Development and Use of Victorian Brown Coals

By

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Victorian Brown Coal Forum, Fukuoka, 6th October 2015

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Early Victorian Brown Coal Exploration

1860-1890	Brown coal was discovered at many locations around Victoria while searching for gold, black coal or water. Few if any analyses were reported.
1873-1889	First Latrobe Valley discoveries in 1873 led to the 'Great Morwell Coal Mine' operating in 1888, north of the river. It produced up to 4,000 t/yr brown coal (50% moisture) and a few briquettes, before closing in 1898.
1894-1924	Mines Dept drilling south of Latrobe River defined a sufficient coal resource for a larger development at Yallourn and led to the creation of the State Electricity Commission Victoria (SECV) in 1919.
1924	The Great Morwell Coal Mine (re-named Yallourn North) was transferred to the SECV in 1924. It continued to operate intermittently as a reserve for SECV operations and to supply higher heating value coal for industry. Production peaked at 1.5 Mt/yr in 1950's before closing in 1963.

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SECV Exploration 1922 to 1980

1922-1955	SECV designed the Yallourn power station assuming the same 50% moisture content as YNth across the river. However, initial mining showed Yallourn moisture was 67% . Subsequent SECV exploration programs ***routinely measured moisture, ash and heating values*** on drill core samples. The next coal development, Hazelwood, south of Morwell, was selected due to its lower moisture content (60%) and similar low ash (3%) to Yallourn.
1955 - 1980	Hazelwood coal caused unexpected ash fouling problems in the power station and also briquette quality problems, both due to inorganic elements in the coal. This had not been systematically studied. A major survey program of LV coal resources commenced in 1955 which ***routinely included the analysis of coal Inorganics*** using new instrumental methods.
1922 to 1980	SECV drilled over 20,000 bores with cumulative depth of over 1,500 km. Coal analyses were performed on over 200,000 core samples. This data is held by Victoria in a coal quality database. A 3D coal quality and stratigraphic model of the Latrobe Valley resource has been developed from this database.

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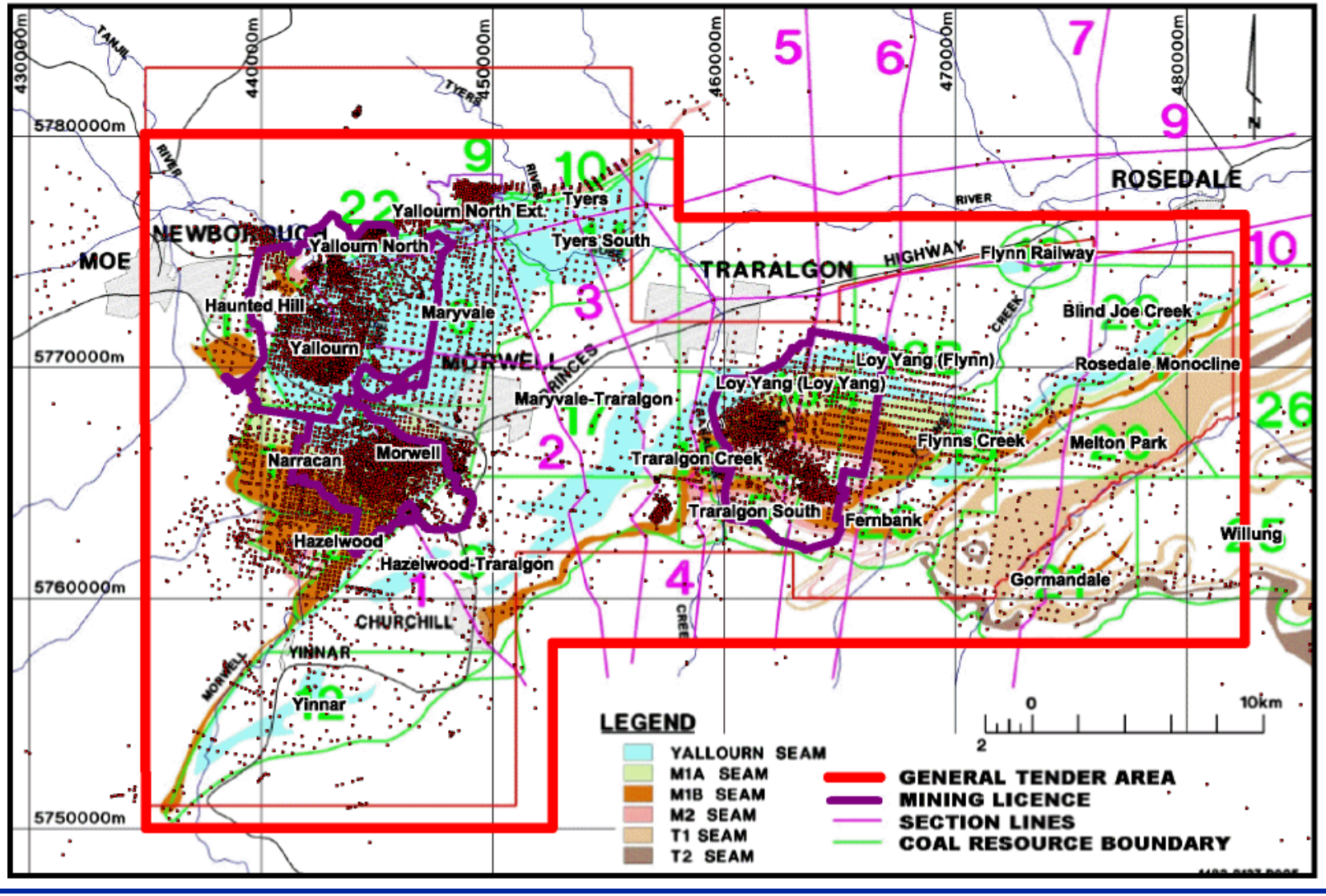
Bores in Latrobe Valley Resource Database



