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Truth in Energy

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Freedom Foundation
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RESPONSE
to the
DRAFT REPORT
of the
PRESIDENTIAL CLIMATE COMMISSION (PCC)
on
South Africa's Electricity Strategy
drawing attention to
Serious Flaws and Inadequacies

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1 INTRODUCTION

The **PCC's Draft Report** supporting Recommendations for South Africa's Electricity System (May 2023), does not use as a foundation, the economic and social well-being of the citizens of our country. Instead, it works from a basic assumption that it will recommend renewable energy because it 'feels philosophically good', not because it is the correct answer as determined by a sound engineering and economics investigation. As a result, the Draft Report needs to be rigorously scrutinised, and all implications carefully considered, against the backdrop of South Africa's current and future energy needs, before we commit ourselves irrevocably to a non-fossil fuel and non-nuclear scenario in a developing country blessed with an abundance of fossil energy and nuclear energy resources.

Very evidently missing from the Draft Report is any reference to any competent Socio-Economic Impact Assessment (SEIA)¹ of the consequences of any radical change in the methods of the production of electricity.

Electricity is an absolute underlying foundation on which any economy is structured, and subsequently functions. As the saying goes, you 'fiddle with it at your peril'. The tragic national experience of load-shedding has illuminated this reality starkly.

An additional concern inherent in the PCC Draft Report, is an apparent adherence to foreign political ideologies exerting pressure for the headlong implementation of what has been termed a 'Just Transition'. We should ask; 'who created this term and why?'

An additional significant question must be posed; Is any such transition really 'just' and if so, for whom? Furthermore, who gets sacrificed to achieve a 'just transition' as required by amorphous others?

The citizens of South Africa must not find their dreams of economic prosperity, and health and welfare, curtailed by foreign desires to score political points by 'taming South Africa to their commands', and what appear to be thought experiments.

Our energy sovereignty is supremely important, and it is essential to maintain total control over it, in the interests of our people.

The PCC Draft Report leaves many feeling distinctly disappointed and uncomfortable.

This Assessment indicates a disturbing number of significant inadequacies and inherent biases, which are indicated here in a brief manner. However, this Assessment reveals and presents a sufficiently illuminating picture to indicate to any thinking reader that the PCC Draft Report is substantively inadequate.

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2 IS IT A 'JUST TRANSITION' FOR SOUTH AFRICA?

The term a 'Just Transition' has come to be an international mantra. The fact that the word 'just' was introduced presupposes that it would be fair and equitable to all concerned. But the reality, pressured onto much of the world by a few First World countries, is turning out to be neither fair or equitable.

It is inflicting and will increasingly inflict on people who are alive today, especially the poor, immense hardship for the rest of their lives to possibly improve things for 100 years from now.

The South African government is being pressured by foreign governments and commercial interests effectively to sacrifice the well-being of all our citizens to satisfy theoretical calculations based on scientific data, which is disputed by many other reputable scientists and other experts internationally. Apart from the negative impact socially and economically on electricity costs and security, the effects on South Africa of an over-hasty 'transition' to an energy production system determined in countries with totally different conditions and stage of economic development from ours, will negatively impact our society, particularly lower social working-class people. Furthermore, much of the negative impact will strike in selected areas such as coal and uranium mining regions. There would be significant knock-on effects for many, resulting jobless people moving to other areas seeking work. This would generate a socio-economic nightmare.

In addition, in an RE environment, much of the income, jobs and associated economic activity would move to foreign suppliers and countries who supply 'renewable energy'² systems to us.

It is not rational to initiate this intentionally. It would amount to sacrificing energy sovereignty deliberately, which is strategically undesirable and counter-productive.

There is nothing inherently 'just' in the misleadingly named 'Just Transition', particularly for South Africa.

With great respect, the PCC has not taken sufficient account of the well-being of the current and future generations of South Africans. South Africa deserves a transition that would be genuinely 'just', that is a transition to sufficient low-cost electricity for national prosperity and security, which is inclusive of all hidden costs, is genuinely sustainable, and which serves the just interests of all.

3 WHAT IS BEHIND THE PCC DRAFT REPORT?

The PCC's Draft Report, unless adapted as suggested in this Response, has severe potentially negative implications for the well-being and economic prosperity of all people living in South Africa. All conclusions reached by the PCC are of great importance for our nation.

The PCC website lists the Committee Members, but unfortunately gives no indication of conflicts of interest. This is an important oversight. There should be full public disclosure of their personal and institutional interests and connections.

Of special concern is that there is a clear indication that the PCC agenda is to promote 'renewable' energy at the expense of fossil fuel and nuclear solutions. Since fossil fuels, particularly coal, and nuclear, are currently of such importance to the well-being of South Africa, it is concerning that the PCC seems to have initiated its work from a distinctive bias against resources and technology with which our country is blessed in abundance, and for resources and technology that must be imported at great cost.

This apparent bias does not seem to be from a standpoint of satisfying South African economic interests, but, if anything, corresponds to foreign economic and political interests.

4 SOCIOECONOMIC IMPACT ASSESSMENT (SEIA)

All new policy proposals and laws must be supported by a properly conducted SEIA³ that examines all costs, benefits, and possible unintended effects before going forward to policy and law.

No such SEIA has been published. This makes it difficult to assess and evaluate the PCC's Draft Recommendations. We accordingly enquire whether a SEIA exists or is in progress, and how to make vital contributions.

5 MISLEADING DATA

Much data in the PCC Draft Report is inaccurate and, as stated above, seems to be informed by a deliberate bias towards predetermined conclusions and recommendations. Not only is much data inaccurate, but it is used out of context.

This is particularly true regarding nuclear power where South Africa is, we repeat, richly endowed with expertise, resources and proven operating technology. For example, the Draft Report asserts a significant water-use for Koeberg Nuclear Power Station (Koeberg)⁴, whereas the truth is that Koeberg uses no cooling water because it uses the ocean. 'Cooling-water use'

indicated for nuclear and other power plants refers to water that could have been used for other purposes, such as agriculture or urban use. All proposed large reactors in South Africa are planned to be on the coast since South Africa has minimal inland fresh water.

The PCC's inaccurate data also suggests a build-time of double what it will take to build a large nuclear plant, and triple what it would take to build a Small Modular Reactor (SMR).

Such inaccurate misleading data suggests extremely poor research, insufficient know-how, anti-nuclear bias, or calculated misinformation. (See expansion below).

6 FOREIGN INTERESTS

The PCC Draft Report gives the impression that foreign interests are influencing South Africa's electricity policy and strategy based on their political and commercial objectives, not ours.

