# Submission to Productivity Commission, August 2025

Comments on the report

**"Investing in cheaper, cleaner energy and the net zero transformation"**

Emeritus Professor James Trevelyan

The University of Western Australia, Nedlands 6009.

E-mail: [REDACTED]

Tel: [REDACTED]

## Summary

This submission represents my personal opinions based on my engineering research and practice career since the 1970s. While I am a member of Engineers Australia, and Emeritus Professor at The University of Western Australia, this submission does not represent the views of either organisation.

This submission provides comments on the interim report *Investing in cheaper, cleaner energy and the net zero transformation.*

A major part of the interim report focuses rightly on generating more energy, sooner, without additional greenhouse emissions.

The interim report is missing policies that incentivise energy efficiency improvements, reducing energy demand, energy cost and reducing emissions at negative cost.

I also report predatory behaviour amounting to extortion by privately employed Queensland government assessors, appointed to enforce compliance with state regulations that impose the same requirements as Federal government regulations.

I shall address both, though not in great detail. I am happy to contribute more detail if requested.

## Implications of market pricing for electricity

Briefly, there are two main consumers of electric energy today, to which we should add electric vehicles as a third future major category. Today's major consumers are industrial processes and air-conditioning.

I am an engineer educated in the 1960s when electric energy, water, and the ability to discharge waste indefinitely could be taken for granted. Engineers of my generation, and most in later generations still find it hard to get their heads around the notion of variable electricity prices and the implications for industrial process design. Therefore, industrial processes and air-conditioning systems are still largely designed around the idea of fixed pricing and infinite availability of energy.

Engineers, therefore, need re-education. Variable speed drives, now economically available, open up process and air-conditioning designs that can use energy much more effectively. Desalination plants are a great example. Electric pumps force water through membranes to filter out salt and other dissolved chemicals. The purified water is stored in tanks or reservoirs. When electricity is expensive, the pumps can be run slowly or not at all. When electricity is cheap, particularly during the day when rooftop solar generation peaks, the pumps can be run at higher speed. Excess water can be stored until it is needed. Therefore, the energy cost can be minimal for a well-run plant. Many existing industrial processes could be rearranged to run like that, taking advantage of cheap electricity when it is available and storing it in different forms.

There is an important corollary here. Traditional approaches to renewable energy production see the necessity of variable "load balancing". This means gas-fired generators or, more recently, battery storage with synthetic electronic inertia to provide the essential capacity to adjust the electricity supply to match demand. However, industrial processes that can run at variable speed can do the same job, balancing electricity supply by adjusting the demand directly. This is a cheaper approach because the additional variable speed generation equipment is not needed to the same extent. In this way, industrial consumers can *be paid* to provide load balancing capacity because they are providing a service to the grid.

However, not many engineers know how to make the necessary changes to their process plant to provide variable demand and balance fluctuations in renewable energy

supply and demand for electricity. Undergraduate engineering education, even today, provides little preparation for that.

Therefore, in a submission on the report *Building an adaptable workforce* I have advocated policies to encourage higher quality post-graduation workplace education for engineers.

Measures like this could transform the industrial energy landscape, provide significant energy efficiency improvements, in essence providing additional generation capacity at little or no cost to the energy utility.

Therefore, I strongly suggest you modify the interim report to take account of this kind of technology – energy efficiency and load balancing – because this way productivity is increased and costs reduced without actually generating electricity.

## Air-conditioning – an example of policy framed by encumbency

The second major electricity consumer is space air-conditioning.

My company designs, manufactures and sells personal air-conditioners that provide energy-efficient cooling.

A $20+ billion incumbent room air-conditioning industry provides accounts for up to 1% of Australia's GDP, 13% of Australia's electric energy consumption, and about 7% of Australia's greenhouse gas emissions, much of that entirely unnecessary[1]

This entire industry is based on the mistaken assumption that cooling or heating an entire room or building is necessary for human comfort.

Coolzy, our personal air-conditioner is a simple machine. Photographs appear later in this submission. It consists of a tiny compressor-driven fridge with a fan inside blowing cool air at the face and upper body of one or more people nearby. About the size and weight of an airline carryon case, it is easily portable. A family watching TV on a couch can share the cooling. A couple sleeping in bed can enjoy a blanket of cool air over the bed. The electricity needed for cooling comfort is as little as 100 Watts per person, compared with 1,000 – 2,500 Watts for a room air-conditioner.

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[1] Brodribb and McCann provide data for Australia (Brodribb & McCann, 2020). The harmful global impact of room air-conditioners is now well-known (e.g. "Global Cooling: Air-conditioners do great good, but at a high environmental cost," 2018).

