



**CCS: Global Trends and Outlook**  
 Einari Kisel, Senior Fellow,  
 World Energy Council  
 Promoting sustainable energy for the greatest benefit of all



Credits to WEC Cleaner Fossil Fuel Systems Knowledge Network  
 Dr. Hisham Khatib, Dr. John Topper, Dr. Elena Nekhaev

## World Energy Council – who we are



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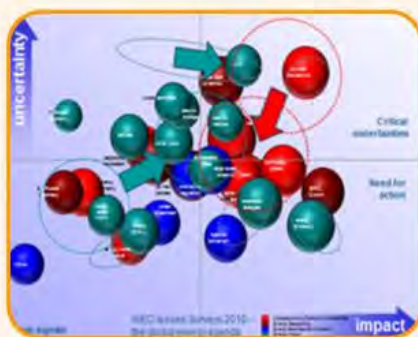
## Energy Leaders Forum:

- Truly global
- Inclusive & impartial
- Committed to our sustainable energy future
- Established in 1923 after World War I
- With over 90 national committees chaired by energy ministers, leading CEOs and practitioners
- Represents over 3000 government, private sector and experts organisations
- Governed by the Executive Assembly (one country/one vote)
- Flagship event: World Energy Congress, every three years, next in Daegu, Korea 2013



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# World Energy Council – what we do



- World Energy Congress
- World Energy Leaders Summits
- Regional Energy Forums
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Identify critical issues & risks  
[www.worldenergy.org/issues](http://www.worldenergy.org/issues)

Develop strategic insight & agendas  
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Facilitate Dialogue  
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# World Energy Council – what we do

## Study groups

- WEC network's 400 experts from over 50 countries bringing multi-sectorial, local and regional perspectives

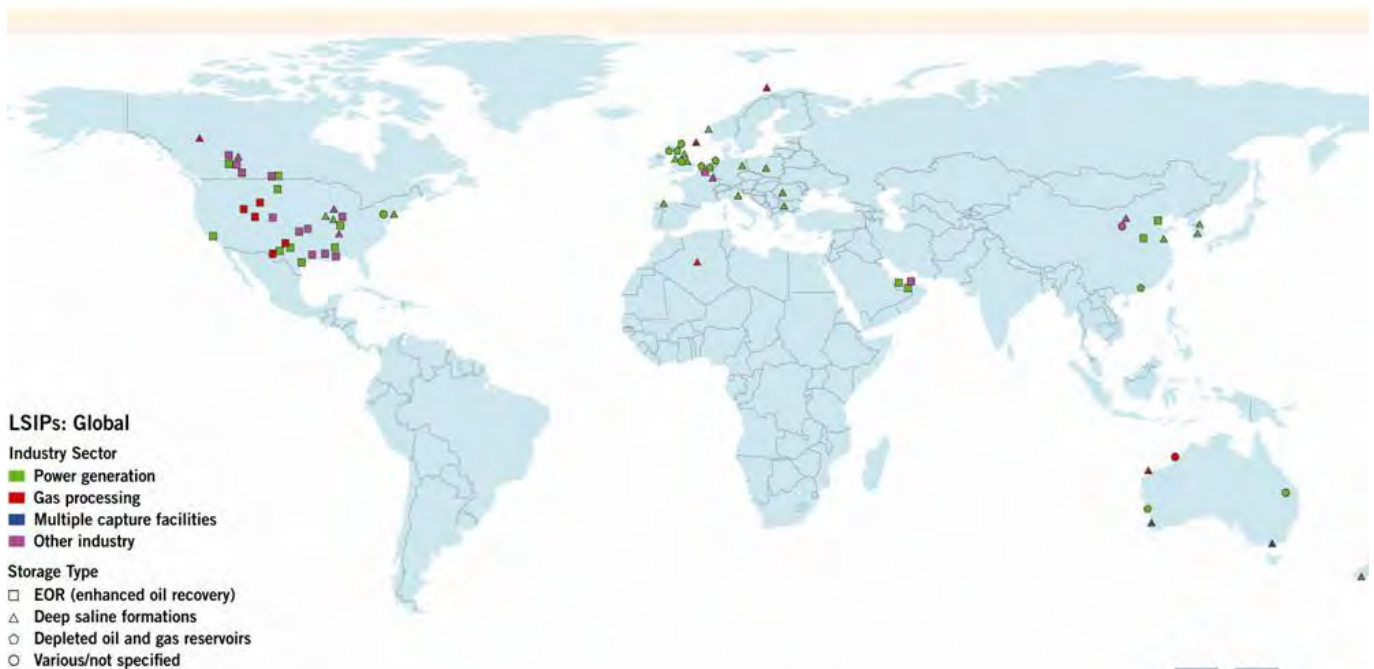


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For sustainable energy.

