

Callide
Oxyfuel Project

Callide Oxyfuel Project – Update

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Project Director

Australia-Japan Coal Technology Workshop
Friday, 26 June 2009



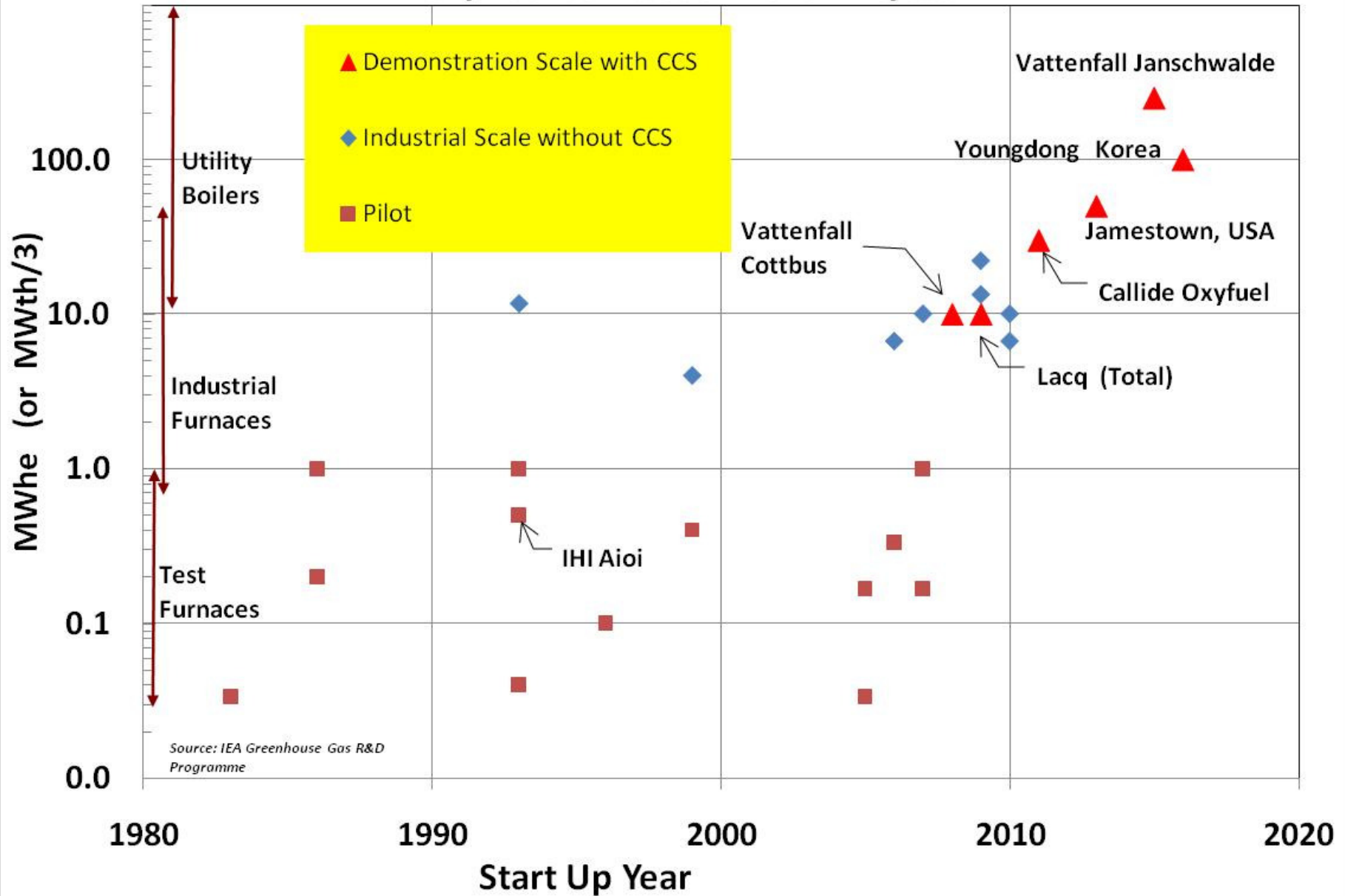
Presentation Overview

- Project background
- Oxyfuel technology developments
- Process description
- Project details (site, plant arrangement, schedule)
- Project achievements
- Oxyfuel implementation pathway

