REPORT ON PROCEEDINGS BEFORE

PORTFOLIO COMMITTEE NO. 7 - PLANNING AND ENVIRONMENT

PROTECTION OF THE ENVIRONMENT OPERATIONS AMENDMENT (CLEAN AIR) BILL 2021

CORRECTED

At , Video Conference, Sydney on Friday, 15 October 2021

The Committee met at 9:55 am

PRESENT

The Hon. Mark Pearson (Chair)

The Hon. Mark Buttigieg
Ms Abigail Boyd
The Hon. Catherine Cusack (Deputy Chair)
The Hon. Rose Jackson
The Hon. Shayne Mallard
The Hon. Taylor Martin
The Hon. Penny Sharpe

The CHAIR: Welcome to the hearing for the inquiry into the Protection of the Environment Operations Amendment (Clean Air) Bill 2021. Before I commence I would like to acknowledge the Gadigal people, who are the traditional custodians of this land on which Parliament sits. I would also like to pay respect to the Elders past, present and emerging of the Eora nation and extend that respect to other Aboriginals present.

Today's hearing is being conducted as a fully virtual hearing. This enables the work of the Committee to continue during the COVID-19 pandemic without compromising the health and safety of members, witnesses and staff. Today we will be hearing from community representatives, environmental organisations, air quality experts, industry representatives and government departments, including NSW Health and the Department of Planning, Industry and Environment [DPIE].

Before we commence I would like to make some brief comments about the procedures for today's hearing. While parliamentary privilege applies to witnesses giving evidence today, it does not apply to what witnesses say outside of their evidence at the virtual hearing. I therefore urge witnesses to be careful about comments they may make to the media or to others after they complete your evidence. Committee hearings are not intended to provide a forum for people to make adverse reflections about others under the protection of parliamentary privilege. In that regard, it is important that witnesses focus on the issues raised by the inquiry terms of reference and avoid naming individuals unnecessarily.

All witnesses have a right to procedural fairness according to the procedural fairness resolution adopted by the House in 2018. There may be some questions that witnesses could only answer if they had more time or with certain documents to hand. In these circumstances, witnesses are advised that they can take a question on notice and provide an answer within seven days due to the short time frame of this inquiry. Today's proceedings are being recorded, and a transcript will be placed on the Committee's website once it becomes available. The hearing is also being broadcast and saved on the parliamentary YouTube channel.

Finally, I will make a few notes on virtual hearing etiquette to minimise disruptions and assist our Hansard reporters. I ask Committee members to clearly identify who questions are directed to and I ask that everyone state their name when they begin speaking. Could everyone mute their microphones when they are not speaking. Members and witnesses should avoid speaking over each other so we can all be heard clearly.

WILL BELFORD, Spokesperson, Future Sooner, affirmed and examined

JONATHAN MOYLAN, NSW Clean Air Campaigner, Healthy Futures, affirmed and examined

MICHAEL CAMPBELL, Executive Member, Community Environment Network (Central Coast), affirmed and examined

The CHAIR: Mr Belford, would you like to commence with a short opening statement of no more than three minutes?

Mr BELFORD: Yes. Thank you. Will Belford speaking. Thank you for the opportunity to present today. I represent Future Sooner [inaudible] Lake Macquarie region. We are concerned about the high levels of childhood asthma that are attributable to the coal-burning power stations in the area. To give you some context, in 2019 and 2020 the four hospitals in this areas had nearly 3,000 admissions for asthma. To be admitted for asthma you have to be unable to breathe, which is a deeply distressing condition to experience. My first daughter had childhood asthma. She needed a steroids inhaler to prevent the attacks. One potential consequence of steroids in the young is stunted growth.

Our interest in this was raised by Dr Ben Ewald, who is a local epidemiologist whose research shows that approximately 650 children in the area have asthma that can be attributed to nitrogen dioxide emissions from the power stations. His report forms part of the submissions that will be addressed later today. In reference to [inaudible] proposed in the amendment, the nitrogen dioxide limits in New South Wales are much higher now than they are internationally. They are at 800 milligrams per cubic metre, whereas in the EU the level is 150 milligrams and in Japan 57. A particular point we would like to raise is the Vales Point station at Lake Macquarie, which for 10 years has had a licence exemption to emit nitrogen dioxide at up to 1,500 milligrams per cubic metre, which is ten times the EU limit. Nitrogen dioxide is a major contributor to asthma attacks, according to Ben Ewald.

We acknowledge that these power stations may have to run for another decade or maybe more. If so, we are asking for stricter emissions standards as proposed by this amendment, to minimise the health toll during this period. To help the energy providers running these stations to take this regulation seriously, these emissions would have to implemented with short time lines for compliance, no exemptions, proper enforcement and meaningful penalties. The technologies exist, to reduce these emissions, and installing them is well within the financial capacity of these companies. Take Vales Point again as an example. In 2019 the station paid a dividend, to its two owners, of $60 million, which is the approximate cost to install selective catalytic reduction technology at the station. If the providers are unwilling to do this, then we would interested in seeing them invest similar amounts in alternative energy sources to speed up the phasing-out of coal.

You will be aware that the World Health Organization [WHO] recently published new global air quality guidelines, and the limits proposed in this amendment would bring New South Wales into alignment with these. This would have the effect of reducing the number of emergency admissions for asthma in the local area and generally improving health of local residents. On this basis we are asking the Committee to endorse the proposed amendment to the Protection of the Environment Operations Act and reduce the allowable emission limits for coal-burning power stations in New South Wales. Thank you.

The CHAIR: Mr Moylan, would you like to make a short opening statement?

Mr MOYLAN: Yes. Thank you for the opportunity to present to this inquiry on the impact of air pollution on behalf of Healthy Futures. We are an organisation of healthcare workers and community members concerned about the serious human health impacts of pollution. Some of our members see the impacts of air pollution on children and vulnerable people in their clinics on a regular basis. It has been difficult and challenging for you as elected representatives to deal with this issue in the past due to the absence of evidence of health harms, but, fortunately, that evidence has been detailed in a study led by Dr Richard Broome from NSW Health, who, I understand, will be speaking later today.

Those impacts are significant. They amount to an externalised cost of $2.4 billion annually, which equates to about $43 per megawatt-hour, which is greater than the wholesale cost of electricity. A later study, led by a team from the University of Exeter, based on atmospheric modelling, found that, across New South Wales, power stations cause 477 premature deaths, 7½ thousand child asthma symptom days and 450 babies to be born underweight in New South Wales every single year. The local government areas [LGAs] with the highest mortality due to power station pollution are the Central Coast, Lake Macquarie, Blacktown, Newcastle, Hornsby, the Hills, Sydney, Sutherland, Warringa, Parramatta and Penrith, in that order. That is because pollution from those power stations travels very long distances to big population centres. We are supportive of any measures that can prevent

the loss of hundreds of lives and thousands of disease exacerbations from the air pollution from power stations in New South Wales.

Other options that Parliament and the executive have at your disposal include the existing load-based licensing scheme, which could be made to be effective by scaling up the fees over a short period of time to meet the damage costs or simply the abatement costs or else adjusting the provisions of each of the licences. In a 2016 submission to the review of the load-based licensing scheme, the Australian Energy Council [AEC] said that optimal load-based fees should be set at the level of external costs. We agree. As economists from the University of Sydney have found, the fees are not set at a level which will drive change. Currently those fees are set at 2 per cent of the external cost of pollution. Given that WHO guidelines for clean air are already being breached in coal-impacted communities, it is critical that Parliament puts the health of children and vulnerable people first. This really goes to the rights of every citizen in New South Wales to breathe clean and healthy air.

The CHAIR: Thank you very much for that. Mr Mike Campbell, would you like to give a short opening statement?

Mr CAMPBELL: Yes. Can you hear me okay?

The CHAIR: Thank you. Yes, we can.

Mr CAMPBELL: Yes. The latest campaign goes back a long way. There was a campaign that I was involved in in 1983 and 1984, which ultimately stopped the building of two power stations on the coast here, the Mardi power station—and the further one was called Olney. What happened was that they were going to build these on the coast here, until we uncovered—I was the president of the ratepayers' association at the time. People had been complaining about asthma in the Lake Munmorah area. I was able to get hold of a document from Dr Howard Bridgman at Newcastle University and two other professors, who explained in their piece, which was titled—I just have it here—"The contribution of industrial fossil fuel use to groundlevel sulphur dioxide concentrations in the Lower Hunter region". 1983. They pinpointed the Doyalson area, which is between Vales Point and the Munmorah power station, as at critical levels by model study and that no more sulphur-dioxide-emitting industries should be positioned in the area.

Of course, it rang alarm bells for us because the electricity had very advanced plans. It had a glass office, and they had table models, and they were about to build the Mardi power station. The doctors at Lake Munmorah were concurring that asthma in that area was at critical levels and that asthma in children was twice the national average and also in bronchitis in older people. We were able to get them to sign a document. There was a commission of inquiry held. We presented these two documents. Of course, one was a causal document, being the university study. The second was an anecdotal resultant document from doctors. The commissioner took this. The end result was—without going into it all—after two years or so, they scrapped the whole idea. The commission of inquiry for electricity planning in New South Wales up to the year 2010, it was titled. It decided that there were not to be three and a half more power stations built in New South Wales as predicted by the Electricity Commission of New South Wales but they remained with just building Mount Piper and that no more power station would be built on the coast.

This was a decision in 1986. It went national. I will show you just briefly. That was on the Newcastle Morning Herald. The girl on the front page in 1985. It went to every State in Australia. It hit the front page, that there was asthma related to power generation. Then, in 1987, they decided to put fabric filters on the Munmorah power station, saying, "We are giving up smoking." What I am trying to say is that this campaign is not something which people have dreamed up—from the community. This has been an ongoing campaign, right back that far, near 40 years that this happened. So I concur with what is happening at the moment. I congratulate Abigail Boyd MLC in putting this amendment to the bill, which, I think, truly reflects, as the previous speakers have said, what is required to bring Australia or New South Wales into the standards that other countries enjoy. Thank you.

The CHAIR: Thank you very much. Now we will move to questioning. I might just open with one question from me. This is to all of the witnesses. I am just wondering. Has there been any data collected from hospitals, maybe emergency wards, which also show other acute respiratory experiences that people have suffered and that may have been related or may be related to the same phenomena? Or is it mainly asthma, chronic asthma and bronchitis?

Mr BELFORD: Belford speaking. It is a good question. It is worth pursuing. It is as not as easy as it might seem to get data out of hospitals, about these things. But that is certainly a question we can pursue.

The CHAIR: That would be good if you could take that on notice, then. Thank you. If you end up not finding anything, that is understandable.

Mr MOYLAN: It is Jonathan Moylan here from Healthy Futures. NSW Health did put out a study on higher rates of presentations for a range of respiratory illnesses back in 2010, which I can provide on notice to this inquiry. Generally, the epidemiological evidence relating to air pollution show very strong associations with things like systemic heart disease, chronic obstructive pulmonary disease [COPD], lung cancer, heart attacks and mortality. There is, obviously, very strong evidence for the impact of mortality along with asthma and other health outcomes.

The CHAIR: That would be very helpful. Thank you. I might now pass on to Ms Abigail Boyd to ask questions.

Ms ABIGAIL BOYD: Thank you, Chair. Thank you very much for all of our witnesses for appearing this morning and for their detailed submissions. We have talked a little bit about the evidence in relation to the health impacts. Presumably, we are limited in the amount of data we have by the lack of air pollution monitoring in the region. Can you talk to me about what the air pollution monitoring looks like in New South Wales and whether you think that is effective?

Mr BELFORD: It is Will Belford speaking. To my knowledge, in the Lake Macquarie area there are three air-monitoring stations. This is a very good question because the results you get from the monitoring station depend on many, many factors, including where the wind is blowing, which direction it is blowing in, various other climatic things that affect what the monitor actually receives. One of the things you will probably hear from the power companies this afternoon is that, according to the monitoring, they are easily within the limits. That is probably the case a lot of the time, but that is just what is being monitored.

One of the discussions we have been having is the necessity of putting more monitoring in. One that was considered was putting monitors in schools, which is, obviously, risky because, if your school is seen to have a high rate of admissions in it, then people are not going to want to send their children there. But, yes, monitoring is something that needs to be improved to provide a base of data about what is actually going on with emissions. They get emitted up at a very high altitude. We do not really know exactly what happens to them, but you will see, in some of the other submissions, models about where it goes and what happens to it. It does not always just blow straight out to sea.

Ms ABIGAIL BOYD: Maybe a question for you, Mr Moylan. You mentioned about how far some of the pollutants travel. Can you explain that to the Committee?

Mr MOYLAN: Yes. The CSIRO have been tracking power station pollution for decades, even using flight trackers and so on. There was one study that followed particulate matter 1 [PM1] pollution all the way from Port Augusta Power Station to Chinchilla in Queensland. The study led from the University of Exeter found interstate health impacts in Victoria and Queensland from the power stations in New South Wales. It is a very large area affected. I guess I would add that the existing monitoring already does also show breaches of World Health Organization guidelines.

In many senses, the health evidence is disturbing, but it is not surprising. In terms of the way that air commonly travels, obviously, the closer you are to a power station, the higher the risk is. The risk is certainly highest in places like Muswellbrook and Singleton and also on the Central Coast, adjacent to power stations. But under certain atmospheric conditions, when you have particularly the nitrogen and sulphur dioxide travelling off the coast of Sydney, it reacts under unfavourable atmospheric conditions, can rush up the Parramatta and Georges river and get trapped under inversion conditions in the Sydney Basin, where there are already exceedances of ozone and particle pollution. A portion of that would be coming from precursor power station pollution.

Ms ABIGAIL BOYD: Mr Moylan, we know that there are dangerous toxins being released from these power stations, there is dangerous pollutants. We know that they travel a long way. But, without adequate air pollution monitoring, it is not possible for individuals to know if they are being exposed at a particular time. Would you say that is right?

Mr MOYLAN: More monitoring would absolutely help. It is possible to do health outcome studies simply with dispersion modelling from power stations. But I think the big concern about monitoring is that people do not know what the quality of the air they are breathing in is in their local area. I think the critical thing is that, given the existing monitors are already showing breaches of the WHO guidelines, really, where there are available abatements, which are in widespread use in China, in the EU, the US, Japan, all over the world, bringing down those levels of air pollution, using abatement technology, would produce significant health benefits.

Ms ABIGAIL BOYD: If I can ask you, Mr Campbell. Given the known risk to people's health from the air pollution coming out of the coal-fired power stations in your area, do you ever get any guidance from the health department or from anybody in relation to how individuals might reduce their risk of exposure?

Mr CAMPBELL: No. As I say, in 2017 I was involved with the Environmental Justice Australia campaign, Toxic and Terminal. I set up a meeting with the area health director of the Central Coast. James Whelan and I attended that meeting. We did not invite the Environment Protection Authority [EPA], but they were there when we turned up. I had a feeling that the area director general could have been more outgoing with his answers. I had a feeling that the Environmental Protection being in attendance was not particularly welcome.

The thing is I asked a simple question at the end of it. It was not a very good meeting, I must say. Not a lot of information came forward. But I did ask "Does this area, Central Coast, monitor admissions, either into the emergency department or in the hospital generally, at both Gosford and Wyong hospitals? Do they measure the periods of time of the year, such as temperature inversion in the wintertime, when upper respiratory tract infection [URTI] are presented? These figures should be available. Are they ever correlated so that they could be matched with such as the National Pollutant Inventory [NPI] figures that the power stations put out for those periods of time?" They could be matched so you would have a dataset for the hospital systems for each season of the year and then say it matches sulphur dioxide, nitrogen oxide emissions and have those put to public, because the public are still in the dark about all this, Ms Boyd. This is an ongoing problem.

We have found generally—this is just because government is Government—a stonewalling effect between what the Environmental Protection does with power stations—and the power stations have been a protected industry, like the coal industry. It is a just a matter of progression through all governments. We have not gone away from that, from this 1960s idea of protecting the coal industry and the power industry. It has laboured on through those years. The thing is self-reporting—we have got it from our study, Toxic and Terminal, of course, the wildly ridiculous self-reporting from some of the stations, such as PM10 for the year 2015 and '16. For instance, Bayswater noted that they had 958,000 kilograms of PM10 emitted in that period of time. Mount Piper had 43,000; Vales Point, 56. So there are alarm bells ringing there.

This idea of self-reporting—"We will put in a report to the NPI." There are supposed to be inspectors. You read about power stations. There are supposed to be inspectors in the power stations. But you talk to EPA. "We will go there if there is a problem. If there is a spill or if something adverse happens, we will turn up." There is no inspectorate that goes around and checks these things. We have found that the anecdotal evidence, of course, is that the bag fillers are not cleaned properly and all this sort of stuff. Vales Point at the moment is pretty ordinary. Getting back to your point, the public should be made available information from the health system about the local hospitals and admissions and marry that with the other things. It should become part of the edict of the EPA and the Government and should come down to local government members being told this, the media being involved and saying, of course, the community pays for this with its health and everything else. We should have knowledge about this.

The CHAIR: Sorry, Ms Boyd. Unless you have a specific question, I will move to Ms Jackson. But if you would like to come in with a follow-up question, then we will go to Ms Jackson.

Ms ABIGAIL BOYD: I just wanted to finish up on that one. Thank you. What I am trying to understand here is that we have evidence from Mr Moylan, that we are looking at health costs of $2.4 billion—per year, I assume. I will come back to you as to what that figure exactly was. We have very little information for the community. We have very little that they can do to protect themselves from those health costs. Would you agree, then, that we have no other option but to require the power stations themselves to curb these emissions to reduce that health cost? I will go to you first, Mr Moylan.

Mr MOYLAN: Yes. That $2.4 billion figure came from Dr Richard Broome's figure. I understand it to be an annual figure. It would be a question to put to him, I would say. Certainly, as I mentioned in the introductory comments, there are multiple different ways. It can be done through a regulatory or a prescriptive approach or through the fee-based scheme that exists. But, either way, absolutely, with the compelling health evidence that we have, that pollution needs to be abated. From a health point of view, we are concerned about the outcome, which is clean air and healthier lungs. The way that that outcome is achieved is, obviously, your responsibility. We would commend any and every effort to tackle air pollution from power stations.

Ms ABIGAIL BOYD: Thank you. Mr Belford. Then I will throw to my colleagues.

Mr BELFORD: I will echo those points. The proposal of the amendment to the air Act, being an across-the-board lowering of emissions, is a simple and, I think, probably very effective way to do this. I can imagine that there will be a lot of objections from the power industry because of the costs involved to them in doing it. There may be more subtle ways to do it. But this way ensures at least it is—to use the expression—a level playing field for all of the coal-burning power stations. They would all have to meet the same requirements. How they chose to do it would be up to them. There may be incentives that the Government could offer, as well as just resetting the limit. But this would be a very good starting point to send a message and set a bar.

The Hon. ROSE JACKSON: I just wondered if the witnesses could talk a little bit more about what the emissions reduction technology actually looks like and how effective the range of technologies are in actually reducing emissions. Is it a very marginal thing? What is the capacity of the technology that is currently available, to significantly abate the negative impacts? I would just like a little bit more information about that.

Mr MOYLAN: I can take that one. It is Jonathan Moylan from Healthy Futures. For flue gas desulphurisation, which reduces sulphur dioxide, it is over 90 per cent reduction. It is incredibly significant. Sulphur dioxide produces in reactions not just fine particle pollution and also, famously, acid rain. Selective catalytic reduction for nitrogen dioxide is even higher. These are really standard pollution controls. I think there is always objection from industry elsewhere, but I remember when I was first speaking with international experts about the impact of air pollution. One thing we were looking into was the potential impact of mercury pollution, which is a potent neurotoxin. I was told mercury pollution used to be a big issue back in the day but, these days, it is not so much of a big issue because power stations have flue gas desulphurisation. They almost fell off their chair when they found out that, actually, they are not used at all in New South Wales. They were just flabbergasted that we were really stuck in the nineteenth century when it comes to pollution control.

The Hon. ROSE JACKSON: I think my next question—then I will throw to my colleagues—just leads on a little bit from that. Mr Moylan or the other witnesses may want to jump in as well. Can you just give us a little bit more evidence about some of those international comparisons or comparisons within Australia. Just talk a little bit to us about how different and, obviously, in light of these submissions that you have provided, deficient the New South Wales regulatory system is from what is happening either in other States or in other countries.

