

**Wuppertal Institut**  
für Klima, Umwelt, Energie  
GmbH

# **The Comeback of Coal-to-Liquids (CTL) Technologies in the U.S. and China**

Salzburg Conference 2008  
„Energy and Climate Policy“ –  
Towards a Low-Carbon Future  
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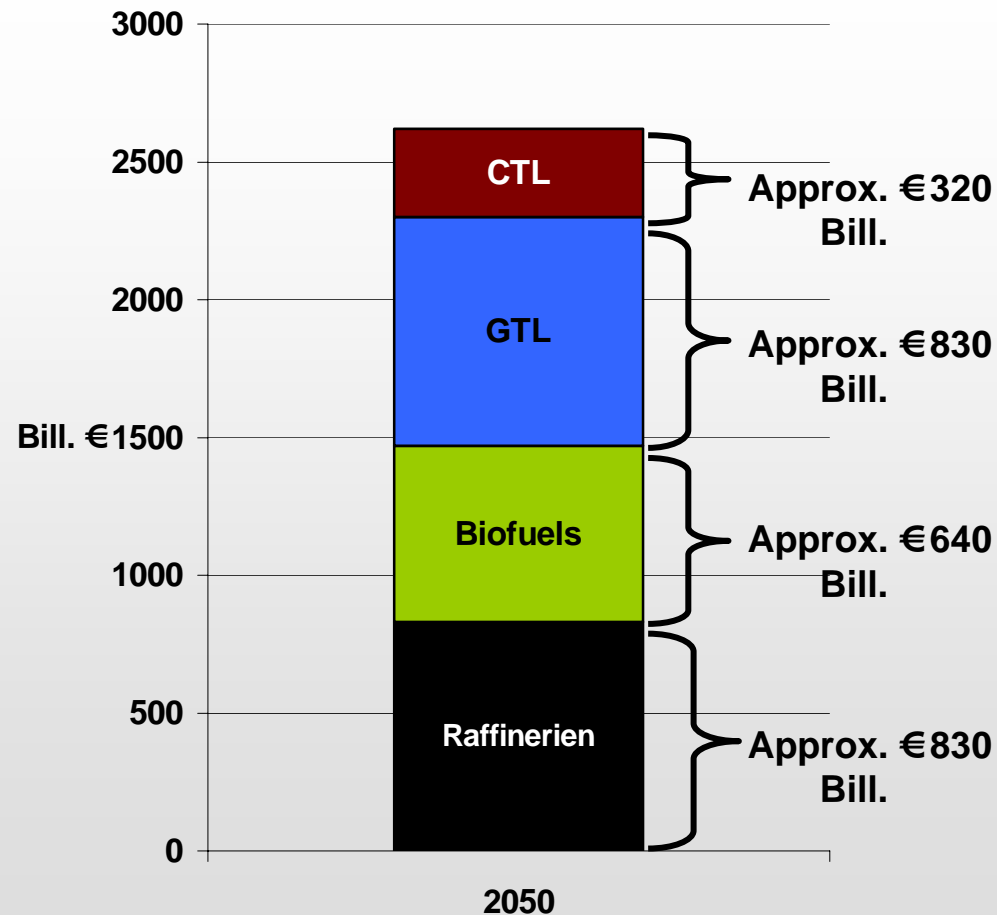
# Research Questions

1. Which *stakeholder-related*, *political*, *techno-economic* and *resources-related parameters* can be identified as determinants of a possible diffusion of coal-to-liquids (CtL) technology in the **U.S., Germany and China**?
2. How do the identified determinants affect the market prospects of CtL in the selected countries?