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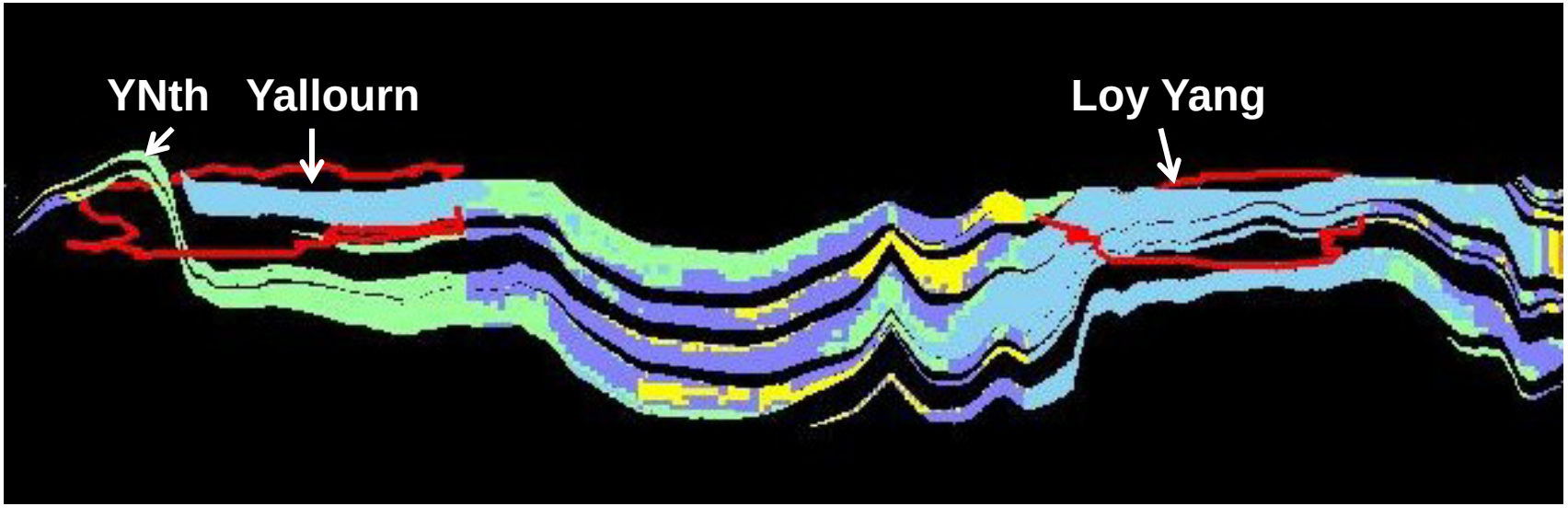
Latrobe Valley E-W Cross-section



