Hague and London Oil

Southern North Sea

The Carboniferous, The Pleistocene and Everything In-Between
Objectives and Strategy

The Company is building a long-life diversified portfolio of assets with a balance of production, development, appraisal and exploration opportunities.

HALO shall do this by leveraging the extensive knowledge, experience and networks acquired over the years to identify and access value accretive opportunities, at lowest cost.

The Company shall show discipline in targeting exploration where there is a clear commercialization path, with focus on larger stakes in lower risk projects and smaller stakes in higher risk projects.

We are building a fighting force of extraordinary magnitude. We forge our tradition in the spirit of our ancestors. You have our gratitude.
Southern North Sea

“Southern Gas Basin”

Everything In-Between
Where Hague and London Oil is:
The Portfolio:
- The Netherlands and United Kingdom (Southern North Sea)
- Producing ca. 2,500boepd
- Reserves of ca. 16mmboe
- 34 Fields
- 13 Licenses
- Ownership (non-operated) of offshore pipeline and onshore processing facilities
- Exclusively Natural Gas (i.e. <5% Associated Gas Condensate)

History:
- Hague and London Oil (HALO) BV formed (2013)
- HALO BV merges with Wessex Exploration Plc, becoming HALO Plc (2014)
- HALO focuses on SE Asia & “Frontier” Exploration (2015)
- HALO applies for F5 Offshore Holland (2016)
- HALO acquires Tullow E&P Netherlands BV (2017)

Future:
- Develop, Appraise & Explore existing Portfolio
- Grow HALO with similar Risk/Reward balance
The Netherlands:

- **Two areas:**
  - Northern
  - JDA

- **Infrastructure**
  - Western Gas
  - Den Helder

- **Statistics**
  - 10mmboe (2P)
  - 2,500boepd
Dutch Asset Overview

Joint Development Area

<table>
<thead>
<tr>
<th>Area</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>JDA</td>
<td>9.95%</td>
</tr>
<tr>
<td>K18-Golf</td>
<td>2.189%</td>
</tr>
</tbody>
</table>

Northern Area

<table>
<thead>
<tr>
<th>Area</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>E Blocks (E10, E11, E14, E18b)</td>
<td>30.00%</td>
</tr>
<tr>
<td>E15c</td>
<td>20.00%</td>
</tr>
<tr>
<td>E18-A</td>
<td>18.357%</td>
</tr>
<tr>
<td>F16-E</td>
<td>4.147%</td>
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Pipelines & Facilities

<table>
<thead>
<tr>
<th>Facility</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>WGT Pipeline &amp; Den Helder HiCal</td>
<td>8.88%</td>
</tr>
<tr>
<td>WGT Extension Pipeline</td>
<td>6.38%</td>
</tr>
</tbody>
</table>
The Joint Development Area:

- 7 Licenses
- 31 Fields
- Pipeline
- Processing
Joint Development Area (HALO 9.95%)

- 31 producing fields spanning 7 licence blocks
- 2018 gross production of ca. 150 mmcfd
- Numerous development and exploration opportunities;
  - in a highly productive basin,
  - with low geological risk, and
  - access to infrastructure.
- A Multi-TCF gross additional prospectivity
- Interest in the WGT pipeline (8.88%) and Den Helder processing facilities
- High levels of operational activity in 2018

The JDA system comprises five processing platforms, of which three have compression facilities.

Well head platforms and subsea completions are used to connect the wells to the processing platforms.

Two different gas qualities are produced in the JDA area: HiCal and LoCal.

LoCal Gas is mainly found in the K15 area and gathered on the K15-FB-1 platform and exported to Den Helder via the LoCal pipeline to the Local processing plant onshore.

The WGT Extension and WGT pipeline transport HiCal gas to the Den Helder terminal onshore. The system provides a degree of security of supply: if a platform goes down, other platforms can continue to produce.
Joint Development Area (HALO 9.95%)

L13-FI Development

Development of the field commenced in 2017 with the drilling of three production wells and hydraulic fracturing, drilled from a mono-tower connected to the K-15-FA production platform.

