



NETZ
ENTWICKLUNGS
PLAN **STROM**

POWER GRID DEVELOPMENT PLAN 2012

START OF CONSULTATION: 30.05.2012





THE GRID DEVELOPMENT PLAN

- Establishes the principles for security of supply and stable grid operation for the next ten years.
- Is the grid development plan for a transmission grid onshore.
- Takes the integration of renewable energy sources and the development of the European power market into account.
- Is a solid planning basis and foundation for a Bundesbedarfsplan, a plan establishing federal requirements.
- Was created by the TSO's on behalf of the legislative authority.
- Describes measures that give consideration to legal requirements and underlying scenarios.
- Important inputs are type, quantity and geographic distribution of the renewable production, consumption, conventional power plants and the obligation to transmit 100% of renewables.



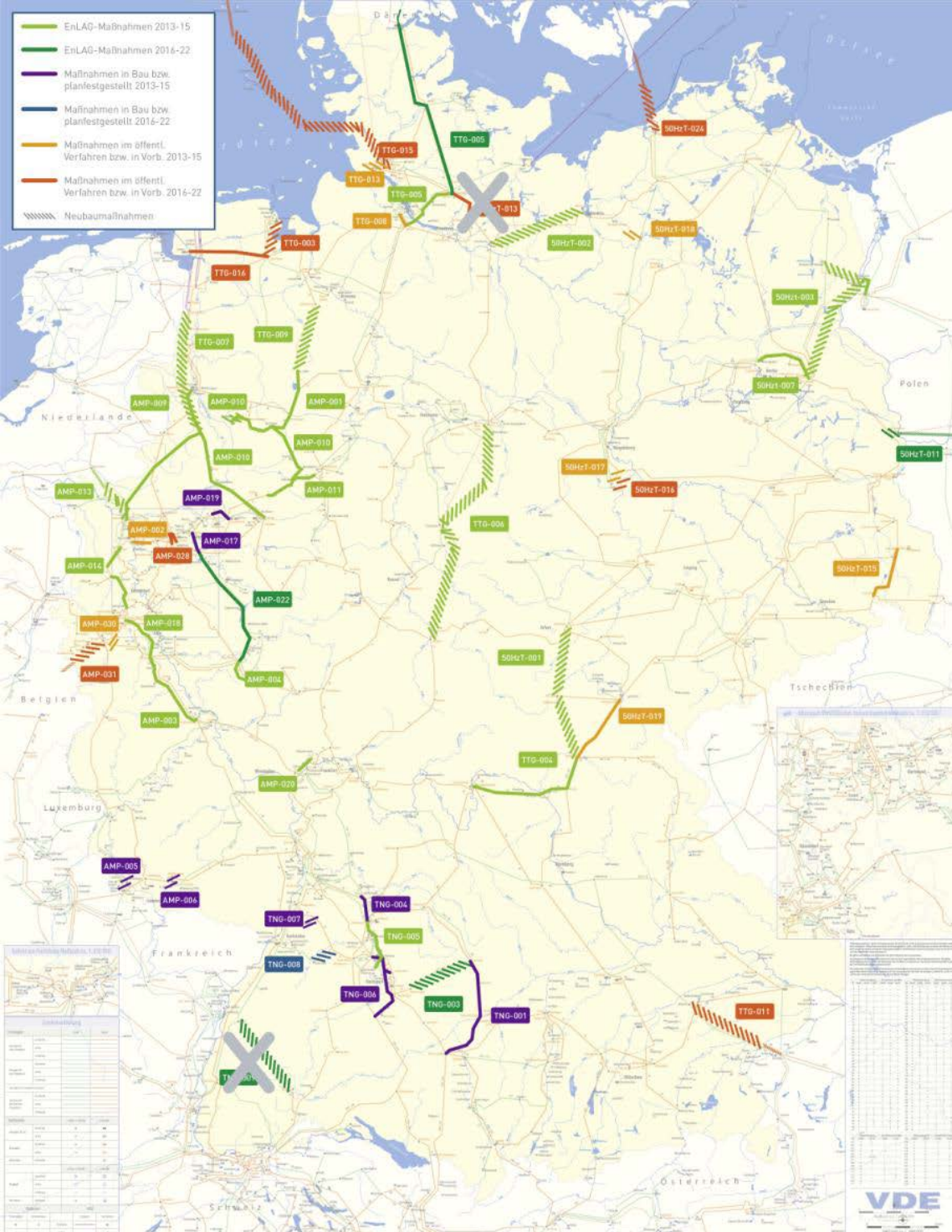
THE GRID DEVELOPMENT PLAN SHOWS

- Nationwide development need, in a set framework, with a focus on north-south connections.
- The transmission need between the starting and end points.
- No new routes (> approval procedures).
- No suggestions for future sites for power plants or renewable energy plants, not even preferred ones.
- Measures with priority of grid optimization and enhancement prior to new construction.
- In the 380 kV AC power system, a reduction of the need for new routes by means of construction in currently existing routes.
- The construction of the 380 kV AC power grid and the high-voltage DC connections (HVDC) for the north-south transmission needs.



GDP – CORNERSTONE OF THE "ENERGIEWENDE"

- The GDP (Grid Development Plan) is a critical contribution to the implementation of the Energiewende, the German energy revolution.
- The TSO's are taking an active role in the implementation of the Energiewende.
- We can make our transmission grid suitable for a successful Energiewende.
- In order to succeed, the grid must be expanded and enhanced to a large extent.
- This is a herculean task that can only be accomplished if everyone pulls in the same direction: politicians, TSO's, society.
- For this we need to shake-up society.



