



NORWEGIAN PETROLEUM  
DIRECTORATE

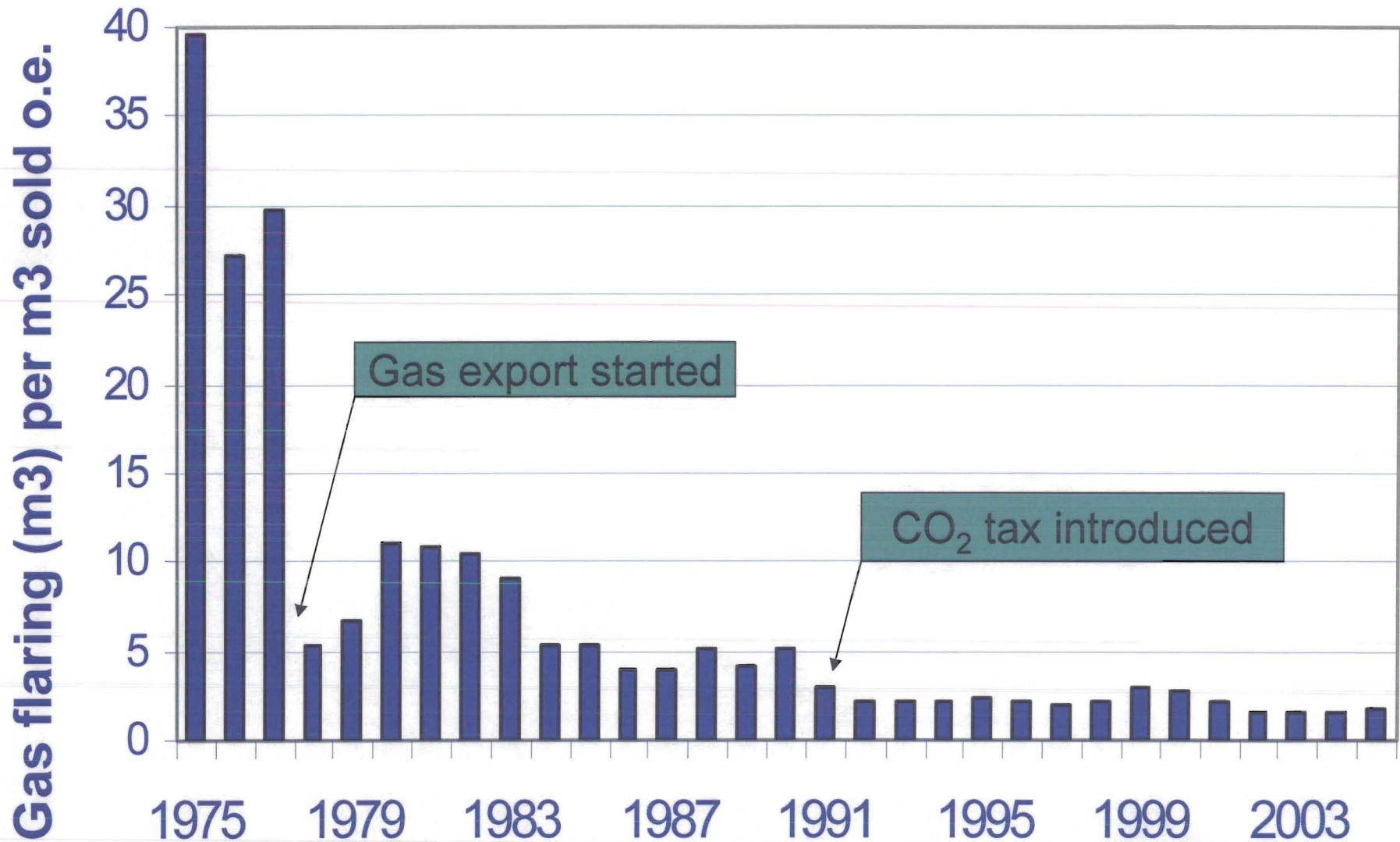
# Flaring on the Norwegian Continental Shelf