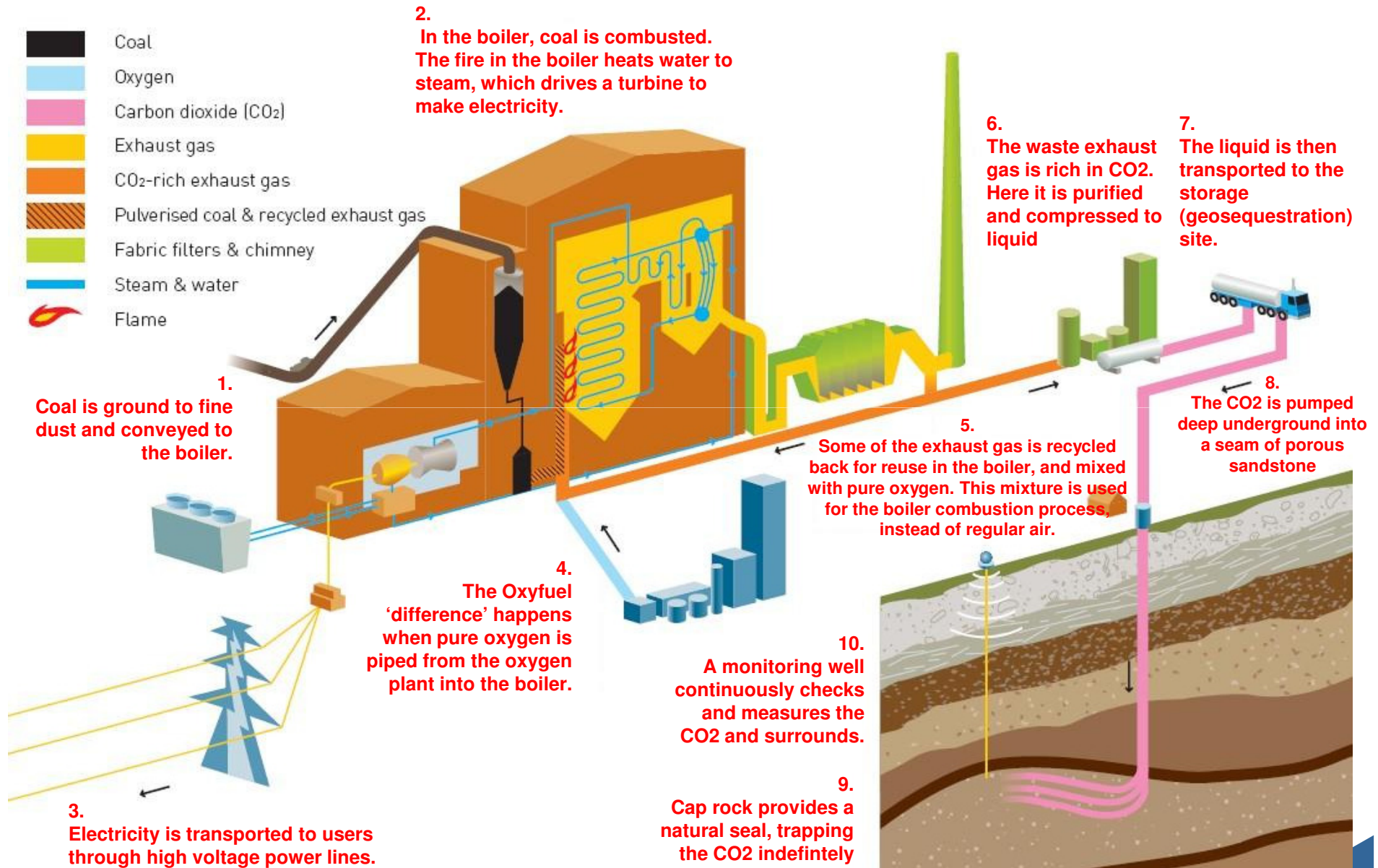
Why Oxyfuel Technology

- Our idea is that several technology options should be developed in parallel; so we support oxyfuel, post combustion capture, gasification and coal-renewable hybrids
- Our focus at this time is Oxyfuel technology, which builds on existing processes such as oxygen combustion in blast furnaces, flue gas reburning for NOx control and furnace temperature control
- Oxyfuel technology can be applied as a retrofit without affecting the steam cycle of the power plant
- The purpose of the demonstration is to understand the real and practical issues of owning and operating a low emission coal facility

