CBA 2 Science in Society Investigation

Research Report

Is Nuclear Power really better for the Environment than Fossil Fuels?

The Science behind Nuclear Fuel

Nuclear fuel comes from inside an atom.
Nuclear plants are different because they do not burn anything to create steam. Instead, they split uranium atoms in a process called fission. As a result, unlike other energy sources, nuclear power plants do not release carbon or pollutants like nitrogen and sulfur oxides into the air. Nuclear reactors are designed to sustain an ongoing chain reaction of fission they are filled with a specially designed, solid uranium fuel and surrounded by water, which facilitates the process. When the reactor starts, uranium atoms will split, releasing neutrons and heat. Those neutrons will hit other uranium atoms causing them to split and continue the process, generating more neutrons and more heat.This heat is used to create the steam that will spin a turbine, which powers a generator to make electricity.
Nuclear energy can be produced in two different ways. Nuclear fusion and nuclear fission. Nuclear fusion is where two light nuclei combine together releasing vast amounts of energy. Now nuclear fission is the one present in nuclear reactors. It occurs when heavy unstable nucleus are split into lighter nuclei.

1. Chooses an interesting topic and research question

2. Uses relevant scientific terminology

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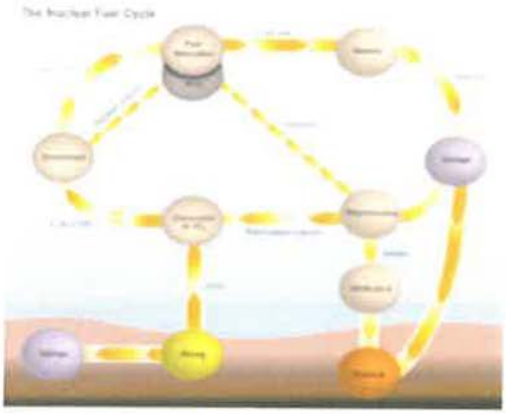

Fig 1: A diagram of the nuclear fuel cycle.

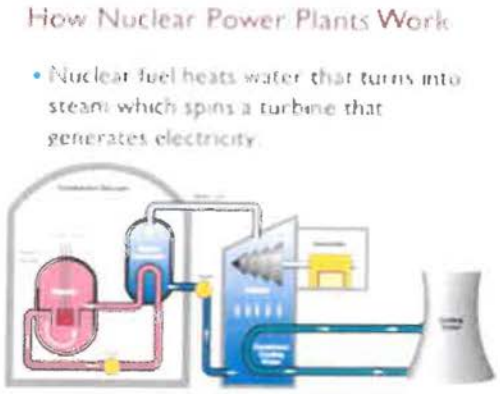

Fig 2 : Description of how nuclear power plants work along with labelled diagram.

How our choice of fuel impacts the environment

Our choice of fuel although it may seem trivial to society is of great importance as it can essentially destroy our world. The environment is what makes up our surroundings plants, trees and water are all a part of our environment and essential to life. There are two types of energy renewable and non renewable. Renewable energy can be used over and over again. It is infinite and will never run out examples are geothermal energy, wind and solar energy. Non-renewable energy is finite . it will run out eventually and does not last forever examples include fossil fuels(coal, oil gas) and uranium. When we indulge in non renewable fuel sources we produce Co2(Carbon dioxide) this Co2 becomes trapped in the atmosphere and contributes to global warming and climate change.

It enhances the already present Greenhouse Effect and destroys the environment by pollution produced in the

3. Uses informative representations

4. Clearly positions the topic as science in society and explains the relevant science and the impact of the topic on the environment

processing of these fuels and the consumption of these fuels. Renewable fuels are the exact opposite. Renewable fuels are clean fuels meaning they are free from greenhouses gases and do not pollute the environment. Now to answer the question how our choice between nuclear and fossil fuels effect the environment. Fossil fuels are a non renewable fuel source and will eventually run out. Fossil fuel plants are expensive to run and cheap to build. They are the most common fuel source and have been adopted as our main fuel source for quite some time. Fossil fuels continue to produce co2 damaging the ozone layer and adding to climate change.