# Global Spread of Projects

## October 2011

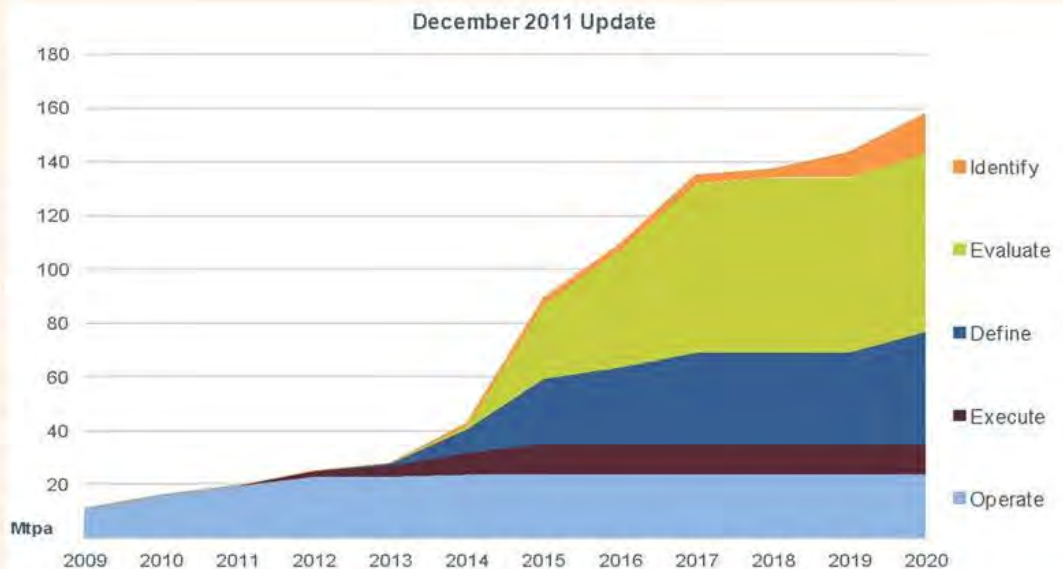


# Large Scale Integrated Projects

## 2011 summary

The Global CCS Institute identified 74 LSIPs around the world. 15 are currently operating or in construction, totalling a confirmed capture capacity of 35.4 million tonnes per annum (Mtpa) of carbon dioxide (CO<sub>2</sub>).

A further 59 LSIPs are in the planning stages of development, with an additional, potential capture capacity of more than 122 Mtpa.



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# Global Status of Large CCS Projects

December 2011 Update

Cancelled Projects			
Europe Area	Longannet Project	2 Mtpa	Considered cancelled – project was shelved following announcement by the UK Department of Energy and Climate Change that it would not fund the construction of the CO <sub>2</sub> capture facilities.
	Vattenfall Janschwalde	1.7 Mtpa	Considered cancelled – plans were stopped, citing the lack of government support and the absence of a clear legal framework.
Newly-Identified Projects			
China	Datang Daqing Oxy-fuel Combustion CCS Demo Project	> 1 Mtpa	New build super-critical coal-fired power plant generating electricity and heat, with oxy-fuel combustion CO <sub>2</sub> capture. Operation is expected to start in 2015.
United States	NRG Energy Parish CCS Project	1.5 Mtpa	Retrofit of post-combustion CO <sub>2</sub> capture technology at a coal-fired power plant in Texas. The CO <sub>2</sub> will be used for enhanced oil recovery starting from 2015.
Project Progress			
United States	Air Products Steam Methane Reformer EOR Project	1 Mtpa	Moved to Execute as it started construction in August 2011 – the new build hydrogen plant is expected to begin operation in 2012.
Other key changes			
Europe Area	Sleipner CO <sub>2</sub> Injection	1.1 to 1.2 Mtpa	Volume of CO <sub>2</sub> captured and injected will be expanded to 1.1 - 1.2 Mtpa in 2014, with the addition of 0.1 to 0.2 Mtpa of CO <sub>2</sub> from the gas produced from the Gudrun field, currently under development.
United States	(HECA) Hydrogen Energy California Project	2.3 Mtpa	Purchased by SCS Energy. The hydrogen plant was requalified as a polygeneration plant and will include the manufacturing of urea. Expected operation date was moved back by one year to 2017.

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## China - CO<sub>2</sub> capture and utilisation trials in the coal fired power sector

- In 2008, Huaneng Group established a side stream post-combustion capture unit on the 800MWe Gaobadian PC CHP plant in Beijing, with an annual CO<sub>2</sub> capture capacity of 3000 tonnes.
- In 2010, Huaneng installed a larger unit on the 2x660 MWe Shidongkou No. 2 Power Plant in Shanghai, which can capture 120,000 tonnes of CO<sub>2</sub> each year.



In both cases, captured CO<sub>2</sub> is sold to the food and beverage industries.



