>5</sup> However, the scope of this paper is to identify and investigate a tactic that terrorists could employ to disable an entire nation. This weapon, if deployed successfully, has the capability to destroy a nation's entire power grid: this is known as an electromagnetic pulse (EMP).

### Electromagnetic Pulse and Its Use

An EMP is intense electromagnetic radiation that creates intense electrical energy. As explained in an article published by the Heritage Foundation, "An electromagnetic pulse is a high-intensity burst of energy caused by the radiation of air particles—either from naturally occurring geomagnetic disturbances...or through the detonation of a nuclear weapon."<sup>6</sup> Two factors determine the success of an EMP attack: the height at which the nuclear device is detonated and the specific pulses emitted from the device.<sup>7</sup> Utilizing a nuclear device that can reach the required height, the emitted pulses could cripple an entire nation.

### Types of EMP Devices

There are four types of EMPs that were identified by Department of Homeland Security's Brandon Wales during a testimony to the House Committee of Homeland Security. Wales identified a High-Altitude EMP (HEMP) as a possible attack device. A HEMP is a nuclear device that is detonated approximately 25 or more miles above the ground of a targeted country.<sup>8</sup> Wales testified that the detonation altitude and utilization of a HEMP device could cause catastrophic power loss to the continental United States.<sup>9</sup> Another type of EMP device that Wales identified is a Source Region EMP (SREMP) which is detonated on or near the ground of a targeted area.<sup>10</sup> While this attack method would not affect power grid systems, power cables,

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<sup>5</sup>Jonathan White. *Terrorism and Homeland Security*. (Boston, MA: Cengage Learning, 2017) 102.

<sup>6</sup>Michaela Dodge, Katie Tubb, Thomas Spoehr, Jack Spencer, and David Inserra. "The Danger of EMP Requires Innovative and Strategic Action." Accessed April 20, 2020. <https://www.heritage.org/homeland-security/report/the-danger-emp-requires-innovative-and-strategic-action>.

<sup>7</sup>Michaela Dodge, Katie Tubb, Thomas Spoehr, Jack Spencer, and David Inserra. "The Danger of EMP Requires Innovative and Strategic Action." Accessed April 20, 2020. <https://www.heritage.org/homeland-security/report/the-danger-emp-requires-innovative-and-strategic-action>; Matthew Weiss and Martin Weiss. "An Assessment of Threats to the American Power Grid." *Energy, Sustainability & Society* 9, no. 1 (2019). <https://doi.org/10.1186/s13705-019-0199-y>.

<sup>8</sup>Michaela Dodge, Katie Tubb, Thomas Spoehr, Jack Spencer, and David Inserra. "The Danger of EMP Requires Innovative and Strategic Action." Accessed April 20, 2020. <https://www.heritage.org/homeland-security/report/the-danger-emp-requires-innovative-and-strategic-action>.

<sup>9</sup>Homeland Security. "Written Testimony of National Protection and Programs Directorate Infrastructure Analysis and Strategy Division Director Brandon Wales for a House Committee on Homeland Security, Subcommittee on Cybersecurity, Infrastructure Protection, and Security Technologies Hearing Titled 'The Electromagnetic Pulse (EMP) Threat: Examining the Consequences.'" Accessed April 20, 2020. <https://www.dhs.gov/news/2012/09/12/written-testimony-nppd-house-homeland-security-subcommittee-cybersecurity>.

<sup>10</sup>Homeland Security. "Written Testimony of National Protection and Programs Directorate Infrastructure Analysis and Strategy Division Director Brandon Wales for a House Committee on Homeland Security,

metallic communication lines, Ethernet cables, telephone lines, and power cords are particularly vulnerable.<sup>11</sup> A third type of EMP weapon is a System Generated EMP (SGEMP).<sup>12</sup> Wales states that this nuclear weapon is detonated above the earth's atmosphere and can cripple space based assets, satellites, and space stations.<sup>13</sup> Last of all, Non-Nuclear EMP (NNEP) are, "...devices designed to produce...electromagnetic energy...[which damage] electronic components, systems, and networks."<sup>14</sup>

### Altitude of Detonation and Pulses

The altitude of the detonation and electrical pulses emitted from an EMP device play a crucial role in the success of a potential terrorist attack, as it effects the range of its destructive capability. Dodge et al. identify three altitudes of detonation and the subsequent area that would be affected from an EMP blast.<sup>15</sup> A 30-mile altitude detonation would affect roughly 720,000 square miles, a 120-mile altitude detonation would affect 3,140,000 square miles, and a 300-mile altitude detonation would affect 6,790,000 square miles of land, which is equivalent to a majority of the contingent United States, parts of Canada, and parts of Central America.<sup>16</sup>