The first well L13-FI-103 completed drilling in Dec. 2017 with production gas being exported via the JDA HiCal evacuation system and processed at the Den Helder gas plant.

Well F13 Fl 103 completed drilling in Dec 2017 finding a structure deeper than prognosed with 358 ft gas column.

The second well, L13-FI-102 was drilled early 2018 with the third well (L13-FI-101) to be drilled in 2018 once the well results are incorporated in an updated reservoir model with first gas realized in July 2018.

K18-Golf & K12 (shared facilities with JDA)

Through its interest in the JDA, the K15 license allows HALO to hold a 2.189% unitised interest in the cross-border K18-Golf field (operated by Wintershall) as well as K12 fields (operated by Neptune) with interest of 3.8-6.8%. The most recent well, K18-G2, had led the operator to request additional capacity usage of the K15 facilities and 3D Seismic studies have improved interpretation of the internal reservoir character within the K18-Golf field.

A fourth development well has recently been agreed in the K18-Golf partnership, and is currently planned to spud in 2020.
Overview of recent JDA activity:

- Three L13-FI development wells were drilled in the JDA as planned. Well activities & installations commenced less than 1 year ago at the L13-FI development.

- After completion, the wells were subsequently stimulated and tested; therefore well operations ceased near the middle of the year.

- Production started in August 2018, and the field is currently producing at around 2.2 MMscf/d net to HaLo

- The L13-FI project was completed ahead of schedule and under budget largely due to the commitment, dedication and performance by the operator
Northern Area (E-Blocks):

Exploration & Appraisal

HALO’s exploration assets include 4 non-operated exploration licences in the E quadrant of the Dutch North Sea. The Vincent well was drilled in 2014, Block E-11.

The Vincent well encountered a 130ft gas column and succeeded in proving the Carboniferous play.

Beyond Vincent, numerous prospects have been identified which contain significant potential.

In 2015, Neptune farmed in to the licences and assumed operatorship from HALO.

There remains potential for significant area development tying in to nearby Neptune equity infrastructure upon further discoveries.

There was very limited activity in the Northern Area in 2018, however, much sub-surface work has been performed in that time on newly licensed 3D seismic data.

The Maple Prospect, a Bunter (lower Triassic) target, is expected to be drilled within E-15c late 2019 or in 2020; the prospect having been re-evaluated on the recently interpreted 3D seismic.
Pipelines and Infrastructure

WGT & WGT Extension

HALO owns equity in the Western Gas Transmission (WGT) system, a key gas evacuation system in the Netherlands.

HALO’s Equity translates into capacity rights in the WGT System with no tariffs due for equity holders. Unused capacity is utilised for third party throughput; third party users pay operating costs plus commercial tariffs for access to WGT.

The tariff income provides a significant income stream while there remains upside potential from tie-ins of nearby discoveries from other companies. WGT required no capital expenditure in 2017 and represented minimal operating costs for owners of the facilities.

HALO has a surplus capacity and would benefit from tariff income from new third party tariff contracts. There remains ullage in both pipelines to accommodate third party production.

Den Helder Plant

HALO also owns 8.88% of the Den Helder processing facilities which is the primary onshore point for receiving gas from the HiCal WGT system, JDA LoCal pipeline and NOGAT trunk-line.

The LoCal plant and pipeline is owned by the JDA and all costs associated with these are included in the JDA budget with operating costs shared among the WGT (plus WGT-Extension) system users on a throughput basis.

There is the potential to upgrade LoCal system compressor as well as the possibility of combining the facilities with other, similar companies nearby to improve efficiency and reduce operating costs further.

