



NORWEGIAN PETROLEUM
DIRECTORATE



Flaring on the Norwegian Continental Shelf

Presentation for Canadian authorities
June 13. 2008



Who's calling..

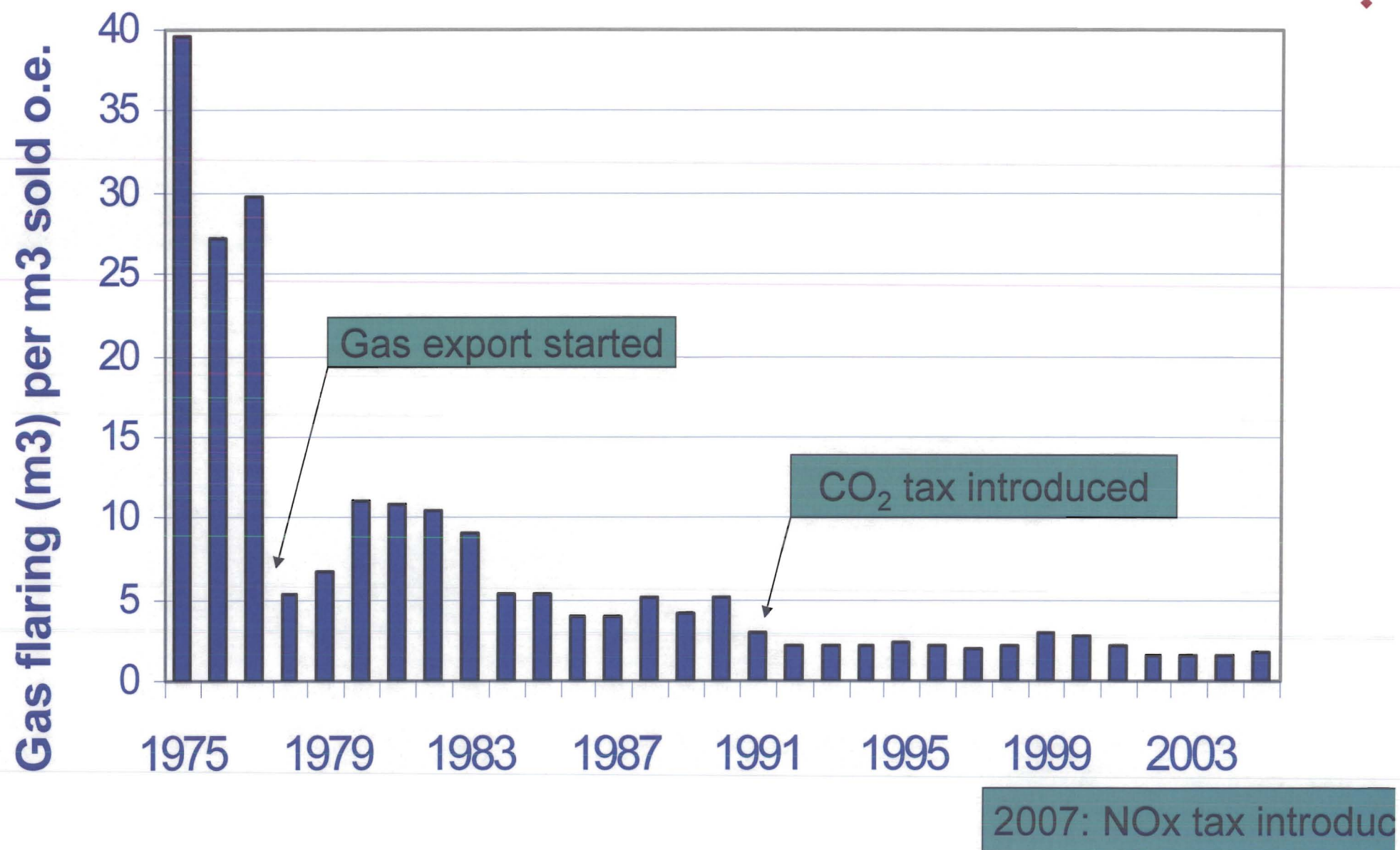
?

