



# WPC FEEDBACK: DOWNSTREAM PERSPECTIVE

April 2012



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## **WPC: Forums with Downstream focus**

- **F12 - New Refinery Technologies to Meet Feedstock Flexibility, Transportation Fuel Demand and Quality**
- **F14 - Technology and Feedstock Changes in Petrochemistry**
- **F15 - Heavy Oil and Residue Upgrading**
- **F16 - Biofuels and Biomass: Feedstock Options Life Cycle Analysis**
- **F20 - Industry Responses to Climate Change**

# Technology and Feedstock Changes in Petrochemistry

## CHEMICALS PORTFOLIO + PERFORMANCE

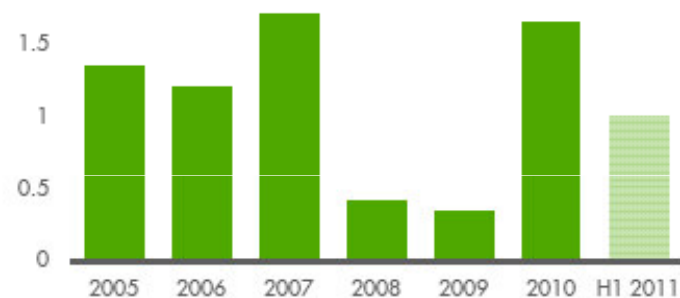
- Base chemicals and derivatives portfolio
- Plant integration with refineries
- Growth potential through advantaged feedstock
- Product innovation

### INTEGRATED CHEMICALS



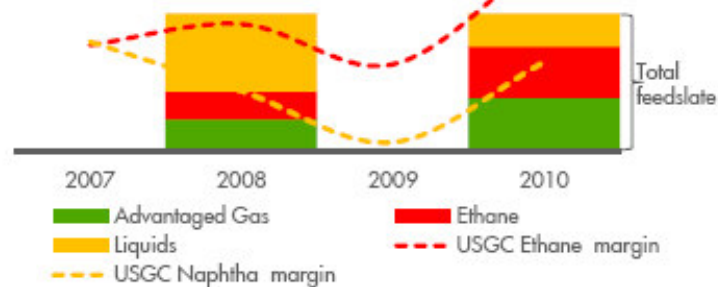
### EARNINGS

CCS Earnings - \$ Bln



### USGC BASE CHEMICALS SHIFT TO GAS FEEDS

Evolution of USGC industry cash margins + feedstock slate



CCS EARNINGS EXCLUDING IDENTIFIED ITEMS



# Heavy Oil and Residue Upgrading

## SHELL IN SITU PORTFOLIO

### PEACE RIVER



- Cold Production, Vertical Steam Drive and Cyclic Steam Stimulation
- Carmon Creek application 2010



- Potential for 80 kboe/d project
- Shell 100%

### COLD LAKE - ORION



- Steam Assisted Gravity Drainage (SAGD)
- Design capacity of 10 kboe/d



- Shell began operations in 2007
- Shell 100%

### AERA ENERGY



- Shell / Exxon LLC (Shell 51.8%)
- Production ~ 160 kboe/d



- Headquartered in Bakersfield CA
- Enhanced Oil Recovery with potential future use of SAGD

### GROSMONT



- Investigating In Situ Upgrading Process (IUP)
- 125,440 hectares in Athabasca oil sands region



