

PARIS 13-15 DÉCEMBRE 2006



G L O B A L F O R U M



FLARING REDUCTION & GAS UTILISATION

INTERCONTINENTAL PARIS LE GRAND HÔTEL

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François Régis MOUTON

World Bank GGFR Adviser

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The producing countries' experience

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Peter VAN DER VEEN

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H.E. Gabriel NGUEMA LIMA

Vice Minister, Ministry of Mines, Industry and Energy,
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Alexandr SAVINOV

Head of division on natural resources policy of the department of fuel and energy complex in the Ministry of Industry and Energy of the Russian Federation

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Martyn HOWELLS

On behalf of Pr. Anthony ADEGBULUGBE, Special Advisor
to the President on Energy Matters, Nigeria

Gas Development in Nigeria

Presentation Outline...

- Overview of Gas Resources in Nigeria
- Gas utilization in Nigeria
- Impediments to gas development in Nigeria
- Future Prospects/ Directions
- Key strategic issues in the Gas sector
- Current Reform Activities
- Conclusion

Overview of Gas Resources in Nigeria...



- While there is some ambiguity as to the precise volume of gas resources in Nigeria, it is generally believed that Nigeria is a gas-rich country.
- Current estimates put the proven reserves at about 187tcf and NNPC estimates that gas reserves may be as much as 660tcf.
- This makes Nigeria the country with the highest gas reserves in Africa and the 7th in the world

Gas Utilization in Nigeria...



- Current associated gas production in Nigeria is about 4.6bcfd
- The utilization of gas currently produced goes to:
 - Power generation
 - Export projects
 - Other domestic uses
 - Flaring - over 55% or close to 2.5bcfd of associated gas produced is currently flared
- Thus Nigeria has the unenviable record as one of the countries with the highest gas flares in the world

Percentage of AG Flared as a % of Total Extracted by 5 Major Oil Producers: 1999-2005



JV Operator	1999	2000	2001	2002	2003	2004	2005
Shell	71.17	58.96	64.22	40.24	37.38	37.18	32.31
Mobil	24.76	29.36	31.33	32.77	68.60	44.80	40.79
Chevron	82.82	96.31	68.70	52.23	67.80	59.60	67.28
ELF	82.51	38.28	37.84	35.84	36.80	22.83	14.36
NAOC	68.37	48.12	62.84	58.47	40.88	41.17	37.72

Impediments to Gas Development in Nigeria...



- Inadequate Gas Supply Infrastructure
- Inappropriate/ unrealistic pricing of gas, especially for domestic use
- Absence of institutional and regulatory framework
- Low level of industrialization
- Inadequate consumptive capacities

Yet our national aspirations are with respect to gas industry are:



- Develop domestic market and end gas flaring by 2008
- Capture economic value and generate as much revenue from gas (as from oil) within a decade
- Promote industrialization by promoting domestic as well as attract foreign gas using industries

Opportunities for Gas Development – Current and Planned Projects...



- These can be looked at from 2 perspectives:
 - Export- Oriented Projects:
 - LNG Projects. The NLNG project, which commenced in 1999 with 2 trains, has expanded to trains 4 and 5. NLNG plans to expand its capacity to 16.8mty thus making Nigeria the third largest exporter of LNG in the world.
 - Other LNG Projects include: Brass LNG, OK LNG expected to come on stream by 2009
 - West African Power Pool (WAPP)
 - West African Gas Pipeline (WAGP)
 - Proposed Trans Saharan Gas Project

Opportunities for Gas Development

– Current and Planned Projects...contd



- Domestic- Oriented Projects
 - Power Projects – current power projections (~16 GW) show that gas will be very prominent. Major oil companies are planning or have already established gas fired Independent Power Plants (IPPs)
 - G2P Initiatives
 - LPG Programme
 - Establishment of NGLs, GTLs
 - Use of gas as the energy source for industries – cement plants, steel plants, fertilizers and petrochemicals
 - Promote development of marginal fields

Key Strategic Issues Being Addressed...



- Creation of an enabling environment for investment
- A comprehensive, integrated gas-to-power approach
- Development of Gas Infrastructure
- Appropriate Regulatory framework
- Gas Pricing Reforms

Government Current Efforts...



- Government is committed to the deregulation of the energy and gas markets
- The Downstream Gas Bill is currently with the National Assembly
- The Natural Gas Fiscal Reform Bill is presently with the National Assembly
- The President has approved a new gas pricing policy
- There are several on-going power projects including the 7 Power Plants that are to be constructed in the Niger Delta as shown in the next slide. Gas is to be the main energy input for these power plants

Increased power generation ...

