Submission No 124

INQUIRY INTO IMPACT OF RENEWABLE ENERGY ZONES (REZ) ON RURAL AND REGIONAL COMMUNITIES AND INDUSTRIES IN NEW SOUTH WALES

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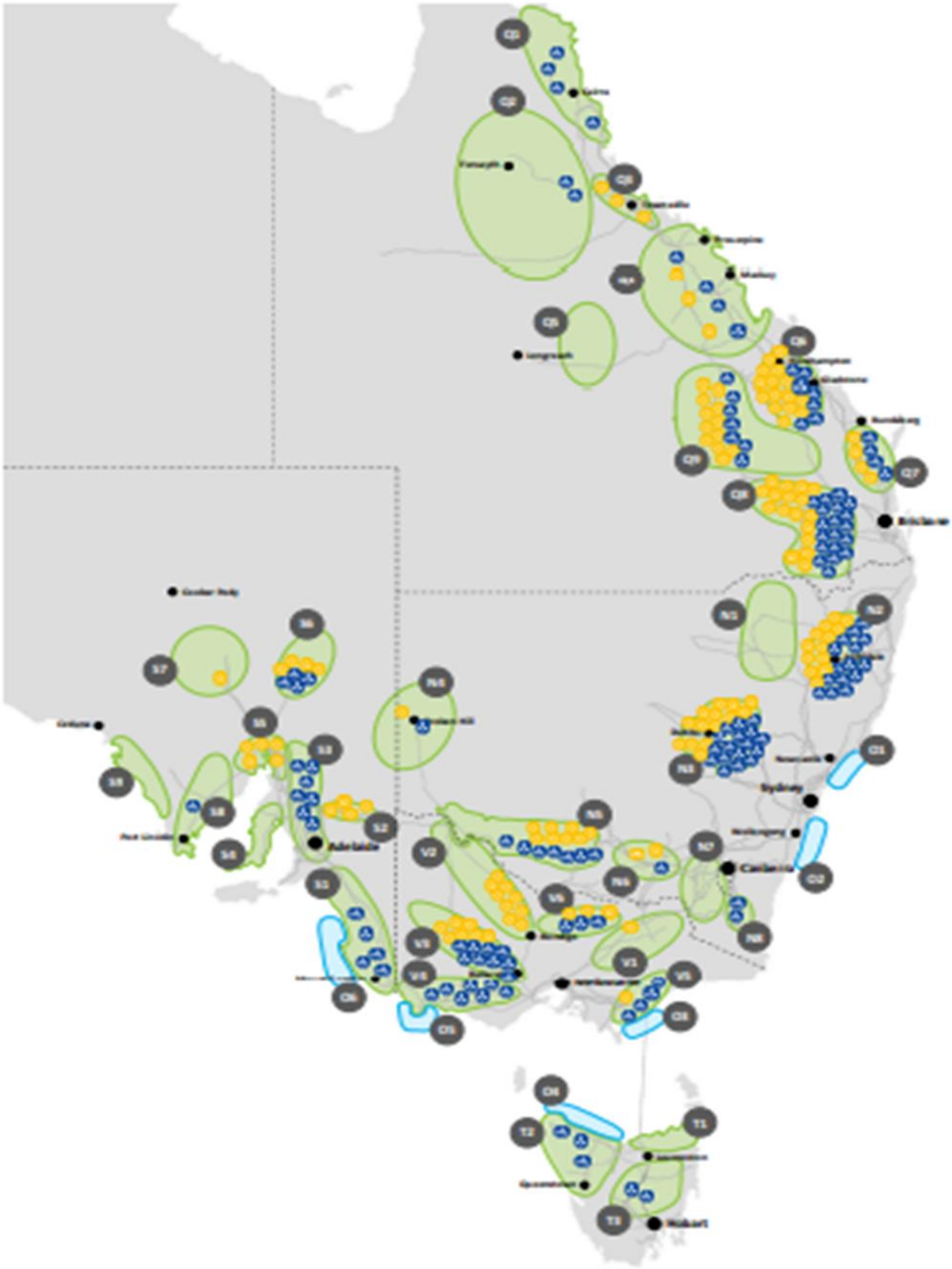
Impacts of Proposed 41 Renewable Energy Zones

By Colin Smith

INTRODUCTION

In 2022, the Australian Energy Market Operator produced a report titled, Integrated System Plan. In this report, the AEMO outlined its plan to replace 16 coal-fired power plants with 41 Renewable Zones. Below is a map of the proposed 41 REZs.



https://aemo.com.au/-/media/files/major-publications/isp/2022/2022-documents/2022-integrated-system-plan-isp.pdf?la=en&hash=D9C31A16AD6BF3FB2293C49AA97FE1EA

The 41 REZs will consist of:

1. 151 onshore wind farms
2. 12 offshore wind farms
3. 137 solar farms
4. 23 pumped hydro projects
5. Approximately 20,000km of addition high voltage transmission lines
6. Hundreds of high-capacity batteries
7. Thousands of community batteries
8. Gas-fired power plants on standby to provide peaking power

The reasoning behind such a huge energy transition is that an energy system built on renewable energy sources provides clean energy at an affordable price.