The Commissioners include many eminent South Africans of unquestionable integrity and national interest service. However, the Climate Commission's website⁵ shows that various committee members have links to the NGO industrial complex of known bias⁶, which includes such organisations as Friends of the Earth⁷, the World Wildlife Foundation⁸ and Earthlife Africa⁹. They are all noted 'environmental' pressure groups that receive billions in funding from foreign oligarchs¹⁰ who are invested in 'renewable energy' and opposed to South Africa using its fossil fuel and nuclear resources. This has profound implications that demands rigorous public scrutiny and enquiry.

The PCC must resist being seduced into serving the interests organisations with self-serving political and commercial agendas. It must, unlike those organisations, be held accountable for the success or failure of our electricity systems. South Africans must live with the consequences of ill-considered policies for many generations. Parliamentary oversight of their work and output is essential. It is unclear whether this is envisaged. Another issue is whether there will be on-going public sight of relevant facts. Transparency and accountability are also essential.

As stated in the Introduction, the PCC Draft Report shows a disturbing bias toward renewable energy and bias against South Africa's coal and nuclear energy. This, it is respectfully suggested, is suicidal for a country that is still heavily dependent on these reliable energies amid an unprecedented energy security crisis, which renewable energy alone cannot yet redress remotely.

7 ECONOMIC TRADE-OFFS

Economics is ultimately about trade-offs, balancing interests, and not ideologically driven dogmatic solutions. High Emissions, Low Efficiency (HELE)¹¹ coal plants, for example, can be part of the decarbonisation solution, or at least an intermediary step as the country transitions to others. Contrary to uninformed opinion, for South Africa to remain with coal in the short term would make no difference to the temperature of the earth as our current CO₂ emissions are just slightly over 1% of all the world's emissions¹². Moving away from coal and towards the 'just transition' immediately as the PCC defines and recommends, would be economic suicide, not least rendering 2.3 million additional South Africans unemployed¹³.

The PCC Draft Report does not mention this trade-off. Neither is there a mention of South African fly-ash industry¹⁴ and the role that this coal by-product plays in decarbonising our cement industry. If we were to build nuclear plants for example, our cement would be of a low CO₂ type and therefore the emissions cited in the PCC Draft Report, would be substantially less for nuclear power. Yet all the Draft's roads lead to the myopic 'renewables' conclusions.

8 THE GERMAN INFLUENCE

The Draft Report is reminiscent of the German thought experiment¹⁵ that influenced the Integrated Resource Planning (IRP2019)¹⁶ via South Africa's Council for Scientific and Industrial Research (CSIR). In March 2023, Germany and South Africa signed a "cooperative agreement" for a "just transition"¹⁷. The question is why this was done and on whose advice? Who was involved in making this decision? This is not apparent from official sources. South Africa does not have an obligation to adhere to neo-colonial relationships without due regard for modern national interests. The large sums of money implicated in the 'just transition', seem to be opposed to South Africa's own interests and voice.

Germany could afford to implement their 'Energiewende' (low carbon energy transition program)¹⁸ being a rich developed nation. However, its recent failure during the Ukraine war forced them to make a U-turn back to coal, just six months after they announced 'the end of nuclear. Wind farms are being demolished to get to the coalfields below them, while driving up their CO₂ emissions¹⁹. This demonstrates the frailty of their 'just energy transition', yet it is being imposed on South Africa. This is a matter of grave concern, especially the interests being served.

9 DECARBONISATION OR BEING SOLD GERMAN IDEAS?

The PCC Draft Report objective is to decarbonise South Africa, but it fails to say that both France and Sweden, both of which rely primarily on nuclear power, emit lower CO₂ emissions per MWh than Germany. France's CO₂ intensity is at 57g of CO₂ per kwh, more than 6 times lower than Germany, at 366g of CO₂ per kWh. Also, France had the fastest route to decarbonisation²⁰ under the successful Messmer Plan (to build huge nuclear power capability following the 1973 oil crisis)²¹. French household electricity prices have always been below the EU average thanks to its successful nuclear power policy.

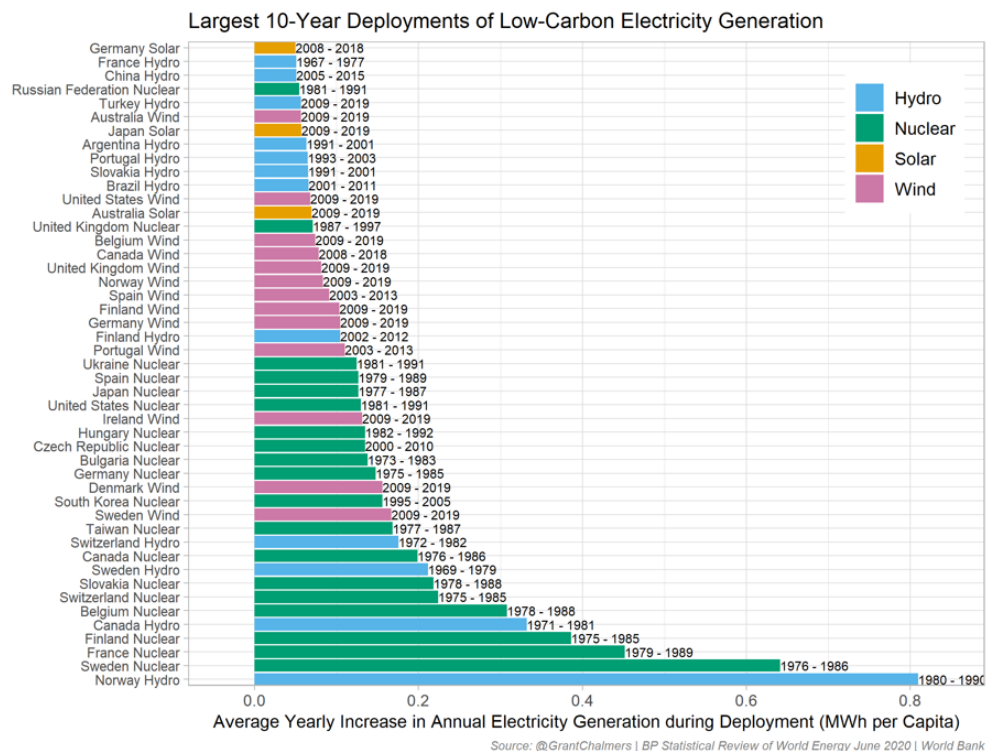
The PCC Draft Report asserts erroneously that nuclear power stations cannot be constructed at a rapid rate when many countries, notably France, China and Sweden, have deployed them in short time spans. No country, to date, has decarbonised on renewables alone. Full decarbonisation is essentially impossible.