Nuclear energy itself is renewable as its origins are from everything inside a atom but the materials used nuclear power plants are non - renewable. Whether it is renewable or not has been a subject to debate but the truth of the matter is it does not produce Co2, it is clean. It is carbon free but like every other energy source there are problems associated with nuclear energy. Nuclear plants are cheap run and expensive to build. Nuclear energy produces radioactive waste which can contaminates our environment and pollutes the land. This waste can then spread into seas and rivers contaminating the water supply. This is a huge reason why many people discourage the use of nuclear energy. To choose the correct energy source we need to consider its effect on the environment. how does it work. will it harm the environment and is it safe?.

How our choice of fuel impacts society

Continuing on from my previous point of how our choice of fuel impacts the environment. Society is also greatly impacted by our choice of fuel. Society is defined as the people living together in a community. These people and their health and wellbeing can boil

5. Explains the impact of the chosen topic on society

down to the choice of fuel we as human beings consume. Non renewable energy sources which examples of these can be seen in the paragraph above produce carbon dioxide and greenhouse gases.

These fuels and I'll take fossil fuels as an example add to and are one of the primary causes of global warming and climate change. Climate change a is a serious problem, one that many people do not take seriously. Many people are unaware of climate change but the truth of the matter is it is in full effect. Society feels the brunt force of global warming. Our use of fossil fuels and excess production of greenhouse gases cause ice caps to melt. Ice caps melting results in rising sea levels which leads to floods. Floods destroy homes and buildings and in the worst case scenarios lead to a loss of life and desolate society. This is just one of the many problems caused by consuming non - renewable energy.

When we choose to go green and use renewable energy sources society is not harmed or damaged in the process. Greenhouse gases are not produced when using renewable energy. There global warming and climate change does not occur. This enables society to continue to grow and flourish whilst not being held back by the fear of destruction. Currently due to us devouring fossil fuels for such a long time global warming and climate change has become reality. We as human beings need to initiate a change in our sources of fuel so that we may live healthy and blooming lives.

6. Explains the relevant science

Nuclear Energy

Nuclear energy like any other energy source has its negative and positive aspects. Although the argument for nuclear energy has always been that its carbon free. It doesn't produce greenhouse gases it's cheap to run and it doesn't contribute to climate change like other forms of energy such as fossil fuels. There are downsides to the use of nuclear energy. From evaluating my sources provided in my research record I have had an in depth look and an educated perspective on nuclear energy. I have cultivated and gathered both the negative and positive elements of nuclear energy.

Negative

Nuclear energy as I have explained before originates from inside an atom. It is an abundant source of energy and from that small atom comes a massive amount of power. To make nuclear energy of use to the public a nuclear reactor must first be created to control the reaction and make it profitable. The nuclear reactors are made using uranium and specially designed pools of water. Nuclear fuel can be used in a reactor for several years and this creates waste that must be disposed of carefully. The used fuel that remains after this time must be stored and then either recycled to make new fuel or carefully disposed of once again racking up costs in the design and structure of nuclear plants - **Source 1 .**

Spent reactor fuel assemblies are highly radioactive and. initially. must be stored in specially designed pools of water. The water cools the fuel and acts as a radiation shield. Spent reactor fuel

7. Views on the chosen topic are considered and discussed at length

8. Explains different sides of the argument in detail

assemblies can also be stored in specially designed dry storage containers.

Fig 3 : A dry storage cask for spent nuclear reactor fuel

The waste provided by nuclear power plants has to be carefully disposed of when the reactor has been used up. If not this waste could cause serious health issues to the general public and the environment. - **Source 3.** This is very expensive and the cost of building nuclear power plants and carefully disposing of the radioactive waste far exceeds those of fossil fuels - **Sources 3 & 6** . Nuclear power is used in the production of nuclear weapons such as nuclear bombs. Nuclear weapons are catastrophic and can cause major damage and destruction to the environment and human life. - **Source 2** . This seemingly perfect form of energy production is dangerous in ways that mankind has never seen, as obvious from its first industrial application as a city destroying weapon. - **Source 6.** Nuclear energy's first industrial application and an example of the destruction caused by nuclear weapons was the Japanese bombing caused by the Americans in August 1945. Atomic bombs were dropped on Hiroshima and Nagasaki and at

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Hiroshima over 90,000 people were killed instantly. Nuclear weapons are deadly and can eradicate people and things instantly.

Fig 4 : Photographic evidence of the bombing of Hiroshima and Nagasaki.