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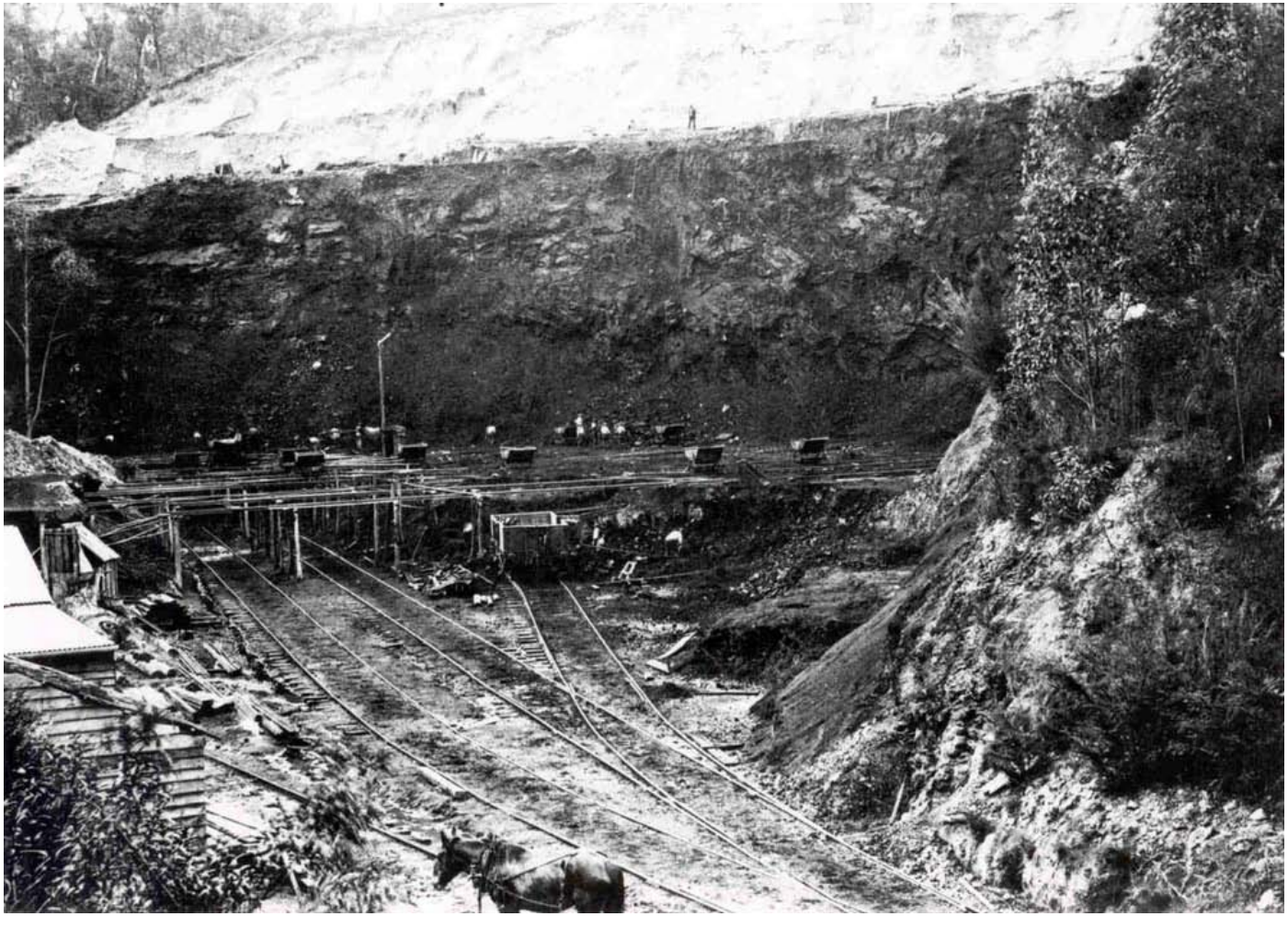
Yallourn North Open Cut in 1917
(Mine opened in 1888 – Closed in 1963)