Sponsor(s)	Size of plant and technology	Location and Status
AES (with Yinka Folawiyo Group as minority partner)	9 Barge Mounted open cycle gas-fired plants, 30 MW each, 270MW, Total	On line, June 2001
Agip (with NNPC and ConocoPhillips),	480MW, CCGT	Kwale / Okpai, Delta State
Shell Afam I (Buyout of AFAM 270 MW with expansion to 900MW) Total	900MW, CCGT 1,650MW	Afam, Rivers State -Completed, due to labor issues however, operations may be delayed until the end of the first quarter next year
Eskom 388 MW	388 MW Coal fired	Enugu, Enugu State Under negotiation
Shell, Afam II	650 MW CCGT	Afam, Rivers State
Agip, Okpai II	450 MW CCGT	Kwale / Okpai, Delta State
ChevronTexaco	780 MW CCGT	Ijede, Lagos State Under negotiation Phase I, 256 MW Phase II, 256 MW Phase III, 268 MW
Total – NNPC,	450 MW CCGT	Obite, Under negotiation
ExxonMobil – NNPC,	500 MW CCGT	Bonny River Under negotiation
FGN National Integrated Power Project, 8 plants FGN Power plants under special arrangement: 4 locations:	2,743 MW CCGT, 2007 1,588 MW CCGT, 2007 3,977 MW, CCGT	Major supporting gas pipelines, ranging from 1-12 km The first two built under special protocol with Government of China-Papalanto (Ogun State), 335 MW gas-fired, Nov '06-Omosho (Ondo State), 335 MW gas-fired, Nov '06 -Ajaokuta (Geregu, Kogi State), 414 MW, Dec '06 -Alaoji in Aba, Abia State, 504 MW, Dec '06
FGN under special arrangement with Government of China	- 3900 MW hydroelectric plant - 950 MW hydroelectric plant	Under discussion: Mambilla (China EXIM, Sino Hydro finance) Zungeru (China EXIM, Sino Hydro finance)

Development in LPG Sector...

- The Government already commissioned international experts on LPG development
- The objective of current efforts in the LPG sector is to:
 - Improve Nigeria's LPG market organization
 - Lay the groundwork for private investor led growth in private sector
 - Promote domestic supply and utilization of LPG

Conclusion...

- The prospects for gas development and utilization is very bright in Nigeria
- Several Initiatives are on-going
- International and local investors are interested
- Appropriate regulatory and institutional reforms to enhance investment environment are on course

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Torbjorn URFJELL

Advisor to the Minister of International Development

The Norwegian Experience

Norway a founder with the World Bank



- Norway is both a founder and a funding partner
- It is encouraging that more countries join the initiative

Fits with Norwegian Priorities



- To be involved in GGFR fits into the development policy priorities of the present Norwegian government:
 - Environment
 - Energy and oil

Resource Perspective

- Venting or flaring never allowed in Norway
- Rules set by the Ministry of Oil and Energy
- Originally from a resource perspective

Gas on the Norwegian Continental Shelf used in three ways



- For power production on the platform
- Exported and sold through a network of gas pipelines
- For re-injection, to increase the pressure in the wells to get the most out of the oil resources

Today's environmental perspective



- Strong environmental concern, important for the Norwegian government and regulating authorities
- Kept high on the agenda by environmental NGOs

Governance is what matters. the Norwegian experience



Strong regulatory authorities is the main reason for success.

- In petroleum resource and revenue management in general
- In strong environmental regulations
- Ability to enforce the laws and regulations.

A vision

- Solve energy needs without increasing CO₂ emissions, through development of new technology
- Develop technology which is able to capture CO₂ for re-injection
- Develop a clean energy technology which makes it possible to produce energy from gas, without CO₂ emissions.

Groundbreaking agreement between Statoil and Norwegian government



- Statoil gets a discharge permit under strict conditions: Has to develop the technology for extraction of CO₂ in parallel to constructing the plant
- First step to be completed by the time the power plant is taken into use, by 2010. 100 000 tonnes of CO₂ will be captured. The second step to be completed by 2015, to capture all CO₂ emissions from the plant.

Alliance between economy, technology and politics



- Norwegian government put a significant amount of money on the table to cover some of the initial costs for developing this clean technology.
- Involves cooperation between the company, research institutions and the relevant authorities.

