

EDVARD GRIEG

The Edvard Grieg field was discovered in 2007 and is located in PL338 in block 16/1 in the North Sea, approximately 180 km west of Stavanger



AS OF MARCH 2012, THE PL338
LICENSE GROUP CONSISTS OF:



Lundin Norway AS
(Operator), 50 %



Wintershall Norge AS,
30 %



RWE Dea AS,
20 %

EDVARD GRIEG

PLATFORM & RESERVOIRS

The Edvard Grieg platform – will process and produce stabilized oil and rich gas from the Edvard Grieg deposit which contains the Luno and Tellus discoveries as well as from future satellites from inside PL338 and the surrounding area. The platform is also ready for future supply of electrical power from shore via an AC sea cable.

Stabilized oil will be exported to Sture, thus connecting the 29" outer diameter oil export pipeline from Edvard Grieg to the Grane Oil Pipeline. Rich gas will be exported to the SAGE (Scottish Area Gas Evacuation) system for further processing, or re-injected into the reservoir.

The reservoir fluid – is a moderately undersaturated oil with a low Gas-Oil Ratio. Pressure support is achieved primarily by water injection and supplemented by limited volumes of gas. The oil-water contact is at 1939 m below sea level.

In addition to the Luno discovery, the Tellus discovery was drilled in the first quarter of 2011 and proved a 48 m oil column in pressure communication with the Luno discovery.

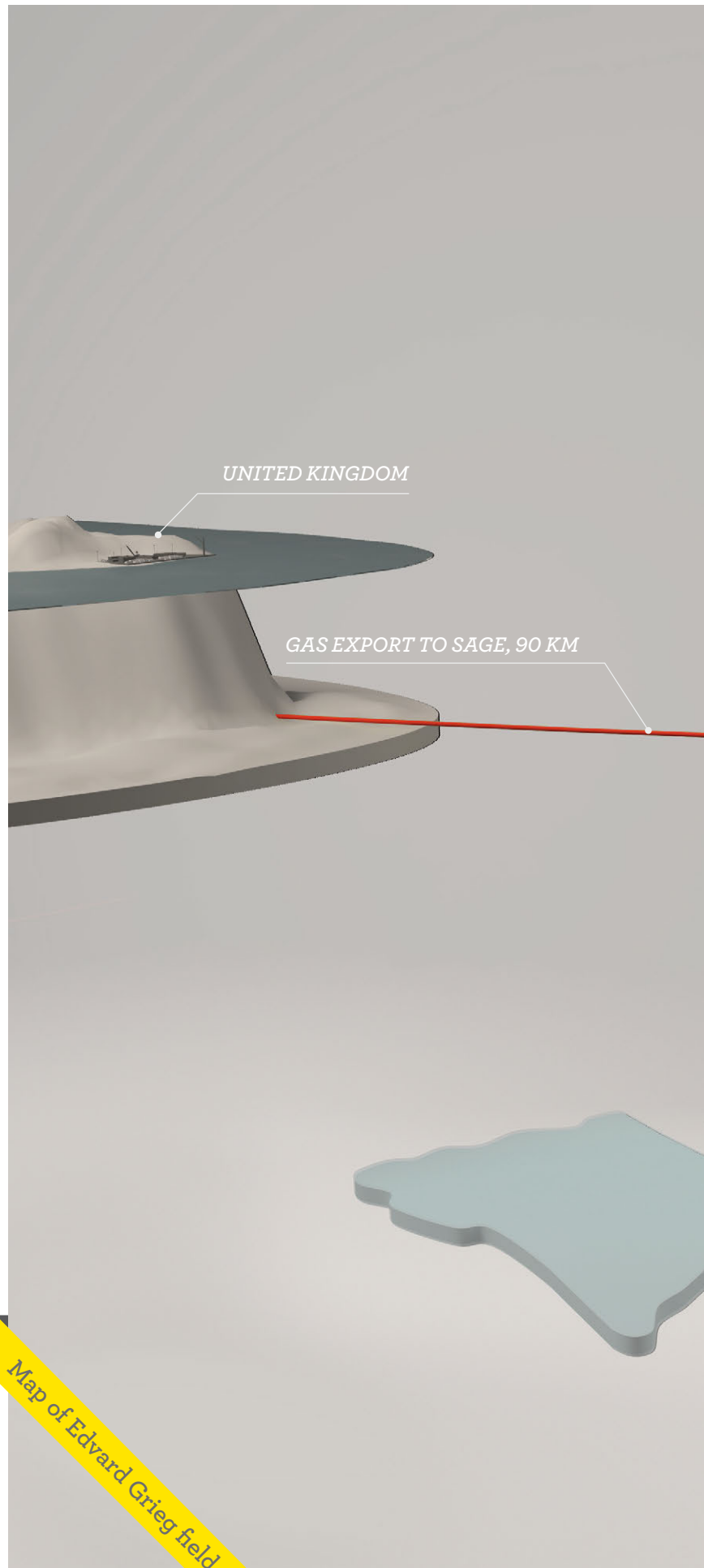
Both reservoirs have highly productive sandstones overlying thick sections of less conventional reservoir types with more uncertain flow potential. Production will start from the central part of the Luno discovery with pressure support from water injectors on the west flank. It is estimated that more than 50% of the oil reserves can be recovered by this initial seven-well development solution, providing a sound economic basis for the project.

