CARBON ENERGY CLUB

belgian technologies for your oil, gas and energy projects

www.carbonenergyclub.be

Belgian Energy Day - IEF
Riyadh, March 16 2014

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Director Carbon Energy Club
Chairman BE NC with World Petroleum Council (as of May 1st)

Overview

- Who are we
  - Carbon Energy Club
  - Renewable Energy Club
- Initiatives in conventional energy
  - Clustering of refining & petrochemical industry
  - Development of a new chemical industry
  - LNG
- Initiatives in renewable energy
  - Situation in Belgium
  - Domains of excellence
- Some examples

Carbon Energy Club

- A business **ecosystem** to help the technology community better understand the oil and gas industry's challenges, in order to develop **better solutions**.
- Independent – not for profit
- Currently **100+** active members: large corporations, SME's, university spin-offs, R&D institutes
- Strong emphasis on sharing experience and learning from each other, but with respect for confidentiality
- Brussels based with an international reach

Renewable Energy Club

Same but different:

- Scope: wind, solar, wave & tidal, biomass & energy storage
- Broad overview of technology development and identify prevailing technologies
- Community: technology community, utility companies, project developpers & venture capital
- President: Mr. Daniel Dobbeni

Conventional energy industry

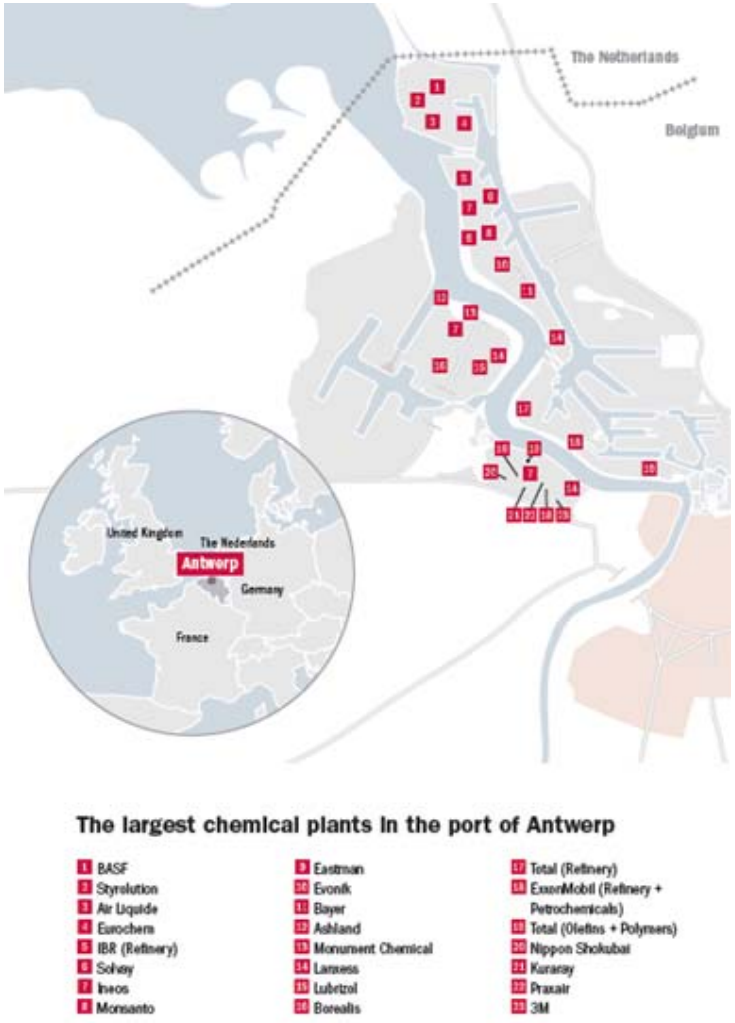
Large refining & petrochemical industry, challenged by:

- High cost of energy
- High cost of labour
- Very strict rules & regulations
- Industry developments in the Middle East, Asia and the USA

So how take on these challenges?

- Short term: make existing infrastructure as efficient as possible
- Long term: start with thinking about developping a new chemical industry

Existing infrastructure: clustering



- Clustering = tackle problems together rather then individually
- Focus on integration of auxiliary services:
  - + Electricity generation
  - + Steam generation (using process heat)
    - ⇨ Cogeneration
  - + Purified water production & treatment
  - + Recycling and valorizing waste product streams
  - + Emission monitoring
  - + Pipeline monitoring and maintenance
  - + Joint logistics
- Stakeholders: petrochemical industry, Port of Antwerp & the technology industry

Develop a new industry: Project Fisch

Flanders Innovation Hub for Sustainable Chemistry

Main innovation programs focus on:

- Transition from feedstock based on fossil fuels to a greener alternative
- Renewable chemicals
- Development of new separation technologies
- Re-use auxiliary product streams
- Micro-reactors for continuous flow production

FISCH
Chemistry for Sustainability

Stakeholders:

- Government
- Chemical industry
- Technology industry
- Universities
- Research institutions

Liquefied natural gas - Exmar

- Pioneer in FLNGRV: Floating LNG Regasification Vessels
  - + Ship-to-ship transfer technology via cryogenic hoses
  - + Used as floating LNG import terminals
- Design breakthrough in Floating Liquefaction Units
  - + Used as a floating LNG export terminal
  - + World's first project for Pacific Rubiales (Carribean FLNG)
- First mover in construction of an floating LNG fuel bunkering barge for the Port of Antwerp

- Other knowledgeable companies include **Port of Zeebrugge, Fluxys**, **Tractebel**,…

Renewable Energy – situation in BE

- Sources:
  - On- & offshore wind
  - Biomass (waste incineration, wood pellets, agricultural waste,…)
  - Solar (PV, residential & industrial)
- Production figures:
  - For 2012: 5,4 %
  - Objective 2020: 13%
- Source for job creation:
  - 2009: 11,235 fte's
  - 2013: 14,700 fte's
  - 2020: 25,000 fte's
- Challenges:
  - Change in the support mechanism (i.e. subsidies)

BE domains of excellence

- Wind
  - + Both on- & offshore
  - + Design, engineering, installation (**DEME**, **Jan De Nul**, **Cofély-Fabricom**, **CG Power**, **Engicon**, **Iemants**, **Sarens**,…)
  - + Testing structures & components: **Offshore Wind Infrastruture Application Lab** (OWI-Lab)
- Solar
  - + Nanotechnology (**IMEC**, University of Leuven)
  - + Engineering solar power stations, both PV & CSP (**Tractebel, CMI**)
- Biomass
  - + Cluster of many disciplines: biotechnology, chemical engineering,
  - + **University of Ghent**, **VITO**, **Project FISCH**,
- Smart grid
  - + Engineering (**Elia**, Tractebel, **Laborelec**,…)

Some examples - refining

- Largest wastewater to energy treatment plant for Reliance's refinery in Jamnagar, India was engineered by the Belgian company Waterleau

WATERLEAU
protecting the 4 elements

Some examples – offshore wind

- Most powerfull offshore wind turbines are currently installed offshore Belgium
- Area is the deepest and most remote from the coast

Some examples – onshore wind

- Untill recently world record for most powerfull onshore wind turbines for Belgian windfarm

Some examples - CSP

- One of the world's largest CSP Power Tower Project with a 60% capacity factor was designed & engineered by the Belgian based companies Tractebel and Cockerill Maintenance & Ingéniérie (CMI)

TRACTEBEL Engineering
GDF SUEZ

cmi

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