Bjornar
was
stated by rd

Steinar Njaa



Historical view of the flaring on the NCS



Gas flaring in Norway

- ◆ Flaring and venting strictly regulated from a resource management point of view since the early days on the Norwegian CS (1971 →)

Gas Flaring and Venting Regulations (Norway)

- ◆ “Flaring in excess of the quantities needed for normal operational safety shall not be allowed unless approved by the Ministry”:

- Associated gas utilisation required to get authority approval of Plan for Development and Operation *PDO - plan for use of associated gas (injection, export) - flaring Not allowed - inject or use only - to different formation or EOR.*
- Annual gas flaring permits and production permits (pollution permits) *Apply to NPD quarterly permits by maintaining work in summer higher volume*
- Avoid waste of petroleum and reservoir energy
- Cold venting is not in accordance with the principle of environmentally prudent petroleum production

Gutenberg protocol; NO_x in 2010 goals. air quality (all sectors) does not look like it will be reached.

- ◆ NO_x-tax and CO₂-tax charged on all fuel and flare consumed and vented

gas $\approx 2\text{€}/\text{kg NO}_x$

6/12/2008 OFFSHORE SET UP FUND USED for NO_x reduction projects.

5K x 4 = 5K/SCM

0.5/mbtu

0.5/€

(.45g/scm gas) \approx 0.5g/l diesel

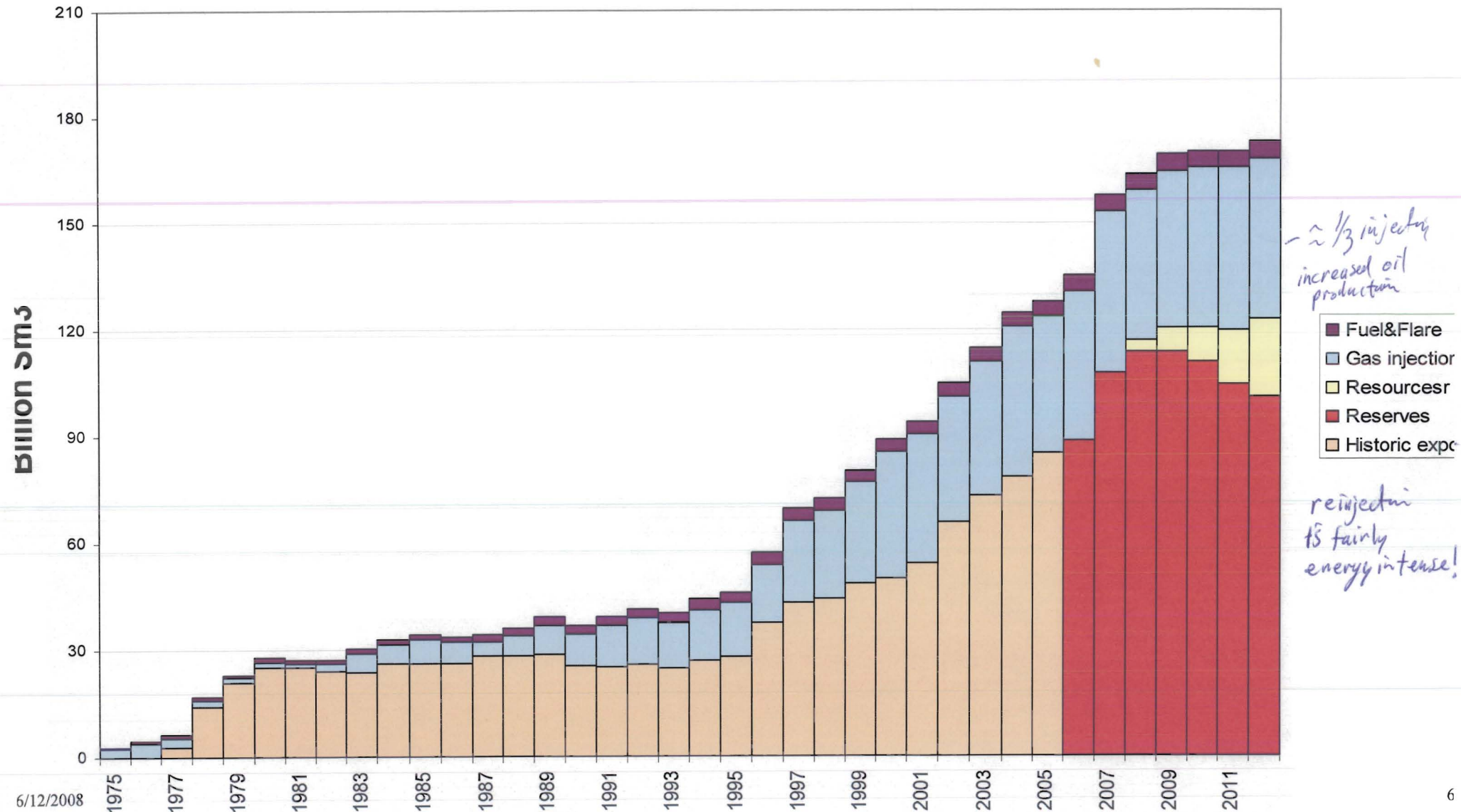
16€/l diesel or/m³ gas

Same?

$\approx 40\text{€}/\text{tonne CO}_2$

Gas Balance

Norwegian Continental Shelf



Less flaring than in
comparable regions
due to:

electricity from hydro
- export in summer
- import in winter

(main coal fuel used in Europe)

Very little domestic use
some offshore for turbines
(23%)

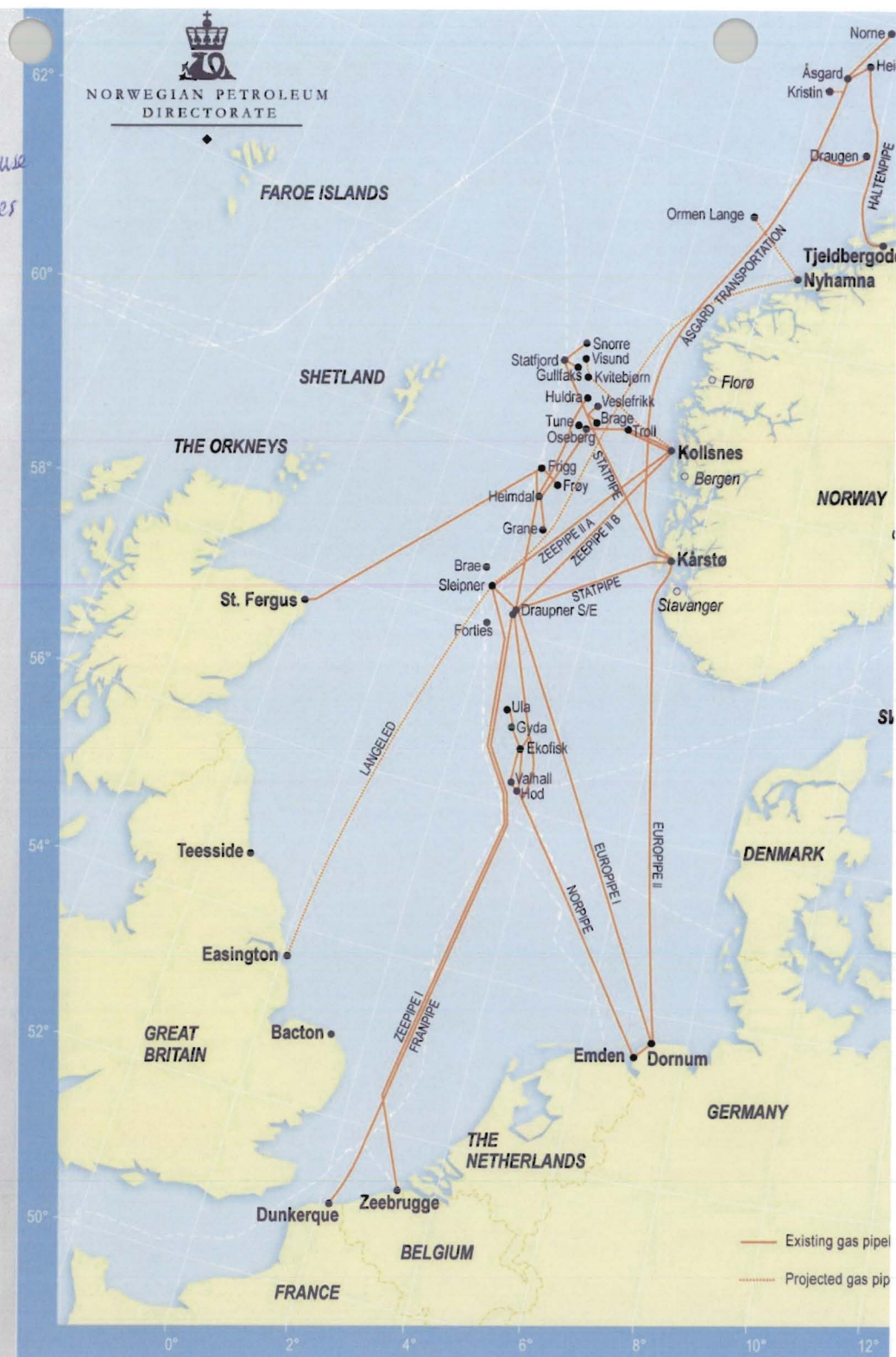
Development of procedures
and technologies to reduce
gas flaring

