IN THE MATTER OF
The Hazelwood Coal Mine Fire Inquiry

STATEMENT OF JANE ELIZABETH BURTON

Date of Document: 17 July 2015
Filed on behalf of: The State of Victoria
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Attention: Andrew Suddick

I, JANE ELIZABETH BURTON, of 55 Grey Street, Traralgon, Victoria, Director of Coal Resources, Department of Economic Development, Jobs, Transport and Resources can say as follows:

A. Introduction

1. My full name is Jane Elizabeth Burton.

2. I am the Director of Coal Resources, in the Energy and Resources Division, at the Department of Economic Development, Jobs, Transport and Resources (**DEDJTR**) based at 55 Grey Street, Traralgon, Victoria.

3. I have been in this role since August 2014. Coal Resources undertakes resource and land use planning, project facilitation and stakeholder and community engagement to inform the potential future use of coal in Victoria in a low carbon emissions future.

4. I include a summary of my academic qualifications and professional history at Annexure A to this statement. Relevantly, I have a Bachelor and a Master of Applied Science, and worked for 13 years as a research associate and as a chemist with respect to brown coal, noting that I have not worked in a professional capacity as a chemist since the early 1990's.

5. This Statement has been prepared pursuant to the request made by the Hazelwood Coal Mine Fire Board of Inquiry by letter of 30 June 2015 and by a further letter of 7 July 2015 (the **Letters**).

6. I note that the Letters request that this witness statement cover the following topics:

   6.1 a description of the features of the coal mined in the Anglesea mine;

   6.2 identify the principal differences between that coal and the coal mined in the Latrobe Valley. In particular:

6.2.1 whether there is a difference in moisture content;

6.2.2 whether there is a difference in sulphur content;

6.2.3 whether there is a difference in heat value;

6.2.4 whether the coal is more or less flammable;

6.3 describe the implications of these differences, if any, on the:

6.3.1 likelihood of fire arising from or impacting on the Anglesea mine compared to the likelihood of a fire arising from or impacting on a mine in the Latrobe Valley; and the

6.3.2 consequences to the environment and the health of the population of Anglesea of a fire taking hold in the mine.

7. My statement addresses the matters in paragraphs 6.1 and 6.2.1, 6.2.2 and 6.2.3 above.

8. The statement of Ross Gregor McGowan, Executive Director of the Earth Resources Regulation Branch (**ERR Branch**) at DEDJTR addresses, among other things, the matters in paragraphs 6.2.4 and 6.3 above.

9. The information contained in paragraphs 10 to 30 of this witness statement is derived from research I have carried out and advice from officers of DEDJTR and is accurate to the best of my knowledge, information and belief.

B. Preliminary

10. Victorian brown coal has been mined and studied since the 19th century. The composition of the coal available to be mined and the ratios of overburden to coal or mining characteristics has influenced where and when coal has been mined.

11. In Victoria, government agencies and licensees have tested the composition of coal in order to assess its quality initially for the purpose of generating electricity but subsequently for other applications. The more energy that can be generated from a given unit of coal the higher is its quality for power generation (subject to its mineral and inorganic content being at appropriate levels to not cause issues with ash fouling and the cost of recovery of the coal being considered) . In practice, coal quality for power generation is determined by its percentage of moisture content and hence net wet calorific value assuming that ash and sulphur content are both low. The higher the percentage of moisture content, the more energy is consumed in drying the coal as part of the combustion process and the less energy is available for generating electricity. The act of drying requires energy that is lost to the electricity generation process. The wet coal has a lower energy content than dry coal, although on a dry basis the energy content of all Victorian brown coals are similar. It should however be noted that moisture is not the only factor that is important in assessing coal quality. Other parameters such as mineral and inorganics, sulphur, volatile matter and ash quantity and composition are all relevant to coal quality and all have significance depending on the end use of the coal.