Mr MOYLAN: Yes. It is Jonathan Moylan here. The limit for sulphur and nitrogen dioxide is between eight and 10 times weaker than the European limits and similarly the US and Chinese and Japanese limits. I think a lot of that material has been presented to this inquiry. They are scandalously weaker. They are very difficult to break. I think just this week, actually, there was actually a breach but not of the upper limit, but the ninety-ninth percentile limit. I think that was due to an operational failure. But, generally, the approach to limit-setting that has been taken by regulatory agencies has been to set—essentially, the rationale has been that they would set licence limits at a level that they have never reached in the past so that it would not actually drive pollution reduction, which really is a very nonsensical approach from our point of view.

The CHAIR: Thank you very much. We will now move to questions from Ms Cusack and then Mr Martin.

The Hon. CATHERINE CUSACK: Thank you, Mr Chair. Mr Moylan, thank you for your evidence. I actually just want to go back a step in terms of monitoring air quality and understanding exactly what is in our air, for example, if you were able to rank the local government areas in terms of the impact of this pollution. I know the science is very emphatic around this, but I thought it would assist our inquiry if you could just take us through the monitoring process, how it is that we know that this stuff is in the air—I think ANSTO may be playing a role in doing the analysis—just to demonstrate how emphatic the evidence is, of the problem, if you could just provide us with some of that evidence. I really think that would assist in terms of the need to do something.

Mr MOYLAN: The Office of Environment and Heritage has a network of compliance monitors across the State. I think there is a legitimate concern, that that compliance monitoring is probably insufficient. But it is quite widespread. In addition to that, as you have mentioned, the Australian Nuclear Science And Technology Organisation [ANSTO] also do particle characterisation studies, where they can measure the components of what is in PM2.5 pollution. There has been a study in the Upper Hunter, the Upper Hunter particle characterisation study. Another one in the Lower Hunter. There has been studies in various parts of Sydney. What they show is about a sixth of the particle emissions in Sydney is from power stations. There has been other research, funded through the national environment science program, that has found that in summertime the contribution of power stations for air quality in every district of Sydney actually exceeds that of vehicle pollution.

Beyond that there has been a couple of studies, one by Dr Ben Ewald, who, I think, will be presenting later, where he was drawing on ANSTO particle characterisation studies and using a technique called high-split backtracking, which is an Australian modelling technique. The other, University of Exeter, study, where the LGA data came from—that used an atmospheric dispersion model called CALPUFF, which is an industry standard that is widely used in environmental impact assessments, although, while it would be possible to do so, there is no requirement for health impact assessments. All that is required there is to do the atmospheric dispersion modelling that is already done in environment impact assessments and use the literature to derive what the health outcomes would be. There are very conservative studies from the global burden of disease that collect those studies.

The Hon. CATHERINE CUSACK: That is a great answer. Are you aware of anybody disputing the problem?

Mr MOYLAN: The power stations themselves have tried to claim—it was interesting. They put out a paper, attempting to dispute one of the studies. They called it a peer review. We got some academics to look at it, who were dumbfounded that anyone could call it a study. One of the arguments—they seem to imply that you cannot rely on epidemiological evidence alone to draw conclusions without a dose response study—basically, stick a kid in a room, expose them to excessive amounts of PM2.5 pollution. Obviously, that would not pass ethics approval. What I found really disturbing about the line of argument, that you could not rely on epidemiological evidence to draw conclusions about health impacts from power stations, is that it was exactly the same argument that the tobacco industry used back in the 1990s to argue against regulation around passive smoking. I would have thought that, in this day and age, with everything that we know and the respect that has been gained for epidemiological science during the pandemic, the power stations could be a little bit more mature than to use similar tactics as the tobacco industry in the 1990s.

The CHAIR: Thank you very much. I will now move to questions from Mr Martin and then Mr Buttigieg and then back to you, Ms Boyd.

The Hon. TAYLOR MARTIN: Thank you, Chair. Thank all of you for taking your time today to present evidence. I am just reading through your submission. I just wanted to pick up especially on the point about childhood asthma across Lake Macquarie and the Central Coast in the Future Sooner submission. This is due to Dr Ewald's work. I will ask him a bit more later on. It makes the link between childhood asthma and nitrogen dioxide emissions. This is a question to all three of you. We will be able to have a bit of discussion with a bit more specific info on what we are dealing with here in the sense that we all know pollution is bad, having particulate matter in your airways will create health issues. Can we just extrapolate a bit more on what are the specific risks around PM10, around PM2.5, mercury emissions. What are the specific risks of each of them? We could have a discussion around that.

The CHAIR: Are you pitching your question to a particular witness or all?

The Hon. TAYLOR MARTIN: Anyone who would like to go first.

Mr MOYLAN: I can speak to that. It is Jonathan Moylan from Healthy Futures. Nitrogen dioxide and sulphur dioxide are respiratory irritants, gases. Really, the strongest evidence for the health harms of nitrogen dioxide come from the Australian Child Health And Air Pollution Study, which was funded—it was carried out to inform the ambient air quality standards, commissioned by the National Environment Protection Council, who informed the work around air quality guidelines. That found very significant impacts on reduced lung function in children at NO2 levels of about eight or nine parts per billion.

Obviously, we know, in the Hunter, for example, there was a similar study that found that about one in six children had reduced lung function in the Hunter. PM2.5 is fine particle pollution. It is about a thirtieth the width of a human hair. You cannot see it. It is invisible to the naked eye. But the International Agency for Research on Cancer [IARC]—I might have the acronym wrong—has listed PM2.5 as a carcinogen. Obviously, you can find information about PM2.5 from the World Health Organisation. It gets past the body's natural defence systems. It can get not just into the lungs but into the veins further, deeper into the human body. It can really affect almost every organ in the human body. Of course, there are other heavy metals like mercury and arsenic and lead that are also emitted from power stations. Mercury can be emitted in a few forms, in a reactive gaseous form. Generally, the pathway to human health impacts is through consumption of seafood.

The CHAIR: Would any other witnesses like to add to that?

Mr CAMPBELL: Yes. Mike Campbell here. Just generalising, Jonathan Moylan is all over it. Good on you Jonathan. Thank you for all of that information. I am 76 now, so I am beyond it a bit. Over the decades, as I say, it goes back a fair way. They were cruder times in the 1980s, but since 2016-17 when Environmental Justice Australia got onto this, and other bodies—if this evidence was around in public on another issue for government, government would be firing back or the industry would be firing back in a big way saying, "This is incorrect," like they do on climate change and all other such things. They fire back very quickly.

What I have found is that there is silence from the industry and the agencies who monitor the industry, and that tells me a lot. It tells me that they do not want any further public discussion on this. It blows things out into the open. That is just how I am reading it because there is simply no refutation of what Mr Moylan has been talking about and there is no refutation of Dr Ewald's proclamations about disease and death that Will Belford has mentioned. You will hear from Dr Ewald later. I am so surprised that bodies have not taken, say, Dr Ewald, on, for instance [inaudible] tells me a lot that they do not—it is a situation where government and industry do not want this to blow out into the wider public because there may be some inaccuracies in all of this. Of course there are. There is no perfection in this. But there is a feeling from my point of view that they do not want this to be exposed any more than it is.

The CHAIR: Thank you, Mr Campbell. Do you have any further questions, Mr Martin?

The Hon. TAYLOR MARTIN: Yes, I do. My question is around the cost of, say, wet scrubbers or flue gas desulphurisation techniques or catalytic reduction methods as well. Would anybody like to put forward any costs that they have seen or heard of for this kind of remediation?

Mr BELFORD: In relation to the catalytic reduction, we have seen costs of anywhere between $30 million and $60 million to fit these to the station, which sounds like a lot of money, but in the context of the revenues generated by these power stations it is not actively a hugely significant amount. It is also worth pointing out that some of these stations have already fitted theirs. Eraring, for example, has nitrogen burners that they fitted at their own expense which reduce nitrogen dioxide emissions by 40 per cent per megawatt hour. Some of these stations have chosen to do this and some have not; there is not a lot of consistency. But the technology exists and it is certainly within the financial capacity of these businesses to do it, without resentment or shareholder rebellion.

The CHAIR: For the purpose of Hansard, that was Mr Belford speaking. I am aware that we only have about seven minutes left, so I am going to move to the next member. Mr Buttigieg?

The Hon. MARK BUTTIGIEG: Thank you, Chair, and thank you to the witnesses for their evidence. It is a very important and interesting subject. I am curious to understand the disparity or disconnect between what is going on overseas or what has gone on overseas and what is happening here with emissions standards and the passive approach we have taken here. That is something that struck me when I was reading the submissions and we have heard evidence on it today. I just wondered, those jurisdictions overseas—for example, Europe and others—that have more stringent standards, did that come about by proactive legislation or was that a result of health issues being manifested in legal actions and then the government reacting? Does anyone know the evolution of that legislative framework for the tighter standards overseas?

Mr MOYLAN: This is Jonathan Moylan from Healthy Futures. Basically, it was widespread public concern because of the health evidence, followed by regulations—the European Industrial Emissions Directive that has been brought in by the European Parliament. But, really, it came from public concern. I think the problem here in Australia is that until last year in 2020, when Dr Broome published his research, there actually just had not been any evidence in peer-reviewed literature. A health impact assessment has been for many, many years widely required in various jurisdictions in Europe. I do not know why we do not do health impact assessments in New South Wales. But now that the evidence exists I would expect that the public concern will only grow stronger and stronger. It is not an issue that is going to go away.

Mr BELFORD: It is Will Belford speaking. If I might add briefly to that, I think one of the issues here is that this issue is invisible—literally invisible. You cannot see these emissions and you do not know you are breathing them. But there is a toll associated with them that is a personal health toll and a health system cost. Other tolls, like road tolls, are highly visible, and we have gone a long way particularly in New South Wales to reduce that to what might be called an acceptable level. The lack of awareness about this, I think, is the problem. The invisibility of the issue means there is very little activism about it because no-one is aware of it. It comes back to the points made earlier about this information being made available to the public.

The CHAIR: Ms Boyd?

Ms ABIGAIL BOYD: Thank you. I just wanted to cover off one thing that we have not talked much about and that is to you, Mr Moylan, about the load-based licensing scheme. As a nation or as a State, is our regulation for imposing the costs of pollution on the polluters themselves also out of step with the rest of the world?

Mr MOYLAN: Jonathan Moylan here. This was an issue that Dr Tiho Ancev, an environmental economist from the University of Sydney, looked at. He did a paper called *Getting the rates right*, which I can provide on notice to the Committee, where he looked at whether the load-based licensing [LBL] scheme was actually driving pollution down. He found that it was not and he did look at a comparison with other jurisdictions elsewhere. He actually held the load-based licensing scheme in New South Wales in very high regard in relation to its design, but the rates are quite low. As I mentioned, they are about 2 per cent of the damage cost of air pollution.

I think the rates are almost—they are there as a cost recovery measure, really. They are not really related to the external costs. It is rare that we would find ourselves on a unity ticket with the Australian Energy Council, but they did say that load-based fees should be set at a level that related to externalised costs. That is a much more sensible way to do that. The LBL scheme has been under review since 2015. We are very eager to see that come out. We have heard that there will be a proposal later this year or early next year, but the long delay in air pollution policy development in New South Wales is obviously a source of frustration.

Ms ABIGAIL BOYD: How much do you think that those load-based licensing fees would need to increase by in order to provide the economic incentive for these power stations to install the best available technology to filter the pollution?

Mr MOYLAN: I can take that on notice. I think the point that the Australian Energy Council was making was that the issues paper around the load-based licensing scheme talked about whether the price should be raised to the abatement cost. They said that it really should be raised to the external cost. I think they were trying to make the argument that perhaps the externalised cost was lower than the abatement cost. But the evidence from Dr Broome's study and many other studies is not surprising at all, which is that externalised cost is borne by the community at large. I do not know precisely how much higher it is than the current load-based licensing fees, but it is orders of magnitude. So, yes, they would need to change and that could be something that could ramp up over time, but it would need to ramp up quickly enough that there would be a health benefit in the short term.

Ms ABIGAIL BOYD: Or they could just install the abatement technology.

Mr MOYLAN: That is right.

The CHAIR: Thank you very much to all witnesses. You have been extremely helpful and informative. I think there have been some questions taken on notice. Unfortunately, due to the short turnaround for this inquiry, it would be much appreciated if you could have those answers with the secretariat by the end of next Friday. We will now adjourn for morning tea.

(The witnesses withdrew.)

(Short adjournment)

NICK WITHEROW, Principal Lawyer, Environmental Justice Australia, affirmed and examined

RACHAEL CHICK, Solicitor, Environmental Defenders Office, affirmed and examined

BRAD SMITH, Campaigns Director, Nature Conservation Council of NSW, sworn and examined

The Hon. CATHERINE CUSACK: I welcome our next witnesses to the inquiry. Thank you very much for your availability and being with us today. Would you like to start by making a short statement of no more than three minutes? Mr Witherow?

Mr WITHEROW: Certainly. Thank you. Environmental Justice Australia is a not-for-profit public interest legal practice. We have been providing legal advice and representation to the community for over two decades on air pollution issues. We advocate for better air pollution laws at the State and Federal level, to protect the health of communities and the environment. The science tells us that there is no safe level of exposure to air pollution. The International Agency for Research on Cancer classifies air pollution as a human carcinogen. A 2019 global review of health study evidence found that air pollution has the potential to damage every organ and every cell in the human body. The science does not support a safe level of exposure. Consequently, ambient air quality standards and emissions limits are a reference level and not a safe level of air pollution.

Even incremental improvements in air quality improve health outcomes. The costs to the New South Wales economy from air pollution from its coal-fired power stations runs to the hundreds of millions of dollars every year. These are costs that are paid for by the New South Wales taxpayers and by communities that live locally to the air pollution generated by coal-fired power stations. However, the health impacts of air pollution from coal-burning power stations is not limited to the communities local to the power stations. Air pollution travels and impacts people hundreds of kilometres away in the form of a host of chronic diseases and, in some cases, premature death.

In the greater metropolitan region, which includes Sydney, Wollongong and Newcastle, New South Wales power stations contribute 45 per cent of the regions oxides of nitrogen and 84.9 per cent of its sulphur dioxide. They also contribute significantly to solid particle pollution and are the third largest contributor to mercury pollution, contributing four times more mercury than motor vehicles. Unlike other sources of air pollution, significant gains are able to made by regulating very few point sources of emissions—the power stations. In other jurisdictions, older coal-fired power stations have successfully complied with stricter emissions limits, as pollution reduction laws which protect human health have been implemented.

The technology to meet contemporary emissions limits is mature and widely used technology. Costs of installation have fallen over the decades. When first implemented in 2011, the US decisions around pollution controls were considered complex and difficult. As the technologies matured, the scientific, regulator and industry consensus formed, settling on what is now accepted as the best practice pollution controls for coal-fired power stations. Similarly, in the EU, following the introduction of the 2010 emissions directive for large-scale combustion plants, regulators undertook lengthy and comprehensive reviews of the performance expected from the retrofit installation of pollution reduction technologies, which included extensive multi-year consultations with interested parties. Consensus was established and formalised in 2017, with the adoption of the best available techniques conclusions by EU member States.

The work has been done around the world and the results are now settled. The technologies to reduce the health effects of emissions from coal-fired power stations are mature technologies—technologies which have now been retrofitted to power stations around the world for decades. New South Wales communities deserve modern air pollution standards that reflect what power station operators are able to achieve if they take reasonable steps to protect human health and the environment.

Ms CHICK: I should probably preface my opening statement by noting that there is some chainsawing happening next to me. I apologise if you can hear that. The Environmental Defenders Office [EDO] welcomes the opportunity to appear before the Committee. EDO is keenly aware of the health impact of coal and has written extensively on the need for effective regulation of air pollution across New South Wales. EDO strongly supports tighter standards for emissions from coal-fired power stations. Our submission identifies opportunities for strengthening emissions exceedance limits in New South Wales to better align with best practice, and provides further recommendations on strengthening air pollution laws, including the regulation of greenhouse gases.

Currently in New South Wales the regulation of air pollutants, particularly from industry, is far from best practice. Coal-fired power stations in New South Wales are currently permitted under their Environmental Protection Licences [EPLs] to emit air pollution at levels many times the maximum prescribed in other jurisdictions, such as the European Union. For the air impurities identified in the bill, the proposed emissions

limits still exceed those set in comparable jurisdictions, such as the European Union, but are much closer to best practice standards than any New South Wales power station is currently required to meet under its EPL.

The proposed limits therefore represent a significant improvement on current standards and would have the additional authority of being set out in legislation, rather than by regulation. However, EDO would also support a mechanism to allow limits to be further reduced in future, with the aim to align with best practice limits, such as a requirement that industrial emitters use best available techniques or technologies. EDO supports the outcome that the bill is seeking to achieve—the strengthened regulation of coal-fired power stations. In addition, we note the bill does not include a proposed limit or standard for greenhouse gases produced by the combustion of coal for electricity, particularly the production of carbon dioxide, despite this causing significant air impurity, which has a material impact on public health.

We strongly recommend regulating carbon dioxide and other greenhouse gas emissions as air pollutants. In November 2020 we released a policy paper exploring opportunities for the Environment Protection Authority [EPA] to regulate greenhouse gas emissions in New South Wales, called *Empowering the EPA to prevent climate pollution*. This report was annexed to our submission to this inquiry. We refer the Committee to the recommendations in that report, particularly in light of the Land and Environment Court's decision in August this year in *Bushfire Survivors for Climate Action v Environment Protection Authority*, which found that the EPA is required to develop objectives, guidelines and policies to ensure environmental protection from climate change. Thank you.

Dr SMITH: Thank you for the opportunity to give evidence today. It is easy to assume in New South Wales that most of us enjoy clean, healthy air most of the time and that means it is one less thing that we need to worry about in this State. I urge the Committee to scrutinise that assumption extremely carefully. All of us have looked out from a high-rise in the CBD or from a hill over western Sydney at the brown haze that hangs above our city. But have we stopped to ask what damage that haze is doing to the millions of people that are breathing that air in? Have we stopped to ask what is causing that pollution, what we could do to reduce it or what benefit the people of New South Wales would enjoy and how much better lives we would live if our air was cleaner still? The World Health Organisation recently released new guidelines that help us answer those questions.

How does New South Wales air rate against the new World Health Organisation guidelines? I can tell you this: not a single monitoring site in New South Wales met the new World Health Organisation standard in 2020 for fine particle pollution. Most sites did not meet standards for other pollutants, such as PM10—course particles—or Nitrogen Oxides The World Health Organisation is telling us that we need to fundamentally shift our tolerance for any source that puts pollution into our air. That includes most of the things we burn, whether that is wood heaters, diesel and petrol cars or coal-fired power stations. Those are the three largest sources of that pollution that we suffer, especially in the Greater Sydney region.

We already have the tools—as the other witnesses have said—to rapidly reduce pollution, especially from coal-fired power stations. That technology is widely used around the world and there is no reason why we should not be using it here. For decades, the coal-fired power stations in New South Wales have been imposing a burden of disease on people living in the area, especially in the Greater Sydney region. Those power stations are causing at least 100 deaths per year and they pay very little for that damage. We have cleaner ways to generate electricity and we have for a long time. It is time to act on those health costs and end that economic distortion. We believe this bill is an effective way to fix that regulation.

I quickly want to say that you will hear later today from two power station owners—Origin and Delta. They might tell you the current regulations are strong and effective. They might tell you that they comply with their licence conditions most of the time. They might tell you that they already pay for the pollution they emit. But I wonder if they can tell you why coal-fired power stations in New South Wales are not required to fit best practice pollution controls, while their colleagues in other countries like the USA, Europe, Japan and many other countries fit those pollution controls and meet far stricter standards than we have in New South Wales. They might tell you that they pay fees for the pollution they emit, but can they tell you why the fees that they are charged are set at levels about 49 times lower than the health costs that pollution is causing for the people of New South Wales? Thankyou.

The CHAIR: Thank you very much. I will now open to questioning. We will start with Ms Boyd.

Ms ABIGAIL BOYD: Thank you, Chair. Thank you to our witnesses for appearing today and for your submissions and thank you to each of you for all of the great work you have done on this issue and others over the years. I will start with you, Mr Witherow. There is a lot of pollution and there is a lot of pollution we cannot do anything about or that we can but it is going to take a long time. When it comes to the pollution from coal-fired power stations, that is pollution we can easily do something about, is it not? Can you explain to us exactly what would be required and what the benefit would be of installing best practice pollution controls.

