

**LTI**



***Leonardo Technologies, Inc.***

# **IEA World Energy Outlook 2008 – Points of Note**

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Robert Gentile

President and CEO

## Policy (WEO-2008)

- On current trends, ***energy related emissions of carbon dioxide and other GHG will rise inexorably***, pushing up average global temperature by as much as 6C in the long term.
- ***Energy Sector will have to play the central role in curbing emissions*** – through major improvements in efficiency and rapid switching to renewable and other low-carbon technologies, such as carbon capture and storage (CCS)
- ***People will need to change the way they use energy***, and energy suppliers will need to invest in developing and commercializing low-carbon technologies.
- To make this happen, ***governments have to put in place appropriate financial incentives and regulatory frameworks*** that support both energy-security and climate-policy goals in an integrated way.

# Energy Demand (WEO-2008)

- World primary **energy demand grows by 1.6% per year** on average in 2006-2030, **an increase of 45%**.
- **Fossil fuel accounts for 80% of the world's primary energy mix** in 2030.
- **China and India account for just over half of the increase** in world primary energy between 2006 and 2030.
- Collectively, **non-OECD countries account for 87% of the increase**.

# Emissions (WEO-2008)

- Global energy related CO2 emissions rise from 28Gt in 2006 to 41 GT in 2030 – an **increase of 45%**.
- 75% of the projected increase in energy related CO2 emissions arise in **China, India, and the Middle East**.
- **97% in non-OECD countries** as a whole.

# Investment (WEO-2008)

- Projections call for cumulative **investment of over \$26 trillion** (\$2007) in 2007-2030.
- **Power sector accounts for \$13.6 trillion**, or 52% of the total.
- The **current financial crisis** is not expected to affect long-term investment, but **could lead to delays** in bringing current projects to completion, particularly in the power sector.
- The **normal cycle of capital replacement is a key constraint** on the speed with which low-carbon technologies can enter into use without incurring disproportionate cost. It will be necessary to face up to the reality of the cost of early capital retirement if radical measures are to be taken to speed up this process so as to deliver deep cuts in emissions.

# Many CCS projects have been announced

However only one integrated project is operating

Integrated projects

Capture

Power generation and industrial applications

Kurosaki JAP	Loy Yang AUS	Hazelwood AUS	NLECI Projects	Vattenfall GER	Sargas NOR	Williston USA	Antelope USA	Iwaki JPN	Enel 1 ITA	Mongstad NOR
Teeside UK	GE POL	GreenGen CHN	Powerfuel UK	Tenaska USA	WA Parish USA	Kimberlina USA	Ft Nelson CAN	RWE GER	ZeroGen AUS	FuturGas AUS
E.ON GER	Hypogen EU	EPCOR CAN	Nuon NLD	White Tiger VNM	Proj. Link UAE	Yantai CHN	Lacq FRA	AEP Alst. USA	Appalach. USA	Wallula USA
Mulgrave AUS	Endesa ESP	Coolimba AUS	APP Pilots	Bndry Dan CAN	Imminham UK	Callide AUS	futureGen USA	Fairview USA	DF1 UK	DF2 USA
Pernis NLD	Hamm GER	Ferrybr. UK	Kingsn. UK	DF3 USA	Brauge NOR	TaskP. CAN				
Tilbury UK	HRL AUS	Willing. UK								
<p>Capture-only projects</p>				Zama Link CAN	K12b NLD	Otway AUS	In Salah ALG	Snohvit NOR	Sleipner NOR	Weyburn CAN/US
<p>Storage-only projects</p>				Permian USA	Reconcovo Brazil	Ketzin GER	Frio Brine USA	Nagaoka JAP	Gorgon AUS	Cranfield USA
				Daiquin CHN	Quinshu CHN	Altmark GER	JAPEX JAP	San Joaq. USA	Bintulu MAL	Monash AUS
				Decatur USA	TAME USA	Moomba AUS	Mt Simon USA	Entrada USA		