I strongly believe that such an energy plan is not going to achieve its intended goals. In fact, it will provide **energy uncertainty**, **drive up energy prices**, **create a huge increase in terminal illnesses for thousands of Australians** impacted and result in a **series of environmental disasters**.

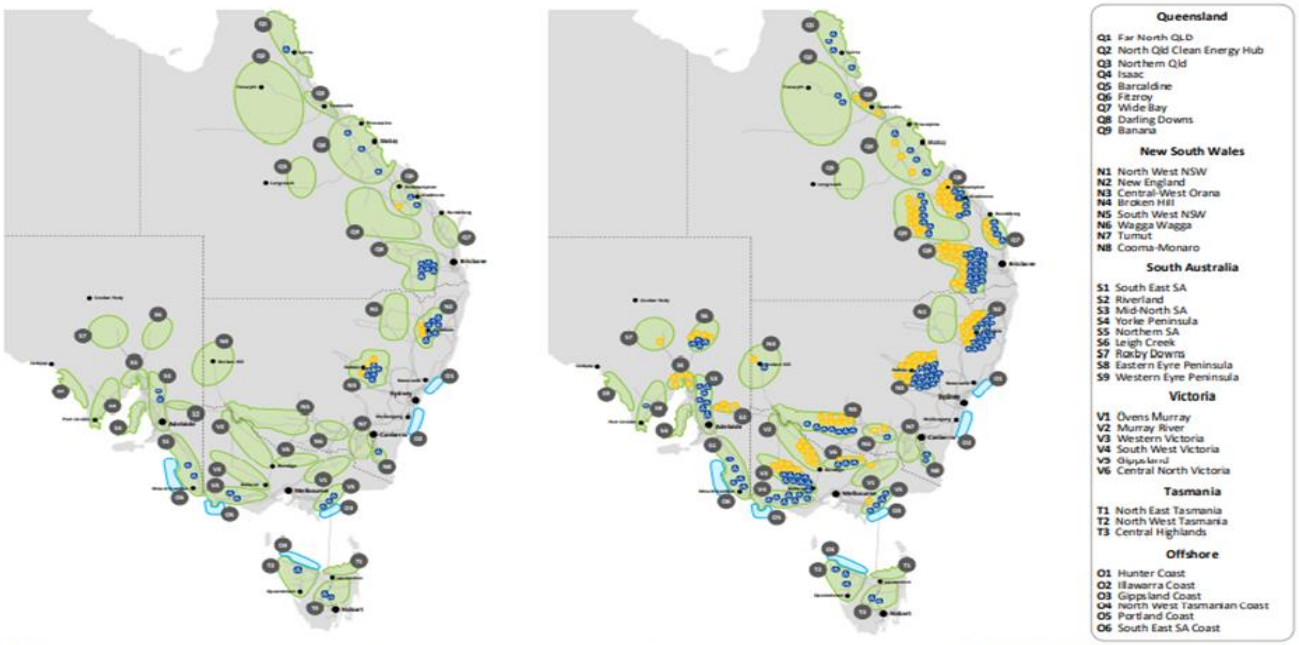
In my report, I will report on following factors:

1. Building 41 REZs is incredibly land-intensive – 10,000 x more than coal power.
2. The costs of the 41 REZs will ultimately drive-up power prices.
3. The hidden costs of the REZs will continue to drive-up power prices.