Fifteen wells, of which seven are horizontal, are included in the base case. Nine of these oil producing wells will be drilled in the south and two in the north. In addition, four down-dip water injectors will be drilled to maintain reservoir pressure. Gas injection for improved oil recovery (IOR) will be evaluated in due course together with other IOR measures such as low pressure production and multi-lateral wells.

THE GENERAL DESIGN PARAMETERS ARE:

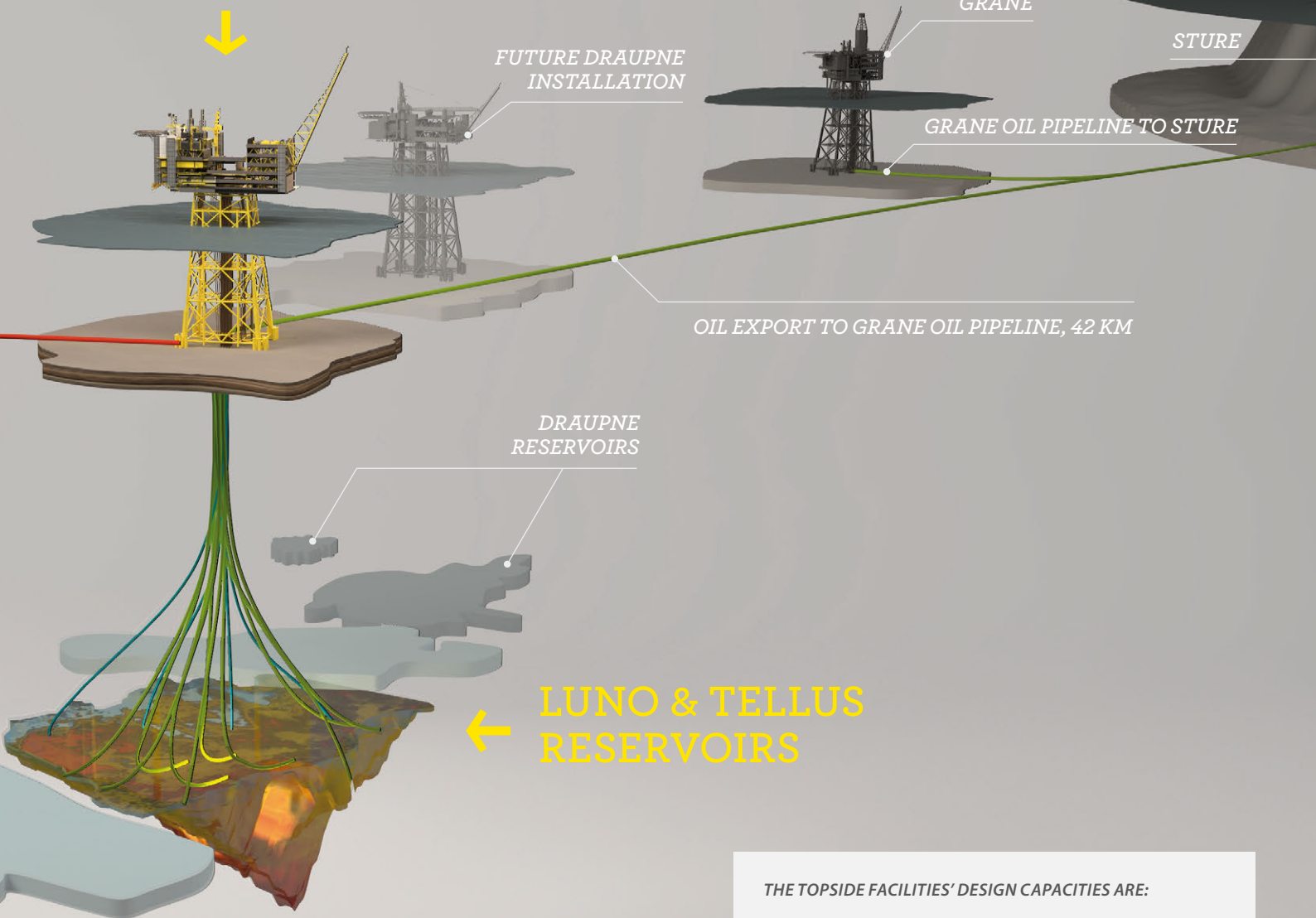
- A design life of 30 years
- Overall regularity of 96% including maintenance
- Water depth of 109 m
- 20 well slots
- Living quarters with 100 single beds and a capacity for 120 people on board