Once detonated, pulses emitted from an EMP would cause catastrophic damage to the targeted nation. Electromagnetic pulses are categorized as E1, E2, or E3 pulses and dependent on the height of detonation an EMP blast can contain all three electrical pulses. E1 pulses are emitted after an EMP is detonated at an altitude of 31 to 62 miles.<sup>17</sup> This E1 pulse is produced, "...[by a] collision...[causing] electrons to be stripped from...atoms, with the resultant flow of electrons traveling downward to earth at...the speed of light."<sup>18</sup> Upon impact, an E1 pulse enters the earth's magnetic field at 50,000 volts of electricity which then leads to the destruction of long-line electrical systems, computers, sensors, microelectronics, and electronic-based systems.<sup>19</sup> The second type of EMP pulse is an E2 pulse. Little has been found on the effects and make-up of E2 pulses; however, what is known is that E2 pulses have similar effects as lightning

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Subcommittee on Cybersecurity, Infrastructure Protection, and Security Technologies Hearing Titled 'The Electromagnetic Pulse (EMP) Threat: Examining the Consequences.'" Accessed April 20, 2020.

<https://www.dhs.gov/news/2012/09/12/written-testimony-nppd-house-homeland-security-subcommittee-cybersecurity>.

<sup>11</sup>Ibid.

<sup>12</sup>Ibid.

<sup>13</sup>Ibid.

<sup>14</sup>Ibid.

<sup>15</sup>Michaela Dodge, Katie Tubb, Thomas Spoehr, Jack Spencer, and David Inserra. "The Danger of EMP Requires Innovative and Strategic Action." Accessed April 20, 2020. <https://www.heritage.org/homeland-security/report/the-danger-emp-requires-innovative-and-strategic-action>.

<sup>16</sup>Ibid.

<sup>17</sup>Matthew Weiss and Martin Weiss. "An Assessment of Threats to the American Power Grid." *Energy, Sustainability & Society* 9, no. 1 (2019): <https://doi.org/10.1186/s13705-019-0199-y>.

<sup>18</sup>Ibid.

<sup>19</sup>James Carafano and Richard Weitz. "EMP Attacks-What the U.S. Must do Now." Accessed April 20, 2020. <https://www.heritage.org/defense/report/emp-attacks-what-the-us-must-do-now>; Michaela Dodge, Katie Tubb, Thomas Spoehr, Jack Spencer, and David Inserra. "The Danger of EMP Requires Innovative and Strategic Action." Accessed April 20, 2020. <https://www.heritage.org/homeland-security/report/the-danger-emp-requires-innovative-and-strategic-action>; Matthew Weiss and Martin Weiss. "An Assessment of Threats to the American Power Grid." *Energy, Sustainability & Society* 9, no. 1 (2019). <https://doi.org/10.1186/s13705-019-0199-y>.

which can damage power lines, telecommunications, control systems, and transformers.<sup>20</sup> The final type of electrical pulse emitted from an EMP device is E3. Weiss and Weiss summarize the effect of E3 pulses: "...[an EMP] burst...generates particles which create a magnetic bubble that pushes on the earth's magnetic field producing a changing magnetic field on the Earth's surface."<sup>21</sup> Once on solid ground, the duration of an E3 pulse can reach up to one minute potentially affecting 70% of the United States' power grid.<sup>22</sup> If unprotected, transformers and substations could suffer irreversible damage when exposed to this level of electrical pulse.<sup>23</sup> If all three pulses emit from an EMP device, "The damage from each strike amplifies the damage caused by each succeeding strike. The combination of the three components can cause irreversible damage to many electronic systems."<sup>24</sup>

### United States

The history of EMP technology testing can be traced back to July 9, 1962, during Operation Starfish Prime.<sup>25</sup> During the Cold War, both the Soviet Union and the United States were engaging in nuclear testing. American and Soviet experimentation would temporarily cease, only to resume shortly thereafter. One such American nuclear test was Operation Starfish Prime. Five days after the celebration of Independence Day, a Thor missile with a 1.4-megaton warhead was launched from a military base on Johnston Island.<sup>26</sup> The warhead exploded 250 miles above the earth: the same altitude at which the International Space Station orbits the Earth.<sup>27</sup> Telephone communications, radio stations, airplanes, and streetlamps became disabled throughout the Hawaiian Islands due to a nuclear explosion that detonated roughly 900 miles

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<sup>20</sup>James Carafano and Richard Weitz. "EMP Attacks-What the U.S. Must do Now." Accessed April 20, 2020. <https://www.heritage.org/defense/report/emp-attacks-what-the-us-must-do-now>; Michaela Dodge, Katie Tubb, Thomas Spoehr, Jack Spencer, and David Inserra. "The Danger of EMP Requires Innovative and Strategic Action." Accessed April 20, 2020. <https://www.heritage.org/homeland-security/report/the-danger-emp-requires-innovative-and-strategic-action>.

