Novoportovskoye oil and gas condensate field – development strategy and transport logistics
Geography and history of field development

Located on the Yamal Peninsula, Yamalo–Nenets Autonomous Okrug
License block size 659.6 km²
Nearest population centres:
- pos. Novy Port (20 km SE)
- pos. Cape Kamenny (89 km NE)
- Salekhard (293 km SW)

Northern climatic zone:
- winter – 60°C, summer +20°C
- 86 days of snowstorms per year
- 245 days under snow cover

Reserves, 2 P, PRMS

Liquid hydrocarbons, mt

<table>
<thead>
<tr>
<th></th>
<th>Proven</th>
<th>Probable</th>
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<tbody>
<tr>
<td>Bovshenkovo</td>
<td>56</td>
<td></td>
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<tr>
<td>NGKM</td>
<td></td>
<td>80</td>
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<tr>
<td>Novoportovskoye</td>
<td></td>
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<tr>
<td>p. Cape Kamenny</td>
<td></td>
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<tr>
<td>p. Novy Port</td>
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<tr>
<td>p. Yar–Sale</td>
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<tr>
<td>Gulf of Ob</td>
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History of development

Stage I 1964–1970
- 31 exploratory wells drilled
- Reserves appraisal

Stage II 1979–1987
- 86 exploratory wells drilled
- Re-evaluation of reserves

Stage III 2000–2012
Gazprom Dobycha Nadym LLC
- Pilot production – 20 wells, 3D seismic
- Reserves appraisal and assessment of oil recovery

Stage IV from 2012
Gazpromneft Novy Port LLC
- Gazpromneft Novy Port LLC
- 42 production wells drilled
- Production development plan endorsed

Gas, bcm

<table>
<thead>
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<tr>
<td>Bovshenkovo</td>
<td>46</td>
<td></td>
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<tr>
<td>NGKM</td>
<td></td>
<td>21</td>
</tr>
<tr>
<td>Novoportovskoye</td>
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</table>
The complex geological structure of the Novoportovskoye field

90% of recoverable reserves are located in five strata

- PK₁
- KhM₁
- KhM₃
- TP₀
- TP₁-₄
- BYa₂₂
- BYa₂₃
- BYa₂₄
- NP₁
- NP₂-₃
- NP₄
- NP₅₁
- NP₆²
- NP₇
- NP₈
- Yu₁₂-₆
- Yu₁₁¹
- Yu₁₁²
- Yu₁₁³
The Novoportovskoye field – winter 2012
Oil, gas and condensate transportation options

- **Oil**
  - Pipeline to **Cape Kamenny** sea terminal and then on to **Murmansk** by sea transport
  - Pipeline to **Sabetta** sea terminal and then by sea transport to **Murmansk** for commercialisation
  - Pipeline to **Kharasavey** sea terminal and then by sea transport to **Murmansk** for commercialisation
  - Pipeline to sea terminal near **Baydaratskaya CS** and then by sea transport to **Murmansk** for commercialisation
  - Pipeline to **Usa OPS** for commercialisation
  - Pipeline to **Krasnoleninskaya OPS** for commercialisation
  - Pipeline to **Purpe OPS** for commercialisation
  - Pipeline to **Payuta rail station** and then by existing rail line Obskaya–Bovanenkovo for commercialisation
  - Pipeline to **Payuta rail station**, and then by rail line Obskaya–Bovanenkovo to **Kharasavey station**, then by sea transport to **Murmansk** for commercialisation
  - Rail transport to **Payuta station** and then by Obskaya–Bovanenkovo rail line for commercialisation
  - Integrated option – Cape Kamenny sea terminal and pipeline to Payuta rail station

- **Gas**
  - Pipeline to **Baydaratskaya CS**
  - Pipeline to **Nydinskaya CS**
  - Pipeline to **Yamburgskaya CS** crossing Gulf of Ob near Cape Kamenny
  - Pipeline to **Yamburgskaya CS** crossing Gulf of Ob near pos. Novy Port

- **Condensate**
  - Integrated transportation of condensate and oil for commercialisation
  - Transportation by existing pipeline (219) to Cape Kamenny with construction of oil shipment terminal
  - Pipeline to **Cape Kamenny** with construction of oil shipment terminal
Pilot voyage of the Vaygach icebreaker