# A Global Comeback of CTL on the Horizon?

IEA Baseline Scenario until 2050

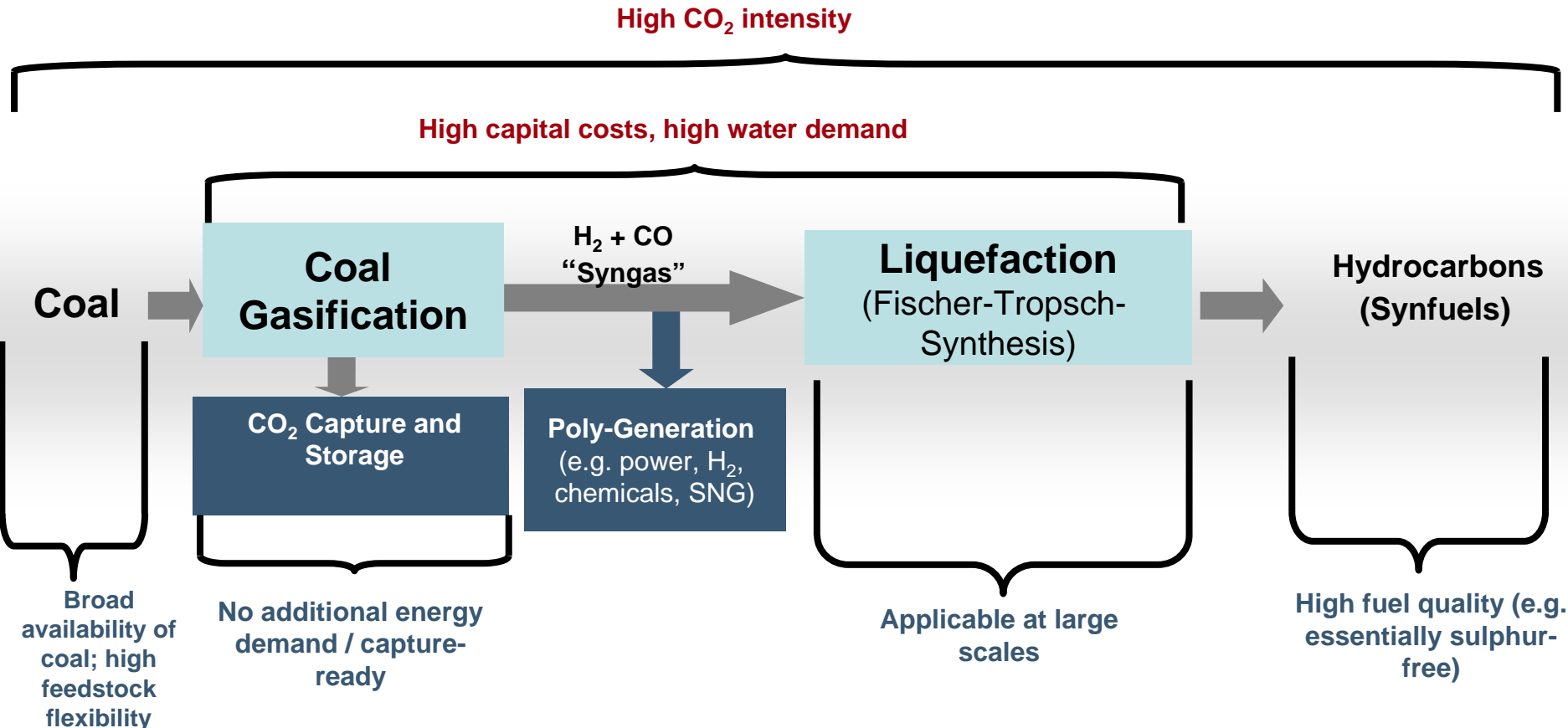
## Global Investments in Fuel Production Capacities until 2050