Norwegian regulatory requirements shall govern the development of the Edvard Grieg field. Relevant NORSOK standards and referenced ISO standards shall be used for design



EDVARD GRIEG PLATFORM

NORWAY



THE TOPSIDE FACILITIES' DESIGN CAPACITIES ARE:

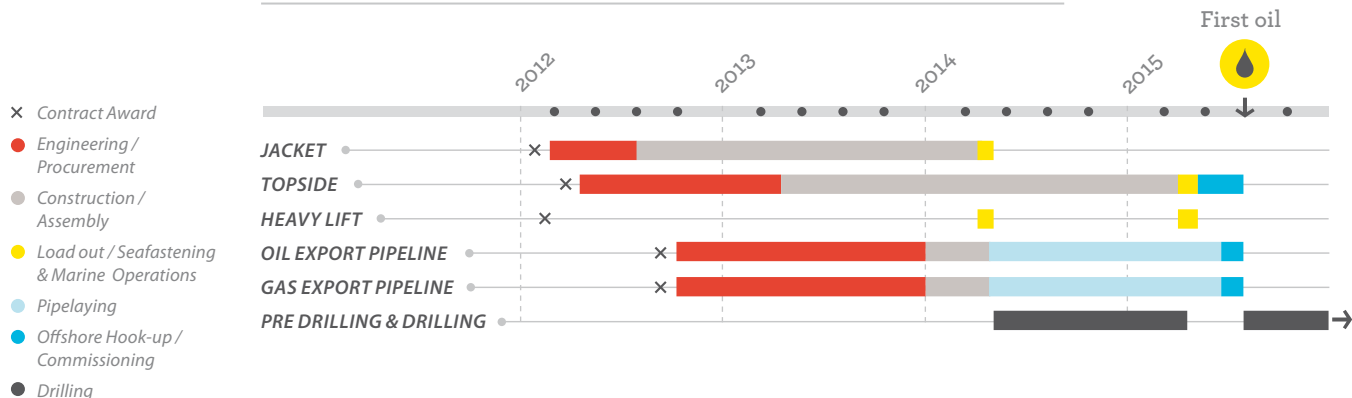
	Units	PL338	PL338 w/tie-in
Max. oil export rate	Sm ³ /sd	14 300	20 000
Max. gas export rate	MSm ³ /sd	2.0	4.0
Water injection capacity	Sm ³ /sd	24 000	Unchanged
Gas processing capacity	MSm ³ /sd	2.5	5.0
Gas lift system capacity	MSm ³ /sd	1.0	2.0
Produced water capacity	Sm ³ /sd	13 000	Unchanged
Total liquids capacity	Sm ³ /sd	28 000	Unchanged
Seawater makeup treatment capacity	Sm ³ /sd	20 000	Unchanged

EDVARD GRIEG PROGRESS

The Edvard Grieg jacket will be installed in May 2014, thereafter a jack-up drilling rig will pre-drill four wells through the pre-drilling deck installed on top of the jacket substructure prior to topside installation. A flotel will be utilized during offshore hook-up and commissioning prior to first oil, which is scheduled for 1st October 2015.

More wells will then be drilled simultaneously alongside production. Gas and oil export pipelines for transfer of saleable products from the Edvard Grieg platform will be installed 2014/2015.

