

MINERAL PROJECTIONS FOR AUSTRALIA

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The Institute for Sustainable Futures

October 2011

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CHAPTER 1

By Mineral

1.1. Coal

TABLE 1.1. Peak years for Australia by state

State	Peak Year	Max Prod.	URR
		Gt/y	Gt
New South Wales	2061	0.5	40.0
Queensland	2056	0.5	43.4
South Australia	2145	0.2	18.3
Tasmania	2101	0.0	0.3
Victoria	1917	0.0	—
Western Australia	2132	0.0	4.6
Australia	2060	1.1	106.6

TABLE 1.2. Coal production in recent years (Mt/y)

State	2003	2004	2005	2006	2007	2008
NSW	111.5	114.3	122.6	124.6	131.3	135.1
Queensland	153.6	160.1	172.7	171.7	184.1	180.5
South Australia	3.2	3.8	3.2	3.8	3.6	3.8
Tasmania	0.3	0.6	0.4	0.6	0.6	0.6
Western Australia	6.1	6.8	6.0	6.3	6.1	6.4
Australia	274.8	285.5	304.8	307.0	325.7	326.5

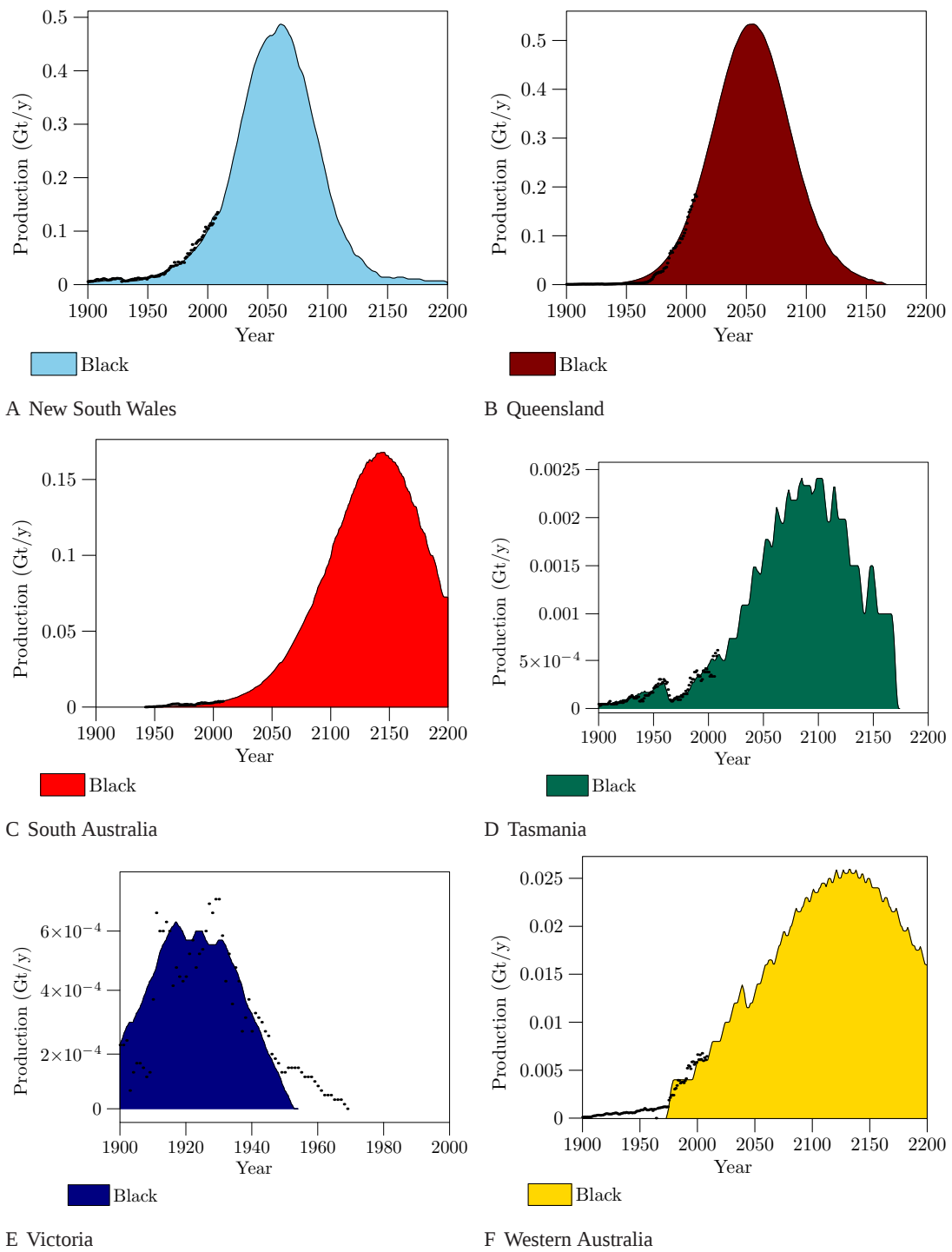
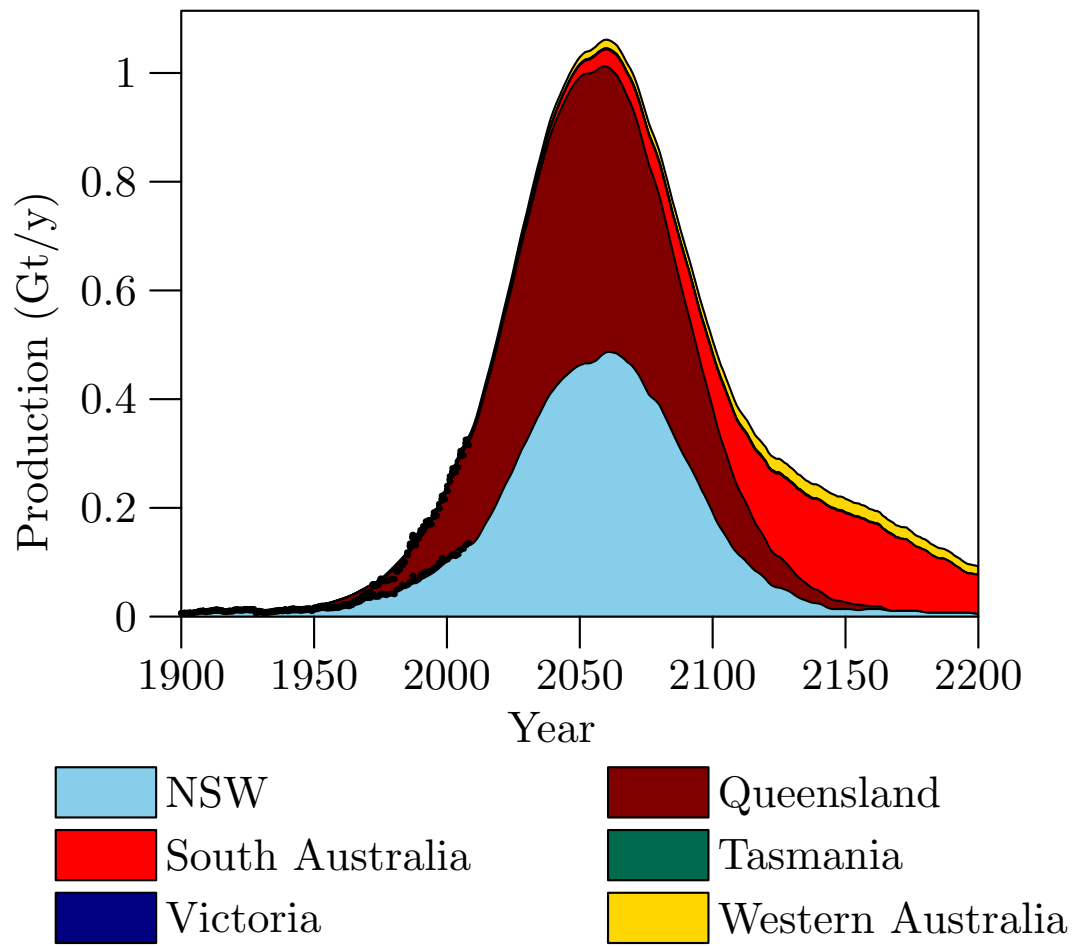


FIGURE 1.1. Coal projections for Australia by State



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FIGURE 1.2. Coal projections for Australia

