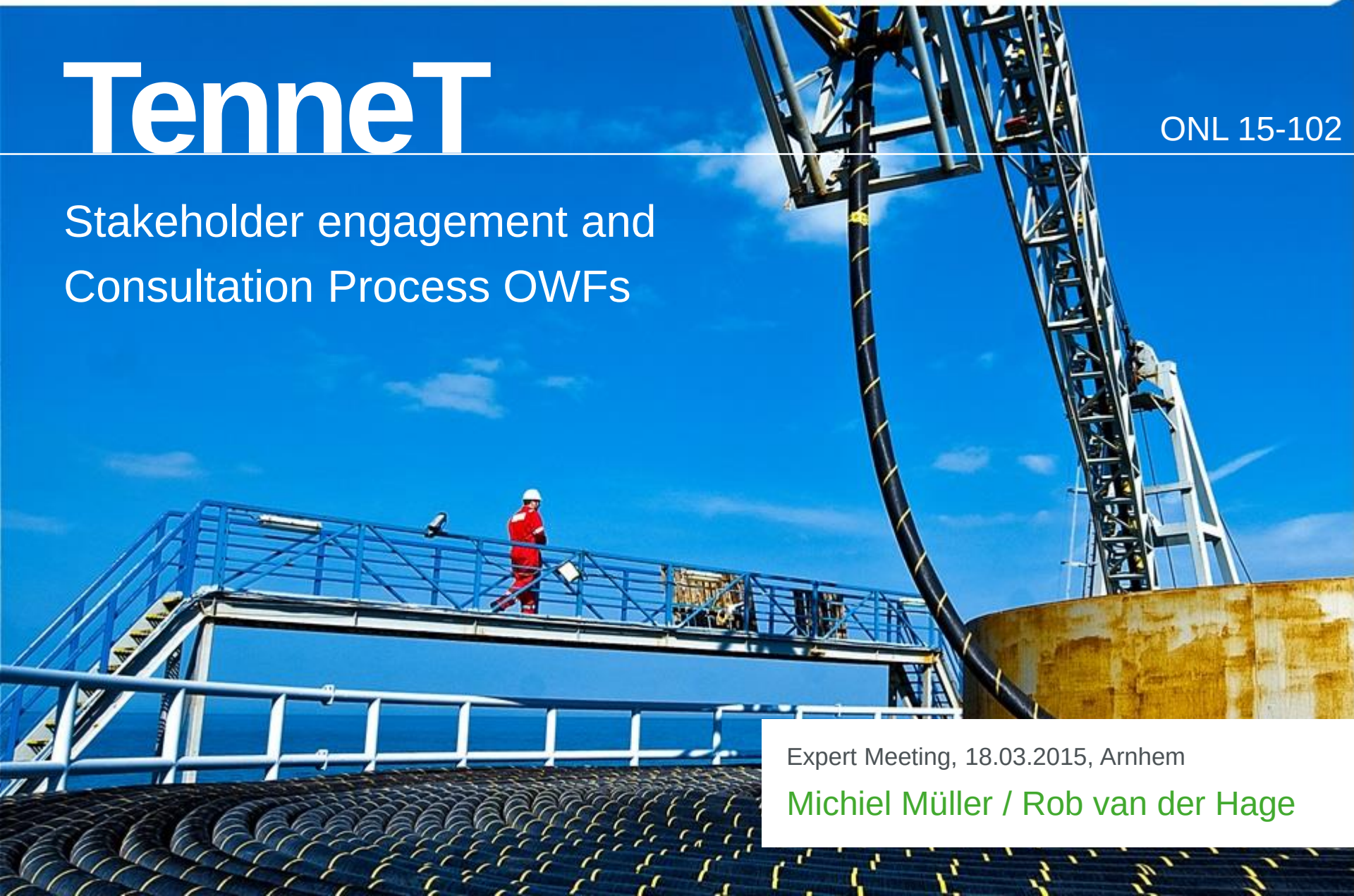
TenneT

ONL 15-102

Stakeholder engagement and Consultation Process OWFs



Expert Meeting, 18.03.2015, Arnhem

Michiel Müller / Rob van der Hage

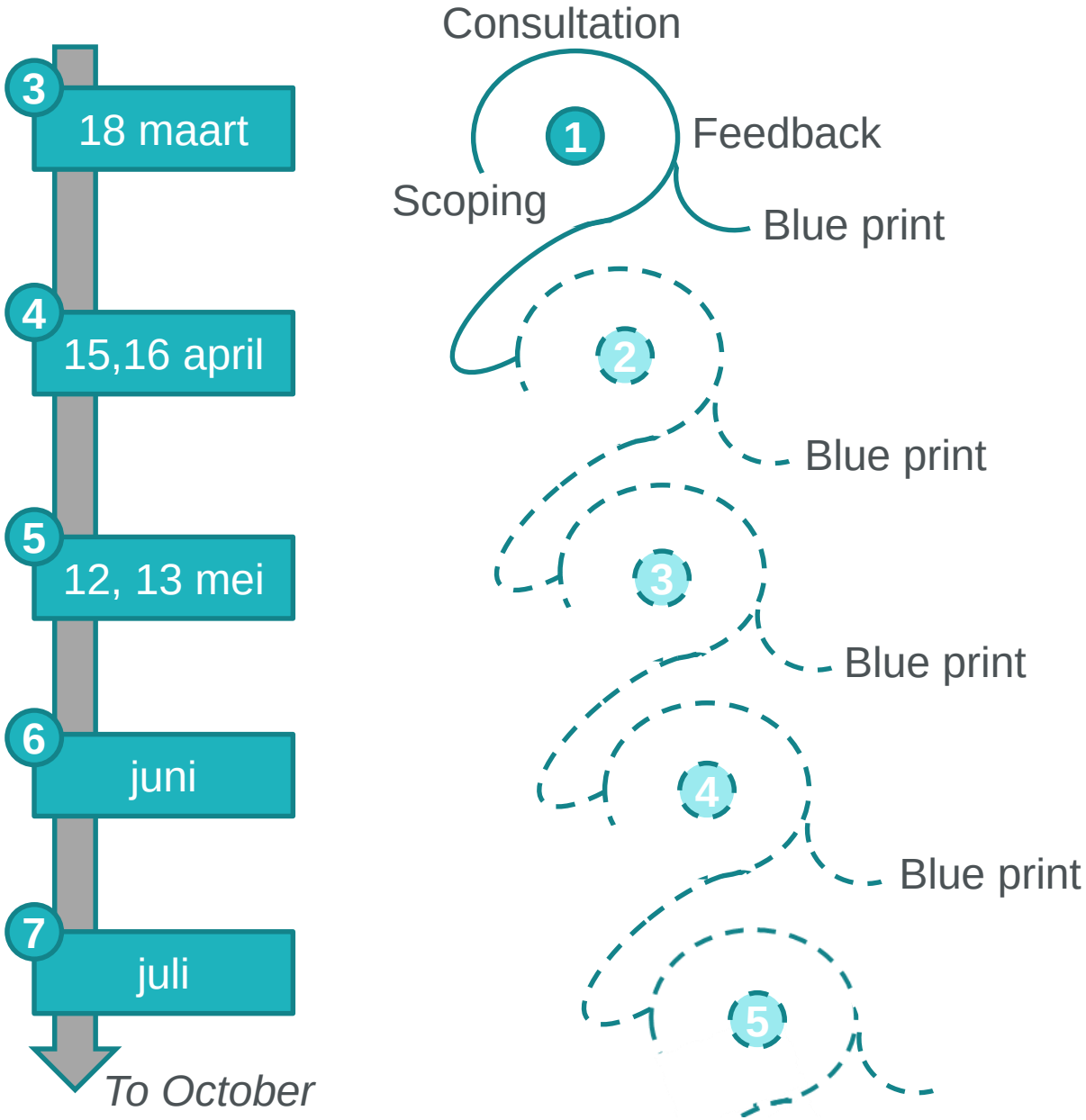
Welcome

Introduction and explanation on stakeholder process and expert meetings

Objective of the managed stakeholder engagement process

To ensure ...	through ...	where ...
> the best possible preparation of TenneT for its role as the Dutch offshore grid operator > a decision process with respect to the development, design, planning, construction and operation of the offshore grid which is clear, transparent and with complete and in-depth consultation of all relevant stakeholders	> a definition/development process of the