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GUIDELINES FOR THE ECONOMIC MODEL RELATED TO THE DANISH PART OF THE OS 2017

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1. Introduction to the guidelines

The economic model in the excel spread sheet is shared as part of this Information Package 1 to provide potential participants in the Danish part of the OS 2017 information about Energinet's current view on the economics of the Danish part of the OS 2017.

These guidelines should be read before using the economic model. The guidelines contain three sections. The first section is a general introduction to the economic model. The second section regards the assumptions in the economic model as well as a description on how to adjust some of the assumptions. Finally, the third section regards the output from the economic model.

The economic model contains a calculation sheet "Costs of Transportation&Tariff", which allows the user to adjust a few assumptions (see section 1.2). Moreover, the sheet illustrates the economic effect on the uniform tariff simulations.

This model replaces the previously shared model released in November 2016, which no longer represents the best view of Energinet.

Several adjustments have been made to provide a more precise picture of the economics since the release of the last model, e.g. updated interest rates, 2017 set as base year and updated capacity bookings. These adjustments have been made to improve the precision of the economic model.

The calculations are solely based on costs related to potential Danish assets in the Baltic Pipe Project:

1. "Norwegian Tie-in"
2. "Expansion of the Danish Transmission System"
3. "CS Zealand"

It is expected that the costs of bullet points 1 and 2 will be included in the Danish cost base. Related to bullet point 3, it is expected that Energinet covers:

- 36 per cent of CAPEX up to 140 MEUR and all CAPEX above 140 MEUR (if any)
- 50 per cent of the fixed OPEX
- Variable OPEX related to flow above 7.5 BCM per calendar year
- If the sum of 50 per cent of fixed- plus variable OPEX related to a flow of 7.5 BCM or below exceeds 10 MEUR/year or 12 MEUR/year, depending on whether CS Zealand is connected to the transmission- or distribution grid respectively, Energinet covers the excessive amount. 30 per cent of the said limit (10 MEUR or 12 MEUR) is adjusted for change in electricity price in price area DK2 over time.

In this information package it is assumed that CS Zealand is connected to the distribution grid, i.e. a cap of 12 MEUR/year is assumed.

The economic model includes entry- and exit capacity bookings and volume throughput for the 0-reference and for the potential Danish part of the Baltic Pipe Project route.

2. Assumption selection in the "Costs of Transportation calculation"-sheet

The calculation sheet ("Costs of Transportation calculation") in the economic model contains several assumptions located at the top of the sheet. Some assumptions are marked in black and cannot be changed, while others are marked in red and can be changed from the Scenario A assumptions.

The different assumptions are described in the sections below.

2.1 Asset assumptions

In the asset assumptions, the cells B6:B8 represent assumptions related to the maximum capacity of the assets (10 BCM). Cell D7 contains the assumed size of the Offshore Interconnector, which affects the OPEX of CS Zealand. Cell F8 indicates the assumed tie-in solution to Norway. None of these parameters can be changed.

Cell G7 shows the assumptions related to the electricity price of CS Zealand. The cost of electricity is essential, since CS Zealand has high energy consumption. It is possible to adjust this assumption and choose between:

1. "Spot price (raw energy price)" – cost of electricity without any taxes, VAT, etc.
2. "Electricity price w/o VAT" – cost of electricity without costs related to VAT and the part of electricity levy which is deductible
3. "Electricity price w/o PSO and VAT" – Same cost as "2.", but without costs related to PSO. Energinet regard this as the basic setting for the economic calculation

Changing the assumption of electricity price solely affects the OPEX related to CS Zealand.

In the area L6:L8, the depreciation period of each asset is set. For all assets, a linear depreciation profile is assumed in this version of the model. For all Energinet scenarios, the depreciation period is assumed to be 30 years. It is possible to change the depreciation period for the potential Danish assets.

With regard to the assets in the Danish part of the Baltic Pipe Project, it is assumed for all Energinet scenarios, that "Expansion of the Danish transmission system", "CS Zealand" and "Norwegian Tie-In" is included in the Danish cost base, as shown in the area P6:P8

Figure 1 Asset assumptions

Asset assumptions						
		Build capacity	Diameter		Solution	Electricity price
Expansion of the Danish Transmission System		10 *bcm/y*				
CS Zealand		10 *bcm/y*				Electricity price w/o PSO and VAT
Norwegian Tie-In		10 *bcm/y*			EP II - Pipeline to Nybro	
CAPEX	OPEX	Economic life	# of quarters start year	f quarters end year	In DK cost base	
310 *MEUR*	3,10 *MEUR/y*	30 *Years*	1	3	OPEX+CAPEX	
50 *MEUR*	*Based on "Input OPEX-CAPEX"-sh*	30 *Years*	1	3	OPEX+CAPEX	
371 *MEUR*	*Based on "Input OPEX-CAPEX"-sh*	30 *Years*	1	3	OPEX+CAPEX	