1.2. Copper

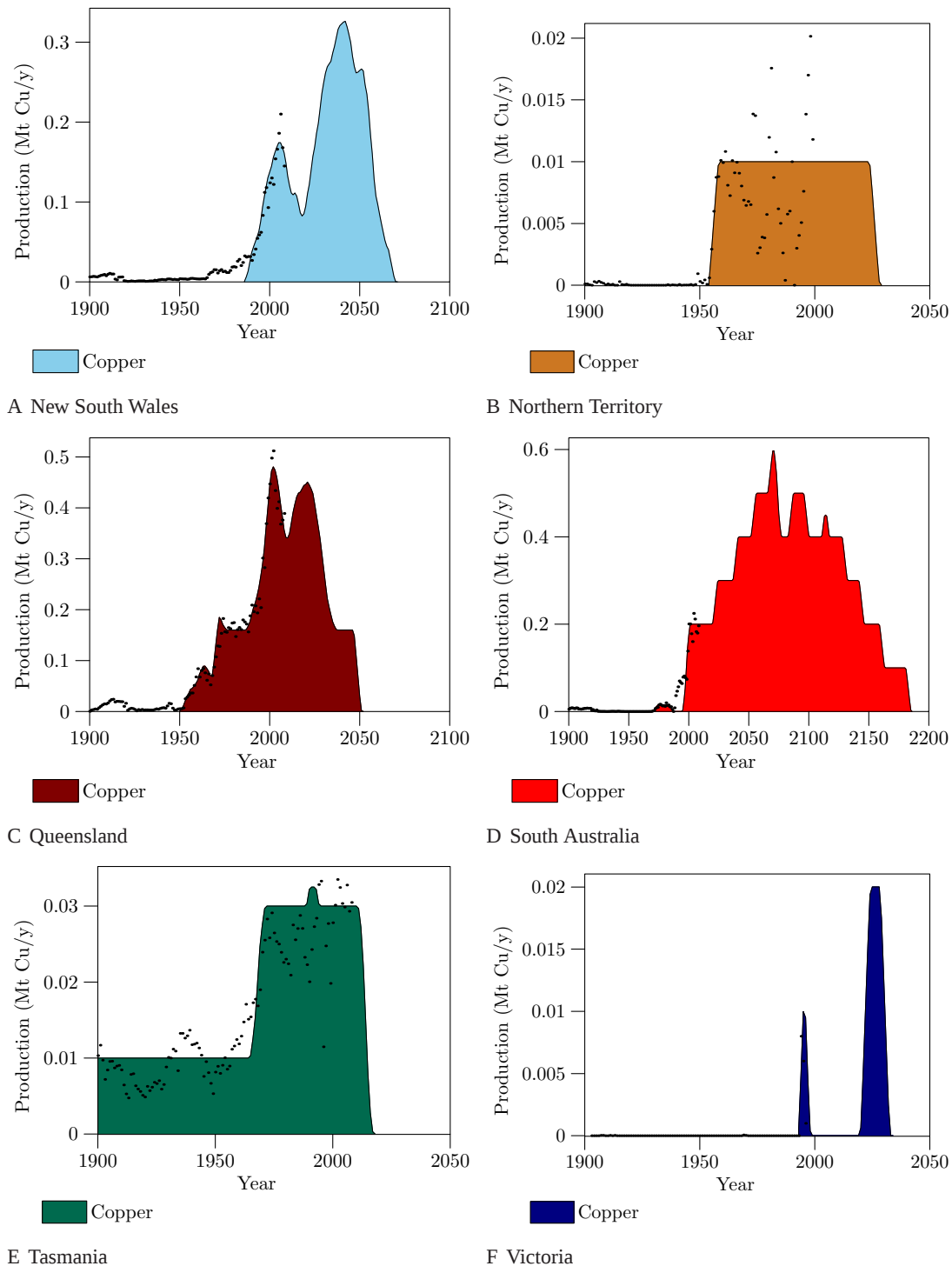
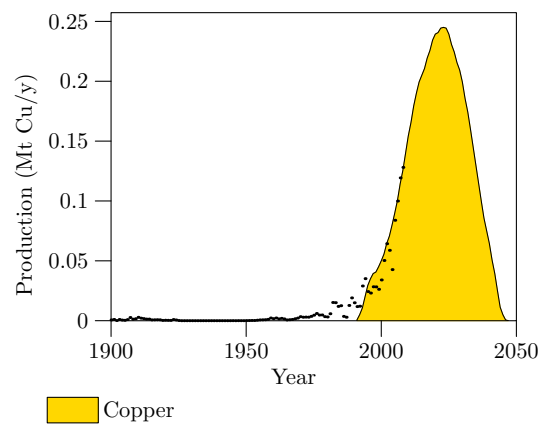
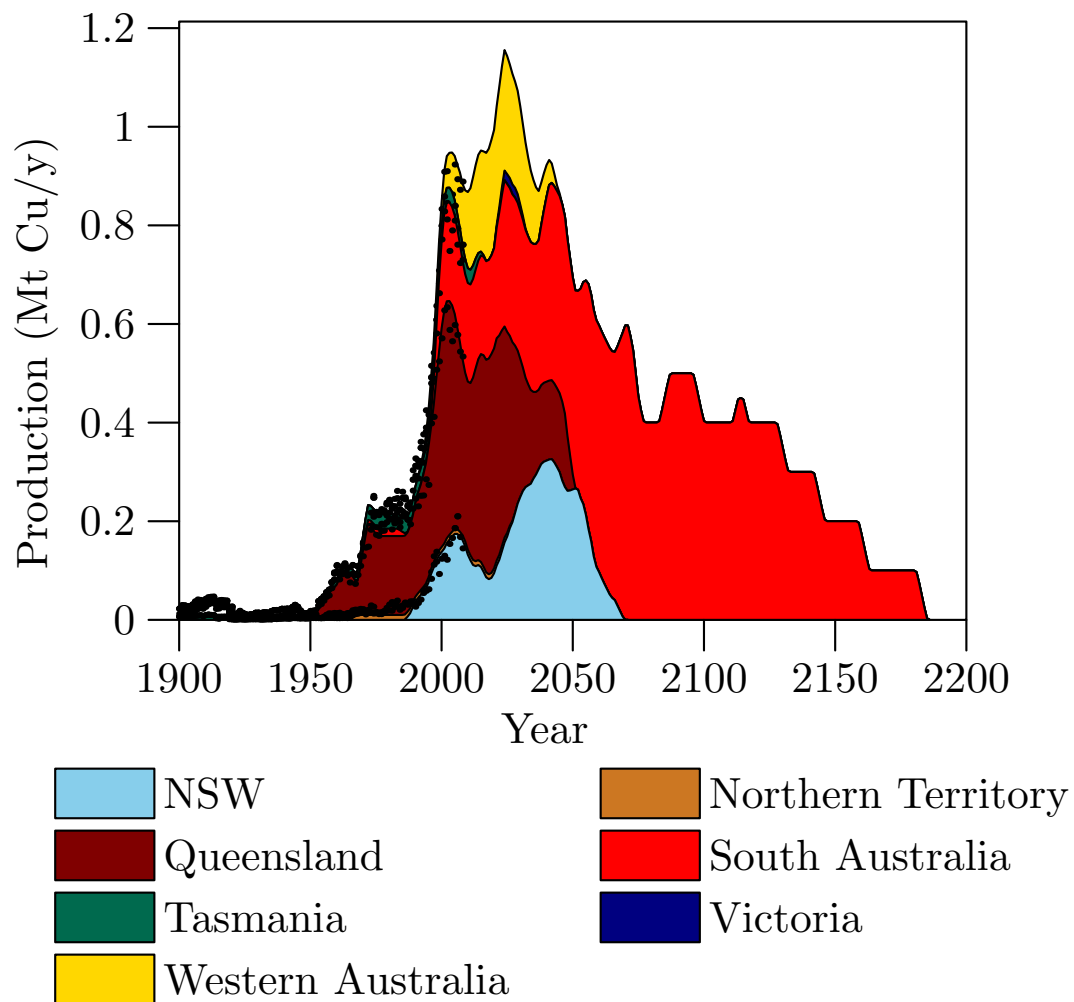


FIGURE 1.3. Copper projections for Australia by State (continues next page)



A Western Australia

FIGURE 1.3. Cont. Copper projections for Australia by State



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FIGURE 1.4. Copper projections for Australia

TABLE 1.3. Peak years for Australia by state

Type	Peak Year	Max Prod. Mt/y Cu	URR Mt Cu
NSW	2042	0.3	13.5
Northern Territory	1991	0.0	0.7
Queensland	2002	0.5	22.8
South Australia	2070	0.6	60.4
Tasmania	1991	0.0	2.1
Victoria	2026	0.0	0.2
Western Australia	2023	0.2	7.0
Australia	2024	1.2	106.7

TABLE 1.4. Copper production in recent years (kt Cu/y)

State	2003	2004	2005	2006	2007	2008
NSW	154	166	186	210	168	145
Queensland	434	399	412	368	376	389
South Australia	160	225	212	183	180	196
Tasmania	32	30	30	33	29	30
Western Australia	59	43	84	100	119	128
Australia	839	863	923	894	872	889