<table>
<thead>
<tr>
<th>Partner</th>
<th>WGT</th>
<th>WGT-Ext</th>
</tr>
</thead>
<tbody>
<tr>
<td>HALO</td>
<td>8.88%</td>
<td>6.39%</td>
</tr>
<tr>
<td>EBN</td>
<td>40.00%</td>
<td>40.00%</td>
</tr>
<tr>
<td>NAM</td>
<td>31.11%</td>
<td>23.00%</td>
</tr>
<tr>
<td>Oranje-Nassau</td>
<td>2.34%</td>
<td>1.35%</td>
</tr>
<tr>
<td>Total</td>
<td>4.65%</td>
<td>23.00%</td>
</tr>
<tr>
<td>Wintershall*</td>
<td>13.01%</td>
<td>6.27%</td>
</tr>
</tbody>
</table>

* operator
Southern North Sea
The UK
The Carboniferous
Greater Pegasus Area:

Blocks 43/12, 43/13b, 43/17b, 43/18b 43/19b

HALO holds a 45% interest in the Greater Pegasus Area, which offers the opportunity of a technically simple gas development that can be developed in sequential phases over the next five to seven years.

Spirit and HALO have submitted a Field Development Plan of integrated appraisal, development and exploration that optimises this phased approach.

The area comprises Pegasus West and other discoveries, including Browney, and adjacent low risk undrilled segments, such as Andromeda.

Discoveries to date:

- **Pegasus West:** 2014 discovery; tested @ 92mmcf/d
- **Pegasus North:** 2011 discovery; 300’ gas column
- **Pegasus East:** 1991 discovery; strong gas kick
- **Browney:** 1986 discovery; tested @ 19mmcf/d
Pegasus West Development Concept:

- Ca. 80bcf recoverable (14mmboe) from first well
- Pegasus West 2014 Exploration & Appraisal well
  - Re-entered and completed as production well
- 57km pipeline to Cygnus
- Cygnus reception facility, Esmond Pipeline, & Bacton
- Enable tie-in of potential future wells
- FID anticipated to be in 2019
- First gas targeted for 2021-2023
Greater Pegasus Area History:

1985-1991: Browney and Cavendish


2006: Cavendish start of Production

Cavendish begins production at 100+mmmscfd. By 2016, over 90% of the connected volume has been produced with no water production. Final recovery factor projected to be 94%. High quality shoreface sand reservoir

2011: 43/13b-6z Pegasus North

Pegasus discovery well with 300’ pay on logs within Namurian. Casing collapsed before testing equipment mobilised. Now recognised as Pegasus North/Central

2013 – 2014 43/13b-7 Pegasus West

Third Energy farms into Pegasus licences taking a 35% WI. Pegasus West discovery well drilled in 2014; rig released end November after 3-zone test with cumulative stabilized test rate of 92mmscfd

2015 Atlantic Petroleum buyout

Third Energy purchases Atlantic Petroleum’s 10% WI in all of the Greater Pegasus licences for £7.5 million increasing net WI to 45%. Centrica and Third Energy both officially declared it a Project. EVALUATE phase begins

2016 Pegasus West Development project

Development planning moves through EVALUATE and SELECT phases. Reprocessing of the 3D seismic dataset and re-interpretation. Partnership determines that development is economic on 1 well: top Centrica UK project

2017 - 2019 DEFINE phase, FDP and FID

Completion of SELECT phase, DEFINE phase in 1H18 and submission of 1st Draft of FDP in 4Q18, re-submitted 1Q19. FEED started in the DEFINE phase and could lead to FID in 2019, drilling of Andromeda in 2H19
Pegasus Development Philosophy:

- Information from the existing 43/13b-7 well are more than sufficient to take FID for the initial development and provide pay-out for the infrastructure (subsea well completion, pipeline and platform mods) and provide a positive return.

- Pegasus will likely be a staged development with all subsequent wells tied into then existing infrastructure:
  - initial development 1-well with no surface facilities.

- Subsequent wells highly economic as they require minimal additional development Capex—all funded from cash flow from initial development.