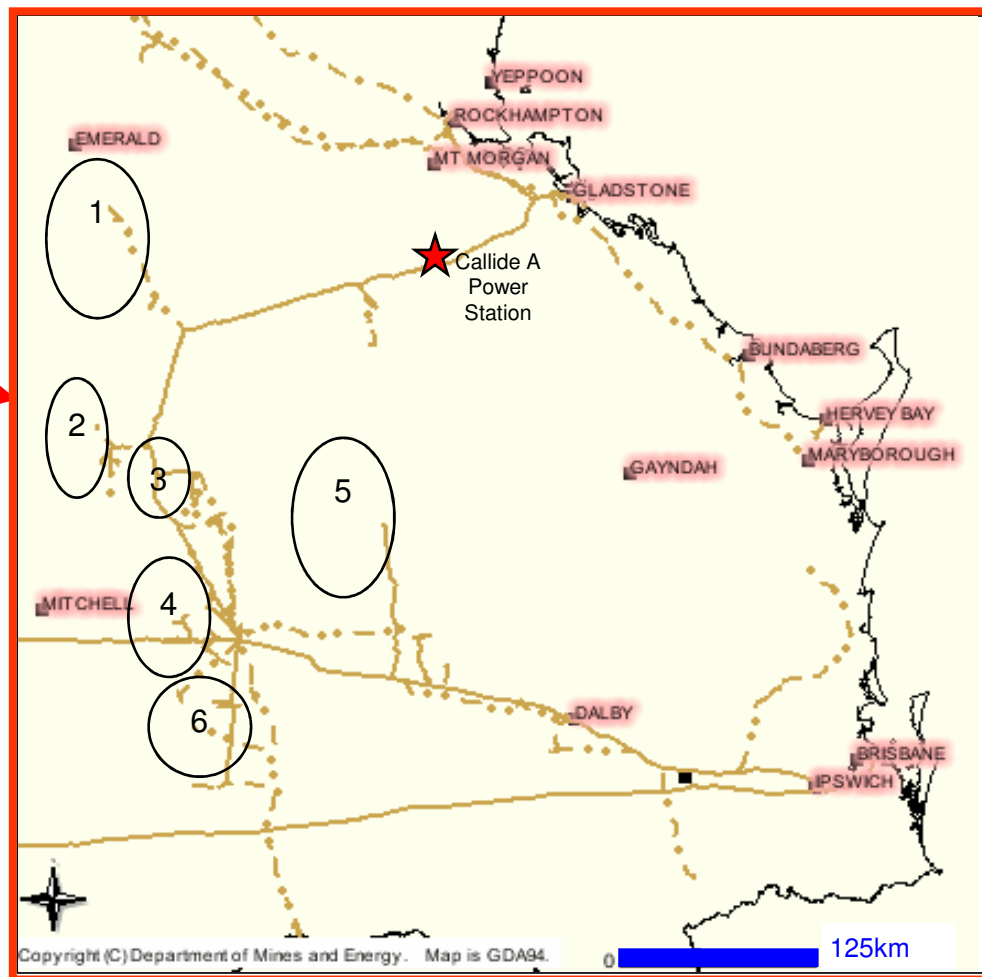
Oxy-Fuel Combustion Boiler Projects



Callide Oxyfuel Project - CCS Process



Callide Oxyfuel Project - Locations



Stage 1 - Capture

Callide A Power Station

4 x 30 MWe

Steam 136 t/h at 4.1MPa, 460°C

Commissioned: 1965 – 69

Refurbished 1997/98

Placed in storage in 2002

Stage 2 - Storage

CO2 storage areas:

6 Areas considered

1. Northern Denison Trough
2. Southern Denison Trough
3. Fairview Coal Seam Methane Field
4. Roma Shelf
5. Burunga/Wandoan Anticlines (Coal Seam Methane Field)
6. Wunger Ridge