Fig 5 : The aftermath of the bombing and shows the effect of radiation on the land.

Nuclear reactors produce radioactive waste which can remain radioactive and dangerous to human health for thousands of years. An uncontrolled nuclear reaction in a nuclear reactor could result in widespread contamination of air and water. - **Source 3.** Examples of the damage caused by nuclear power plants are these three significant accidents: Three Mile Island (1979), Chernobyl (1986), and Fukushima(2011). Chernobyl and Fukushima resulted in radiation exposure with the worst nuclear death toll of 58 people at Chernobyl, and none so far from Fukushima. Increased thyroid cancer as a result of radiation released from Chernobyl involved about 4000 people - **Sources 4 & 5**.

Positives

Nuclear energy has been argued as one of the best sources of energy available to the public particularly for the reason that it does not produce greenhouse gases. Nuclear power reactors do not produce direct carbon dioxide emissions - **Source 3.** Nuclear power plants use the heat produced by nuclear fission to generate steam that drives turbines, like in fossil fuel plants. The great thing that really is the fighting argument for nuclear energy is that no greenhouse gases are produced in this fission process, and only small amounts are produced across the whole fuel cycle. The amount of fuel used to generate electricity is so much less than that used in fossil fuel plants. It is much more practical to do this with used nuclear fuel than with the wastes and emissions from fossil fuels. Nuclear fuel can be used in a reactor for several years and nuclear power plants can run for many months without interruption, providing reliable and predictable supplies of electricity. This is much cheaper than the costs of running fossil fuel plants - **Source 1.** Nuclear energy is a carbon free alternative to fossil fuels and nuclear power has far lower routine emissions than energy from burning fossil fuels. It produces no atmospheric gases and uses up no expensive organic chemicals - **Sources 2 & 6.** Nuclear energy itself is renewable as it comes from the element thorium which is infinite but the materials such as uranium used to control nuclear reactions are finite. It is believed that through advancements in technology we may be able to create a safe way to control nuclear energy meaning that nuclear energy would be renewable. - **Source 1.** Contrary to popular opinion the mortality rate of

9. Presents the information in a well-structured way using relevant science terminology and informative representations

nuclear energy is far lower than that of fossil fuels. Coal, a fossil fuel is seen as being the energy source with the highest mortality rate while nuclear energy has the second lowest mortality rate. - **Source 5.** After 14,000 reactor-years of operation, over a 50-year history, three significant accidents have occurred: Three Mile Island (1979), Chernobyl (1986), and Fukushima(2011). The risk of an uncontrolled nuclear reaction is low. In one year, over 4,000 U.S. coal miners are injured and nearly 24,000 die prematurely from diseases such as lung cancer. World wide 3 million people die a year from air pollution from fossil fuels - **Sources 3 & 5** . When compared to the mortality rate of nuclear power is is by far the safer fuel . - **Sources 4 & 5**

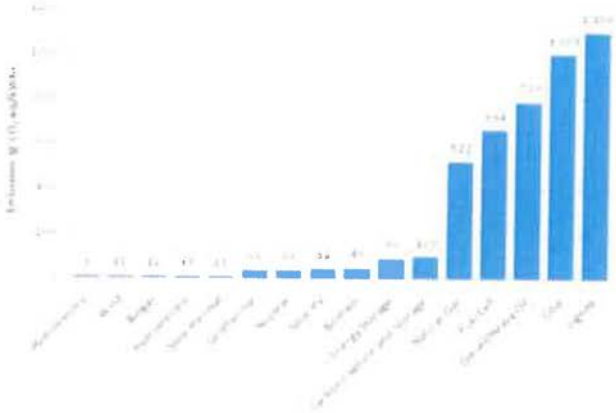

Fig 6 : Life cycle emissions of various energy sources

From Fig . 6 it is very clear that nuclear power emits significantly less than comparable fossil fuel sources. Nuclear generation is one of the safest and least environmentally damaging forms of energy generation.