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Abdelhamid MAGHREBI

Manager of HSE strategies and development,
Qatar Petroleum

The producing countries' experience

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World Bank GGFR Adviser

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Bent SVENSSON

GGFR Program Manager, World Bank Group

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Aidan RING

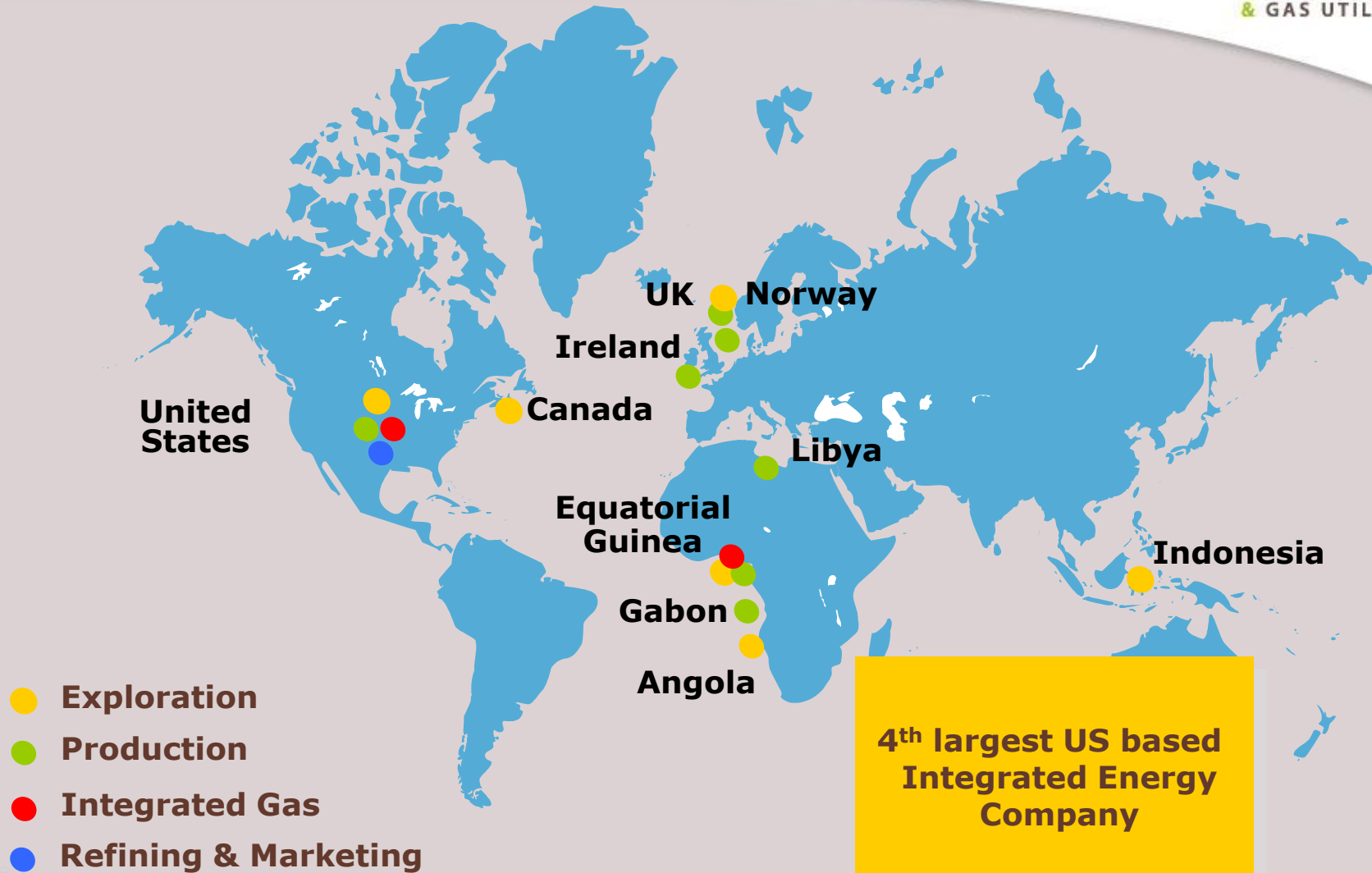
Business Development Manager, Marathon

EGLNG

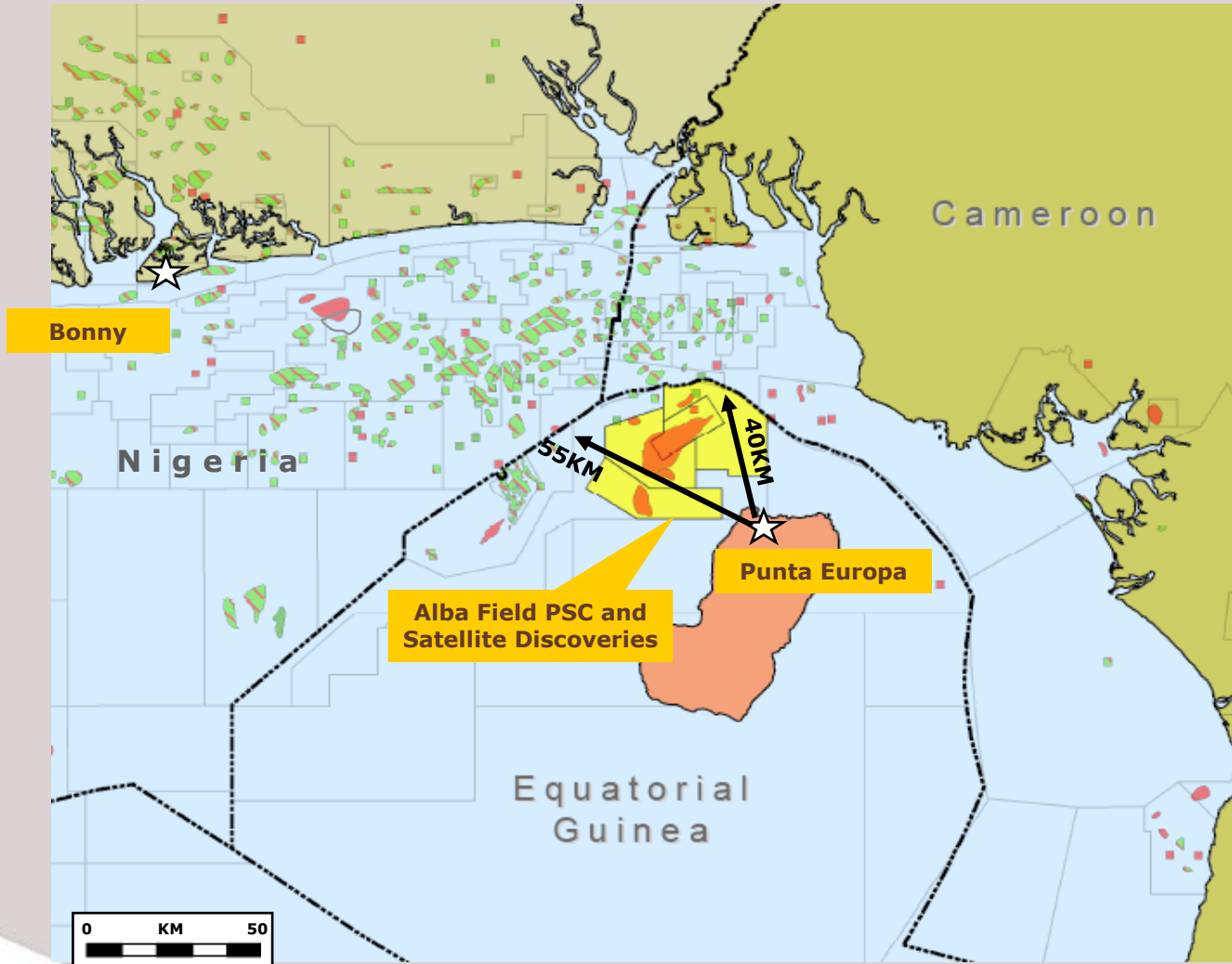
An Opportunity to Reduce Gas Flaring in the Gulf Of Guinea