12. The heat value or energy content of the coal is described by the Net Wet Specific Energy or sometimes the Gross Dry Specific Energy. A formula has been derived that determines the Net Wet Specific Energy from the Gross Wet Specific Energy as follows:

> NWSE = GWSE – 0.206H – 0.023M
>
> where H is the percentage of organic hydrogen in the coal on a wet basis, and M is the percentage of moisture in the sample. (The net wet specific energy takes into account the non-recoverable latent heat of vaporisation of the water formed and of that present in the coal that is lost to the atmosphere) It is considered that NWSE provides a better practical assessment of a coal as an energy source[1]. Sometimes GDSE is also referred to as Higher Heating Value or HHV and Net Wet Specific Energy referred to as Lower Heating Value or LLV.

13. The data collected on coal quality along with the cost of mining, reflects these fundamental economics of the coal-fired electricity generation industry in Victoria. Our knowledge of coal derives from three main activities:

13.1 testing of coal obtained from bores drilled by the State Electricity Corporation of Victoria (**SECV**) before privatisation;

13.2 testing of coal obtained from bores drilled by licensees after privatisation; and

13.3 routine production testing on coal mined and consumed in the power stations.

14. The knowledge acquired from these tests is stored in five main sources:

14.1 Gloe, C.S. "The economically winnable Brown Coal reserves in the Latrobe Valley", 1980;

14.2 Durie et al, *The Science of Victorian Brown Coal: Structure, Properties and Consequences for Utilisation* (1991). This book was prepared with a strong reliance upon SECV coal testing and utilisation experience;

14.3 work plan variation applications prepared by licensees. These rely upon a combination of SECV data and in-house and outsourced testing via registered laboratories;

14.4 information contained within annual production and royalty return documentation from each of the brown coal miners; and

14.5 routine production testing on coal mined and consumed in the power stations.

15. It is these sources, in addition to my own expertise and experience, which form the basis of this statement.

[1] Durie et al, *The Science of Victorian Brown Coal, Structure, Properties and Consequences for Utilisation* (1991).

C. Coal mined in Victoria

16. Brown coal is located in three basins:

    16.1 Gippsland Basin;

    16.2 Otway Basin; and

    16.3 Murray Basin.

17. The brown coals were deposited in these basins during the Tertiary age (less than 65 million years).

18. The Anglesea coal mine is located in the Otway Basin. The three operating Latrobe Valley coal mines are located in the Gippsland Basin.

19. I have set out the characteristics of the coal mined at the four Victorian coal mines in Table 1.

Anglesea

20. Three groups of coal seams are present in the sub-surface in the Anglesea area. The uppermost and thickest group is Group A. It is up to 36 m thick. This is the only coal seam which has been mined at the Anglesea coal mine. The Anglesea coal is the highest rank brown coal being mined in Victoria and can be considered to be approaching a hard brown coal.[2]

21. The composition of the brown coal deposits in the Gippsland Basin differs from that at the Anglesea coal mine. Indeed, there are also notable differences between the three Latrobe Valley coal mines.

Yallourn

22. Coal from the Yallourn coal seam is mined at the Yallourn coal mine. This is the topmost and youngest coal seam.

23. The Yallourn coal seam has the highest moisture content per unit of coal mined of the three coal seams that are mined in the Latrobe Valley.

Hazelwood

24. Coal from the Morwell 1 coal seam is mined at the Hazelwood coal mine. Currently the Hazelwood mine is mining in the West Field.

Loy Yang

25. Coal from the Morwell 1 and Morwell 2 coal seams is mined at the Loy Yang coal mine.

Analysis

[2] George, AM, Economic Geology of Australia and Papua New Guinea, The Australasian Institute of Mining and Metallurgy, Chapter 2 Coal, 1975

26. Table 1 provides data for moisture (%ar), Sulphur (%db) and NWSE (MJ/kg). Two sources of data are provided, one is cited from Gloe (1980) and the other from data provided to the Department by the individual mine operators.