offshore electrical infrastructure together with the stakeholders that ensures: > transparency on key choices/decisions > provision of a complete set of fact-based documentation that forms the basis of choices > maximum consensus on these choices where possible > transparency on projected cost and (future) cost reduction	> TenneT takes a leadership role in realising the Energy Agreement > by listening to the stakeholders involved, > pro-actively contributing its knowledge and expertise, > incorporating input from the stakeholders, and > making final decisions in the interest of society

Consultation process



Selection of topics

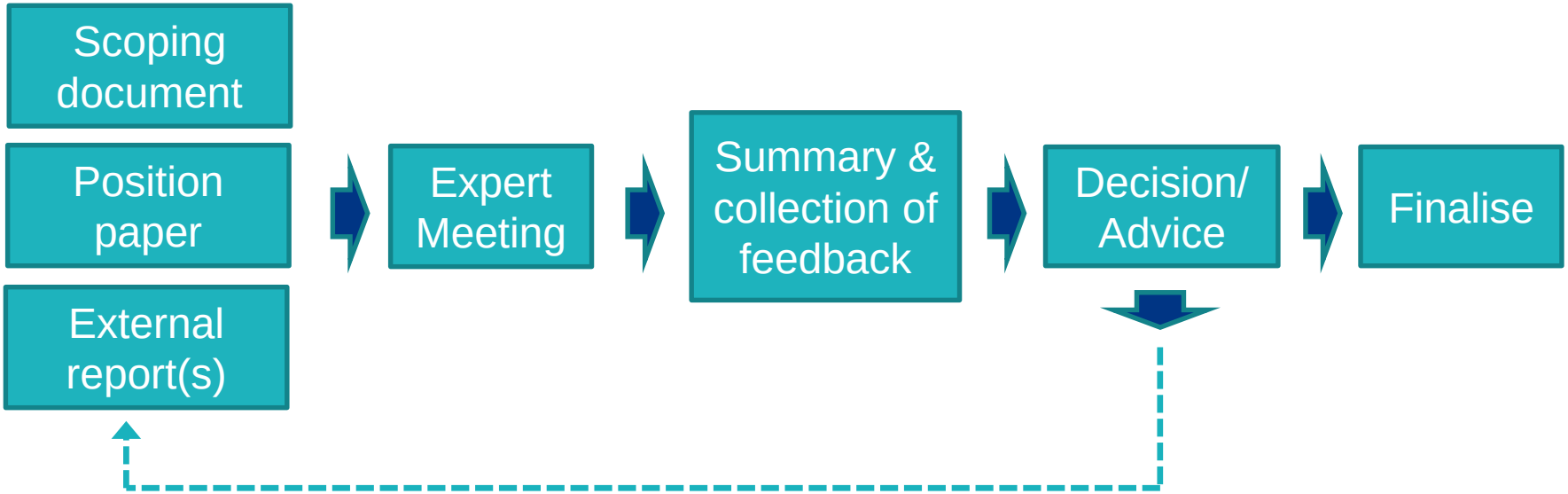
Technical
- Voltage level
- Point of coupling
- SCADA, metering
- Redundancy

