



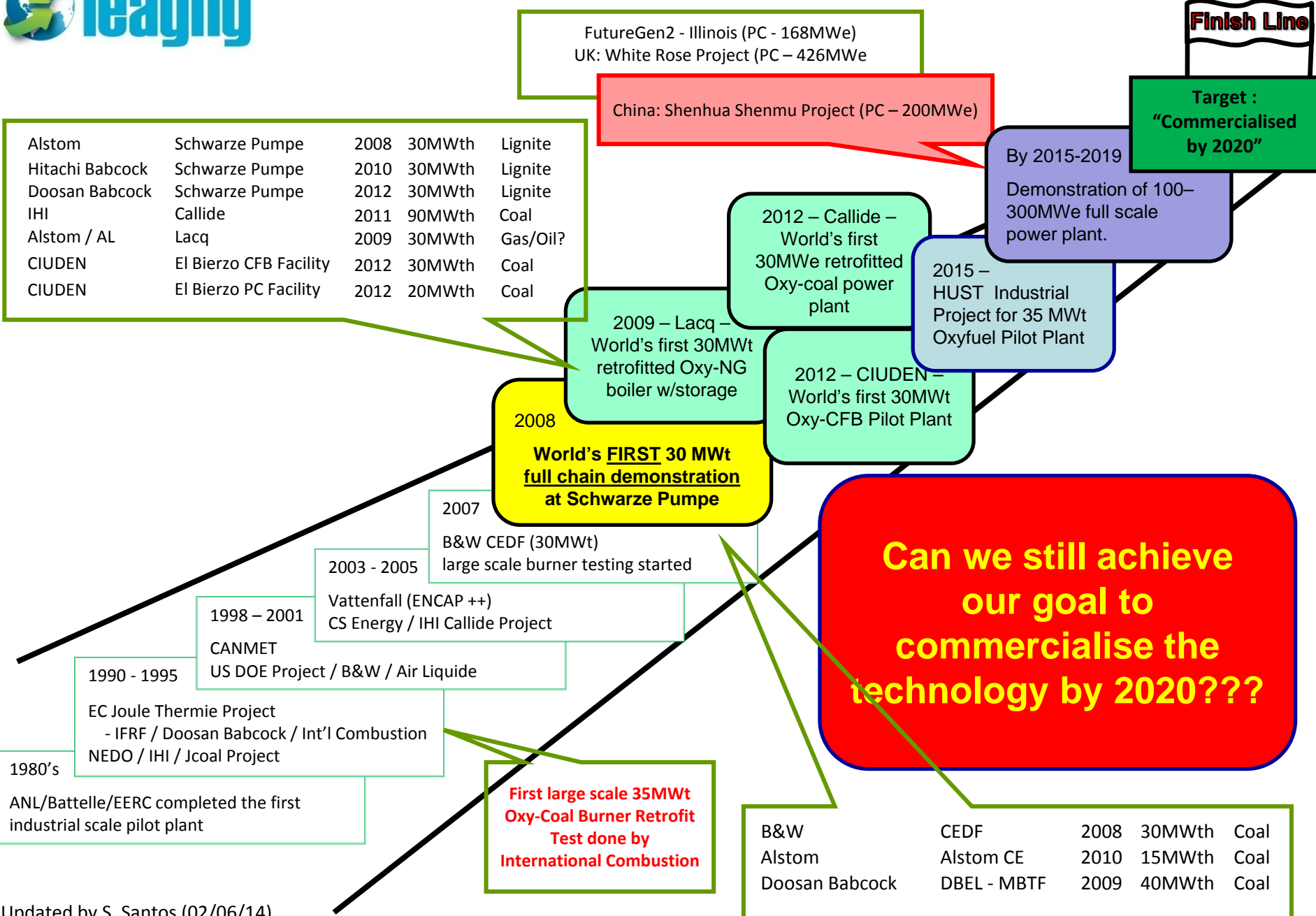
4th Meeting of the Oxy-Corrosion Working Group

Stanley Santos

*IEA Greenhouse Gas R&D Programme
Cheltenham, UK*

Imperial College London

June 2014



Alstom	Schwarze Pumpe	2008	30MWth	Lignite
Hitachi Babcock	Schwarze Pumpe	2010	30MWth	Lignite
Doosan Babcock	Schwarze Pumpe	2012	30MWth	Lignite
IHI	Callide	2011	90MWth	Coal
Alstom / AL	Lacq	2009	30MWth	Gas/Oil?
CIUDEN	El Bierzo CFB Facility	2012	30MWth	Coal
CIUDEN	El Bierzo PC Facility	2012	20MWth	Coal

FutureGen2 - Illinois (PC - 168MWe)
UK: White Rose Project (PC - 426MWe)

China: Shenhua Shenmu Project (PC - 200MWe)

Finish Line
Target : "Commercialised by 2020"

By 2015-2019
Demonstration of 100-300MWe full scale power plant.