**Total: Approx. €2.620 Bill.**

# Drivers and Barriers

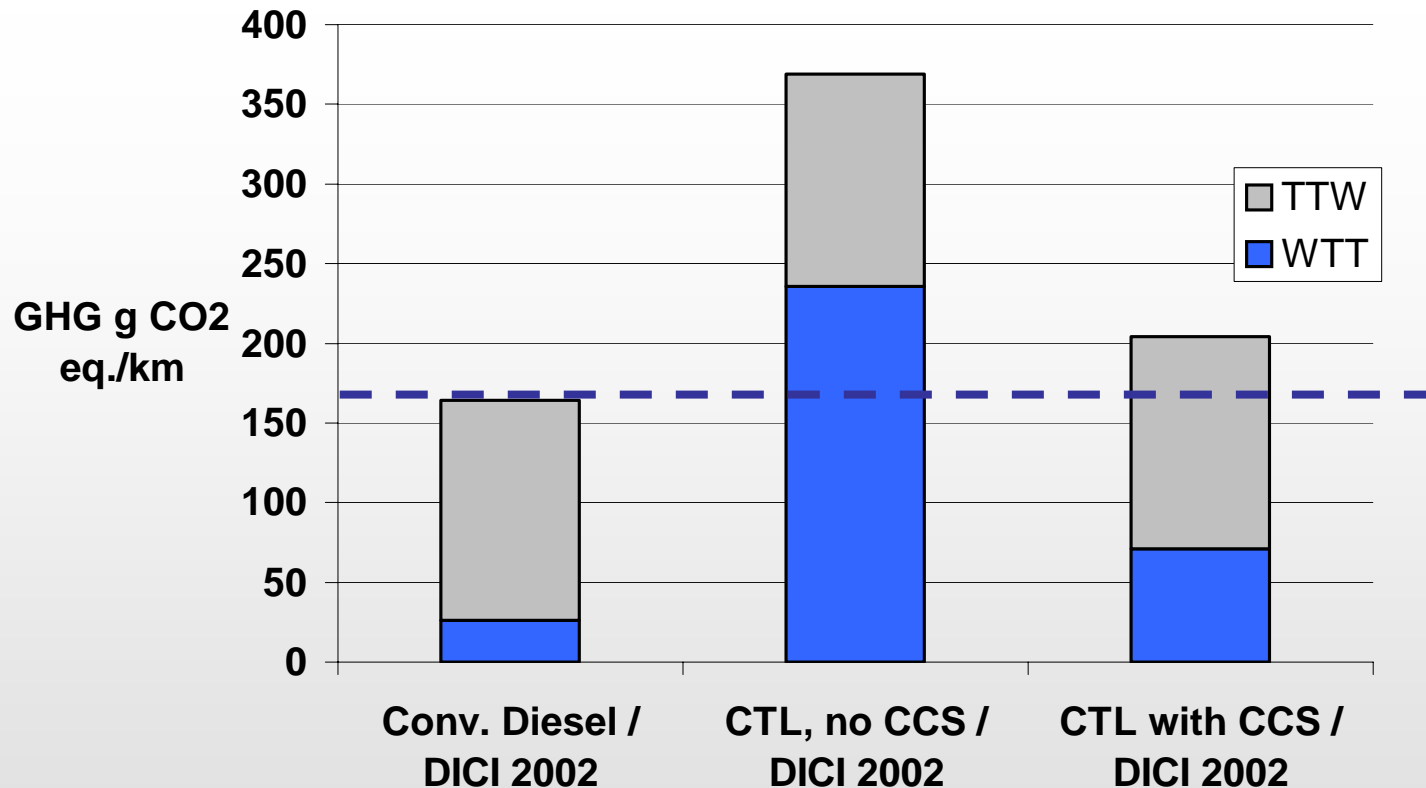
## Barriers



## Drivers

# Climate Impact

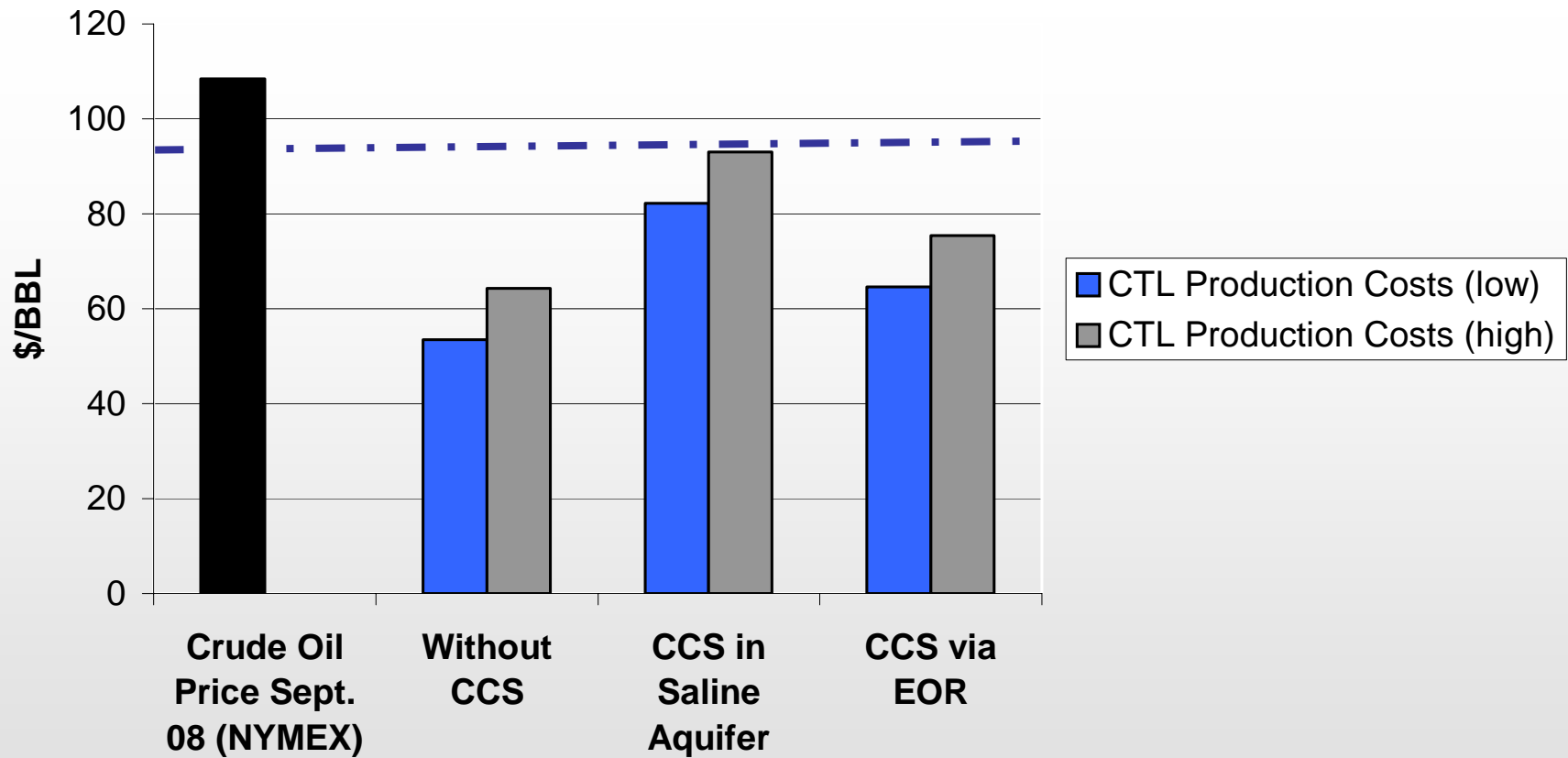
## Well-to-Wheel (WTW) – GHG Emissions per Km



**CTL leads to higher GHG emissions than conventional diesel – even in combination with CCS.**

**DICI 2002:** Direct Injection Compression Ignition Diesel Engine, 2002 state of technology

# CTL Production Costs



**CTL production costs – with and without CCS - are significantly below the current oil price level. But: High degree of economic uncertainty due to oil price volatility.**