— Gas & Oil Pipelines

CO2 storage site options - Northern Denison Trough

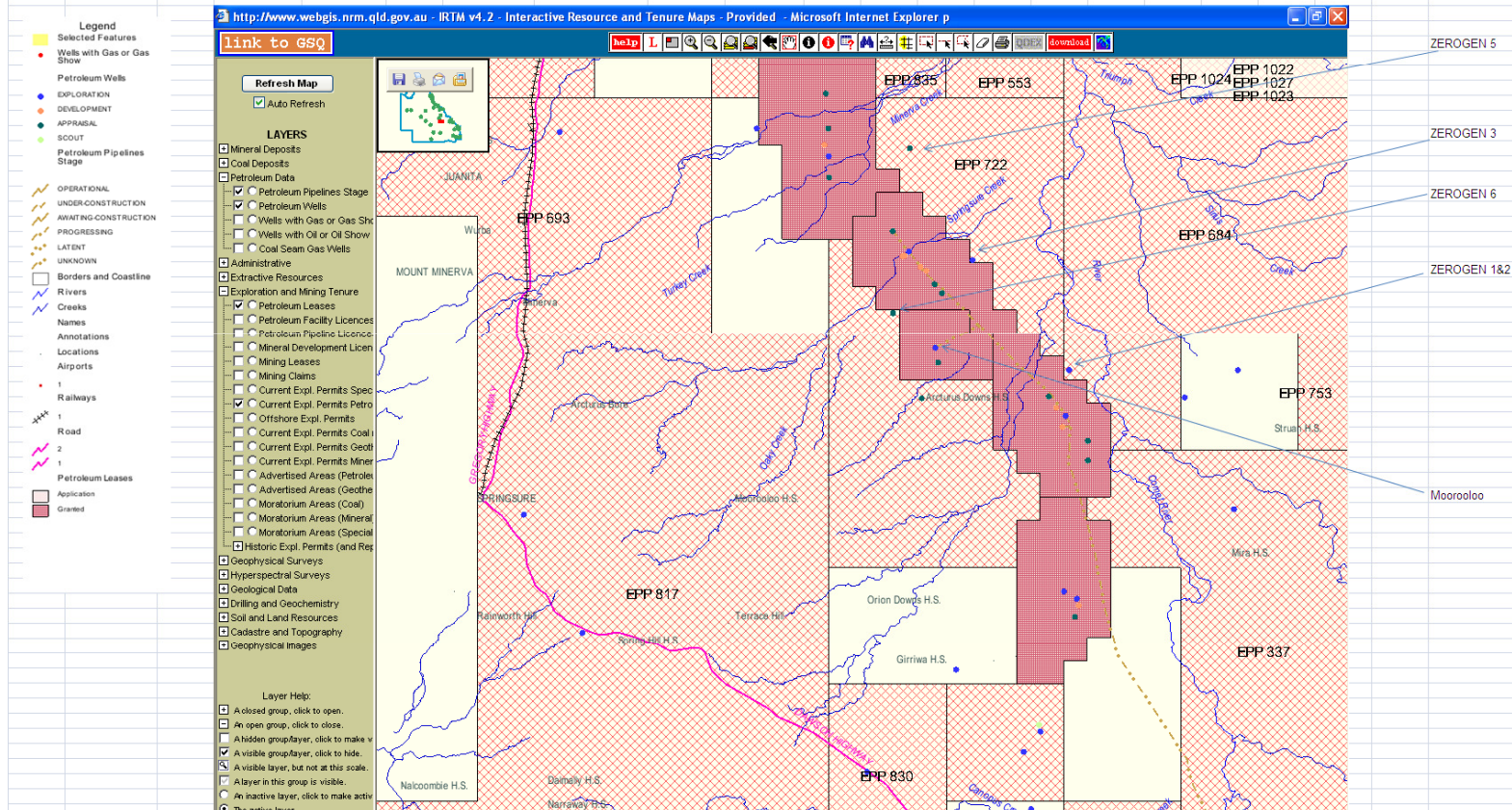
Interactive resource and tenure maps

