



# "Unlocking the Potential: Exploring the Sustainable Benefits of Nuclear Power as a Clean Energy Solution"

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## I. THE NUCLEAR AGE

This paper focuses on outlining the impact of nuclear and atomic energy in our time and how it is essentially the key to unlocking a world without scarcity of energy. Nuclear and atomic energy, whose sordid past dates back to the 1900s, gave way to the establishment of the United Nations after its disreputable usage. Our intention is to determine whether this unpredictable form of energy can be controlled with laws and if it holds a beneficial future in acting as a source of energy without repeating history.

As history dictates, nuclear and atomic energy could be the key to peace or a weapon that wages war. Owing to its hazardous nature and risky disposition, there are diplomatic approaches to nuclear energy and its safety. These are the key aspects which will be discussed in detail to ponder upon the astronomical repercussions of nuclear energy. Nuclear energy has a strong foothold in our world. Its existence, although deemed a bane by many, is emerging to seem as a rather eminent tool. To President John F. Kennedy and Premier Nikita Khrushchev<sup>1</sup> This energy would mean complete destruction for mere mortals, but maybe the scientists and politicians of this day and age feel differently.

The regulations and its aftermath on this form of energy will present us with an idea of where our world stands on nuclear energy. Whether all it can ever be is a powerful weapon to cause mass destruction or a mellow source that might one day power the earth.

### 1.1 Introduction

An apple that fell from a tree led the way for our current laws of gravity. A nuclear explosion is inspiring a new form of energy. Humanity is constantly struggling with the reality of scarce energy resources and their search for new ways to power their world led them to an erratic source regulated by commissions and their Acts.

Einstein predicted black holes and years later, technology affirmed his theory. His theory of general relativity was then, a mere notion. Nuclear energy that was once seen as a mere weapon to cause destruction may now, with the required technology, meet our daily energy needs.

The Kardashev scale<sup>2</sup>, probably a concept unheard of by most, measures civilization's level of technological advancement. Classifying the civilizations based on energy consumption throughout the cosmos. Our world will not rank on the lowest category<sup>3</sup> of this hypothetical scale unless we learn to control this currently unpredictable form of energy.

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<sup>1</sup> OFFICE OF THE HISTORIAN UNITED STATES OF AMERICA , Cuban Missile Crisis U.S. Department of State, <https://history.state.gov/milestones/1961-1968/cuban-missile-crisis> (last visited Jun 8, 2022).

<sup>2</sup> N S Kardashev, 1964SvA8. - harvard university, <https://articles.adsabs.harvard.edu/pdf/1964SvA.....8..217K> (last visited Jun 8, 2022).

<sup>3</sup> MICHAEL SHERMER & CARL SAGAN, *Toward a Type 1 civilization*, LOS ANGELES TIMES, July, 2008, <https://www.latimes.com/archives/la-xpm-2008-jul-22-oe-shermer22-story.html#:~:text=Based%20on%20our%20energy%20efficiency,assessments%20put%20us%20at%200.72.>

### *1.2 Environmental Concerns*

Nuclear energy is derived from the fission of uranium and plutonium, meaning it is capable of replacing most tasks performed by the combustion of fossil fuels. It is a zero emission clean energy source but produces more electricity on less land than any other clean energy source. However, the detonation of a nuclear bomb, the cataclysmic explosion that arises from it, shows how far reaching the environmental impacts are. The Hiroshima and Nagasaki nuclear incident caused decimation within 4.4 square mile radius of detonation, meaning the radioactive particles fell to the earth contaminating everything that was contained in it. "The Atomic Scientist" published an article<sup>4</sup> suggesting that a nuclear war would be so powerful that it would plunge the world into darkness. Causing cancerous tumours in the survivors of Hiroshima and Nagasaki and contaminating crop lands in the Ukraine after the Chernobyl incident, nuclear energy has been known to cause environmental hazards world over. When the concept of this energy shudders a majority of our world population, the question arises as to how this form of energy can be regulated. Environmentalists in the 16th century believed coal to be an environmental concern when price increments forced the people of London to switch from firewood to coal<sup>5</sup>. Anything when fallen into the wrong hands receives bad publicity. Which is why nuclear energy is the coal of the 21st century to many environmentalists.