Misleadingly, CO₂ emissions are made to appear benign by what might be called 'operational sleight of hand'. Popular low CO₂ numbers are achieved by referring only to operational CO₂. In the real world all CO₂ must be included. 'Renewables' CO₂ is much more substantial when, as explained above, up- and down-line realities are included, such as mining, processing and manufacturing inputs; intercontinental and local transportation; construction and maintenance; decommissioning and waste disposal, and the like. There are more subtle CO₂ impacts due to the removal of land from other uses such as agriculture, urbanisation, conservation, and industry.

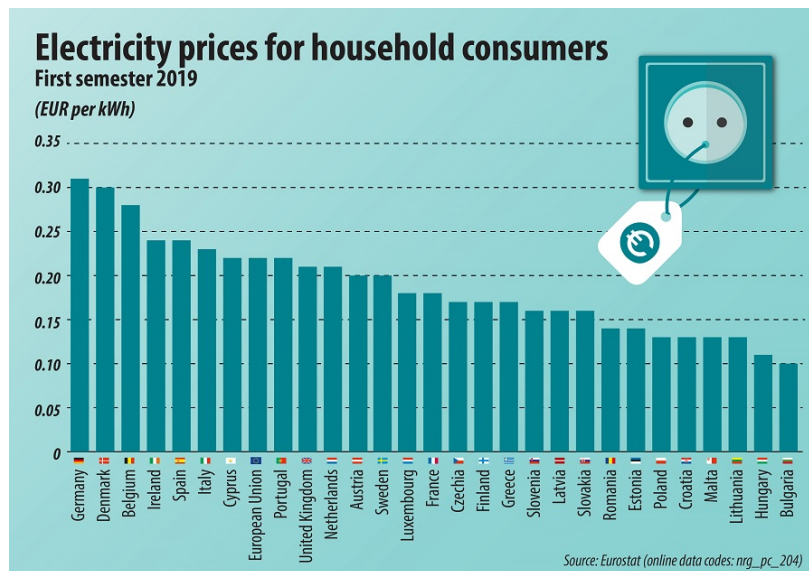
It appears that no systematic study has been conducted on such substantial secondary impacts of 'renewables', including on nature, environment, scenery, recreation and climate. Since no study is widely known as published it can safely be assumed that there is none. Had there been, it would be well-known, especially if the findings were benign. In the absence of such information, generous 'renewables' rhetoric must be dismissed.

10 HISTORICAL EVIDENCE

How fast can nuclear be deployed compared to RE?



The charts show that household electricity²² prices in Germany (€30.9 per 100KWh) and Denmark (€29.8 per 100KWh), with high renewable penetration (65% in Denmark and 29% in Germany)²³, are the highest in the EU and the German middle class is increasingly feeling the burden of fuel poverty²⁴. Yet nuclear powered France (€17.8 per 100KWh) and Sweden (20.8€/per 100KWh) are below the EU average (€21 per 100 kWh)(see Eurostat News Release, 7 May 2020). Data from 2019 is used to correct for the biasing effect of Covid19 and the Russian-Ukraine War.



ec.europa.eu/eurostat

11 PCC DRAFT SUGGESTS A PROHIBITIVELY COSTLY OPTION THAT WOULD NOT ACHIEVE DECARBONISATION

It is unrealistic to believe that an industrialising country (as intended for South Africa) could rely on intermittent weather-dependent technologies for reliable baseload capacity and electricity security. The objectively and dispassionately analysed evidence shows that South Africa should opt for a mix of energy sources to support its national needs.

Renewable energies can and should play their part in specified and appropriate contexts, such as competitively priced roof panels, but cannot support national grid baseload requirements.

Prohibitively costly and environmentally unfriendly battery storage is not yet capable of rendering ‘renewable’ power dispatchable. This scientific debate was settled at the end of 2022 by the global energy crisis that saw the scramble for energy at the heart of the geopolitical New Great Game²⁵. Germany’s industries for example closed down²⁶, because their politicians were told that ‘energy security’ and ‘baseload’ are outdated concepts in ‘smart grids’. However, in the wake of the Russia-Ukraine war, Germany found itself severely compromised. It was dependent on Russian natural gas (scarcely ‘carbon neutral’), and without leverage over Russia or the United States, it was forced to import fuel from the latter at a high tariff, exacerbated by Russian sanctions.

It is important to understand that in any intermittent electrical system, dispatchable fuels, usually in the form of fossil fuels (natural gas, coal, diesel or oil) will always offer the safety of reliable power. In times of crisis, if there is not sufficient capacity, the grid collapses. In 2023, German leaders finally came to the admission that they needed France’s nuclear power stations²⁷, because

having closed their remaining three in favour of ‘renewables’, they no longer have baseload capacity. South Africa cannot afford to consider short-cited policies.

Swedish policymakers leaders have now also realised that they have to re-establish substantial nuclear plans to ensure national electricity stability²⁸.

12 THE CRITICAL IMPORTANCE OF NUCLEAR POWER

There has been a dramatic and long-overdue worldwide revival of interest in nuclear power. The world is realising the value proposition of nuclear energy (notably the UK, Eastern Europe, Sweden, Finland, South Korea, China and others). They are amongst those adding it to their energy mix. The Draft PCC Report envisages taking South Africa in the opposite direction; into a myopic ‘one source fits all’ dead-end. It is premised on ignoring nuclear power, which is by all objective criteria by far the cleanest, safest, greenest and most cost-effective option. The proverbial ‘cherry on the top’ or ‘bonanza’ is that South can supply its own needs easily, and export uranium to many other countries.

Nuclear energy is of low entropy²⁹ quality, the type without which the industrial revolution³⁰ could not have taken place. This is clear from the seminal work of economist Sir Anthony Wrigley, on the ‘low entropy theory of wealth’ that aimed to link energy and economics. GDP per capita measures the amount of low entropy energy in the system. Wealth destruction is more likely to occur under high entropy systems (as Siemens recently realised with wind farms) as they are more likely to encounter metal fatigue³¹. This is also clear from the work of the late famed physicist, Richard Feynman³².

Nuclear power’s full thermodynamic potential has not yet been remotely realised. Prominent examples include the production of hydrogen, the desalination of seawater (that South Africa desperately needs), industrial heat, small modular reactors (SMRs), already in use in China³³, as well as more advanced thorium-based reactors that are predicted. Why the PCC ignored such readily available and extremely relevant facts is not explained in the Draft Report.

Opponents of nuclear power appear to be unaware of or dishonest about the fact that nuclear power is the lowest carbon option for South Africa, if not the entire world.

13 NUCLEAR WASTE

This is a highly misunderstood issue in the uninformed war of words. Nuclear waste consists of low-level waste, medium-level waste and high-level waste, the latter being mostly limited to spent fuel.