Objectives

- Check navigability of the Gulf of Ob during challenging ice conditions
- Confirm possibility of transporting oil from the Novoportovskoye field by sea

Climatic conditions of the Gulf of Ob

- −25°C February: absolute lowest −56°C
- Ice depth: Up to 2.35 m
- Ice-free navigation: approx. 85 days per year

Outcomes

- Goal achieved – the ice-breaker successfully traversed the challenging ice conditions of the Gulf of Ob*
- Possibility of organising oil transportation via the Gulf of Ob confirmed
- Specialists from the Krylov Shipbuilding Institute invited to take part in the voyage. Objectives: to research ice conditions in the Gulf of Ob
- First positive experience of working with Atomflot confirmed

* Pilot voyage undertaken in 2011

Baydaratskaya Bay
Yamal Peninsula
Novoportovskoye field
Cape Kamenny
Port Sabetta

~ 400 km

~ 400 km

Gazprom Neft | 6
First oil shipments by road – winter 2013

Transportation by rail to the Enisey refinery

More than 10,000 tonnes shipped during this period
The Novoportovskoye field – winter 2013
Infrastructure solutions during pilot development

Following treatment at the CGP oil is transported via pressure pipeline to the CODAP at Cape Kamenny.

Oil is transported by ice-class tankers via the Northern Sea Route to countries in North-West Europe.

Central Gathering Plant (CGP)

Well clusters

Temporary transportation system

Crude oil delivery and acceptance point (CODAP)

Pressure pipeline

Gulf of Ob
Pro tem summer oil shipments – 2014

First oil shipment (2014): 101,000 tonnes

Second oil shipment (2015): 180,000 tonnes
Photo reportage – summer oil shipments, 2014
Transportation to countries in North–West Europe

Icebreaker support from FGUP Atomflot

Total oil shipped (2015): 112,000 tonnes
Photo reportage – winter oil shipments, 2015
Layout of production facilities at the Novoportovskoye oil and gas condensate field under full production

- Arctic terminal
- Oil pipeline
- Gas pipeline
- Gulf of Ob
- Cape Kamenny
- Muravlenko
- Noyabrsk
- P. Novy Port
- Yamal Peninsula
- CGP
- CS with GTP
- PBS with PWSU
- Phase 1
  - 219 mm-diameter oil pipeline
  - 110 kW HV line
  - 12 clusters/289 wells
- Phase 1 + Phase 2 + Phase 3
- Gas Phase
- 110 kW HV line
- 6 tankers
- CODAP
- Yamburg CS
- Phase 1
Year-round Arctic loading terminal

Tower-type Arctic loading terminal (ALT)

- Loading capacity up to 40,000 tonnes per day
- Winter temperatures as low as -50°C
- Ice depth up to 2.5 metres. Fresh water

Onshore oil pipeline
- Total length 3.1 km
- Diameter 720 mm

Underwater oil pipeline
- Total length 7.6 km
- Diameter 720 mm

2016: Test oil offloading

July 2016: Specialist tankers ready
Photo reportage – installation of the Arctic terminal, September 2015
Tanker fleet and icebreaking support vessels

**Tanker fleet**

- **Tanker type:** Arctic Shuttle Tanker
- **RMRS class:** Arc 7
- **Deadweight:** 42,000 tonnes
- **Maximum draught:** 9.5 metres
- **Main-engine capacity:** 2x11000 kW

**Icebreaking support vessels**

- **Designer/developer:** Aker Arctic
- **Ice class:** Icebreaker8
- **Navigation area:** unlimited
- **Maximum draught:** up to 8 metres
- **Main-engine capacity:** at least 22 MW
Oil transportation

Oil is transported from the field via a 105-km pressure-pipeline to a CGP near Cape Kamenny and then shipped by tanker from the CODAP.

Murmansk identified as the optimum point for intermediate transhipments under transportation by standard bulk-fleet due to tankers not being impacted by ice, customs clearance taking place at the accruing port, and the high draft at the port.

The length of the route from Cape Kamenny to Murmansk totals approximately 2,500 km, with tankers completing round-trips in two and a half weeks.