Presentation for Canadian authorities  
June 13. 2008





## Historical view of the flaring on the NCS



2007: NO<sub>x</sub> tax introduced

## 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  
reinject or use only  
↳ different form than on E02.*
  - 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  
*Butenbergs protocol; NO<sub>x</sub> in 2020 goals. air quality (all sectors) does not look like it will be reached.*
- NO<sub>x</sub>-tax and CO<sub>2</sub>-tax charged on all fuel and flare consumed and vented *?*

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

6/12/2008  
 OFFSHORE SET UP  
 FUND USED for NO<sub>x</sub>  
 reduction projects

12.5/mbtu  
~~8.0~~  
~~6.0~~

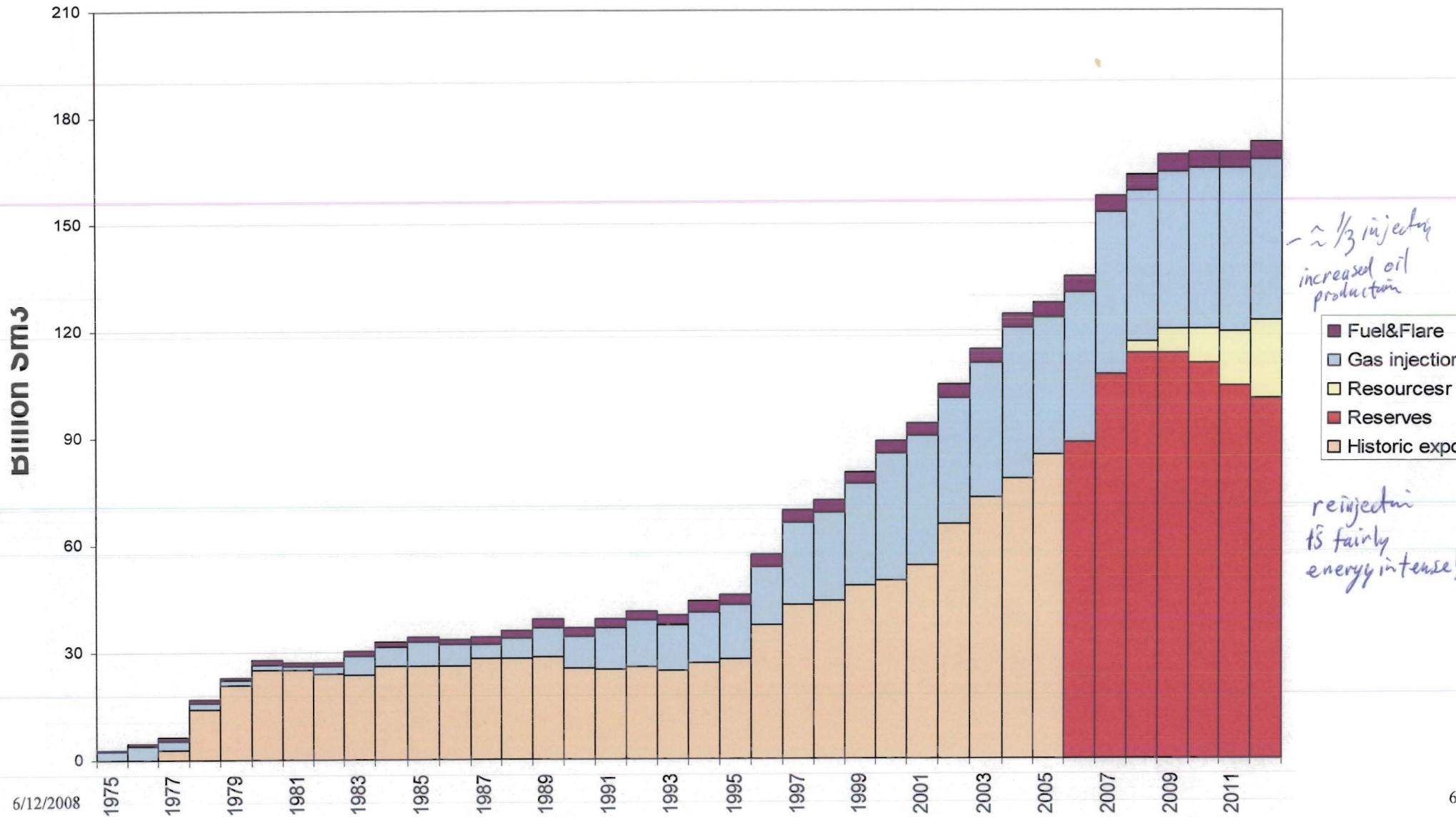
5K  
~~4-5~~ g/scm

0.45 g/scm gas  
 $\approx 0.5\text{g/L diesel}$   
 $\frac{1}{16}\text{E/L diesel}$   
 $\text{or}/\text{m}^3\text{gas}$

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

Same?

# Gas Balance Norwegian Continental Shelf



# Less flaring than in comparable regions due to:

electricity from hydro  
- export in summer  
- import in winter  
(main coal to electricity in Europe)

Very little domestic use  
Some offshore turbines (23%)