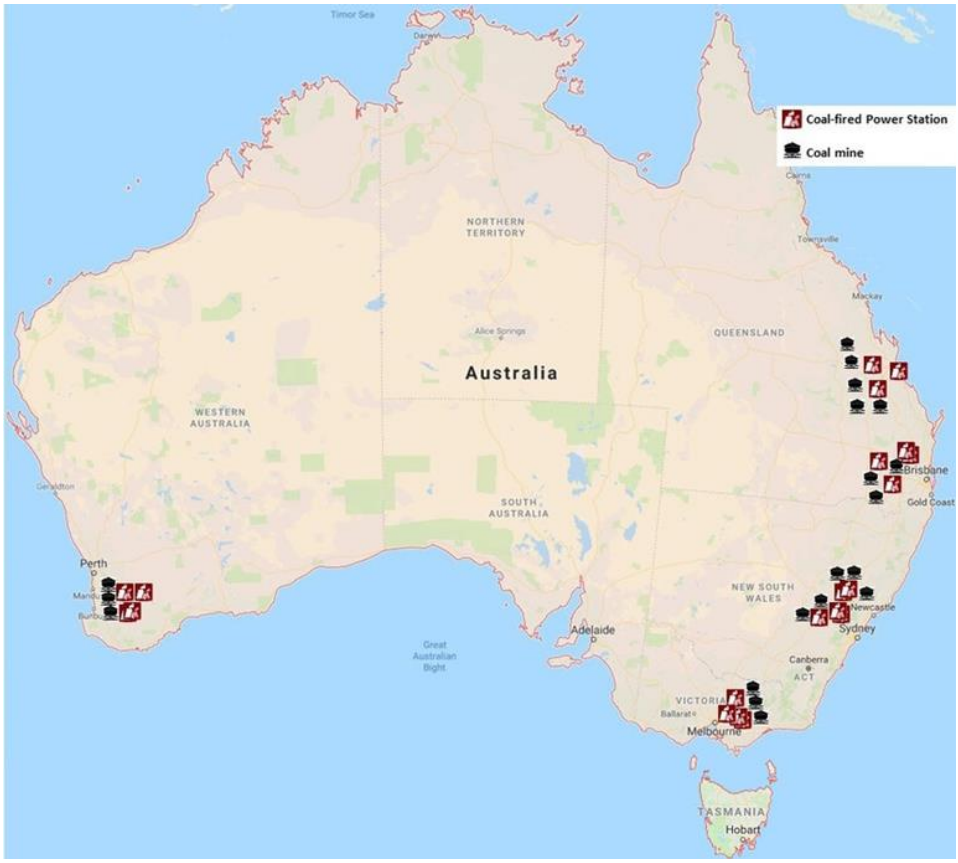
1. The magnitude of land required to host 41 REZs.

Looking again at the map of the 41 REZs, my estimation of the total area required to build these energy zones is approximately 750,000 square kilometres – almost the entire size of NSW. It is a huge waste of land when the alternative - 16 coal-fired power stations - fits into 75 square kilometres – the area of the Parramatta CBD.

Figure 15 REZ development in the *Step Change* scenario – 2029-30 (left) and 2049-50 (right)



† AEMO has updated the REZ boundaries for N5 aligned with geographical area of the SWNSW REZ in Schedule 1 of the draft REZ declaration, available at https://www.energy.nsw.gov.au/sites/default/files/2022-03/Draft%20South-West%20REZ%20Declaration.pdf. AEMO will update all relevant parameters in the 2024 ISP.
‡ EnergyCo is in the early stages of planning for two new REZs in the Hunter-Central Coast and Illawarra regions of New South Wales, as set out under the New South Wales Electricity Infrastructure Act 2020. These REZs are not shown because they are not yet geographically defined.



So, in effect, the AEMO's plan is to use 10,000 times more land with renewable energy projects that don't provide 24-hour baseload power, while replacing wind and solar energy sources every 15-20 years. It is a massive exercise.