27. Acronyms used are:

27.1 ar = as received;

27.2 db = dry basis;

27.3 NWSE = net wet specific energy (sometimes referred to as lower heating value); and

27.4 GDSE = gross dry specific energy (sometimes referred to as higher heating value).

28. See paragraph 12 for a more detailed description of NWSE and GDSE.

TABLE 1 – Moisture, Sulphur and Specific Energy for Four Coal Mines

	Moisture (% ar)		NWSE (MJ/kg)		Sulphur (% db)	
Data Source	Data from mine owner	Gloe[3]	Data from Mine owner	Gloe	Data from Mine owner	Gloe
Yallourn Mine	65.18[4]	64.0	6.83[5]	7.1	0.29	0.29
Hazelwood Mine	60.12 - 63.28[6]	60.9	8.15[7]	8.5	-	0.36
Loy Yang Mine	61.92[8]	62.1	8.2[9]	8.0	0.42	0.35
Anglesea Mine	44.7[10]	46.2	12.89[11]*	12.33*	3.3[12]	3.9

*Calculated from GWSE data according to the formula cited earlier

[3] Gloe, C.S. "The economically winnable Brown Coal reserves in the Latrobe Valley", 1980.
[4] Average moisture reported (2013/2014) to the ERR Branch.
[5] Average NWSE reported (2013/2014) to the ERR Branch.
[6] Moisture reported in EES, West Field Extension, Main Report Volume 1, 2004
[7] Average NWSE reported (2013/2014) to ERR Branch
[8] Average moisture reported (2013/2014) to the ERR Branch.
[9] Average NWSE reported (2013/2014) to the ERR Branch.
[10] Average moisture reported (2000-2011) in Alcoa Anglesea Power Station Mine Work Plan, Sept 2011, page 6
[11] Average NWSE reported (2000-2011) in Alcoa Anglesea Power Station Mine Work Plan, Sept 2011, page 6
[12] Average sulphur reported (2000-2011) in Alcoa Anglesea Power Station Mine Work Plan, Sept 2011, page 6

29. It should be noted that samples taken from the mines do not differentiate between seams, rather a "run-of-mine" sample is taken that is representative of the area being mined. The above table provides data that has been sourced from documentation provided by the miners to ERR Branch for various purposes.

Comparison

30. The data presents a consistent picture. Coal mined at the Anglesea coal mine tends to have a lower average percentage of moisture content, and hence a higher net wet specific energy, than coal mined at the three Latrobe Valley coal mines. The sulphur content of coal mined at Anglesea coal mine is higher than that mined at the three Latrobe Valley coal mines.

Dated: July 2015

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JANE ELIZABETH BURTON

ANNEXURE A

Qualifications

Master of Applied Science (2001)

Supplementary Studies – Applied Science (1986)

Bachelor of Applied Science (1982)

Professional employment

August 2014 to present	Director, Coal Resources, Department of Economic Development, Jobs, Transport and Resources
July 2013 to July 2014	Manager Stakeholder and Community Relations, Department of State Development, Business and Innovation
January 2010 to July 2013	Manager Coal Planning, Stakeholder & Community Relations, Department of Primary Industries
January 2006 to January 2010	Manager Transit Cities, Latrobe City Council and Manager, City Planning and Development (for five months in 2006 to cover a temporary vacancy)
December 2004 to December 2005	Manager, Agriculture Program, WorkSafe
September 2000 to December 2004	Industry Specialist, Rural Commerce Unit, Regional Development Victoria
July 2004 to December 2004	Executive Officer, Latrobe Valley Ministerial Taskforce
November 1999 to August 2000	Corporate Projects Officer, South Gippsland Shire Council
July 1996 to August 2000	Short Course and Business Manager, EEA Group

1995 to 1996	Post-graduate student, Monash University
1992 to 1995	Senior research associate, Monash University
1989 to 1992	Chief chemist, Brown Coal Liquefaction Victoria Pty Ltd
1987 to 1989	Senior chemist, Brown Coal Liquefaction Victoria Pty Ltd
1985 to 1987	Chemist, Brown Coal Liquefaction Victoria Pty Ltd
1982 to 1985	Research associate, Monash University