Planning
- Allignment

Legal
- ATO / REA

Other
- Innovation

Consultation process Offshore Windfarm Sector



- Website launched to support the consultation process, providing access to all relevant documents and opportunity for feedback.
- Agenda and background documents for next expert meeting provided two weeks prior to the meeting. Feedback enabled on website.
- Summary of expert meeting and feedback released after the expert meeting, including proposed next steps.

Expert meeting's topics rolling agenda

		nov	dec	jan	feb	mar	apr	may	jun	jul	sep	oct	nov
T.1	Voltage level												
T.2	# of J tubes / bays												
T.3	Point of Common Coupling												
T.4	Access to platform												
T.5	Operation of Bays												
T.6	Protection												
T.7	Implementation RfG code												
T.8	SCADA												
T.9	Metering												
T.10	Data links / communication												
T.11	Overplanting												
T.12	Redundancy / availability												
T.13	Installation interface management												
T.14	O&M interface management												
P.1	Planning												
L.1	ATO / REA												
L.2	Initial Investment Plan												
O.1	Innovation												
O.2	Stranded asset mitigation												

I. Inform
D. Discuss
N. Notify
Closed

Agenda

WHEN	WHAT	TYPE OF SESSION
10.00-10.15	Welcome	Introduction
10.15-10.45	Introduction and explanation on stakeholder process and expert meetings Agenda for today	Presentation
10.45-11.15	General update on process	Presentation (inform only)
11.15-12.15	T1_Voltage level [D]	Discussion
12.15-12.45	Break & collect lunch	
12.45-13.05	T2_ # of J tubes / bays [D]	Discussion
13.05-13.25	T3_ Point of Common Coupling [D]	Discussion
13.25-13.45	L1_ ATO / REA [I]	Presentation
13.45-14.00	Break	
14.00-14.55	P1_Planning [D]	Discussion
14.55-15.00	Closure	Presentation
[N]	Notification session	
[D]	Discussion session	
[I]	Information session	

General update on process

General update on process

Technical

- Overall frame work - scenario EZ & initial investment plan
- Basic design platform started
- Focused on structurising transparent consultation process and topic definition/prioritisation
- Ongoing: Preparation of internal documents and external reports for future consultation topics

Planning

- Permitting: NRD finalised
- Importance to align on overall planning of all involved stakeholders
- Today: planning of consultation topics. Realisation planning in Expert Meeting April

Legal

- Legal frame work ATO/REA
- AMvB compensation

T1_Voltage level

Discussion

T1_Voltage level

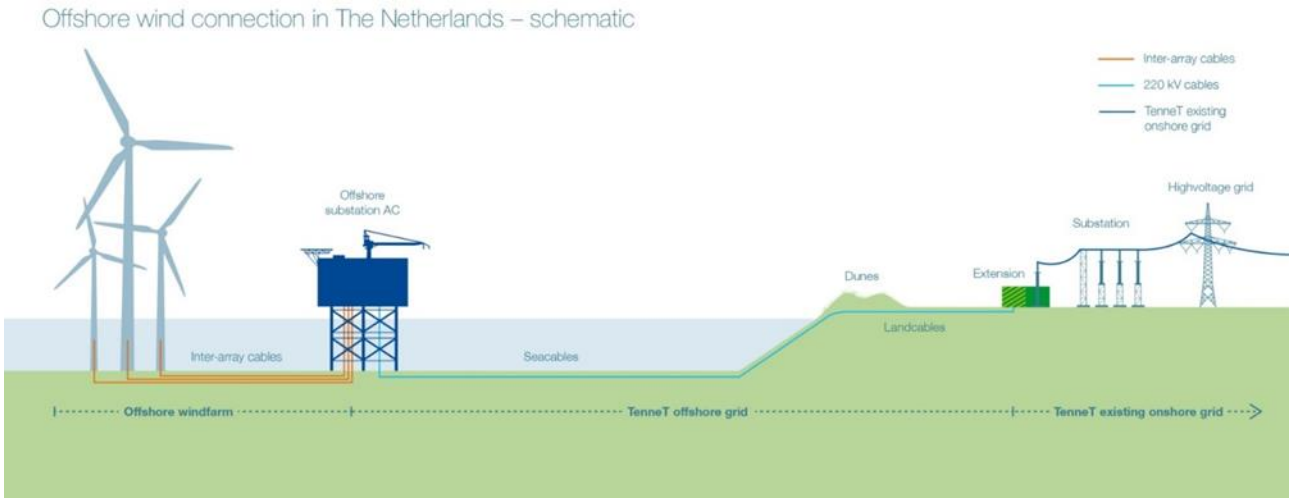
Structure of the discussion

- (10 min) Clarification position TenneT
- (15 min) Questions & concerns - Report DNV-GL
- (10 min) Response & clarification - DNV-GL
- (15 min) Questions & concerns - Postion paper TenneT
- (10 min) Response & clarification - TenneT