1.3. Gold

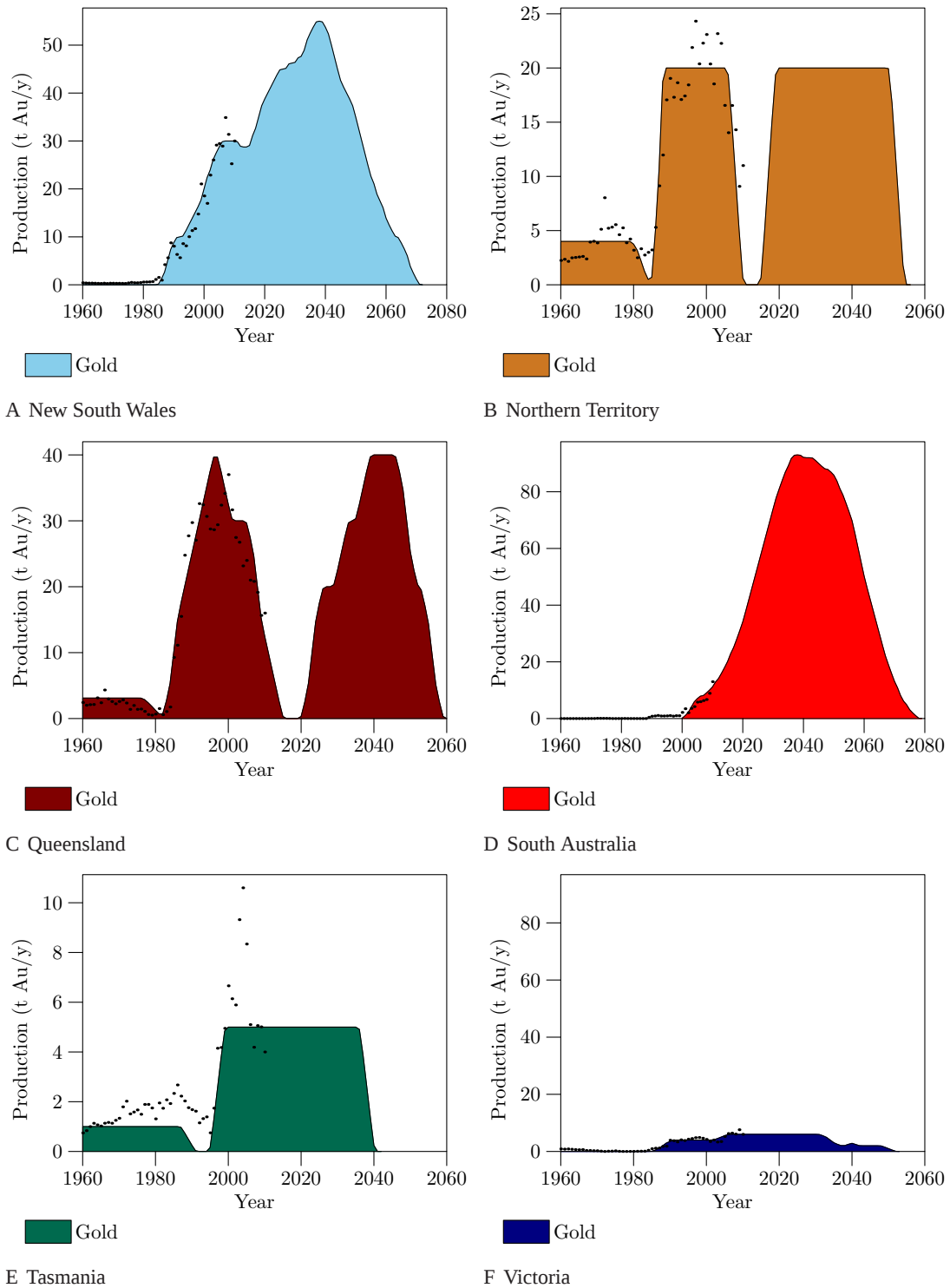
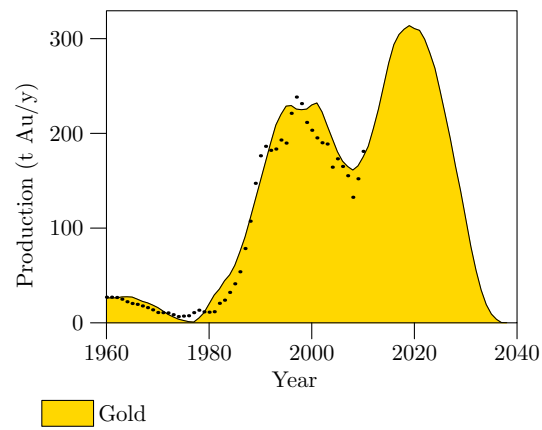
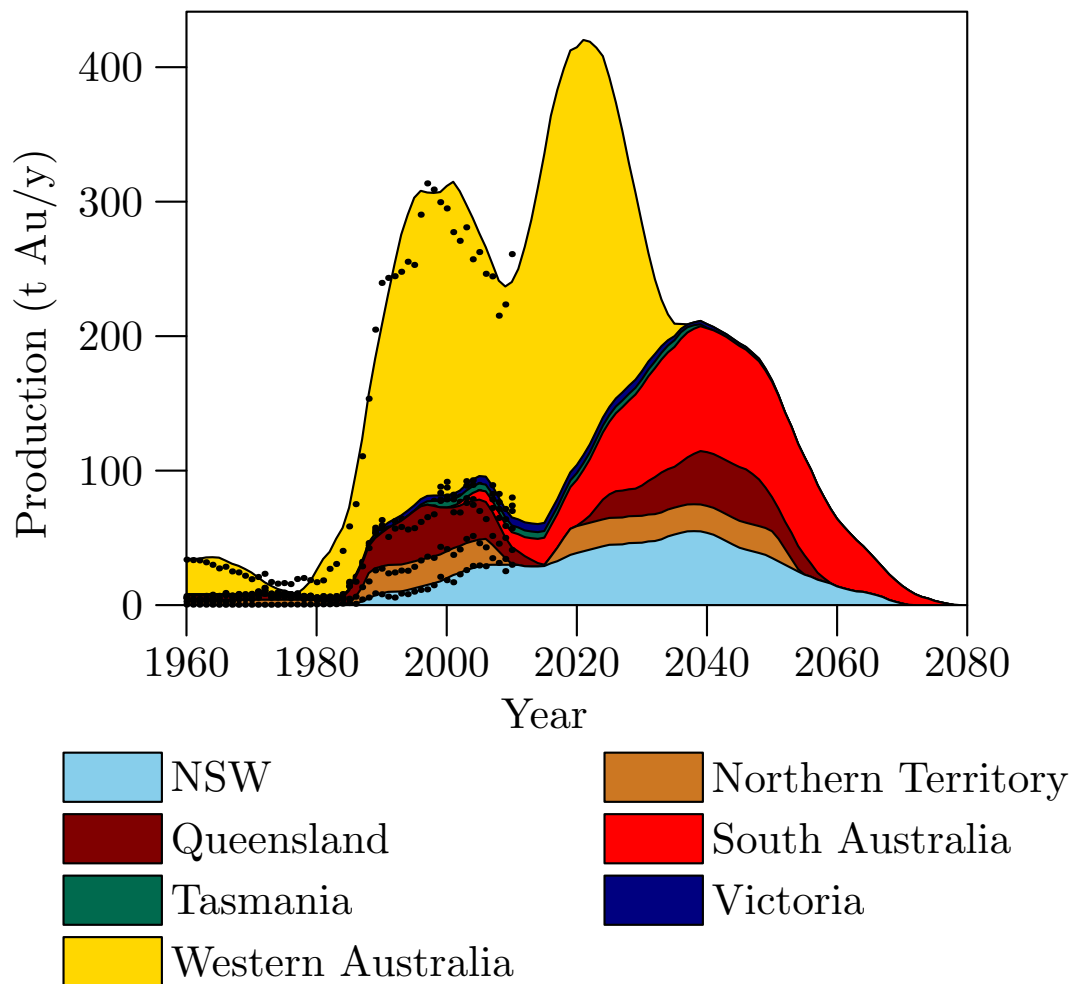


FIGURE 1.5. Gold projections for Australia by State (continues next page)



A Western Australia

FIGURE 1.5. Cont. Gold projections for Australia by State



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FIGURE 1.6. Gold projections for Australia

TABLE 1.5. Peak years for Australia by state

Type	Peak Year	Max Prod. t Au/y	URR t Au
NSW	2038	55.0	2967
Northern Territory	2019	20.0	1269
Queensland	2042	40.0	2447
South Australia	2038	93.0	3640
Tasmania	2017	5.0	318
Victoria	1857	92.3	2578
Western Australia	2019	313.8	12155
Australia	2021	420.3	25374

TABLE 1.6. Gold production in recent years (t Au/y)

State	2003	2004	2005	2006	2007	2008
Northern Territory	23.2	22.3	16.6	14.0	16.5	14.3
NSW	26.0	29.1	29.5	28.9	34.9	31.4
Queensland	26.8	23.2	24.0	21.0	20.8	19.2
South Australia	3.6	4.2	5.8	5.9	6.3	6.7
Tasmania	9.3	10.6	8.3	5.1	4.2	5.1
Victoria	3.3	3.5	5.2	6.3	6.4	6.1
Western Australia	188.8	164.3	173.2	165.1	155.3	132.5
Australia	280.9	257.2	262.5	246.4	244.5	215.2

1.4. Iron

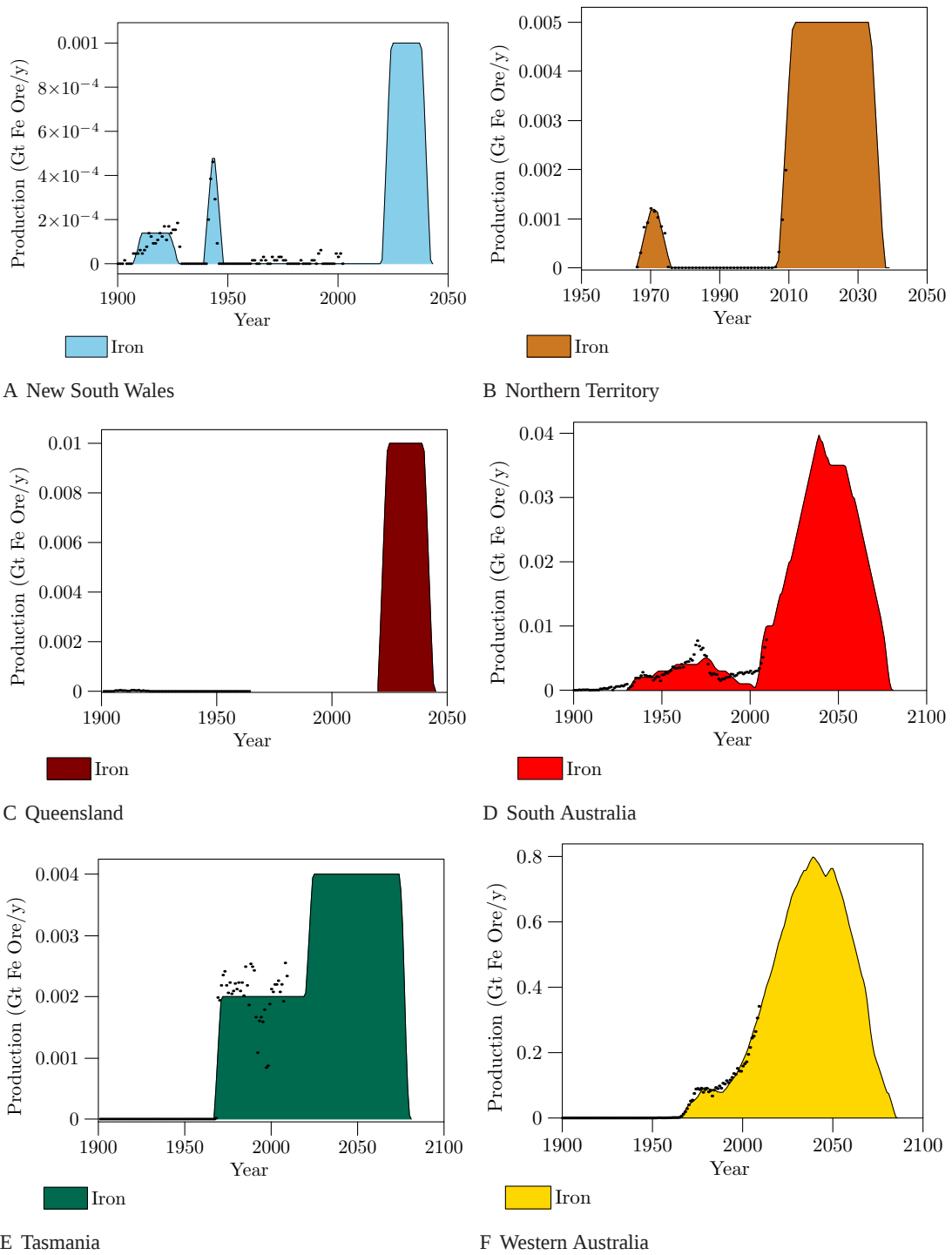
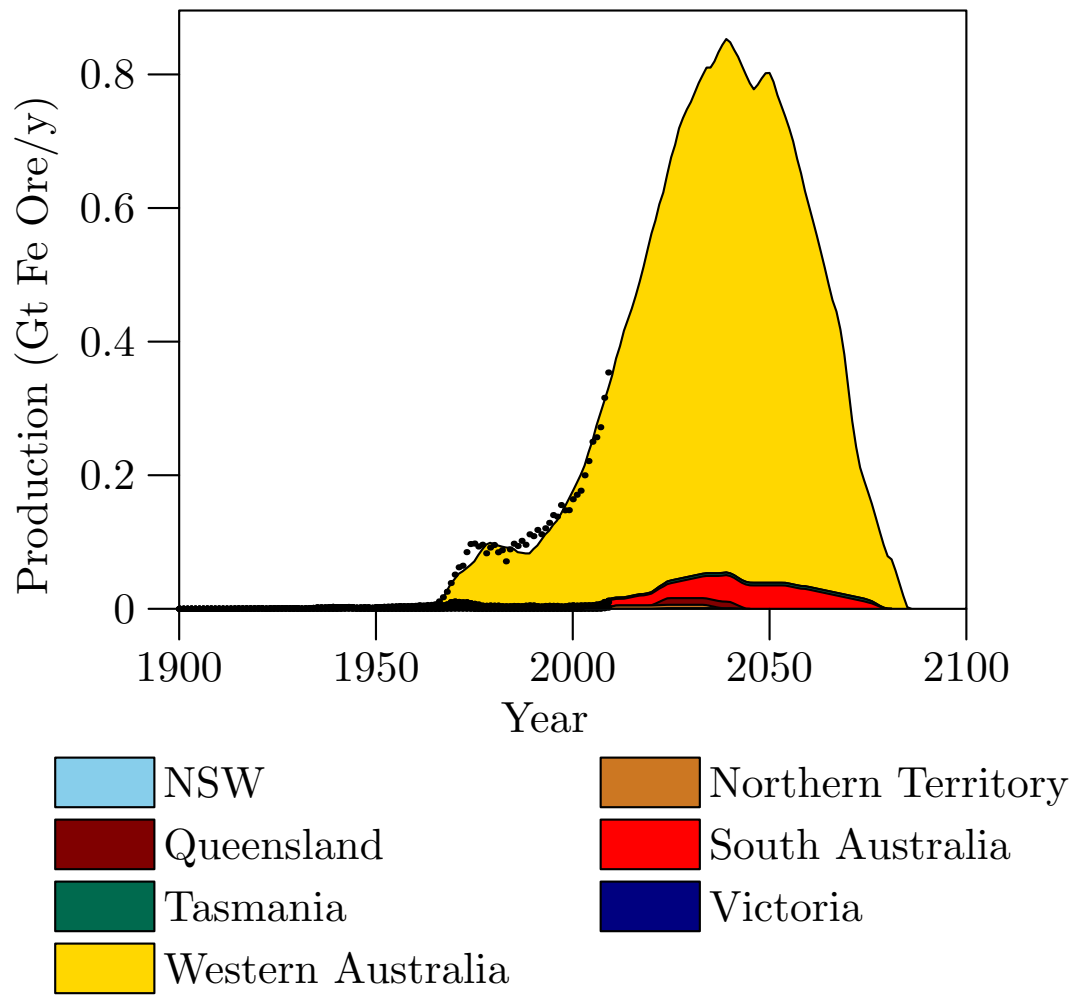