<sup>21</sup>Matthew Weiss and Martin Weiss. "An Assessment of Threats to the American Power Grid." *Energy, Sustainability & Society* 9, no. 1 (2019): <https://doi.org/10.1186/s13705-019-0199-y>.

<sup>22</sup>James Carafano and Richard Weitz. "EMP Attacks-What the U.S. Must do Now." Accessed April 20, 2020. <https://www.heritage.org/defense/report/emp-attacks-what-the-us-must-do-now>.

<sup>23</sup>Michaela Dodge, Katie Tubb, Thomas Spoehr, Jack Spencer, and David Inserra. "The Danger of EMP Requires Innovative and Strategic Action." Accessed April 20, 2020. <https://www.heritage.org/homeland-security/report/the-danger-emp-requires-innovative-and-strategic-action>.

<sup>24</sup>James Carafano and Richard Weitz. "EMP Attacks-What the U.S. Must do Now." Accessed April 20, 2020. <https://www.heritage.org/defense/report/emp-attacks-what-the-us-must-do-now>.

<sup>25</sup>Nick Schwellenbach. "Empty Threat?." *Bulletin of the Atomic Scientists* 61, no. 5 (2005): 50-57. <https://web-a-ebsohost-com.ezproxy.liberty.edu/ehost/command/detail?vid=12&sid=1b563af2-3820-4bfe-bd81-b66518e018e2%40sessionmgr4006&bdata=JnNpdGU9ZWhvc3QtbGl2ZSZZY29wZT1zaXRI#AN=18128396&db=sih>.

<sup>26</sup>Ibid.

<sup>27</sup>Nick Schwellenbach. "Empty Threat?." *Bulletin of the Atomic Scientists* 61, no. 5 (2005): 50-57. <https://web-a-ebsohost-com.ezproxy.liberty.edu/ehost/command/detail?vid=12&sid=1b563af2-3820-4bfe-bd81-b66518e018e2%40sessionmgr4006&bdata=JnNpdGU9ZWhvc3QtbGl2ZSZZY29wZT1zaXRI#AN=18128396&db=sih>; Morgan Wright. "US Would be Crippled by an EMP Attack, which we Pioneered Nearly 60 Years Ago." Accessed April 20, 2020. <https://thehill.com/opinion/technology/427633-us-would-be-crippled-by-an-emp-attack-which-we-pioneered-nearly-60-years>.

from its shores.<sup>28</sup> The United States had received the effects of an EMP attack. This blackout was a direct result of the United States military's nuclear testing.

### Infrastructure Weaknesses

#### Transformers

Transformers and their substations are the backbone of the United States' electrical grid. The purpose of a transformer is to convert electricity into higher or lower voltages rendering the electricity usable for everyday life.<sup>29</sup> This vital component of society is not immune to the consequences of a successful EMP strike against the United States. The Federal Energy Regulatory Commission (FERC) holds that there are 30 high voltage transformers throughout the United States. These transformers are weak links throughout the entire system. If an EMP were able to successfully target only nine of these transformers, a coast-to-coast blackout throughout the contingent United States could happen.<sup>30</sup> While the destruction of transformers would be devastating, replacing these transformers would prove to be even more costly. Overseas manufacturers account for 85% of the United States' transformer inventory.<sup>31</sup> Manufacturing and shipping of these custom-built transformers would take approximately 12 to 18 months.<sup>32</sup> In addition, shipment and installation of these transformers within the United States would take several months' time.<sup>33</sup>

#### Nuclear, Chemical, and Natural Gas Plants

Nuclear, chemical, and natural gas plants would be at risk and could create significant risks to the public should an EMP be deployed against the United States. Electricity ensures that spent rod pools receive their needed cooling within nuclear facilities; however, in the case of an EMP attack, electricity would not be available to provide such a service.<sup>34</sup> While nuclear power plants have back-up generators installed to protect the plant during a power outage, these

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<sup>28</sup>Nick Schwellenbach. "Empty Threat?." *Bulletin of the Atomic Scientists* 61, no. 5 (2005): 50-57. <https://web-a-ebsohost-com.ezproxy.liberty.edu/ehost/command/detail?vid=12&sid=1b563af2-3820-4bfe-bd81-b66518e018e2%40sessionmgr4006&bdata=JnNpdGU9ZWZWhvc3QtbGI2ZSZzY29wZT1zaXRI#AN=18128396&db=sih>.