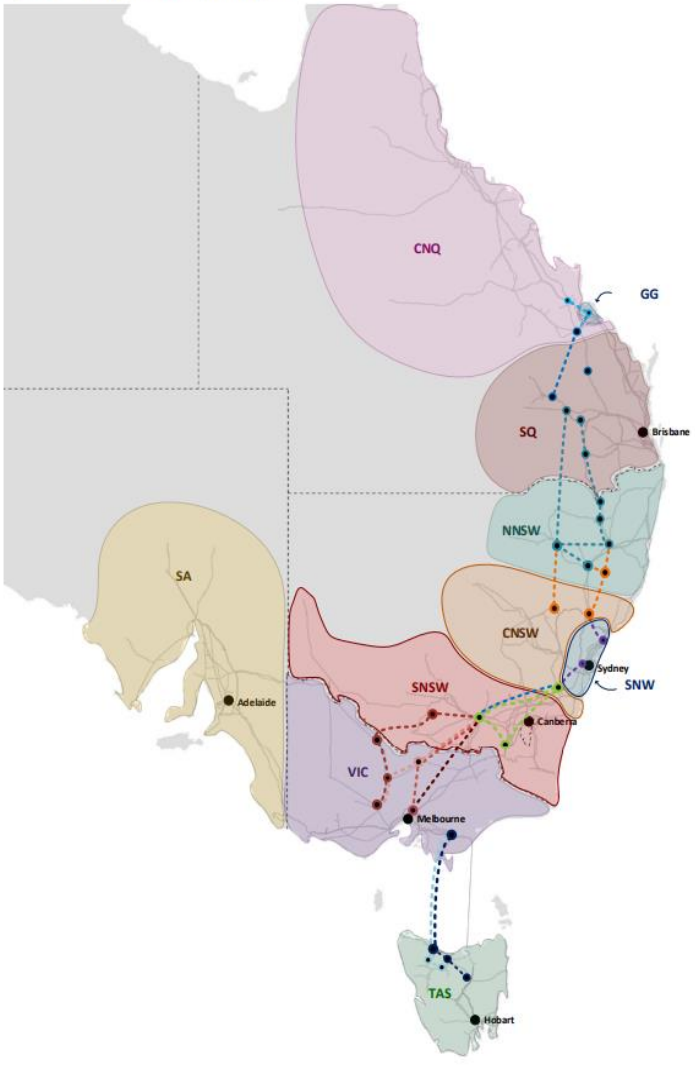
The other factor to consider is the amount of landed needed in high voltage transmission lines to connect the 41 REZs to the energy grid. My estimate, not including offshore wind farms is 20,062km – equivalent to half the circumference of the world.

The Australian Energy Market Operator released in August 2021 its **Transmission Cost Report**. Part 1 of this reports, details **9 transmission projects** to connect and update existing projects to the grid.

However, Part 2 of this report lists an **additional 88 transmission line, electricity substations and battery projects** to support the 41 REZs.

Full details of the length of the 97 transmission line projects and costings are listed in the following section.

Figure 6 Flow path development options



© AEMO 2021 | 2021 Transmission Cost Report page 29

2. The costs of the 41 REZs are will ultimately drive-up power prices.

The total cost of the renewable energy transmission lines has often been reported to media at costing $22 billion. But, according to the **AEMO Transmission Cost Report**, the actual estimated cost when adding up all the **97 projects** is a much higher amount - **$61.551 billion**.

No. of Projects	Eastern Australia Project Name	Estimated Cost	Additional Network Capacity (MW)	Approximate Length of New Lines (km)
PART 1 - Transmission Line Projects to Update Existing Networks				
1	Central and North Queensland to Gladstone Grid	$408 million	550 MW	285km
2	Southern Queensland to Central & North Queensland	$1,615 million	1500 MW	300km
3	Northern New South Wales – Southern Queensland	$3,125 million	3800 MW	960km
4	Central New South Wales to Northern New South Wales	$3,578 million	5355 MW	943km
5	Central New South Wales to Sydney, Newcastle and Wollongong	$3,136 million	5600 MW	306km
6	Southern New South Wales to Central New South Wales	$3,315 million	4400 MW	1,516km
7	Victoria to Southern New South Wales	$4,076 million	4880 MW	2.058kM
8	Tasmania to Victoria (Stage 1)	$2,170 million	3756 MW	885km
9	Tasmania to Victoria (Stage 2)	$1,810 million	5256 MW	667km
Maximum Total Cost for Transmission Line Projects to Update Existing Networks		**$23.233 billion**		**7,920km**
No. of Projects	**Eastern Australia Project Name**	**Estimated Cost**	**Additional Network Capacity (MW)**	**Approximate Length of New Lines (km)**
PART 2 - Transmission Line Projects to Support the Candidate Renewable Energy Zones				
10	North West New South Wales (N1)	$3,584 million	1660	647km
11	New England (N2)	$2,316 million	1800	563km
12	Central West Orana (N3)	To be determined at a later date (figure 1.1)	2000	127km
13	Broken Hill (N4)	$4,004 million	1750	1,041km
14	South West NSW (N5)	$1,416 million	1500	327km
15	Wagga Wagga (N6)	$1,229 million	2600	327km
16	Tumut (N7)	To be determined at a later date (section 3.8)	2200	383km
17	Cooma-Monaro (N8)	$140 million	150	82km
18	Hunter Central Coast and Illawarra	To be determined at a later date	To be determined at a later date	To be determined at a later date
19	Far North Queensland (Q1)	$1,893 million	945	593km
20	North Queensland Clean Energy Hub (Q2)	$410 million	500	387km
21	Northern Queensland (Q3) section 4.3.10	To be determined at a later date (section 4.3.10)	To be determined at a later date	402km
22	Isaac (Q4) section 4.3.10	To be determined at a later date (section 4.3.10)	To be determined at a later date	528km
23	Barcaldine (Q5)	$950 million	1500	386km
24	Fitzroy (Q6) section 4.3.10	To be determined at a later date (section 4.3.10)	To be determined at a later date	254km
25	Wide Bay (Q7)	$473 million	900	183km
26	Darling Downs (Q8)	$43 million	500	0km
27	Banana (Q9)	$1,092 million	3000	400km
28	NQ1 Facilitating power out of North Queensland	$801 million	740	386km