My Opinion

Nuclear power is better for the environment than fossil fuels

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After intense evaluation and examination of my sources I have concluded that nuclear power is a better option for the environment than the burning of fossil fuels. My opinion has been influenced by the many sources provided in my research record. Before I had chosen this topic I was completely uninformed and had no knowledge on the topic of nuclear energy. The idea that nuclear fuel was a bad thing unknowingly had already been etched into my mind. Automatically and responsively when people hear nuclear energy only negative thoughts seem to percolate through, usually referencing atomic bombs. The public are scared of nuclear energy and to tell the truth they have every right to be. They think of the time when nuclear energy was weaponised and America bombed Japan. - **Source 6.** Most are unable to differentiate between nuclear energy and nuclear weapons. Let it be known that they are very different.

Nuclear energy in all its glory is an amazing source of clean renewable energy. There is absolutely no shying away from the fact that nuclear energy as powerful as it is can be catastrophic. When discussing nuclear energy we must give the facts whether it be positive or negative. Chernobyl, Fukushima and Three Mile Island are examples of the damaging effects of nuclear radiation - **Source 4.** Nuclear power produces radioactive waste and must be disposed of carefully else it can cause serious damage to the environment and cause serious health issues to the general public - **Source 3.** Fig 5. shows the horrible and dreadful effects of radiation to the environment and the land. Though my opinion is in favour of nuclear energy, from an initial perspective nuclear energy seems too dangerous.

The risks just seem too much and it does not feel worth it. However over the course of researching i've discovered the risk of an uncontrolled nuclear reaction is low. Precautions have been taken and improvements to nuclear stations to reduce the risk of this happening again - **Source 4.** Nuclear waste is disposed of carefully to make sure that radioactive waste does not reach society and the environment Across the board nuclear energy is not only safer for the environment but also for society. Coal (fossil fuel) i've discovered during researching is the energy source with the highest mortality rate while nuclear energy has the second lowest mortality rate. - **Source 5.** Coal mining kills over 4,000 people a year in the U.S. alone. Worldwide 3 million people die a year from air pollution from fossil fuels. Not only do fossil fuels harm people and society they are also non- renewable. At the rate we as mankind are using fossil fuels they

10. Gives a justified personal opinion informed by research linking the information to the argument and using science explanations

11. There is a recognition that the research has changed the students opinion

will be long gone soon enough and the lasting effects on the world that have been caused by these fuels will be irreversible. Nuclear energy can be classified as renewable. Nuclear energy does not produce greenhouse gases. It does not harm the environment. It is an abundant source of energy and the fuel stored in a reactor can be used for several years, providing a steady and reliable energy supply - **Source 1.**

Our world is changing drastically at a rapid rate. We need to combat the effects of fossil fuels on the environment by switching to a better more suitable source of energy, which is nuclear. As I have outlined in my report the positive elements of nuclear energy, i'm convinced that nuclear energy is truly and honestly the better fuel. The positives far outweigh the negatives. Nuclear energy is a clean source that does not harm the environment by producing atmospheric gases and it can be stored in a reactor and used for many years. The most dangerous aspect of nuclear energy is radioactive waste which is damaging to the environment and human health - **Source 3.** This risk of this plus an uncontrolled nuclear reaction is low. Although we are able to use wind power, solar power, geothermal, hydro, and anything else we can think of, the base power-source must be constant-running, high-output nuclear stations - **Source 6.** The many people who are pro nuclear, I am now able to understand and see why you argue for nuclear energy. To those who are against nuclear energy I also am able to understand why. Finally the people who don't really have an opinion or know where they stand with nuclear energy. I hope this report has provided you with an in depth look into nuclear energy and you are now able to form an educated and legitimate opinion. Last but not least to answer the big red question that I based this report on, yes I believe that nuclear energy is better for the environment than fossil fuels.

Research Record

1 . World Nuclear Association

Link: http://www.world-nuclear.org/nuclear-basics/electricity-generation-what-are-the-options.aspx

I think this is a reliable source.
The media article comes from a reliable source a respectable organisation. This organisation has a mission " to promote a wider understanding of nuclear energy". The author is reliable, we know this as the author comes from a reputable organisation. It is written in scientific language. It has reliable data, this data is backed up by facts and accurate information. There is no bias seen in this article as this article evaluates and compares the different forms of energy generation available and weighs both the negatives and the positives. It compares both fossil fuels and nuclear power. The article states that "fossil fuel plants require huge quantities of coal, oil or gas. These fuels may need to be transported over long distances. The price of fuels can rise sharply at times of shortage, leading to unstable generation costs" while it does this it also evaluates nuclear power "the amount of fuel used to generate electricity is so much less than that used in fossil fuel plants it is much more practical to do this with used nuclear fuel than with the wastes and emissions from fossil fuels". It is clear that they have evaluated both forms of energy and come to a fair conclusion. There is no evidence of long term data. It is not published in a scientific journal. It is not examined by more than one scientist. I do however believe that this article is reliable as it has a reputable author and source , accurate information and there is no

