

Revised Gas Lifting and Balancing Agreement

Hydrocarbon Management Workshop 2024

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GLBA: Gas Lifting and Balancing Agreement - Regulatory framework

Joint Operating Agreement – Model Agreement

ATTACHMENT A TO AGREEMENT CONCERNING PETROLEUM ACTIVITIES PURSUANT TO PRODUCTION LICENCE NO **xxx**

ARTICLE 6. THE JOINT ASSETS

- ▲ 6.1 Each Party shall own an ideal share of the capital assets, including rights of any kind which have been acquired or developed by the Operator or by any of the Parties on behalf of the joint venture. This also applies to produced Petroleum which has not been disposed of by any Party.

The size of the ideal share is equal to the Participating interest.

VI. DISPOSAL OF PETROLEUM

ARTICLE 20. LIFTING OF OIL

- 20.1 Each Party has the right and obligation to take in kind and dispose of a share of the produced Oil, which shall be equivalent to his Participating interest.

The property right, and the liability and risk pertaining to the produced Oil, is transferred to the individual Party at a point of delivery which shall be determined by the management committee prior to the commencement of production.

ARTICLE 22. DISPOSAL OF NATURAL GAS

- 22.1 Each Party has the right and obligation to take in kind and dispose of a share of produced Natural Gas which shall be equivalent to its Participating interest.

The property right, and the liability and risk pertaining to the Natural Gas are transferred to the individual Party upon lifting at a delivery point which shall be determined by the management committee prior to commencement of production.

- 22.2 The Parties shall enter into a gas lifting and balancing agreement which is subject to approval by the Ministry prior to the commencement of production. For adoption of the gas lifting and balancing agreement, a unanimous vote by the management committee is required.

- No formal requirements to the GLBA other than to be approved by Ministry
 - Thereof, no formal requirements to the Gas Production Program

GLBA - background

Why do we have “Gas Lifting and Balancing Agreements”?

- **1 Oct 2002:** Transition to company-based sales
 - Equinor press release, 2 Oct 2002:
 - *As a result of the change, buyers can now negotiate with and order gas from any gas owner they wish.*
 - *Opportunities for licensees to produce their share of a field’s reserves have been made more flexible.*

- **1 Jan 2003:** Gassled established
 - Most of the Norwegian gas transport systems in place at the time were combined in a large new joint venture (Gassled).

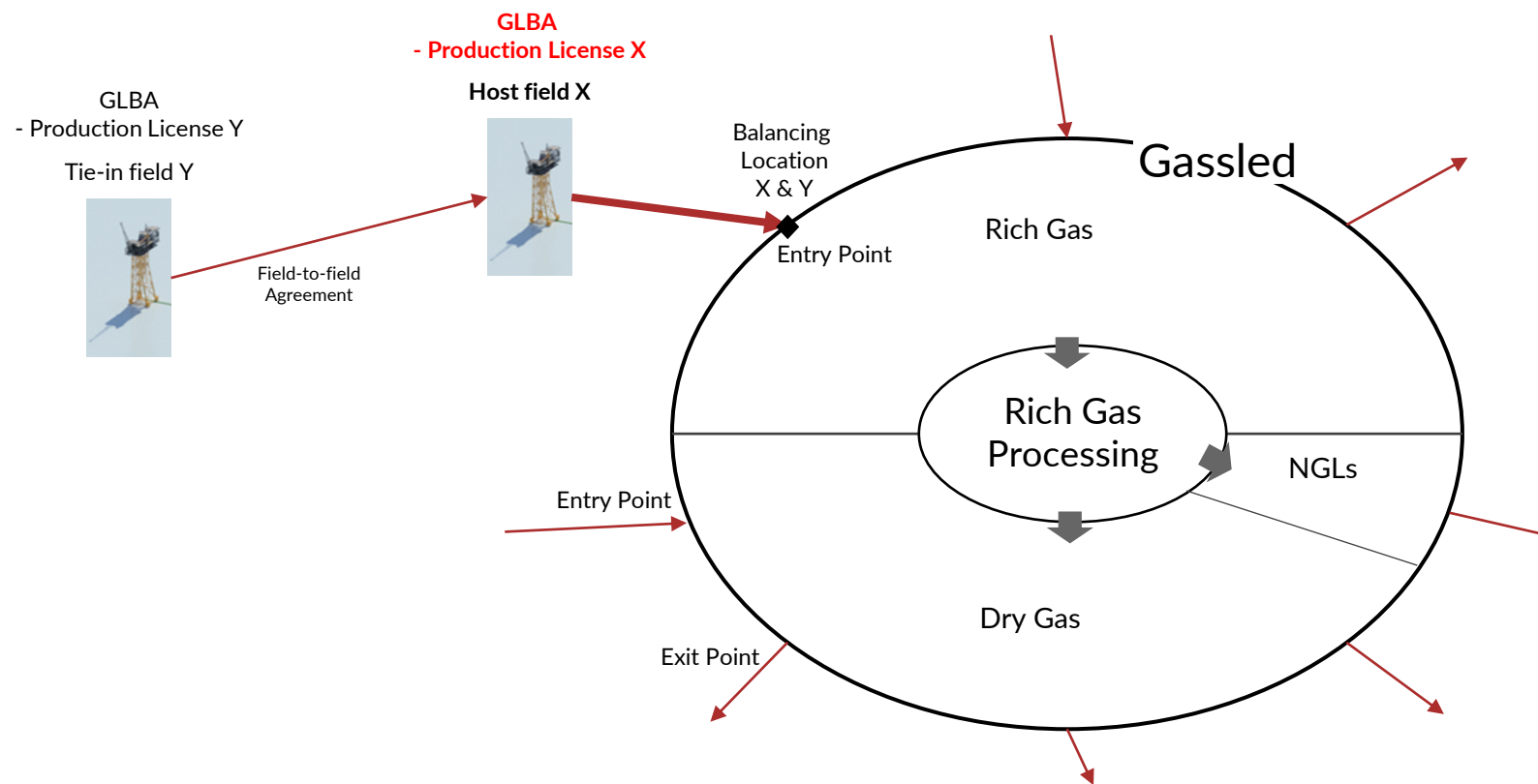
GLBA: «Flex» or «Must Take»?