Marathon's Operational Footprint



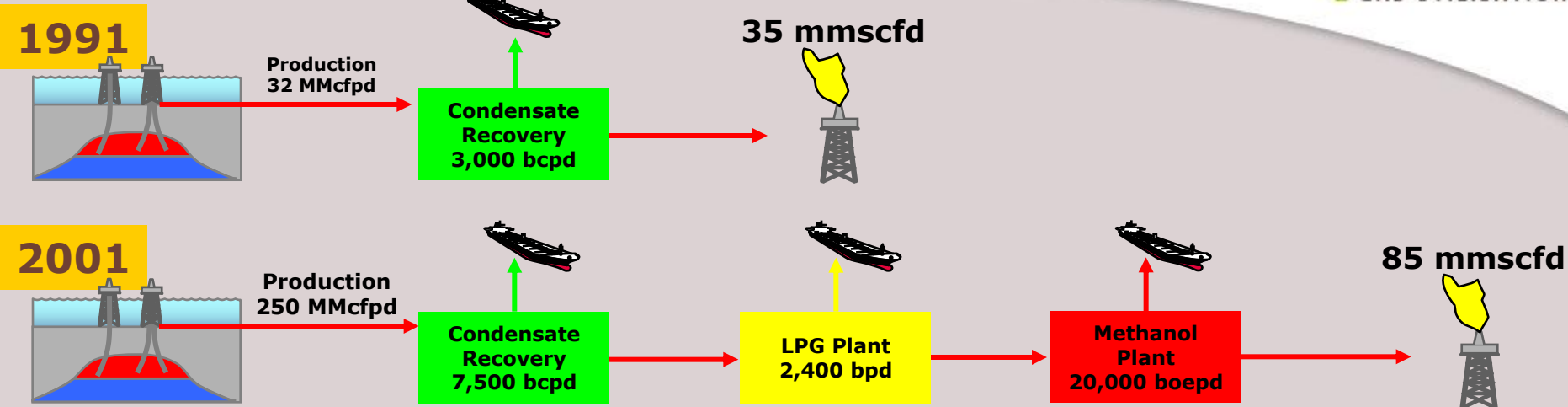
EGLNG Location Map



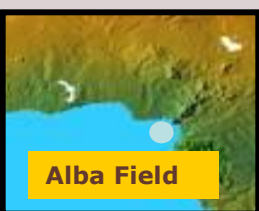
*Positioned to be
Regional Gas Hub*

Sources: IHS Energy and Wood Mackenzie

History of Production in the Alba Field



Asset Acquired by Marathon 2002



Condensate
60,000 boepd
Gross



LPG
20,000 boepd
Gross



Methanol
20,000 boepd
Gross



LNG
75,000 boepd
Gross

Total
175,000 boepd
Gross



Equatorial Guinea Experience

LNG Jetty

Methanol Tank Farm

Tanker Mooring Area

Methanol Plant

Construction Dock [New]

Construction Dock [Original]