Transportation by specially equipped tankers with a deadweight of up to 40,000 tonnes

Icebreaker support from FGUP Atomflot

Oil transported to ports in Western Europe from Murmansk
Oil production over the course of the project

<table>
<thead>
<tr>
<th>Year</th>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>Well drilling begins</td>
</tr>
<tr>
<td>Aug 2012</td>
<td>First fracking on the Yamal Peninsula</td>
</tr>
<tr>
<td>May 2012</td>
<td>Field moves into pilot production</td>
</tr>
<tr>
<td>2013</td>
<td>Endorsement of field development plan</td>
</tr>
<tr>
<td>May 2013</td>
<td>First winter-road shipments completed</td>
</tr>
<tr>
<td>2014</td>
<td>Export duty concessions secured</td>
</tr>
<tr>
<td>Aug 2014</td>
<td>First summer sea shipments initiated</td>
</tr>
<tr>
<td>2015</td>
<td>First winter sea shipments completed</td>
</tr>
<tr>
<td>May 2015</td>
<td>Year-round oil shipments initiated</td>
</tr>
<tr>
<td>2016</td>
<td>Full testing of ALT begins</td>
</tr>
<tr>
<td>May 2016</td>
<td>Full testing of oil pipeline initiated</td>
</tr>
<tr>
<td>June 2016</td>
<td>Year-round oil shipments initiated</td>
</tr>
<tr>
<td>2017</td>
<td>Independent power generation begins</td>
</tr>
<tr>
<td>July 2017</td>
<td>Full testing of CGP initiated</td>
</tr>
<tr>
<td>Aug 2017</td>
<td>Gas injection (gas flooding) initiated</td>
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<tr>
<td>Aug 2018</td>
<td>Phase I handed over to Production Directorate</td>
</tr>
<tr>
<td>2019</td>
<td>Gas injection (gas flooding) initiated</td>
</tr>
</tbody>
</table>

## Oil production, t/d

<table>
<thead>
<tr>
<th>Year</th>
<th>Production</th>
</tr>
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<tbody>
<tr>
<td>Dec–12</td>
<td>16 thousand tonnes</td>
</tr>
<tr>
<td>Dec–13</td>
<td>148 thousand tonnes</td>
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<tr>
<td>Dec–14</td>
<td>342 thousand tonnes</td>
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<tr>
<td>Dec–15</td>
<td>2,922 thousand tonnes</td>
</tr>
<tr>
<td>Dec–16</td>
<td>~ 5.5 mn tonnes</td>
</tr>
<tr>
<td>Dec–17</td>
<td>~ 6.5 mn tonnes</td>
</tr>
<tr>
<td>Dec–18</td>
<td>~ 7.4 mn tonnes</td>
</tr>
<tr>
<td>Dec–19</td>
<td>~ 7.4 mn tonnes</td>
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</tbody>
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Restoration of aquatic biological resources

Appropriate restoration of aquatic biological resources – in the order of 20 million muksun (white fish) fry or the equivalent – undertaken throughout the development of the Novoportovskoye oil and gas condensate field.

In 2015 3.6 million muksun fry and 270,000 peled fry (both fish of the salmon family) released into the Ob River and the Ob–Irtysh basin.
Technical and design solutions for environmental protection

### Applying environmentally-friendly technologies in the permafrost conditions and fragile ecosystem of Yamal

- Use of natural-flow horizontal pipeline systems (“GET”)
- Thermo-regulators used
- Overground pipeline laying
- Construction of overland throughways for deer migrations
- Leak-detection systems used
- Skin-effect heat tracing systems used

### Objectives

- Fully test and ensure the load-bearing capacity of building and equipment foundations
- Localise the thermal impacts of buildings and facilities to avoid impacting the permafrost
- Significant improvements to pressure-pipeline reliability and safety
- Significant reductions in manmade pipeline impacts on the environment
- Avoid permafrost thaw around well heads
Minimising environmental impacts. Achieving targets – of at least 95% – in associated petroleum gas (APG) utilisation.

Construction of the largest GTPP on the Yamal Peninsula with capacity of 96 MW (scaleable up to 144 MW). Independent generation to commence 2Q2017.

Construction of unique gas compressor station and processing plant for immediate re-injection of APG, with capacity of up to 7.4 bcm/y. Gas re-injection to start 2Q2017.

Drilling and installation of well clusters (3) for APG reinjection.