No. of Projects	Eastern Australia Project Name	Estimated Cost	Additional Network Capacity (MW)	Approximate Length of New Lines (km)
30	NQ3 Facilitating power to Southern Queensland	$1,615 million	1500	387km
31	South East SA (S1)	$571 million	1500	91km
32	Riverland (S2)	$77 million	700	158km
33	Mid-North SA (S3)	$582 million	950	313km
34	Yorke Peninsula (S4)	$443 million	450	155km
35	Northern SA (S5)	$210 million	1200	90km
36	Leigh Creek (S6)	$606 million	500	265km
37	Roxby Downs (S7)	$424 million	500	262km
38	Eastern Eyre Peninsula (S8)	$64 million	300	182km
39	Western Eyre Peninsula (S9)	$943 million	1000	436km
40	SA Group constraints - MN1_SA	$922 million	950	308km
41	SA Group constraints - NSA1	$234 million	600	90km
42	North East Tasmania (T1)	$230 million	500	104km
43	North West Tasmania (T2)	$374 million	1600	151km
44	Central Highlands (T3)	$666 million	1000	266km
45	Ovens Murray (V1)	$0 million	350	0km
46	Murray River (V2)	$1,300 million	1200	517km
47	Western Victoria (V3)	$2,125 million	1200	383km
48	South West Victoria (V4)	$930 million	1500	239km
49	Gippsland (V5)	$1,488 million	2000	212km
50	Central North Vic (V6)	$1,364 million	1700	253km
Maximum Total Cost of Transmission Line Projects to Support the Candidate Renewable Energy Zones		**$33.556 billion**		**11,878km**
PART 3 - Transmission Line Projects to Support Offshore Wind Zones				
51	Hunter Coast	Undisclosed	Undisclosed	Undisclosed
52	Illawarra Coast	(Estimated $470m)	2000	Undisclosed
53	Gippsland Coast	Undisclosed	Undisclosed	Undisclosed
54	North West Tasmania Coast	Undisclosed	Undisclosed	Undisclosed
PART 4 - Connection for Solar, Wind, and Solar Thermal Generation Technologies				
55	Far North Queensland (Q1)	$37 million	275	5
56	North Queensland Clean Energy Hub (Q2)	$47 million	275	10
57	North Queensland (Q3)	$37 million	275	5
58	Isaac (Q4)	$37 million	275	5
59	Barcaldine (Q5)	$47 million	275	10
60	Fitzroy (Q6)	$37 million	275	5
61	Wide Bay (Q7)	$37 million	275	5
62	Darling Downs (Q8)	$37 million	275	5
63	Banana (Q9)	$37 million	275	5
64	North West New South Wales (N1)	$53 million	330	10
65	New England (N2)	$53 million	330	10
66	Central West Orana (N3)	$53 million	330	10
67	Broken Hill (N4)	$53 million	330	10
68	South West NSW (N5)	$53 million	330	10
69	Wagga Wagga (N6)	$53 million	330	10
70	Tumut (N7)	$41 million	330	5
71	Cooma-Monaro (N8)	$41 million	330	5
72	Ovens Murray (V1)	$34 million	220	5
73	Murray River (V2)	$44 million	220	10
74	Western Victoria (V3)	$34 million	220	5
75	South West Victoria (V4)	$64 million	500	10
76	Gippsland (V5)	$44 million	220	10