Development of procedures and technologies to reduce gas flaring

Development of integrated gas transport systems

Gas storage solutions

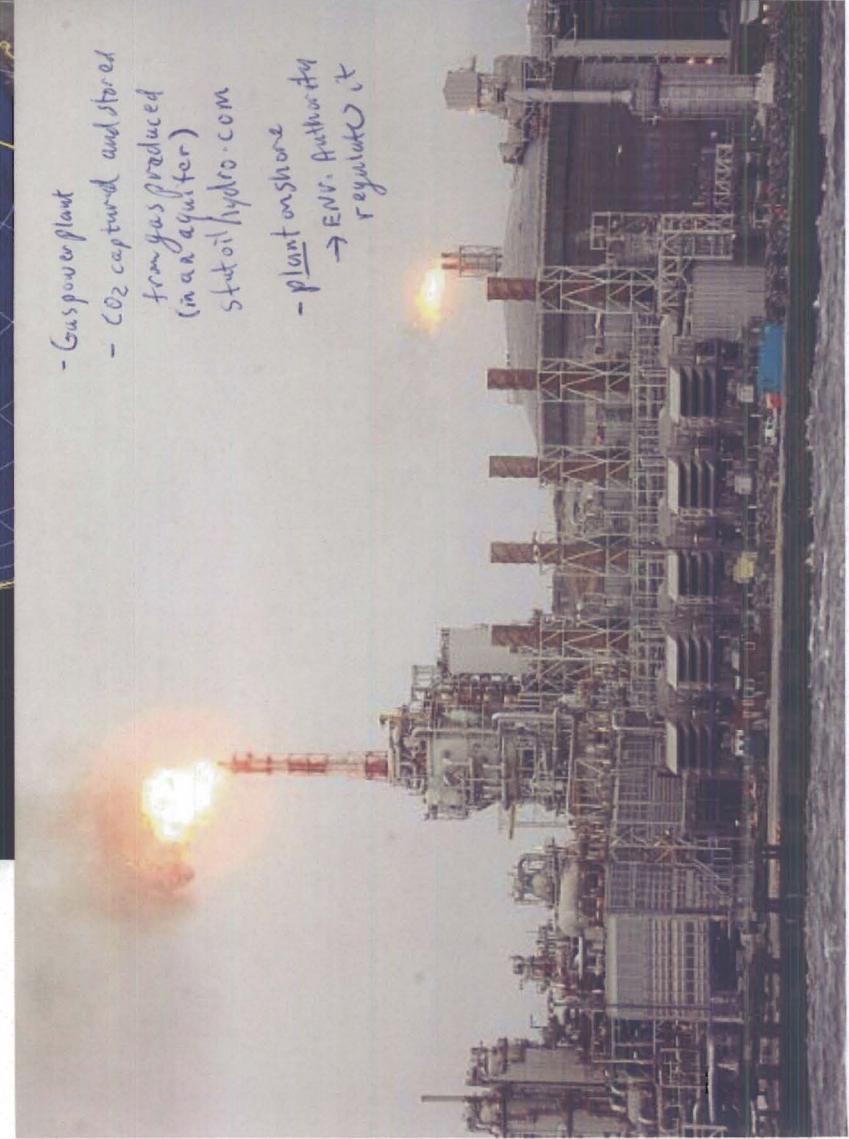
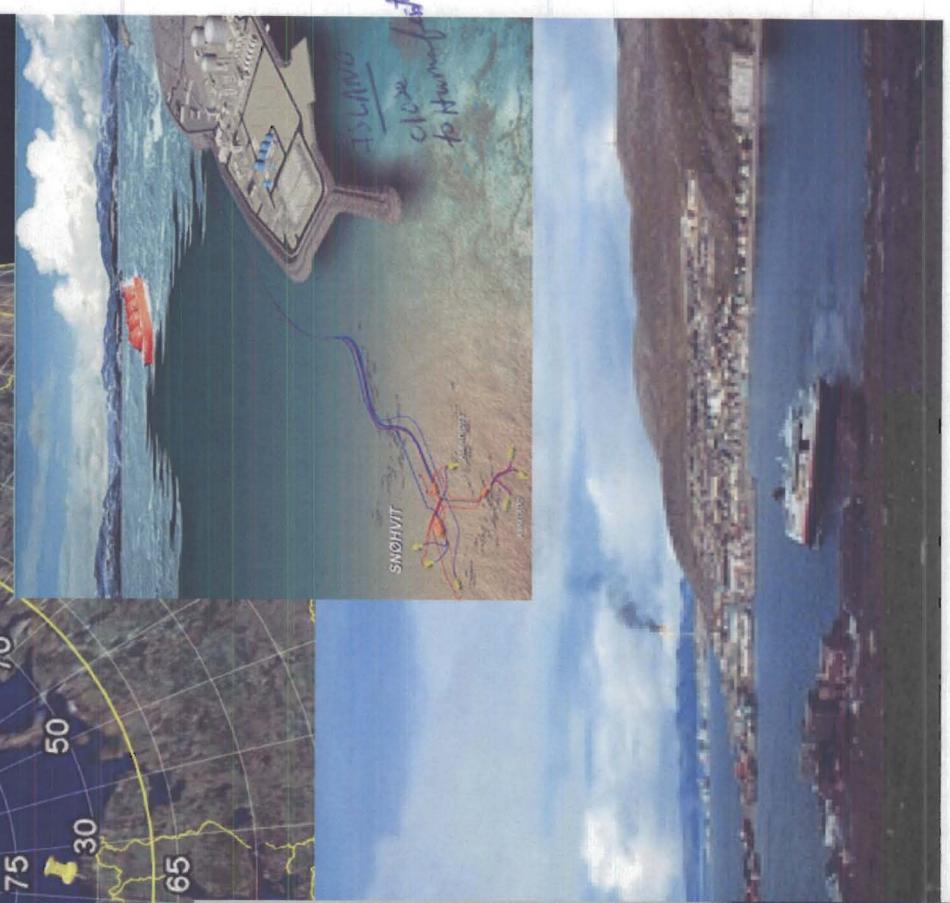
More focus on enhanced oil recovery – easy access to gas