http://www.dme.qld.gov.au/mines/tenure_maps.cfm

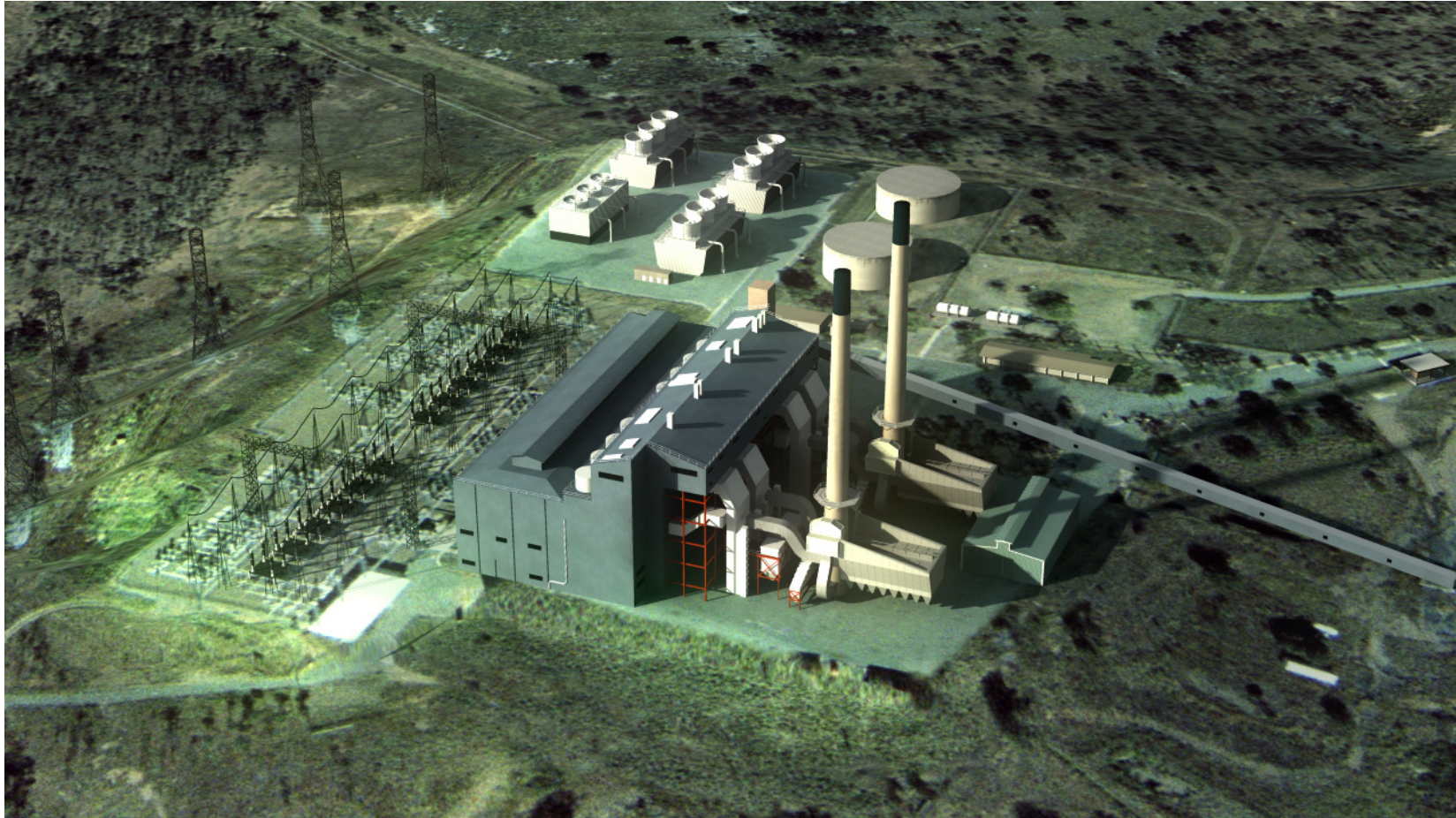
<http://www.webgis.nrm.qld.gov.au/webgis/webqmin/viewer.htm>