No. of Projects	Eastern Australia Project Name	Estimated Cost	Additional Network Capacity (MW)	Approximate Length of New Lines (km)
77	Central North Vic (V6)	$44 million	220	10
78	South East SA (S1)	$47 million	275	10
79	Riverland (S2)	$47 million	275	10
80	Mid-North SA (S3)	$37 million	275	5
81	Yorke Peninsula (S4)	$37 million	275	5
82	Northern SA (S5)	$37 million	275	5
83	Leigh Creek (S6)	$47 million	275	10
84	Roxby Downs (S7)	$47 million	275	10
85	Eastern Eyre Peninsula (S8)	$47 million	275	10
86	Western Eyre Peninsula (S9)	$37 million	275	5
87	North East Tasmania (T1)	$34 million	220	5
88	North West Tasmania (T2)	$34 million	220	5
89	Central Highlands (T3)	$34 million	220	5
Maximum Total Connection Costs for Solar, Wind, and Solar Thermal Generation Technologies		**$1.502 billion**		**260km**
PART 5 - Connection Costs for Other Generation Technologies (excluding batteries)				
No. of Projects	**Connection Voltage kV**	**Estimated Cost**	**Connection Capacity (MVA)**	**Approximate Length of New Lines (km)**
90	500	$45 million	600	1
91	330	$32 million	400	1
92	275	$31 million	300	1
93	220	$27 million	250	1
Maximum Total Connection Costs for Other Generation Technologies (excluding batteries)		**$135 million**		**4km**
PART 6 - Connection Costs for Batteries				
No. of Projects	**Connection Voltage kV**	**Estimated Cost**	**Connection Capacity (MVA)**	
94	500	$41 million	600	
95	330	$29 million	400	
96	275	$29 million	300	
97	220	$25 million	250	
Maximum Total Connection Costs for Batteries		**$124 million**		
Total Length of Transmission Lines for 41 Renewable Energy Zones is				**20,062km**

https://www.aemo.com.au/-/media/files/major-publications/isp/2021/transmission-cost-report.pdf?la=en

The **total transmission line and battery costs** to connect the **41 Candidate Renewable Energy Zones** to the energy grid **by 2037** are approximately **$61.551 billion**:

- **$23.233 billion** for the Total Cost for Transmission Line Projects to Update Existing Networks
- **$33.556 billion** for the Total Cost of Transmission Line Projects to Support the Candidate Renewable Energy Zones
- **About $3 billion** for the Total Cost of Transmission Line Projects to Support Offshore Wind Zones (estimated $470-500 million x 4 projects)
- **$1.502 billion** for the Total Connection Costs for Solar, Wind, and Solar Thermal Generation Technologies
- **$135 million** for the Total Connection Costs for Other Generation Technologies (excluding batteries)
- **$125 million** for the Total Connection Costs for Batteries

The **total cost for the installation** of the **41 Candidate Renewable Energy Zones by 2050** is likely to cost approximately **$2094.975 billion**:

- **$1208 billion** for installing new wind turbines on 151 onshore wind farms, assuming 100 wind turbines per wind farm ($24million x 15,100 wind turbines)
- **$226.5 billion** in annual government subsidies ($600,000 x 15,100 onshore wind turbines x 25 years)
- **$211.2 billion** for installing new wind turbines on 12 offshore wind farms, assuming 100 wind turbines per wind farm ($44million x 1,200 wind turbines)
- **$18 billion** in annual government subsidies over ($600,000 x 1200 offshore wind turbines x 25 years)
- **$411 billion** for installing 1 million solar panels on 137 solar farms ($3billion x 137 solar farms)
- **$10.275 billion** in annual government subsidies over ($3,000,000 x 137 solar farms x 25 years)

The GRAND TOTAL COST of the AEMO projects for the transmission line projects and installation of the 41 Renewable Energy Zones by 2050 is an unbelievable amount - $2156.526 billion or $2.1565 trillion!!!

I would argue that a new energy system that, on its own does not provide 24-hour base load power without a firming power like gas, coal or nuclear, and which costs $2.1565 trillion is not value for money. I suspect the people who will bear the costs of energy from such a complicated and land-intensive system will be all energy consumers and the Australian taxpayers.

Furthermore, rising energy costs contribute to inflation and the closure of businesses and higher unemployment. Out of 31 OECD countries, Australia is ranked last in manufacturing capacity with it manufacturing only contributing to 5% of the economy.

When Australian states began privatising the energy industry, renewable energy started to become an increasing part of the energy mix. During this 10-year period (2007-2017), according to research from the economist Leith Van Onselen, Australia's energy prices tripled.
https://www.macrobusiness.com.au/2017/07/privatisation-pushed-australias-electricity-costs/

In the period, 2017-2025, Australia's energy prices have tripled once again.

Supporters of renewable energy like the Climate Council, the Climate Change Authority, the Australian Renewable Energy Agency, the Clean Energy Finance Corporation and the Australian Energy Market Operator have failed to present to the public the true total cost of the 41 REZs - $2.1565 trillion.