<sup>29</sup>Matthew Weiss and Martin Weiss. "An Assessment of Threats to the American Power Grid." *Energy, Sustainability & Society* 9, no. 1 (2019): <https://doi.org/10.1186/s13705-019-0199-y>.

<sup>30</sup>Ibid

<sup>31</sup>Ibid.

<sup>32</sup>Task Force on National and Homeland Security. "A Call to Action for America: A collaborative report by: Task Force on National and Homeland Security, Secure the Grid Coalition, and other partners Updates and Revised, June 2020." Accessed July 14, 2020. <https://securethegrid.com/wp-content/uploads/2020/06/A-Call-to-Action-for-America-Revised-on-6-11-2020.pdf>.

<sup>33</sup>Task Force on National and Homeland Security. "A Call to Action for America: A collaborative report by: Task Force on National and Homeland Security, Secure the Grid Coalition, and other partners Updates and Revised, June 2020." Accessed July 14, 2020. <https://securethegrid.com/wp-content/uploads/2020/06/A-Call-to-Action-for-America-Revised-on-6-11-2020.pdf>.

<sup>34</sup>McCreight, Robert. "Grid Collapse Security, Stability and Vulnerability Issues: Impactful Issues Affecting Nuclear Power Plants, Chemical Plants and Natural Gas Supply System." *Journal of Homeland Security & Emergency Management* 16, no. 1 (2019). <https://web-a-ebsohost-com.ezproxy.liberty.edu/ehost/pdfviewer/pdfviewer?vid=17&sid=fb356e2f-07a4-45dd-a5da-3c84d1985f48%40sdc-v-sessmgr02>.

generators would be rendered inoperable during the aftermath of an EMP blast. With no electricity, the control of the cooling systems is lost and therefore there is an increased probability for explosion, meltdown, flooding, and fires in the nuclear complex.<sup>35</sup>

### Commission Findings

#### 2008 Commission Report

*The Report of the Commission to Assess the Threat to the United States from Electromagnetic Pulse (EMP) Attack*, published in April 2008, identified nine vulnerable sectors of the United States if the nation were to be attacked by an EMP: electric power, telecommunications, banking and finance, petroleum and natural gas, transportation, food, and water infrastructures.<sup>36</sup> This report acknowledges that the United States heavily relies on technology which could greatly be crippled or destroyed in an EMP attack.<sup>37</sup>

Following the publication of the 2008 commission report, Dr. William Graham testified before the House Armed Service Committee on the commission's findings and recommendations. Dr. Graham stipulated that the United States should not remain vulnerable to a potential EMP attack. Dr. Graham also stated that public and private sectors can coordinate an effort to improve America's security over the course of three to five years.<sup>38</sup> During his testimony Dr. Graham identifies the response the United States should take:

“The appropriate response to the EMP threat is a balance of prevention, planning, training, maintaining situational awareness, protection, and preparations for recovery. Such actions are...feasible and well within the Nation's means and resources to accomplish...if the EMP threat is unaddressed the current status of U.S. critical infrastructure can both invite and reward attack.”<sup>39</sup>

It was determined through the 2008 commission report and Dr. Graham's testimony that the EMP threat is known throughout the federal government. Despite this knowledge, little has been done to address the issue. If this issue continues to be ignored America's vulnerabilities will continue to grow, and potential damages from an EMP will continue to grow in severity. Public, private, and military sectors will be adversely affected if no precautions are taken.

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<sup>35</sup>Ibid.

<sup>36</sup>National Coordinating Center for Communications. “Electromagnetic Pulse (EMP) Protection and Resilience Guidelines for Critical Infrastructure and Equipment.” Accessed April 20, 2020. [https://www.cisa.gov/sites/default/files/publications/19\\_0307\\_CISA\\_EMP-Protection-Resilience-Guidelines.pdf](https://www.cisa.gov/sites/default/files/publications/19_0307_CISA_EMP-Protection-Resilience-Guidelines.pdf).

<sup>37</sup>Ibid.

<sup>38</sup>*Dr. William R. Graham Chairman Commission to Assess the Threat to the United States from Electromagnetic Pulse (EMP) Attack Statement Before the House Armed Service Committee July 10, 2008.* Accessed July 14, 2020. <http://www.empcommission.org/docs/GRAHAMtestimony10JULY2008.pdf>.

<sup>39</sup>Ibid.