12. Finds information about the topic from a large number of varied and balanced sources, and gives a complete reference list

13. Sources referenced throughout the article

evidence of bias in this article. In summary the article says that the gasses produced by fossil fuels are a lot more than the gases produced from nuclear power.

2. Institute for energy and environmental research

Link: https://www.ieer.org/ensec/no-1/comffnp.html

" Comparison of Fossil Fuels and Nuclear Power" is the title of the article.

I have concluded that this is a reliable source. It comes from a well respected and reputable organisation. The author is Arjun Makhijani who holds a Ph.D. in engineering with a specialisation in nuclear fusion. There is scientific language used in this article. There is no bias seen in this article. It clearly and boldly gives both disadvantages of fossil fuels and nuclear power "Besides carbon dioxide emissions, fossil fuel mining and technologies for controlling emissions other than carbon dioxide to the air and water contribute to environmental degradation, which is often very severe in its local and regional impacts. Further, fossil fuel use in the present mode presents risks of climate change that are not yet well understood, but may be catastrophic and irreversible" 'this quote shows the brutally honest portrayal of fossil fuels while also examining nuclear power in the same way "nuclear power has far lower routine emissions than energy from burning fossil fuels. However, it presents hazards of its own, notably the risk of accidents like Chernobyl, with

severe, long-lasting consequences over huge regions. In addition, the security risks posed by large inventories of nuclear weapons-usable materials have no counterpart in fossil fuels" . Data used is reliable and there is evidence of long term data which can be seen in the screenshot taken from the article below. It is not published in a scientific journal. Only one scientist had worked on this article. To paraphrase the article concludes that neither fossil fuels or nuclear power prove to be a good energy source for a sound environmental and security policy. That moderate fossil fuel with engineering measures to prevent the release of carbon dioxide gas into the atmosphere along with the use of renewable energy sources joined with increased energy efficiency measures provide the best alternative for economical, sustainable energy in the future.

COMPARISON OF FOSSIL FUELS AND NUCLEAR POWER

	Nuclear with plutonium economy	Nuclear, once-through uranium use	Fossil Fuels, present approach	Fossil Fuel, moderated use, and Renewables
Resource Base, present economics*	indefinite future	50 to 100 years, possibly more	a few hundred years	indefinite future
Resource Base, including very low-grade resources	not required	indefinite future	thousands of years	not required
Incremental Climate Change Risk	none**	none	potentially catastrophic	some if fossil fuels are largely phased out
Potential Consequences of catastrophic accidents	severe: long-lasting effects over large regions	severe: long lasting effects over large regions	no consequences for large regions but may be locally severe; effects generally short-term	no consequences for large regions but may be locally severe; effects generally short-term
Air Pollution, routine operations	relatively low	relatively low	severe to moderate, depending on control technology	moderate to low, depending on control technology
Water Pollution, routine operations	potentially serious at mines and mills, but limited due to low uranium requirements; potentially serious at waste disposal sites	often serious at mines, mills, and uranium processing sites (includes non-radioactive and radioactive pollutants); potentially serious at waste disposal sites	often serious at coal mines, serious at some oil fields (includes non-radioactive and radioactive pollutants, notably radium-226 near many oil wells)	potentially very low
Risk of Nuclear Weapons Problems	yes	yes, but less than with a breeder reactor economy	none	none

* See text.
** Questions have been raise about the effect of krypton-85 from extensive reprocessing necessary for a breeder reactor system on cloud formation and hence potential climate change. However, krypton-85 can be removed from exhaust gases by cryogenic cooling.

Fig 1 : A table comparing nuclear and fossil fuels

3. US Energy Information Administration

Link: https://www.eia.gov/energyexplained/index.php?page=nuclear_environment

The title of this article is "Nuclear Power & the Environment" it discusses nuclear power and states both the positive and negative outcomes of nuclear power.