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Early production by hand up to 5,000 t/yr
Upgraded SECV mining peaked at 1.5 Mt in 1950's

Yallourn Area Development

1922 -	Yallourn Mine	Capacity up to 18 Mt/yr
1924 - 1971	Yallourn Briquette Factory	Peak capacity 700 kt/year
1924 - 1968	Yallourn A Power Station	12 Chain grate boilers total 75 MW
1932 - 1970	Yallourn B Power Station	10 Chain grate boilers total 100 MW
1954 - 1985	Yallourn C Power Station	6 x 20 MW First pulverised fuel boilers in Victoria
1958 - 1987	Yallourn D Power Station	6 x 20 MW
1961 - 1989	Yallourn E Power Station	2 x 120 MW
1973 to 1982	Start up of 4 Yallourn W Units	2 x 350 MW and 2 x 375 MW First boilers with separation firing

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Yallourn Mine – commenced 1922

Current capacity: 18 Mt/yr

Morwell Area Development

1956 -	Hazelwood (Morwell) Mine	Capacity up to 20 Mt/yr
1956 - 1970	Lurgi Briquette Gasification Plant (Gas & Fuel Corporation)	700,000 m^3/day town gas
1959 - 2014	Morwell Briquette & Power Complex	1.2 Mt/yr briquettes & 170 MW Cogen power station (8 x 25 MW)
1964 to 1971	Start up of 8 Hazelwood Power Station Units	8 x 200 MW
1970 - 2014	Briquette carbonisation plant (Australian Char P/L)	80 kt/yr char from 180 kt briquettes

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Hazelwood (Morwell) Mine – commenced 1954

Current Capacity: 20 Mt/yr

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Loy Yang Area Development

1984 -	Loy Yang Mine	Capacity up to 30 Mt/yr
1985 to 1987	Start up of 4 Loy Yang A Power Station Units	4 x 500 MW with separation firing
1992 - 2000	Lurgi Steam Fluidised Bed Drying Plant	Design Capacity: 150 kt /yr dry coal
1993 &1996	Start up of 2 Loy Yang B Power Station Units	2 x 500 MW with separation firing

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Loy Yang Mine - commenced 1982

Capacity: 30 Mt/yr

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Advances in Brown Coal Mining

To 1921	Pick and shovel with delivery by wheel barrows and horse drawn wagons
1922	SECV - Mechanical Shovels, with horse drawn wagons and ropeways to surface
1928	Bucket Chain dredgers in combination with shovels and narrow gauge railways on mining benches
1950	Bucket Wheel dredgers introduced, operating in combination with bucket chain dredgers. Coal transport now by movable conveyor belts
From 1960	All new dredgers of bucket wheel design since 1961. Loy Yang mine has 4 dredgers digging up to 3,500 t coal/hr delivering 30 Mt/yr to the Raw Coal Bunker. This stores about 19 hrs supply for Loy Yang A & B stations. Transport is by 2 m wide conveyors travelling at 5.2m/s for up to 7 km
2002	Bulldozer mining developed at Yallourn, pushing coal down the slope feeding in-line crushers, replacing dredgers at Yallourn Mine