## 2020 Task Force Report

An abbreviated collaborative EMP report was published in June of 2020 by the Task Force on National and Homeland Security and the Secure the Grid Coalition.<sup>40</sup> At the onset of this report the following was noted, “The EMP Commission was re-established in 2016-2017 by the U.S. Congress due to the lack of implementation of the 2008 EMP Commission’s recommendations...”<sup>41</sup> This report acknowledges that an EMP attack is an existential threat to the United States as 90% of the American population could be killed as a result of the aftermath of an EMP attack.<sup>42</sup> It was established that the United States government is aware of this threat, yet little has been done to establish any precautionary measures.

This task force outlines the executive actions that previous administrations have taken to provide answers to an EMP attack. The Obama administration Executive Order “Coordinating Efforts to Prepare the Nation for Space Weather Events” and components of the “2017 National Defense Authorization Act” included legislation to address the EMP threat.<sup>43</sup> The only provision of these legislative acts that addressed EMPs was to require the Department of Homeland Security to oversee a review of critical infrastructure segments of the United States.<sup>44</sup> The Trump administration has also taken actions, through executive order, to begin investigation into EMPs and the potential damage one could cause to the United States. Signed March 26, 2019, Executive Order “Coordinating National Resilience to Electromagnetic Pulse” seeks to: “...[identify] critical...infrastructure at risk, [improve] the understanding of EMP effects, [evaluate] approaches to [mitigate] EMP effect, [strengthen] existing infrastructure...and [improve] the response to EMPs.”<sup>45</sup> Also on May 1, 2020, President Trump issued Executive Order “Securing the United States Bulk-Power System.”<sup>46</sup> While both administrations have acknowledged the EMP threat through executive orders, this task force report admits that these acts do not ensure that any governmental actions have taken place.<sup>47</sup>

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<sup>40</sup>Task Force on National and Homeland Security. “A Call to Action for America: A collaborative report by: Task Force on National and Homeland Security, Secure the Grid Coalition, and other partners Updates and Revised, June 2020.” Accessed July 14, 2020. <https://securethegrid.com/wp-content/uploads/2020/06/A-Call-to-Action-for-America-Revised-on-6-11-2020.pdf>.

<sup>41</sup>Ibid.

<sup>42</sup>Ibid.

<sup>43</sup>Ibid.

<sup>44</sup>Task Force on National and Homeland Security. “A Call to Action for America: A collaborative report by: Task Force on National and Homeland Security, Secure the Grid Coalition, and other partners Updates and Revised, June 2020.” Accessed July 14, 2020. <https://securethegrid.com/wp-content/uploads/2020/06/A-Call-to-Action-for-America-Revised-on-6-11-2020.pdf>.

<sup>45</sup>Peter Brookes. “The White House was Right to Issue the Executive Order on the EMP Threat.” Accessed April 20, 2020. <https://www.heritage.org/homeland-security/report/the-white-house-was-right-issue-the-executive-order-the-emp-threat>.

<sup>46</sup>Task Force on National and Homeland Security. “A Call to Action for America: A collaborative report by: Task Force on National and Homeland Security, Secure the Grid Coalition, and other partners Updates and Revised, June 2020.” Accessed July 14, 2020. <https://securethegrid.com/wp-content/uploads/2020/06/A-Call-to-Action-for-America-Revised-on-6-11-2020.pdf>.

<sup>47</sup>Ibid.

### Preventative Measures

An EMP strike against the United States, if successful, would cripple society. Technological advances are innumerable and, with these advancements, the American people become more reliant on technology. An EMP strike would attack power grids and transformers bringing a majority of, if not all, electronics to a grinding halt with no guarantee of a swift recovery. There are precautions that can be taken by the United States government and the power and energy industries. The National Coordinating Center for Communications (NCC) summarizes preventative measures for EMP attacks:

“Each federal, state, and local critical infrastructure owner...can prioritize EMP protection efforts by determining their infrastructure’s overall importance by...assessing the risk to society if the infrastructure is disrupted and...comparing their infrastructure’s role in supporting one or more...[of the] National Essential Functions defined in Presidential Policy Directive 40, National Continuity Policy.”<sup>48</sup>

The federal government and industry leaders must share information relating to the strengths and weaknesses of the United States’ power grid. Once these weaknesses are identified, steps must be taken to harden the power grid, which could involve utilizing Faraday cages and other protective devices. Cohen summarizes the United States’ actions in addressing the EMP threat: “The Commission to Assess the Threat from Electromagnetic Pulse Attack has warned since 2001 that essential...infrastructure is at risk...little has been done to address the EMP menace.”<sup>49</sup>