I believe this article is a reliable source because the article is taken from a government website. The author is reliable as they come from a government association. There is scientific language used in this article. Reliable data is given in this article which is backed up by facts and accurate information and there is no evidence of long term data. There is no bias in this article as the article evaluates the pros and cons of nuclear power. The article states that "An uncontrolled nuclear reaction in a nuclear reactor could result in widespread contamination of air and water" but it also says "The risk of this happening at nuclear power plants in the United States is small" . It compares and contrasts nuclear energy and fossil fuels " Unlike fossil fuel-fired power plants, nuclear reactors do not produce air pollution or carbon dioxide while operating. However, the processes for mining and refining uranium ore and making reactor fuel all require large amounts of energy" it is clear there is no bias as while stating the positive effects of nuclear power

against fossil fuels it also mentions the negative effects of nuclear power. It is not published in a scientific journal and no more than one scientist worked on this article. To summarise this article says that the risk of an uncontrolled nuclear reaction is low and nuclear reactors do not produce air pollution or carbon dioxide while operating.

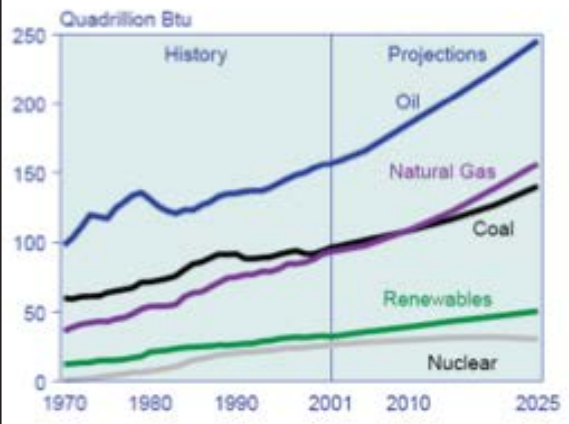
4. Decodedscience.org

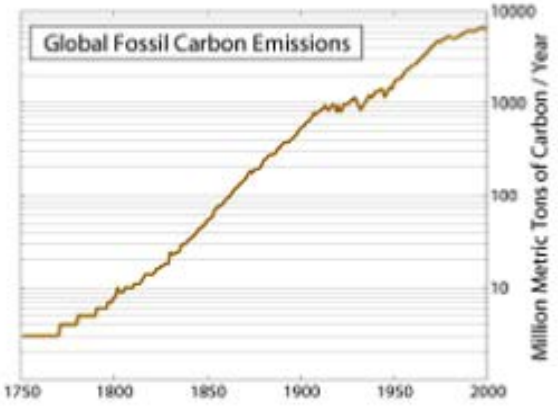
Link: https://www.decodedscience.org/fossil-fuel-vs-nuclear-for-safe-and-clean-power/7682

The title of the article is " Fossil Fuel vs. Nuclear for Safe and Clean Power". As the title states the article is focused on comparing both fossil fuels and nuclear power.

I have regarded this source as reliable as it is provided by an organisation of qualified scientists. The author is reputable, a Judy Haar who holds a Master's Degree in Nuclear Chemistry. There is no scientific language used in this article. The data is reliable, it contains images of both predicted and historical values of energy consumption and Co2 emission which can be seen below it also has evidence of long term data. This article is not biased. The quote "After 14,000 reactor-years of operation, over a 50-year history, three significant accidents have occurred: Three Mile Island (1979), Chernobyl (1986), and Fukushima(2011)." shows the fairness presented in this article because although this is designed to promote nuclear energy against fossil fuels it does not shy away from the fact that nuclear energy has had a somewhat dangerous history. It also presents the dangerous history of fossil fuels "oil pollution, look no further than the Gulf of Mexico spill or its contribution to global warming. Coal, although inexpensive to recover, has mercury and carbon dioxide as by-products, both requiring expensive

treatment option" and then comes to the conclusion that " the amount of radiation produced from a coal plant far exceeds that of a nuclear plant." This article is not published in a scientific journal. To summarise this article nuclear power is safer than fossil fuels





5. Pandora's Promise - Documentary

Link : https://m.youtube.com/watch?v=QiNRdmaJkrM&t=365s

This documentary focuses on nuclear energy and people who once preached against nuclear energy now embracing it.