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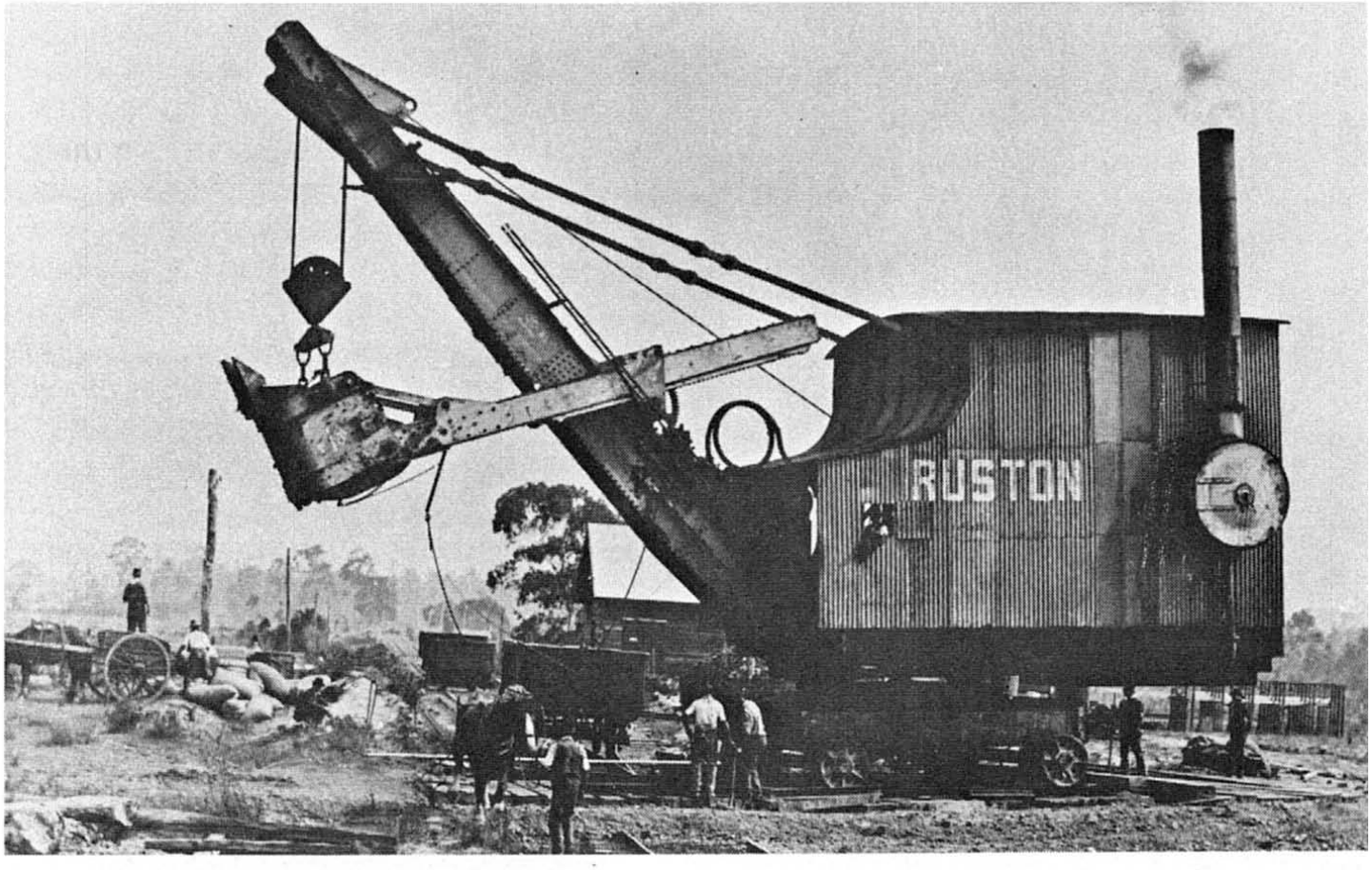
1922 – Steam shovel at new Yallourn Open Cut