After powering the Western Cape for almost 40 years, Koeberg's spent fuel can fit in a few boxes on half of a tennis court. This spent fuel is safely stored in the fuel pools inside containment buildings, and has 'cooled down' enough to be stored safely – we stress, safely – in storage casks indefinitely. Today, spent fuel from the likes of Koeberg is more likely to be reprocessed into advanced nuclear energy fuels than stored in underground repositories.

The management of spent fuel is already factored into the operating costs of the nuclear power plant and is not an additional cost. This fact needs to be properly explained and understood rather than the scaremongering by the anti-nuclear lobby.

This is not true of 'renewables'. Decommissioning and disposal of highly toxic waste are not fully accounted for in the purported 'RE' cost.

The PCC Draft Report also ignores the fact that in South Africa already has a highest quality waste depository at Vaalputs in the Karoo dessert, where waste is stored safely. This site is in one of the most barren and stable locations in the world, with a water table 1000m below the surface and zero possibility of corrosion.

Radiation risks are blown out of all proportion by activists. Long half-life waste is 'long' because of miniscule radiation rates. Such radiation is so slow that human beings and life on earth generally have natural immunity. The well-known phenomenon is called 'hormesis' in general, and 'radiation hormesis'³⁴ in particular. It has been observed for instance, in the medical records of the atomic bomb survivors³⁵.

World Health Organisation (WHO) data demonstrates that the 31 deaths³⁶ due to radiation at Chernobyl were people who received ultra-high levels of short-life radiation, and nobody died of radiation in the Fukushima disaster, which was in no sense a 'nuclear' disaster³⁷. Fukushima was as good as a controlled experiment in nuclear safety that found risks to be minimal, indeed lower even than most pro-nuclear experts believed.

As Dr Wade Allison³⁸ argued in that aftermath of Fukushima, and the lessons learned, that the time has come to stop fearing and running from radiation³⁹. From an economist's perspective, the now disproven Linear No Threshold theory (LNT) that informs much of the fear, is arguably the most expensive scientific mistake in scientific history⁴⁰.

For more on LNT mythology, refer to Louw-Posma-LNT Science and Economics Paper⁴¹ and the US Health Physics Society's 21 series interview with Dr Edward Calabrese⁴². Edward Calabrese is an eminent toxicologist at the School of Public Health and Health Sciences at the University of Massachusetts at Amherst and the world's expert on Hormesis.

14 MISLEADING AND OUT OF CONTEXT DATA

The PCC Draft Report is misleading in that it includes as reliable and relevant tables that are out of context, and are not benchmarked on proven international data, especially about nuclear energy (see below).

For example, Table 14 of the PCC Draft Report makes serious, and misrepresentative claims about Nuclear Power regarding the cost, footprint, water usage, build time and radiation waste. These claims are inconsistent with the standard literature⁴³.

TABLE 14: SUMMARY RESULTS OF TECHNOLOGY ASSESSMENT (ENERGY GENERATION)

Technology	Coal	Gas	Nuclear	Wind	Solar PV	CSP	Large hydropower
Resource / feedstock availability in South Africa	High feedstock availability (53 bn tonnes in reserves)	Moderate feedstock availability - large potential resource but difficulty to exploit (200 tcf onshore, 60 tcf offshore)	Fuel imports required	High resource availability (average 559 W/m ²)	High resource availability	High resource availability	Limited water resource availability
Build-time (years)	10 – 12	2 – 3	12 - 15	2 - 3	1.5 – 2	2 - 3	4 - 7
Cost / affordability (LCOE R/kWh)	~1 - R2.58	1.5 (combined cycle) and 3.4 (open cycle) 2.5 – 3.3 (Peaking support)	R2.23 - 3.47	0.44 – 0.85	0.48 – 0.7	2.1 – 2.65	0.31
CAPEX requirement (R/kW)	R105 285	R21 250	R212 500	R26 486	R16 575	R128 086	R20 192
Reliability and stability	Reliable and stable if existing fleet is maintained	Reliable and stable	Reliable and stable	Reliable and stable if coupled with storage and peaking support	Reliable and stable if coupled with storage and peaking support	Reliable and stable if coupled with storage and peaking support	Reliable and stable, but can be affected by drought
Direct GHG emissions (kgCO ₂ e/kWh)	0.93 – 1.26	-0.45	0	0	0	0	0

Technology	Coal	Gas	Nuclear	Wind	Solar PV	CSP	Large hydropower
Lifecycle emissions (KgCO ₂ e/kWh)	1.023	0.45	0.015 – 0.05	0.012 – 0.015	0.124	0.009	0.021
Air pollution (gSO ₂ /kWh and gNO _x /kWh)	6.9 – 13 (SO ₂) 2.3 – 6.1 (NO _x)	SO ₂ NA 0.3-0.4 (NO _x)	No air pollutants from generation	0	0	0	0
Water use (l/kWh)	2 – 2.4 (wet cooling) 0.12 (dry cooling)	0.598	1.5 – 2.7	0	0	3.5	~ 68
Land use (m ² /MWh)	15	1.3	0.3	0.4	19	22	14 for large plants 22 for small-to-medium plants
Waste	Significant quantities of fly ash produced. In South Africa 36 Mt of fly ash produced annually	No waste produced via the generation. Waste is associated with the decommissioning of facilities	Radioactive waste produced. Koeberg Nuclear Power Station produces 32t/yr. of spent fuel waste	No waste produced via the generation. Waste is associated with the decommissioning of facilities	No waste produced via the generation. Waste is associated with the decommissioning of facilities	No waste produced via the generation. Waste is associated with the decommissioning of facilities	No waste produced via the generation. Waste is associated with the decommissioning of facilities

15 ADDITIONAL POINTS OF CONCERN IN PCC DRAFT REPORT

15.1 Levelized Cost of Energy (LCOE)

The Draft Report places great emphasis on the ‘levelized cost of energy’ (LCOE), which measures lifetime costs divided by energy production as the relevant metric⁴⁴. It ignores the widely acknowledged criticism against this metric⁴⁵, such as the social costs, system costs, intermittency, transmission costs, distribution costs and integration costs of renewables⁴⁶.