Stripped from natural gas / other

No storage solution

Storage solution

Storage

Complete
Operating
Announced
Capture-ready
~~X~~ Dormant or cancelled



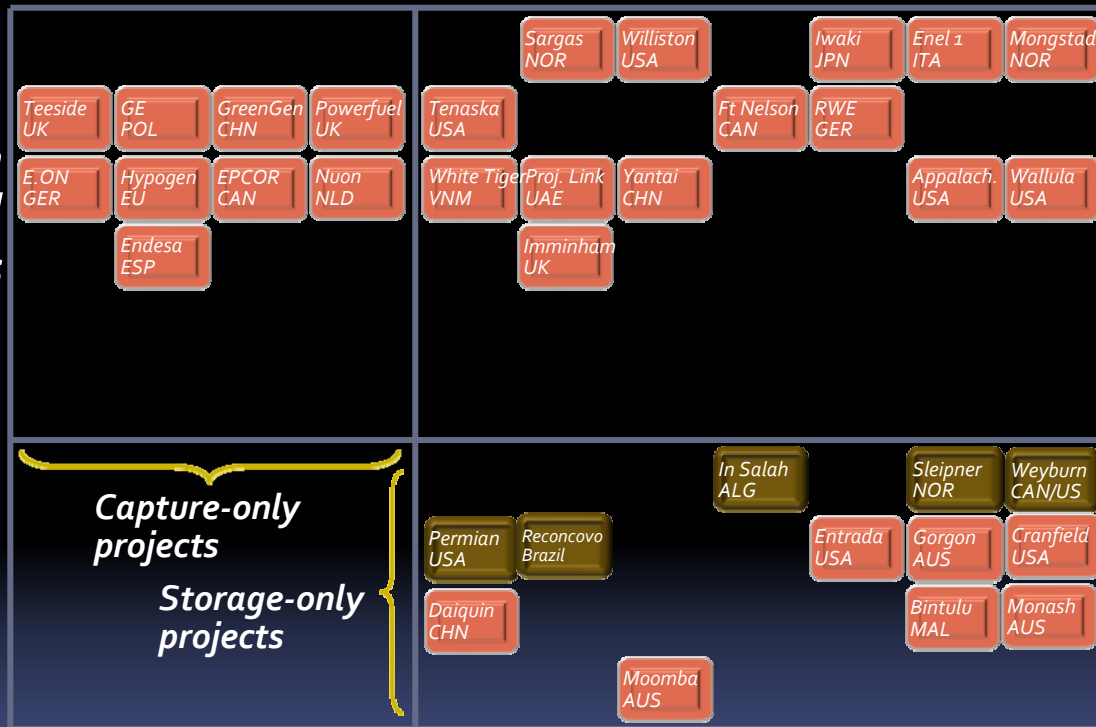
Source: IEA, Fossil fuel-fired power plants and CO<sub>2</sub> capture and storage; CSIRO, Australian CCS Commercial and R&D Projects, 2007; Gassnova, International CCS Technology Survey 2008; Carbon Capture and Sequestration Technologies @ MIT, <http://sequestration.mit.edu/tools/projects/index.html>; RET interviews

# No integrated industrial-scale projects have started

**Integrated projects**

**Capture**

**Power generation and industrial applications**



**No storage solution**

**Storage solution**

**Storage**

**Operating**

**Announced**



Note: Industrial-scale defined as more than 250 MW power production and/or greater than 1 Mtpa CO<sub>2</sub> storage  
 Source: IEA, Fossil fuel-fired power plants and CO<sub>2</sub> capture and storage; CSIRO, Australian CCS Commercial and R&D Projects, 2007; Gassnova, International CCS Technology Survey 2008; Carbon Capture and Sequestration Technologies @ MIT, <http://sequestration.mit.edu/tools/projects/index.html>; RET interviews