E&P in the Netherlands; challenges and opportunities

facts, figures and futures.

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 Ministry of Economic Affairs
This presentation

- Dutch oil and gas fields
- Hydrocarbon Reserves
- Tax relief for E&P projects
- Fallow acreage
- Stranded fields
- Prospectivity & Exploration
- Shallow Gas Leads
- Dinantian Carbonates play
- Drilling Hazards
- Easy access to E&P data
  www.nlog.nl
E&A wells 2005-2011

Exploration wells: average POS and success ratio

- POS & success ratio (%)
- Number of exploration wells

- Successful wells
- Dry holes
- Average POS
- Success ratio
Documented Dutch resources
Ambition for small field production:
Maintain yearly production @ 30 bcm till 2030
How to reach the ambition

- Tax incentives
- Gas in under-explored areas
- Gas in new plays
- Challenging reservoirs
  - Tight reservoirs
  - Shallow gas reservoirs
- Unconventional reservoirs
  - Shale gas
  - CBM
- Tail end production
Fiscal and regulatory incentives and framework

› Marginal fields and prospects incentive (2011)

› Research & development incentive (2012)

› Small fields policy (long standing successful strategy)
  › Guaranteed off-take (GasTerra)
  › Guaranteed transport (Gas-Transport-Services)

› 40% Participation of EBN in exploration (2000) and production (1973)


› Fallow acreage incentive (2011)
Margins of small field production

- Finding costs: mainly geology & geophysics (G&G) costs (including seismic surveys and expensed dry exploration wells)
- Depreciation: on a unit-of-production (UOP) basis (depreciation over capitalised successful exploration wells are included in this category)
- Production costs: including transport, treatment, current and non-current costs
Fallow acreage incentive

For interested parties other than the current operator or its co-licensees:

Application from 1st of July 2012 by submitting a work plan.

Appreciation of the work plan by government.

If positive transfer of fallow licence to applicant.

If negative fallow licence stays with current licence holder.

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If “NO” then it means that the license remains with the current main licensee.

If license is transferred in this period then a 3 month extension is granted for submission work plan all subsequent terms are postponed accordingly.
Fallow acreage incentive

Number of prospects per area

Prospect expectation volume (bcm) per area

<table>
<thead>
<tr>
<th>No. Gasfields</th>
<th>No. Oilfields</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abandoned</td>
<td>Undeveloped</td>
</tr>
<tr>
<td>Abandoned</td>
<td>Undeveloped</td>
</tr>
</tbody>
</table>

Fallow Acreage
- Offshore: 1
- Onshore: 3

Open Acreage
- Offshore: 11
- Onshore: 2
Marginal fields/prospect incentive

- A gas field or prospect is marginal when:
  - Volume,
  - Productivity and
  - Distance to infrastructure are below a threshold.

- Then project screens for tax deduction of 25% of the investment.
This year's results of the marginal fields/prospect incentive

Definition of threshold plane

\[ Q_{\text{threshold}} = 1.2 \times \text{Volume}^{-0.66} \times \text{Distance}^{0.15} \]
Example

- Stranded field K4-Z
  - Discovered in 1974
  - 1 discovery well
  - 3 appraisal wells
  - Stranded for 37 yr

- Now being developed aided by the marginal field incentive
Stranded Gas

<table>
<thead>
<tr>
<th>Stranded Gas Fields</th>
<th>Number</th>
<th>GIIP (bcm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>~80</td>
<td>~130</td>
<td></td>
</tr>
</tbody>
</table>

Stranded (fallow) gas and oil fields

When the Netherlands and the Netherlands sector of the Continental Shelf a number of oil and gas accumulations have been discovered which for a variety of reasons have not been taken into production. A brief analysis made in 2010 of 77 stranded fields showed that on average they contain 1.4 bcm of GIIP, resulting in an estimate of about 80 bcm in total. It is estimated that the corresponding total reserves could range from 45 to 55 bcm, given fair to good economic conditions for development.

More information on specific fields can be found in the fact sheets below. Once the relevant wells have been identified, the available well information can be downloaded or ordered from TNO (gas portfolio).

Since 2010 specific fiscal measures are in place to stimulate the production of marginal fields.