The task force report from 2020 listed six recommendations that should be followed to mitigate the threat of a potential EMP attack. The first recommendation made is for the President to establish an executive agent tasked with the responsibility of managing the national protection and defense against EMPs.<sup>50</sup> As a second precaution EMP protection must be incorporated into cybersecurity systems, electrical grids, and other critical infrastructure.<sup>51</sup> Thirdly, a joint Presidential-Congressional Commission should be organized to protect critical national infrastructures from the results of an EMP.<sup>52</sup> A fourth recommendation is for governmental agencies and industries to implement new standards to protect infrastructure from E3 EMP pulses.<sup>53</sup> Fifth, the Department of Energy and Department of Defense should create testing for widely-utilized, full-system transformers. Any subsequent information gleaned from these tests should then be shared with individuals within the electrical industry.<sup>54</sup> Last of all, this task force

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<sup>48</sup>National Coordinating Center for Communications. “Electromagnetic Pulse (EMP) Protection and Resilience Guidelines for Critical Infrastructure and Equipment.” Accessed April 20, 2020. [https://www.cisa.gov/sites/default/files/publications/19\\_0307\\_CISA\\_EMP-Protection-Resilience-Guidelines.pdf](https://www.cisa.gov/sites/default/files/publications/19_0307_CISA_EMP-Protection-Resilience-Guidelines.pdf).

<sup>49</sup>Ariel Cohen. “Trump Moves to Protect America from Electromagnetic Pulse Attack.” Accessed April 20, 2020. <https://www.forbes.com/sites/arielcohen/2019/04/05/whitehouse-prepares-to-face-emp-threat/#5dd9cd35e7e2>.

<sup>50</sup>Task Force on National and Homeland Security. “A Call to Action for America: A collaborative report by: Task Force on National and Homeland Security, Secure the Grid Coalition, and other partners Updates and Revised, June 2020.” Accessed July 14, 2020. <https://securethegrid.com/wp-content/uploads/2020/06/A-Call-to-Action-for-America-Revised-on-6-11-2020.pdf>.

<sup>51</sup>Ibid.

<sup>52</sup>Ibid.

<sup>53</sup>Ibid.

<sup>54</sup>Ibid.

report suggests that a new EMP Commission report must be created to replace the report conducted in 2014; however, a timeline for completion was not established.<sup>55</sup>

An additional recommendation made by the 2020 task force report is to establish an EMP Manhattan Project.<sup>56</sup> The original Manhattan Project was commissioned during Franklin Delano Roosevelt's administration with the task of developing an atom bomb before Nazi Germany.<sup>57</sup> From 1942 through 1945 the Manhattan Project, "...built nuclear facilities and...cities that never before existed...[introduced] new weapons that ended World War II and prevented the Cold War from becoming World War III."<sup>58</sup> The task force report proposes that the EMP threat must be taken seriously and an EMP version of the Manhattan Project would provide the urgency needed to combat this issue. While making this suggestion, this report does not expound on the structure or organization of such a program.

### Potential EMP Nations

Despite the fact that the United States discovered the EMP, multiple nations now possess the capability to utilize EMPs as a weapon against the United States. Although not labeled as a terrorist nation by the State Department, Russia is one such nation. As established above, the United States and the Soviet Union both conducted nuclear tests during the Cold War. The Soviet Union's nuclear testing program was known as the K project, which spanned the years between 1961-1962 and included five nuclear tests.<sup>59</sup> One such test on October 22, 1962, was designed to specifically test the Soviet Union's EMP capabilities.<sup>60</sup> A 300 kiloton warhead was detonated at an altitude of 180 miles; the test ultimately worked causing damage and fires to telephone sub-lines.<sup>61</sup> Power plants and cables in Karaganda, Astana, and Almaty were also destroyed during the testing<sup>62</sup>

China also poses a significant threat to the United States with regard to EMP use. Open-source information from Taiwan's military claims China has designed a Super-EMP weapon; this weapon design was formulated from information that was stolen from United States' nuclear laboratories.<sup>63</sup> It has been determined that China conducts the most missile training and testing in the world and are expected to double their inventory of nuclear weaponry.<sup>64</sup> The danger of China's ability to use an EMP is further corroborated by Dr. Peter Pry:

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<sup>55</sup>Ibid.

<sup>56</sup>Ibid.

<sup>57</sup>Ibid.

<sup>58</sup>Ibid.

<sup>59</sup>Task Force on National and Homeland Security. "A Call to Action for America: A collaborative report by: Task Force on National and Homeland Security, Secure the Grid Coalition, and other partners Updates and Revised, June 2020." Accessed July 14, 2020. <https://securethegrid.com/wp-content/uploads/2020/06/A-Call-to-Action-for-America-Revised-on-6-11-2020.pdf>.