THE BASIS OF THE GRID DEVELOPMENT PLAN: THE STARTING GRID

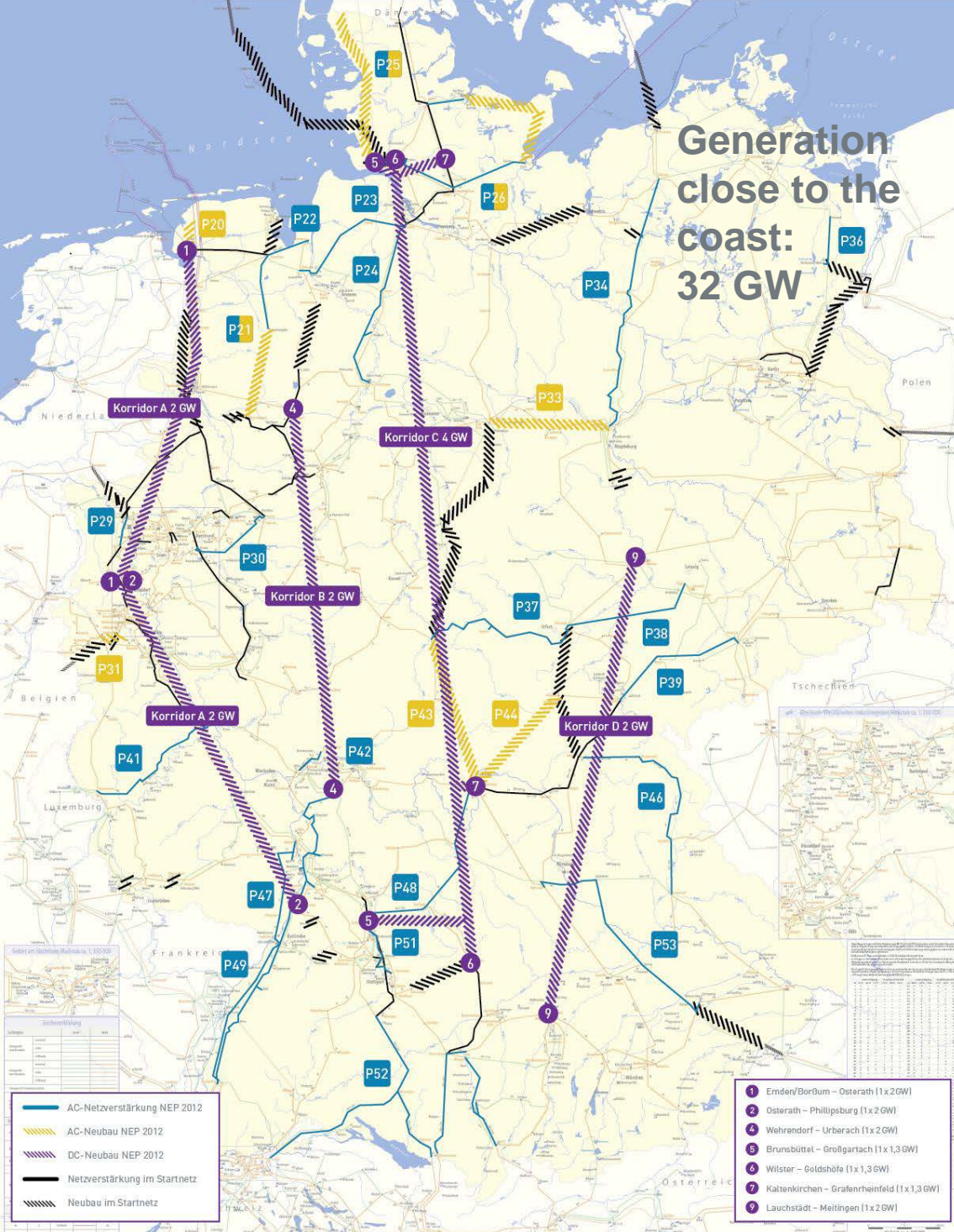


The starting grid contains:

- The current grid (actual network)
- The EnLAG (law related to grid expansion) measures
- The grid expansion measures involved in the implementation (identified development, some already under construction)
- Further measures with approved investment budgets whose planning status is already extremely advanced and that are already in the public and legal approval process – or in preparation for it.

Optimization of existing routes

- New AC construction in existing routes: 1,000km
- AC enhancements and AC power circuit systems: 400 km
- **Grid construction in new routes**
- AC route construction 1,000 km
- **Estimated investment: Eur 7 billion**



THE SCENARIO FOR B 2022 Including Starting Grid

- Based on the pilot study of the BMU (Ministry of Environment)
- Fulfills all requirements for the target year 2022
- The outlook for the year 2032 confirms the measures
- The result of the grid development plan

Optimization in existing routes

- New AC construction in existing routes: 2,800 km
- AC enhancements and AC power circuit systems on existing routes: 1,300 km
- DC power circuit systems: 300 km

Grid expansion in new routes

- AC route construction 1,700 km
- 4 DC corridors
Transmission capacity 10 GW
New DC route construction: 2,100 km

Estimated investment:

Eur 20 billion



GRID EXPANSION NEEDS THE SUPPORT OF POLITICS

- A suitable framework for investments.
- Consensus in the federal government and states regarding the 'if' - the need for expansion of the grid, and the 'how' - the technology and route corridors.
- Speedy planning approval processes at state level / waiver of regional planning procedures where possible and implementation thereof within the legal time limit of 6 months.
- Close coordination of cross-border projects without loss of time or - if this is not possible - planning approval processes at the federal level.
- Close coordination between federal planning and state planning authorities without loss of time.
- Political backing for the authorities in local planning conflict management.
- Adequate staffing of the authorities.