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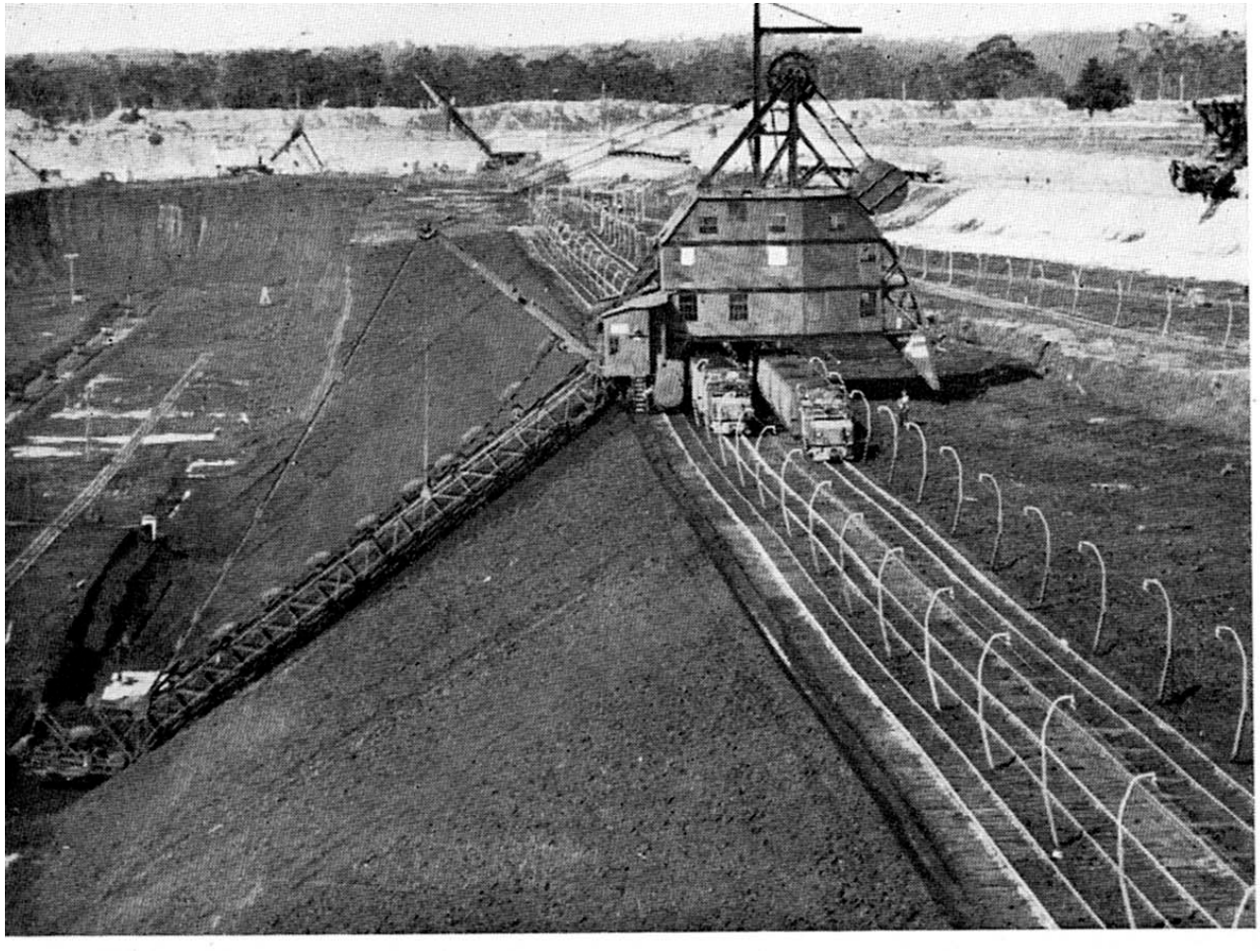
1929 – First bucket chain dredger with trains at YOC