The beginning of the documentary focuses on the opinions of people opposed to nuclear energy. They say " It's wicked".

Fig 2 : World Energy Consumption 1970-2025

Fig 3: Global CO2 Emissions:

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I think this is a reliable source because the documentary gathers a lot of people. Editors, scientists,environmentalists and energy experts are all called to discuss their views on nuclear energy. All of those who were once opposed to nuclear energy now embrace it and this documentary shows why. They debunk all negative and untrue assumptions about nuclear energy while also establishing the assumptions that are true.The filmmaker Robert Stone is reliable as he has had experience making nuclear related documentaries which can be seen in his documentary 'Radio Bikini' (1988). There is no bias in this documentary because it does highlight the negative effects of nuclear energy. Mark Lynas an environmental activist says and is aware that "there's no other energy source that does this that leaves huge areas contaminated by this strange invisible presence which you know is potentially deadly". He is aware of the reason society is scared of nuclear energy and also sees why we would want to do without nuclear power. The documentary goes on then to elaborate on why nuclear energy is the best option. It shows through graphs the mortality rates associated with each energy technology. Coal is seen as being the energy source with the highest mortality rate while nuclear energy has the second lowest mortality rate. It's unbiased as it clearly evaluates the negative and positive effects of nuclear energy. It also discusses Chernobyl a nuclear accident that occurred in 1986 and discusses how this accident is what turned people away from nuclear energy. Reliable data is used in showing these mortality rates. The community in this documentary uses scientific language when explaining their views on nuclear energy. Contributions are made by more than one scientist. In summary the documentary says nuclear energy is the better option for energy as it has low mortality rates, the risk is not as common as people would think and it doesn't produce greenhouse gases like fossil fuels.

6. Atomic Awakening: A New Look at the History and Future of Nuclear Power - Book

The beginning of the book states " The purpose of this book is not to sell nuclear power" so immediately we know that this book will be objective, based on fact and unbiased. This is a reliable source as the author of the book James Mahaffey was a senior research scientist at the Georgia Tech Research Institute and has worked at the Defense Nuclear Agency now renamed the Defense Threat Reduction Agency, the National Ground Intelligence Center, and the Air Force Air Logistics Center, focusing on nuclear power, nano-technology, and cold fusion. He has also published many books on nuclear power so he is very well educated on the subject. There is scientific language used in this book all throughout. The data is reliable and backed up by facts and accurate information. There is evidence of long term data where the author references World War II and 1970's America. The book is unbiased which I had already stated due to the first sentence of the book (see above) . To further prove this point a quote from the book states " A coal plant is cheap to build and expensive to run. A a nuclear plant is cheap to run and expensive to build. From a total expense standpoint, it is a lot better to have the expense spread out over the life of the plant as fuel costs than to pay interest on the initial build for the life of the plant" this quote explains how from an expense standpoint fossil fuels are the better option. It explains how it is better to invest money into running the plant than spend more money plus interest on building the plant. It is not published in a scientific journal and only one scientist has worked on this book. This book can be summarised using a

14. References a book topic is very well researched

quote " Nuclear power, waiting quietly in its coma, has now become inevitable. That is, the ultimate need for nuclear power has finally caught up with its mad dash to develop. Whether you like it or not, the industrial world no longer has a choice. The age of burning coal and gasoline is over, as atmospheric chemistry and general environmental pollution have approached states of crisis, and hydrocarbons are becoming to expensive to burn. We need wind power, solar power, geothermal, hydro, and anything else we can think of, but the base power-source must be constant-running, high-output nuclear stations. The expansion of nuclear power is awakening as you read."

Reference List

1. http://www.world-nuclear.org/nuclear-basics/electricity-generation-what-are-the-options.aspx

2. https://www.ieer.org/ensec/no-1/comffnp.html

3. https://www.eia.gov/energyexplained/index.php?page=nuclear_environment

4. https://www.decodedscience.org/fossil-fuel-vs-nuclear-for-safe-and-clean-power/7682

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5. Pandora's Promise Documentary - https://m.youtube.com/watch?v=QiNRdmaJkrM&t=365s

6. Atomic Awakening: A New Look at the History and Future of Nuclear Power

Table evaluating my sources
Some sources included here
have not made it into the record

OVERALL JUDGEMENT **EXCEPTIONAL**