Extracted - 22 June 2009

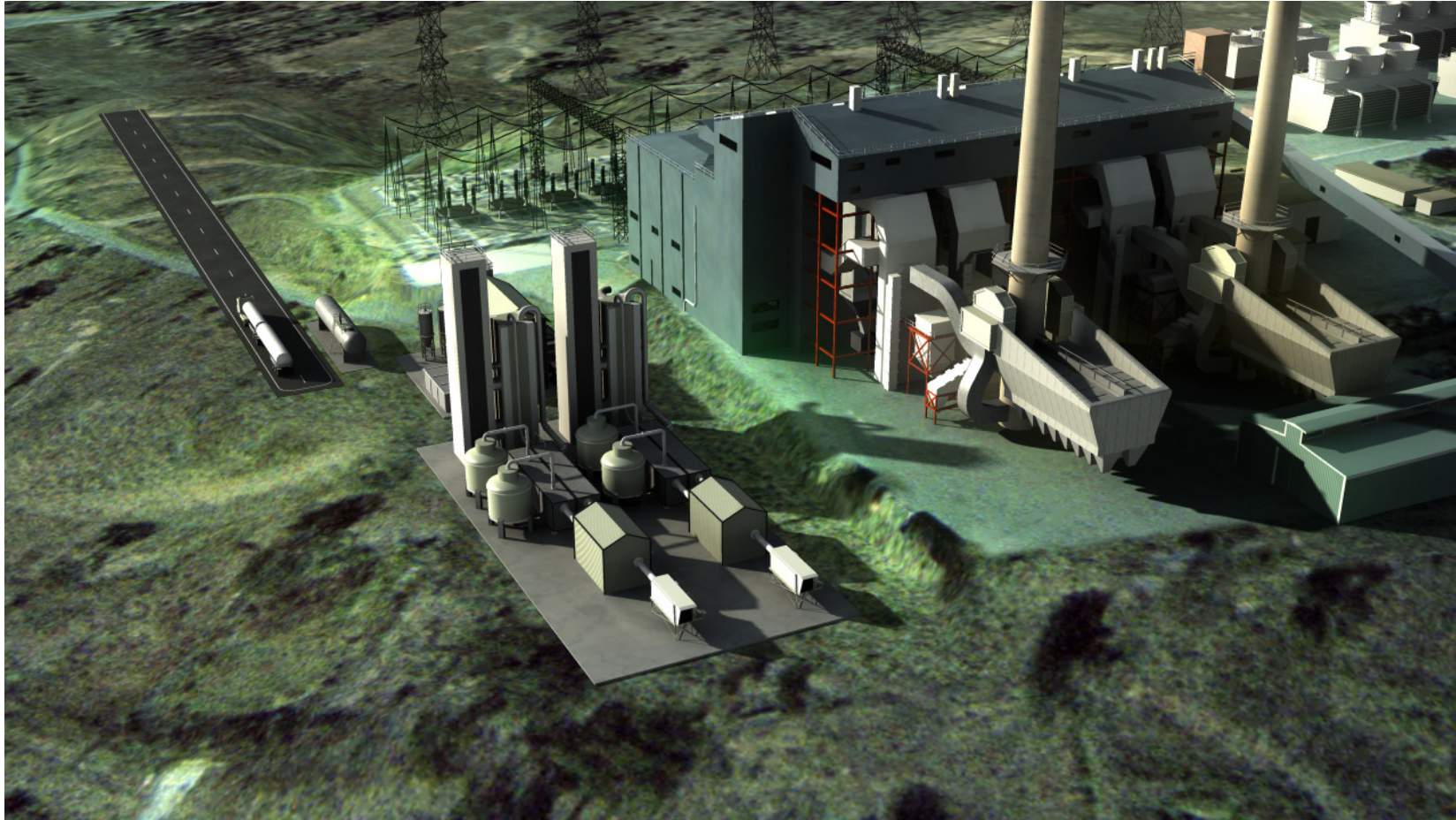
Rec	Well Type	Operator	Well Name	Result	Fig Release Date	Latitude	Longitude	Company Report Number	Publication Reference
1	EXPLORATION	SGO	ZEROGEN 1	COAL	8-Jul-06	24 01 29	148 30 17	Not avail	Not avail
2	EXPLORATION	SGO	ZEROGEN 2	DRY PLUS OIL SHD	15-Aug-06	24 01 28	148 30 16	Not avail	Not avail
3	APPRAISAL	BNS	ZEROGEN 5	UNKNOWN	16-Jun-08	23 52 1	149 23 23	Not avail	Not avail
4	APPRAISAL	BNS	ZEROGEN 6	UNKNOWN	9-Jun-08	23 59 1	149 22 46	Not avail	Not avail
5	EXPLORATION	AGR	ZEROGEN 3	UNKNOWN	16-Dec-07	23 56 46	148 28 10	Not avail	Not avail