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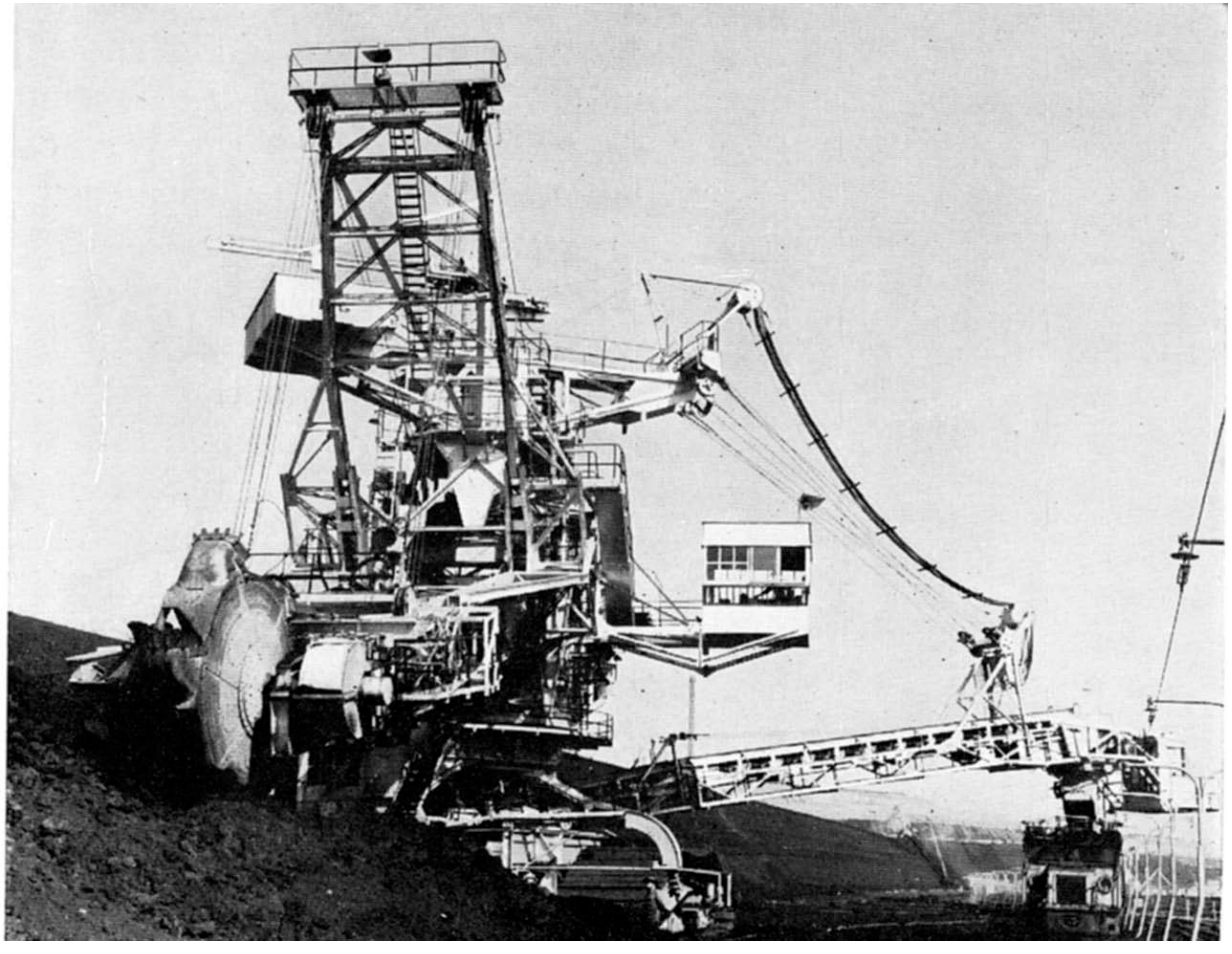
1950 – First bucket wheel dredger (650 t/h), YOC



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Loy Yang Dredger No 16 (3,750 t/h)

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3 dredgers plus a compact provide 30 Mt/yr
Conveyors 2 m wide travelling up to 7 km @ 5.2 m/sec

2002 - Dozer Mining at Yallourn Open Cut

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VICTORIAN BROWN COAL RESOURCE DATA

Total Geological Resource		**430,000 Mt**
Measured and reserved Latrobe Valley brown coal		**65,000 Mt**
Readily Recoverable economic reserves by open cut mining		**33,000 Mt**
Brown Coal Production 2013#		**67 Mt/yr**
- *Moisture Content*	*60-67 %*	
- *Ash Content*	*0.5-3.5 %*	
- *Overburden/Coal Production Ratio*	*0.26 m^3/t*	
Cumulative Production since 1924		**2,400 Mt**
Lifetime of Reserves at present rate of consumption		**~ 500 yrs**

Current production reported to be 59 Mt due to reduced demand, increased renewable generation and plant closures.