15.2 The Full Cost of Electricity (FCOE)⁴⁷

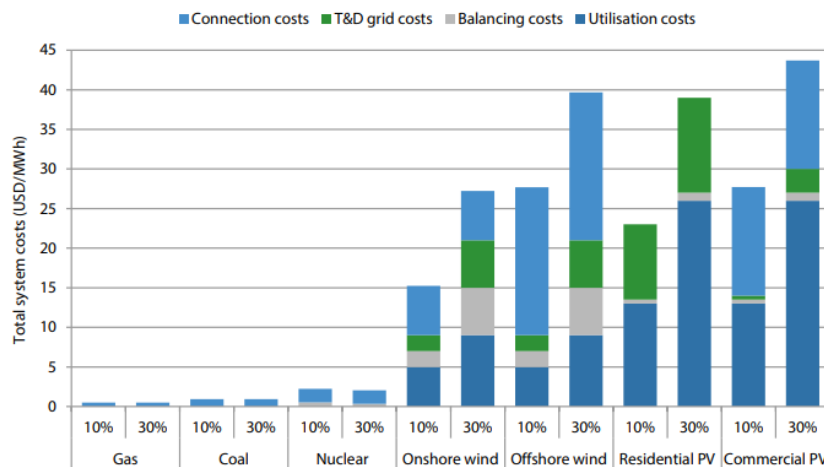
To prevent Independent Power Suppliers from passing on additional costs to consumers, the OECD⁴⁸ produced a Report⁴⁹ according to which the integration cost of ‘renewables’ had to be included to determine the FCOE. The PCC Draft Report omits this, which has serious implications. It misrepresents ‘renewables’ as cheaper than they are and conceals that it is more affordable to integrate nuclear power than ‘renewables’ into a fully integrated grid.

Such errors and omissions of readily available facts raise concerns regarding what might explain them. Hopefully, they are not functions of bad faith bias, and will, in good faith, be corrected in the final Report.

Eskom and the Office of the Minister of Electricity recently announced that the power utility will spend an estimated R210 billion on transmission lines, which will connect remote power-generating solar plants and wind farms located in parts of the Northern and Western Cape. This is a huge cost to connect intermittent ‘renewables’. The true cost of ‘renewables’ has been misrepresented as ‘fence’ or ‘factory gate’ cost, that is the cost of delivery to the immediate boundary as opposed to electricity consumers. Since it does not include grid connection and integration costs, it misrepresents the true cost of ‘renewables’. The proposed expenditure will not generate any electricity, which highlights the true and substantially higher cost of ‘renewables’ to the South African

economy and unaware public⁵⁰.

Figure ES.3: **Grid-level system costs of selected generation technologies for shares of 10% and 30% of VRE generation**



15.3 Footprint

A windfarm occupies 300 to 400 times more land to generate the same capacity as a nuclear power plant. The Draft Report misrepresents them as having the same environmental footprint and diversion of land from arguably more valuable purposes.

15.4 Water Cooling

Our coastal based nuclear power plants use the ocean for cooling, therefore minimal or no water usage. The same applies for inland Small Modular Reactors which are mostly air-cooled. The Draft Report cites nuclear energy as a high water consumer. This is incorrect and misleading. Water and land are extremely valuable resources and should be assigned to power generation responsibly.

15.5 Out-of-Date Build Times

The Draft Report suggests erroneously that it would take twelve (12) to fifteen (15) years to build a nuclear reactor. In truth, the UAE’s Barakah nuclear power plant⁵¹, where 150 South Africans were part of the team, effectively took only seven (7) years to get its first reactor online. It was actually nine (9) years when the two (2) years delay due to covid disruptions was added. Because the units were staggered, the second and third unit came online 12 to 18 months apart. The plant’s total capacity of 5600MW will supply up to 25% of the UAEs energy needs. To attract the skills that it lost, South Africa could entice many of these highly qualified workers to come home and apply what they learned abroad.

It is unclear why such readily available information is omitted from the Draft Report and why the time required for nuclear build is so substantially overstated. We trust that this critical information will be corrected in the final Report.

15.6 Omission of Failed ‘Renewable’ and Successful Nuclear Plants

Table 17 of the Draft Report cites a few successful renewable projects, as in Germany, whilst omitting failed projects or any mention of countries that are moving towards more nuclear power, such as Sweden, UK, South Korea, the UAE and Egypt.

15.7 Source of the PCC Data?

The Draft Report places great emphasis on Lazard, a financial service agency⁵² without observing independent researchers found that Lazard’s data for the UK and USA are in stark contrast to actual real-world data. The question arises as to where the PCC sourced their data⁵³, and why it presented Lazard data without the appropriate disclaimer.

15.8 Environmental Impacts

It is curious that ‘renewables’ are thought of as environmentally or ‘green’. The Draft Report includes no mention or caution regarding potentially devastating environmental impacts.

This Analysis does not cover these because doing justice to it would require a substantial self-standing Report.

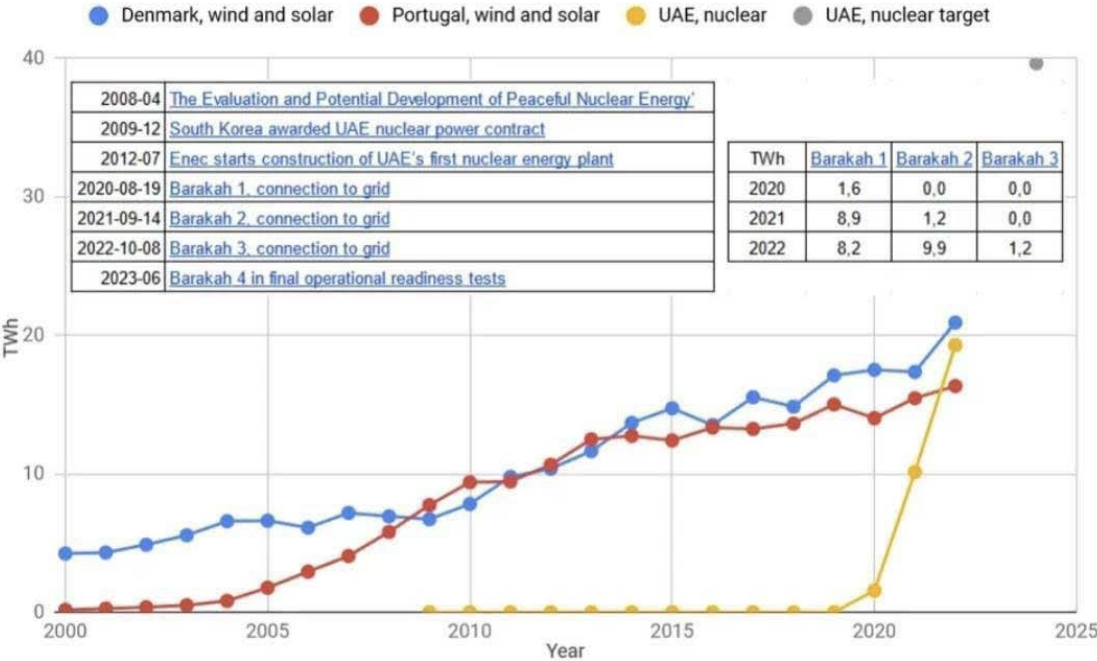
What, with respect, the Draft Report ought to address fully can be illustrated by way of a dip-stick example.