FIGURE 1.7. Iron projections for Australia by State



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FIGURE 1.8. Iron projections for Australia

TABLE 1.7. Peak years for Australia by state

State	Peak Year	Max Prod.	URR
		Gt Fe Ore/y	Gt Fe Ore
New South Wales	2031	—	—
Northern Territory	2022	—	0.1
Queensland	2032	—	0.2
South Australia	2039	—	1.9
Tasmania	2049	—	0.3
Western Australia	2039	0.8	44.4
Australia	2039	0.9	47.1

TABLE 1.8. Iron ore production in recent years (Mt Fe Ore/y)

State	2003	2004	2005	2006	2007	2008
South Australia	3.0	3.0	3.4	4.2	5.1	6.7
Tasmania	2.2	2.3	2.1	2.2	1.9	2.6
Northern Territory	0.0	0.0	0.0	—	0.3	1.0
Western Australia	194.7	215.8	244.6	250.4	264.4	305.7
Australia	199.9	221.2	250.1	256.8	271.8	315.9

1.5. Lithium

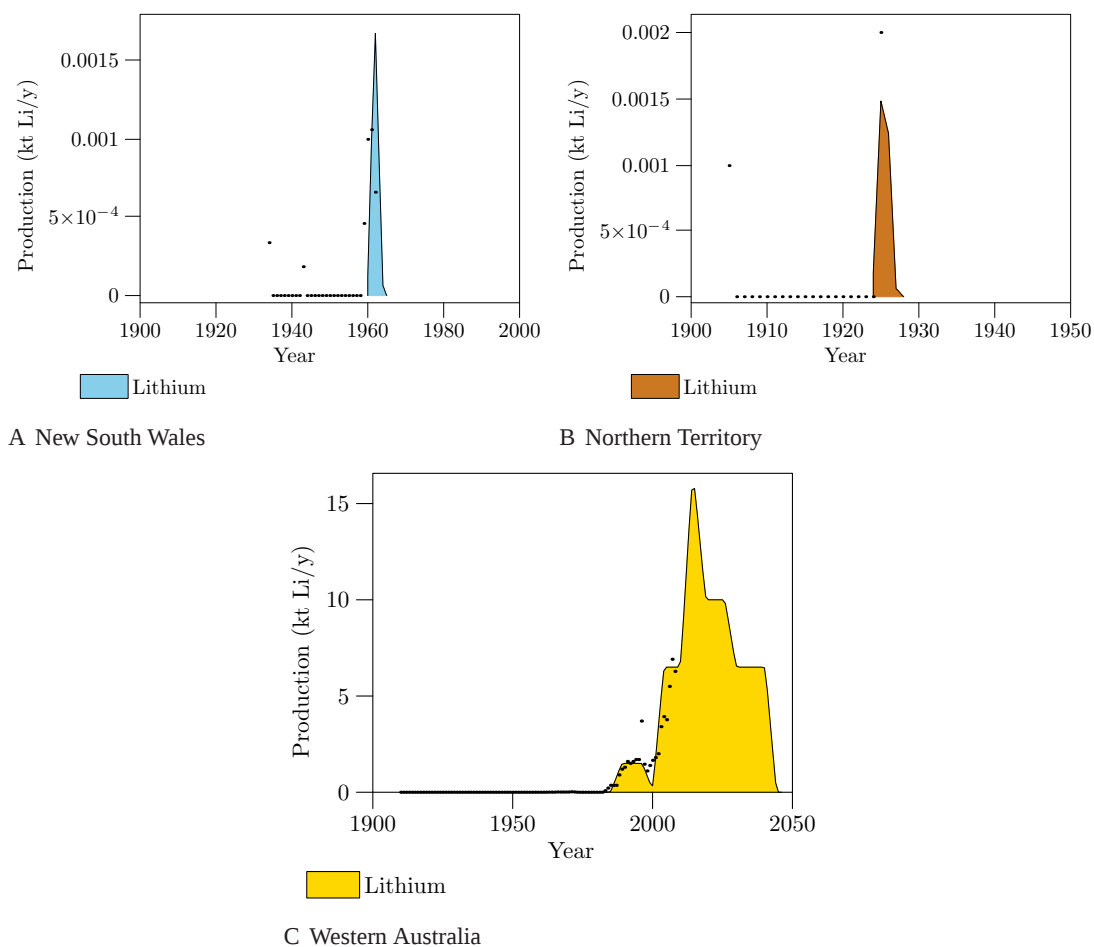


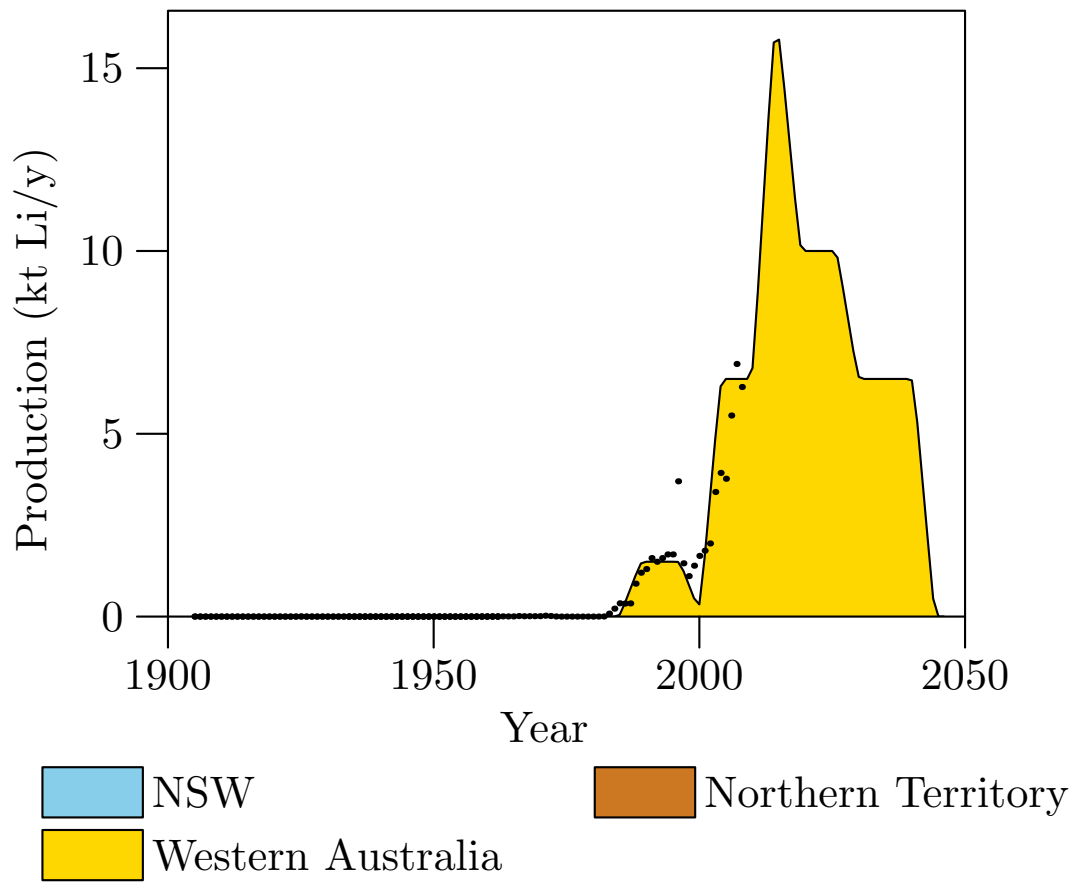
FIGURE 1.9. Lithium projections for Australia by State