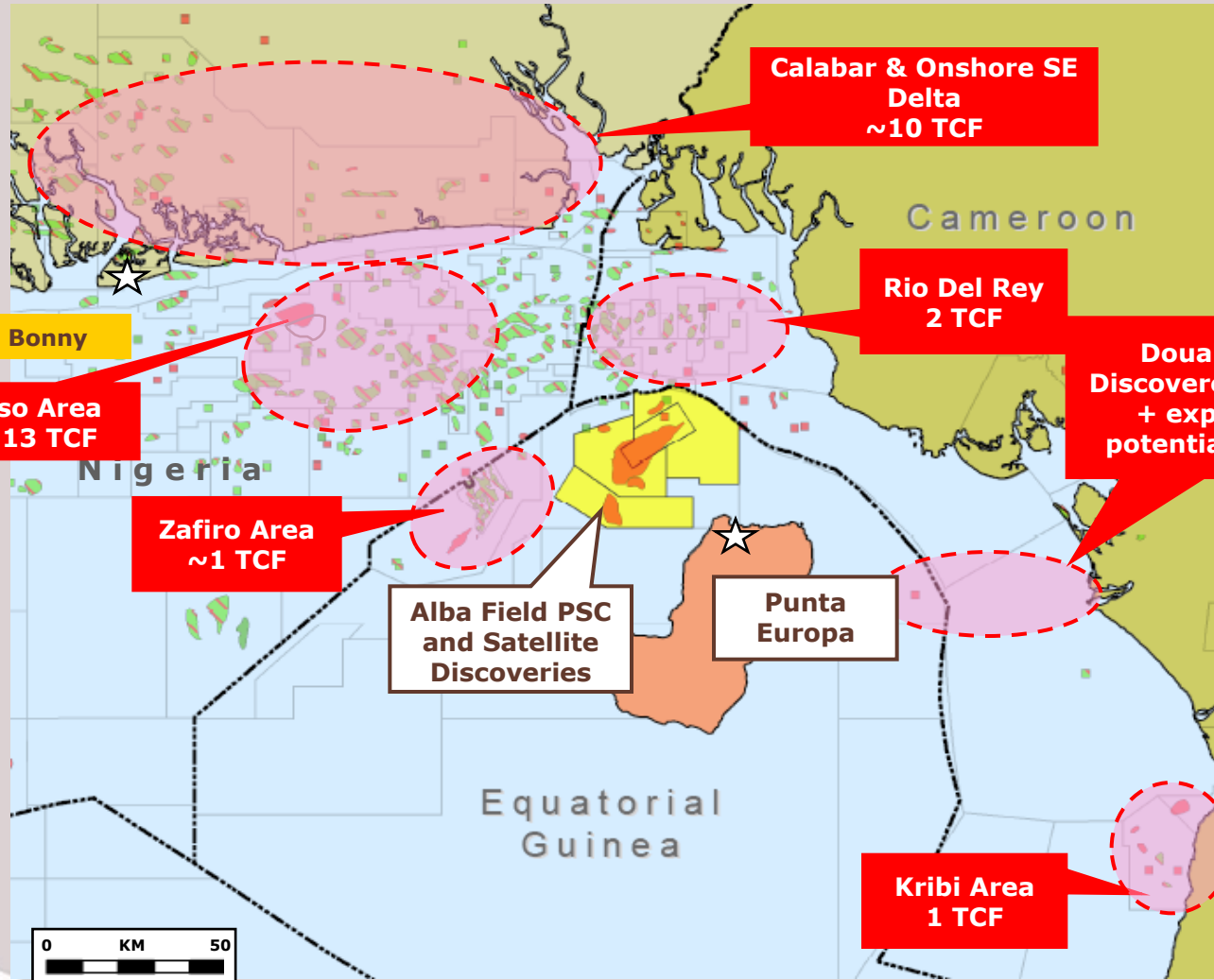
Balance of Facilities

- Pipelines
- Liquids Recovery
- Gas Processing
- Liquids Storage

LNG Plant 3.7×10^6 Tonnes / Year
[Under Construction]



EGLNG Location Map



Positioned to be Regional Gas Hub

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Pat BLOUGH

VP Gas Commercialization, Chevron

Chevron's Efforts in Flaring Reduction



Parallel Processes

**Internal Process
(Chevron)**

**Chevron
Flaring & Venting
Standard**



**External
Process
(GGFR)**

GGFR Standard



**Associated
Gas
Recovery
Plan**

Chevron Commercial Project Activities Supporting Flaring Reduction



- Escravos Gas Projects
- West Africa Gas Pipeline
- Sanha Condensate
- Angola LNG
- Escravos Gas to Liquids

Keys to Flaring Reduction Success

Challenges Must Be Overcome

- Government / Stakeholder approval hurdles
- Adequate project funding
- Security in areas of operation
- Regional manpower and materials availability
- Reliability of transportation infrastructure
- Internationally competitive fiscal terms
- Escalating costs
- Market access
- High cost/reliability of associated gas tie-ins
 - Competition with cheaper, more reliable gas resources



Key Roles for GGFR Partnership

- **Continue** focus on commercialization issues
- **Develop** regional processes to help identify key barriers and facilitate project success
- **Help** identify solutions beyond individual operator abilities
- **Encourage** cooperative participation by all partners (operators and governments)
- **Utilize** World Bank's expertise in convening key parties on difficult issues



Thank you



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Global Supplier
Global Partner

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Mikhail GORDIN

Gas Business Development TNK-BP

TNK-BP Associated gas monetisation Projects

Associated Gas Business

TNK-BP Gas Organisation



- TNK-BP Oil and Gas Company:
 - Russia's number three oil and gas company, owned 50-50% by BP and a group of Russian shareholders (AAR)
 - Production is concentrated in Western Siberia and Orenburg oblast
 - 2005 production*: 1.77 mmbpd of oil equivalent
 - Gas business development based on new large fields in Eastern and Western Siberia and Associated Gas Projects
- Associated gas flaring today due to:
 - Underdevelopment of gas gathering infrastructure
 - Lack of the regional gas processing capacity
 - Bottlenecks in dry gas pipeline system combined with demand seasonality
- Associated gas projects:
 - Shall be big enough to allow integration and compact enough to remain doable
 - Require sustainable commercial deal with involved parties
 - Require fit-for-purpose technical solution

Associated Gas Business

TNK-BP Gas Organisation



- TNK-BP associated gas project activities:
 - Gas gathering infrastructure development to sufficient level in all areas of operations supported by long-term commercial initiatives
 - JV with Sibur in Nizhnevartovsk to resolve gas processing capacity constrains and deal with dry gas evacuation bottleneck
 - Nizhnevartovsk Power Station 3rd Unit Project to increase regional gas demand
 - Gas processing capacity expansion and liquids handling in Orenburg
 - Projects review on the ability to generate carbon credits under Kyoto protocol
- TNK-BP associated gas project plans:
 - Reduce flaring to no more than 5% of total gas production by 2010 with further reduction in future
 - Spend in excess of \$500 MM of capital on associated gas projects
 - Compliment every oil field development project with comprehensive associated gas handling solution

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P.G. CAVAZOS

Environmental Manager, ExxonMobil

ExxonMobil's Experience

ExxonMobil

Taking on the world's toughest energy challenges.™

ExxonMobil's experience



- ExxonMobil's flare reduction and gas utilization efforts
- Flare reduction achievements in Nigeria
 - Reduction of routine flaring
 - Reduction of operational flaring
- Protect Tomorrow. Today.