Wind farms are typically on hills or ridges. They extract energy from prevailing wind. The full long-term implications are speculative. There will be changing weather and climate conditions and patterns. Much has been said legitimately about impacts on birds and bats, including endangered high-flying species, but no attention has been given to impacts on wind-dependant nature, such as rainfall, crops, pollens, insects, moths, butterflies, seeds and the like. Impacts of maintenance roads, foundations and cables on sub-terranean life are not addressed, including root systems, insects, reptiles, moles etc.

16 NUCLEAR POWER “TAKES TOO LONG”, “IS TOO EXPENSIVE”, AND OTHER MYTHS

The PCC Draft Report emphasises erroneously that nuclear energy costs too much and takes too long to build, which is why it has no place in the draft recommendations.

This is incorrect. The figure below shows how just one nuclear power station brought more power onto the grid for the UAE than the entire country of Denmark and Portugal did with wind farms in twenty (20) years. Unlike nuclear plants which can last many decades, those wind farms have a mere twenty (20) year life cycle.



Given that many of South Africa’s operating coal power plants rapidly expanded at a rate of 1.4GW per year, from 1970 to 2000, with a life expectancy of 50 years we should expect their retirements in the form of a ‘coal cliff’, where our stations are retired, from 2020 onwards, that is now.

This has been compounded by inadequate maintenance where, despite adding 8GW of coal, 7GW of renewables, 2GW of diesel OCGTs, and 1.3GW of pumped storage since 2010 to the grid, South Africa is generating only the equivalent amount of power that it had in the mid-1980s. Clearly immediate action is required.

Given our dire energy crisis, South Africa needs the fastest route possible to get 100TWhs of new electricity generation capacity per year onto the grid to augment the current 200TWhs. This must be done with technologies that can deliver our ‘energy trilemma’ objectives, namely secure, sustainable, and affordable electricity for all.

To achieve these objectives would require 12GW of nuclear energy, whereas renewable energy would require four to five times this amount: 48GW to 60GW. That will need battery storage. But even then, there must be back-up dispatchable power like gas or coal.

There is an unfortunate and dishonest tendency to omit the fact that intermittent power sources must be accompanied by back-up capacity. That is the true cost of ‘renewable’ power. The PCC Draft Report avoids real-world comparison of ‘apples with apples’. Using proven international benchmarks, such as the BP Statistical Review of World Energy (2019)⁵⁴, nuclear energy will deliver the 100TWh per year far more quickly and cheaply than ‘renewable’ energy, with the bonus of stable low-cost clean electricity that Koeberg has been delivering for almost 40 years.

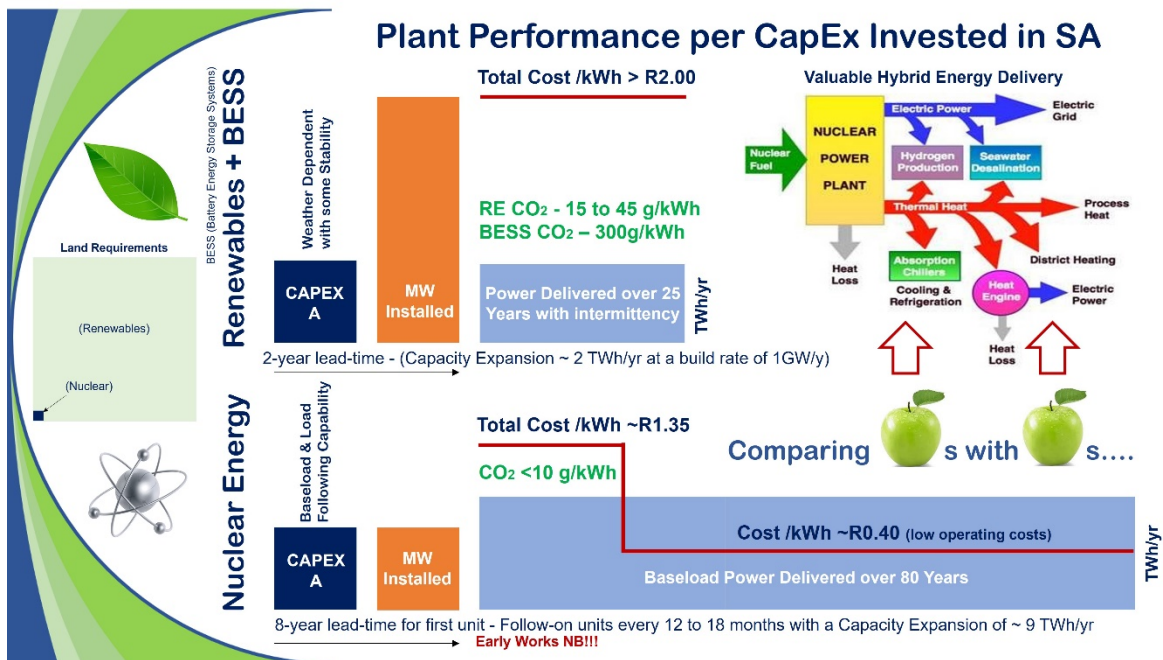
17 AFFORDABILITY

Reference is made above to popular nuclear myths, in particular that it ‘costs too much’⁵⁵. This misperception stems from not understanding the nuclear life cycle and that there are two tariffs. While nuclear should cost below the R2.00 per kWh (cited in the PCC Draft Report’s Table 14), this rate falls dramatically by about 60% once the Capital Expenditure (CAPEX) is repaid, which is cheaper than the values that the PCC Draft Report cites for wind and solar. (See the figure below)

A standard approach is for about 85% of the nuclear newbuild cost to be funded by the nuclear vendor / supplier country through export credit agency funding at about 3% interest rate, which reduces the LCOE even further. Repayment starts when the plant is generating power and profit. The funding will not reflect on Eskom’s balance sheet. That is how the 9600MW build program was structured from 2007 to 2018. The payment is over a number of years; not all at once as maliciously misrepresented by the anti-nuclear lobby. Nuclear is affordable when viewed in context⁵⁶. For example, the cost of national Health Insurance (NHI) as proposed no is never quoted as a lump sum, but an annual expenditure over many years.

The LCOE is made up of capital (CAPEX) repayments and operating costs, which include fuel costs. Like Koeberg, when the CAPEX is amortised (after 16-18 years), the tariff drops by about 60% to cover the operating and waste management costs. Unlike coal and gas, nuclear power plants use very little fuel, and operating costs are much lower. In this, nuclear is virtually unique. Within about a fifth on the life of a plant, the cost of nuclear power falls precipitously so as to render it the cheapest electricity source by substantial margins. Nuclear is the essential option for any policy beyond a myopic short-term time horizon.