T1_Voltage level

Input

- Previous Expert Meetings and Bi-lateral meetings
- External report DNV-GL
- Position paper TenneT (ONL15-058-T1_Voltage level_PP_v1)



T1_Voltage level

Main considerations

- TenneT contributes to the overall cost reduction target, through standardisation of all 5 offshore platforms to be realised for the development of 3450 MW offshore wind, with a single platform serving concentrated large (700 MW) wind areas and use of technology that is ready for future large capacity wind turbines.
- Implementation of 66 kV infield cable voltage is considered technically feasible, with respect to both the cables, turbines and all connecting electrical equipment
- 66 kV operating systems are expected to become the cheapest option available, reducing cable length, number of J-tubes, installation work and losses with increasing wind farm size to 700 MW in the Dutch offshore wind tenders.
- Key cable manufacturers are currently in the process of getting 66 kV cables certified, and expected to finish certification in time for realisation of the first offshore wind tender. First cables are expected to come to the market in 2015.

Position: TenneT is inclined towards standardising the connection voltage level of the inter-array cables to the TenneT offshore transformer platform at 66 kV for all five platforms to be realised by TenneT up to 2023.

T1_Voltage level

Cost impact: high level breakdown

Quantitative	LCoE Impact	Uncertainty	Comment
Cost element Developer			
Wind turbines: transformer	0.4%	Low	Transformer costs expected to increase 40% - 50% (2). Transformer cost consitute ~2% of WTG CAPEX (3).
Wind turbines: switchgear	0.2%	Medium	Conservative increase in switchgear costs assumed of 50% (1). Switchgear ~1% of WTG CAPEX (3).
Array cable costs	0.3%	Medium	Increase in cable costs [EUR/m] of 10% (1).
Array cable length	-1.7%	Low	Decrease in cable length [km] of 30% (1).
Cost element TenneT			
Substation: Compensation equipment	0.1%	Low	Increase cost of reactive power compensation equipment of 50% (1). Compensation equipment constitute ~5% of Offshore Substation CAPEX (3).
Substation: Connection	0.0%	Medium	Switchgear worst case increase in costs assumed of 50% (2), however, since the number of required switchgear decreases, the cost increase is partly offset. The net effect is expected to be minimal (3).
Substation: J-tubes	0.0%	Low	Decrease in cost by decrease in number of J-tubes (from 28 to 16) (1,2,3)
Impact on yield			
Losses	-0.2%	Medium	Losses 33 kV 0.8%; losses 66 kV 0.55% from (1). Impact on LCoE directly related (conservatively value of -0.2% chosen) (3).
Society			
Borssele Alpha LCoE impact	-1.0%	Medium	Summation of the LCoE impact from separate items above (3).
Impact future years	-1.5% to -2.5%	Medium	Price for 66 kV equipment expected to decrease by 10% - 20% in the coming years (1). LCoE impact estimate (3).

Qualitative	LCoE Impact	Uncertainty	Comment
Technical	none	Low	No key technical issues expected hindering the implementation of 66 kV for offshore wind (1).
Logistics	Positive	Low	As it is possible to accommodate more power on a 66 kV circuit, quantity of array circuits entering the substation can be minimised. Fewer substations are therefore required in the 66 kV case, making a 700 MW offshore platform possible. (1)
Certification	Negative	Low	Key cable manufacturers are in the process of developing wet-design 66 kV cables and in the process of certification of these cables. Expected to be completed within 18 months under a program by the Carbon Trust (UK). (1) Amongst developers, different views exist with respect to the necessity of separate certification of turbines for the new 66 kV voltage level, as well as whether certification of
Market	Negative	Medium	Most market factor are considered as externalities (e.g. steel prices, many wind farms being realised at the same time etc.) and not included in LCoE calculations. The main market component which may have a direct impact on the cost levels for 66 kV relative to 33 kV, result from the number of suppliers that are able to deliver suitable turbines and cables. Most major turbine manufacturers are currently capable of supplying 66 kV turbines. The number of 66 kV cable suppliers may be limited to the larger companies. (3)
Financial	Negative	Medium	Financers have indicated no specific risk premium will be added if similar guarantees are given by cable suppliers for 33 and 66 kV. However, as 66 kV is a new technology, it is expected that some cost increase may result from additional uncertainties in supply and operation of new equipment. (4)

References: DNV GL report (1), TenneT internal (2), Ecofys internal (3), Market feedback (4)

T1_Voltage level

Questions & concerns

Break & lunch

T2_ # of J tubes / bays

Discussion

T2_ # of J tubes / bays

Input

- Position paper TenneT (ONL15-060-T2_ J tubes_ bays_PP_v1)

Main considerations

- Maximum nominal current per string: The maximum nominal current for each 66 kV string/bay is selected to be 630 A (= 72 MVA) to ensure the availability of suitable cables and switchgear.
- Maximum active power per string: since the offshore wind farms are expected to contribute to the grid stability with reactive power, it is not possible to connect 72 MW to one string/bay.
- The number of strings should be such that on average there is 20% spare capacity to provide flexibility in wind tuirbine distribution.