2015 - HUST Industrial Project for 35 MWt Oxyfuel Pilot Plant

2012 - Callide - World's first 30MWe retrofitted Oxy-coal power plant

2009 - Lacq - World's first 30MWt retrofitted Oxy-NG boiler w/storage

2012 - CIUDEN - World's first 30MWt Oxy-CFB Pilot Plant

2008
World's FIRST 30 MWt full chain demonstration at Schwarze Pumpe

2007
B&W CEDF (30MWt) large scale burner testing started

2003 - 2005
Vattenfall (ENCAP++)
CS Energy / IHI Callide Project

1998 - 2001
CANMET
US DOE Project / B&W / Air Liquide

1990 - 1995
EC Joule Thermie Project - IFRF / Doosan Babcock / Int'l Combustion
NEDO / IHI / Jcoal Project

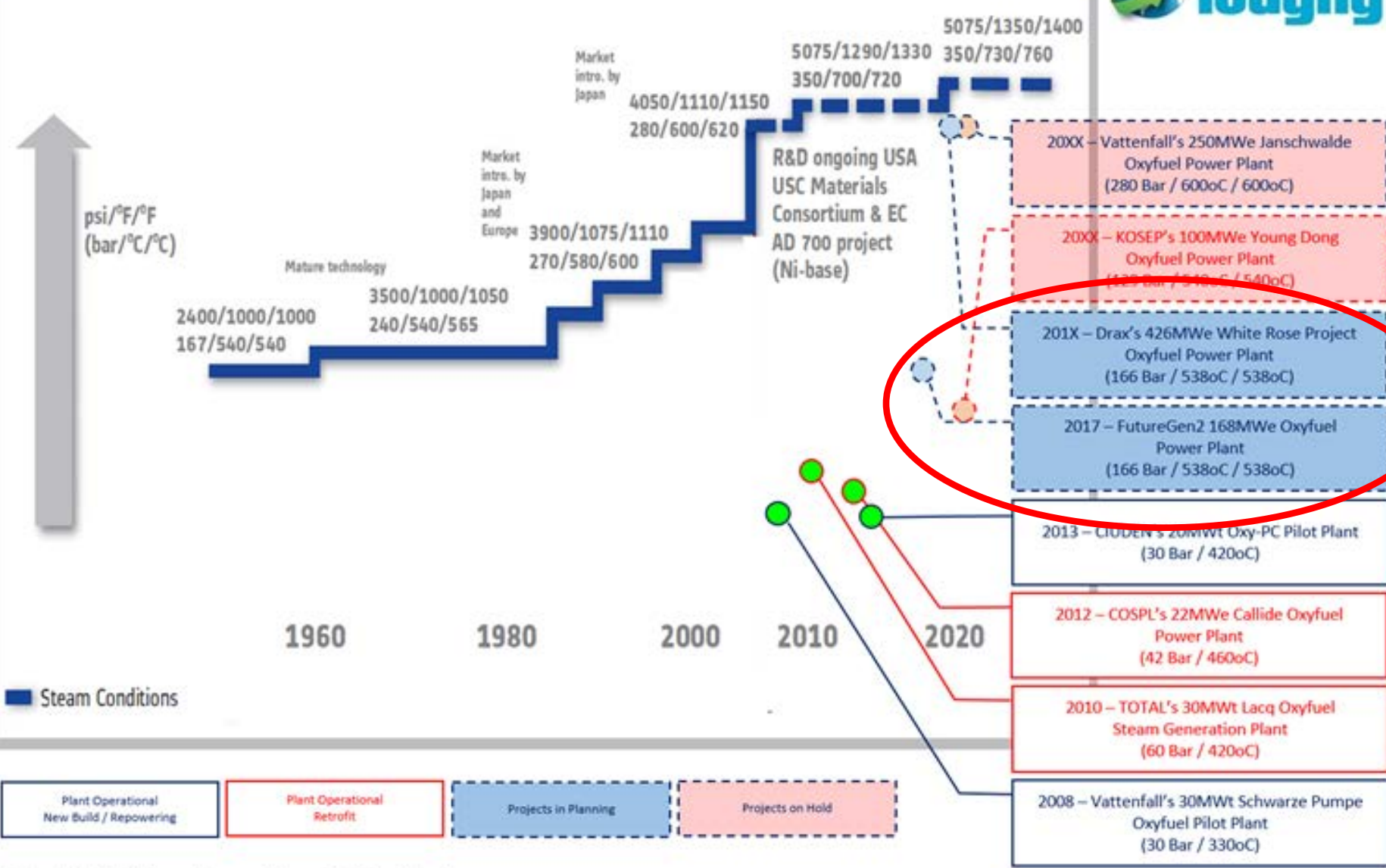
1980's
ANL/Battelle/EERC completed the first industrial scale pilot plant