18 LEVELLING THE ENERGY PLAYING FIELDS



This is why Koeberg costs R0.40 per kWh, which is less than any other energy source in South Africa. For the first 20 years, power is sold at grid parity (at R2 per kwh, a break-even point), and in the remaining 40 to 60 years, nuclear wins with the added advantage that it does not need to be replaced after 20 years.

19 THE FUTURE – DENYING NUCLEAR DENIALISTS

“To appreciate and engage the benefits of nuclear energy, human society should overcome the fear of it, in the same way as it did when it accepted fire a million years ago. Then, by leap-frogging their animal instincts, humans became the dominant life form on Earth. Today, we acknowledge the drawbacks of carbon combustion – its tendency to propagate without control, the effect of the pollution that it spreads,and even its de-stabilising effect on climate. In place of fire, physical science offers nuclear energy”.*

(Dr Wade Allison, Emeritus Professor of Physics and Fellow of Keble College, University of Oxford.)

(* Dr Allison’s view on climate change is not necessarily that of all the authors but is included for accuracy and authenticity).

Historically South Africa has been heavily dependent on coal from the north for its electricity generation, but this requires long-distance, energy sapping transmission lines to power the rest of the country. Therefore, we need a more distributed, clean energy transition, which can be

achieved sensibly with a balanced and sustainable energy mix, and should include our regional neighbours with their hydro and gas resources.

If SA follows UAE's lead on nuclear power, then at around eight (8) years from start of construction we can put 10 to 13 TWhs (terawatt hours) per year on the grid and another 10 to 13 TWhs every 12 to 18 months thereafter with a series of new power plants. For the initial decade and a half, nuclear energy will run at about the cost of grid parity and afterwards SA will have affordable energy until the end of this century. Nuclear power is an investment in the nation's future.

Clearly, the expansion of South Africa's energy capacity can be delivered by all the abundant natural energy resources and technologies we have available including cleaner coal, gas to power, regional hydro, wind & solar, nuclear energy and natural gas for heating, an optimum mix. South Africa is indeed fortunate. Why are we wasting this by following the dictates of foreign powers?

20 CONCLUSION

Industry experts need to be responsible in planning and developing an optimal and viable solution for South Africa's decade-long energy crisis, and not aligned to their anonymous, vested interests. Improving Eskom's plant performance is the only short-term relief we have. It will get much worse if we don't immediately implement a sensible and workable plan over the short, medium, and long terms.

We had a viable plan in our Integrated Resource Plan IRP2010. Had we stuck to it, we would not be experiencing our national energy disaster. We do not have time for activist ideologies and other 'thought experiments'. The time is now. South Africa and its electricity needs are ready to make that change and join the future.

21 TRUTH IN ENERGY AUTHORS, CONTRIBUTORS AND SIGNATORIES

Hügo Krüger is a YouTube podcaster, writer, and civil nuclear engineer who has worked on a variety of energy related infrastructure projects ranging from nuclear power, LNG and renewable technologies. He holds a Masters degree in Nuclear Civil Engineering from École spéciale des travaux publics, du bâtiment et de l'industrie Paris and a Bachelors in Civil Engineering from the University of Pretoria. (Primary author.)

Des Muller is the CEO of NuEnergy Developments and the spokesperson for the SA Nuclear Build Platform. An experienced energy consultant with expertise across many energy sectors, he is driven by the need for a balanced and sustainable energy portfolio for Southern Africa. (Primary author)

Leon Louw, Free Market Foundation Founder and retired President. Internationally recognised Nobel Peace Prize nominee, author, and policy analyst, he is the CEO of the Izwe Lami Freedom Foundation. (Primary author)

Andrew Kenny is a nuclear engineer qualified in both engineering and physics, working in power engineering and related industries. He regularly writes public interest articles for media on a variety of subjects and has a substantial following.

Jayne Boccaleone, policy and communications consultant and Founder of Truth in Energy with Leon Louw.

Dr Rob Jeffrey, noted economist, currently Managing Director of Econorisk. After an early career in investment banking he moved into industry, where he was Managing Director and Chair of a number of construction and industrial companies. He has previously been Chairman of the Construction Engineers Association (CEA) and has specialised in energy economics with an in depth analysis of coal and the South African economy.

Dr Pali Lehohla is the Past Statistician General of South Africa. He is a qualified statistician and regularly writes popular interest newspaper articles on a range of thoughtful topics. He served as Chair of the UN Statistics Commission. He is a member of the Independent Advisory Panel (IAP) to the UN Secretary General.

Princess Mthombeni, “Princy”, is an award-winning communication specialist, and a founder of Africa4Nuclear from KwaZulu-Natal, South Africa. Her globally recognized work involves providing high-level strategic support to the government in leading, executing, and ensuring the success of nuclear communication strategies.

Dr Kelvin Kemm is a nuclear physicist and is Past Chairman of the South African Nuclear Energy Corporation (NECSA). He is currently Chairman of Stratek Global (Pty) Ltd a nuclear project management company.

22 SOURCES AND ENDNOTES

That this Response includes some duplication is deliberate for the purposes of emphasis. The endnotes include text which could have been in the above text but which has been confined to substantive analysis, argument and comment. The authors are willing to provide elaboration on request.

Freedom Foundation (Izwe Lami) is a newly established policy institute created by the old Free Market Foundation creator, Leon Louw, to continue and invigorate its work and values and his life-long commitment to economic and individual freedom.

Truth in Energy (TiE)

Truth in Energy describes a group of energy experts with wide and diverse experience whose objective is to present optimum solutions to solve the energy crisis in South Africa. TiE is not driven by source ideology but by the efficient mix to deliver sustainable, cost effective and affordable electricity for all citizens.

TiE is a policy unit within the Freedom Foundation, whose CEO Leon Louw, continues to be at the forefront of leading policy and economic ideas for over 45 years.

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² ‘Renewable’, as all informed people know, is a misnomer. Solar panels and windmills (to which the term generally applies), the infrastructure required, and the mineral resources involved, are, if anything, less renewable than the requirements of virtually all other power sources.

³ <https://www.dpme.gov.za/keyfocusareas/Socio%20Economic%20Impact%20Assessment%20System/Pages/default.aspx>

⁴ <https://www.eskom.co.za/eskom-divisions/gx/nuclear/>

⁵ <https://www.climatecommission.org.za/commissioners>

⁶ <https://robertbryce.substack.com/p/the-anti-industry-industry>

⁷ <https://www.foei.org/>

⁸ <http://www.worldwild.org/>

⁹ <https://earthlife.org.za/>

¹⁰ <https://propagandainfocus.com/cop27-where-green-deals-are-signed-in-red-ink/>

¹¹ <https://whatswatt.com.au/what-is-hele-coal->

[power/#:~:text=What%20is%20a%20HELE%20plant,it%20a%20smaller%20environmental%20footprint.](https://whatswatt.com.au/what-is-hele-coal-power/#:~:text=What%20is%20a%20HELE%20plant,it%20a%20smaller%20environmental%20footprint.)