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Colin BRAITHWAITE

Gas Business Development Manager, Shell

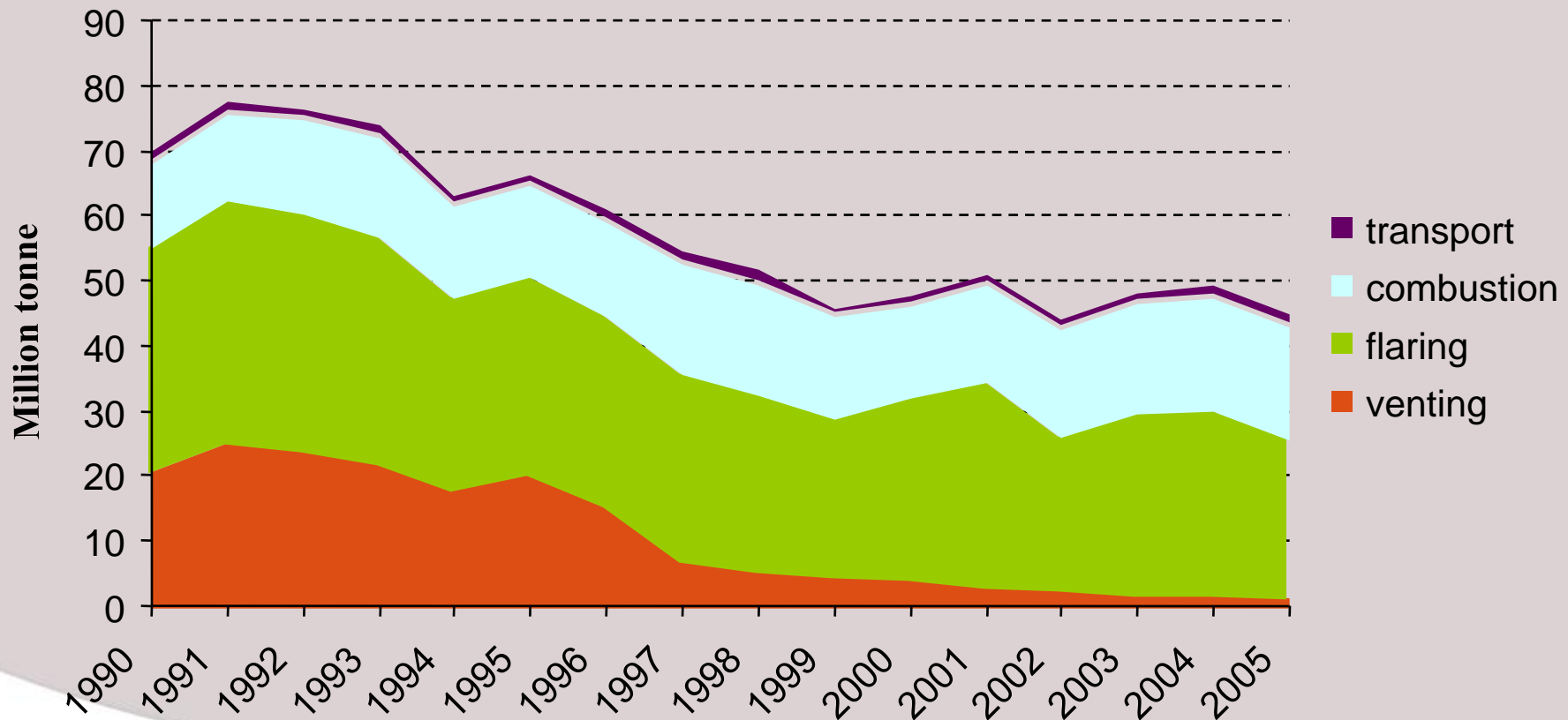
Global Gas Flaring Reduction Conference



Total GHG Emission for Shell EP in CO₂ eq.



- 1990 to 2005 - 29% reduction in CO₂eq (with 24% increase in production)



Key Challenges – "Flares out" in Nigeria

- Target is 2008/9
- LNG is the key enabler
- NLNG Trains 1 – 5 operational
- Train 6 in construction
- Train 7 being considered
- Olokola LNG being considered
- Associated gas gathering under way
 - \$2.3 bln spent over last 5 years
 - 1000 wells, 75 flow stations
- \$21 billion investment in AG, NAG and LNG (1997-2006)
- Local & regional market development
 - West Africa Gas Pipeline
 - Local markets- industry, power, communities



Key drivers of progress



- Creating a culture where the potential value of associated gas is recognised
- Collaborative action by governments, companies and stakeholders to address barriers
- Clear legal and fiscal frameworks to support flaring reduction
- Development of domestic markets to ensure that countries see the long-term benefit of associated gas