The speed of grid expansion determines the speed of the Energiewende

START OF 6-WEEK CONSULTATION



- Consultation: <http://www.netzentwicklungsplan.de/content/konsultation-2012>
- Report: <http://www.netzentwicklungsplan.de/content/netzentwicklungsplan-2012>
- Events: <http://www.netzentwicklungsplan.de/content/dialogveranstaltungen>

The screenshot shows the website interface for 'NETZ ENTWICKLUNGS PLAN STROM'. At the top right, there is a navigation bar with links: 'Impressum / Kontakt', 'Presse', 'Fragen / Antworten', and 'Dialogveranstaltungen'. Below this, the logo 'NETZ ENTWICKLUNGS PLAN STROM' is displayed on the left. To the right of the logo are three main menu items: 'Stromnetze', 'Übertragungsnetzbetreiber', and 'Prozessplan'. The 'Übertragungsnetzbetreiber' and 'Prozessplan' items have dropdown arrows. Below the navigation is a large green heading 'Konsultation 2012'. Underneath this heading is a sub-heading 'Mit dem Netzentwicklungsplan auf dem Weg zu einer neuen Energieinfrastruktur'. The main text states: 'Am 30.05.2012 veröffentlichen die Übertragungsnetzbetreiber den ersten Entwurf des Netzentwicklungsplans Strom 2012 auf dieser Website.'



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THANK YOU FOR YOUR ATTENTION



BACKUP



EVENTS CONCERNING THE GRID DEVELOPMENT PLAN DATES FOR DIALOGUE WITH THE PUBLIC



Together with the GDP process, the TSO's are organising several events, and are banking on the active involvement of everyone involved.