¹² <https://ourworldindata.org/co2/country/south-africa>

¹³ <https://www.dailymaverick.co.za/article/2021-05-10-get-the-shovels-out-death-of-the-coal-industry-must-bring-new-beginnings-in-mpumalanga/>

¹⁴ https://www.lafarge.co.za/2_2_2_3-Alternative_raw_material

¹⁵ <https://www.eg.fr/actualites/rapport-dalerte-ingerence-des-fondations-politiques-allemandes-et-sabotage-de-la-filiere-nucleaire-francaise>

¹⁶ <https://www.energy.gov.za/irp/2019/IRP-2019.pdf>

¹⁷ <https://robertbryce.substack.com/p/the-anti-industry-industry>

¹⁸ <https://www.world-nuclear.org/information-library/energy-and-the-environment/energiewende.aspx>;

<https://en.wikipedia.org/wiki/Energiewende>

¹⁹ <https://www.cleanenergywire.org/news/intensive-use-german-coal-power-plants-releases-additional-15-mio-t-co2-2022->

[report#:~:text=The%20'intensive%20use'%20of%20German,commissioned%20by%20Green%20Planet%20Energy.](https://www.cleanenergywire.org/news/intensive-use-german-coal-power-plants-releases-additional-15-mio-t-co2-2022-report#:~:text=The%20'intensive%20use'%20of%20German,commissioned%20by%20Green%20Planet%20Energy.)

²⁰ <https://bfrandall.substack.com/p/ever-heard-of-gaslighting>

²¹ https://en.wikipedia.org/?title=Messmer_plan&redirect=no

²² <https://ec.europa.eu/eurostat/web/products-eurostat-news/-/DDN-20191126->

[2#:~:text=In%20the%20first%20half%20of,the%20first%20half%20of%202019.](https://ec.europa.eu/eurostat/web/products-eurostat-news/-/DDN-20191126-2#:~:text=In%20the%20first%20half%20of,the%20first%20half%20of%202019.)

²³ World Bank data.

²⁴ https://energy-poverty.ec.europa.eu/system/files/2021-10/epov_member_state_report_-_germany.pdf

²⁵ <https://quillette.com/2022/03/09/the-new-great-game/>

²⁶ <https://www.businessinsider.com/germany-faces-entire-industries-collapse-russia-natural-gas-supply-cuts-2022-7?r=US&IR=T>

²⁷ <https://europeanconservative.com/articles/news/germany-we-need-nuclear-power-from-france/>

²⁸ <https://world-nuclear-news.org/Articles/Changes-to-Swedish-law-proposed-to-enable-nuclear>

²⁹ The second law of thermodynamic states that the ‘entropy’, or disorder, in a system always increases. That is why it is difficult to put broken eggs back together using the same amount of energy that breaks them – to ‘reverse the arrow of time’. As the entropy increases, all infrastructure eventually decays as it is subjected to up and down cycle stress throughout its life.

³⁰ <https://cepr.org/voxeu/columns/opening-pandoras-box-new-look-industrial-revolution>

³¹ <https://www.cnn.com/2023/06/23/siemens-energy-scraps-profit-outlook-as-wind-turbine-troubles-deepen.html>

³² <https://youtu.be/ROrovyJXSnM>

³³ <https://world-nuclear-news.org/Articles/China-s-demonstration-HTR-PM-reaches-full-power>

³⁴ <https://www.youtube.com/watch?v=GANStqWcZg4&t=5714s>

³⁵ <https://pubmed.ncbi.nlm.nih.gov/23304106/>

³⁶ There are narrowly varying estimates of Chernobyl radiation deaths. The UN suggests a few more, perhaps 50 radiation fatalities. This is fewer than fatalities in the mining, transportation, processing, manufacture, installation, maintenance, decommissioning and waste disposal of other electricity sources.

<https://world-nuclear.org/information-library/safety-and-security/safety-of-plants/chernobyl-accident.aspx>

³⁷ <https://world-nuclear.org/information-library/safety-and-security/safety-of-plants/fukushima-daiichi-accident.aspx>

³⁸ Dr Wade Allison is one of the few remaining people alive today to have known Lise Meitner, the Jewish woman who split the atom in Nazi Germany.

³⁹ <https://www.bbc.com/news/world-12860842>

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- ⁴⁰ <https://www.freemarketfoundation.com/article-view/linear-no-threshold-lnt-fully-an-economics-perspective-on-nuclear-safety-leon-louw-and-bonne-posma>
- ⁴¹ https://issuu.com/johna.shanahan/docs/louw-posma-lnt_science_and_economics_paper-main-fi
- ⁴² <https://www.ans.org/news/article-3854/health-physics-society-presents-the-history-of-the-linear-nothreshold-model/>
- ⁴³ Further information, evidence and argument will be provided on request.
- ⁴⁴ The LCOE is measures the average cost of generating one kilowatt hour (kWh) of electricity over the lifetime of a generating asset. The LCOE takes into account all direct and indirect costs associated with a system, such as installation, operation, maintenance, fuel, transmission, baseload, decommissioning, waste disposal etc.
- ⁴⁵ <https://www.mackinac.org/blog/2022/nuclear-wasted-why-the-cost-of-nuclear-energy-is-misunderstood>
- ⁴⁶ <https://www.hoymiles.com/resources/blog/what-is-levelized-cost-of-energy-and-how-does-it-work/>
- ⁴⁷ https://issuu.com/johna.shanahan/docs/220520_full_cost_of_electricity_schernikau_-_pre_p
- ⁴⁸ <https://www.oecd.org>
- ⁴⁹ <https://www.oecd-neo.org/ndd/pubs/2018/7441-full-costs-2018-es.pdf>
- ⁵⁰ <https://www.iol.co.za/business-report/energy/the-true-cost-of-renewables-in-sa-e63eb7b3-265e-4735-bb09-24d025842611>
- ⁵¹ <https://www.enec.gov.ae/barakah-plant/>
- ⁵² <https://www.lazard.com/>
- ⁵³ <https://watt-logic.com/2023/06/14/wind-farm-costs/>
- ⁵⁴ <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2019-full-report.pdf>
- ⁵⁵ <https://www.newstatesman.com/spotlight/climate-energy-nature/2022/12/nuclear-power-slow-expensive-distraction>
- ⁵⁶ <https://hkrugertjie.substack.com/p/financing-options-for-nuclear-plants>

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