Fact sheets have been compiled on behalf of the Ministry of Economic Affairs, Agriculture and Innovation. These fact sheets are to inform interested parties about the main characteristics of the accumulations.

Overview stranded fields

- Stranded gas and oil fields in the Netherlands (April 2010) (excel sheet)

Listing fact sheets of stranded fields (April 2010)

<table>
<thead>
<tr>
<th>Onshore</th>
<th>Offshore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field</td>
<td>Licence type</td>
</tr>
<tr>
<td>Alblasserdam</td>
<td>Production licence</td>
</tr>
<tr>
<td>Roestaa</td>
<td>Production licence</td>
</tr>
</tbody>
</table>
Prospectivity in proven plays
Prospectivity in proven plays

Prospect portfolio fingerprint as reported =>

[Graph showing distribution of prospects by MSV (BCM) classes with associated total MSV per class. Color-coded by POS, numbers indicate number of prospects in each category.]
Gas in under-explored areas & new plays

Legend:
- Gas field
- Oil field
- Satellite platform
- Production platform
- Subsea
- Explo. Lic. HC Applied for
- Explo. Lic. HC
- Prod. Lic. HC Applied for
- Prod. Lic. HC
- Storage Lic. Applied for
- Storage Lic.

Reservoirs:
- Triassic
- Chalk
- Zechstein
- Lower Cretaceous
- Rotliegend
- Jurassic
- Carboniferous

Expl. Well
- Gas Field
- Oil Field

Under-explored area
Mature exploration area
Dinantian play
Unconventional Gas

Geological map showing exploration areas and reservoirs.
Shallow Gas

Shallow Gas: gas in Tertiary unconsolidated strata at max 1000m depth
Why now?

- First shallow gas fields in production
- New 3D seismic 2012
- Marginal field tax incentive always applicable
- Significant shallow gas potential in northern offshore
Dinantian Carbonate play review NL

Play elements of the Dinantian carbonate play

<table>
<thead>
<tr>
<th>Structure</th>
<th>(faulted) carbonate platform</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source</td>
<td>Namurian / Dinantian shales (lateral migration)</td>
</tr>
<tr>
<td>Reservoir</td>
<td>karstified / fractured (Visean) limestone</td>
</tr>
<tr>
<td>Seal</td>
<td>Namurian shales (top / side seal)</td>
</tr>
</tbody>
</table>
Unconventional reservoirs

- Shale gas in:
  - Posidonia
  - Basal Namurian hot shales
Drilling Hazards JIP – Pilot Project

› To provide a pilot proof of concept for an integrated Drilling Hazards Information System (DHIS) for the onshore and offshore Netherlands.

› The establishment of such an information system will enable oil & gas (and e.g. geothermal) drilling Operators to be aware of significant geological drilling incidents which have occurred in the past, and thereby lead to **safer and cheaper drilling operations** in the future.
Research & development incentive (2012)
Upstream Innovation Programme

To find innovative solutions to get maximal recovery of gas from the Dutch subsurface.

Total Budget 2013: 6.2 Million Euro, of which 50% is private funding.
E&P and Geothermy

- 5 doublets drilled in the Netherlands
- 4 have seen hydrocarbons => very low saturations
  - 3 gas
  - 1 oil
- Anticipated flow 150 m$^3$/h
  - Solution gas: 1 - 1.5 Nm$^3$/m$^3$ of gas => 3600 m$^3$ gas/d
  - Traces of oil: 0.00005 m$^3$/m$^3$ of oil => 0.18 m$^3$ oil/d ≈ barrel/day

- Interesting opportunity for win-win situation
  - Economic project evaluation with upfront risk-integration
  - One system two energy carriers
  - Shared investors
  - Tail-end production from the start
Subsurface Data
Seismic Data

› 3D-seismic coverage
  › 75% of the offshore
  › 40% of the onshore

› Still improving
  › eg DEF spec survey of FUGRO
Well Data position

› Some 4500 wells
› of which 1452 exploration wells
Data availability

› All public domain data freely available through:
  › The Dutch (NL) Oil & Gas Portal
  › www.nlog.nl
Conclusion

› Lot of exploration and production potential in the Netherlands
› Stable fiscal and regulatory environment
› Fit for purpose tax incentives
› Extraordinary data-position

› Visit us in booth 10