Development of integrated
gas transport systems

Gas storage solutions

More focus on enhanced oil
recovery – easy access to gas

in some cases increased field
development costs



Snøhvit LNG-plant

Snøhvit – Only Norwegian gas field
without gas transport pipelines

- Gas power plant
- CO₂ captured and stored from gas produced (in an aquifer)
statoilhydro.com
- plant onshore
→ ENV. Authority regulate it



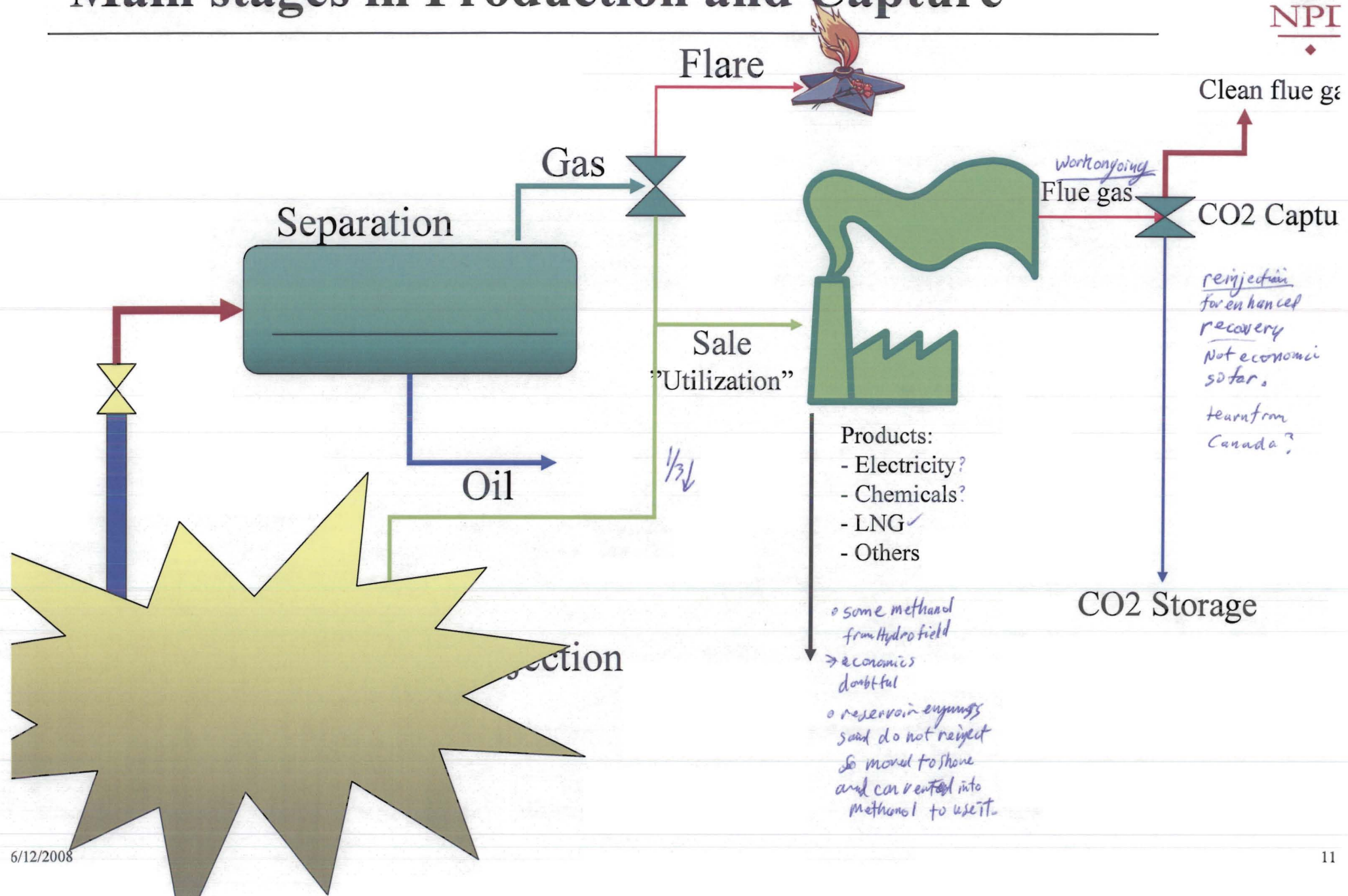
Some comments..

- ◆ Environmental standards are easier to adapt in pre-development phase than in production phase
- ◆ Gas infrastructure – investments in infrastructure, 3rd party access, tax deductability
(tariffs) (other provinces?)
- ◆ Probably harder to reduce flaring in remote areas without gas pipelines
- ◆ Approx. 20 – 40 % of ^(volumes) flaring is continuous flaring while the remaining share is caused by events and mishaps to secure safety and operational purposes
 flue gas | natural gas strips oxygen from water for re-injection
 - Near end of life with lower pressure ~~and~~ redundant equipment could prevent flaring but not many fields have redundancy.
- ◆ ”Are we certain that the actual flaring is necessary for safety purposes?”
– OCs carry through awareness campaigns

Injection of CO₂ from CO₂-rich gas

- ◆ Snøhvit and Sleipner ^{*injection into a very large aquifer shallow*} are two fields where CO₂ needs to be removed from the produced gas in order to meet the specifications set downstream.
- ◆ Both fields are built with CCS-technology for injection of CO₂ into aquifers close by

Main stages in Production and Capture



Main issues the last years

- ◆ Offshore electrification
 - All new developments must assess against environmental effects and cost to supply electricity from shore.
- ◆ CO2 Capture and Storage
- ◆ Reductions in climate gas emissions – multiple regulations
- ◆ Opening of Barents Sea and the areas important for fisheries around Lofoten – stricter environmental regulations

Our website:

www.npdp.no