<sup>60</sup>Ibid.

<sup>61</sup>Ibid.

<sup>62</sup>Ibid.

<sup>63</sup>Pry, Peter. "China: EMP Threat: The People's Republic of China Military Doctrine, Plans, and Capabilities for Electromagnetic Pulse (EMP) Attack." Accessed July 18, 2020. <http://highfrontier.org/wp-content/uploads/2020/06/China-EMP-Threat.pdf>.

<sup>64</sup>Ibid.

“China’s military doctrine...of using [a] HEMP attack to win on the battlefield, defeat U.S. aircraft carriers, and achieve against the U.S. homeland a surprise ‘Pearl Harbor’...is replete with technical and operational planning consistent with a nuclear first-strike. Indeed, China’s classification of HEMP attack in military doctrine as ‘electronic warfare’ or ‘information warfare’ indicates that HEMP is not even considered a form of nuclear attack, but...equivalent to non-nuclear EMP weapons and cyber warfare.”<sup>65</sup>

It has been documented that Chinese military writings state that prevailing against the United States in war would include the deployment of EMPs against American soil.<sup>66</sup>

### Terrorism and EMPs

Terrorist entities have the potential to utilize EMPs against the United States. On November 20, 2017, the United States’ Department of State officially labeled the Democratic People’s Republic of Korea (North Korea) as a state sponsor of terrorism.<sup>67</sup> Before this designation, North Korea had created and tested EMP weaponry which North Korea has named a Super-EMP warhead.<sup>68</sup> The United States became aware of this fact in 2004 when a group of Russian generals leaked information of North Korea’s Super-EMP to the United States’ Congressional EMP Commission.<sup>69</sup> Peter Pry states the following: “...as of [December] 12, North Korea’s successful orbit of a satellite demonstrates its ability to make an EMP attack against the United States – right now....Thus, North Korea now has an Assured Destruction capability against the United States.”<sup>70</sup> These satellites regularly orbit across the United States which could enable North Korea to strike the United States with an EMP.<sup>71</sup>

The nation of Iran also presents a potential terrorist threat to the United States. On January 19, 1984, the United States’ Department of State labeled the country of Iran as a state sponsor of terrorism.<sup>72</sup> The following summarizes Iran’s nuclear testing: “...Iranian flight-tests of the Shahab-3 medium-range missiles ‘have in recent years involved several explosions at high altitude...Iran has officially described all [of] these...tests as successful.”<sup>73</sup> These tests are

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<sup>65</sup>Ibid.

<sup>66</sup>Ibid.

<sup>67</sup>U.S. Department of State. “State Sponsors of Terrorism: Bureau of Counterterrorism.” Accessed July 13, 2020. <https://www.state.gov/state-sponsors-of-terrorism/>.

<sup>68</sup>Pry, Peter. “PRY: North Korea EMP Attack Could Destroy U.S. – Now.” USFA Counterproliferation Center CPC Outreach Journal, no. 1038 (2012): 27-28. <https://media.defense.gov/2019/Jul/25/2002162270/-1/-1/0/CPC%20OUTREACH%201038.PDF>.

<sup>69</sup>Ibid.

<sup>70</sup>Ibid.

<sup>71</sup>Task Force on National and Homeland Security. “A Call to Action for America: A collaborative report by: Task Force on National and Homeland Security, Secure the Grid Coalition, and other partners Updates and Revised, June 2020.” Accessed July 14, 2020. <https://securethegrid.com/wp-content/uploads/2020/06/A-Call-to-Action-for-America-Revised-on-6-11-2020.pdf>.

<sup>72</sup>U.S. Department of State. “State Sponsors of Terrorism: Bureau of Counterterrorism.” Accessed July 13, 2020. <https://www.state.gov/state-sponsors-of-terrorism/>.

<sup>73</sup>Schwollenbach, Nick. “Empty Threat?.” *Bulletin of the Atomic Scientists* 61, no. 5 (2005): 50-57. <https://web-a-ebsohost-com.ezproxy.liberty.edu/ehost/command/detail?vid=12&sid=1b563af2-3820-4bfe-bd81->

consistent with how EMP attacks would be conducted.<sup>74</sup> While these tests do not reveal an intent to utilize EMP weaponry against the United States, Iran does appear to possess such technology and would be able to use these missiles as EMPs if they wish. It should be noted that Dr. William Graham stated the following regarding Iran:

“Iranian military writings explicitly discuss a nuclear EMP attack that would gravely harm the United States...the [EMP] Commission does not know the intention of Iran in conducting these activities, we are disturbed by the capability that emerges when we connect the dots.”<sup>75</sup>