Can we still achieve our goal to commercialise the technology by 2020???

First large scale 35MWt Oxy-Coal Burner Retrofit Test done by International Combustion

B&W	CEDF	2008	30MWth	Coal
Alstom	Alstom CE	2010	15MWth	Coal
Doosan Babcock	DBEL - MBTF	2009	40MWth	Coal

Efficiency Improvement with Increasing Steam Conditions

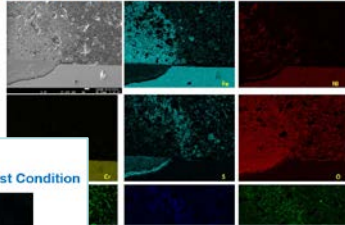


S. Santos (16/04/2014) - figure of steam conditions adapted from Alstom’s paper

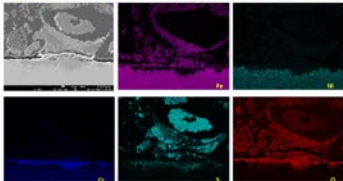
Fireside Corrosion:
Implications and Solutions
for Oxy-combustion Boilers

Cranfield
UNIVERSITY

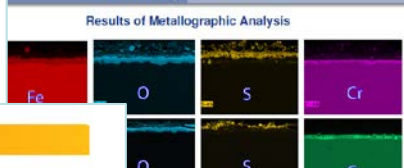
babcock & wilcox power generation group
309H Morphology from Air-Firing OH Gattling Coal Test Condition



babcock & wilcox power generation group
309H Morphology from Oxy-Firing OH Gattling Coal Test Condition

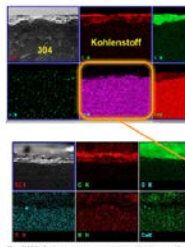


babcock & wilcox power generation group
Experimental Oxides
From Elemental Analysis Summary



Results of Metallographic Analysis

304 – 580C (Sample C and D)



Open Questions in Corrosion



- Is corrosion a limiting factor or not? Who will give a definite answer?
- Influence of dual conditions like both side on a separating wall (pipe wall in steam power plants).
- Influence of an ash layer on high temperature corrosion.
- How to extrapolate from laboratory data to the field ?
- Are all parameters and there interaction known?
- What is the impact of carburization for a long time?
- Can corrosion/carburization impact the fatigue life?
- ...Open questions discussion...

24.08.2013

Third OCC, Spain 2013

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This meeting...

IEAGHG Oxy-Corrosion WG Meeting

Imperial College London

18th – 19th June 2014

Previous Meetings...

IEAGHG Special Workshop on SO₂, SO₃, Hg and Corrosion Issues in Oxyfuel

Combustion London, UK

25th – 26th January 2011

OxyCORR Workshop

Berlin, Germany

27th – 28th August 2012

<http://oxycorr.eu-projects.de/>

3rd Oxyfuel Combustion Conference (OCC3)

Special Session – Oxy Corrosion

Ponferrada, Spain

10th September 2013

<http://www.ieaghg.org/conferences/occ/18-conferences/occ/340-workshop-1-corrosion>

Steering Committee



- ***Axel Kranzmann (BAM)***
- ***John Oakey (Cranfield University)***
- ***Bettina Bordenet (Alstom Power)***
- ***Alexander Gerhardt (Vattenfall)***
- ***Steve Kung (B&W)***
- ***Jeorg Maier (IFK)***
- ***Marta Eugenia Escoto de Tejada (IFK)***