TABLE 1.9. Peak years for World by Continent

Type	Peak Year	Max Production	
		kt Li/y	kt Li
NSW	1962	0.0	—
Northern Territory	1925	0.0	—
Western Australia	2015	15.8	364.2
Total	2015	15.8	364.2

TABLE 1.10. Lithium production in recent years (kt Li/y)

State	2003	2004	2005	2006	2007	2008
Western Australia	3.4	3.9	3.8	5.5	6.9	6.3
Australia	3.4	3.9	3.8	5.5	6.9	6.3



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FIGURE 1.10. Scenarios for Australia by state

CHAPTER 2

By State

2.1. NSW

TABLE 2.1. Peak years for NSW

Type	Peak Year	Max Prod.	URR	Units	
Coal	2061	0.5	40	Gt/y	Gt
Copper	2042	0.3	13.5	Mt Cu/y	Mt Cu
Gold	2038	55.0	2967	t Au/y	t Au
Iron	2031	—	—	Gt Fe Ore/y	Gt Fe Ore
Lithium	1962	—	—	kt Li/y	kt Li

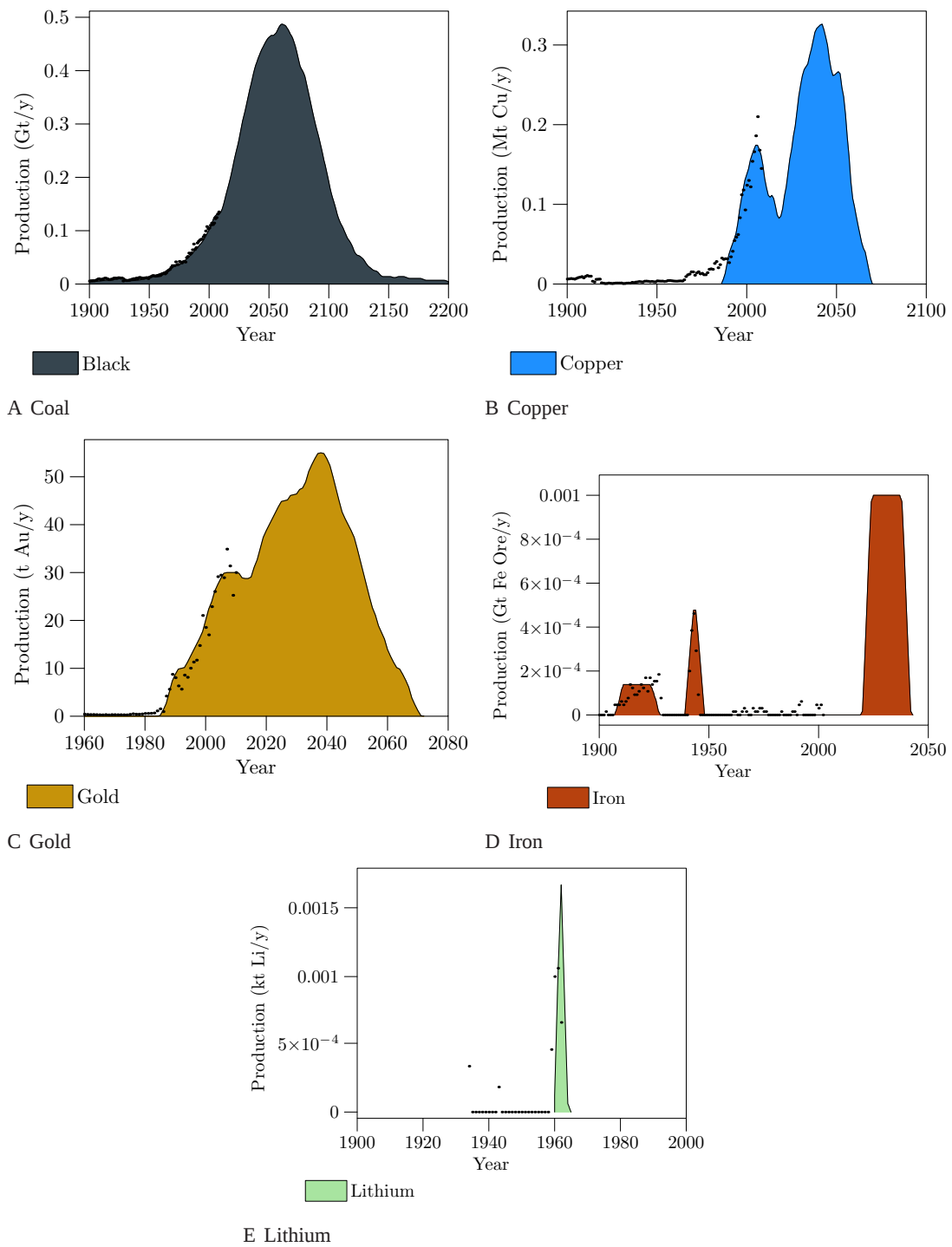


FIGURE 2.1. Scenarios for NSW

2.2. Northern Territory

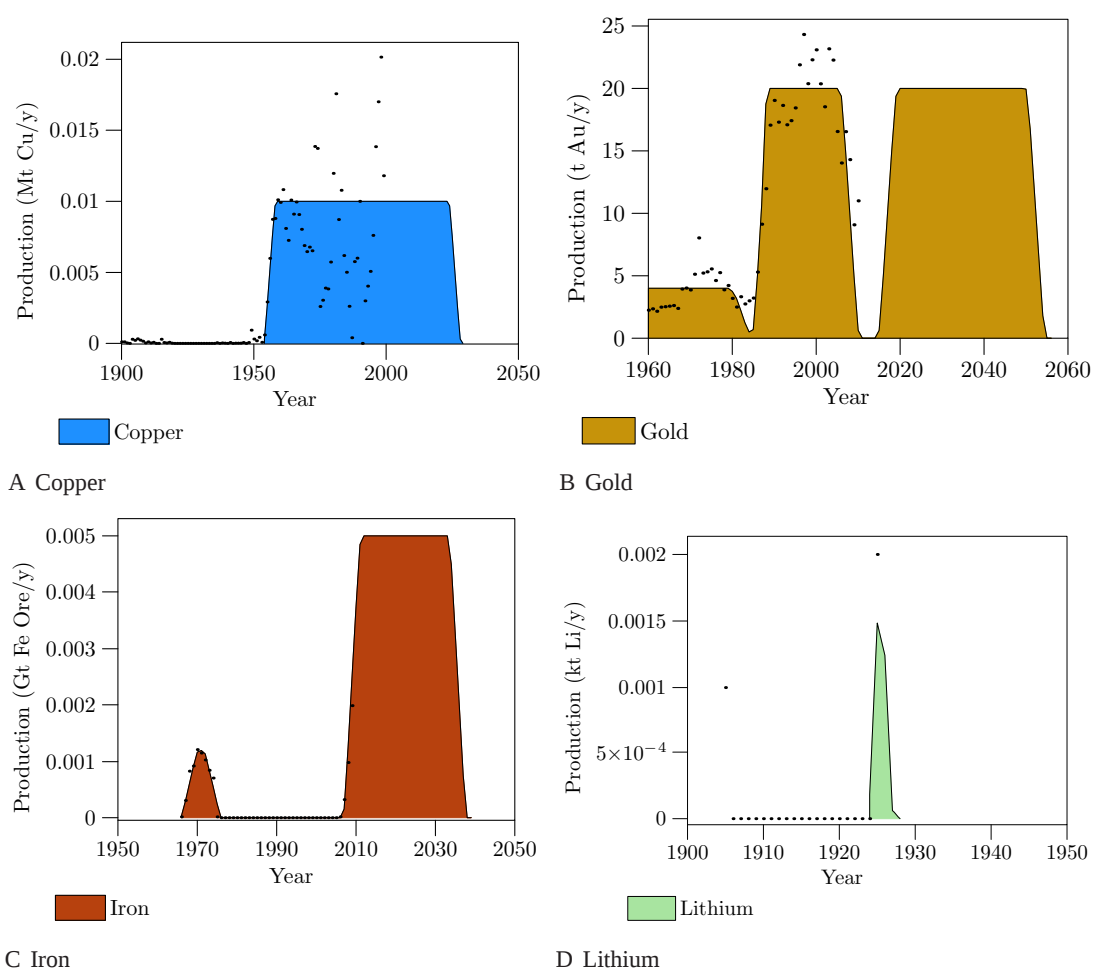


FIGURE 2.2. Scenarios for Northern Territory

TABLE 2.2. Peak years for Northern Territory

Type	Peak Year	Max Prod.	URR	Units	
Copper	1991	—	0.7	kt Cu/y	kt Cu
Gold	2019	20.0	1269	t Au/y	t Au
Iron	2022	—	0.1	Gt Fe ore/y	Gt Fe Ore
Lithium	1925	—	—	kt Li/y	kt Li