T2_ # of J tubes / bays

Position:

- TenneT states that in case of **66 kV** inter-array cables (based on 64 MW per cable) a standard platform shall be equipped with 16 J-tubes (2x7 for PPM, 1 for test or spare, 1 for the connection to the neighbouring platform).
- TenneT states that in case of **33 kV** inter-array cables (based on 35 MW per cable) a standard platform shall be equipped with 28 J-tubes (2x13 for PPM, 1 for test or spare, 1 for the connection to the neighbouring platform).

T2_ # of J tubes / bays

Questions & concerns

T3_ Point of Common Coupling

Discussion

T3_ Point of Common Coupling

Input

- Position paper TenneT (ONL15-061-T3_Connection Point_PP_v1)

Main considerations

- TenneT will keep the same policy for customer connections of PPM.
- This, standardized by IEC 60859, defines a clear interface which is also applicable for responsibilities regarding the realisation phase, as well as the maintenance phase.
- It prevents different ownerships of the switchgear installation for the different functionalities: connection of PPMs, transformer feeders, possible reactive power compensation and coupling of bus bars.

Position: The connection point (CP) between the offshore power park module (PPM) and TenneT is specified at the cable termination of the inter-array cables and the switchgear installation on the platform.

L1_ ATO / REA

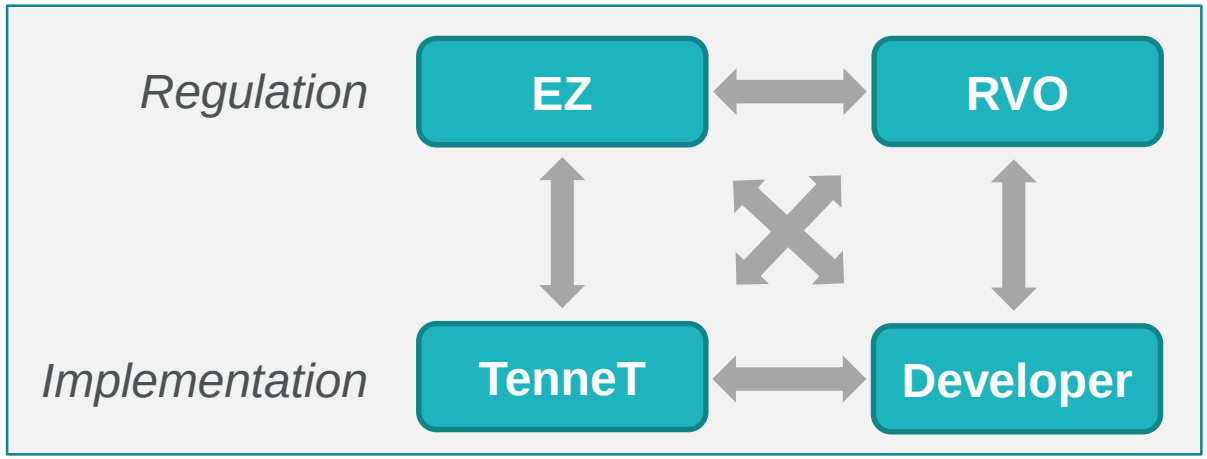
Presentation

Break

P1_Planning

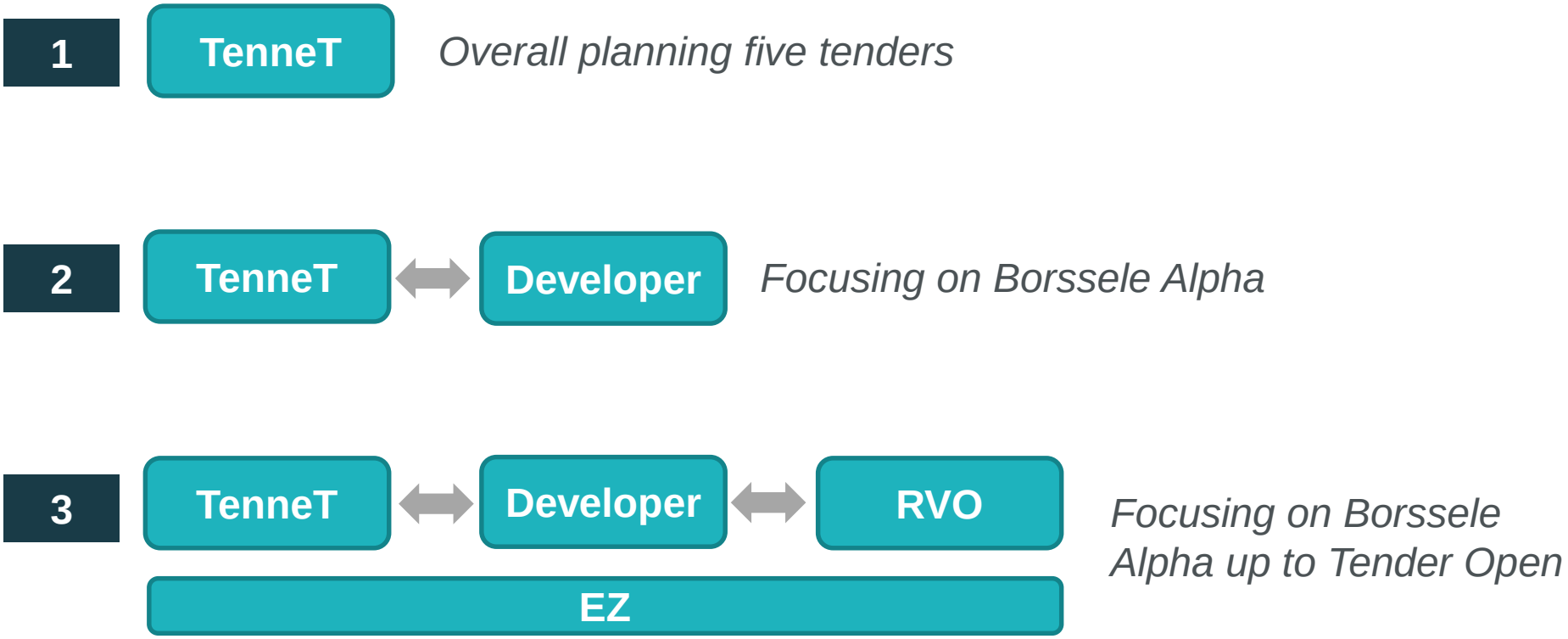
Discussion

NL Offshore wind: stakeholder interaction

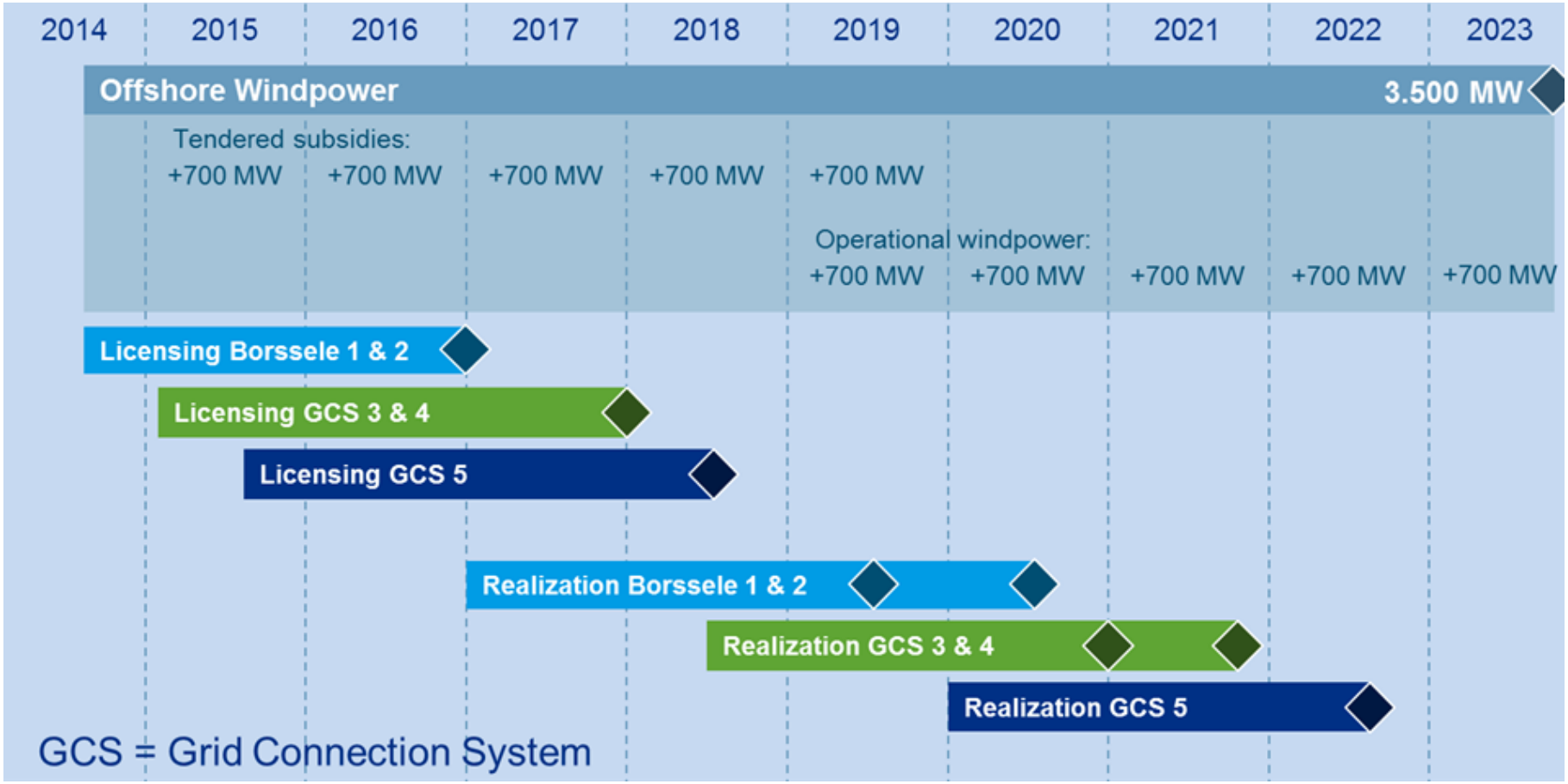


Stakeholder interaction tracks

Expert Meeting – 18 march 2015:



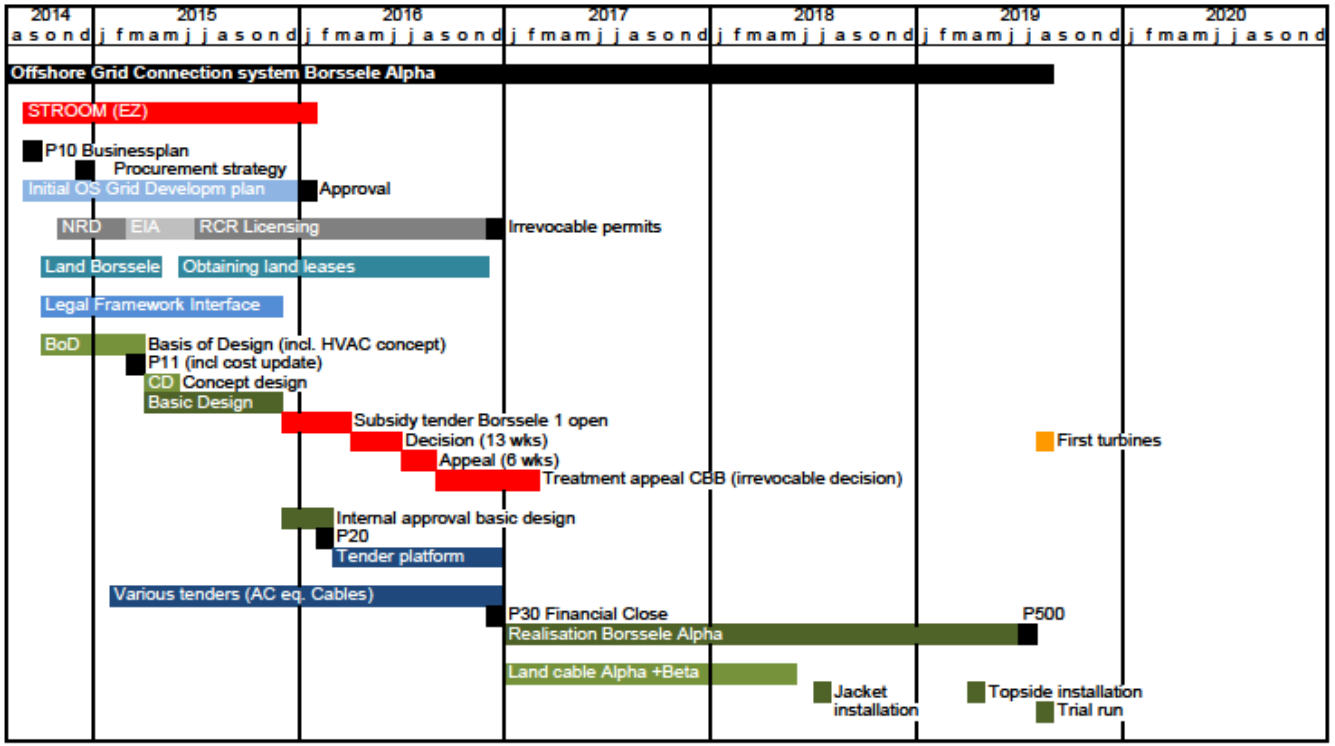
1 Internal planning TenneT



1 Internal planning TenneT

Roll-out planning Borssele Alpha

Doc ONL 15-026 v1.0
For consultation
Date: 20150129



TenneT – Developer interaction

Borssele Alpha planning

- Design choices
- Contracting
- Regulations

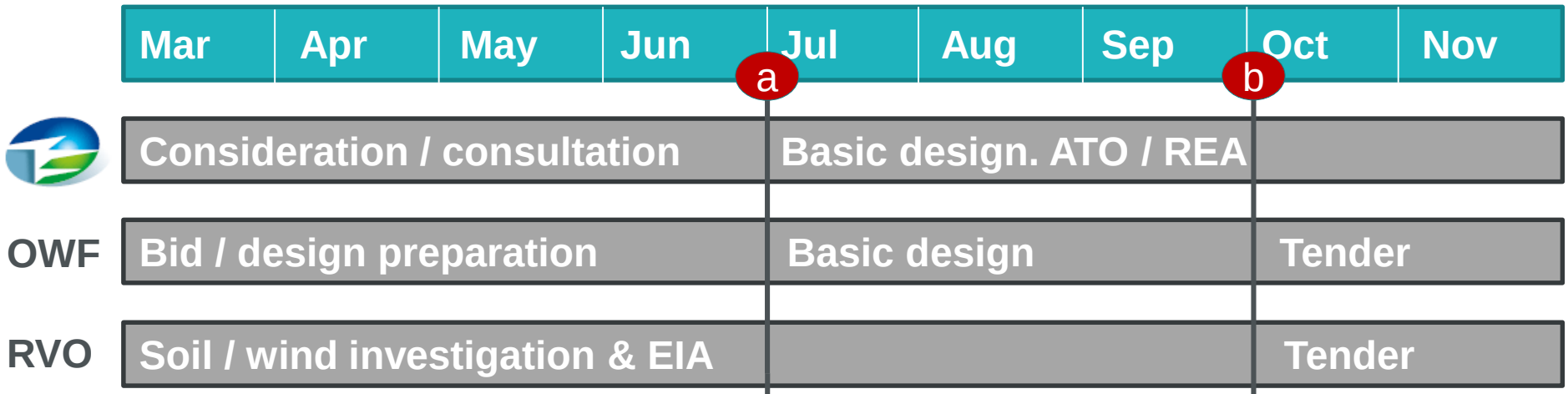
leading up to Tender Open

1

Practical alignment / implementation

2

TenneT – Developer – RVO interaction detail



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T.11	Overplanting
T.12	Redundancy / availability
P.1	Planning
O.1	Innovation
O.2	Stranded asset mitigation
	Geophys / geotech data
	Concept site decision