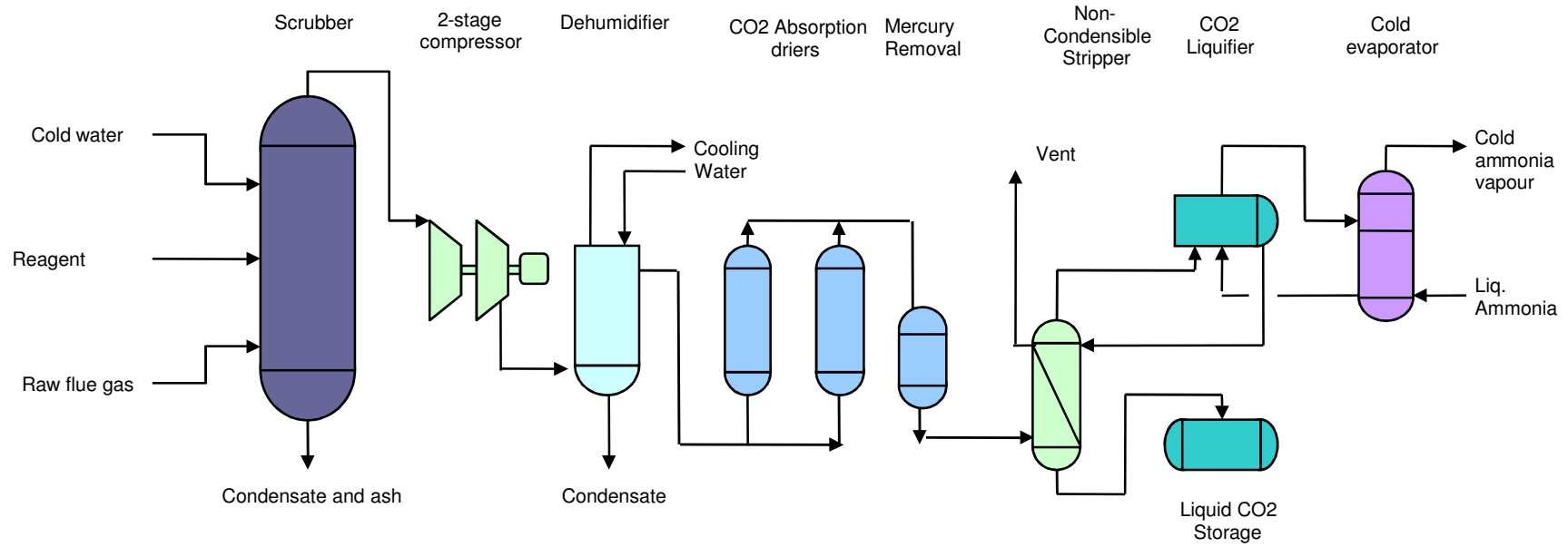
Callide A Power Station



Oxygen and CO2 capture plant



CO2 compression & purification plant (CO2CPU): Flowchart

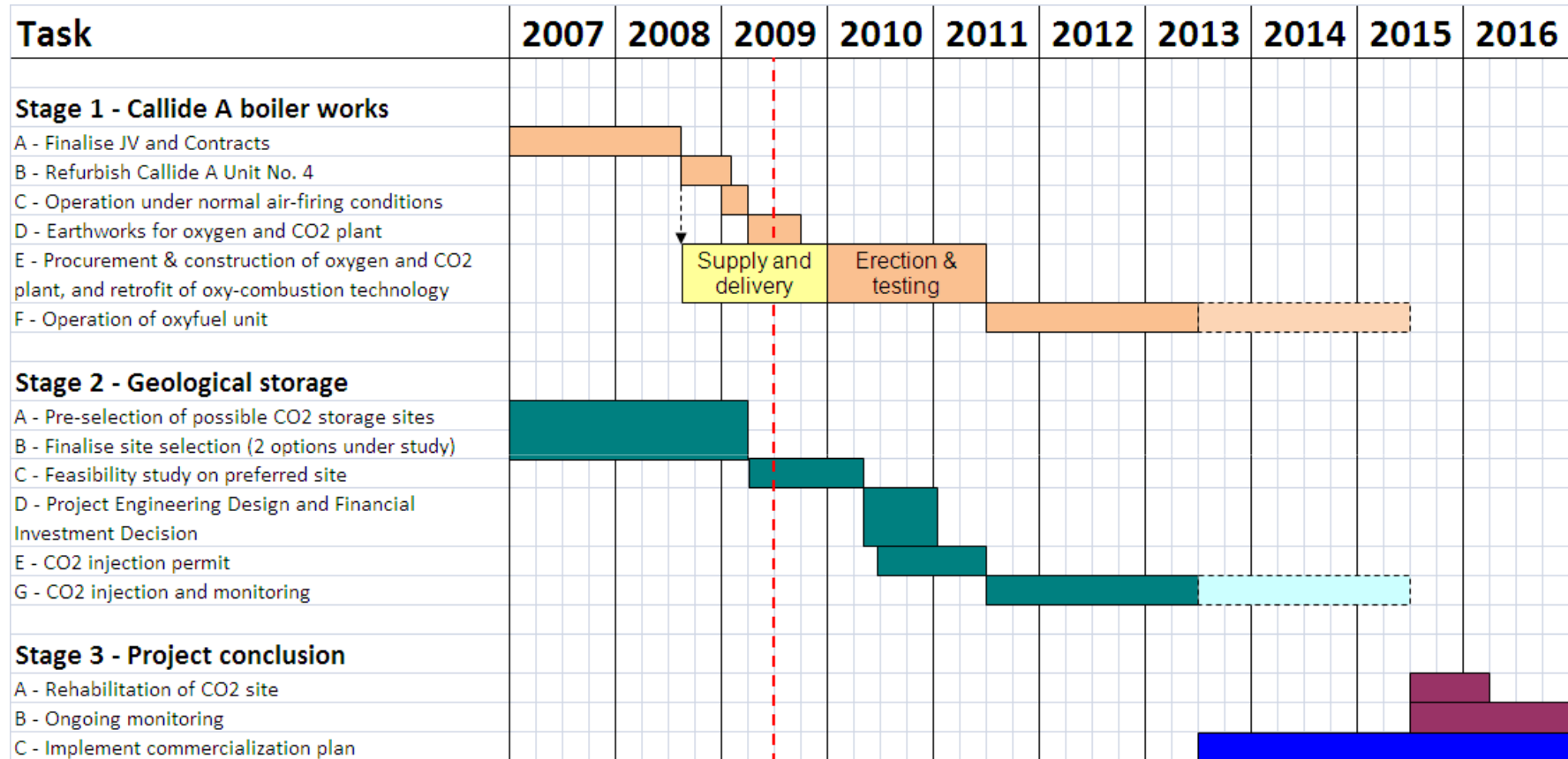


CO2 compression & purification plant (CPU): Inputs & outputs

75 t/day liquid product

Parameter	Units	CPU Inlet	CO2 Product
Flow rate	kg/s	1.3	0.9
	Am ³ /s	1.7	
Temperature	°C	145	-30
Pressure	kPa (a)	101	1600
Composition			
H ₂ O	mole %	20.0	< 0.002
O ₂	mole %	4.2	< 0.003
N ₂ (+ Ar)	mole %	18.6	< 0.1
CO ₂	mole %	55.9	99.9
SO ₂	mole %	0.06	< 0.003
NO _x	mole %	0.03	< 0.003
Particulate	mg/Nm ³	< 100	< 1
Trace elements (As, Be, Cd, Hg, V)	ppbv	< 1	< 0.1