2.2 Construction assumptions

This section, C12:H14, regards the assumptions related to the construction phase for the three potential Danish assets. By changing the assumption, the distribution of CAPEX over the construction period is changed, which will influence the "Interest construction" cost. The interests incurred during the construction phase are added to the total asset value and depreciated over the lifetime of the asset.

It is possible to change the assumption on distribution of CAPEX over the construction phase, but please note that the sum of the percentages for each asset should equal 100 per cent.

Figure 2 Construction assumptions

Construction assumptions							
% of construction	Constructic	2017	2018	2019	2020	2021	2022
Expantion of the Danish Transmission System	2022	1%	4%	10%	32%	38%	15%
CS Zealand	2022	3%	1%	18%	32%	31%	15%
Norwegian Tie-In	2022	3%	3%	17%	45%	32%	0%

2.3 Abandonment assumptions

This section, K12:K14, shows the current estimate of the future abandonment cost for each asset. Provision to the abandonment cost is assumed to be collected during the asset lifetime.

Figure 3 Abandonment assumptions

Abandonment assumptions		
	2017 value of ABEX (MEUR)	Abandonment start
Expantion of the Danish Transmission System	40	2052
CS Zealand	3	2052
Norwegian Tie-In	25	2052

2.4 Danish Open Season 2017 Capacity Agreements and volume

In this section, the assumptions of duration of Danish OS 2017 Capacity Agreements capacity booking and the volume is set to 15 years, for all Energinet scenarios. These assumptions cannot be changed.

Figure 4 Open Season 2017 Capacity Agreements

Danish Open Season 2017 Capacity Agreements and volume		
	Start year	Period
Volume (Utilisation)	2022	15 *Years*
Capacity booking	2022	15 *Years*
# of quarters 1st year	# of quarter	1

2.5 Throughput after Danish OS 2017 Capacity Agreements

This section, H18:H19, regards the assumptions related to number of years with volume and capacity bookings after the end of the Danish OS 2017 Capacity Agreements. The assumption for all Energinet scenarios is that volume and capacity bookings will last 15 years after the Danish OS 2017 Capacity Agreements. It is possible to adjust the number of years with volume and capacity bookings.

Figure 5 Throughput after contract life assumptions

Throughput after Danish OS 2017 Capacity Agreements			
	Start year	Period	# quarters first year
Volume (Utilisation)	2037	15 Years	1
Capacity booking	2037	15 Years	

2.6 Load factor

In the cell M17, the assumed load factor is shown. This load factor is applicable for the whole period, i.e. the period during the capacity bookings in the Danish OS 2017 Capacity Agreements and the following period. It is not possible to adjust the load factor.

Figure 6 Load factor

Load factor	
Expected LF	0.85

2.7 General assumptions

In this section, C23:C25, it is possible to see the discount rate and base year of the model. These parameters do not affect the uniform tariff simulation or the Costs of Transportation calculation.

The economic model in this Information Package assumes 2017 as base year. In the previous economic model, the base year was 2016.

Figure 7 General assumptions

General assumptions	
Discount rate	4%
Base year	2017
DKK:EUR exchange rate	7.46

3. Output

In this section the various outputs of the model are described.

3.1 Cost-base

In this section, lines 34 to 100, the costs related to the Baltic Pipe Project are calculated. The lines "CAPEX, annual", "OPEX, annual" and "Cost base new infrastructure" show the costs related to the Danish part of the OS 2017. Furthermore, the expected cost base of Energinet without the Baltic Pipe Project is presented in "0-ref cost-base". The cost base of Energinet has been updated since the last release of the economic model in November 2016 with a projection of the expected annual OPEX and CAPEX from 2017 onwards.