	Before consultation	During consultation		After consultation	
Date	Dialogue and information day in January 2012	GDP presentation* on 30.05.2012	Dialogue and information day on 13.06.2012	Comment review on 12.07.2012 <i>Planned</i>	Feedback day on 13.08.2012 <i>Planned</i>
Table of Contents	<ul style="list-style-type: none"> • Introduction of process for creating the GDP • Information and dialogue concerning methods used and marginal conditions • Active exchange of information with public and politicians 	<ul style="list-style-type: none"> • GDP 2012 presentation • Introduction of consultation procedure • Information about other dialogue and information events 	<ul style="list-style-type: none"> • Opportunity to ask TSO's questions about the results of the GDP** • Coordination of comprehension questions before submitting statements • Assistance with consultation process 	<ul style="list-style-type: none"> • Request from TSO's for verbal feedback from consultation participants • Opportunity to clarify submitted statements • Exchange of information** between everyone involved 	<ul style="list-style-type: none"> • Feedback on suggestions from consultation • Summarising reply from TSO's to consultation • Justification for considering suggestions in second draft of GDP to the BNetzA (Federal Network Agency)

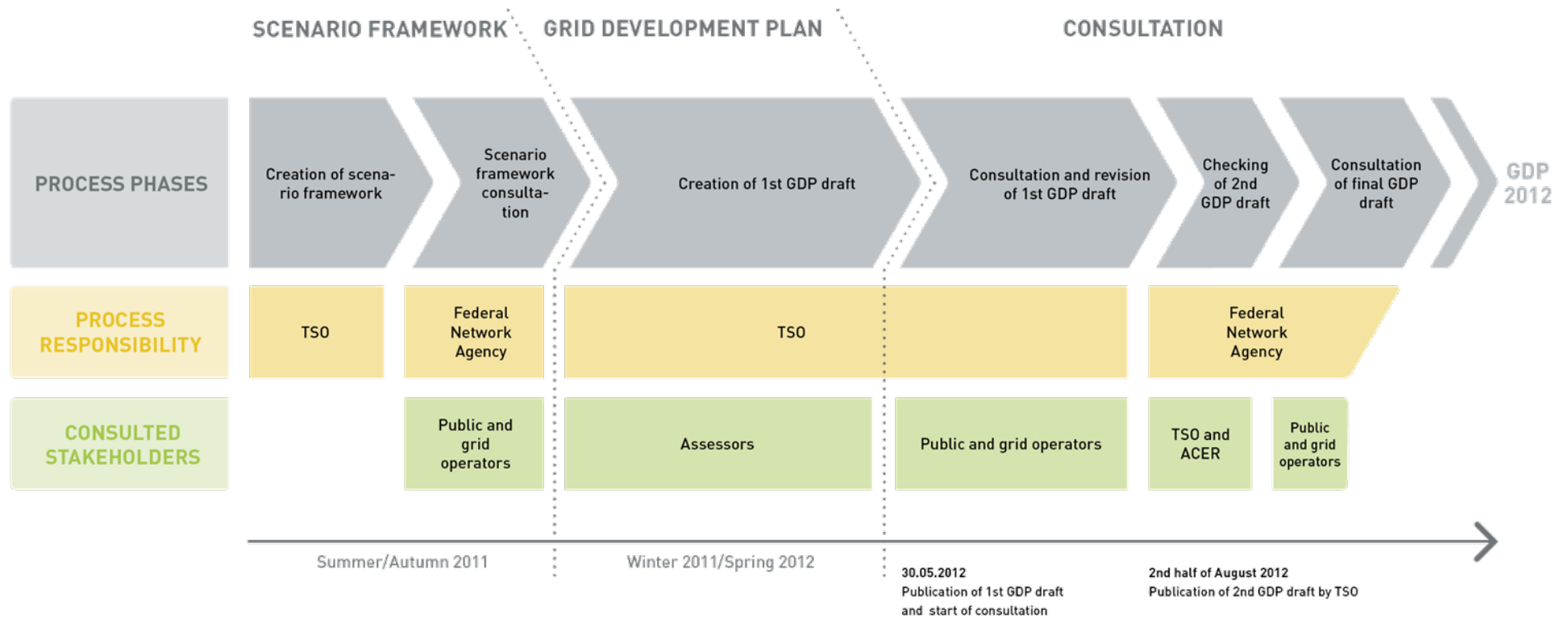
* Grid Development Plan;