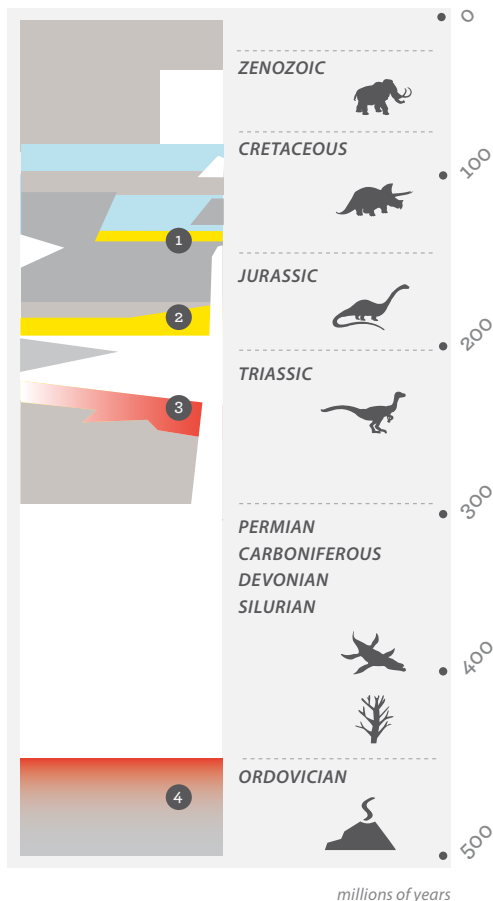
A SIMPLIFIED OVERALL SCHEDULE SHOWING THE MAJOR CONTRACTS AND ACTIVITIES



RESERVOIR ROCKS SPANNING 300 MILLION YEARS

EDVARD GRIEG RESERVOIR LEVELS

- 16/1-13, 16/1-15 & 15 A T2 (Tellus)
- 16/1-8 (Luno)
- 16/1-8, 16/1-10, 16/1-13 (Luno)
- Basement 16/1-15 & 15 A T2 (Tellus)



The Luno and Tellus oil discoveries covers a wide range of reservoirs of different ages and qualities. The different sub-reservoirs represent one discovery of a single accumulation with a common oil-water contact.

The oldest reservoir on the Edvard Grieg field is found in the northern segment – the Tellus area. Well 16/1-15 drilled through a thin sandstone followed by more than 200 m with 440 million year old fractured and weathered basement rock of which almost 50 m is in the oil column.

The main part of the Luno discovery is conglomerates and sandstones deposited during the Triassic period, around 210 million years ago. A 50 m thick Triassic Aeolian sandstone of excellent reservoir quality was encountered in well 16/1-13 in the central part of the Luno basin. More than 50% of the Edvard Grieg reserves are from this sandstone.

The youngest part of the Edvard Grieg field is a shell-rich sandstone deposited in the lower Cretaceous period, around 140 million years ago.

In summary, the reservoir rocks on the Edvard Grieg field spans an age range from 440 to 140 million years, representing a range from porous basement and conglomerates to high quality sandstone with excellent properties.

DRILLING, COMPLETION & WELL INTERVENTION

Drilling Rig

The drilling and completion operations will be carried out by a Rowan Drilling Keppel Fels N-class jack-up rig built in Singapore in 2010/2011. The rig will be located beside the Edvard Grieg platform and then skid the drilling cantilever over the well slots.

Wells

15 wells will be drilled, of which 12 will target the Luno area and three will target the Tellus area

- In the Luno area, nine oil producing wells and three wells that can alternate between gas injectors and water injectors are planned
- In the Tellus area, there will be two oil producers and a single water alternating gas well
- Seven oil producing wells will be drilled horizontally in the reservoir section
- The longest well will be an estimated 5.5 km in length
- In total the 15 wells will require 61 km of drilling

- The completion of the 15 wells is estimated to take 1150 days in total
- The oil production wells are designed for gas lift to increase overall recovery

Simultaneous Operations

The Edvard Grieg platform is designed such that well intervention operations (coiled tubing, wireline work, etc.) can be performed simultaneously while the drilling rig carries out drilling and completion operations.

Reservoirs Formations

There will be four different types of reservoirs drilled:

1. Sandstone
2. Conglomeratic sandstone (being sandstone with integrated granite stones of different sizes)
3. Conglomerate
4. Weathered and fractured basement (Tellus)

Reservoirs Formations



EDVARD GRIEG JACKET & TOPSIDE

Jacket

The Edvard Grieg platform substructure will consist of a four legged launch-installed jacket steel structure with a vertical clean face towards platform south to allow access for a jack-up drilling unit. A pre-drilling deck will be installed on top of the jacket after it has been piled to the seabed.