Many people argue that this was one of the major factors that led to the Liberal-National Party Coalition losing the 2023 NSW State election. Likewise, many pollsters predict that **increasing energy costs** that have contributed to inflation, 8 quarters of negative growth and an 8% reduction in the standard of living will be the main factor why the Australian Labor Party will lose the upcoming Federal election.

3. The hidden costs of the 41 REZs are will also drive-up power prices.

Many politicians and energy experts claim that renewable energy is the cheapest form of energy. In an ideal world this may seem the case. After all, energy harnessed by the wind and the sun is abundant and free.

But, from a practical point of view, there are many undisclosed costs to renewable energy including:

- **Production costs** of wind turbines and solar panels.
- **Transportation costs** of wind turbines and solar panels.
- **Installation costs** of wind turbines and solar panels.
- **Production and installation costs of transmission lines, substations/generators, and storage batteries** to transport the electricity produced by wind and solar farms.
- **Decommissioning costs of $848,000 (2019 estimate)** for each wind turbine.
- **Recycling costs** for environmentally disposing of millions of solar panels.
- **High maintenance costs** to support and repair each wind turbine.
- **Insurance and repair costs** for electricity infrastructure damaged by lightning strikes.

MAINTENANCE COSTS OF WIND TURBINES SKYROCKET ENERGY PRICES

The repair costs of wind turbines are always left out of the equation when sprucing the advantages of cheap energy produced by wind turbines. In fact, **the repair bills for wind turbine components are regularly in the hundreds of thousands of dollars. The cost of repairs increases with the age of the wind turbine.**

> *A windmill is only as weak as its weakest component, and the more components a windmill has, the more complex the maintenance.* ***Wind turbines are complex machines. Each has around 7,000 or more components,*** *according to Tom Maves, deputy director for manufacturing and supply chain at the American Wind Energy Association (Galbraith).*
> *Galbraith, K.* ***Wind Power Gains as Gear Improves****. New York Times, 7 Aug 2011*
>
> ***Maintenance costs start to rise after 2 years*** *(it's almost impossible to find out what these costs are from turbine makers). Vibration and corrosion damage the rotating blades, and the bearings, gear boxes, axles, and blades are subjected to high stresses.*
>
> ***Gearboxes can be the Achilles' heel, costing up to $500,000 to fix due to the high cost of replacement parts,*** *cranes (which can cost $75,000-$100,000), post installation testing, re-commissioning, and lost power production.*
> ***Wind vision a new era for wind power in the United States.*** *Department of Energy 2014*

Likewise, it is well-documented how tall electricity infrastructures are lightning magnets. Not only are the repair costs to high voltage transmission towers and wind turbines costly, but so too **the cost of insuring these structures against lightning damage.** The potential cost of class legal actions against governments and energy companies in the event of future devastating bushfires and loss of life caused by lightning strikes on electricity infrastructures could potentially be in the billions of dollars.

In recent years, ***insurers have incurred considerable lightning losses in cases where the Lightning Protection Systems design has been ineffective.*** *This led to insurers taking the position that lightning damage to blades with these ineffective LPS designs was no longer unforeseeable and therefore not insurable.*

Ultimately, insurers play a vital role in the chain and without their support for a particular wind turbine, the equipment becomes un-bankable.

https://global.lockton.com/gb/en/news-insights/managing-the-lightning-risk-of-wind-turbines

The 41 REZs consisting of 151 onshore wind farms, 12 offshore wind farms and 137 solar farms proposed by 2050 will be **expensive to operate, maintain and replace or decommission over 20-25 years.**

Besides the insurance and maintenance costs, there are eight other hidden costs.

1. **Raw Material Extraction**

Renewables, such as solar panels and wind turbines, are celebrated for their minimal emissions during operation. However, the story begins much earlier with the extraction of raw materials. Essential components like lithium, cobalt, and nickel are vital for these technologies. Extracting these rare earth metals often involves operations that can devastate local environments. Deforestation, water depletion, and soil erosion are just the tip of the iceberg. Additionally, the working conditions in many mining regions, particularly in developing countries, can be hazardous and exploitative. When you consider the environmental and social costs, one must question if the price is too high for the green promise.

2. **Energy-Intensive Manufacturing**

Building a solar panel or a wind turbine isn't as eco-friendly as you might think. The manufacturing process is surprisingly energy intensive. Ironically, much of this energy still comes from fossil fuels. This fact offsets some of the environmental benefits that these renewable technologies promise. The carbon footprint of producing these infrastructures is significant, and until cleaner manufacturing methods become mainstream, this remains a hidden environmental cost. It's a reminder that transitioning to green energy involves more than just the technology itself; it requires a rethinking of the entire production chain.