Three major incidents, the Three-Mile Island in Pennsylvania, Chernobyl in Ukraine and Fukushima in Japan, contribute to the negative perception that is often adapted when it comes to nuclear energy. But it is indicated by certain reports that even the worst possible accident at a nuclear plant is less destructive than other major industrial accidents. It is affirmed that nuclear energy has its drawbacks, but it isn't the worst of two evils. To ensure that the pros outweigh the cons, the environmental impacts are assessed. The first aspect that contributes to this assessment is that nuclear power produces energy through fission and not chemical burning, meaning there is no carbon emission, ergo, it does not contribute to global warming. Even the nuclear power plants operate at a higher capacity and release less radiation compared to any other major energy source. The major cons of nuclear energy owe their existence to those that have abused the source. The public perceives nuclear energy to be a major question mark because of two main reasons; risk and disposal. For mere reassurance, and with the ulterior motive of proving a point, studies show that the worst possible accident at a nuclear plant is less destructive than other major industrial accidents<sup>6</sup>. Looking at the worst nuclear accident in history at Chernobyl, it was analysed by the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), composed of a group of scientists that reported that there were no long term health effects from the accident. The problem of nuclear waste disposal is one of the biggest concerns owing to the effect it has on the environment if any leaks occur. With that being said, technological strides have been made in many countries to contain nuclear waste. The U.S. Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico currently stores low- level and tsuranic military waste and could easily contain the world's nuclear waste for the next thousand years. Finland is also advanced and is curving out a permanent repository. So when looking at it, compared to coal, nuclear energy isn't the worst of the two evils.

### *1.3 Regulations*

Almost every country has a nuclear energy regulatory body that governs their nuclear power usage. The International Atomic Energy Agency (IAEA), was created after seeing a necessity in international cooperation regarding nuclear safety. Article II of the statute reads "*The Agency shall seek to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world. It shall ensure, so far as it is able, that assistance provided by it or at its request or under its supervision or control is not used in such a way as to further any military purpose.*" In the last 15 to 20 years, time and effort has been invested in order to further their purpose. The organisation continues to establish safety standards and conducts regular assessments. A very avid example would be, during the situation that arose between Russia and Ukraine, this regulatory body updated news regarding the nuclear power plant in Ukraine.

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<sup>4</sup> ALAN ROBOCK & OWEN BRIAN TOON, *Self-assured destruction: The climate impacts of Nuclear War* Taylor & Francis, <https://www.tandfonline.com/doi/full/10.1177/0096340212459127> (last visited Jun 8, 2022).

<sup>5</sup> Alan Dyer | Published in *History Today* Volume 26 Issue 9 September 1976, *Wood and coal : A change of Fuel* *History Today*, <https://www.historytoday.com/archive/wood-and-coal-change-fuel> (last visited Jun 8, 2022).

<sup>6</sup> *Safety of Nuclear Reactors - World Nuclear Association*, <https://world-nuclear.org/information-library/safety-and-security/safety-of-plants/safety-of-nuclear-power-reactors.aspx> (last visited Jun 21, 2022).

This body established a legal framework to regulate nuclear power usage and is assisting member states in developing nuclear technology and utilising nuclear technology safely<sup>7</sup>.

#### *1.4 Diplomacy for energy*

When the talk of a world dominated by the threat or the action of war is brought up, it always boils down to either a failed diplomatic relationship or an aggrieved diplomatic relationship. This comes from the way of numerous historical proceedings which stems from the period of Franklin Roosevelt<sup>8</sup> when he chose to hide nuclear information restricting any diplomatic talks at all. The ideation of a diplomatic relationship can be credited to President Harry Truman when he conveyed the information of the existence of a nuclear weapon to Premier Joseph Stalin<sup>9</sup> eventually starting conversation leading to neither countries using it post the second world-war era. The diplomatic conversation, although resulting in numerous threats, paved the way for a more peaceful approach in the future, which we are attempting to achieve. The diplomatic capacity of nuclear energy and power is limited to weaponry and destruction only since every comparable talk about anything nuclear in nature has resulted in either using it as a deterrent or creation of nuclear weaponry. Nuclear Diplomacy went from a bipolar structure to a multipolar issue when multiple countries broke the code to nuclear energy. The usage of nuclear sources as a source of energy could only have any significant impact in this world if diplomacy convinces both the parties the rest of the world that the usage is restricted for the welfare of the world and their country, as taking inspiration from The Outer Space Treaty<sup>10</sup>. The security of knowledge lies in understanding that everyone is benefitted to its maximum extent when nuclear sources are used for the safe generation of energy. This development would push numerous struggling nations above its limitations and help many suffering people get efficient and subsidised energy.