Mr WITHEROW: Certainly. As the Committee will hear, there is a large proportion of the pollution in New South Wales, in particular the greater Sydney region, that comes from only five sources, and that is the power stations. The technology exists to remove by far the majority of that pollution in the realm of—depending on the pollutant—90 per cent to 95 per cent of that air pollution, through the use of technologies that exist and have been around for decades and, as you have heard and you will hear again I am sure, have been used in jurisdictions around the world. There are some challenges with installing them, but they are not insurmountable.

You will probably hear from the power station operators on that. They will say that they pose a risk to the national electricity market and there will be significant outages and all these sorts of things. But the reality is that these technologies can be installed alongside the power stations while they are operating, and then during scheduled outages they can be stalled—an engineering term for the tie-in period, which is something like six weeks, where they actually tie the pollution controls into the existing power station infrastructure. The result of that would be a relatively small number of emitters, only five, significantly improving the air quality in New South Wales, in particular the Greater Sydney or greater metropolitan region. There is no safe level of air pollution. While air pollution or air quality will never be perfect, it can be improved. Every single improvement represents a saving of the health and disease burden for the New South Wales community.

Ms ABIGAIL BOYD: As you say, there are five coal-fired power stations at the moment in New South Wales, soon to be four. By taking action at just four locations, we could reduce air pollution that is coming from those coal-fired power stations by between 90 per cent and 95 per cent. What overall impact would that have on the quality of Sydney and Greater Sydney's air quality?

Mr WITHEROW: It is difficult for me to quantify that, but if we know that for example close to half of the oxides of nitrogen and 86 per cent of sulphur dioxides are coming from the power stations, we can say that that is air pollution that will no longer be headed into the Greater Sydney region. It is the fine particle portion which is especially dangerous. Oxides of nitrogen and sulphur dioxide go on to form particles in the atmosphere which then come down into Sydney. They transform from a gas form or a condensable particulate, as it is called, into a solid particle, which then joins the particular burden in the greater New South Wales region. It would make a significant difference to the air quality of New South Wales and, perhaps, more importantly, the health impacts.

Dr SMITH: Ms Boyd, I might be able to provide a direct answer to that question about how much pollution would be reduced.

Ms ABIGAIL BOYD: Please do.

Dr SMITH: You will hear later in the day from some scientists who have worked to quantify that reduction. For example, Dr Richard Broome—who I think is the last witness you will hear from—did a study in 2017 and found that by fitting nitrogen dioxide and sulphur dioxide pollution controls to the power stations that would have a health benefit of $2.5 billion in the Greater Sydney metropolitan area and would reduce premature deaths by around 40 deaths per year. There have been other estimates. A more recent one also done by scientists at the then Office of Environment and Heritage found that coal-fired power station pollution was responsible for around 19 per cent of the man-made air pollution—that is the fine particle pollution which is most harmful to health—in the Greater Sydney area. That is the sort of reduction that we will see.

Ms ABIGAIL BOYD: Sorry, I was on mute. The first one to do it today. Thank you for that. Sometimes when we propose reforms like this the response we get, particularly from industry, is, "This is how we've always done it. This has been our practice for however long." Is it the case that the awareness around the health impacts of air pollution has increased markedly even in the last five years, but also in the last decade? Can you talk about what we know now around air pollution impacts that we just did not know 10 or 20 years ago? I will go to you first, Mr Smith, if you would like.

Dr SMITH: I think it is fair to say that and, certainly, I think the World Health Organisation's guidelines show that. When they released these new guidelines they said the reason that they have tightened their guidelines very significantly is because there is now a vast body of evidence that shows that—as other witnesses have said—there is no safe level of pollution and even at low levels pollution is extremely harmful. They say by meeting the guidelines that they set, millions of lives can be saved every year.

Certainly, the awareness in the science has improved dramatically and there have been studies in Australia that have helped to improve our understanding. A large study was done on the impacts of nitrogen pollution on children, which found that even at very low levels, nitrogen dioxide pollution caused more cases of asthma. We have used that research to show that coal-fired power station pollution around the Central Coast and Lake Macquarie region where two coal-fired power stations are sited is responsible for around 650 cases of childhood asthma every year.

Certainly, the science has come a long way, but I think also awareness in the public has changed. We all went through the black summer bushfires, now almost two years ago. We all experienced days—probably for the first time—of breathing hazardous air pollution and we saw hospital admissions skyrocket. We saw thousands of people going to hospital with asthma. Around 445 deaths were attributed to breathing in the smoke from those bushfires. Children were born preterm and underweight. These are all the impacts of air pollution. We see them on those hazardous days. Perhaps the thing that people are less aware of is that those impacts are also happening when we are breathing in lower levels of air pollution.

Ms ABIGAIL BOYD: Thank you. I guess it is that invisible pollution aspect. At least during the fires we could all see it. I will ask you, Mr Witherow, with that increased public awareness and with the increasing body of evidence about the health impacts, what do you make of the Government's latest reiteration of the clean air regulations, which have come out just recently, after 11 years of not being updated? Do you think they reflect the science?

Mr WITHEROW: I think that the current proposed amended limits in the Act go a long way to reflecting best practice, but they still do not go far enough, as was foreshadowed by Ms Chick. You will see we have proposed amendments which we think better reflect the science and also amendments in consultation with engineers and US experts that we think are achievable by the power stations if they were to install and optimise pollution controls. I think I will leave it at that.

Ms ABIGAIL BOYD: Perhaps I could ask you, Ms Chick.

Ms CHICK: Sure. As Mr Witherow said, we do not believe that the current regulations adequately limit pollution from coal-fired power stations. Similarly, the proposed bill—although it is a significant improvement on what currently exists, we think it still does not go far enough. In other comparable jurisdictions and the Organisation for Economic Cooperation and Development [OECD] guidelines there is a requirement to use best available technologies or best available techniques to reduce emissions. That requirement is underpinned by guidelines on what best available techniques are and provides guidance as well on the limits that are achievable if those best available techniques are used. We think that in addition to the limits proposed in the bill it would also be useful to provide a mechanism in the bill or in the Act to ensure that as technology improves, emission reductions can continue to take place under the Act.

Ms ABIGAIL BOYD: Just one more question and then I will hand over to my colleagues. Ms Chick, do you think that there is a risk that with the increasing amount of evidence that we have now, there might be a legal action in the future against the authorities that they ought to take action?

Ms CHICK: We have already seen some legal action. I referred in my opening statement to the Bushfire Survivors for Climate Change Action case. That case found that the EPA has a duty to enact policies and guidelines to protect the environment in New South Wales from climate change. That is an example of where legal action has determined that. I think that in terms of air pollution and the impact on public health, yes, there is a risk, particularly in circumstances where there is widely known evidence of the health impacts of air pollution.

The CHAIR: Thank you. We will move on to questions from Ms Cusack.

The Hon. CATHERINE CUSACK: I just wanted to ask the witnesses if they could expand more on why pollution from the power stations located in the Hunter is particularly affecting western Sydney, including perhaps an outline of the movement of air, how that air can get trapped, how it can combine with other pollutants and what happens in summertime when the temperature of that area is elevated. I wondered if we could have a clearer description of the facts or science around this process. It is understandable that people in the vicinity of the power stations would be impacted, but I do not think it is understood in Sydney why it is so important here.

Dr SMITH: I can have a crack at that one, but I wonder if perhaps one of the air dispersion scientists will be able to give you a better description later today. Sydney has power stations on two sides—by Lake Macquarie there are two power stations, in the Hunter Valley there are two power stations and then there is one at Lithgow on the other side of the Blue Mountains. Like you said, western Sydney often has temperature inversions, which means that the polluted air is trapped in the Sydney Basin.

The pollution from the power stations goes up quite tall stacks into the air and disperses from there. It disperses throughout the Greater Sydney region. The best way that we know that is the case is because the CSIRO did a study some years ago where they actually took samples of air pollution and studied them using their techniques to look at the radioisotopes in the pollution to understand where the pollution came from. They discovered that—like Mr Witherow said—a very large fraction of the pollution was coming from the coal-fired power station. I guess we have that evidence that that is where the pollution is coming from and it is getting stuck in western Sydney.

You mentioned the effects that temperature has. I suppose one of the more complicated things about pollution is often we say that the fine particles are the most harmful to people's health—PM2.5. But it is also important to note that some of the other gases that the power stations emit, like nitrogen dioxide and sulphur dioxide, those gases in the atmosphere with the addition of sunlight then form fine particles. A large proportion of the fine particles that we breathe in come out of the power stations as gases and then form particles in the air, which then people breathe in and it harms the health. I suppose the other process that is a problem is the formation of ozone, which is another harmful gas that harms people's health. Those are some of the ways that coal-fired power stations are causing people problems.

The Hon. CATHERINE CUSACK: It is fair to say, is it not, that tracking using the radioisotopes you referred to not only can confirm that these pollutants are coming from power stations, but are accurate enough to even tell you which power station they are emitting from? Is that your understanding?

Dr SMITH: I am sorry, I cannot comment on that. Perhaps you will have to try one of the scientists later today. My apologies.

The Hon. CATHERINE CUSACK: I will. Thank you very much. I will yield that line of questioning till later.

The CHAIR: We will now move on to Ms Jackson.

The Hon. ROSE JACKSON: Thank you, Chair. My first question is to Mr Smith. I wondered if you could answer from your point of view the question that you posed to us for the representatives of the power stations, which is: Why is the New South Wales regulatory regime so different? Considering the work that has happened internationally and the work that has been done at the WHO, why are we so far behind?

Dr SMITH: Thank you for that question. I think the answer is complicated, but there are perhaps some things that we can say. Firstly, acid rain was a large problem in Europe and the USA. All these regulators went, "What are we doing? We have this big acid rain problem." I think that was a problem we did not have to the same extent in Australia because we did not have the same concentration of industrial facilities that they had in those parts of the world. Some of the really strong regulations started as acid rain regulations and especially fitting flue gas desulphurisation to remove the sulphur dioxide from the power stations came from there.

I think part of it is this idea that in Australia we do enjoy generally pretty good air, whereas I think that air pollution concerns in places like Japan, Europe and the US came far earlier. I guess, you know, you can talk about London where they had that pea soup air. London has that real history of pollution and, I think, is more aware about the need to try to reduce pollution than perhaps we are here. I think the WHO advice really shows that, no, we are not an exception to this problem. We are suffering from air pollution. It is coming from 100 kilometres away. People may not realise that, but that is the reality. Maybe that is why we have been a bit behind in regulating pollution to the same standards.

The Hon. ROSE JACKSON: The other witnesses should feel free to jump in as well. I will ask my next question. I think it was in your submission, Mr Witherow, where you talked about the option of potentially, for example, low interest loans to assist with some of the costs associated with implementing these new technologies. That is an important issue here. If we are going to look at additional regulations there are going to be additional costs associated with that and exploring some of the options for managing that is something that I think would be useful to do. I wondered if you could comment on that.

Mr WITHEROW: Sure. I think we made the point that the operators are all investing in their power stations in various ways—we have got Vales Point seeking to expand their coal mine and we have got Bayswater seeking to expand their coal ash dam. So there is a very low interest environment at the moment for the operators to access capital in order to make these improvements or to make these expansions or however you want to characterise them. We do not see any barrier about why they cannot be doing the same thing with respect to pollution controls.

New South Wales power stations have got closure dates standing from 2029 through to 2042, so it is not an insignificant amount of time there foreshadowing staying open. What they will say is, "We are nearing the end of our lives, why should we have to close?" and all this other stuff. But the reality is that they are the closure dates which they have got foreshadowed at the moment and they are profitable businesses with access to relatively cheap capital. I think that the issues around the financing of coal projects—I am not sure those barriers would be in place if they were coming forward looking for finance to control toxic pollution from the stacks. I think the issues with finance they have are around new power stations with new coalmines and these sorts of things.

The Hon. ROSE JACKSON: Yes, that is right. I understand that some of the barriers that they may have had are because organisations that would ordinarily provide finance in that way are perhaps becoming more

environmentally conscious and conscious of the risks or problems associated with investment in expansion of those operations, but those same concerns would not be associated with investments that directly mitigated environmental risk. Is that the point you are making?

Mr WITHEROW: Yes, that is right. We did raise in our submission the pathway that some of the United States jurisdictions went down which was providing tax credits, grants and also those state-sponsored loans. But I am not sure that is something that we would necessarily say is necessary or desirable in the New South Wales context. I think that they are all profitable businesses and they have all potentially got access to fairly low cost of money at the moment. I think it would be historically one of the lowest costs of money we have ever had.

The CHAIR: Are you finished, Ms Jackson?

The Hon. ROSE JACKSON: Yes, that is fine, thank you.

The CHAIR: We will now move to Mr Buttigieg and then come back to Ms Boyd.

The Hon. MARK BUTTIGIEG: It is really just a follow-up on my colleague Rose's question. The obvious argument will be, "Look, what are you doing to us? We are already facing these insurmountable hurdles with regards to lowering emissions in the context of the goal of reducing global warming. We have got these closure dates. In order to maintain stability of the grid we need base load power and now you are going to put these extra hurdles up against us as well. It is just not economically viable or sustainable for the industry and, if you want us to survive to maintain network stability during that transition to a renewable economy, you are going to have to lay off on this stuff." That would be the obvious argument that people would run, perhaps not in such blunt terms, but I just want to get your views on that.

Dr SMITH: I think it is a really important question. I might start off and then let others have their say. The first thing I want to say is that air pollution controls have already been effective. Eraring Power Station owned by Origin Energy, who you will hear from later, in 2012 fitted low oxides of nitrogen [NOx] burners. That is changing the type of burner they have in the coal power station to emit less nitrogen oxide. That pollution control was fantastically effective—far more effective than they thought it would be or at least than they claimed it would be in their environmental impacts. We did a study of the emissions from a power station over the last 12 months and their emissions from nitrogen dioxide on average were below 300 milligrams per cubic metre. That is about five times lower than the licence limits at most power stations in New South Wales and already would meet far more stringent requirements than what they have in their pollution licence. That was fitted in 2012 so for the last nine years that power station has economically competed in the market even though it is omitting about half as much nitrogen oxide as all of the other power stations in New South Wales, who for the last decade have been causing asthma when they could have been running low NOx burners. That is my first point.

I think the second point is that, as I was saying before, this is a very large health cost that currently is being externalised onto the community. In my view, that is an economic distortion. Today another proposal for a pumped hydro facility at Bathurst was put forward—around 300 megawatts—so we now have four projects in the Lithgow area that add up to more dispatchable power than is currently produced by the Mount Piper Power Station in Lithgow. So we have this option. We can keep running the Mount Piper Power Station at Lithgow, which produces 1,400 megawatts of dispatchable power, or we could change these other four proposals—two pumped hydro proposals and two battery proposals—that will produce more dispatchable power, provide more flexibility to the grid and do so with zero emissions. How can we incorporate that health benefit that those clean power stations would put onto the community—those billions of dollars of health cost that they would save—other than by regulating the coal power stations correctly?

Mr WITHEROW: I would just like to add a little bit to Dr Smith's answer. I have got two points to make. The first is that the power stations, in our view, consistently overestimate the costs and underestimate the costs of the associated benefits. We detail this in our submission but just to run you through it. In 2019 the Australian Energy Council on behalf of the power station operators produced a report whereby they estimated the cost of retrofitting fabric bag filters to the power stations per 720 megawatt unit at $67.8 million per unit. The costs of these technologies are coming down. They are not going up. In 2007 Delta reported that the actual cost of installing two units at 660 megawatts was $55 million. So we think that the costs are consistently overstated by the power stations, or overestimated by the power stations, and that is one of our recommendations to the Committee—that these costs should really be examined quite carefully to test the veracity of these claims made by the operators about the actual costs associated with them.

The second point is that the current limits for fine particle pollution coming from New South Wales power stations is set at 50 micrograms per cubic metre. We are proposing much lower limits, but the question remains—they have got fabric bag filters already attached to these power stations. What is it about the operation

of those fabric bag filters which means they cannot already be achieving the proposed limits for fine particle pollution which are proposed in the clean air bill? There is something going on with the operation of these filters whereby they are not being operated as effectively as they could be or as effectively as they could be with probably quite minor upgrades or changes to the systems in which they operate.

The CHAIR: We will now move to questions from Ms Boyd and then Ms Cusack.

Ms ABIGAIL BOYD: I just wanted to pick up on that. We hear a lot about the potential costs and we seem to be talking tens of millions. If we took a more conservative position, perhaps we would be looking at—what do you think—about $300 million, or something like that, per station? Do you have any broad cost in mind of what that would be or do we really need to do the research? I will start with you Dr Smith.

Dr SMITH: I am sorry, Ms Boyd. I do not have those numbers in front of me but I think Mr Witherow's point is important and that is that the cost of these technologies has been coming down. As countries like China and India now require flue gas desulphurisation and selective catalytic reduction to be fitted to power stations, it is being rolled out at a much larger scale and so I expect the costs of those technologies has come down significantly in recent years. Some of the coal-fired power stations have been required by the EPA to do studies of the costs of fitting those technologies so they will have estimates. I think we have looked at some of those estimates. Some of them have been deemed commercial-in-confidence so we do not have all of the numbers in front of us. But I think it is worth studying what the cost is now that those technologies have been coming [audio malfunction].

Ms ABIGAIL BOYD: [Inaudible].

Mr WITHEROW: Sorry, Ms Boyd. You are on mute.

Ms ABIGAIL BOYD: I have done it twice now. Thank you. It was a long week. On the assumption that we are looking at around $300 million—let us just use that as an example. Perhaps this is a question to you, Mr Witherow. If each power station was to borrow funds at the low rates available at the moment, we might be talking $30 million to $40 million of cost over a 10-year period for them to install this technology, versus what we think is around $2.4 billion worth of health costs that we could save per year—all regulation will impact on business and on the business bottom line but there is a balance to be struck here. I guess the question is do you believe that it is reasonable for the Government to impose this cost on these power stations at this time, given the health costs?

Mr WITHEROW: It is good question and I think it would be open to the Committee to form a view that if the power stations intend on closing then it is unreasonable to expect them to install pollution controls and this is what has happened in the United States jurisdictions. They have set dates in the future for when stricter limits need to come in and then they enter into a negotiation period with the power stations and effectively exchange early closure for an exemption for a very limited period of time. You will see that reflected in our submission where we think we need to set a date in the future when these limits would come into play. That is for two reasons. The first one is to allow them to schedule, plan and implement if they are going to go ahead and install pollution controls, but the second is to allow them to make these commercial decisions about whether or not it is actually viable for them to continue if they need to go ahead and install pollution controls. That then gives the market and the Australian Energy Market Operator [AEMO] time to schedule those outages or those early closures and plan accordingly. But I think it is absolutely reasonable to set those sorts of limits and those sorts of parameters with respect to these pollution controls because the reality is that they are making a lot of money and they are externalising the cost of doing so, and we could talk about the economic costs of it but there is also a very human cost.

Ms ABIGAIL BOYD: Absolutely. I will just see if the other witnesses would like to comment on that general balance of costs between health and the cost to the power stations, and then I know that my colleague Ms Cusack has a question, so we will go to her after. Dr Smith, did you want to comment on that?

Dr SMITH: Yes, thank you. I think the question of whether it is reasonable to require the power stations to fit best practice controls in a way is the same as the question of do we believe the people of New South Wales have the right to breathe healthy air. And I think most people would say the answer is yes. I agree with Mr Witherow's point around the need for flexibility around the timing of installing these technologies and making sure that businesses have time to come up to the standard but, if power stations in other jurisdictions have been able to roll out best practice pollution control technologies, I see no reason why power stations in Australia should not be required to do the same.

The CHAIR: Thank you. Ms Chick?

Ms CHICK: From a regulatory perspective, these sorts of measures are consistent with the Act, and consistent with the objects of the Act, one of which is the principles ecologically sustainable development and one of which is the polluter pays principle. As Mr Witherow and Dr Smith have said, at the moment power stations are externalising the cost of their pollution onto the community who are bearing the costs. The polluter pays principle requires that, as the name suggests, polluters bear the cost of their pollution. Fitting pollution control devices to remove pollution—yes—is a cost on power stations but it is also removing that cost from the community and is therefore in accordance with the polluter pays principle, and that is one of the things that the Act is set up to ensure. The load-based licensing system is meant to do this but you have heard evidence today that the costs are too low for that to actually happen and so failure of a market-based mechanism like that means that maybe now it is time to be more prescriptive about that to meet the polluter pays principle.