2.3. Queensland

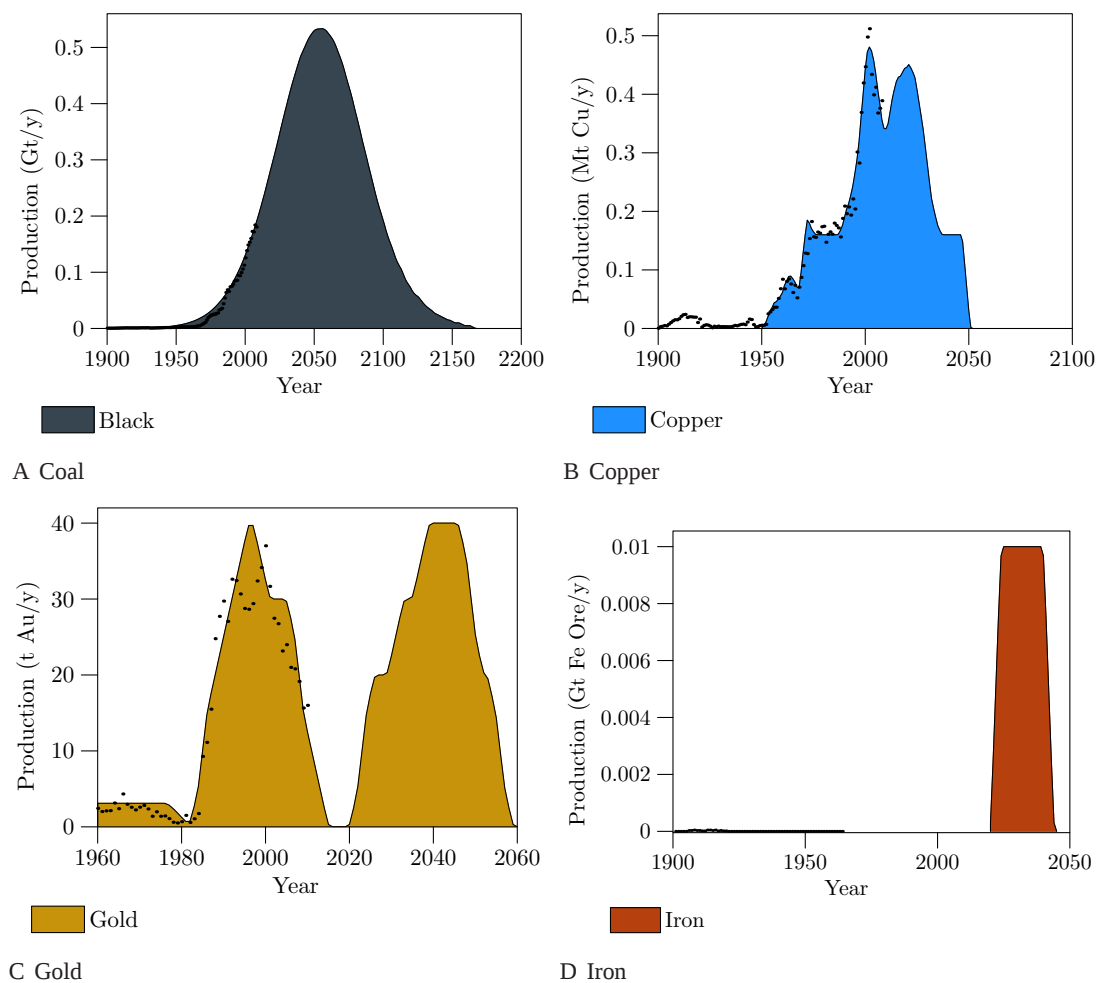


FIGURE 2.3. Scenarios for Queensland

TABLE 2.3. Peak years for Queensland

Type	Peak Year	Max Prod.	URR	Units	
otoprule Coal	2056	0.5	43.4	Gt/y	Gt
Copper	2002	0.5	22.8	kt Cu/y	kt Cu
Gold	2042	40	2447	t Au/y	t Au
Iron	2032	—	0.2	Gt Fe Ore/y	Gt Fe Ore

2.4. South Australia

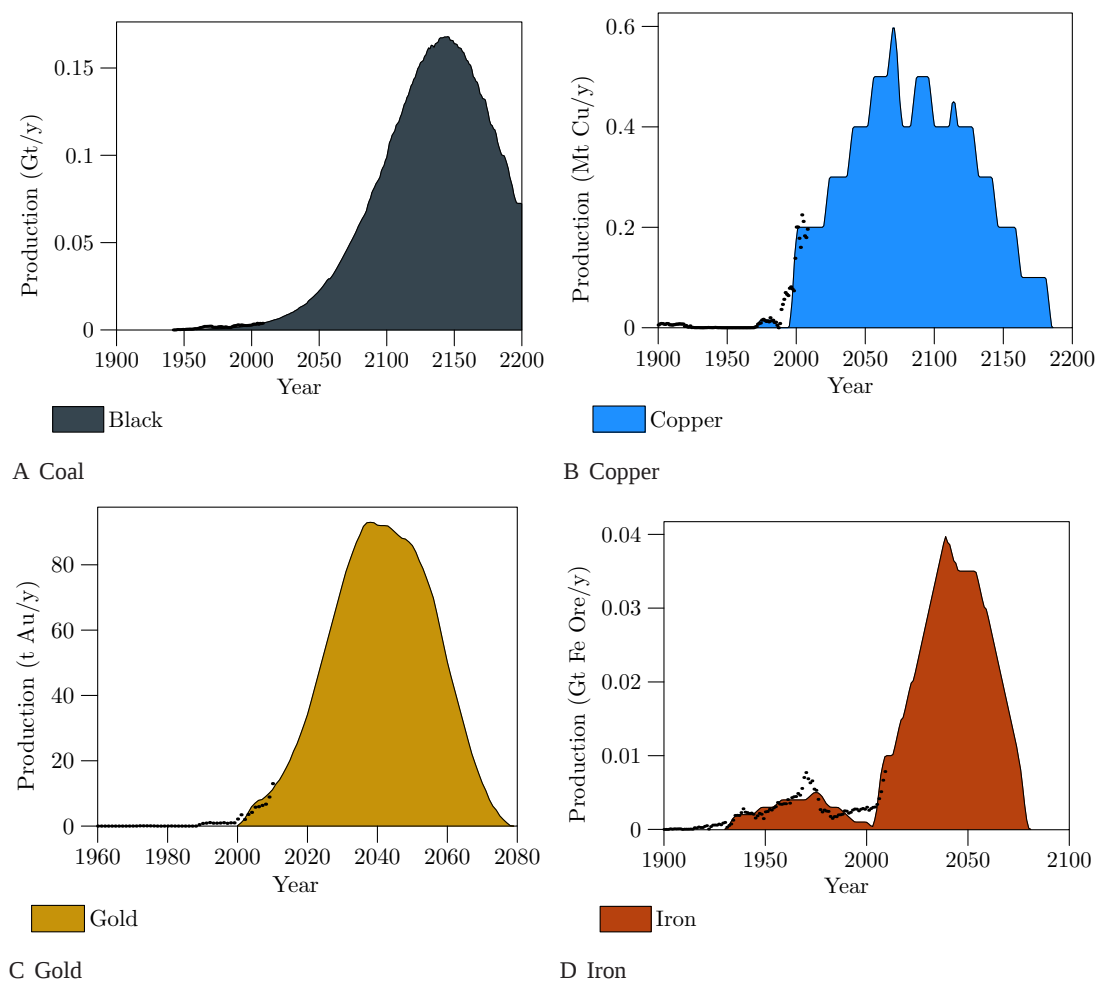


FIGURE 2.4. Scenarios for South Australia

TABLE 2.4. Peak years for South Australia

Type	Peak Year	Max Prod.	URR	Units	
Coal	2145	0.2	18.3	Gt/y	Gt
Copper	2070	0.6	60.4	kt Cu/y	kt Cu
Gold	2038	93	3641	t Au/y	t Au
Iron	2039	—	1.9	Gt Fe Ore/y	Gt Fe Ore

2.5. Tasmania

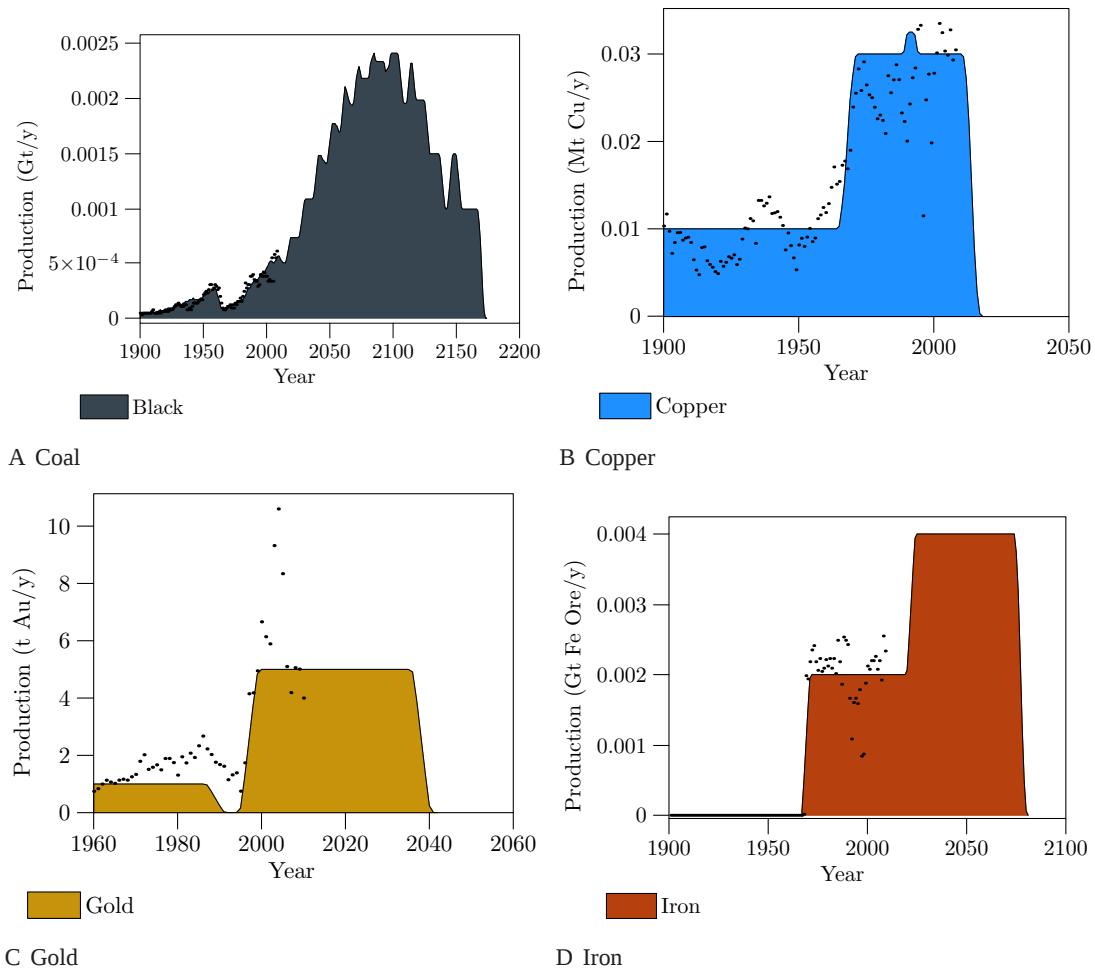


FIGURE 2.5. Scenarios for Tasmania

TABLE 2.5. Peak years for Tasmania

Type	Peak Year	Max Prod.	URR	Units	
Coal	2101	—	0.3	Gt/y	Gt
Copper	1991	—	2.1	kt Cu/y	kt Cu
Gold	2017	5.0	318	t Au/y	t Au
Iron	2049	—	0.3	Gt Fe Ore/y	Gt Fe Ore