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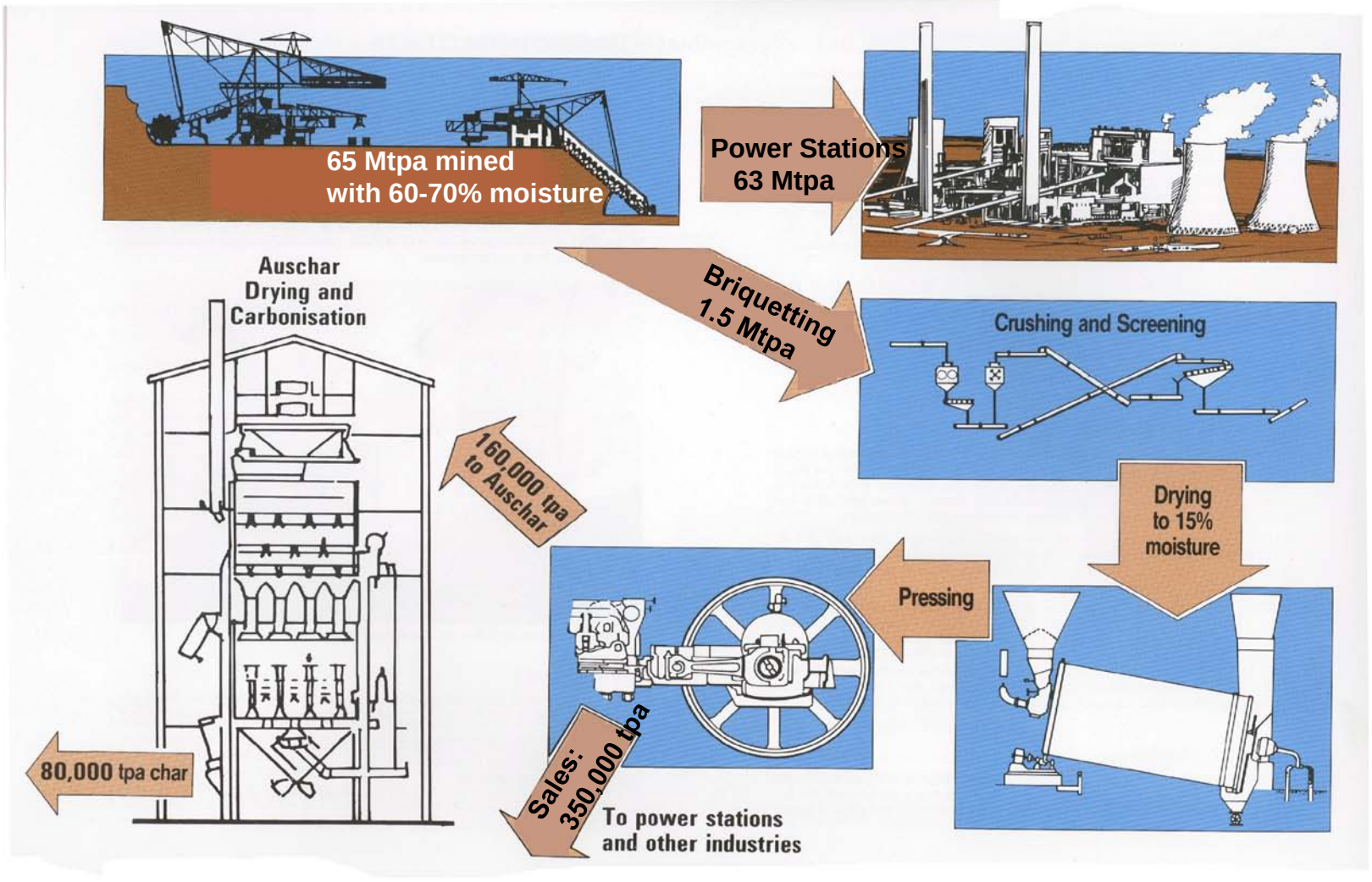
Major Uses of Victorian Brown Coal



Note: In 2014, both the carbonisation plant and the Morwell Briquette Factory closed

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