The CHAIR: We will now move to Ms Cusack.

The Hon. CATHERINE CUSACK: I wanted to direct my question to Mr Witherow and just actually advance that discussion we were having about externalising the costs of pollution. When I was at school back in the eighties we were taught there were only two free public goods—one was air and one was water. And this was because they were unlimited. It is an understatement to say that now in 2021 we think very differently about both of those items. In terms of economics those items are now being priced very much. I am talking about taking a really hard line market approach here. There are other reasons but just from an economic market approach, it is fair to say that we have moved in a direction now of capturing the true costs of those items. It is perhaps not new costs; they are just costs that have not been recognised in the past. Would you say that incorporating the true costs, including those costs that the public are bearing in terms of health for example, into the cost of power production and internalising those costs would assist us to better price the actual production of power by these power stations? And that that could lead to improvement all by itself?

Mr WITHEROW: If I understand your proposition, I think that is right—that there is a cost of generating the power. Those costs are not the same for all generators because some are accessing sun, some are accessing wind and some are accessing coal. The power stations which are accessing coal are not paying the full cost whereas the other generators are. They are not paying the human and health costs of that and in order to compete on a level playing field they should be paying that cost, and it also will have the effect of improving health outcomes for literally millions of people.

The Hon. CATHERINE CUSACK: This would make renewables more competitive in many respects in the energy market? Because what I am suggesting is that it is in fact the power stations that are getting the massive public subsidy here; it just has not been correctly captured in the past. And these costs are actually quite enormous.

Mr WITHEROW: I think that is right. I think that every time someone is let off the hook for an expense which someone else is bearing, and that expense is met by the public purse, they are in effect getting an indirect public subsidy.

Dr SMITH: Ms Cusack, could I just add something briefly on that point? I think that is exactly right. This is a large subsidy from the public to these coal-fired power stations and probably later today you will hear the power stations argue that they require that subsidy in order to keep power bills down. But again I would say that that is a spurious argument. If we look a little bit into history, just a couple of years ago AGL and Origin, the biggest coal power station operators in New South Wales, were making very large profits—$500 million a year they increased their profit by. That is because they were able to charge more for the power that they were selling than what it cost them to produce the power and they made a big margin.

Now the situation is very different. Those power stations are making much lower profits and most of them are staring down the barrel of not being profitable because wholesale prices for electricity have halved in that time—in the past couple of years. The future is uncertain. Liddell Power Station will close its first unit in less than six months and the other three units shortly after. Will that mean that wholesale prices recover slightly and these coal-fired power stations make more profits? We do not know and it is impossible to predict the future. But what we do know is that these power stations have a plan to continue operating to 2035 in the case of Bayswater. In the case of Vales Point the owners say that they want to keep that running indefinitely and have a life extension plan to 2049. On the other hand, perhaps it will be unprofitable by 2025. We do not know the answer to that but we do know that in the next five, 10 or 20 years, or however long they keep operating, every year they will be causing the death of hundreds of people and that is a big subsidy that should be taken away.

The CHAIR: I would like to ask a question. I think all of you could possibly answer this. In the submissions I did see a reference to this. Has it been considered that there is a similar narrative to asbestos with what is going on here with the pollution from these facilities—in the narrative of what happened with the whole asbestos story which led to obviously class actions et cetera. Is there a similar narrative here in any way?

Dr SMITH: Certainly, Mr Chair, our understanding of the health impact of this pollution has changed rapidly and I think that was the case with asbestos. Whether or not that will lead to class actions, I might leave that to the lawyer.

The CHAIR: Does anybody else wish to comment on that from the witnesses? I might move now to Ms Boyd.

Ms ABIGAIL BOYD: I was unprepared for another round of questioning, Chair. So unless someone else wants to ask a question, I will come up with one.

The CHAIR: That is fine. If the evidence has been so sharp and pointed that we can finish a little bit earlier then, unless any of the other—

The Hon. CATHERINE CUSACK: Mr Chair, I have a question.

The CHAIR: Great. Thank you, Ms Cusack.

The Hon. CATHERINE CUSACK: Again, I would just like a historical context here. These power stations were mainly built by taxpayers and have gone through a period of what some would refer to as contracting out or privatisation or what, but how important do you think it has been to separate regulation from ownership in order for us even to be having these conversations today?

Dr SMITH: Ms Cusack, I think this goes a little bit to the question that Mr Buttigieg asked earlier as well, or perhaps it was Ms Jackson, around why the power stations are not being regulated more stringently. I would say that, even since the power stations have been privatised, the regulations really have not kept pace with the science and our understanding of the harm that has been caused. The protection of the environment operations regulation, I understand, came into effect in 2010 and it has not really been updated or significantly altered in that time. The clean air regulation did have some forward-looking parts. It has a ratchet mechanism built in. So in 2012 some of the oldest facilities in the State were required to meet new standards so that there was this continual improvement in New South Wales. But unfortunately 2012 was a long time ago and there have been no ratchets since. There has been no review and there have been no improvements in that Act.

The regulation I think is well out of date for a review. There are pollution groups—old facilities, Group 3—that do not have any date at which time those stations will be required to come up to scratch with more recent or more appropriate pollution controls. The last significant improvement we saw was at Eraring, like I said, in 2012. That power station was still owned by the State Government at that time. Sadly, I do not think we can say that privatisation was necessarily helped the regulator to regulate these facilities more stringently. In fact, I would say the regulator has been very unwilling to use its powers to regulate these power stations and I think that is why this bill is appropriate.

The Hon. CATHERINE CUSACK: Okay, so taking that forward. I refer to a government model for the ideal way of proceeding forward. I know, for example, that the Independent Pricing and Regulatory Tribunal does a lot of the reviews in relation to pricing and it plays an important role. How can we get these costs legally incorporated into the regulatory framework so that they are actually captured and priced in? It just seems to me that once those costs can be internalised then the power stations themselves have a huge financial incentive to stop polluting. But at the moment there is no incentive for them to do that. Can you comment on the governance?

Dr SMITH: Absolutely. I think you have hit the nail on the head. There are several different ways to do that—to regulate this effectively. One of the ways is a load-based licensing scheme we have in New South Wales where polluters are required to pay for their pollution. Each of the power stations each year pays several million dollars to account for the hundreds of thousands of tonnes of toxic pollutants that they put out. Unfortunately, those fees are set at a level that is far below the health costs. Doctors for the Environment did a calculation and found that those fees are set at a level 49 times too low. So increasing the cost under the load-based licensing scheme is one way of internalising those costs and that might drive power stations to fit pollution controls, it might drive them to change their operations and it might drive some of the more polluting power stations to just withdraw from the market and allow cleaner technologies to come into place. So that is one option. But unfortunately that scheme has not been reviewed. It has been under review since 2017—almost as long as I have been in my job—and we have seen no progress on that. So that is another case of where the Government and the regulator has been—

The Hon. CATHERINE CUSACK: Okay, so just looking at that then—what would be a good way for load-based pricing to be undertaken? I have a sense it is a bit of a behind closed doors negotiation between regulators and industry. Do you think perhaps there could be more transparency around that? My background is economics and I am really keen to understand how we can have market settings that are going to assist us to solve

the problems because very, very prescriptive regulation just seems a last resort to me. Can we get the settings right in the process of determining genuine prices?

The CHAIR: Sorry, Ms Cusack. I just have to come in there because Ms Boyd would like to ask a very quick question. Would you mind taking that question on notice Dr Smith and other witnesses? Is that okay?

Dr SMITH: [Inaudible].

Mr WITHEROW: [Inaudible].

Ms CHICK: [Inaudible].

The CHAIR: Thank you very much. Ms Boyd, a very quick question.

Ms ABIGAIL BOYD: Sorry, just super quickly. It appears from the answers being given that people may not be aware of the latest clean air regulation that was released in the last couple of months where the schedule in relation to the particular limits that we are discussing in context of this bill have not been updated. Were you aware of that new regulation?

Dr SMITH: Ms Boyd, yes, I was aware. My understanding is that the regulation was due for review and it was automatically repealed under the sunset provisions. My understanding is that it has only been renewed for one year and hopefully that will give the EPA and the Minister the chance to actually review that bill because it desperately needs it—absolutely. Just to go back to Ms Cusack's point, I think this bill would achieve effectively the same outcome as internalising those costs through the load-based licensing scheme but one way to ensure that that scheme is priced effectively is—I think you are right—to commission a study about the actual health costs of that pollution and set the fees accordingly.

The CHAIR: On that note, I am sorry, we will have to conclude with your evidence. Thank you witnesses. It has been extremely helpful. I will now close this particular section of the inquiry and we will now move to our next witnesses making themselves available for this inquiry.

(The witnesses withdrew.)

BEN EWALD, Member, Doctors for the Environment Australia, affirmed and examined

CHRISTINE COWIE, Senior Research Fellow, University of New South Wales South Western Sydney Clinical School and Woolcock Institute of Medical Research, affirmed and examined

The CHAIR: Doctor, would you like to give a short statement of no longer than three minutes? You do not have to but if you have one it is welcome.

Dr EWALD: Yes, okay. The proposed bill sets new limits on pollution from coal-fired power stations. The limits are at approximately one-eighth of current levels for gasses and one-fifth of current levels for particles. The new limits would bring New South Wales into line with jurisdictions in Europe, North America and North Asia. As a doctor I am interested in the health effects of these pollutants. The gases nitrogen dioxide [NO2] and sulphur dioxide are respiratory irritants, and the fine particle pollution increases the risk of cardiovascular disease as well as having effects on fetal growth, diabetes and various other diseases. About 15 years ago when electricity generators all belonged to the New South Wales Government, the last two plants using old electrostatic precipitators, which were Liddell and Vales Point, were upgraded to the much more effective fabric filters. One of my patients here in Newcastle was a power station engineer working there at the time, so I asked him why this was done. He replied, "It was the right thing to do. The technology has moved on since those plants were built."

Things have moved on again both in pollution controls and in understanding the epidemiology of health effects of air pollution. Part of this new understanding about air pollution was summarised in 2016 by the United States Environmental Protection Authority publishing a new integrated science assessment on the health effects of nitrogen dioxide. After reviewing the world literature they classified chronic NO2 exposure as a cause of respiratory disease. They go to a lot of pains to establish this is not just an association but a causal association. In a similar effort the WHO recently revised their standards for ambient air quality. While many standards were changed, the one I want to focus on is the annual limit for nitrogen dioxide. Australia recently revised our standard down from 30 parts per billion to 15, but WHO revised theirs from 20 parts per billion down to 5 parts per billion—a much stricter standard. In their statement WHO recognises that there is no threshold of effect. Five parts per billion is not a safe level but a level that gives substantial protection from the risks of exposure.

I have done some calculations on the health burden of NO2 on the prevalence of asthma in children, based on modelling of the power station contribution to annual average NO2 exposure across the New South Wales local government areas [LGAs]. The LGA with the highest NO2 from power stations was Lake Macquarie, where all power stations together contribute 2.5 parts per billion to the annual average NO2 level. This exposure would be the cause of asthma for 6 per cent of children with asthma and, since asthma is quite a common disease, that works out to about 321 cases of asthma that can be attributed to that exposure in the Lake Macquarie LGA. This occurs even though the ambient air in that local government area meets Australian standards and probably even the new WHO standards. Things have also moved on in pollution controls. I understand that selective catalytic reduction is a post-combustion treatment that can be bolted onto an old power station and can be 90 per cent effective. This sort of technology is required on all coal power stations in advanced countries around the world. I think it is high time such controls were required in New South Wales for any power station that is going to continue generating for more than a few years.

The CHAIR: Dr Cowie, would you like to give an opening statement at all?

Dr COWIE: [Inaudible].

The CHAIR: I think you are on mute, Dr Cowie.

Dr COWIE: Thank you. I would, thank you. Thanks for the opportunity to provide evidence at this inquiry. I did, in my introduction, forget to also mention that I am here representing the Centre for Air Pollution, Energy and Health Research [CAR] and that is a National Health and Medical Research Council funded Centre of Research Excellence. The centre brings together more than 30 health and air pollution researchers from at least seven universities. It is the only research group of its kind nationally to bring together researchers focusing on the health impacts of air pollution. Our expertise lies in epidemiology, exposure assessment, toxicology, biostatistics and clinical respiratory medicine. Broadly, CAR supports measures which have the impact of making air safer to breathe and that includes tightening of current emission standards from coal-fired power stations in New South Wales. We know that fossil fuel emissions contribute to both short- and long-term, direct and indirect human health effects. So we recommend continual tightening of emission standards from fossil fuelled industries and as part of this stance we also oppose strongly the approval of new coal-fired power stations and other fossil fuel sources.

Our submission succinctly summarises and provides some evidence for the statement that there is no safe level of air pollution. Given this, we advocate for continual exposure reduction to air pollution emissions.

Continual exposure reduction is really a stance that has been taken worldwide by other jurisdictions as well. Worldwide there are recent studies that have investigated the effects of exposure to lower level air pollution which are the levels that we typically see in Australia. To date, the research indicates that even at low levels air pollution exerts an effect on health. Sometimes this is at a cellular level and seen in biomarkers such as inflammatory markers, and sometimes it is in health outcomes such as increased risk of asthma, lower lung function, increased risk of stroke or premature mortality. Of note, the World Health Organization has just last month issued revised air quality guidelines in light of "the marked increase in evidence on the adverse effects of air pollution" over the past 15 years and also the fact that "studies in high-income countries with relatively clean air have reported adverse effects at much lower levels than had previously been studied". The WHO guidelines are now more stringent than our national standards set through the National Environment Protection Measure for air quality.

Locally, in Australia, CAR researchers have demonstrated adverse effects in epidemiological studies at the levels currently experienced in Australian cities. There are a number of studies in our submission but there are quite a number more that we have not included. So we have local evidence to suggest that there is no safe level of air pollution exposure in terms of human health. CAR has also published a number of health impact assessments, and the one most relevant to this bill is one published last year by Richard Broome et al in 2020. That modelled the health impacts of eight major sources. That paper reported that power stations were one of the top three highest polluting sources of PM2.5, and in the Greater Sydney metropolitan region, along with woodfired heaters, which was found to be the most polluting source, and on-road vehicles.

The paper also estimated that power stations contributed to 45 premature deaths annually, which equated to 620 years of life lost. Years of life lost is a measure which takes into account the age at which deaths occur. This is despite power stations usually being sited away from large population centres. While the paper modelled the actual PM2.5 concentrations and indicated that from power stations those concentrations peaked in low population density locations, beyond those locations concentrations were spread fairly evenly across the greater metropolitan region, mainly because of atmospheric transport. In addition to the PM2.5 emissions, the paper estimated that nitrogen dioxide and sulphur dioxide emissions, which are linked to secondary particle formation, were associated with 38,000 and 14,000 years of life lost, respectively, at a cost of $1.8 billion and $0.66 billion, respectively. The other thing to note is that these estimates are based on mortality impacts only and they have not estimated—

The CHAIR: Dr Cowie, I am sorry to interrupt. It is just that we only have 35 minutes left for questions. So I think if you can table your statement, then the Committee will be taking equally as much notice of it. Just so we can move on to questions, do you mind if we wind it up there?

Dr COWIE: No, that is fine.

The CHAIR: Thank you very much. I might just start off with a question. I think I did see an indication of that in the submissions but, in order to gather data about the health impacts—whether it be an acute respiratory state or whether it be chronic or as much as many of the other symptoms and effects that you have described—have you noticed any resistance to providing data in your gathering of data from unusual quarters like health departments or hospitals?

Dr COWIE: Are you addressing that to me?

The CHAIR: To both of you. Either of you could answer that question, if it is a question for which you have an answer.

Dr COWIE: I can go first.

The CHAIR: Yes, sure, Dr Cowie, if you would like to answer first.

Dr COWIE: In terms of reaching the collected data like hospitalisations and mortality data there is a process that needs to be gone through and submissions need to be made to ethics committees in health organisations. You usually have to pay for the data. Sometimes the data is free. Sometimes if it is linked to existing health cohorts you will need to pay for the data linkage but there is a standardised process to go through for obtaining routinely collected health data.

Dr EWALD: Those estimates that Dr Cowie was quoting from Richard Broome, and my numbers about asthma cases in the local government areas, are based on applying what is known from international literature to the observed air quality exposure that we have locally. This is not done by counting up the number of children turning up in Wyong hospital with asthma. It is done by applying what we know from the world literature and how much asthma we would expect given that amount of NO2 exposure or particle exposure. It is called the health impact assessment method and it is not based on counting the cases of disease in New South Wales.

Dr COWIE: If we are looking at mortality, it does use actual mortality statistics.

The CHAIR: Great, thank you very much. I might now go to Ms Boyd.

Ms ABIGAIL BOYD: Thank you to both of you for coming along today with your submissions and for your extensive work in this area. We have a lot to thank you for. Perhaps I could start with you, Dr Ewald. I have read your original study on this. Just to summarise it—if this bill was to be enacted and the coal-fired power stations in New South Wales were required to install this pollution filtering technology, how many lives do you think would be saved every year?

Dr EWALD: That is a tricky question because we do not know the total reduction of pollution that would occur compared to what is allowed now. These standards are for the maximum allowable chimney stack concentration. How that would relate to a change in exposure in ambient air out where people live, that is a complex relationship. When I estimated the mortality burden from power stations in New South Wales, I got a much larger number than Richard Broome did—I got about 280 deaths per year. That was based on particle characterisation work done by David Cohen from Australian Nuclear Science and Technology Organisation [ANSTO]. There are different ways of estimating this. The health impact assessment part of it—from how much air pollution to how many deaths—that is a fairly standard method, and I think we would agree on that. The difference is in the model exposure to the air—how much air pollution people are exposed to. So from my figure of about 280, I think meeting the standards proposed in the bill would get rid of about three-quarters of that, but that is an approximation. Likewise, if we take Richard Broome's estimate of 45 deaths per year, then three-quarters of those would be reduced by enforcing these new limits in power stations.

Of course, not all power stations are equal because it is dependent on wind directions. The summer conditions that favour sulphate particle production are associated with more likely north-easterly winds, and that blows the pollution from the Central Coast power stations down to Sydney where large numbers of people are exposed. So the Central Coast power stations will have a larger health burden than, say, Mt Piper around Lithgow or the Upper Hunter power stations that are much further away. It has not been exactly quantified how many deaths per terawatt hour of production each power station produces, but I think that the burden is greater from the power stations that are upwind of Sydney and that have a large surrounding population. Many more people live near the Central Coast power stations than they do near the Lithgow power stations or the Bayswater [inaudible] power stations.

Ms ABIGAIL BOYD: I appreciate that you are a researcher and very precise, and I guess I am trying to make a more general point. Do you think then it would be fair to say if the power stations installed the technology that would be required or—let's put it another way—if they were to comply with the limits proposed in this bill, that we would be likely to save at least 200 lives a year across the State?

Dr EWALD: That is a reasonable guess based on my estimate of mortality, but I think that it is as likely that Richard Broome's estimate of mortality is also correct, so it might be two-thirds of that number.

Ms ABIGAIL BOYD: What was his mortality estimate?

Dr EWALD: It might be 200 less deaths based on my numbers or 30 less deaths based on Richard Broome's numbers.

Ms ABIGAIL BOYD: Still a lot of lives either way. Do you perhaps have an idea of the reduction in the numbers of children presenting with asthma as a result of those pollution emissions technologies being installed?

Dr EWALD: If the NO2 scrubbers can eliminate 90 per cent of the NO2 releases, then we would get about that same reduction in the local numbers of children whose asthma can be attributed to that exposure. So for Lake Macquarie, it would probably be 300 less children with asthma if we could get those NO2 scrubbers installed. That is in that LGA and an equal number from Central Coast LGA.

Ms ABIGAIL BOYD: Then statewide?

Dr EWALD: I have not done the numbers statewide.

Ms ABIGAIL BOYD: That is okay.

Dr EWALD: I have published an analysis of this and I can send that to you.