2.6. Victoria

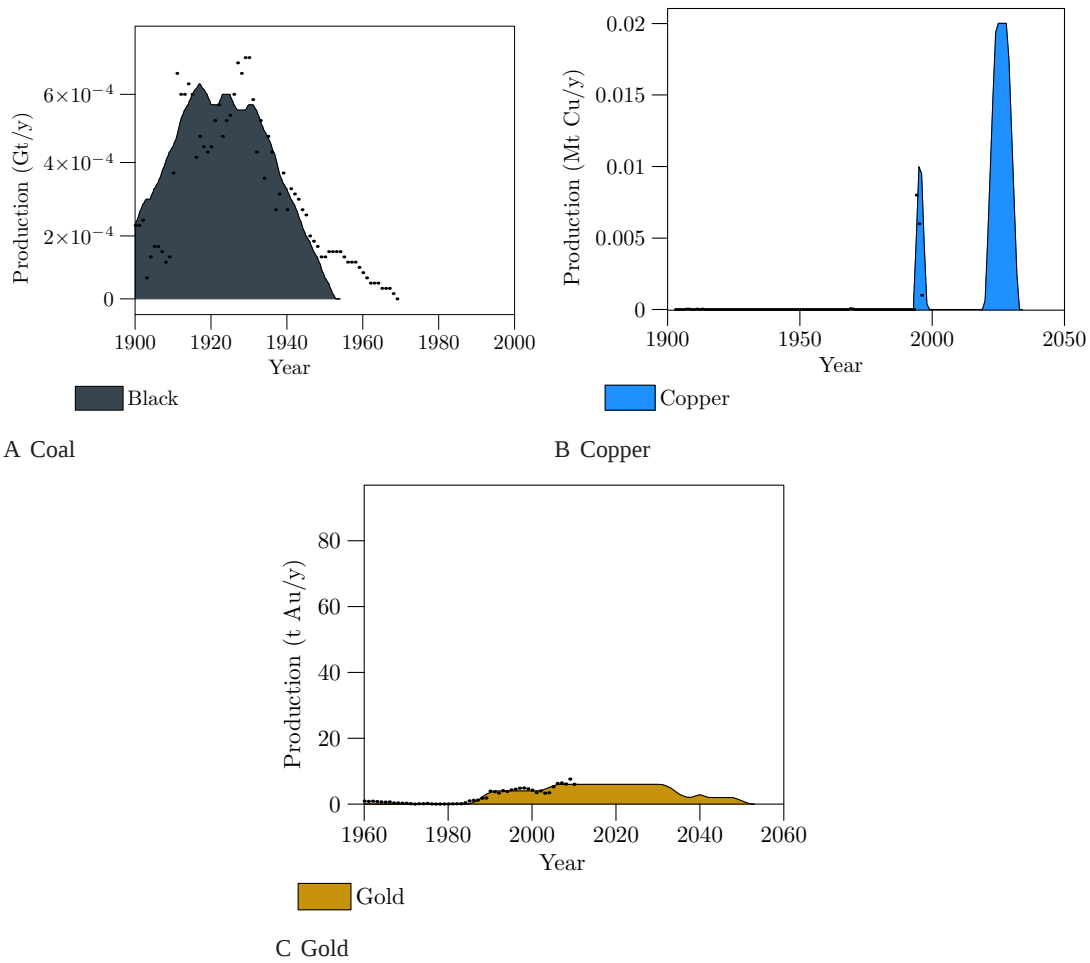


FIGURE 2.6. Scenarios for Victoria

TABLE 2.6. Peak years for Victoria

Type	Peak Year	Max Prod.	URR	Units
Coal	1917	—	—	Gt/y Gt
Copper	2026	—	0.2	kt Cu/y kt Cu
Gold	1857	92.3	2578	t Au/y t Au

2.7. Western Australia

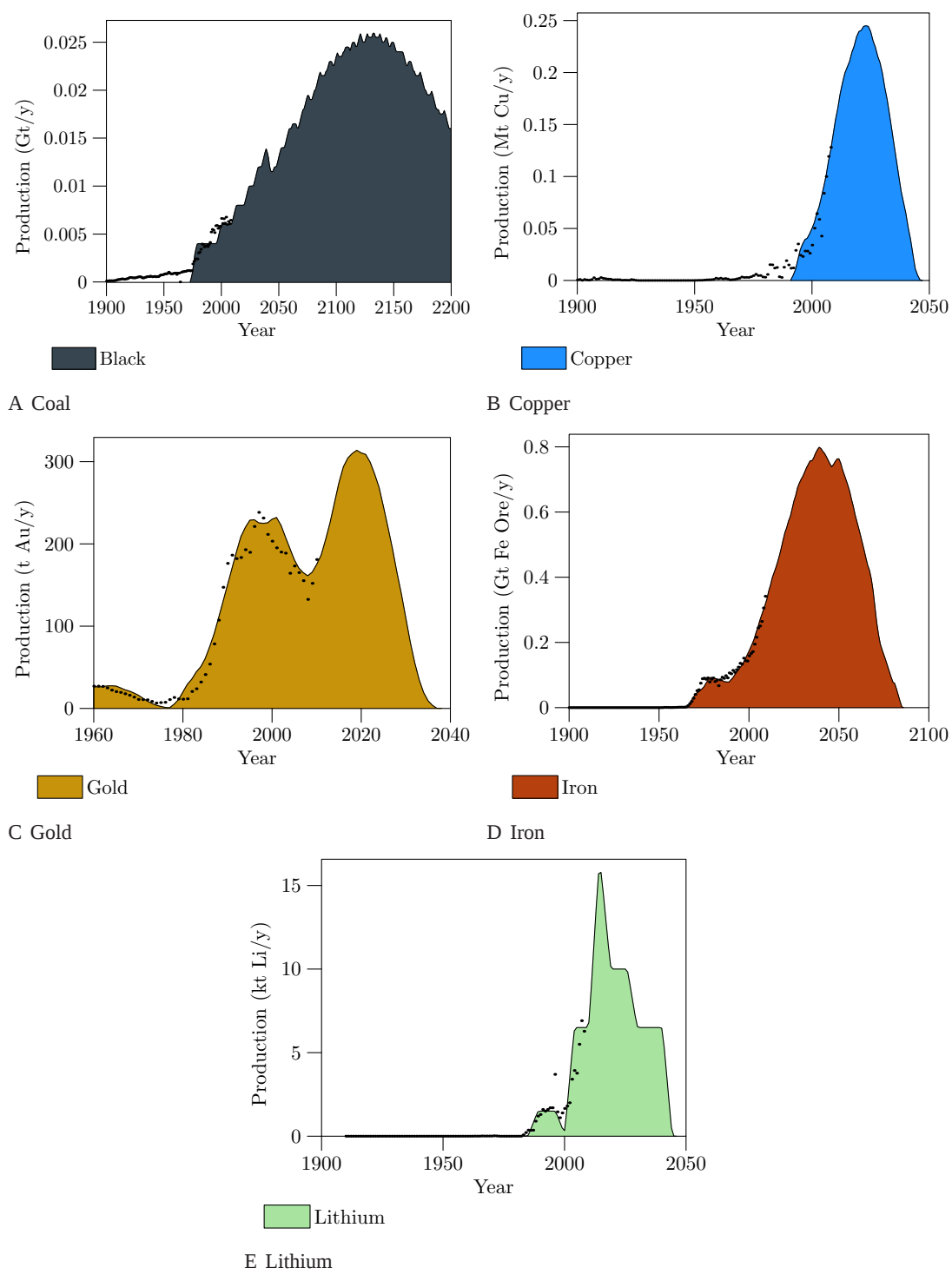


FIGURE 2.7. Scenarios for Western Australia

TABLE 2.7. Peak years for Western Australia

Type	Peak Year	Max Prod.	URR	Units	
Coal	2132	—	4.6	Gt/y	Gt
Copper	2023	0.2	7.0	kt Cu/y	kt Cu
Gold	2019	313.8	12155	t Au/t	t Au
Iron	2039	0.8	44.4	Gt Fe Ore/y	Gt Fe Ore
Lithium	2015	15.8	364.2	kt Li/y	kt Li