Callide Oxyfuel Project - Schedule



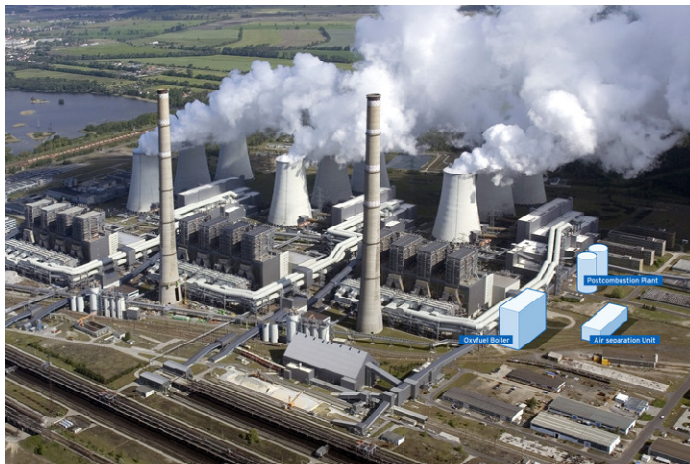
Callide Oxyfuel Project - Achievements

Date	Project milestones achieved as at end-June 2009
Nov-03	Project idea conceived
Mar-04	Oxyfuel included in COAL21 National Plan of Action
Sep-04	Japan-Australia Feasibility Study MOU signed
Mar-06	1st Meeting with METI (Dr Tani-San, Yamagata-San)
Mar-06	Project MOU signed & funding application submitted
Oct-06	Commonwealth Government LETDF Program - Funding Announcement
Nov-06	Recognition by APP as flagship project (Project No. CFE-06-6)
Dec-06/Jan-07	Oxy-firing pilot tests completed at IHI facility in Aioi (3 x 10 t coal)
Nov-07	Feasibility study completed (published in April 2008)
Mar-08	Project agreements signed
Jul-08	Project Financial Close: Project plan & budget approved by Joint Venture
Aug-08	Plant supply contracts awarded to IHI Engineering Australia, Air Liquide (France), GLP Plant (Melbourne), CBH and Siemens
Jan-08	Plant refurbishment/overhaul completed
Mar-09	Plant Testing (under air-firing) and data gathering - completed
Jun-09	Tenders called for site earthworks

Oxyfuel CCS Implementation Pathway

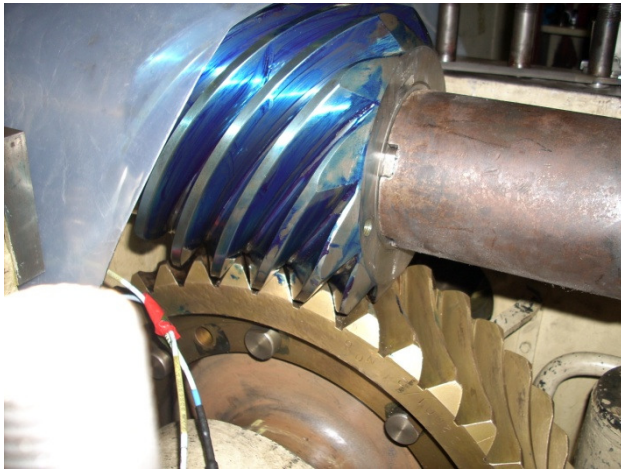
Implementation should be progressed at several levels:

1. Retrofit to existing units – generally as the 1st phase of implementation
2. Construction of new plants - generally as the 2nd phase of implementation
3. 2nd generation oxyfuel plants will involve higher levels of integration and possibly incorporation of solar thermal feedwater heating systems
4. Parallel development of more efficient and lower cost oxygen plants – will be a key factor in the success of oxyfuel technology
5. Development of CO₂ storage regulations, CO₂ transport infrastructure and proving up of large CO₂ storage reservoirs – necessary to underpin large projects



Vattenfall's Jämschwalde 250MW Plant
– Proposed location for Oxyfuel
demonstration plant by 2015

Photos from Recent Plant Refurbishment Work



Callide Oxyfuel Project – Participants

Oxyfuel Project Partners



Supporting Collaborators



Thank you

for more information: www.callideoxyfuel.com