# International CTL Projects

## Planned and Under Construction

	Planned (Feasibility/Engineering)	Under Construction
<b>North America</b>	<p><b>USA:</b> 13 Fischer-Tropsch (FT) Plants (Total Capacity: 332.000 BBL/Day)</p> <p><b>Canada:</b> 1 FT Plant (40.000 BBL/Day)</p>	
<b>Asia-Pacific</b>	<p><b>China:</b> 4 FT Plants (Total capacity: 340.000 BBL/Day), 2 Hydrogenation Plants (capacities yet to be announced)</p> <p><b>Indonesia:</b> 1 FT Plant (76.000)</p> <p><b>Philippines:</b> 1 Hybrid Plant (60.000)</p> <p><b>Australia:</b> 2 FT Plant (Total: 105.000)</p> <p><b>New Zealand:</b> 1 FT Plant (50.000)</p>	<p><b>China:</b></p> <p>3 FT Plants (Total Capacity: 12.000 BBL/Day; Start-up: 2008/2009)</p> <p>1 Hydrogenation Plant (Capacity: 1<sup>st</sup> Stage: 20.000; 2<sup>nd</sup> Stage: 66.000 BBL/Day), Start-up: Sept. 08</p>
<b>Europe</b>	<p><b>Germany:</b> 2 Polygeneration Plants (RWE, BASF); Feasibility Studies, capacities yet to be announced</p>	

# CTL Lead Markets: United States

## Involved Stakeholder Groups

Opponents

„GREEN GROUP“:

Environmental NGOs + Congress Climate Champions

Fiscal Groups

Congress Fiscal Conservatives

Neutral/  
Undecided

Oil Industry

Key Ministries (DOE, EPA)

Supporters/  
Pot. Investors

„CTL Coalition“:

Technology Providers, Coal Industry, Trade Unions, Trade Associations

DOD/Air Force, Coal States



# CTL Lead Markets: China

## Involved Stakeholder Groups

### Opponents

Oil Industry  
Energy Research Institutes  
(*Environmental NGOs*)

### Neutral/ Undecided

Central Government  
Power/Chemical Industry

### Supporters/ Pot. Investors

Joint Ventures:  
Technology Providers, Coal Industry (esp. Shenhua)  
Car Industry  
Coal Provinces

# CTL Lead Markets: United States

## Policy Framework

<b>Driver</b>	<p>Synergies with existing clean coal R&amp;D projects</p> <p>Incentives for coal technologies in Energy Policy Act 2005</p> <p>Alternative Fuel Credit</p>
<b>Barrier</b>	<p>Energy Bill 07: CO<sub>2</sub> standard for fuel procurement of governmental agencies</p> <p>Ban on long-term fuel procurement contracts for the Department of Defense</p>

High uncertainty about future climate policy strategy

# CTL Lead Markets: China

## Policy Framework

Driver

CTL is mentioned in the 11th Five-Year Plan and included in major energy R&D programmes (e.g. 863 Programme)

CTL is promoted by high-level government officials and regional governments of coal-producing provinces

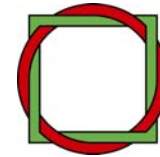
Barrier

CTL Regulation 06: Minimum capacity for approval of new CTL projects (<66.000 BBL/Day) because of high water demand

Local bans on diesel passenger vehicles (e.g. in Beijing)

# Conclusion

- **CTL commercialisation is inhibited by three technical parameters:**
    - **High investment costs;**
    - **High water demand;**
    - **High CO<sub>2</sub> intensity – even in combination with CCS.**
  - **In the U.S., CtL deployment is yet uncertain. It is supported by a well-organised industrial, political and societal opposition which faces strong opposition.**
  - **The U.S. energy policy framework contains both barriers and incentives for CtL commercialisation.**
  - **In China, CtL is pushed by a of state-owned companies with immense financial resources. The central government supports CtL but awaits the technology's demonstration.**
  - **China's 2006 CTL regulation has slowed but not stopped CtL development. The policy framework is supportive of CTL.**
- => China is more likely to become a CTL pioneer market than the U.S.**



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**Thanks for listening!**



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