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## China - Greengem IGCC CCS project

- High-efficiency, coal-based IGCC polygeneration system and efficient treatment of pollutants with near-zero emissions of CO<sub>2</sub>.
- Phase 1 is to prove the scale-up of the Chinese gasifier
- Phase 2 aims to improve the IGCC polygeneration technology, and to determine how best to take forward the fuel cell power generation technology, and to produce up to 30-60,000 tonnes/year of CO<sub>2</sub> for EOR trials.
- Phase 3 will comprise a 400 MWe demonstration of the overall concept.



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## China - CCS potential in the coal to chemicals sector



- Growth in scale and extent of application in the coal to chemicals sector, with the opportunity to capture CO<sub>2</sub> at relatively low cost
- Potential for some early CCS demonstrations and commercial prototypes, probably for EOR applications

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## China - CCS trial underway

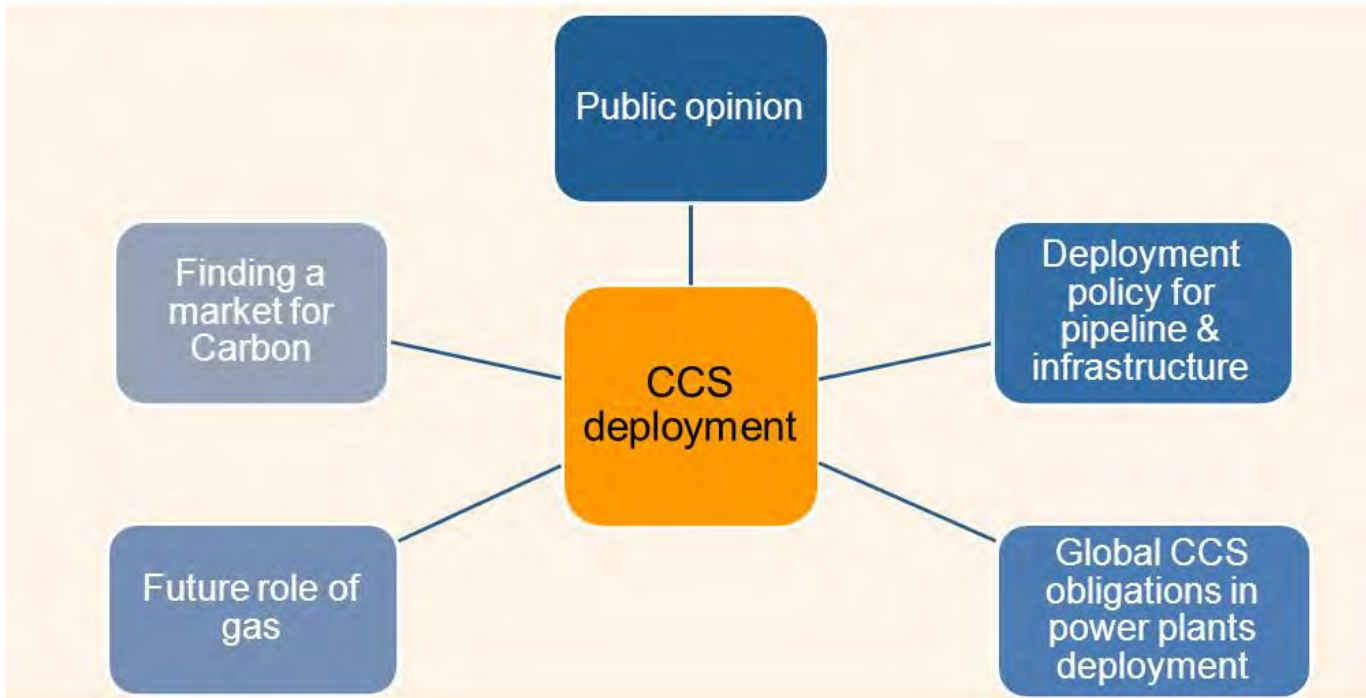


- The first major coal gasifier CCS trial in China is underway at the Shenhua Direct Coal to Liquids (CTL) Demonstration Plant, close to Erdos, Inner Mongolia Autonomous Region
- Aim is to remove up to 100,000 tonnes/year of CO<sub>2</sub> from the waste stream and transport it for storage in a nearby aquifer

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## Factors influencing the future deployment of CCS



## Key Factor: Political Regulatory Regime

- Future of CCS is not only about demonstrating the technology and reducing its price
- CCS deployment depends on potential political regulatory regimes:
  - New power stations with CCS
  - Regulatory limitations of Carbon emissions
  - Near – Zero CO<sub>2</sub> emission requirements

Thank you for your attention

## Questions?

- Contact :
  - Einari Kisel, Senior Fellow, European Policies and Partnership Development at World Energy Council, [kisel@worldenergy.org](mailto:kisel@worldenergy.org)
- Visit our Cleaner Fossil Fuel Systems webpage on [www.worldenergy.org](http://www.worldenergy.org)
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