Compared with a room air-conditioner, our machines *save* about 0.5 tonnes of $CO_2$ emissions while *saving* about $300 in electricity costs annually.

Our machines have been built for the harshest climates in Pakistan where daytime temperatures reach 48°C. We field tested our machines at Marble Bar in Western Australia. Watch this video for entirely unprompted comments by locals: https://youtu.be/fvmA0eDhwek.

In a similar way, electrically heated blankets can warm people with as little as 50 Watts per person, compared with 1,000 – 2,500 Watts to heat a room.

A simple, large diameter exhaust fan running almost silently through the night on 400 Watts can provide the same cooling as a ducted whole-house air-conditioner using 10,000 – 20,000 Watts. A ducted evaporative cooler can do the same during the day, provided enough clean water is available.

There are many other innovations emerging in this space, from wearable cooling devices to clothing that naturally loses heat or prevents heat loss.

Yet the compressor-driven room air-conditioning industry has dominated the information space for Australians, convincing them that far more costly, energy-guzzling machines provide the only effective comfort solutions.

The National Construction Code reinforces this perception by moving Australian building designs towards solutions that favour refrigerative air-conditioning with measures such as comprehensive insulation and draft sealing. Personal air-conditioners, electric throw blankets, evaporative cooling and ventilation offer far cheaper solutions that work equally well in simple, low-cost buildings.

The room air-conditioning industry has moved buildings from efficient, low-energy passive designs that evolved over centuries to reinforced concrete structures with large glass windows. These contemporary building designs increase our dependence on energy-intensive, costly compressor-driven air-conditioning for heating and cooling.[2]

In sufficient numbers, room air-conditioners add to the urban heat island effect which has raised temperatures in cities and towns far more than global climate warming.[3]

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[2] (Roaf & Nicol, 2017)

[3] (Ballinas & Baradas, 2012)

The fashion industry has also responded to the compressor-driven air-conditioning industry by offering clothing with reduced warmth in winter and reduced cooling in summer.[4]

Emerging research is starting to show that room air-conditioning encourages people to live in a constant temperature around 22°C throughout the year, reducing the body's natural heat and cold adaptation, and also reducing cardiovascular function.[5] Cheaper and less environmentally harmful alternatives promote better health and climate resilience, reducing the demand for artificial heating and cooling.

What are the implications of these technologies?

The discussion in the interim report based on *building energy-efficiency ratings* is *framed* by assumptions created by the room air-conditioning industry. Using the energy-efficiency technologies I have described above, building energy-efficiency ratings are almost irrelevant. Our personal air-conditioners can create comparable comfort in a beach or bush shack just as easily as a highly insulated, costly, contemporary house in Canberra, Camberwell or Cabramatta, using a tiny fraction of the amount of energy. Our air-conditioners work just fine in Pakistan with a climate far hotter than most of Australia is ever likely to be.

In other words, the policies set out in the interim report have already been framed in terms of costly technologies that enjoy encumbent status, but don't lead to easy productivity improvements. Alternative solutions, some of them far older than room air-conditioning, provide far more economic and healthier solutions.

As in the earlier discussion on industrial electricity consumption, the answers lie in education, improving information available to consumers, and critically engineers as well. In a submission on the report *Building an adaptable workforce* I have advocated policies to encourage higher quality post-graduation workplace education for engineers.

The National Construction Code is also a prisoner of the encumbent room air-conditioning industry with its prescriptions for sealed, insulated buildings. Far cheaper building designs are possible with the same or better energy-efficiency. Just as the

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[4] (F. Nicol, 2017; J. F. Nicol & Roaf, 2017; Roaf & Nicol, 2017)

[5] (Périard, Travers, Racinais, & Sawka, 2016) (van Marken Lichtenbelt, Pallubinsky, & Te Kulve, 2018)