Ms ABIGAIL BOYD: I think that is incredibly useful because it gives us who are not scientists a bit of an idea of exactly what the impact is at the moment of not requiring these power stations to install this technology. I think that is incredibly useful information. Thank you. I have lots more questions, but I am very keen to let my colleagues ask some questions first. So, Chair, perhaps if you could come back to me, that would be very useful.

The CHAIR: Sure. We will now move to Ms Sharpe for questioning and then Ms Cusack.

The Hon. PENNY SHARPE: Thanks for coming to the inquiry today. I have two questions. My first question is—and I think Dr Cowie reflected on this: What were the transition arrangements in other jurisdictions in relation to this? Obviously it is quite costly and there is a lot that needs to be done in relation to installing the new technology. You are also obviously aware about how old and clapped-out our coal-fired power stations are as well, with very limited life. Are you able to provide any information about some of the transition arrangements that have been put in place as people have installed the new technology?

Dr COWIE: We do not have expertise on that particular issue itself. It is really more of an engineering-type expertise that you are asking [disorder].

The Hon. PENNY SHARPE: I know that you are doctors. That is fine. I just thought, given that you have looked at it so much, you might actually have some reflections for us?

Dr COWIE: I do know that the European Union [EU] brought in I think it was new regulations with new limits in 2017 or 2018, requiring stricter limits over there, which I believe are stricter than what we currently have here in New South Wales.

The Hon. PENNY SHARPE: Most places are stricter than us.

Dr COWIE: We are not experts in terms of the other transitions overseas.

The Hon. PENNY SHARPE: That is fine. In comparing the proposed limits with international standards, my reading of the bill and my understanding is that—I suppose it is not strictly true to say that this would bring New South Wales into line with other jurisdictions. It is my understanding that this would set much tougher standards than other jurisdictions. Can I just test my understanding? What I am saying—and full disclosure here that I have not been back in this portfolio for very long and this is not my work, so I just want to check this stuff. For solid particles, for example, the proposal in the bill is 20 milligrams; the EU is 50, China is 30, and the United States is 125. Are you able to confirm that for me?

Dr EWALD: The standards for power stations in those places were in the original Doctors for the Environment Australia [DEA] submission, which I have not got in front of me at the moment. There is a table in there setting out the standards in various places. I think the New South Wales standards for particles are actually quite good. The particles are currently not the problem. It is the sulphur dioxide and the nitrogen dioxide that remain the problem. Like my engineering patient said, 15 years ago they did put in the particle filters at Liddell and Vales Point; certainly Bayswater, Mt Piper and Eraring had those from new because they were built later and that was the standard at that time.

The Hon. PENNY SHARPE: That is right.

Dr EWALD: We do not have a primary particles problem from power stations; we have got an SO2 and NO2 problem. Of course, those gases form secondary particles in the atmosphere. So it ends up as a particle problem where people are breathing.

The Hon. PENNY SHARPE: I have got that. For sulphur dioxide, in the EU it is 400, China is 200, and the United States is about 1,500. Is that your understanding?

Dr EWALD: No. I think for—in the EU, there is one standard for old plants requiring retrofit and another standard for new built plants, and they were all around the 100 and 150 kind of range, and then Japan, it was more like 50 milligrams per cubic metre.

The Hon. PENNY SHARPE: That is great. Thank you for that. I will go back to your submission and look at that detail. As I said, I had been confused, so you have helped me to go back and have a look at that. There is nothing else from me.

The CHAIR: We will now go to Ms Cusack.

The Hon. CATHERINE CUSACK: Thank you very much for the submission that you have made and for your evidence today. It is very difficult in terms of the health burden putting a monetary cost on that, and I suppose as someone coming from an economics point of view, I would see that as a helpful thing in terms of internalising these costs onto power stations so the true cost of their power could be reflected. I guess, as doctors, you do not want to be putting a price on any premature deaths; I assume that that is correct. Secondly, when we talk about premature deaths and years of life lost, isn't there a much greater cost in terms of quality of living for so many other people who, for example, cannot even leave their homes on a high-pollution day in Sydney?

Dr EWALD: There are standard methods for putting a value on the value for statistical life. Those methods are set out by the Department of Prime Minster and Cabinet and are standard economic methods. It is a little more complicated when you do what Richard Broome did and work out the sort of years of life lost in the

future in all people currently alive today and then discounting that back to present values. There is, I think, serious argument about the discounting method used for that. I did a previous piece of work looking at a system that New South Wales has called the load-based licensing system, which charges large emitters an amount per tonne of each pollutant at release. Based on some work done by the people down at ANSTO, the nuclear science organisation, looking at the sulphate particles collected in Richmond, you could work out how many deaths per tonne of exposure there was and work that out as a fee for the load-based licensing system. So they currently do pay a fee per tonne of SO2, but that fee would have to be 50 times higher to reflect the value of the health burden. There is a mechanism there but the numbers are all wrong. If the numbers were put up—in the case of SO2, by 50 times—then it would match the health burden. So that would be the effective method [disorder]—

The Hon. CATHERINE CUSACK: Can you unpack that a bit more for us? How is that fee determined and what is your role in that process? I think this is going to be a pretty key feature of our inquiry about underpricing in the load-based licensing system. Could you give us a bit more detail around that?

Dr EWALD: New South Wales has a system of load-based licensing. We have had it since about 1997, I think. It is a very sophisticated design. It puts a price per tonne of pollutant on a whole range of different pollutants. There is one price for nitrogen dioxide, another one for SO2, another one for particles, another one for mercury. The prices are all different, reflecting the relative toxicities of these things—although we do not know where that was derived from; maybe Dr Cowie knows. For a big place like Bayswater, I think they end up paying a fee of about $2 million a year for their pollution fees, but still that is a very small fee compared to the size of their operation. For the one pollutant I looked at, the fee was way lower than the actual externalised cost borne by the community from that pollution exposure. If the load-based licensing fees were increased to actually match the externality, that would be a very sophisticated way of regulating these pollutants rather than setting numerical limit values and saying, "Well, if you're above the value, you're no good, and if you're below the value, it's fine." That would go to what Dr Cowie was talking about—a continual exposure reduction method where if you can properly internalise the costs, that leads to the lowest cost abatement and the most efficient improvement in health. But we have had the scheme for 20 years and the fees have never been set at a level that had any teeth. So the polluters just pay the fee and go on polluting.

The Hon. CATHERINE CUSACK: Who is setting those fees, and does this bill do anything to address that problem?

Dr EWALD: No, this bill takes a different approach to the same problem. Having a set regulated limit is one approach and having a fee imposed on polluters is a different approach, which would achieve the same end. So this bill is about setting a regulated number. The load-based licensing, it is legislated and there are regulations about it. It is all an official part of how the New South Wales Government works. It is just the numbers are wrong in terms of matching the health burden.

The Hon. CATHERINE CUSACK: How could we correct those numbers? How can we rectify that?

Dr EWALD: That is outside my area of expertise. That is the politicians' problem.

The Hon. CATHERINE CUSACK: But they are not fees that are established by scientists, basically; in fact, the fees appear to be at odds with what the scientists and the medical experts are telling us. Is that a fair statement?

Dr EWALD: The load-based licensing system came to my attention when a review of the licensing system was launched about five years ago, so I kind of learnt up how it worked, but that review has been parked for the last several years and nothing seems to be progressing. That would be an alternate way of solving the same problem. I think the current bill would get us there to reductions in the health burden or a more sophisticated load-based licensing system, which would apply across a whole range of industries and not just power stations. So there would be benefits in taking that approach, but it would have to be toughened up a lot and I am sure there would be opposition from some of those polluting industries.

The Hon. CATHERINE CUSACK: Thank you. I just want to clarify one more thing in terms of the health burden. These calculations are based on deaths and years lost. I guess I am asking is the bigger cost on quality of life factored into this at all? On a heavy pollution day in Sydney, people are very impacted, particularly with respiratory illnesses; some cannot leave home. We have the weather forecasters now telling us the pollution load to assist them with that. Is that aspect of public health burden being caught in the costing for load-based licensing?

Dr EWALD: I have seen analyses done from elsewhere in the world, from places in the United States or Europe, where they have added up all the morbidity—the days of asthma and the symptomatic days—together with the mortality burden. When you work out a very comprehensive cost analysis, it is always the mortality burden that dominates. In a way, the monetary value ascribed to a day when a child has asthma and has to use a

puffer is often a small monetary value. When you add it all up across the community, it is the mortality estimates that dominate. That is just the way economics are done. Look, I agree—there are days when it is very unpleasant to be outside. The worst particle days are during bushfires, of course. The power station pollution is kind of a constant background level and the really high peaks have always been through fire days. There is work being done by the asthma foundation, for instance, on doing public education about how sensitive people can get through days like that without triggering off their asthma. There were deaths of people with asthma during the Black Summer fires, whose asthma was set off and was very severe. That is a separate piece of work. I think the power station pollution is a constant background that goes all year, but it is not responsible for those peaks.

The Hon. CATHERINE CUSACK: Interesting. I will just put my hand up and say when my son was little, he was a severe asthmatic and we were in the kids hospital every winter. Eventually, our family made the decision we could not live in the air in Sydney and we moved to the North Coast, and it actually solved the problem. So I am just curious to know if the impacts that this pollution has on families like that are captured in any way; I suspect not. Thank you very much for the answer.

The CHAIR: Before I go to Mr Martin, I want to ask a question. When measuring the impact of harm on people from this, you mainly talked about people who have died or treatment of asthma, but has the number of beds in hospitals used for people to recover from the consequences been calculated? Is that part of the calculation as to the impact?

Dr EWALD: There was an estimate of that in one of Richard Broome's earlier papers about PM2.5 in Sydney, whether you calculated a mortality burden and a hospital care burden for cardiovascular disease. That work is out there, but I cannot quote the numbers.

The CHAIR: Was it just cardiovascular disease or respiratory disease as well?

Dr EWALD: I think his work, it was cardiovascular.

The CHAIR: Okay.

Dr EWALD: When you look at the serious disease burden, it is a bit like smoking. Everyone knows about smoking causing lung cancer and smoking causing chest disease, but in fact smoking kills more people through heart attacks than it does through respiratory disease. Air pollution is the same—the biggest burden is from heart attacks and strokes, and that is what kills people. It is a pro-inflammatory state across the person's physiology rather than just affecting lungs.

The CHAIR: Thank you very much for that. It is very helpful. I now move to Mr Martin.

The Hon. TAYLOR MARTIN: I thank you both, not only for the time you have taken today for this inquiry but for all your work in this area. I might pick up in the same vein that my colleague Catherine Cusack disclosed her family story; another colleague let me know that I should probably disclose my interest in this area. I grew up on the Central Coast; I still live in Terrigal. I have an acquired chronic lung condition. I have my puffer here with me today; I need it every day. I am 30 years old and some days I struggle to breathe. Earlier Ms Boyd started raising the numbers of deaths. Could we talk a bit more about those who actually live with a chronic lung disease rather than just the statistics of who die at the end of the day from one? With these proposed technologies installed, what kind of reduction in cases might we be able to see in the Lake Macquarie-Central Coast area alone or the wider metro Sydney Basin? Dr Ewald, you mentioned 90 per cent earlier—that we may well see a 90 per cent reduction in cases if we see a 90 per cent reduction in NOx gases. How many people could that possibly equate to?

Dr EWALD: The 90 per cent is the effectiveness of the selective catalytic reduction in reducing NO2. In my looking at child asthma, the power station NO2 was responsible for about 6 per cent of the child asthma. So if 90 per cent of that was removed, we might remove 5 per cent of child asthma but not more than that.

The Hon. TAYLOR MARTIN: Following on from that, can somebody recover and basically have reprieve from symptoms should these pollutants be removed—so for that 5 per cent, for instance—where it is caused from the pollutants in the environment in their area?

Dr EWALD: Certainly. If the NO2 is the trigger for a person's asthma, remove the NO2 and their asthma can well resolve. There are lots of other exposures. The biggest trigger of asthma, of course, is viruses and the next biggest trigger is probably indoor pollution from gas stoves and gas heating. Then there is also outdoor ambient NO2 exposure, which is part of the mix. Different people will have different triggers and removing the trigger will help the asthma get better, but it is hard to tell for an individual person what their trigger is going to be and that depends on all their details. I think there is a lot to do. As a public health measure, cleaning up that outdoor ambient air pollution is important but, as an individual measure, I think the next thing people should be

doing is turning off their gas connection, getting rid of their gas stove and their gas heaters because that is also a potent trigger for asthma.

Dr COWIE: There have also been studies in the States that have shown that children who have moved to communities with better air pollution have been able to improve their lung health as well and vice versa—children who moved to more polluted areas had resultant decreases in their lung function.

The CHAIR: Can I just ask a question there for clarification? Do we have data to show us how much this pollution actually causes the condition of asthma or any other serious respiratory disease as opposed to how the pollution aggravates an existing condition? Can you elucidate on that for us, or is the information there for us to find?

Dr COWIE: We have known about air pollution being a trigger for asthma for quite a long time and other respiratory diseases, but there is quite a lot of evidence now that air pollution is causative for asthma as well. I know that there are health impact statements from the States that have looked at traffic-related air pollution, for instance, being causative of I think it was about 10 per cent of the asthma burden. We were involved in a study that looked at gas heating and cooking and estimated that it was causative for about 11 per cent of the asthma burden in children in Australia. I think the thing to note, though, is that these figures are estimates. Science is not black and white; there are often measures of grey in here. So putting in exact numbers can be difficult. There is a measure of error around any of these numbers. I guess where we sit in CAR is that any measure to reduce air pollution from any manmade source is a good thing and it will contribute to better health. We can give you estimates numbers but there will always be a measure of error around it, but it is still a worthwhile pursuit to reduce those air pollution emissions.

The CHAIR: Dr Ewald, before we go to Ms Boyd? Thank you very much for that.

Dr EWALD: It is an important point that NO2 exposure in child asthma, it is both a cause of the child having asthma as a diagnosis and a cause of asthma attacks on any particular day. So there is both an acute effect and a chronic effect.

The CHAIR: Thank you very much. That is very helpful and clarifying. We certainly agree that science is never black and white. It is always good to get the trends. Ms Boyd.

Ms ABIGAIL BOYD: I want to pick up on that line of questioning, then. I understand that in addition to our understanding of the impact of particular pollutants on human health, we are also getting a better understanding of the interaction of different pollutants when it comes to human health. Do you have any insight you can give us on the interaction between the particular pollutants we are trying to curb with this bill with pollutants that you might get from less preventable things? I guess I am talking about bushfires in particular. Is there a cumulative impact of those things?

Dr COWIE: That they interact in the atmosphere at the same time, or do you mean day upon day accumulation of exposure?

Ms ABIGAIL BOYD: I am sorry; I am talking about at the same time, as to whether the chemical interaction create something bigger than—I guess, the sum being bigger than the two parts?

Dr COWIE: Particulate matter [PM] consists of usually a carbon core and upon it can attach a number of different toxic elements and compounds, and the source of the particulate matter will dictate what sort of compounds or elements are attached to it. For instance, traffic-related particulate pollution will have more vanadium in it, and it will be different to particulate matter being sourced from bushfires or particulate matter being sourced from power stations, which will have more sulphates and nitrous oxides on it as well as probably heavy metals as well. So there are different elements. There have been a number of studies conducted to try and disentangle which type of particulate pollution is more toxic, and there is still a long way to go with that. We do not have a really good handle, although I think there is probably enough evidence to indicate that any particulate matter from combustion sources exerts some more toxic effect than non-combustion sources like PM from dust or sea salt PM. There are some cellular studies that seem to indicate that PM from bushfires, for instance, might be more toxic than even from cigarette smoke, but I think there still needs to be a lot more evidence that comes out about that.

Ms ABIGAIL BOYD: Just on that, you mentioned sea salt. One of the things I have been told by a particular air pollution expert, actually, was that when the sea salt molecules combine with some of the coal-fired power station pollution, it tends to weigh them down and so you get this kind of falling more heavily on coastal towns sometimes than you would on the inner city. Is that something you have looked into, that sort of rates around the coast versus further inland?

Dr COWIE: We have not looked into that, no. As particulate matter pollution travels, it will pick up other toxins and other pollutants and form secondary particulate pollution, and it is called aged industrial particulate matter, for instance. That might have more chemicals absorbing onto the particulate matter, but I have not seen any evidence at the moment to indicate that that is worse. Along the coast, you get a lot of sea salt PM, that is for sure—and that makes sense—and further west you tend to get more wood heater PM. I do not know the evidence behind what you have been [disorder].

Ms ABIGAIL BOYD: That is fine. Sorry, it was a bit of a curly question. Just one last question to Dr Ewald, if I could. One of my colleagues was asking before about the difference between the load-based licence regime and what is being proposed in this bill. They are the same, I guess, only insofar as the load-based levies are sufficient to incentivise the coal-fired power station to actually install the filters. Is that correct? Is that your understanding?

Dr EWALD: Yes. The current load-based licensing system has ineffective fees, so it does not work; it does not achieve its stated goal. Either setting a numerical value that should not be exceeded, which is what your bill does, or applying a fee that is adequate to alter production practices—they are two ways to get to the same goal.

Ms ABIGAIL BOYD: If, however, these coal-fired power stations were to look and say, "At least one of our stations might close within a short period of time," they could choose instead to just keep polluting at the high levels and paying the higher costs, could they not?

Dr EWALD: Yes. Under the current load-based licensing, the size of the fee is not significant. They will pay the fee and keep polluting, yes. The numbers are all wrong and it would be a substantial increase, not just a little bit—50 times greater.

Ms ABIGAIL BOYD: I think they would probably prefer to have the bill.

Dr EWALD: It is complicated. Liddell, obviously, is going to close next year. It would not make sense to be putting pollution controls on Liddell but other power stations that are going to keep going, if they are going to keep going for five or 10 years, then that is still a substantial health burden that should be avoided.

Ms ABIGAIL BOYD: Thank you.

Dr EWALD: [Disorder]—

The CHAIR: I am sorry, but we are probably going to need to conclude this part of the inquiry at this point—unless you had something absolutely compelling to tell us, Dr Ewald?

Dr EWALD: I was just going to make the point that part of the pollution has a day-by-day effect on health and it also has a chronic effect on health, and they are studied by quite different methods. The day-by-day effect is not nearly as big as the chronic effect. So the chronic effect of annual exposures is about five times bigger than the sum of all the day-by-day exposures through the year. Most of these health effects are based on the annual exposure across the whole year, and that is more related to the annual total that comes out of the chimney rather than what comes out in any one hour. So regulating one hour [disorder] value at the chimney top, that is more related to day-by-day exposure, but it is the total annual tonnage that matters for the annual pollution exposure and that is what really drives the health effects.

The CHAIR: So it is obviously cumulative.

Dr EWALD: Yes. It is the chronic cumulative effects that matter more than what is in any one hour.

The CHAIR: Thank you. Your evidence has been extremely informative. It is greatly appreciated. We will now adjourn until 12.30 for lunch.

(The witnesses withdrew.)

(Luncheon adjournment)

GREG JARVIS, Executive General Manager, Energy Supply and Operation, Origin Energy, affirmed and examined

STEVEN RIGBY, General Manager, Asset Management and Development, Origin Energy, affirmed and examined

GREG EVERETT, Chief Executive, Delta Electricity, affirmed and examined

JUSTIN FLOOD, Executive Manager, Sustainability, Delta Electricity, affirmed and examined

The CHAIR: We will recommence the hearing to continue an inquiry into the Protection of the Environment Operations Amendment (Clean Air) Bill 2021. We now welcome Mr Greg Jarvis, Mr Steven Rigby, Mr Greg Everett and Mr Justin Flood. I am not sure whether each of you would like to make a short opening statement or make one together.

Mr JARVIS: I think we are making separate opening statements. I will be happy to go first, if that is okay.

The CHAIR: Okay. Could you please keep them to a maximum of three minutes and identify yourself when you do—so each time you are asked to give evidence, please identify who you are. Thank you very much. You can commence, Mr Greg Jarvis.

Mr JARVIS: Greg Jarvis, Origin Energy. Thank you for the opportunity to appear before this hearing. Origin is one of Australia's largest energy retailers, generators, gas suppliers, and renewable energy companies. In New South Wales, we have a generation portfolio comprising coal, gas, hydro, wind and solar. Eraring is Australia's largest coal-fired power station. As the national electricity market [NEM] transitions to more intermittent renewable generation, Eraring will play an important role, providing stability and reliability to New South Wales and the national electricity market. To reduce greenhouse gas emissions and transition to a decarbonised future, Origin has committed to exiting coal-fired power stations by 2032. However, we are not exiting the Eraring community. Our proposed 700-megawatt Eraring battery storage project is one of the largest battery projects under consideration in the world.

