Doctors for the Environment Australia
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# DEA Particle Assessment Report Port Augusta 2012

Data supplied by EPA South Australia for the period 2005-2011.

## Introduction

Port Augusta is home to South Australia's coal fired power stations that have supplied electricity since 1963 (Playford Power Station) and 1985 (Northern Power Station) and supply greater than 30% of the States power needs.[1]

These power stations utilise brown coal from the Leigh Creek mine, which is transferred via rail to the facility in Port Augusta. The operation stockpiles brown coal to be used in the two power stations between supply transfers via a rail link from Leigh Creek.

DEA is interested in the development of clean and renewable electricity production to reduce the harm to community's health and as such does not support the continued use of coal for energy generation.

http://dea.org.au/images/general/Coal_Policy_Document.pdf

http://dea.org.au/images/general/Briefing_paper_on_coal_2011.pdf

DEA supports and advocates for the installation of available non-fossil fuel technology to replace coal fired power stations eliminating the health burden on Australian communities.

We do not support the use of gas because of its health impacts

http://dea.org.au/images/general/Gas_and_Health_Report_01-2012.pdf

Recently DEA has accessed particle data regarding the operations in Port Augusta and the following is the assessment of the data.

## Background

### What are particles?

Particles can be a mixture of many different components that can be drawn from multiple sources.

Particles come in a range of sizes and these can be classified by their maximum size. For example a $PM_{10}$ refers to particulate matter less than 10 millionths of a metre in effective diameter, while $PM_{2.5}$ refers to particulate matter less than 2.5 millionths of a metre in effective diameter. This would mean that the particles represented by $PM_{10}$ all have a diameter of between 0.1 and 10 micrometers (0.1 represents the limit of filter pore size).

[1] http://alintaenergy.com.au/assets/generation/flinders/

## Why is size important?

Size is important, as it will provide a good guide as to how far a particle will be able to penetrate into the lungs of an individual. For example $PM_{10}$ particles are the cutoff point at which particles will be able to enter the human respiratory anatomy[2], while $PM_{2.5}$ particles are able to enter deeper into the lungs and reach many alveoli (air sacs in the lungs).

Larger particles are effectively removed from the air that is breathed in by physiological mechanisms of the human respiratory tract. These include nose hairs, mucus membranes in the nose and throat and the coughing mechanism used to expel particles from the upper airways.

## Why measure particles?

Particles are important to measure as it provides an estimate of risk regarding the potential health effects of particle pollution. There is no safe level of particle pollution at the smaller size fractions. This means that at very low levels , health effects are beginning to occur. The higher the level of fine particle pollution breathed in, the higher the risk of a health effect. This is compounded by the duration and level of exposure to ambient air pollution and other sources of particles experienced at work or socially (smoking).

## What are the standard levels to protect health?

The National Environment Protection (Ambient Air Quality) Measure was introduced in all States in Australia in 1998 and aimed to have compliance in 2008.

Revisions to the NEPM included a reporting standard for PM2.5 in 2003 and an investigation standard for Air Toxics (or organic pollutants) in 2004.

This protection measure is aimed at ensuring that undue health effects of air pollution are prevented or appropriately managed in each State to ensure the health of communities that may live in or around major populated centres or pollution sources.

Standards exist for $PM_{10}$ particles and gaseous pollution that provides the higher limits permitted or the number of days these levels can be breached.

These include:

| | NEPM Standard | NEPM Goal |
|---|---|---|
| $PM_{10}$ | 50 $\mu$ g/m$^3$ daily average | Less than 6 days in a year *(Allows for natural events)* |

The World Health Organisation also has guidelines for the safe levels of PM10 pollution and assessments against these would be made.

| | WHO Standard |
|---|---|
| $PM_{10}$ | 50 $\mu$ g/m$^3$ daily average |
| $PM_{10}$ | 20 $\mu$ g/m$^3$ annual average |

The DEA policy on ambient air pollution is at
http://dea.org.au/images/general/DEA_Air_Pollution_Policy_03-12.pdf

## Why is DEA concerned about Port Augusta?

DEA has become aware of increased rates of lung cancer[3] and levels of childhood asthma in Port Augusta and are concerned that the levels of pollution from the coal fired power stations

[2] Wood-Black F. (2012), Journal of Chemical Health and Safety, Vol 19 Issue 2.
[3] See www.dea.org.au

are contributing to the elevation in these cases. Coal pollution has long been associated with health effects and as such an investigation into the levels of air pollution in Port Augusta was conducted.

## Pollution levels - Data analysis

DEA have accessed ambient air particle data form 4 locations in Port Augusta from the EPA in South Australia that have shown high levels of pollution data in the past. The data is for the period from 2005 to 2011 and is measured via a method that provides for 1 day in 6 monitoring.

This method provides for cycling of monitoring throughout the week to ensure that every day of the week is monitored on a number of occasions that will limit bias due to weekday and weekend effects.