- Depending on Gas/Oil Ratio (GOR)
 - Dry Gas Fields – with no/limited liquid production -> Flex
 - Rich Gas Fields - with liquid production -> Flex or Must Take?
 - Oil Fields – with associated Gas -> Must Take

- *Based on “sound reservoir management”*
 - *Principle: Should not significantly impact oil production*

- Is production capacity constraint or not?
 - Capacity > Permit
 - Real flexibility
 - Capacity = Permit
 - Flexibility? Only downward flex.
 - Unused capacity is “lost”

GLBA - Context



Production Planning

RNB -> Production Permit -> Production Program

- **Production Permit**
 - Guidelines for production permit applications: «..based on the values for saleable volumes of petroleum reported for the **RNB**..» -> Oil, NGLs and Dry Gas
 - Therefore, production permit given as saleable «Dry Gas» (40MJ/Sm3)=Energy

- **Gas Production Program** (according to GLBA)
 - Shall be «within Permit»

Simplified example:

Year	Unconstrained Production			Capacity		Deferral		Production Permit RNB Profile 1-14			RNB Profile 15			Balancing Location X & Y		
	Host	Tie-in	Hub	Hub	Host	Tie-in	Host	Tie-in	Hub	Host	Tie-in	Hub	Host	Tie-in	Hub	
1	100		100	100			100	0	100				100	0	100	
2	100		100	100			100	0	100				100	0	100	
3	90	30	120	100	-20		70	30	100	20	-20	0	90	10	100	
4	75	20	95	100	5		80	20	100	-5	5	0	75	25	100	
5	50	10	60	100	15		65	10	75	-15	15	0	50	25	75	
6	25		25	100			25	0	25				25	0	25	
	440	60	500		0	0	440	60	500	0	0	0	440	60	500	

RNB Guidelines: Commercial agreements between fields should be reported in RNB-file "Profile 15"

Main updates/clarifications to revised GLBA

1. **“Gas” should include gas, received or delivered, resulting from agreements with tie-in fields**
 - Field to field agreements (as reported in RNB “profile 15”)
 - Gas transferred prior to lifting
 - Gas nominated to Gassco and lifted by the parties to the GLBA must include (net) gas originating from tie-in fields

2. **“Gas” lifted at Balancing Location is Rich Gas** (assuming a rich gas field)
 - Rich Gas export from Balancing Area according to measurement and allocation by field operator
 - Parties share of Rich Gas export is based on Dry Gas nominations to Gassco

3. **Clarification regarding Operator data vs. Gassco data**
 - Gas Export from Balancing Area is based on Operator data
 - Parties share of Gas lifted from Balancing Area is based on Gassco data
 - «Rich Gas Requirement» according to Gassco Operations Manual, Art. 2.4-2.5