Where the GGFR can add most value

World Bank Facilitation

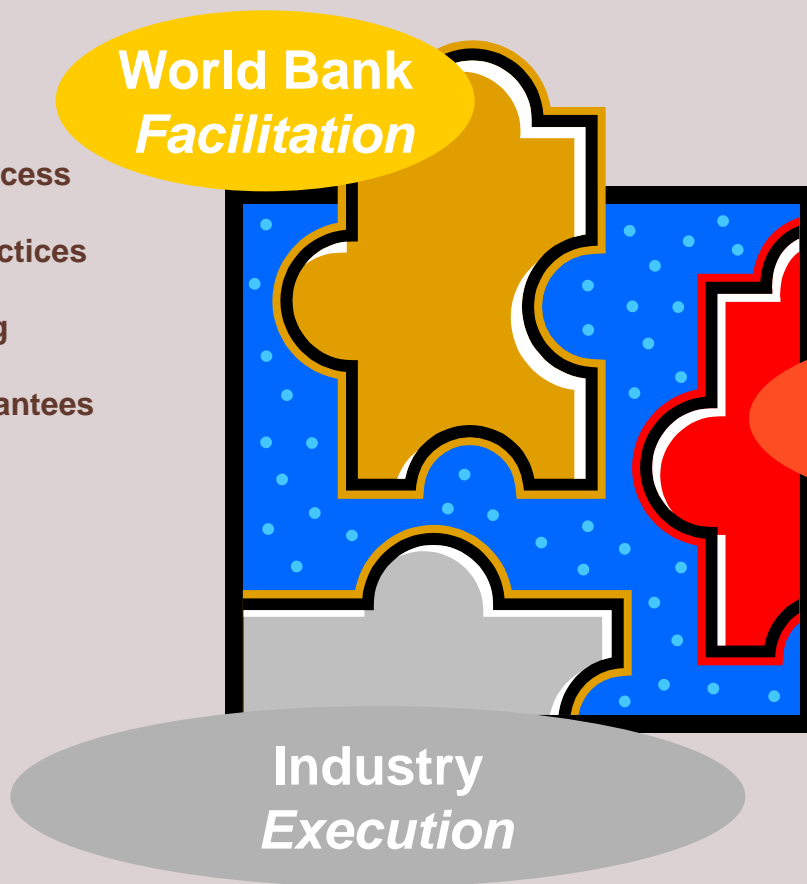
- international process
- sharing best practices
- capacity building
- capital and guarantees
- energy policies

- regulatory
- promote commercial infrastructure
- joint ventures – risk/reward sharing
- project evaluation
- pricing and subsidies

Governments Frameworks

- access to global markets
- financial strength
- global best practice
- technologies
- sustainable development policies

Industry Execution





GLOBAL FORUM

FLARING REDUCTION
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Edgar FURUHOLT

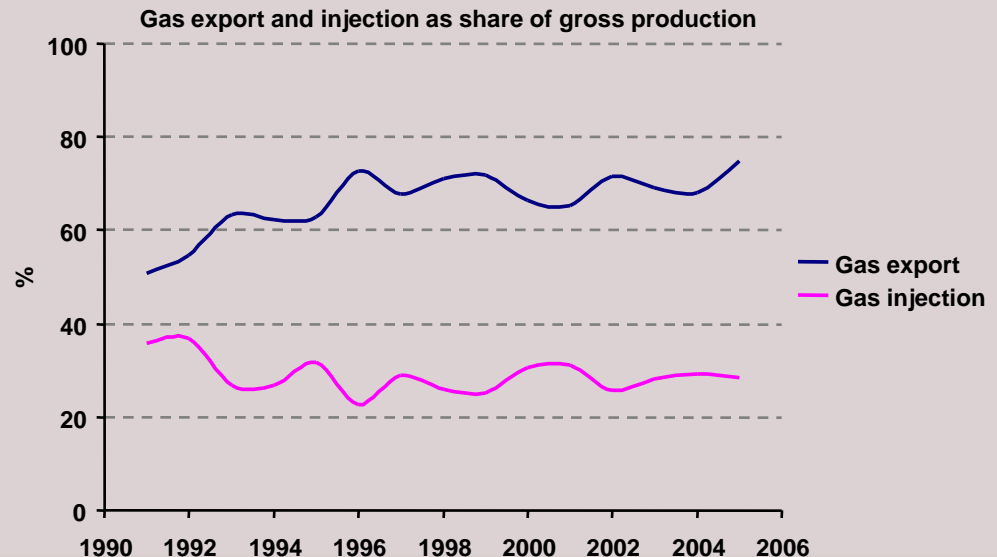
Special Adviser on Environment, Statoil

The oil companies' experience Statoil

The Norwegian framework

Push for technology development

- Flaring for disposal of gas has never been allowed
- CO₂ tax of 0.12 \$/Sm³ gas (3.2 \$/MBTU)
 - Statoil technologies to meet the challenge:
 - Gas injection for IOR
 - Large export pipelines in deep water
 - Methanol
 - LNG
 - GTL
 - Closed flares



Gas transport and terminals

- Export pipelines to Germany, Belgium, France and the UK
- High regularity and great flexibility
- Statoil is technical operator for 6,000km of pipeline