New South Wales is taking a leading role nationally in ambitious action on climate change with its Electricity Infrastructure Roadmap and electric vehicle policy. Renewables are clearly the lowest-cost new electricity generation, and there are plenty of projects and growth potential. A decarbonising electricity system in New South Wales will have ample opportunity to grow at competitive prices and decarbonise other parts of the economy, including the transport and industry, and take advantage of low-carbon economic growth opportunities. The challenge in this market is to keep the system reliable and affordable through this transition.

Eraring's emissions of NOx and SOx, solid particulates and mercury are well below our Environment Protection Authority [EPA] licence limits, and the plant's measured impact on ambient air quality complies with existing air quality standards, which have recently been tightened for NOx and SOx. Eraring cannot meet the air emissions limits proposed by this bill for most of the listed substances. Origin has invested heavily in environmental controls at Eraring in recent years, including low NOx burners, while fabric filters remove 99.9 per cent of particulate emissions. I have included a table that summarises Eraring's average and maximum emissions, with reference to the current EPA limits and the limits proposed in this bill as an appendix to the written version of these opening remarks, and we have provided this to the secretariat. Note that we do have two ambient air monitoring stations in the community around Eraring Power Station around Eraring, managed by Origin, as well as an EPA station at Morisset and these do not indicate problems with local air quality other than those caused by bushfires.

Origin contributed to a national study by the Australian Energy Council, which looked at the cost of implementing further pollution controls. The study found that indicative costs for installing this technology at Australian power stations would be cost-prohibitive. It would be several hundred million dollars per unit at Eraring and such an imposition would likely result in the power station being closed, with significant impacts to reliability and affordability in the New South Wales electricity system. I think there is a very reasonable argument that, given the limited remaining life span of Australian coal generators and the fact that Australian air quality is generally good by world standards, this is a disproportionately stringent standard to be considering. It is important that government and industry work together to make the transition to net zero as seamless as possible for customers. The renewables will be built and the coal plant will exit. Existing coal plant will have a critical role in maintaining a reliable and affordable supply of electricity through the transition to net zero.

The CHAIR: Thank you very much. Mr Rigby, do you have a short opening statement?

Mr RIGBY: There is no opening statement from myself. That was from Mr Jarvis, representing Origin.

The CHAIR: Mr Everett?

Mr EVERETT: Mr Flood will give Delta's statement.

The CHAIR: Okay. Thank you.

Mr FLOOD: Justin Flood for Delta. Thanks for inviting us to appear here today. Vales Point Power Station has been operating in the Lake Macquarie region for over 40 years, and we appreciate the opportunity to present to you on the state of the local and regional environment with respect to air quality. Contrary to statements made in submissions and the second reading speech for the Protection of the Environment Operations Amendment (Clean Air) Bill 2021, the Central Coast region has the best air quality in the Greater Metropolitan Region, according to information published by the New South Wales Government. The influence by power stations on air quality of other regions, such as Sydney, is much less than being claimed. According to the NSW Department of Planning, Industry and Environment in its 2020 *Air Quality Study for the NSW Greater Metropolitan Region*, 82.5 per cent of measured NOx levels are attributable to on- and off-road mobile sources—that is, cars and trucks. The highest contributors to particulate emissions are wood-fired heaters, industry—not including power stations—and motor vehicles.

The case for setting stricter limits on the emissions of NOx, SOx and particulates for New South Wales power stations alone, as proposed in the draft bill, does not exist and will not result in a discernible improvement in air quality in the Greater Metropolitan Region. I am sure that the Committee appreciates the basis for any regulation is that it needs to be appropriate to the context it applies to. References in submissions received by the Committee are made to comparisons to tighter international standards for emissions and argue that New South Wales should adopt the same standards. What they have failed to communicate is that those jurisdictions with tighter emissions standards have much poorer air quality, caused by a heavier concentration of people and industry in a relatively small area.

By way of example, Germany is a nation of 83 million people in an area of 360,000 kilometres squared. It has a coal-fired power station capacity of 48 gigawatts. In New South Wales, we have just over eight million people in an area of 810,000 square kilometres, with a coal-fired power station capacity of 10 gigawatts. The issue not being considered in setting emissions limits comparable to overseas jurisdictions is that the total emissions to the air shed, and then ground level impacts, should be considered rather than focusing on emissions per volume of gas emitted.

The emission levels in the draft bill may be referable to some overseas settings but have no New South Wales relevant context. Submissions supportive of these emission levels fail to acknowledge where power station emissions rank in terms of ground level contributions to air quality and do not propose tighter regulation of sources with much higher contributions, presumably because they are anti-coal rather than proposing regulation to improve air quality. To this end, none of the submissions contemplate energy security consequences in New South Wales or the electricity cost for consumers of unnecessary tighter regulation, both of which would be primary considerations in a regulatory test of a proposal.

While looking at international comparisons and health impact, Australia has the second lowest mortality rate from air pollution—behind only New Zealand—amongst over 40 nations, according to a study by The Organisation for Economic Co-operation and Development [OECD]. The same OECD work notes that over 95 per cent of Australia's population has the benefit of living with air quality that is better than the World Health Organisation threshold for particulate pollution. In the USA, a nation whose tight air emissions limits have been championed by some, that figure is about 40 per cent.

Claims by a GP linking poor air quality in the Central Coast and Lake Macquarie regions to low birth weights and incidence of diabetes have been professional discredited yet are often repeated. It is concerning that in the New South Wales Legislative Council, such falsehoods are propagated, plus additional ones such as Vales Point being fined by the EPA for not maintaining its fabric filter dust collection plant. To be clear, Vales Point has not been fined and the EPA, when it investigated, found Delta's maintenance practices to be appropriate.

Submissions purporting that all health issues related to air quality are preventable through the phasing out of coal-fired power generation have no foundation in basic data pertaining to air quality in New South Wales. There are multiple emissions sources that contribute to air pollution, with wood heaters the highest contributor to particle emissions and motor vehicles the highest contributor to nitrogen oxides [NOx]. The current transition towards renewable energy will further dramatically reduce power sector emissions by the end of the decade. Whilst genuine air quality data shows there is no need for further regulation, if the real objective of this bill is to improve air quality, it should have prioritised sources of air emissions in the greater metropolitan region other than power stations.

By way of example, in 2016 the Federal Department of Infrastructure and Regional Development noted that NOx, sulphur oxides [SOx] and ground level ozone—an indicator of photochemical smog—are detrimental to human health and that motor vehicles are a major contributor to these pollutants in urban air sheds. Finally, air pollution monitoring has been conducted on the Central Coast by industry for years. This data demonstrated that the overall air quality is in the range of good to very good, yet some would discredit this data because it does not suit their narrative. In response, the Department of Planning, Industry and Environment installed its own air quality monitor in Morisset in 2020. For those not aware, Morisset is located between the Vales Point and Eraring power stations. It is not surprising to discover that the data from this new and independently operated air monitoring station produces comparable results to that of Delta's longstanding air quality monitor at Wyee. This proves beyond doubt that the alarmist claims regarding poor local air quality are just plain wrong.

In closing, Delta reiterates that the standards proposed in the clean air bill 2021: (1) are derived from international settings that bear no resemblance to the New South Wales setting; (2) are not based on data relating to the sources of ground level impacts, otherwise the bill would focus on wood heaters, motor vehicles, off road fuel utilisation and other higher contributors; (3) give no consideration to the diminishing contributions from coal-fired power stations as renewables replace energy production; and (4) represent unbalanced regulation, as no consideration has been given to the cost to industry of the regulation, the flow-on cost to consumers or the energy security consequences in New South Wales.

The CHAIR: Have either of your companies put in written submissions?

Mr FLOOD: Delta has not.

Mr JARVIS: Origin has not.

The CHAIR: Can you explain why? In an inquiry, it is very helpful for the members of the Committee to have that information at hand to be able to question you. I am just wondering if there is a reason why you did not.

Mr FLOOD: There are three reasons why Delta did not. Firstly, a version of this bill was introduced in 2018 and did not progress. Coal-fired emissions have reduced since that time when that proposal did not warrant implementation. Secondly, it was assumed that expert advice would be sought from the Government regarding the New South Wales context for the new limits set in the bill. Lastly, the EPA reviewed all power station licences in 2020, so there has already been a contemporary review of emission limits.

Mr JARVIS: From an Origin perspective, similar reasons. We make a number of submissions on many different things going on in the market.

The CHAIR: Thank you. I will now hand over to Ms Boyd to commence questioning.

Ms ABIGAIL BOYD: Although I am tempted to begin with Mr Flood, I will begin with you, Mr Jarvis. Thank you very much for attending. We have had your attendance at previous inquiries as well. I am most grateful for that. Thank you also for not trying to rubbish the science behind this. I understand that at Eraring, you have already put some pollution technology improvements on recently. Is that correct? Is that in relation to the nitrogen?

Mr JARVIS: Yes, that was the low NOx burners. I think it was around about 2010-ish that we installed those—maybe a little bit later. Steve, when were they added?

Mr RIGBY: It was over a period around about that when we installed all of the low NOx burners as part of our upgrade that was completed.

Ms ABIGAIL BOYD: When we are looking at this bill and what you would need to do to be able to say that you would not breach the limits in the bill, would you have to upgrade that technology or would that do the trick?

Mr JARVIS: [Disorder].

Mr RIGBY: [Disorder]. From a technical point of view, no. That is the best technology for NOx and the burners. The upgrades would be to other parts of the plant that would be prohibitive from a cost point of view.

Ms ABIGAIL BOYD: So for you it is primarily the flue gas desulphurisation and the activated carbon injection aspects for the SOx and the mercury. Is that right?

Mr RIGBY: It would be for the SOx, the NOx and also you could do a little bit on the particulates, but it would cost quite an extensive amount.

Ms ABIGAIL BOYD: Have you calculated how much that would be?

Mr RIGBY: All of those three technology types we actually worked as part of a national study with the Australian Energy Council. We actually looked at the cost of implementing further pollution controls in those three areas. The study found that the capital cost of the filtration, the wet flue gas desulphurisation modification and the selective catalytic reduction would be about $430 million. That is not inclusive of about $25 million in additional operating and maintenance costs for that type of technology.

Ms ABIGAIL BOYD: Let us call it $455 million. Did you say that was last year? When was that study taken?

Mr RIGBY: The report, I believe, was about 18 months ago.

Ms ABIGAIL BOYD: Would it be fair to say that some of that technology has got cheaper in the meantime?

Mr RIGBY: I would not expect that the technology type would be any cheaper. It is all based on—most of the technology build would be on components and it may actually go up.

Ms ABIGAIL BOYD: $455 million. How long has Eraring got until it is slated for closure? What is the closure schedule on Eraring?

Mr JARVIS: We have stated publicly 2032. Quite frankly, we are operating Eraring very differently today. We produce a lot less energy out of Eraring. It is predominantly used as a function to keep the lights on these days.

Ms ABIGAIL BOYD: If this bill was to pass—which I understand you do not want it to because it is going to cost money—and you were looking at this $455 million capital expenditure, presumably you could borrow that much from the market over a 10-year [disorder].

Mr JARVIS: These plants are very marginal today, so if we had to spend that kind of capital, I think that would be the end of Eraring.

Ms ABIGAIL BOYD: I understand that is the conclusion that you are drawing, but I really want to get down to what the cost would be. Would it be fair to say that if you could find investment, which I am sure Origin could in the current market, especially if it is for something environmentally friendly, you would be looking at $50 million a year over 10 years?

Mr JARVIS: To be honest, I will have to go into capital structures. Borrowing any kind of money for a coal plant these days is highly prohibitive.

Ms ABIGAIL BOYD: As I say, it is definitely to expand. But when we are talking about actually doing something good for the world, I think you might find there is more capital there. We might say $50 million a year. Are you arguing that if you had that extra $50 a million a year cost on Eraring for the next 10 years that you would just have to close Eraring down?

Mr RIGBY: If you look at the calculations that you are looking at, the $455 million would be for one unit. There are four units at Eraring.

Ms ABIGAIL BOYD: Sorry, are you saying that it is actually four times that?

Mr JARVIS: That is right.

Mr RIGBY: It would be four times that. Yes.

Ms ABIGAIL BOYD: Are you able to provide that on notice to show us what those calculations are? That does sound quite a bit higher than what we have been hearing. That would be very useful. Are you intending on all units of Eraring to continue until 2032?

Mr JARVIS: It is all about having capacity available to the market. We have a unit off today, for example—but to have it available if we get hot summer days and things like that. How we run Eraring going forward is going to be very different to how it did run. It is all about keeping the lights on. These plants were not designed to do what they are doing today, that is for sure.

Ms ABIGAIL BOYD: I understand. Can you explain why your counterparts in other countries have been able to afford this technology and continue without going out of business but someone with your financial credentials is not capable of doing that?

Mr JARVIS: There are different characteristics in different markets. I do not want to go through every detail but Japan has different characterisations. It is very landlocked, it does not have other technologies and it does not have renewables policies like we do in this country. There are many different factors to assess here. I

think Delta, in their submission, were talking about different geographies and people. There are lots of characteristics you need to take into account. Quite frankly, from an Origin perspective, to put further capital—we already spend a lot of capital to make sure that the availability is around. But to put more, you simply look at doing something different. I do not want to get into if we can borrow. Our balance sheet is tight and it is very difficult to raise money for coal-fired power stations.

Ms ABIGAIL BOYD: How much was your operating profit last year?

Mr JARVIS: We had massive losses. I can take that on notice, but the reality is we had big losses because we wrote off a lot of our power station plant capital.

Ms ABIGAIL BOYD: What was your profit after tax for Origin as a whole?

Mr JARVIS: I will take that on notice. I cannot remember after write-offs and what have you.

Ms ABIGAIL BOYD: That is alright. I am sure I could look it up. I am just wondering if it is over $50 million or not.

Mr JARVIS: Yes, it is all available. It is not very good, let me tell you.

Ms ABIGAIL BOYD: I have one final question before I pass to my colleagues. There has been some talk about whether instead of doing this we could increase the load-based licensing levy to an amount that would actually incorporate the true health costs of the air pollution coming out of the coal-fired power stations, which some have estimated to be 50 times what it would be now. Presumably, that would be far more financially prohibitive for you than if we were to go with this bill.

Mr JARVIS: I do not know whether I can comment. I do not know what the number is and I do not know how we can pass it onto consumers. Again, I can take that on notice but you need to provide a bit more detail than that.

Ms ABIGAIL BOYD: I understand. I will pass onto my colleagues. Chair, please come back to me if there is time.

The Hon. PENNY SHARPE: Thanks for coming along today, and thank you for your opening statements. They have been quite helpful. My first question is really an opening question that anyone can answer. If the bill was passed, what next steps would each of your companies have to take as a result?

Mr FLOOD: If the legislation was passed, with the way it is written, Delta would have to cease generating immediately because we could not meet the limits. It is structured in a way for immediate implementation.

The Hon. PENNY SHARPE: There are no transitional arrangements in relation to the bill, so I am trying to get a bit of a handle on it. Do either of the other two want to jump in on that? My question, then, is if it was to pass, what transitional arrangements would you need in terms of being able to do it? I am assuming some time frames, with all of the warnings that you have given us today. Can people just take me through that?

Mr FLOOD: I will start. Putting aside the financial viability—

The Hon. PENNY SHARPE: Yes, putting that aside. I have heard your message, which is that you literally have to contemplate pulling up stumps.

Mr FLOOD: We would have to get planning approvals and go through a process there of preparing environmental impact statements. That could take [disorder].

The Hon. PENNY SHARPE: What is your experience of how long that takes?

Mr FLOOD: A few years.

The Hon. TAYLOR MARTIN: I am sure it would be a State-significant project to be worked through.

The Hon. PENNY SHARPE: It still takes a bit of time, though, even under that situation.

Mr FLOOD: We would have to put a specification out to market to procure the equipment and then take the units out for a period of time to put in place the pollution controls. That would be another three to five years, easily, in that process. They are not simple things to implement, these pollution controls. You are essentially pulling apart the back of the boiler and installing massive amounts of equipment.

The Hon. PENNY SHARPE: Does anyone else want to jump in on that?

Mr JARVIS: Similar. I am trying to build new technology, such as batteries and pump hydro and things like that. They take years, even with special planning approvals.

The Hon. PENNY SHARPE: Yes. If you have to cease there, what is the impact in relation to the jobs at your various operations?

Mr FLOOD: Delta directly employs around 500 people at both the power station and the adjacent mine.

Mr RIGBY: You would be talking close to 300 direct reports. It would have an impact in relation to the maintenance activities that happen each year. There are probably about 500 people for a 3-month period each year that come to do the major maintenance and the capital that we put into the plant.

Mr JARVIS: The local coalmines would clearly be impacted as well.

The Hon. PENNY SHARPE: What arrangements would you have to put in place in relation to those workers? Is it pretty much stand down tools while we spend time doing the transition? Is it a requirement for some sort of transitional support? Can you take me through that?

Mr JARVIS: We have not gone into the detail of that. Clearly there would have to be a transition for our workers. We would have to look after our workers and look for other jobs. Clearly we would have to look at our site differently as well. We do not want to leave the community. We would really want to invest on these sites in other technology. We have to take into account all of those factors.

The Hon. PENNY SHARPE: That is it from me. I think that Ms Jackson has got some questions.

The Hon. ROSE JACKSON: I have two questions. Any of the witnesses can feel free to comment. Your evidence is that the passage of this bill will lead to the pretty rapid closure of your operations. Do you have any views about the impact that might have on the reliability of base load power in New South Wales? What kind of consequence would that have for our reliability and, if you wanted to comment on it, the affordability of power?

Mr EVERETT: I can address the first part of that question, mainly because the Australian Energy Market Operator [AEMO] recently put out its statement of opportunities, which is pretty much a supply and demand reliability assessment. The reliability assessment for New South Wales is 0.0006 per cent. That is the percentage of unserved energy. It was showing that New South Wales, upon closure of the next power station after Liddell—it is showing that at 2029, which is the date that we are indicating for Vales Point—increases to 0.008. That is more than 10 times the amount of unserved energy shown in the reliability standard.

The Hon. ROSE JACKSON: Are you suggesting that if this bill were to pass and those closures were quite significantly brought forward, that increase in unreliability, for want of a better word, would also be brought forward?

Mr EVERETT: Yes, absolutely. Relevant to that, I would note that in the period between May and July—and we were somewhat surprised there was not much media attention on this—AEMO issued around 170 lack of reserve notices for New South Wales. Even with the capacity that we have available through the last winter, we did have instances where load had to be shed at the Tomago aluminium smelter. We had many instances where that would have had to have occurred on a more widespread basis. That was with the capacity that we have.

The Hon. ROSE JACKSON: Excuse my ignorance, but what triggers a lack of reserve notice?

Mr EVERETT: There is aggregation as you get to within the two largest units within your jurisdiction, and then it goes up a level when you are down to one. When you are hard up against it and you have got no reserve, that is a lack of reserve 3.

The Hon. ROSE JACKSON: We have heard evidence this morning that there is a pretty significant health impact from the current operations of the power stations. I know some of the witnesses on this panel have challenged some of that, but there did seem to be quite a lot of compelling evidence around that. You are saying this particular legislative instrument to respond to that is going to have extremely negative consequences on your operations, on employment and on reliability of power. Are there any alternatives that you have in mind? You do not prefer this mechanism for the reasons that you have outlined, but if we were to be persuaded that there are some particularly negative health outcomes that we are keen to minimise, are there any other suggestions that you have? A witness in an earlier panel talked about some different programs that they have in the United States, I think it was—tax incentives or other arrangements that might have been tried internationally to achieve improved environmental and health outcomes but not going down this particular path.

Mr EVERETT: I am happy for others to answer this after me, but our position is that these are assets which are approaching the end of their life, so investment in them is extremely difficult. Moreover, we would not agree with the information that is being presented on health impacts. In our opening submission, we have got references to New South Wales Government reports showing that the air quality is good or very good. It also shows the much lower contribution that we have to any health impacts than many other sectors.