In India, The Civil Liability for Nuclear Damage Act, 2010 was enacted as a final nail that was needed to activate the Indo-US nuclear deal wherein the United States of America had a reference of diplomacy<sup>11</sup> for the usage of such power in their Atomic Energy Act of 1954. This was to establish a full diplomatic corridor between India and USA for absolute civil nuclear cooperation. The aspect of significance this played in the world was unmatched when 2 nuclear countries agreed on the line of peace. Previously, Russia and USA used this same nuclear power on the road of the cold war. Communication through the way of power to deter security issues is far more sensible than no communication with such power. The United Nations also has a treaty on the Non-Proliferation of Nuclear Weapons (NPT)<sup>12</sup> which was enacted to create a world without the constant threat of a world-ending nuclear war by discouraging the spread of nuclear weapons and its relevant technology. This paved the way for the remission of silence on the topic of nuclear energy and weaponry.

## **II. Solution**

The ideal world would not be afraid of using its best sources of energy as an advantage against other sources that have torn this world bit by bit, and we only realised it after centuries of destruction had already been done. The answer might lie in the fact that nuclear energy by itself is NOT dangerous and rather a friend than a foe.

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<sup>7</sup> History, IAEA (2016), <https://www.iaea.org/services/technical-cooperation-programme/history> (last visited Jun 21, 2022).

<sup>8</sup> U.S. DEPARTMENT OF STATE, ATOMIC DIPLOMACY U.S. Department of State, <https://2001-2009.state.gov/r/pa/ho/time/cwr/104434.htm#:~:text=Atomic%20diplomacy%20refers%20to%20attempts,from%20the%20American%20nuclear%20monopoly>. (last visited Jun 13, 2022).

<sup>9</sup> POSTDAM, U.S. Department of State, <https://2001-2009.state.gov/r/pa/ho/time/wwii/93275.htm> (last visited Jun 13, 2022).

<sup>10</sup> Robert.wickramatunga, United NationsOffice for Outer Space Affairs Outer Space Treaty, <https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/outerspacetreaty.html> (last visited Jun 13, 2022).

<sup>11</sup> U.S. Department of State, <https://2001-2009.state.gov/r/pa/prs/ps/2007/aug/90050.htm> (last visited Jun 14, 2022).

<sup>12</sup> Treaty on the non-proliferation of nuclear weapons (NPT) – UNODA, United Nations, <https://www.un.org/disarmament/wmd/nuclear/npt/> (last visited Jun 14, 2022).

The archetypal controller of such power has almost always been predisposed to use it for everything other than what it can be the best at, providing energy and fueling anti-war power. The reason why it is an effectively used weapon is because it is being turned around to be used as such. The comparison of how a single nuclear pellet can produce as much energy as 800kgs of coal simply summarises the research in a line and encourages regulatory bodies to work towards de-weaponizing and energising the nuclear sources.

### **III. Conclusion**

The conceptualization of nuclear energy as a primary source stem from the dying resources of our Type 0.72<sup>13</sup> civilization on the Kardashev scale. When we ultimately control the nuclear power capabilities in our current planet, we have a chance at surviving till Type 1. It is single handedly the most capable and reliable source of energy even though the implications have initially originated from war torn desperation and intercountry threats but it can eventually be used as a catalyst for human evolution by the way of harmony and peace. The immense amount of energy that is being wasted just in the fear of one country overpowering the other is pushing civilization itself back centuries. The research concludes that it is because of the people it is trusted with that give it so much negative publicity.

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<sup>13</sup> Alex Hughes, Kardashev scale: What is it and where is earth listed? BBC Science Focus Magazine (2022), <https://www.sciencefocus.com/future-technology/kardashevs-scale/> (last visited Jun 24, 2022).