GLBA (flex) - Rights and Obligations

Yearly

- Operator
 - Establish Gas Production Program
 - Based on sound reservoir management
 - Only link to oil production
 - Max production within Permit
 - Defines parties Annual Lifting Entitlement (ALE)
 - Estimated daily min production
 - Calculate Adjusted Lifting Interest (ALI)
- Parties
 - Shall nominate/lift within ALE

Daily / (Weekly)

- Operator
 - Issue Weekly Availability Forecast (WAF) (max/min)
 - Based on sound reservoir management
 - Production within Permit
 - Inform parties if
 1. exceeding ALE, or
 2. not able to meet Min nomination
- Parties
 - Nominate within daily Max/Min
 - Subject to:
 1. not exceeding ALE, and
 2. not able to meet Min nomination
- Consequences (loss of entitlement):
 - Daily Nom < Min: **Deemed lifted (Shortfall)**
 - Cum. Underlift < Underlift Cap: **Reserve Loss**

Gas Lifting at Balancing Location – Main Principles

Daily Gas Export at Balancing Location (Entry Point Gassled)

- As allocated by Operator (Mass and composition)
- Based on metered export
- Calculated in energy

Gassco Imbalances

- Comprise all differences, temporary or permanent, between daily Gas Export and Gas Delivery Requirement
- Allocated according to Unit/Lifting Interest

Gas Delivery Requirement to be delivered to Balancing Location

- Gas needed to meet Daily Nominations as calculated by Gassco
- Calculated in energy

Gas Lifting Accounts:				
Party	Lifting Interest	Gas Delivery Requirement	Gassco Imbalances	Gas Export
A	40 %	12.0	3.2	15.2
B	60 %	20.0	4.8	24.8
Total	100 %	32.0	8.0	40.0
Gas Delivery Requirement based on Daily Nominations				
Gas Export at Balancing Location				
Gassco Imbalances by-difference				
Gassco Imbalances allocated based on Lifting Interest				
Party's Gas Export at Balancing Location				

Gassled Terms and Conditions – App. A, Operations Manual:

6. "Gas Delivery Requirement" shall mean the actual quantities of Gas to be delivered from the Shipper's Field in order to meet the Shipper's nominations. The Shipper's Gas Delivery Requirement shall be calculated according to articles 2.4 and 2.5.

2.4 Shipper's Gas Delivery Requirement in Area A, Area B and in Area E

The Gas Delivery Requirement into Area A shall be the Gas Delivery Requirement at the Area D Entry Point D1 (Kårstø) according to article 2.5 multiplied with the Area C rich gas factor for the respective Field(s) and/or the Gas Delivery Requirement at the Area A Exit Point A2 and/or Area A Exit Point A3.

Operations Manual

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The Gas Delivery Requirement into Area B shall be the Gas Delivery Requirement at the Area D Entry Point D1 (Kårstø) according to article 2.5 multiplied with the Area C rich gas factor for the respective Field(s) and/or the Gas Delivery Requirement at Exit Point B2.

2.5 Shipper's Gas Delivery Requirement in Area D

The Gas Delivery Requirement at the Area D Entry Point(s) shall be the Shipper's Daily Nominations at the Area D Exit Point(s) adjusted for;

- any part of Fuel Gas allocated to the Shipper in Area D,
- any part of the difference between the total sum of Gas metered at the Area D Entry Point(s) adjusted for the calculated change in Gas inventory in Area D, and the total sum metered at the Exit Point(s) including Area D Fuel Gas.

Balancing - Adjusted Lifting Interest (ALI) formula

Simplified ALI-formula:

$$ALI_A = LI_A + \frac{PU_A}{EUR * CP - CGE}$$

➤ $ALI_A\% = LI_A\% + \text{Party A's Underlift in \% of remaining reserves}$

Example:

- Lifting Interest: $LI_A = 40\%$
- Underlift: $PU_A = 1$
- "Remaining Reserves" $EUR * CP - CGE = 100$
- Adj. Lifting Interest $ALI_A = 41\%$

Where:

- ALI_A = Party A's Adjusted Lifting Interest
- LI_A = Party A's Lifting Interest
- PU_A = Party A's Underlift (or Overlift)
- EUR = Estimated Ultimate Recovery
- CP = Convergence Point percentage (typically 95%)
- CGE = Cumulative Gas Export

Flex period - Lifting according to Lifting Interest
 Balancing Point: Export has reached 60% of EUR
 Balancing period - Lifting according to Adjusted Lifting Interest
 Must Take Point: Export has reached 80% of EUR
 Must Take period - Lifting according to Adjusted Lifting Interest before CP and Lifting Interest after CP