However it should be noted that this only provides information regarding 16.67% or the equivalent of 2 months worth of days assessed, with the remainder of the year not assessed.

Data was calculated such that any day that had one or more sites with $PM_{10}$ levels greater than 50 $\mu g/m^3$ indicated the region was in exceedence

Data from 2005 to 2011 outlined in figure 1 below showed numerous events that were above the national standard and in 2007 more than twice the number of days were above the goal that is specified as acceptable under the NEPM (Ambient Air Quality).

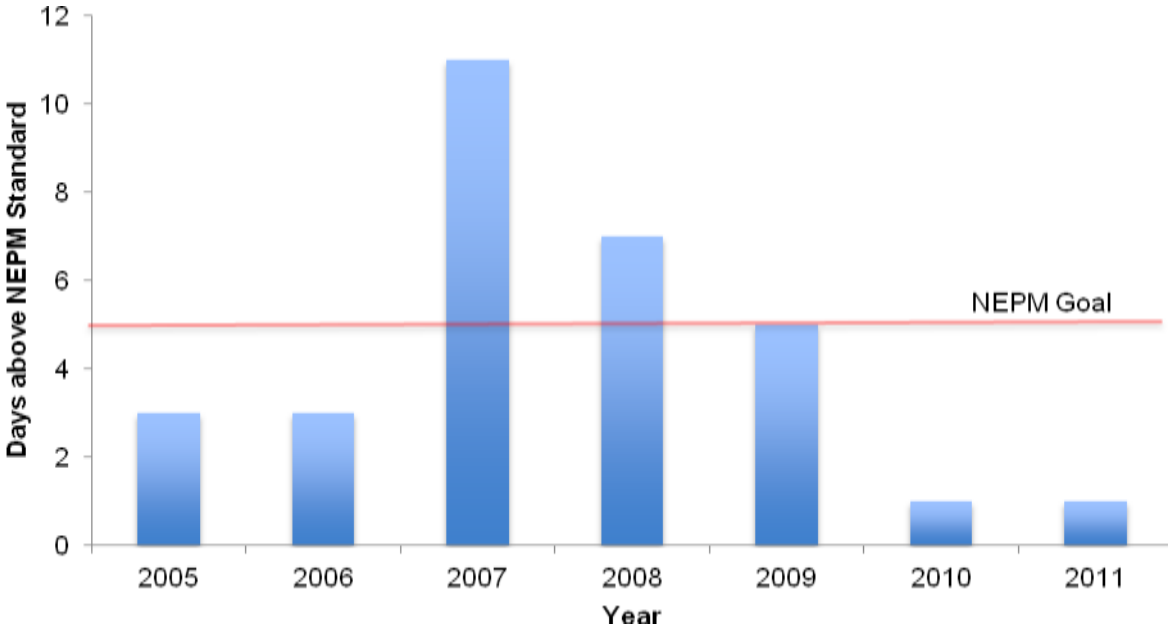


Figure 1: Graph showing the number of days that were above the NEPM (Ambient Air Quality) standard and indicating the goal of 5 exceedences of the standard per year.

As shown in figure 1 the levels of particles measure in 16.67% of the year are in excess of the NEPM goal (2007 and 2008) for the number of days where measured $PM_{10}$ is greater than the National Standard. In 2007 the levels were greater by more than double the levels deemed acceptable thus increasing the risk to community health in Port Augusta. This

signifies that nearly one day in five, or almost 20% of the samples, in the Port Augusta region in 2007 were greater than the $PM_{10}$ NEPM Standard. Given the monitoring regime this is the "best case scenario" for $PM_{10}$ particle in Port Augusta in 2007. There is little reason to suggest that exceedences would not have occurred on occasions in the remaining 83.3% of the year that was not monitored.

Unacceptable $PM_{10}$ impact was again observed in 2008 with the number of days being 40% greater than the accepted goal as specified under the NEPM. Other years showed high event days that were less numerous however monitoring would be taken to be representative of the year. On occasions particles noted on filter samples have been coal like and suggested to be coal that has been transported from the facility to the community.

### Extrapolation of 1 day in 6 sampling

Extrapolation of any events measured can be applied without affecting the annual average, maximum or minimum levels attained throughout the year. For example if the conditions were to be repeated identically on 5 more occasions each throughout the year the average, maximum and minimum pollution levels would remain the same.

Using the monitored data as a representation of the levels of $PM_{10}$ measured during the year and keeping in mind and there being 6 times as many days in a year as are sampled, a simple extrapolation of data might be carried out to apply the same pattern of pollution levels collected across a year. This is shown in figure 2.