in some cases increased field development costs



# Snøhvit LNG-plant

Snøhvit – Only Norwegian gas field  
Without gas transport pipelines



## Some comments..

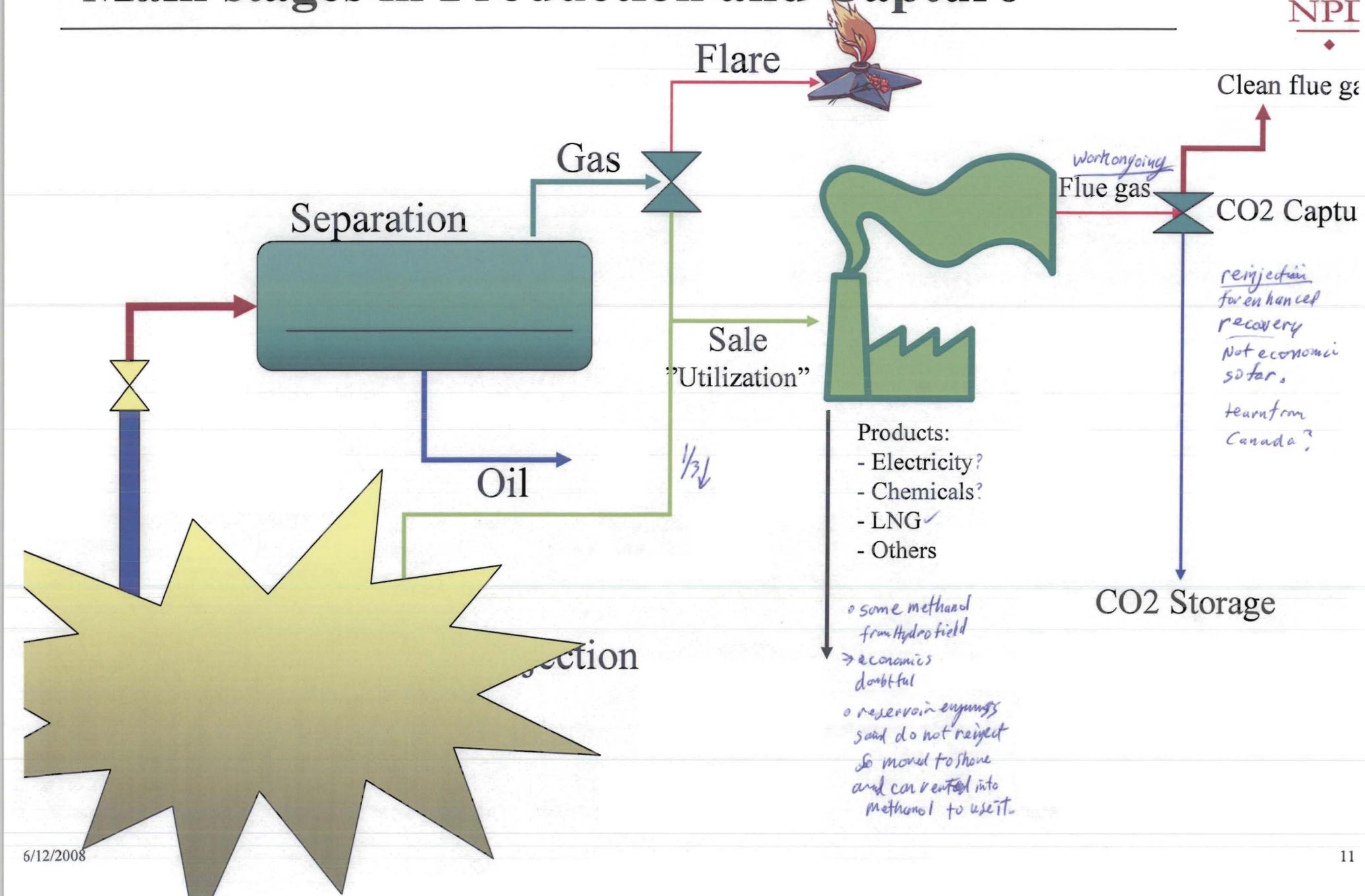
---

- ◆ 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
  - (volumes)
  - flue gas [natural gas strips oxygen from water for re-injection]
- ◆ Approx. 20 – 40 % of flaring is continuous flaring while the remaining share is caused by events and mishaps to secure safety and operational purposes
  - near end of life with lower pressure ~~the~~ 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 CO<sub>2</sub> from CO<sub>2</sub>-rich gas

- ◆ Snøhvit and Sleipner are two fields where CO<sub>2</sub> needs to be removed from the produced gas in order to meet the specifications set downstream.  
*injection into a very large aquifer shallow*
- ◆ Both fields are built with CCS-technology for injection of CO<sub>2</sub> 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.npd.no](http://www.npd.no)**