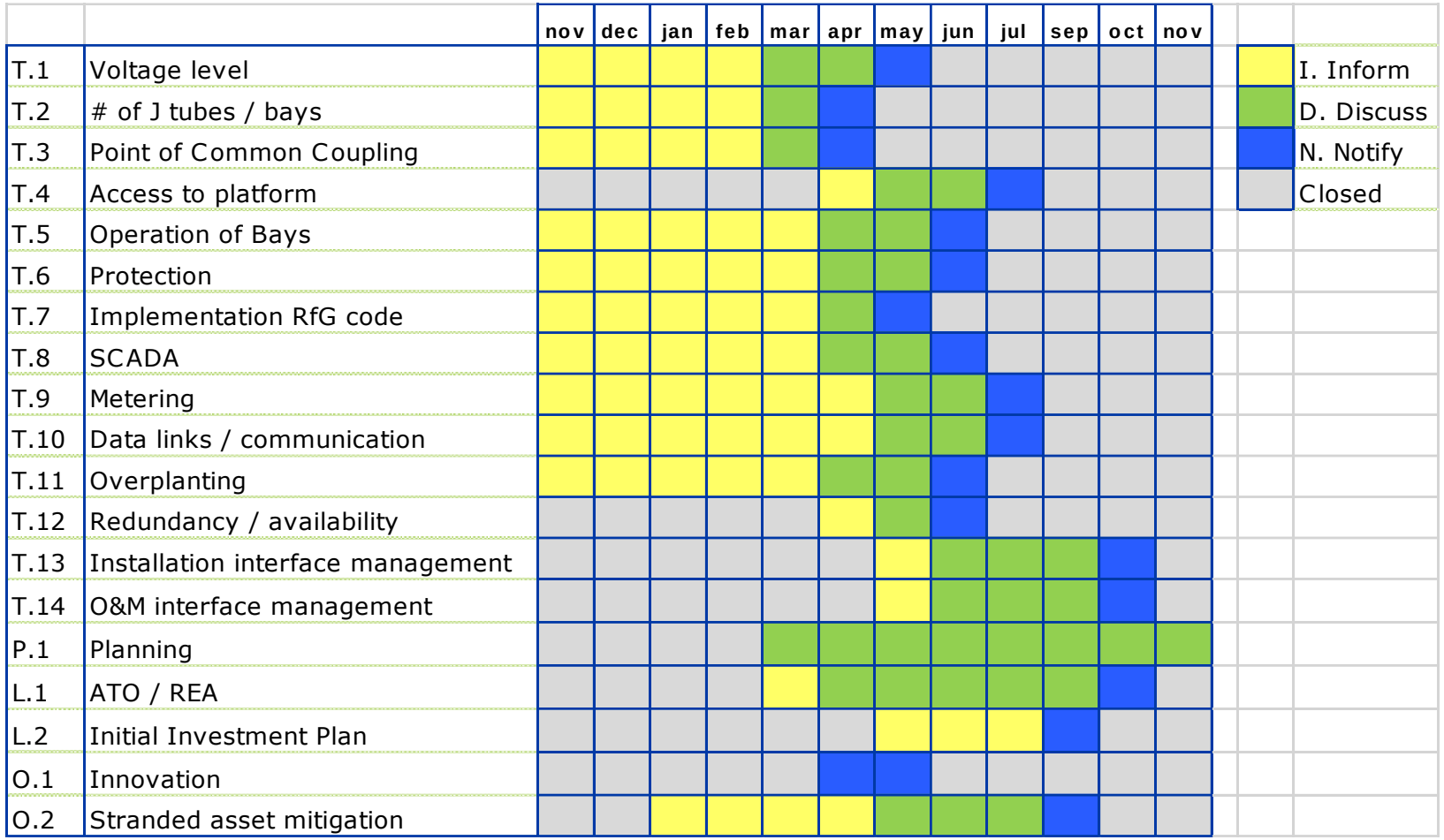
T.4	Access to platform
T.13	Installation interface management
T.14	O&M interface management
P.1	Planning
L.1	ATO / REA
L.2	Initial Investment Plan
	Wind data
	Final site decision

2 TenneT – Developer interaction

What is needed for a successful tender?

- voltage level connection
- maximum transport capacity
- TenneT single line diagram
- geographical information (location platform, location J-tubes, cable routes, etc.)
- (technical) connection requirements (RfG, reactive power compensation, etc.),
- definition connection point (technical, location),
- planning TenneT

TenneT – Developer interaction



This overview relates to topics for which an interface choice made by TenneT influences the design and/or business case of the project developers. Which topics are unidentified in this overview?

Please have a look at the planning of these topics over time. In case of any delays in this planning – which topic cannot be delayed since it will cause a full stop in your design planning?

Next Expert Meeting

Borssele Alpha planning

- Design choices
- Contracting
- Regulations

leading up to Tender Open

1

Practical alignment / implementation

2

- Bid to construction
- Focusing on TenneT & Developer
- Requirements before / after FID

Closure

Thank you