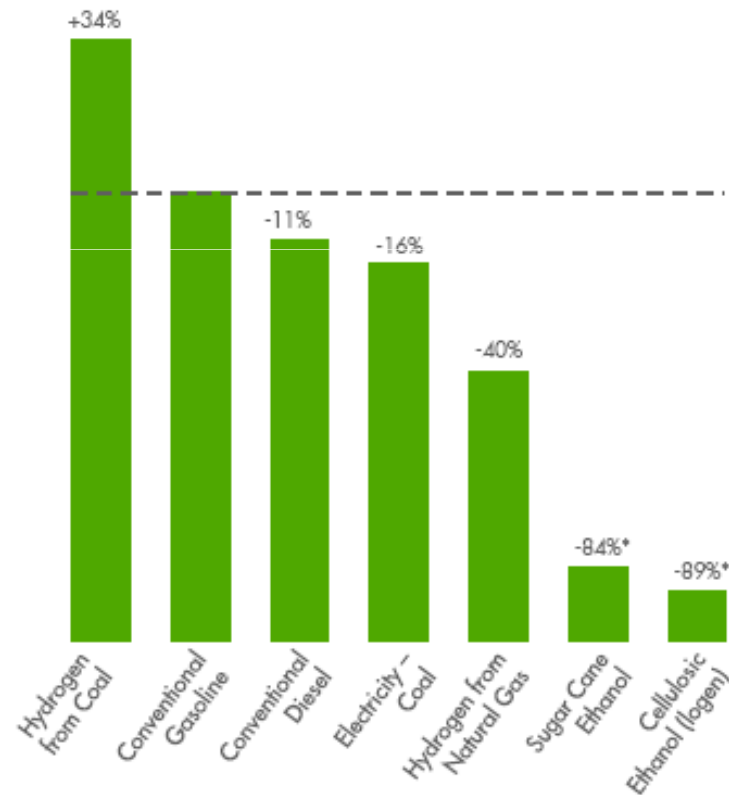
- Shell 100%



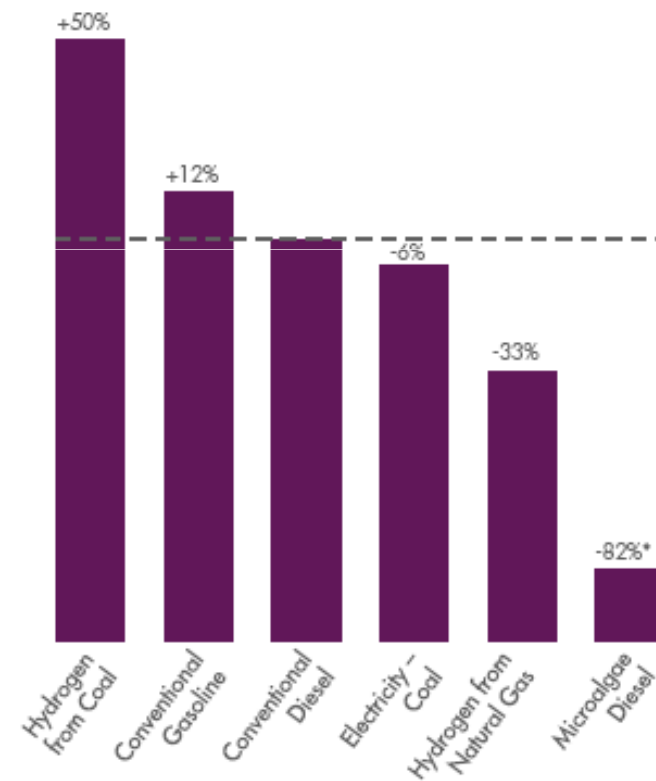
# Biofuels and Biomass: Feedstock Options Life Cycle Analysis

## GASOLINE COMPARED TO ALTERNATIVE FUELS WELL-TO-WHEEL CO<sub>2</sub> INTENSITIES

CONVENTIONAL GASOLINE BASELINE



CONVENTIONAL DIESEL BASELINE



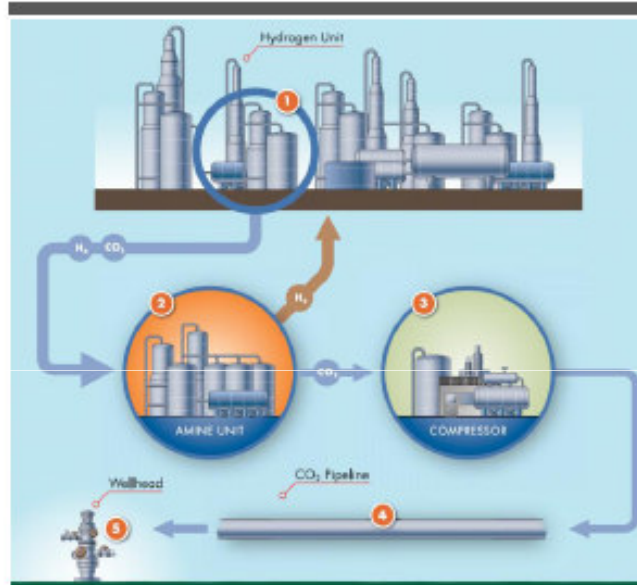
Source: CONCAWE/JRC/EUCAR WYW report (version 3)

\* Biofuels numbers do not include possible indirect land use change effects



# Industry Responses to Climate Change

## QUEST - CARBON CAPTURE & STORAGE PROJECT



- Capture CO<sub>2</sub> at the Scotford Upgrader from 3 Hydrogen Units
- >1 mtpa CO<sub>2</sub> will be transported by pipeline and stored over 2 km underground
- Funding agreements signed with Government of Alberta and Government of Canada for C\$865 million over the construction and 10 year operating life of the project
- Regulatory application submitted Dec 2010
- FID planned in 2012

### QUEST PROJECT PROPOSED TIMELINE