2.8. Australia

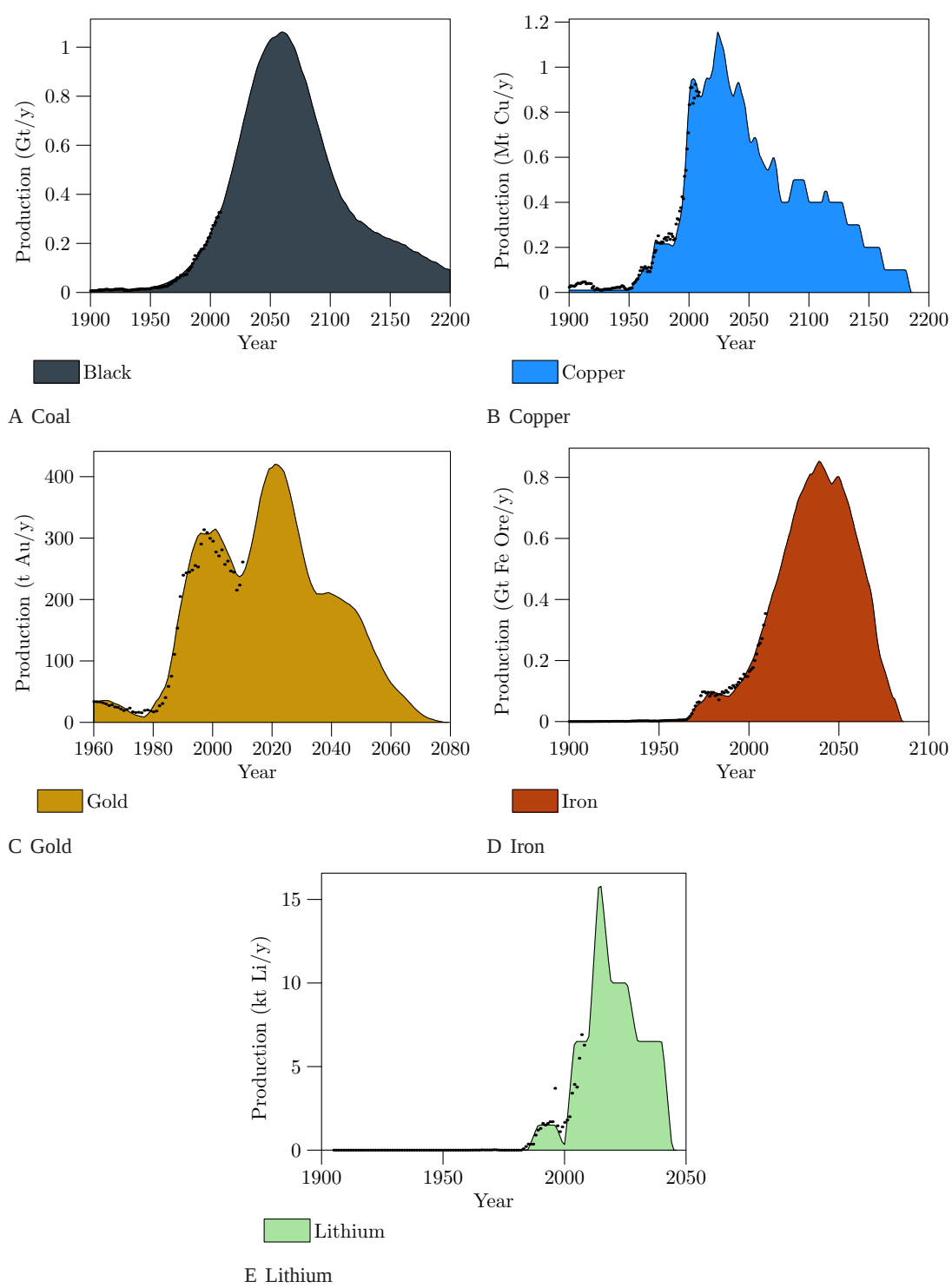


FIGURE 2.8. Scenarios for Australia

TABLE 2.8. Peak years for Australia

Type	Peak Year	Max Prod.	URR	Units	
Coal	2060	1.1	106.6	Gt/y	Gt
Copper	2024	1.2	106.7	kt Cu/y	kt Cu
Gold	2021	42.03	25374	t Au/y	t Au
Iron	2039	0.9	47.1	Gt Fe Ore/y	Gt Fe Ore
Lithium	2015	15.8	364.2	kt Li/y	kt Li

CHAPTER 3

Appendix

3.1. Coal

TABLE 3.1. Mining constants for coal

Name	Y_s	Q_T Gt	r_{Q_T}	M_L Mt/y	M_H Mt/y	L_L	L_H	t_t	r_t
NSW 1	1938	20.077	5.5	0.020	10	20	60	2010	0.03
NSW 2	1800	4.472	2.5	0.025	3.5	50	80	2012	0.03
NSW 3	1850	0.120	5	0.025e	3.5	50	80	2010	0.03
NSW 4	1942	0.650	6	0.010	0.010	40	40	NA	NA
NSW 5	2000	2.304	6	0.025	3.5	50	80	2010	0.03
NSW 6	1850	0.100	4.5	0.01	0.10	50	50	1910	0.03
NSW 7	1930	7.203	6	0.02	5.0	50	70	2015	0.03
NSW 8	1890	0.10e-1	2	0.01	0.20	50	50	1950	0.03
NSW 9	1977	0.24e-1	4.5	0.75	0.75	25	25	NA	NA
NSW 10	2000	2.731	4.5	1.0	5.0	40	70	2050	0.03
NSW 11	1995	0.232	2.5	1.0	1.0	30	30	NA	NA
NSW 12	2020	2.102	4.5	1.0	5.0	40	70	2050	0.03
NSW 13	1907	0.1e-2	4.5	0.05	0.05	40	70	2050	0.03
NSW 14	1950	0.33e-2	4.5	0.10	0.10	40	70	2050	0.03
NSW 15	2020	0.46e-2	4.5	0.30	0.30	40	40	NA	NA
Queensland	1915	43.362	3	0.30	5.0	30	50	2010	0.037
SA	1945	18.323	2	0.10	10	30	50	2050	0.037
Tasmania	1885	0.279	2	0.02	0.5	60	60	2015	0.037
Victoria	1890	0.23e-1	3.5	0.1	0.1	30	30	NA	NA
WA	1973	4.590	1.5	2	2	70	70	NA	NA

TABLE 3.2. Disruption constants for coal

Name	D_s	D_f	D_n
NSW 1	2003	2008	0.75
NSW 2	1928	1929	0.2
NSW 2	1989	2005	0.25
Tasmania	1958	1963	-0.1

3.2. Copper

TABLE 3.3. Mining constants for Copper

Name	Y_s	Q_T	r_{Q_T}	M_L	M_H	L_L	L_H	t_t	r_t
		kt Cu		kt Cu/y	kt Cu/y				
NSW 1	1986	3	5	0.025	0.025	15	15	NA	NA
NSW 2	2010	10.5	5	0.025	0.050	15	35	2020	0.037
NT	1954	0.7	2	0.010	0.01	80	80	NA	NA
Queensland 1	1950	1.2	4	0.02	0.02	10	10	NA	NA
Queensland 2	1968	12.6	4	0.160	0.160	85	85	NA	NA
Queensland 3	1987	3	6.5	0.03	0.03	10	10	NA	NA
Queensland 4	1997	6	6.5	0.03	0.03	20	20	NA	NA
SA 1	1970	0.2	3	0.015	0.015	30	30	NA	NA
SA 2	1995	60.2	2	0.10	0.1	80	80	NA	NA
Tasmania 1	1895	0.95	1	0.010	0.01	100	100	NA	NA
Tasmania 2	1965	1.15	3	0.010	0.01	50	50	NA	NA
Victoria 1	2020	0.17	2	0.020	0.02	80	80	NA	NA
Victorica 2	1993	0.03	2	0.020	0.02	80	80	NA	NA
WA	1991	7	5	0.020	0.02	25	25	NA	NA

3.3. Gold

TABLE 3.4. Mining constants for Gold

Name	Y_s	Q_T	r_{Q_T}	M_L	M_H	L_L	L_H	t_t	r_t
		t Au		t Au/y	t Au/y				
NSW 1	1847	250.0	14	2	2	27	27	NA	NA
NSW 2	1880	220	6	2	2	30	30	NA	NA
NSW 3	1927	47	8	0.5	0.5	20	20	NA	NA
NSW 4	1985	2449.7	4.3	5	5	30	30	NA	NA
NT 1	1945	137	10	2	2	40	40	NA	NA
NT 2	1985	425	10	20	20	25	25	NA	NA
NT 3	2015	707	10	20	20	40	40	NA	NA
Queensland 1	1859	626.2	4	0.6	2	20	40	1950	0.03
Queensland 2	1928	122.3	3	0.6	2	40	80	1950	0.03
Queensland 3	1982	740.0	15	10	10	27	27	NA	NA
Queensland 4	2020	958.6	6	10	10	30	30	NA	NA
SA	2000	3640.7	8	4	4	40	40	NA	NA
Tasmania 1	1875	112	4	1	1	125	125	NA	NA
Tasmania 2	1995	205.6	4	5	5	50	50	NA	NA
Victoria 1	1848	750	4	83	83	20	20	NA	NA
Victoria 2	1856	700	4	46	46	25	25	NA	NA
Victoria 3	1872	850	4	21	21	50	50	NA	NA
Victoria 4	1985	277.9	4	2	2	50	50	NA	NA
WA 1	1890	1000.0	15	5	5	20	20	NA	NA
WA 2	1920	600.0	5	5	5	15	15	NA	NA
WA 3	1940	600.0	5	5	5	20	20	NA	NA
WA 4	1977	4200	10	20	20	20	20	NA	NA
WA 5	1998	5754.5	10	20	20	20	20	NA	NA

TABLE 3.5. Disruption constants for NSW

Name	D_s	D_f	D_n
NSW 4	2003	2010	0.7

3.4. Iron

TABLE 3.6. Mining constants for Iron

Name	Y_s	Q_T	r_{Q_T}	M_L	M_H	L_L	L_H	t_t	r_t
		Gt Fe Ore		Gt Fe Ore/y	Gt Fe Ore/y				
NSW 1	1907	0.25e-2	4	0.15e-3	0.15e-3	40	40	NA	NA
NSW 2	1939	0.25e-2	4	0.5e-3	0.5e-3	40	40	NA	NA
NSW 3	2020	0.18e-1	4	0.1e-2	0.1e-2	40	40	NA	NA
NT 1	1966	0.7e-2	4	0.12e-2	0.12e-2	40	40	NA	NA
NT 2	2007	0.133	4	0.5e-2	0.5e-2	40	40	NA	NA
Queensland	2020	0.2	4	0.1e-1	0.1e-1	40	40	NA	NA
SA 1	1930	0.200	4	0.1e-2	0.1e-2	50	50	NA	NA
SA 2	2003	1.748	4	0.5e-2	0.5e-2	40	40	NA	NA
Tasmania 1	1967	0.110	4	0.2e-2	0.2e-2	60	60	NA	NA
Tasmania 2	2020	0.217	4	0.2e-2	0.2e-2	60	60	NA	NA
WA 1	1965	43.748	5	0.1e-1	0.1	50	50	2020	0.37e-1
WA 2	1965	0.7	5	0.1e-1	0.1e-1	10	10	NA	NA

TABLE 3.7. Disruption constants for NSW

Name	D_s	D_f	D_n
NSW 4	2003	2010	0.7

3.5. Lithium

TABLE 3.8. Mining constants for Lithium

Name	Y_s	Q_T kt Li	r_{Q_T}	M_L kt Li/y	M_H kt Li/y	L_L	L_H	t_t	r_t
NSW	1960	0.0037	4	0.004	0.004	50	50	NA	NA
NT	1924	0.003	4	0.006	0.006	50	50	NA	NA
WA 1	1910	0.00013	4	0.005	0.005	50	50	NA	NA
WA 2	1961	0.0033	4	0.005	0.005	50	50	NA	NA
WA 3	1985	17	4	1.5	1.5	50	50	NA	NA
WA 4	2000	261.797	4	6.5	6.5	50	50	NA	NA
WA 5	2010	29.77	4	6	6	50	50	NA	NA
WA 6	2010	55.5	4	3.5	3.5	20	20	NA	NA
WA 7	1963	0.113	4	0.020	0.020	50	50	NA	NA