- Consequently, the development is already de-risked based on the resources from Pegasus West alone.
Greater Pegasus Area: Discoveries, Prospects and Potential Transportation
Southern North Sea

The Netherlands

The Pleistocene
The Shallow Gas Play can be Summarized as…

Phase I: sands transported to Delta front, deposition of delta toe sands

Phase II: no sands transported to Delta front, deposition of mainly clays, sands remain close to shore

Phase III: sands transported to Delta front, deposition of delta toe sands

Schematic evolution of the deposition of reservoir sands/seals. Sands are shown as yellow, clays as green or blue. Note the background subsidence, which ultimately controls the creation of accommodation space on the shelf.

…Deltaic sands, ranging from deeper water delta-toe sands to shallow water delta top-sets
The Shallow Gas Play can be Summarized as...

...deeper marine sands sealed by continuous shale deposition off the shelf, sourced by delta clays
The Shallow Gas Play can be Summarized as...

...structure developed by the rising of salt diapirs causing deformation of the overburden. The diapirism of the Permian salt may be caused by the rapid infill of the basin, and...

...structuration is post deposition and contemporaneous if not earlier than the gas generation.
Challenges

- Thinly Stacked Reservoirs
- Poorly Consolidated Sands
- Shallow
- Low Relief
- Low Pressure

Solutions

- Horizontal Wells
- Expandable Screens
- Hi-Res Seismic
- Compression
Legacy 2D Seismic Data Indicates “Bright” Amplitudes Conforming to Structure

Top Pleistocene gas sands

Mid Miocene Unconformity

Base Tertiary
Structural Prospects May Have Added Stratigraphic Potential

The GWC, as well as saturation (Sg) and reservoir quality (Φ), remains the biggest variables and risks within the Shallow Gas Prospect for both volumes and deliverability. There is some seismic indication, in bright amplitudes & phase change outside of closure, that there is a possible down-dip, on-lap stratigraphic component to some Prospects.

Sg & Φ can only be quantified in drilling but, there is a strong possibility that the GWC could be de-risked seismically & that this could indicate volumes in excess of the current “maximum” in the structural spill-point.
Indicative Project

- 50m water depth
- 700-1000m target depth
- Amplitude Anomaly
- 4-way Dip Closure

- Pleistocene Deltaic Sand
- Natural Gas (likely hi-cal)
- Anomaly and Phase conform to Structure
- 120Bcf Recoverable
**Summary**

<table>
<thead>
<tr>
<th>Indicative Shallow Gas Development ‘ca.120Bcf’ Economics</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil reserves (mbbls)</td>
<td>-</td>
</tr>
<tr>
<td>Gas reserves (Bcf)</td>
<td>120</td>
</tr>
<tr>
<td>Total reserves (mboe)</td>
<td>20</td>
</tr>
<tr>
<td>Capex</td>
<td>247</td>
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<tr>
<td>Capex/boe</td>
<td>12,3</td>
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<tr>
<td>Opex/boe</td>
<td>12,4</td>
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<tr>
<td>NPV</td>
<td>79</td>
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<tr>
<td>NPV/boe</td>
<td>3,9</td>
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<tr>
<td>IRR</td>
<td>25%</td>
</tr>
<tr>
<td>Breakeven, $/bbl</td>
<td></td>
</tr>
<tr>
<td>Govt take (%)</td>
<td>41%</td>
</tr>
</tbody>
</table>

**Company**

- Oil reserves (mbbls): 0
- Gas reserves (Bcf): 120
- Total reserves (mboe): 20
- Capex: 247
- Capex/boe: 12,3
- Opex/boe: 12,4
- NPV: 79
- NPV/boe: 3,9
- IRR: 25%
- Breakeven, $/bbl: 
- Govt take (%): 41%

**Shallow Gas Field Development**

[Graph showing shallow and deeper anomalies]
Southern North Sea - Shallow Gas Summary

- Proven Hydrocarbon Resource
- Proven Development Technology (Expandable Screens)
- Availability of Acreage
- Extensive Existing Seismic Coverage
- Amplitudes Lead and Seismic Character Lead Exploration
- Key Risks:
  - Gas Saturation
  - Reservoir Quality
- New Seismic Data Would be Cost-Effective
- Improved Reservoir Characterization through New “Tuned” Seismic
- Stratigraphic Component Could lead to much larger Structural Leads
- Favorable Economics (i.e. Small Fields Policy)
- Access to Infrastructure (i.e. NOGAT, etc)
- “Hub and Spoke” Development Concept: CPP & Satellites
- Delays Abandonment by years for Ageing Infrastructure
So, Why Southern North Sea?