The CHAIR: I would just like to ask a question. It is the Chair here. Any of you can answer it. Have either of your companies ever sought or been given advice—and you can go back even 30 or 40 years, if you want—that if it was to develop to the point where your industry is going to come into question and may have to wind down, how you would prepare to do that, even if it was to be called upon quite quickly? The question is have you sought advice in the past to prepare you for a major reform or to wind down to another form of energy provision? Are there any advices that have been sought or given to you in how to prepare for something like this—a bill to come along of this nature and for it to have been passed in Parliament?

Mr JARVIS: Maybe I will have a go. We are under no illusions around the broader decarbonisation debate. In fact, we have been on the front foot. We did have a carbon price at one stage and we built assets accordingly. Overall, the industry is moving in the direction of decarbonisation. We have to build the assets of the future. It takes a lot of capital. It takes a lot of time. Certainly, in the case of Origin, we are doing that. I think the industry overall is doing it as well. I think you are seeing massive changes in our industry. Again, we are under no illusions here.

The CHAIR: So why are you so frightened of this bill if you actually have been prepared and advised to be prepared over time?

Mr JARVIS: Because these are aging assets. It is very important in the transition that it keeps the lights on until we build the assets of the future. It is incredibly important. I can give you case examples around the world. Have a look at the UK today, have a look at the US and the transitioning going on around the world in its different forms. These aging coal assets still have an important place to keep the reliability in the system. We completely understand about decarbonisation and what we need to do.

The Hon. CATHERINE CUSACK: Chair, may I ask a question?

The CHAIR: [Inaudible].

The Hon. TAYLOR MARTIN: Chair, you are on mute. It is working now. We have done so well throughout the day.

The CHAIR: I am not muted.

The Hon. TAYLOR MARTIN: We can hear. You are live.

The CHAIR: Can you hear me?

The Hon. TAYLOR MARTIN: Yes. All eyes on you, Chair.

The CHAIR: Sorry, we have been having some connection problems here. I take that question was answered and we can move to Ms Boyd for further questioning.

The Hon. TAYLOR MARTIN: I think Catherine was asking. I also have one.

Ms ABIGAIL BOYD: Can I just ask one on that train of thought? It is up to you, Chair.

The CHAIR: I can hear you now.

Ms ABIGAIL BOYD: Apologies, Chair. Who have you given the call to?

The Hon. CATHERINE CUSACK: Abigail, I think he has given you the call. I suggest we proceed like that and I will wait.

The CHAIR: I am back now. Thanks, Ms Boyd.

Ms ABIGAIL BOYD: I have a quick question for you, Mr Jarvis. I can understand that you are assuming that all of this cost will be borne by your operations. I am sympathetic to the costs involved in transitions. I am sympathetic to the idea that there should perhaps be some government support given we are transitioning from an unsustainable industry to a sustainable one to get us where we need to go, particularly if it is to look after workers. If this bill was to be passed because the Government perhaps looked at $2.5 billion of costs of health savings that it would make every year, what would it take for you to keep the lights on in terms of government support?

Mr JARVIS: It is a big question. I think good public policy should be about markets. I want to just provide the transition. At the end of the day, we have to invest billions of dollars in the new technology going forward. I do not think governments can afford that kind of money. Really, I think we need the time to get the new assets built. That simply takes time. To have government policies [audio malfunction] I am not so sure that is good policy. I think the market just needs a signal to get on with it. That is the main purpose.

The Hon. CATHERINE CUSACK: Mr Jarvis, I will direct my questions to you because I am aware that, out of everybody, Origin has tried harder in this space and understanding the changes that the world is going

through. Can I first of all establish that perhaps your industry has a bit of inquiry fatigue and maybe that contributed to not getting a submission for our particular inquiry? I hope you understand that puts us at a bit of a disadvantage because the verbal evidence that we are getting is very strident and very much in contrast with what we have heard. Is it possible for some documentation to come through—even if it is something you have given somebody else—that will assist us to understand the costings in the statements that you are making now? That is my first question.

Mr JARVIS: There is certainly fatigue because there are lots of inquiries. If the question is more about the transition and what is going to occur, I am more than happy to do that. We have given a lot of submissions on how the energy market should transition to a lower carbon future. If that is the question, we have got oodles of it. I can take that question on notice and get the team to come back to you.

The Hon. CATHERINE CUSACK: This discussion about climate change and renewable energy has been going on for nearly two decades now. There has been a lot of resistance from the coal-fired power generator industry, which I think is just a lot of pushback on all of that and there are a lot of resources put into defending the status quo in the industry, if I can put it like that. This is my perception. But there must have been some sense that ultimately we were going to get to a position like this and that, in the interest of the assets, this inevitable shift needed to be planned for. That is what has kind of taken me by surprise—the sense from the verbal submissions you have all given, particularly from Mr Flood. He was terribly strident in his submission. Can you just unpack a bit of that for us?

Mr JARVIS: Is that for Mr Flood or for me?

The Hon. CATHERINE CUSACK: That is for you as well. I would appreciate Mr Flood's comments, but he is so emphatic that this is all rubbish. I wanted to hear from Origin first and then maybe from Mr Flood.

Mr JARVIS: Firstly, we are frustrated by where the debate has gone. We are under no illusion about decarbonisation. We are running Eraring far differently to how it used to run. We wind it up like a yo-yo. In the middle of the day, we try to run it right down because there is so much solar on, and then wind it back up. Greg Everett did mention that back in July and August when there was a lack of reserve—there was a lot less sunshine and less wind—there was a real shortage, so we had to wind it up. The reality is that we have spent a lot of capital just making sure it is more flexible. We even take units off now. We have been on this for a long time now. This is not a surprise where we have woken up yesterday. We have been on this debate for well and truly over a decade. I will not go into all public policy decisions and what have you, but it has been, from an industry point of view, very hard to manage these investments going forward. I will not go into that detail. At the end of the day, there is a simple reality here. Renewables are actually fairly easy. That is the simple bit. Running the assets differently and building assets like batteries to keep the lights on, that is the true challenge going forward. I will pause there and I will hand over to Mr Flood.

Mr EVERETT: Mr Flood, if you do not mind, I might just field that question. I would note that, in New South Wales, I would agree with Greg Jarvis that the industry is not in denial. The industry has been changing rapidly. There has been many coal-fired plant closures—Wallerawang, Munmorah, Redbank, Liddell is about to occur. Those closures and those responses to greenhouse challenges—the industry is dealing with those. What we would say is that this particular bill does not address greenhouse. It addresses other pollutants. We do not believe that there is any hard evidence to support this.

You asked about submissions previously. In our opening statement, we will have a number of references. We are also happy to provide further information beyond our opening statement to reports from the Department of Primary Industry and from the EPA that show that air quality in New South Wales in the greater metropolitan region is either good or very good. The only events that you really see of poor air quality relate to bushfires. We will have a reference to an OECD paper, which shows that Australia has the second least mortality because of pollutants. We will also have plenty of references, again, from New South Wales Government publications which show what the sources of pollution are. In most cases, the highest ones are motor vehicles. We would reinforce that motor vehicles emit NOx, in particular, but particulates and other pollutants at ground level, where the population density is. They have a much greater impact. We are very happy to provide more information.

The Hon. CATHERINE CUSACK: You are not a public health organisation; you are a business. I get that. But, as members of this inquiry, we have been given a lot of evidence that there are public health issues that need to be addressed. We would love the evidence that you are offering. To blanket refuse to admit that there is a public health imperative here—which is essentially the position—would for us, as members of the inquiry, need some more evidence because the evidence that we have received so far has been fairly compelling.

Mr EVERETT: We will gladly also provide a reference to a report and we will provide the report as well. We have seen that a lot of the submissions have referred to a report by Dr Ben Ewald. The Australian Energy

Council had that peer reviewed by a professional air science company, Environmental Risk Services [EnRiskS]. That is a company that is qualified to conduct air modelling and air science studies for the EPA in New South Wales. They made a lot of derogatory comments about that Ewald study. We do not need to go through all of those here, but we are very happy to provide that reference to you. That is the study that most of the evidence that you have seen has referenced. To be honest, it did not withstand peer review.

The Hon. CATHERINE CUSACK: That is all of my questions.

The CHAIR: Thank you very much, Ms Cusack. That brings us to the end of this part of the inquiry. Thank you very much, witnesses, for coming along, giving us this information and allowing us to question you. We look forward to your opening statements with all of your references, et cetera. That is important to us.

(The witnesses withdrew.)

(Short adjournment)

SARAH BALMANNO, Manager Strategic Policy and Programs, Climate Change and Sustainability Division, Energy, Environment and Science Group, Department of Planning, Industry and Environment, affirmed and examined

RICHARD BROOME, Acting Executive Director, Health Protection NSW, NSW Health, affirmed and examined

The CHAIR: Thank you very much for attending this inquiry into the Protection of the Environment Operations Amendment (Clean Air) Bill 2021 to give evidence. Dr Broome, do you have a short statement to open with? I think you are on mute.

Dr BROOME: I lost my cursor. My apologies. I do have a short statement. Air pollution is an important public health problem internationally and in New South Wales. By international standards, air quality in New South Wales is generally very good, but it is still responsible for around 1 to 2 per cent of the burden of disease. NSW Health has a supporting role in the New South Wales Government's management of air pollution. We work closely with agencies with policy and regulatory responsibilities like DPIE, NSW Environment Protection Authority and Transport for NSW, providing advice about what the science tells us on the health effects of air pollution and also what the impacts of air pollution have in New South Wales.

NSW Health's advice on the health effects of air pollution is generally informed by conclusions of comprehensive reviews of scientific evidence conducted by bodies such as the World Health Organisation and the United States Environmental Protection Agency. I just mention that the recently released World Health Organization [WHO] air quality guidelines are an example of the kind of review that we draw upon in terms of our advice. These guidelines—these ones specifically, the new WHO ones—provide some support for the way that we have been interpreting the science around air pollution for the last several years which is that, essentially, even at the low levels of air pollution that we see in New South Wales it still has health effects.

I would also just mention that NSW Health, through its membership of the Environmental Health Standing Committee of the Australian Health Protection Principal Committee [AHPPC], is able to contribute to national policy on air pollution—so that is things like national standard settings, National Environment Protection Measures [NEPM] standards and the like. More personally, I am a public health doctor and for the last 10 years or so I have taken a fairly leading role in the conduct of health impact assessments around air pollution in New South Wales. Obviously, particularly relevant to this Committee—and I think it has been spoken about already—is the work that I published in 2020 with colleagues from the CSIRO and the University of Sydney that was funded by the NSW Environment Protection Authority [EPA] and NSW Health.

That work looked at PM2.5 and was primarily focused on wood heaters, but it also quantified the burden of mortality of a number of other major sources of emissions in the Sydney region. It used a state-of-the-art atmospheric modelling framework developed by Martin Cope at the CSIRO to estimate source-specific PM2.5 concentrations across the greater metropolitan region [GMR] of Sydney, which also includes Newcastle and Wollongong. The study showed that, from a heath perspective at least, wood heaters, on-road vehicles and power stations are the three most important sources of air pollution in our region. Wood heaters were estimated to be responsible for an annual loss of life of around 1,400 years, on-road sources—so that is things like cars and trucks—about 990 life years, and power stations, 620.

One of the things with these sorts of impact assessments is how to communicate what the findings actually show and one of the things with air pollution is that, by and large, the risks for any individual person are relatively low, but because everybody is exposed those low-level risks add up into a large public health burden. To try and put some context around that, for example, those figures that I just quoted, if you put those in terms of life expectancy, wood heaters would be responsible for around 12 days loss of life expectancy on average; roads, eight days; and power stations, five days. Now, obviously, those numbers are not evenly distributed—some people will be more susceptible or more exposed—but it provides a bit of an indication.

I think, also, as the Committee has already heard, this study quantified the potential benefits in terms of reduced mortality of increasingly stringent wood heater emissions standards and also the effects of removing not all nitrogen oxide emissions and sulphur oxide emissions from power stations. I do not think the results are directly relevant to the matter under consideration, but what they certainly show is that even though air quality is good in New South Wales there is substantial benefit to improving it further.

The CHAIR: Thank you very much for that. Ms Balmanno, are you there?

Ms BALMANNO: Yes, I am here. Can you hear me?

The CHAIR: Great.

Ms BALMANNO: Sorry, but I had some sound problems.

The CHAIR: There you are. That is much better. Welcome.

Ms BALMANNO: Thank you.

The CHAIR: Do you have a brief statement to make to us?

Ms BALMANNO: Yes, I do.

The CHAIR: Okay. Thank you.

Ms BALMANNO: I am the Manager of Air Policy in the Department of Planning, Industry and Environment [DPIE]. That means my team is responsible for cross-government air policy issues, including the development of the New South Wales Clean Air Strategy, delivery of the National Pollutant Inventory for New South Wales and coordinating amendments to the Protection of the Environment Operations (Clean Air) Regulation. We work very closely with our colleagues in climate and atmospheric science, who maintain the air quality monitoring network and conduct air quality research, and with the NSW Environment Protection Authority who, as you know, are responsible for regulating industry through environment protection licences and related mechanisms.

The New South Wales Government released a draft of the New South Wales Clean Air Strategy for consultation earlier this year. It notes that New South Wales is transitioning towards cleaner energy and implementing cleaner technology. The New South Wales electricity system is transitioning, with a large number of decentralised generators like wind, solar farms and other technology types connecting, while older coal-fired electricity generators are retiring. This will deliver substantial emission reductions and air quality improvements across New South Wales. The Government's Electricity Infrastructure Roadmap will facilitate the entry of new renewable energy generation to replace these existing aging coal-fired power stations. Also, the Government is currently considering the stakeholder submissions on the draft Clean Air Strategy and working towards releasing a final version shortly. Thank you.

The CHAIR: Thank you very much. I think we will commence with questions from Ms Abigail Boyd.

Ms ABIGAIL BOYD: Thank you. Could I just start with you, Dr Broome? You said that there is substantial benefit to improving air quality, which I think is pretty obvious. Thank you so much for the work that you have been doing on this and for quantifying those three categories or major sources of air pollution in this State. Are you able to quantify the health costs as a result of the power station air pollution in particular? Is that something you are able to do?

Dr BROOME: I am afraid it is not something that I have the right—I guess, the information available to be able to do that at the moment. I mean, there were some estimates in that paper from 2020 about the potential benefits of removing those emissions. I suppose I am just trying to, how can I say—so, for example, power stations are estimated to cause a loss of life years of around about 620 each year. So if you could reduce emissions you would remove a proportion of those. I am sorry, I will have to go to—there is quite a lot of information in these tables. Table 4 in my report says that if you were to remove all nitrogen oxide emissions, for example, from power stations you would reduce PM2.5 concentrations—so population-weighted PM2.5 concentrations—across the GMR by 0.14 micrograms per metre cubed. To try and put that in perspective, the national standard is eight and, give or take, most places in New South Wales would have an annual average PM2.5 concentration of around eight micrograms, depending a little bit on where you are. So it would reduce it by 0.14 in that context.

That, over time—so with some very general assumptions and why I think this work is not directly relevant to what you are considering, but if you assumed that power stations continued—if you had two options, one that they continued as they currently are or were in 2013 versus removing the emissions, then over time you would gain around about 38,000 life years amongst the people who were alive in 2013. Does that—sorry, it gets very—it is quite a complicated idea. In our paper, what we did was—it was a very simple thing in regard to quantifying what might the benefits of removing emissions, which was really saying if you carried on as we are you would have this level of exposure and if you removed emissions you would have a different level of exposure. Now, in reality, that probably is not the case because, as I understand it, well, power stations are scheduled to close and things otherwise, so there will be some reduction in power station emissions over time that we did not account for.

Ms ABIGAIL BOYD: I would love to just be able to look at the numbers of lives that we could save and the numbers of, you know, kids presenting with asthma that we could perhaps prevent. But, unfortunately, a lot of, I think, the issues in this particular bill are going to come down to the cost—on the one hand the health costs versus on the other hand the cost to these power stations of upgrading their technology. There was a number

thrown around earlier around health costs of around $2.5 billion or $2.4 billion per year. Is that something that came out of your report and, if so, what does it refer to?

Dr BROOME: Do you mind, I am just going to dig through my paper again. I just mentioned to you, for example, there a figure of 38,000 life years amongst the cohorts of people—so the five million people, for example, that were alive in 2013. We did quantify what that would be worth and I believe it was—so for NO2 it would be something around about the 1.8 billion mark, I believe and for sulphur oxides, 0.66 billion. But that is probably—that would be an overestimate of what you might achieve in reality because, as I said, power station emissions, as I understand it at least, are declining anyway because they are closing.

Ms ABIGAIL BOYD: I will ask you just one more question and then I will throw over to my colleagues so that I am not hogging all the time. We know that wood heaters are also contributing to air pollution and we know that the vehicles are as well. We heard from our last set of witnesses, I think, an argument that they felt unfairly picked upon. I am interested in how many wood heaters we have in New South Wales, like, how many points of pollution source we have when it comes to wood heaters and how many vehicles we have that are emitting pollution versus the number of power stations, which we know is five. Are you able to give us that?

Dr BROOME: I am afraid I do not have that sort of—

Ms ABIGAIL BOYD: Alright.

Dr BROOME: The Australian Bureau of Statistics publishes figures about household energy use and things like that, that give you an idea of the proportion of people. I am wondering if Ms Balmanno might have, as well, from a DPIE perspective, any insights?

Ms BALMANNO: No, we do not have exact figures on wood heaters either [disorder].

Ms ABIGAIL BOYD: But, presumably, it is many, many thousands. It is not—

Ms BALMANNO: Yes. But you also have the problem, obviously, that a lot of houses have wood heaters and they do not use them, so it is quite a hard number to quantify.

Ms ABIGAIL BOYD: Thank you. Chair, I will hand back to you.

Dr BROOME: Can I—just to follow up. Obviously, one of the issues—and I think this has been touched upon—is it is important where the emissions take place and it varies. So wood heaters in rural areas will have less of a health impact than wood heaters in, say, Sydney, where there is a much larger population. Cars, as well, will have a proportionately higher health impact than some other sources of pollution because they are emitting pollution where people are. There are some—again, if you go to my paper, there are some estimates about the relative—or the difference between the total quantity of emission versus the total health impact. You can see wood heaters and on-road vehicles have a relatively higher burden of disease. But the power stations, as well, relative to their particle emissions, have a relatively higher health impact as well and that is, I think, largely due to the secondary particle formation. So what we saw in the air pollution model that was used in our paper was that there was a relatively even spread of particle pollution from power stations across the GMR. That was not peaked at any particular location, but that is, I think, because there is a lot of atmospheric chemistry that goes into the production of secondary particles so they disperse, I suppose.

Ms ABIGAIL BOYD: Thank you. Very helpful.

The CHAIR: I would just like to ask a couple of questions. Have you done work on comparing how other countries around the world have been measuring what are acceptable and not acceptable levels of substances like nitrogen oxide and sulphur dioxide from emissions from power stations? Because we have heard evidence that the standard here in New South Wales is of a much lower standard in terms of the numbers of parts per million or parts per whatever in measuring these gases and toxins—that the standards are generally much lower for power stations in New South Wales than in most developed countries in the world. Has your department looked at this?

Dr BROOME: NSW Health does not get too involved in the technical aspects of air quality management, so I think that is a question for the EPA. They would be the ones that would be responsible for that sort of work.

The CHAIR: But surely NSW Health would take into consideration, just like other factors that might impact the people of New South Wales' health—is there not a part of NSW Health, which is meant to be looking after the health of the people of New South Wales, that has consulted with the EPA in looking at these issues, considering there have been quite a few concerns growing over the years about these very issues?

Dr BROOME: We are often in contact with the EPA. As I mentioned in my opening statement, we provide advice on a range of matters, but obviously air pollution is one of those and part of this work that we have

been talking about was actually funded by the EPA. They commissioned that work to look specifically at particular sources of air pollution. So I guess we have an effective working relationship to sort of take these things on. But I think the technical aspects of emissions controls on power stations is not something that we have specific views on because it is obviously, you know—what we do want to see is air pollution as low as reasonably achievable, from a health perspective.

The CHAIR: The Hon. Taylor Martin, do you have any questions?

The Hon. TAYLOR MARTIN: No, not at this stage.

The CHAIR: Okay. Ms Boyd?

Ms ABIGAIL BOYD: Thank you.