Equally problematic are Iranian ties with terrorist organizations including Hezbollah. Iran utilizes Hezbollah as an extension of its foreign power, and Hezbollah is commanded by the nation of Iran.<sup>76</sup> Hezbollah’s Secretary-General, Hassan Nasrallah, stated the following regarding the relationship between Hezbollah and Iran, “We are open about the fact that Hezbollah’s budget, its income, its expenses, everything it eats and drinks, its weapons and rockets, come from the Islamic Republic or Iran.”<sup>77</sup> Iran has access and has tested various missiles, many of which could be manufactured to become EMPs.<sup>78</sup> With the connection between Hezbollah and Iran, Hezbollah could potentially gain access to an EMP and use this weapon to attack the United States.

### Conclusion

The United States’ dependency on technology makes the nation more vulnerable to a catastrophic attack by an EMP. The time required to order and install new transformers would further exacerbate a catastrophe. EMP technology was first discovered by the United States, yet little has been done to identify and rectify potential vulnerabilities within society should this technology be used against the United States by foreign powers. Life within the United States would come to an abrupt halt as the majority of electronics and satellites would be rendered inoperable. Carafano and Weitz conclude that the United States must prevent the potential usage of an EMP, provide resilience to the power grid system, plan for the unthinkable if an EMP

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<sup>74</sup>Dr. William R. Graham Chairman Commission to Assess the Threat to the United States from Electromagnetic Pulse (EMP) Attack Statement Before the House Armed Service Committee July 10, 2008. Accessed July 14, 2020. <http://www.empcommission.org/docs/GRAHAMtestimony10JULY2008.pdf>.

<sup>75</sup>Dr. William R. Graham Chairman Commission to Assess the Threat to the United States from Electromagnetic Pulse (EMP) Attack Statement Before the House Armed Service Committee July 10, 2008. Accessed July 14, 2020. <http://www.empcommission.org/docs/GRAHAMtestimony10JULY2008.pdf>.

<sup>76</sup>PragerU. “What is Hezbollah?” September 16, 2018. Video, 2:36. <https://www.prageru.com/video/what-is-hezbollah/>; White, Jonathan. *Terrorism and Homeland Security*. Boston, MA: Cengage Learning, 2017, 204.

<sup>77</sup>Ibid.

<sup>78</sup>Schwellenbach, Nick. “Empty Threat?.” *Bulletin of the Atomic Scientists* 61, no. 5 (2005): 50-57. [https://web-a-ebsohost-com.ezproxy.liberty.edu/ehost/command/detail?vid=12&sid=1b563af2-3820-4bfe-bd81-b66518e018e2%40sessionmgr4006&bdata=JnNpdGU9ZWZhc3QtbGl2ZSZzY29wZT1zaXRl#AN=18128396&db=sih.](https://web-a-ebsohost-com.ezproxy.liberty.edu/ehost/command/detail?vid=12&sid=1b563af2-3820-4bfe-bd81-b66518e018e2%40sessionmgr4006&bdata=JnNpdGU9ZWZhc3QtbGl2ZSZzY29wZT1zaXRl#AN=18128396&db=sih)

strike would be successful, and protect America's capacity to communicate.<sup>79</sup> Such protection can include protecting vulnerable infrastructures with Faraday cages or metal shielding.<sup>80</sup> An EMP would wreak havoc on the United States' infrastructure, economy, and military, and most severely, would claim the lives of countless, innocent Americans. Actions must be taken to prevent an EMP attack from occurring and begin to protect critical components of the United States' infrastructure. Not only is this the job of the federal government, but American citizens must research these potentially catastrophic issues.<sup>81</sup> It is also the responsibility of the American citizenry to petition their respective congressmen and congresswomen to investigate and address the EMP threat.

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<sup>79</sup>James Carafano and Richard Weitz. "EMP Attacks-What the U.S. Must do Now." Accessed April 20, 2020. <https://www.heritage.org/defense/report/emp-attacks-what-the-us-must-do-now>.

<sup>80</sup>Techpro23. "EMP Protection and How it Affects the Military." *Tech Protect*. Accessed July 18, 2020. <https://techprotectbag.com/emp-protection-and-how-it-affects-the-military/>.

<sup>81</sup>Task Force on National and Homeland Security. "A Call to Action for America: A collaborative report by: Task Force on National and Homeland Security, Secure the Grid Coalition, and other partners Updates and Revised, June 2020." Accessed July 14, 2020. <https://securethegrid.com/wp-content/uploads/2020/06/A-Call-to-Action-for-America-Revised-on-6-11-2020.pdf>.

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