Topside

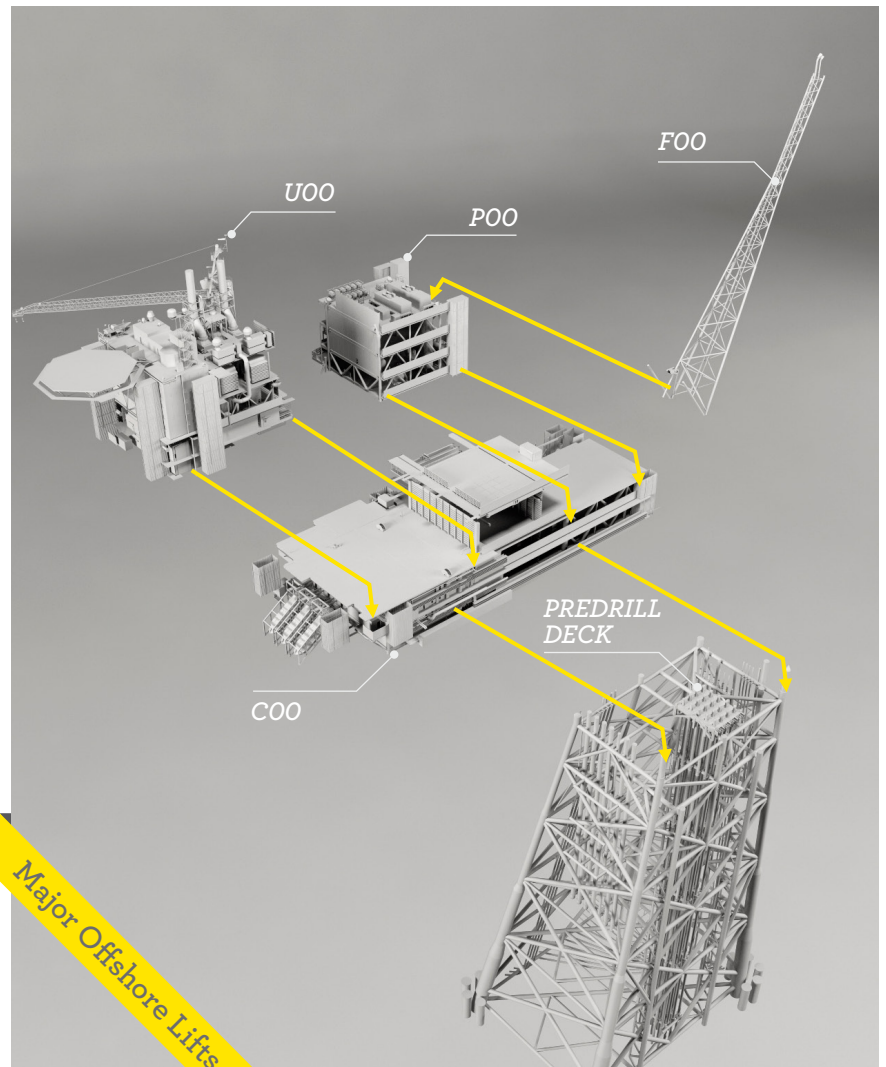
The topside is a modularized processing plant, consisting of a main deck frame with equipment (C00), a process module (P00) with separately installed flare stack (F00) and a utility module with integrated living quarters (U00).

THE MAIN PROPERTIES OF THE JACKET:

Dimensions: 46 x 27.5 m (top), 66 x 50 m (total)
Height: 134 m
Weight: 13 000 tons (dry)
19 500 tons (operation)

THE MAIN PROPERTIES OF THE TOPSIDE:

Dimensions: 90 x 27.5 m (top), 110 x 43 m (total)
Height: 68 m
Weight: 20 800 tons (dry)
24 000 tons (operation)



PROCESS SYSTEM

- Future Riser / J-tubes
- Gas
- Oil
- Water
- 🌀 Cooler
- 🔥 Heater
- 🌀 Pump
- 🔗 Valve

The facilities will be designed with two parallel inlet separators and a test separator with shared downstream trains for oil stabilization and gas treatment. Lift gas required for well production will be taken off downstream from the second stage export compressor.

Normally the produced water will be re-injected into the reservoir after passing through a redundant treatment system consisting of hydrocyclones and degassing drums. This is to ensure a low oil content in the water.

The separation system will be a three stage separation process with an electrostatic coalescer due to energy efficiency and to limit the size of the recycle streams.