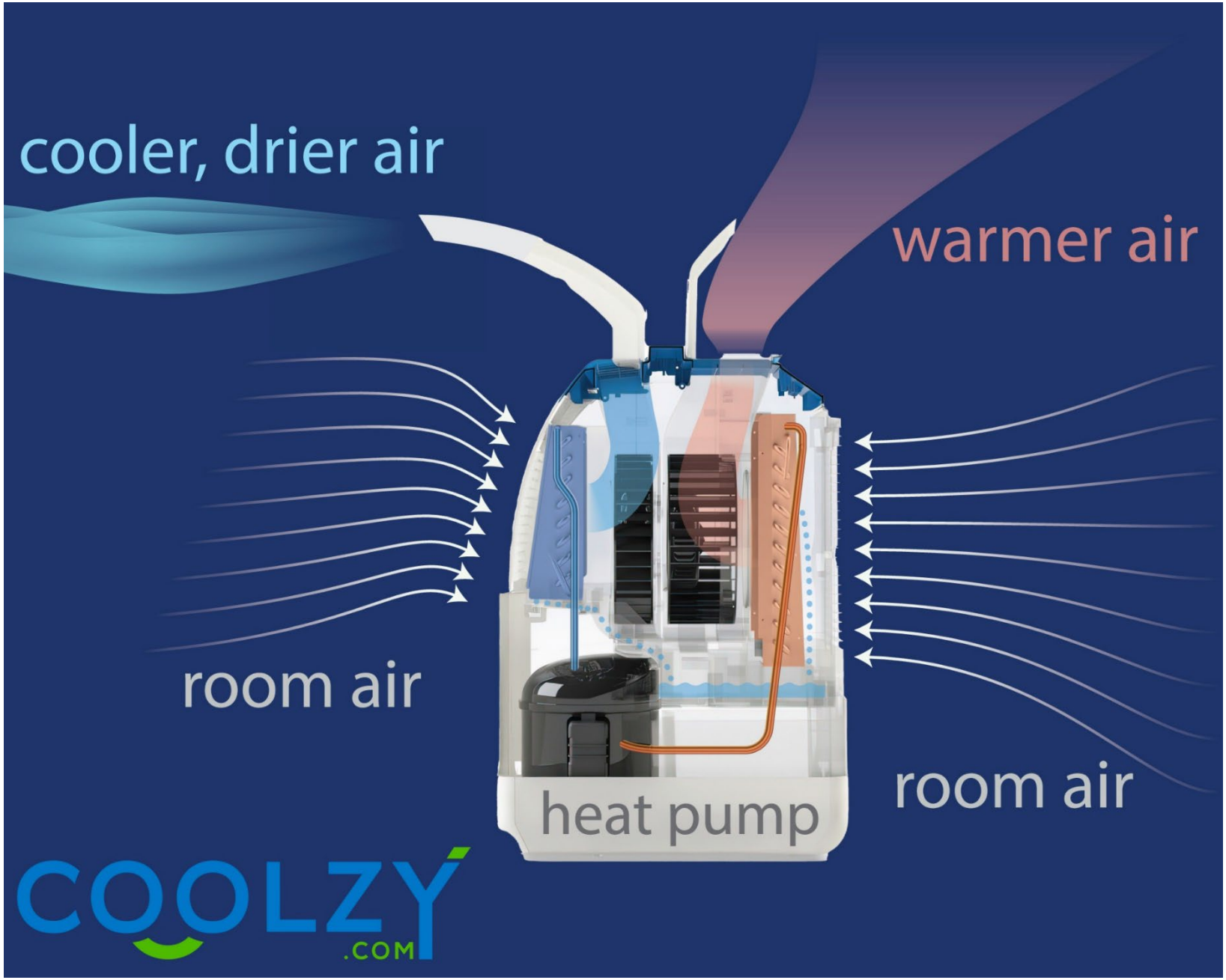
interim report advocates a technology-neutral approach, seeking the most economic solutions, documents such as the National Construction Code need to take a similar approach. Simply defining a desirable maximum energy consumption per square metre of covered space might be a great start. Provide the best possible information on alternatives and leave it to the ingenuity of engineers and homeowners to devise their own solutions.

## A note on regulation

Our company (Close Comfort Pty Ltd) has been subjected to predatory behaviour by self-employed assessors appointed by the Queensland State Government to enforce regulations concerning air-conditioners. They were touting for business and also issuing threats to our business if we did not engage them. These regulations required us to submit the same documents as we submitted for Australian safety compliance purposes. The assessor we eventually hired charged us an exorbitant fee for unnecessarily printing documents.

Not only is the regulatory regime unnecessary as it imposes the same requirements as Federal government regulations, but the behaviour of the assessors can only be described as extortion.

Full details can be provided on request in a confidential submission.


cooler, drier air
warmer air
room air
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COOLZY
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Coolzy: a tiny fridge with a fan, concentrated cooling where it counts


Coolzy runs on only 340 watts and provides 5 - 7 °C apparent cooling

Coolzy: quiet and perfect for healthy sleep

Coolzy creates a cool air blanket, apparent cooling is about 5 - 7 °C


Coolzy with Igloo Tent provides comfort equivalent to a split air-conditioner with indoor temperatures up to 40 °C with less than 200 Watts per person

Coolzy + Igloo tent: sleeping sanctuary on less than 200 Watts per person

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