Figure 8 Cost-base

	Unit	2017	2018
Asset construction (CAPEX)	MEUR	**14**	**22**
Interest construction (CAPEX)	MEUR	**0**	**0**
Asset primo (CAPEX)	MEUR	**0**	**0**
Asset ultimo (CAPEX)	MEUR	**0**	**0**
Depreciation (CAPEX)	MEUR	**0**	**0**
Interest (CAPEX)	MEUR	**0**	**0**
CAPEX, annual	MEUR	**0**	**0**
Expantion of the Danish Transmission System	MEUR	0	0
CS Zealand	MEUR	0	0
Norwegian Tie-In	MEUR	0	0
Operations during OS contracts (OPEX)*	MEUR	**0**	**0**
Operation after OS contracts (OPEX)	MEUR	**0**	**0**
OPEX, annual	MEUR	**0**	**0**
Expantion of the Danish Transmission System	MEUR	0	0
CS Zealand	MEUR	0	0
Norwegian Tie-In	MEUR	0	0
Cost-base new infrastructure, 10 bcm/y	MEUR	**0**	**0**
Expantion of the Danish Transmission System	MEUR	0	0
CS Zealand	MEUR	0	0
Norwegian Tie-In	MEUR	0	0
0-reference cost-base	MEUR	**60**	**60**
OPEX	MEUR	32	32
CAPEX	MEUR	28	28
Total cost	MEUR	**60**	**60**

3.2 Volume

In this section, lines 109-119, the expected volumes are presented. "0-ref volume" relates to the expected volume in the Danish Transmission System without the Baltic Pipe Project. "Scenario A volume during OS 2017 Capacity Agreement (LF 0.85)" relates to the Danish part of the Baltic Pipe Project volume expected during the Open Season 2017 Capacity Agreement period. "Scenario A volume after OS 2017 Capacity Agree-

ment (LF 0.85)" relates to volumes transported after the Open Season 2017 Capacity Agreements end. All volumes are in million MWh.

Figure 9 Volume overview

	Unit
0-reference volume	M MWh
Scenario A volume during OS 2017 Capacity Agreements (LF 0.85)	M MWh
Scenario A volume after OS 2017 Capacity Agreements (LF 0.85)	M MWh
Total volume throughput	M MWh

3.3 Yearly amount based on booked capacity

In this section, lines 127-141, the expected yearly amount of entry and exit capacity bookings of the 0-reference and the Scenario A assumptions are presented. For Scenario A of the Danish part of the Baltic Pipe Project, it is assumed that entry capacity equals exit capacity. The yearly amount is calculated based on average capacity bookings in the unit kWh/h/year. This number is multiplied by 24 hours and 365 days to reach an annual amount instead of a kWh/h/year measure. The calculation is performed in order to calculate a total uniform tariff in EUR pr. MWh transported for the Danish part of the Baltic Pipe Project.

Figure 10 Yearly amount based on booked capacity

Yearly amount based on booked capacity*	
	Unit
0-reference amount of capacity bookings (Entry)	M MWh
0-reference amount of capacity bookings (Exit)	M MWh
Scenario A amount of capacity bookings during OS 2017 Capacity Agreements (LF 0.85)**	M MWh
Scenario A amount of capacity bookings after OS 2017 Capacity Agreements (LF 0.85)**	M MWh
Total amount based on capacity bookings	**M MWh**

*The yearly amount is calculated based on capacity bookings (kWh/h/year)

**For the Danish part of the Baltic Pipe Project it is assumed that Entry capacity = Exit capacity

3.4 Total Costs of Transportation calculation

In this section, lines 149 to line 165, the Costs of Transportation is calculated based on the cost and volume estimates. The "0-ref Costs of Transportation" calculates the expected Costs of Transportation in EUR/MWh related to the 0-reference cost base and 0-reference volume. The "Total Costs of Transportation (Scenario A volume)" relates to the total cost base (0-reference and Baltic Pipe Project) and the total volume transported. The Total Costs of Transportation is calculated for Scenario A, B and C, which is described in the document “Information Package 1: Scenario-based Costs of Transportation and uniform tariff simulations”

Figure 11 Total Costs of Transportation calculation based on volume

	Unit
0-reference Cost of Transportation	EUR/MWh
Total Costs of Transportation (Scenario A volume)	EUR/MWh

3.5 Simulation of the uniform transmission tariff

In this section, lines 169 to 185, the uniform tariff is simulated. The simulation assumes that all costs can be separated on the total volume and capacity booking (i.e. the uni-

form tariff principle). It is assumed that the volume tariff covers all OPEX, while the capacity tariff covers all CAPEX, which is split 50-50 between entry and exit capacity.

Figure 12 Simulation of the uniform transmission tariff

	Unit
0-reference	EUR/MWh
Scenario A assumptions	EUR/MWh
Scenario B assumptions	EUR/MWh
Scenario C assumptions	EUR/MWh