The Hon. PENNY SHARPE: Sorry, I have got questions. Thanks very much. One, I just wanted to know where New South Wales is up to in relation to wood heaters. I know it is slightly off topic but, given the contribution, I know that over probably several decades there has been an attempt to sort of wind that back. Are either of you able to give us an update on where that is up to?

Ms BALMANNO: The Government recently, as I mentioned, released the draft Clean Air Strategy earlier this year and that did actually seek feedback on various activities and programs to do with air quality and all the pollution sources, including wood heaters. That document did note that, at this stage, the Government is not considering a statewide ban on wood heaters. But we in the department, as well as with the EPA and working with local councils, are going to continue working with them to ensure that the information is out there for the correct wood heater use. We will also be continuing to gather evidence for potential future actions as well that the Government might be interested in taking.

The Hon. PENNY SHARPE: Great. Thank you. My second question is: Have you done modelling in relation to the electric vehicles announcement recently on the impact on air quality as a result, obviously, of the massive growth in electric vehicles in the market and on the road?

Ms BALMANNO: I understand modelling was undertaken. I was not involved in that, so I cannot speak with any authority. I could take that one on notice and provide the Committee with some information.

The Hon. PENNY SHARPE: Yes, if you could, that would be terrific. Thank you.

Ms BALMANNO: Yes.

The Hon. PENNY SHARPE: This is my last question and then I am happy to hand back to everyone else. One of Labor's concerns is the sort of transitional arrangements that would need to be put in place if this bill was actually put forward. Could you take us through the kinds of things that you would be looking at in terms of transitional arrangements?

Ms BALMANNO: Well, I suppose, probably the first thing I would say would be we actually do have some questions about how this bill would even operate legally in relation to the regulatory framework as it stands, because I note that these limits would be in the Act whereas the other limits are actually in the regulation. So there would be a bit of an issue in terms of how it would actually all work together from a legal and regulatory perspective. If we could get over those issues then I think any sort of transitional arrangements that the Government would want to get into with the generating companies would be a matter for the Government. Because I think, as the previous witnesses from Origin and Delta attested, it would take quite a number of years to get these technologies implemented and, obviously, very significant costs. So I think there would be a lot of negotiation on the Government's perspective.

The Hon. PENNY SHARPE: Thank you for that. That is helpful. I will ask one more question. I know that you are not from the EPA and you are not responsible for the load-based licensing arrangements, but I think it is probably a question to you, Ms Balmanno, around how you would see this interact or actually work with a load-based licensing arrangement?

Ms BALMANNO: As I said, there are some questions about how it would work, legally, in terms of the way it is drafted at the moment. But the load-based licensing framework operates quite separately—well, it is connected, but it operates quite separately to the limits that are in environment protection licences. So it would not necessarily change—this would not necessarily have any direct impacts on the load-based licensing, if that is what you are asking? That would have to be amended separately, yes.

The Hon. PENNY SHARPE: Yes, how they would interplay, that is right. So you could end up with, sort of, two systems is what I am—that would have to be dealt with, is my question.

Ms BALMANNO: Yes.

The Hon. PENNY SHARPE: Yes. Thank you. That is it from me.

The CHAIR: Thank you very much. Ms Boyd?

Ms ABIGAIL BOYD: Yes. Thank you. Just picking up on that point, we already have two systems in that we already have a set of restrictions as well as a load-based levy—sorry, limitations on emissions as well as a load-based levy. That is correct, is it not, Ms Balmanno?

Ms BALMANNO: Yes.

Ms ABIGAIL BOYD: You said you have got some legal concerns. As I am sure you are aware, the bill was drafted by the Parliamentary Counsel's Office and is intended to—and my understanding is it does—act to override the regulation to the extent of any inconsistency. Do you have any specifics about the legal concerns?

Ms BALMANNO: No. I am not a lawyer. That is just the advice that I have been given, that that would have to be something that the EPA would need to work through in terms of how they implemented the new policy.

Ms ABIGAIL BOYD: Okay. With respect, it seems quite simple that you would have certain limits. But, yes, if you do have any more information on that I would love to see it, because we are of course open to amending the bill to make it more legally robust if it is in fact a problem. Can I just ask you, Ms Balmanno, the Clean Air Strategy of the Government, when it comes to coal-fired power stations it seems to take the approach of "this thing is going to happen anyway, so we don't need to worry. We're going to phase out coal-fired power eventually, so we don't need to worry about the impact on air quality today." Is that fair?

Ms BALMANNO: I suppose I would more say that I think what some of the earlier witnesses have said is the Government is quite committed to a decarbonisation agenda and the Electricity Infrastructure Roadmap, in particular, is supporting the closure of the coal-fired power stations, and so with that comes the air quality improvements that we are talking about being needed today as well. So that is the Government's—so, I think, in terms of any opinion about whether or not that is the Government's policy, I think that would be a question for the Government.

Ms ABIGAIL BOYD: Fair enough. But there is nothing additional, is there, in the Clean Air Strategy, in relation to coal-fired power stations? There are no additional measures. It is just simply a statement that as we transition away from coal-fired power there will be less pollution from coal-fired power?

Ms BALMANNO: Yes, and it also talks about other sources of pollution as well, I suppose.

Ms ABIGAIL BOYD: Yes, of course.

Ms BALMANNO: And it also does refer to the regulatory framework—to the EPA's licensing and monitoring of power station compliance.

Ms ABIGAIL BOYD: Yes, but that is all pre-existing. It is not so much a strategy as a statement of fact.

Ms BALMANNO: Yes.

Ms ABIGAIL BOYD: So I think we can all agree that we cannot just turn the coal-fired power stations off tomorrow—the current energy network is in fact reliant on them and although we are transitioning and we are very pleased to see the Government moving in that direction, we have a number of years yet of these coal-fired power stations operating and pumping out significant levels of pollution. Do you think it is acceptable that we do not try to curb the number of deaths that are resulting from air pollution in the meantime—sorry, that is a question to you, Ms Balmanno—that is coming out of the coal-fired power stations? We know, based on the science, that the coal-fired power stations are estimated to lead to a certain number of deaths every year. Why has the Government not included consideration of that in its Clean Air Strategy? Do you know or is this not a question—and please tell me if I am unfairly asking you a question that really should be directed to the Minister.

Ms BALMANNO: I was actually going to say that. I think that is a more a matter for the Government in terms of the choices they have made, in terms of what is in the strategy.

Ms ABIGAIL BOYD: That is absolutely fair. Thank you, and apologies. Dr Broome, if I could come back to you. In the previous session there was a little bit of criticism raised about Dr Ewald's study, which we have heard a bit about today. Could you tell us your views in relation to that study?

Dr BROOME: Apologies, I did not see the previous session so I do not know the specifics. I mean, look, you can always criticise a study. I noticed—I did watch Dr Ewald. He was very polite. I mean, ours has produced lower numbers. I think what we have used—as I said in the opening statement—was, at the time, a

state-of-the-art emissions model. There is obviously uncertainty and I think that is probably the biggest issue with a lot of these sorts of health impact assessments, is around the exposure assessment.

We used an emissions model. As I understand it, Dr Ewald used evidence from a few points from the past coal speciation studies conducted by the Australian Nuclear Science and Technology Organisation [ANSTO] and CSIRO. If you were to ask me, I would suggest that that may be more likely to overestimate the quantity of coal-fired power PM2.5 by virtue of where the monitors that they collect them were, for example. But, I mean, the truth is always a little bit difficult to know and perhaps it lies somewhere in between. I would stand by ours. I think we used robust models. We put a lot of effort into making sure that the CSIRO's air pollution model was as good as it could be, but there is still uncertainty.

Ms ABIGAIL BOYD: Of course. But, yes, I guess the general conclusions from Dr Ewald's study are—you would not view them as being somehow irresponsible or—I am trying to find a polite word. You would not rubbish them? They are just from a—

Dr BROOME: Yes. And I suppose, perhaps, when doing these studies people come at them from a different perspective. So we have come at this from the point of view of trying to be as rigorous as we can with the science and probably erring on the side of conservatism, perhaps, in terms of the way we have done it. I do not know—I cannot speak for Dr Ewald's approach.

Ms ABIGAIL BOYD: If you had unlimited access to Government funds—let us just imagine—would it be useful and would it improve the quality of the research you are doing to have a greater network of independent air pollution monitors around the State? Do you think we have enough?

Dr BROOME: Just in relation to the specifics of this paper, it does not directly use air pollution monitors. It is a computer model. Obviously, I think that the model is validated by matching it to, say, checking how the model performs against what they measure on the ground. I mean, absolutely, there is always an argument for having more monitoring, but it comes down to the cost of that versus the benefit, always, and I do not have a—I am not in a position to say that we need more at this stage. I think, again—and Ms Balmanno might know more about it, but obviously DPIE have a very large network of air pollution monitors already, I think, and they are constantly considering whether they need more.

Ms ABIGAIL BOYD: From a health perspective, if we knew, for instance, that there was a particularly high risk of air pollution—so, say here where I am on the Central Coast, if we knew that today there was particularly bad coal-fired power station pollution overhead for whatever reason, what could we do or what action would we take to protect ourselves and try and stop the worst of the impacts?

Dr BROOME: So, typically, there is already an air quality information system and an alert system, that I suspect you are aware of? Yes. Each day—and, sorry, I do not want to tread on Ms Balmanno's toes—DPIE predict what air pollution is going to be in the coming days and they use that to alert people if it is likely to be poor. Generally speaking, in New South Wales, the issues that lead to poor air quality are bushfires or hazard reduction burns or, in winter as well, just inversion layers—so when people are lighting up their wood heaters and it is cold and you get an inversion layer so that the smoke settles. So, typically, those are the things that cause high air pollution—or dust storms, is the other thing. It is pretty unusual and I have not heard that you get—all these other sources tend to produce air pollution at a fairly constant and consistent way, so they do not tend to lead to high exceedances, high 24-hour averages.

Ms ABIGAIL BOYD: I understand.

Dr BROOME: There is that system and so if you are alert to it and you know you are someone who is more sensitive, the idea is it helps you to take action and that action ranges from cutting back on outdoor physical exercise to staying indoors more, depending on the level.

Ms ABIGAIL BOYD: So if you had chronic asthma and you were potentially being triggered by particular pollutants coming from coal-fired power stations your option, really, is to stay indoors?

Dr BROOME: Yes, and I would always urge you to seek the advice of your doctor to make sure that, if you are having chronic symptoms, you are getting all the treatment that you can to get on top of those. One of the challenges with air pollution science is that it really does not give us a great deal of information about what it means for individuals. A lot of it is done at a very, sort of, broad population scale. So I think part of the messaging is always that people have to know how they respond themselves and if they do find that, for example, on smoky days that they are more sensitive, those people should be more cautious and those people should—again, if you are asthmatic and you know that smoke is a trigger, make sure you are talking to your doctor so that you have got the best plan possible.

Ms ABIGAIL BOYD: Can I just ask you one more question and then I will see if my colleagues have any questions. We have been hearing a lot, as the public awareness of air pollution is getting better and people are understanding the risks of air pollution more, about the message to perhaps close your window or to stay indoors when things are particularly bad or that just limiting it, if it is a chronic thing, would be a good thing to do. Please do tell me if this is outside of your expertise, but when we combine that with advice in relation to COVID and keeping good ventilation, opening windows up—particularly in our schools—would we expect, if we continue to live in this sort of—so there are a lot of assumptions here, but would we expect if we continue to live with those sorts of COVID restrictions that we might see an increase in the impact of air pollution on general health?

Dr BROOME: That is a very difficult question. I think, obviously, we want to do what we can to reduce people's exposure to air pollution generally. Obviously, COVID is something that we are also mindful of and currently we obviously do grapple with those sorts of issues, and we are working through what that advice should be. But, generally, I think one of the challenges with it is trying to provide people with balanced advice which is likely to provide an overall benefit for them insofar as for most people, under most circumstances, the risks of air pollution are relatively small. That is not to say some people are certainly at higher risk and some people will certainly experience symptoms at low levels of air pollution. But, by and large, most people will either not experience symptoms or will experience mild symptoms. So it can often be quite a nuanced message for people to make sure that those at greatest risk are able to take action but, at the same time, not hindering unnecessarily the lives of people who perhaps are less susceptible.

Ms ABIGAIL BOYD: I guess the point I am trying to make here is that it is incredibly difficult to avoid air pollution, is it not?

Dr BROOME: Yes. Absolutely. Since the bushfires—I do not know if you are aware—the New South Wales air quality information system has evolved somewhat, so we are now providing hourly PM2.5 information, for example, which was not the case before. The idea of that is, whilst we do not know precisely what the health effects of an hourly change in PM2.5 are, it does provide people with a fairly immediate indication that perhaps, especially if they are experiencing symptoms, now is a good time to take action. So we are constantly improving these systems to try and keep abreast of, I guess, the emerging evidence.

Ms ABIGAIL BOYD: Thank you. I could go on, but I will just pause to check if anyone else wants to ask a question.

The CHAIR: At the moment, there does not seem to be anybody else seeking questions, so you can either continue or we can wrap up. It is up to you.

Ms ABIGAIL BOYD: I will just ask a few more questions, thank you.

The CHAIR: Sure.

Ms ABIGAIL BOYD: Again, back to you, Dr Broome. Is it fair to say that we have seen significant additional research in relation to air pollution come out in the last five to 10 years and the understanding, I guess, of the scientific community improve around air pollution impacts?

Dr BROOME: Yes, I mean, I think that is certainly the case. My own opinion is that particularly what we have seen recently is air pollution studies conducted at lower levels of air pollution—well, probably at both ends of the spectrum. We have seen big air pollution studies conducted in China, where air quality is—or, actually, China and other places with relatively poor air pollution. But, at the same time, in the United States of America air quality has improved dramatically over the last 20 years or so, so we are seeing more and more evidence of that—the effects of air pollution at low levels.

So, for example, if you looked at the 2005 WHO air quality guidelines, they had a cut off at 10 for PM2.5. That was really because there was no evidence at that stage that supported the hypothesis that there were health effects below 10. Subsequent to that, we have seen a number of cohort studies in places like Canada and other parts of the United States where people are now living at levels of five or six, sort of similar to what we have in New South Wales. So we have got much more clear evidence now that there is no threshold at 10. We have assumed there has been no threshold at 10 for some time, but there is now pretty good evidence to support that, which was perhaps lacking, you know, 10 or 15 years ago.

Ms ABIGAIL BOYD: So, given that, I guess when we look at our regulations in New South Wales we have the same limits on all sorts of pollution. Nothing has changed since 2010. In 2010, the regulation is put in place and we set limits for all forms of different pollution, including coal-fired power stations and other types of industry. We come to 2021 and nothing has changed. Would you expect that we would at least have increased those or, I guess, strengthened those limits a little bit in that time to reflect that growing body of knowledge?

Dr BROOME: I am just wondering if Ms Balmanno might like to say anything about the air pollution standards?

Ms ABIGAIL BOYD: Thank you, that is probably more appropriate. Ms Balmanno?

Ms BALMANNO: I assume you are talking about the National Environment Protection Measure, the ambient air quality standards under—

Ms ABIGAIL BOYD: No. No, sorry, I am talking about—

Ms BALMANNO: No?

Ms ABIGAIL BOYD: —under the New South Wales legislation, the clean air regulation.

Ms BALMANNO: So, specifically, the power station limits?

Ms ABIGAIL BOYD: No, the clean air regulation that applies to all—that was just reinstated in 2021.

Ms BALMANNO: But what standards are you referring to, sorry?

Dr BROOME: Sorry. I just wanted to, I guess, make the point that since two thousand and—sorry, I do not remember the precise years, but obviously we have now the PM2.5 standard which we did not do in 2010. I believe there has just been a revision of the NO2 standards and a whole range of other NEPM standards. So there is—there has been uptake of a lot of the new and emerging evidence and each time those standards get updated they do take those things into account. So it is not—so NSW Health is only indirectly involved in this stuff. The other thing, I suppose, to mention is that the PM2.5 standard, until the recently published WHO guideline, in New South Wales has been below the WHO's guideline. So I do not think it is quite fair to say that things have not changed in light of the emerging evidence.

Ms ABIGAIL BOYD: Thank you. So they have made their way into the national standards, they have just not made their way then into the New South Wales clean air regulations. Is that correct, Ms Balmanno?

Ms BALMANNO: Yes. The national standards are for ambient air quality, whereas the clean air regulation has specific limits for particular sites and facilities. So the national standards are used in terms of trying to determine the policy and how you apply that at particular locations and sites, but the actual national standards do not appear in the legislation per se, if that makes sense?

Ms ABIGAIL BOYD: Okay. But if our ambient air standards are tightened up from a national level you would expect that to come down to also tightening up individual polluter restrictions as well. You would expect an overall tightening up to reflect the new science?

Ms BALMANNO: It might, in some cases. The main thing that it does actually impact is the processes that the EPA uses in terms of the advice they provide on individual environmental impact assessments that are done for new developments. So they actually have their own document that has guidance in terms of how they assess those and what they consider. The national standards do impact how the EPA operates that process.

Ms ABIGAIL BOYD: Okay, but the EPA cannot require the power stations to meet a stricter limit than what is under those regulations. That is correct, is it not?

Ms BALMANNO: The EPA does have the power under the regulation to have an alternative limit, yes.

Ms ABIGAIL BOYD: A stricter limit than they do in the regulation?

Ms BALMANNO: They could, but—so, technically, a lower limit, yes.

Ms ABIGAIL BOYD: Sorry.

Ms BALMANNO: So, yes, they can.

Ms ABIGAIL BOYD: They could but they have not? So, for example, at Vales Point—

Ms BALMANNO: I think, actually, for a couple they have.

Ms ABIGAIL BOYD: Vales Point has a 10-year exemption, I believe, from one of the restrictions. Sorry, I do not have the data in front of me.

Ms BALMANNO: So, for example, for the particles limit the licences are actually tighter for some of them than the regulation at the moment.

Ms ABIGAIL BOYD: Okay. For some of them, though they do have exemptions from the regulations as well, do they not?

Ms BALMANNO: Yes, they do have an alternative limit. Also for NOx, I note that a few of them have a much tighter limit than the regulation. So, yes, the EPA does have the flexibility and that is the whole point of the regulatory framework the way it is designed at the moment. You have the very highest number in the regulation but then you actually have a lot of flexibility in the regulation for the EPA to actually determine the appropriate limits for each particular facility based on geography, the age of the facility—you know, all sorts of—potential future closures, all those sorts of things they have to consider in terms of setting those limits.

Ms ABIGAIL BOYD: So why would Vales Point's emissions limits be so much more lax than the other power stations? Would that be on the basis of its age?

Ms BALMANNO: That would be a question for the EPA, who made the decision to—yes.

Ms ABIGAIL BOYD: Thank you.

The CHAIR: Sorry, just for clarification there, is your evidence that the age of a facility and the fact that it is likely to be closing in, say, the next one to five years, is actually taken into account in determining the amount of pollution it can expel? So because it is an older operator and it would be finding it much harder to get the levels of, say, nitrogen oxide or sulphur dioxide down it would have to spend a lot more money—just because it is older and is going to become redundant, that is factored into the determination as to the health of the air that people breathe?

Ms BALMANNO: I am—again, it is probably a better question for the EPA. I think when I was referring to the age I was more referring to the type of technology that the plant has and in terms of what control technology is available and possible to be implemented at the various sites, because each site is obviously different. So I was not really commenting on that aspect that you are referring to.

The CHAIR: Yes, I understand. You are just aware that—

Ms BALMANNO: Yes.

The CHAIR: —that is no doubt a factor that is taken into account?

Ms BALMANNO: Yes.

The CHAIR: Okay, if there are no more questions, I think we can probably close that part of the hearing today. Do any other members have questions? Witnesses, thank you very much for your evidence. It is very helpful. I think you have taken on notice some questions. Because of the quick turnaround on this inquiry, if you could have the answers to those questions to us by the end of next Friday, that would be very much appreciated.

SECRETARIAT: On receipt of the transcript—they will need to get the transcript first, Chair.

The CHAIR: Who does?

SECRETARIAT: These witnesses.

The CHAIR: I think you need to get a copy of the transcript—the specific transcripts—for comment, for you particularly, Dr Broome. Okay. Thank you very much everybody.

(The witnesses withdrew.)

The Committee adjourned at 14:19.