This %-points should be assessed/reviewed based on field specific reservoir management

Summary

- GLBA should include all Gas to be lifted by the parties
 - Gas lifted is Rich Gas (assuming a Rich Gas field)
 - Agree to use Gassco data to determine parties lifting
 - Formulas can be simplified
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- Goal – revised GLBA:
 - A more transparent GLBA
 - Easier to use the commercial opportunities given by the GLBA
 - Better foundation for further development of GLBA

Supplementary slides

Deemed lifted / Shortfall

- Nomination of Gas below daily minimum:
 - Could potentially harm gas and liquid production and reserves
 - Penalty to a Party for nominating Gas below minimum (Deemed lifted -> Shortfall)
 - Such Shortfall penalty is
 - independent of any actual impact on reserves and production, and
 - independent on whether the gas is produced and exported at the Balancing Location or not
 - A Shortfall penalty results in a loss of entitlement to Gas to the Party incurring a Shortfall
 - Shortfall is redistributed to all Parties, including the Party incurring the loss, according to their respective Unit Interest

Calculating a Party's share of Shortfall (SF_A):

$$SF = \text{Max} [0; \text{DMOQ} - \text{TDN}]$$

$$DL_A = \text{Max} [0; \text{DMOQ}_A - \text{IDN}_A]$$

$$DL = \sum DL_i$$

$$SF_A = (DL_A / DL) * SF$$

Where:

- DL_A = Party A's Deemed Lifted Gas
- DL = Sum Deemed Lifted Gas
- SF = Shortfall
- SF_A = Party A's share of Shortfall
- DMOQ = Daily Minimum Offtake Quantity
- IDN/TDN = Individual/Total Daily Nomination

The Shortfall penalty imposed on the Parties lifting below their Daily Minimum Offtake Quantity (reduced entitlement) shall be redistributed to all Parties according to their Lifting Interest (increased entitlement).

Party A's Redistributed Shortfall: $RSF_A = -SF * LI_A$
 Party A's Net Shortfall: $NSF_A = SF_A + RSF_A$
 All Parties Net Shortfall: $NSF = 0$

1)	$SF = \text{Max} [0; \text{DMOQ} - \text{TDN}]$					
2)	$DL_A = \text{Max} [0; \text{DMOQ}_A - \text{IDN}_A]$				1)	2) & 3)
3)	$DL = \sum_{i=1}^n DL_i$	Party	DMOQ	IDN/TDN	SF	DL _i
		A	50	38		12
		B	50	52		0
4)	$SF_A = \frac{DL_A}{DL} * SF$	Total	100	90	10	12
						10

Reserve Loss

- Lifting of Gas below yearly Underlift Cap:
 - Could potentially harm Gas production and reserves
 - Penalty to a Party for lifting Gas below Underlift Cap (Reserve Loss)
 - Such Reserve Loss penalty is
 - independent of any actual impact on reserves and production, and
 - independent on whether the gas is produced and exported at the Balancing Location or not
 - A Reserve Loss penalty results in a loss of entitlement to Gas to a Party incurring a Reserve Loss
 - Reserve Loss is redistributed to all Parties, including the Party incurring the loss, according to their respective Unit Interest

Underlift Cap:

$$PUC_A = (EUR * LI_A - CGE_A) * UL * (1 - LI_A)$$

Where:

PUC _A	=	Party A's Underlift Cap, 30 September in Calendar Year Y-1
EUR	=	Estimated Ultimate Recovery
CGE _A	=	Party A's Cumulative Gas Export from production start up to and including 30 September in Calendar Year Y-1
LI _A	=	Party A's Lifting Interest
UL	=	Underlift limit equal to 10 per cent

Adjusted Underlift:

$$PAU_A = CGE * LI_A - CGE_A - CSF_A - CRL_A$$

Where:

PAU _A	=	Party A's Adjusted Underlift, 30 September in Calendar Year Y-1
CGE	=	Cumulative Gas Export from production start up to and including 30 September in Calendar Year Y-1
CSF _A	=	Party A's cumulative Shortfall quantity up to and including 30 September in Calendar Year Y-1
CRL _A	=	Party A's cumulative Reserve Loss up to and including 30 September in Calendar Year Y-1 (For the sake of clarity: To calculate a Party's Reserve Loss on 30 September Y-1, CRL will be from 30 September Y-2. From October Y-1, the CRL will include RL on 30 September Y-1)

If PAU_A is negative, then Party A has an Overlift. Sum of all Parties Overlift and Underlift shall be zero.

$$RL_A = \text{Max} [0 ; PAU_A - PUC_A]$$

$$RL = \sum RL_i$$

Where:

RL _A	=	Party A's Reserve Loss for Year Y-1
RL	=	Total Reserve Loss

Party A's Redistributed Reserve Loss:

$$RRL_A = - RL * LI_A$$

Party A's Net Reserve Loss:

$$NRL_A = RL_A + RRL_A$$

All Parties Net Reserve Loss:

$$NRL = 0$$

Revised Reserve Loss:

Cap:

Do not include adjustment for Deemed lifted/Shortfall in Cap because it could lead to a "double counting" of Shortfall, first a reduction in entitlement as Shortfall and then again as a reduction in entitlement as Reserve Loss.