Gas to methanol

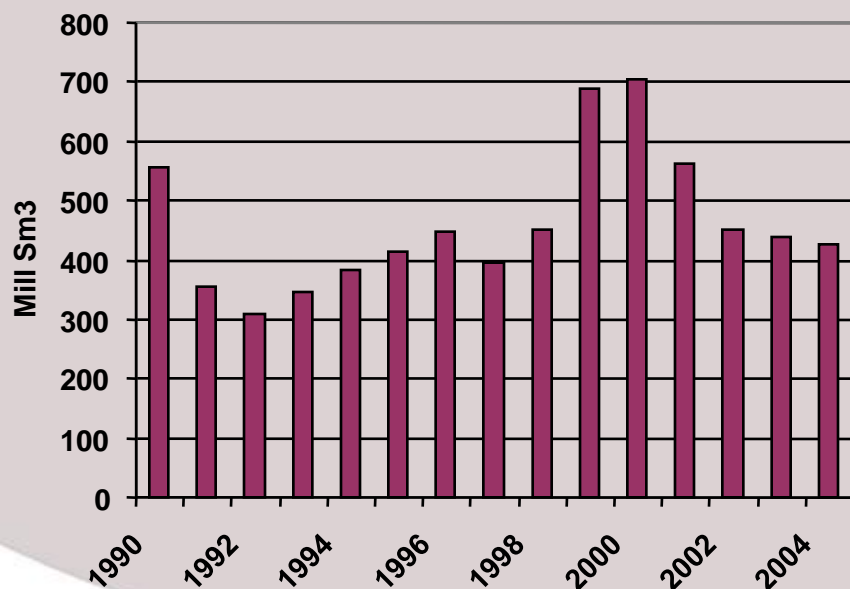
Heidrun - Tjeldbergodden



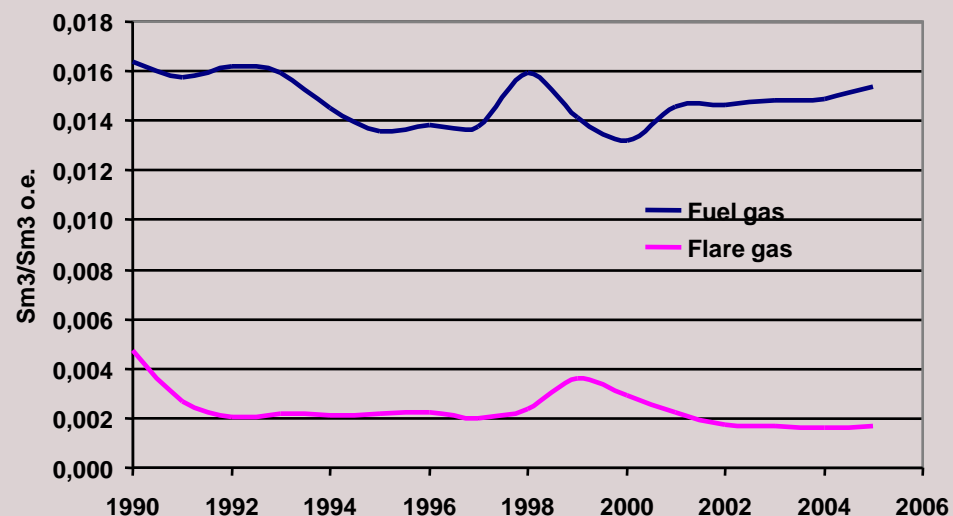
Norwegian Petroleum Activities Act, Section 4.4

- Burning of petroleum in excess of the quantities needed for normal operational safety shall not be allowed unless approved by the Ministry

Flared volume



Fuel gas and flare gas relative to oil and gas production

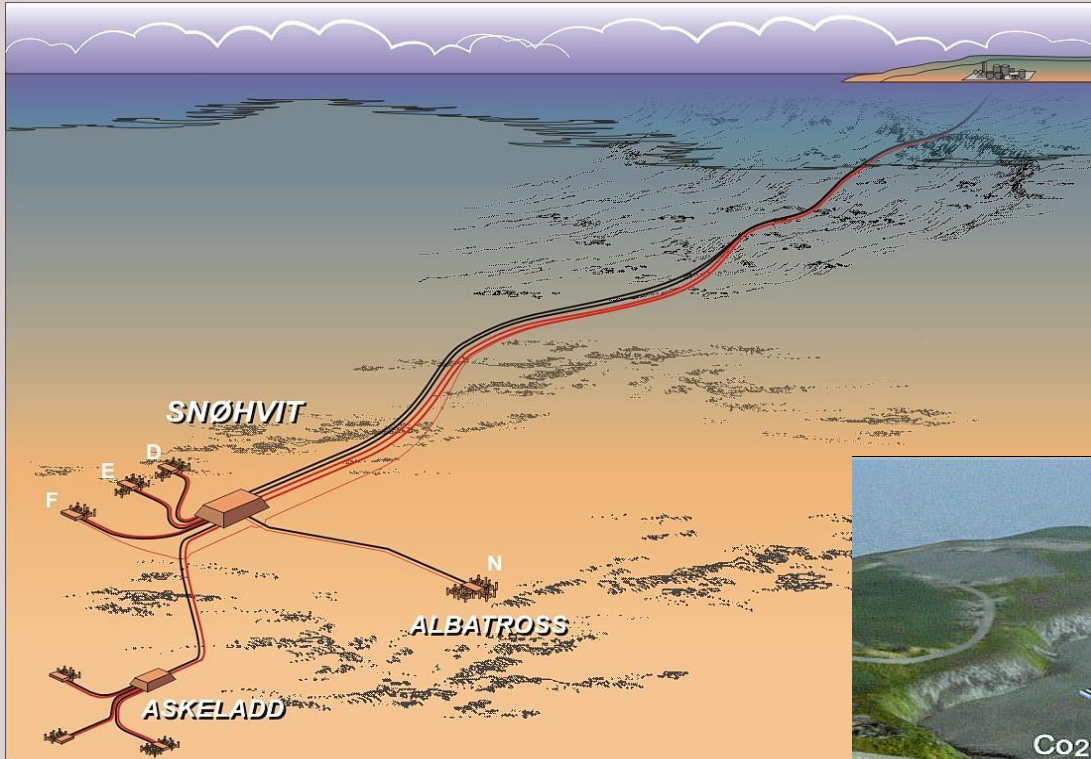


Mongstad CHP station

- Excess gas is currently flared
- Will be used in CHP with CCS



Gas to LNG Snøhvit



Closed flare



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