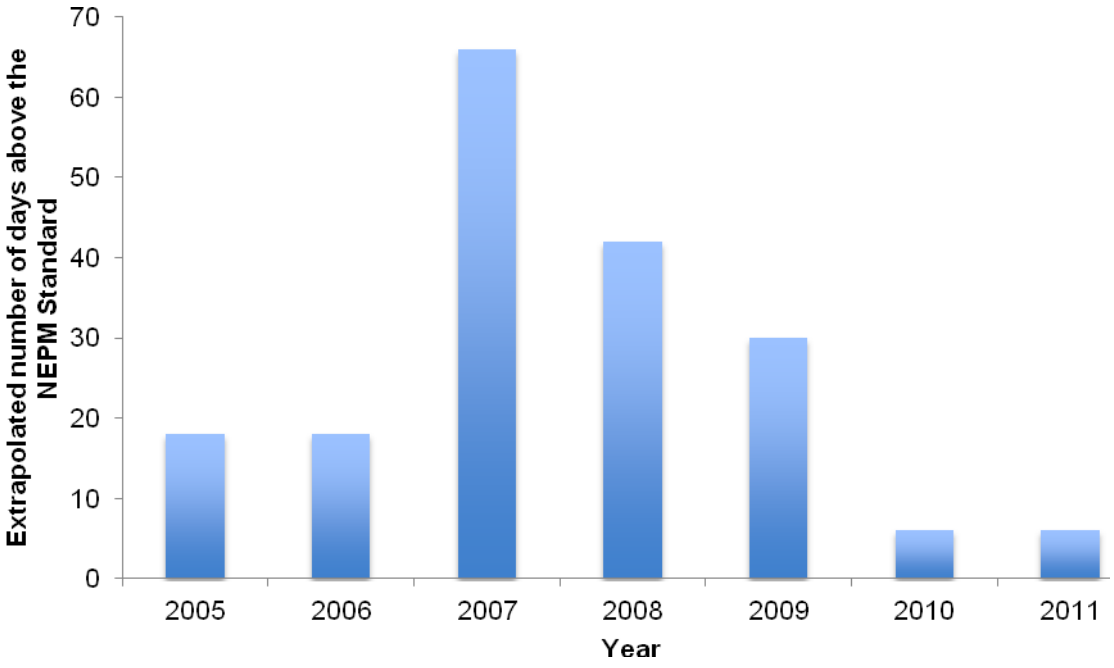


Figure 2: Graph showing the extrapolated number of days that were above the NEPM (Ambient Air Quality) standard and indicating the goal of 5 exceedences of the standard per year.

Clearly if this simple pattern extrapolation is conducted the levels of pollution that are estimated from monitored data show an excessively high exposure of the community in Port Augusta to $PM_{10}$.

It can also be assumed that there may be more, or less high level events across the year during the non-assessed days. This potentially could increase the number of days of impact

above or also decrease the number of events to be as lower than outlined in figure 2, but the number of days would never fall below those outlined in figure 1.

Further analysis of data from the sampling sites in Port Augusta shown in table 1 highlight the level at which the maximum daily value was in Port Augusta in each year.

| | | PM10 ($\mu$ g/m$^3$) | |
|---|---|---|---|
| Year | Days > NEPM Standard | Region Maximum | Regional Maximum Annual Average |
| 2005 | 3 | 195.6 | 21.3 |
| 2006 | 3 | 96.9 | 22.3 |
| 2007 | 11 | 400.1 | 36.0 |
| 2008 | 7 | 78.2 | 25.2 |
| 2009 | 5 | 136.4 | 22.1 |
| 2010 | 1 | 113.3 | 15.3 |
| 2011 | 1 | 113.5 | 16.0 |

Table 1: $PM_{10}$ summary table of regional maximum and days above the NEPM Standard.

Regional maximum values can be seen to be up to eight times the daily limit in 2007 and nearly double the daily standard during most other years.

The regional maximum annual averages were calculated to compare to the World Health Organisation's annual average guideline (20 $\mu$ g/m$^3$) and can bee seen to be above this limit from 2005 to 2009.

La Nina weather patterns have been suggested to be a reason for the decreased PM10 levels in 2010 and 2011, however the Bureau of Meteorology has at the time of this report indicate that historically after two years of a La Nina weather pattern there is a 70% chance of reverting to a neutral or El Nino weather pattern. This would likely increase the levels of particles again to unacceptably high levels increasing the PM10 levels in the Port Augusta region.

## Conclusion

Data presented in this report show periods of unacceptably elevated $PM_{10}$ levels that increase the health risks for the Port Augusta community.

Monitoring that is indeed designed to be representative (cycling throughout the week) might be further extrapolated and becomes suggestive of excessively high levels indicating a much higher risk toward the health outcomes of the residents within the local community.

Given that power generation is a continuous operation there is limited opportunity for the community to be relieved of background elevation of $PM_{10}$.

It is for these reasons that DEA continues to seek to support the introduction of renewable generation technologies for electricity within the Australian communities to protect the health of individuals, communities and reduce the public health burden of yesterday's polluting technology.