Adjusted Underlift:

Only include in Adjusted Underlift "gross" cum. Shortfall and "gross" cum. Reserve Loss. These elements are controlled by each party themselves. "Net" Shortfall and "Net" Reserve Loss could potentially be negative numbers (increasing entitlement and underlift) caused by other parties Shortfall and Reserve Losses and result (theoretically) in a Reserve Loss for a party always lifting maximum.

Underlift Limit:

By simplifying "Underlift Cap" and "Adjusted Underlift" (but still complicated), focus should be on setting correct **Underlift Limit (UL)**.

Overlift and Underlift

– basis for Adjusted Lifting Interest and balancing

A Party's entitlement to Cumulative Gas Export (CGE) is always the sum of:

	Party A's Cumulative Gas Export:	CGE_A
+	Party A's Overlift/Underlift:	PU_A
+	Party A's cumulative Net Shortfall:	$CNSF_A$
+	Party A's cumulative Net Reserve Loss:	$CNRL_A$
=	Party A's entitlement to Cum. Gas Export:	$CGE * LI_A$

Therefore, a Party's Overlift or Underlift is always: $PU_A = CGE * LI_A - CGE_A - CNSF_A - CNRL_A$

IF $PU_A > 0$, then Underlift.

IF $PU_A < 0$, then Overlift.

And:

$$LI_A = (CGE_A + PU_A + CNSF_A + CNRL_A) / CGE$$

Where:

Net Shortfall: A party's net "Deemed lifted" quantity

Net Reserve Loss: A party's net Reserve Loss quantity

Balancing - Adjusted Lifting Interest (ALI) formula

Old ALI-formula:

~~$$ALI_A = \frac{EURD * CP * LI_A - CGE_A - CSF_A - CNRL_A}{EURD * CP - CGE - CSF}$$~~

ALI: Adjusted Lifted Interest
 EURD: Estimated Ultimate Recovery, plus Deemed Lifted quantity (Shortfall)
 CGE: Cum. Gas Export
 CSF: Cum. Shortfall
 CNRL: Cum. Net Reserve Loss
 CP: Convergence Point percentage (typically 95%)

New ALI-formula:

$$ALI_A = \frac{(EUR * CP * LI_A - CGE_A) - CNSF_A - CNRL_A}{EUR * CP - CGE} = LI_A + \frac{PU_A}{EUR * CP - CGE}$$

EUR: Estimated Ultimate Recovery
 CNSF: Cum. Net Shortfall

- Only one minor adjustment from old formula, removed CP multiplier from DL*CP

➤ **ALI% = LI% + party's Underlift in % of remaining reserves**

➤ Example:

- $LI_A = 40%$, $PU_A = 1$, $EUR * CP - CGE = 100$ ("remaining reserves")
- $ALI_A = 41%$

Calculation:

$$ALI_A = [PU_A / (EUR * CP - CGE)] + LI_A$$

$$PU_A = CGE * LI_A - CGE_A - CNSF_A - CNRL_A$$

$$ALI_A = [CGE * LI_A - CGE_A - CNSF_A - CNRL_A / (EUR * CP - CGE)] + LI_A$$

$$ALI_A = [CGE * LI_A - CGE_A - CNSF_A - CNRL_A / (EUR * CP - CGE)] + \{LI_A * (EUR * CP - CGE) / (EUR * CP - CGE)\}$$

$$ALI_A = [CGE * LI_A - CGE_A - CNSF_A - CNRL_A + LI_A * (EUR * CP - CGE)] / (EUR * CP - CGE)$$

$$ALI_A = (-CGE_A - CNSF_A - CNRL_A + LI_A * EUR * CP) / (EUR * CP - CGE)$$

$$ALI_A = [EUR * CP * LI_A - CGE_A - CNSF_A - CNRL_A] / (EUR * CP - CGE)$$

Insert PU in ALI-formula
 Multiply 2nd term with common denominator
 Common denominator

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