3. **Hidden Environmental Costs**

As renewable energy technologies age, they pose another challenge: disposal. Solar panels and wind turbine blades have a lifespan, and once they are no longer functional, they need to be disposed of. Unfortunately, many of these components are not easily recyclable. This means they often end up in landfills, contributing to waste. The environmental costs of disposing of these materials can be significant, further complicating the green narrative. While innovations are underway to tackle these disposal issues, they are not yet widespread, leaving a gap in the sustainability cycle.

4. **Social Impact in Mining Communities**

Behind every solar panel or electric vehicle battery lies a story of mining. In countries like the Democratic Republic of Congo, mining for rare earth metals is a booming industry but comes with a dark side. Many mining communities face exploitation, with rampant issues like child labour and poor wages. The working conditions are often unsafe, putting miners at risk daily. These social impacts are a stark reminder that while renewable energy is clean at the point of use, its life cycle can be marred with human rights concerns. It's a complex picture that challenges the simplistic view of renewables as wholly good.

5. **Economic Inequality**

Renewable energy might be the future, but its benefits are not equally distributed. **Government subsidies and incentives** for solar installations and electric vehicles often favour wealthier individuals who can afford the initial investment. Meanwhile, the funding for these programs frequently comes from **taxes or energy surcharges,** which disproportionately affect low-income households. This dynamic creates a widening gap in energy equality, where the rich get richer, and the poor bear a heavier burden. It’s an economic imbalance that needs addressing to ensure fair access to green technologies.

6. **Land Use Conflicts**

The **vast land requirements for large-scale solar and wind farms** often lead to conflicts over land use. These installations can encroach on sensitive ecosystems or lands belonging to indigenous populations. The push for renewable energy, while noble, sometimes overlooks the rights and needs of local communities. Balancing the demand for green energy with the preservation of cultural and ecological landscapes is a delicate challenge. It highlights the importance of inclusive planning and dialogue with affected communities before proceeding with renewable projects.

7. **Intermittency and Grid Costs**

Renewable energy sources like **wind and solar are inherently intermittent**. This variability means that maintaining a consistent and reliable energy supply requires significant investments in energy storage systems and backup power solutions. Often, this backup comes from traditional fossil fuel sources, adding to the overall cost of a renewable energy system. These grid costs are an often-overlooked factor in the renewable energy equation, emphasizing the complexity of transitioning to a sustainable energy future.

8. **Global Supply Chain Vulnerabilities**

The global supply chain for renewable energy materials is fraught with vulnerabilities. Many of the rare earth metals needed are concentrated in a few countries, like China, creating geopolitical and economic risks. Dependence on these limited sources makes the renewable energy sector susceptible to **supply disruptions and price volatility.** This situation underscores the need for diversified supply chains and innovative recycling solutions to ensure the affordability and sustainability of renewable energy systems. Understanding these intricate layers of the renewable energy sector is crucial as we push towards a sustainable future. The journey is complex, and while renewables hold immense potential, they come with costs that society must acknowledge and address.

Green Energy is Not Free: Who's Really Paying the Price for Renewables?

CONCLUSION:

There are many unexpected consequences that come with the transition to renewable energy that impact energy prices, inflation and the cost of living.

NSW Central-West Orana REZ Transmission Project

Transitioning from coal-fired power and gas-fired power to wind and solar is uneconomic and unaffordable. It creates a range of environmental problems and health problems. It produces more landfill and is a waste of resources.

FOUR MORE SENSIBLE AND RELIABLE ENERGY SOLUTIONS:

Australia must develop energy sources that make use of existing coal-fired power plants sites and their connection to existing high voltage transmission lines.

Four sustainable energy alternatives to a proliferation of wind farms, solar farms and 20,062km of high voltage transmission lines are:

1. **Converting the current coal-fired power stations into clean coal-fired energy where chemicals produced by fossil fuel burning were captured before entering the air** (nitrogen oxide that contributes to acid rain, sulphur dioxide, mercury, particulate matter from fly ash and black carbon/soot). Therefore, the only emissions produced are steam and carbon dioxide (carbon dioxide is not a pollutant).
2. **Converting the current coal-fired power stations into clean gas-fired power stations where chemicals produced by fossil fuel burning were captured before entering the air.**
3. **Converting the current coal-fired power stations into nuclear power stations where there is no fossil fuel burning.**
4. **Option 1,2 or 3 accompanied by pumped hydro power projects.**