- Relatively “under-invested” in by Major Oil Companies for a long time
- Proven aspects of Hydrocarbon Systems: Source, Reservoir & Trap
- Availability of, or access to, proximal Infrastructure & Market
- Natural Gas being ascendant in terms of demand

Again, Why Southern North Sea:

- HALO saw some “niche” aspects of the Southern North Sea (SNS)
  - New plays had been exploited within the overall SNS
  - Abandonment had become an issue for ageing Infrastructure
  - Competition was relatively less than other areas in the North Sea
  - Capital was available for Acquisitions and Developments
  - Fundamentally, the Geology is supportive of SNS investment

Geology:

- Rottliegendes (i.e. mainstay), etc. has been largely tested and is quite mature
- Carboniferous has been very successful and not yet fully exploited
- Tertiary has been proven and completion technology makes it commercial
- Value remains in a “targeted” approach balancing all risk: technical/commercial
Advanced Education
Geosciences
Alternatives to Oil & Gas within the Related Disciplines
What else could we do?

Tulane University – New Orleans, LA USA

- School of Science and Engineering
- Department of Geology was founded by Dr. Reinhard Steinmayer in 1926 as the
- Dr. Steinmayer was an Oil and Gas geologist
- He was also interested in anthropology & founded:
  - Middle American Research Institute (MARI)
  - New Orleans Geological Society (NOGS)

Department of Earth and Environmental Sciences

Undergraduates
- 48 Environmental Earth Science majors
- 10 Geology majors

Graduate Students
- 13 Ph.D.
- 8 M.S.

Past five years
- Graduated 14 Ph.D.’s
What other things are we doing?

- **The Cochran Family Professorship**
  - The Endowment was established in 2015
    - by Michael and Mathilda Cochran
  - Designated for a distinguished professor:
    - Earth and Environmental Sciences
  - The Current Cochran Family Professor:
    - Karen Johannesson
  - Professor Johannesson has been at Tulane since August 2007
  - Professor Johannesson specializes in Geochemistry & Trace Elements

Professor Johannesson sampling groundwater from a well in West Bengal, India for arsenic speciation analysis
Supporting the Geosciences:

- Professor Johannesson studies trace element speciation and cycling in the environment
- This includes the fate and transport, as well as the chemical speciation of trace elements like:
  - Arsenic, tungsten, selenium, antimony, and the lanthanide series elements (i.e. the rare earth elements)
- Graduated 5 PhD students and 3 M.S. students from Tulane University

Awards and Honors

- 2015 Clair C. Patterson Award
- Fellow of the Geochemical Society
- Fellow of the European Association of Geochemistry
- Fellow of the International Association of Geochemistry
- Fellow of the Geological Society of America
- 2018 Outstanding researcher at Tulane University
Summary:

• Some “Mature” Basins offer much Opportunity:
  • The likely potential is a combination of:
    • Proven geology, new plays within those;
    • Marginal developments near infrastructure;
    • By-passed plays, exploitation thereof;
    • Access to Infrastructure, or available; and
    • Innovative development technology.
  • Mature Basins also offer:
    • Availability of capital for exploitation;
    • Wider acceptance of concept within proven basin; and
    • Relatively, expeditious route to commercialization.

• Southern North Sea
  • New plays exist within many a “Mature” Basin but;
    • Carboniferous, highly variable and proven yet potential remains, and
    • Upper Tertiary, previous “Drilling Hazards” are legitimate prospects
      • Expandable screens, deviated drilling.

• If any individual is “Successful” then inspire others:
  • Not necessarily for Hydrocarbons
  • Much work is done in the Geosciences which also benefits the World