** Transmission System Operators;

*** Statements concerning GDP 2

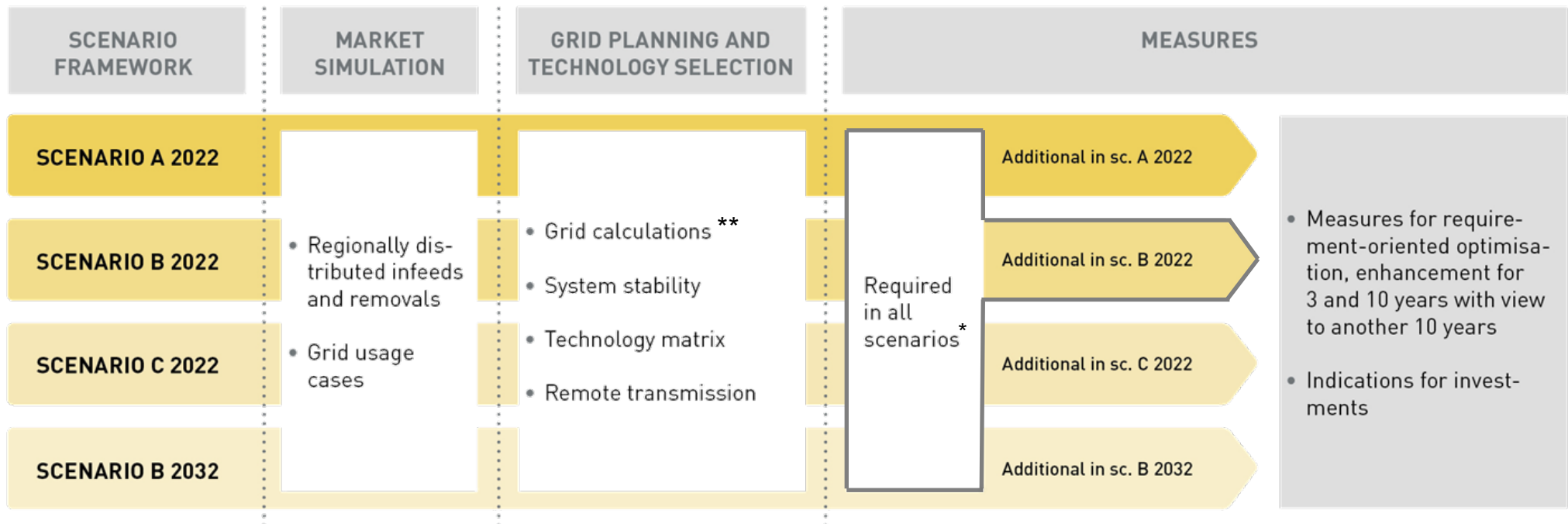


THE PROCESS OF CREATING THE GRID DEVELOPMENT PLAN



PROCEDURAL MODEL FOR DEVELOPING GDP 2012

METHOD FOR DEVELOPING A REQUIREMENT-ORIENTED SOLUTION



* Main focus on scenario B 2022

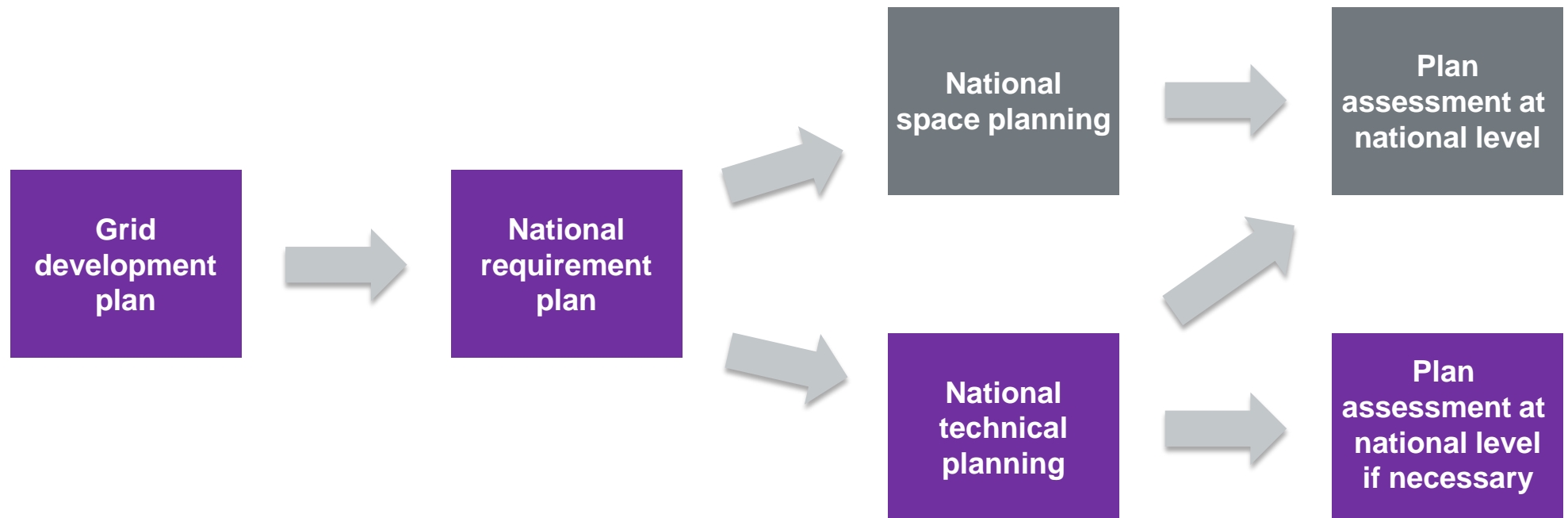
** Examination of sensitivities in consumption behaviour



DOWNSTREAM PROCESSES

PROCESS STEPS AFTER DECIDING ON THE GRID DEVELOPMENT PLAN

Before implementing the grid development plan, several procedural steps for permits with individual participation procedures will be run through.



ANALYSIS OF GRID REQUIREMENTS FOR 4 SCENARIOS – ONE OF WHICH IS LEADING SCENARIO B 2022



- **Leading scenario B (with view to 2032)**

Additional expansion of renewable energy sources, additional capacity of flexible natural gas power plants, no implementation of planned coal-fires power plants

- **Scenario A**

Moderate expansion of renewable energy sources, bottom edge in scenario framework, higher proportion of conventional power plants (partic. coal)

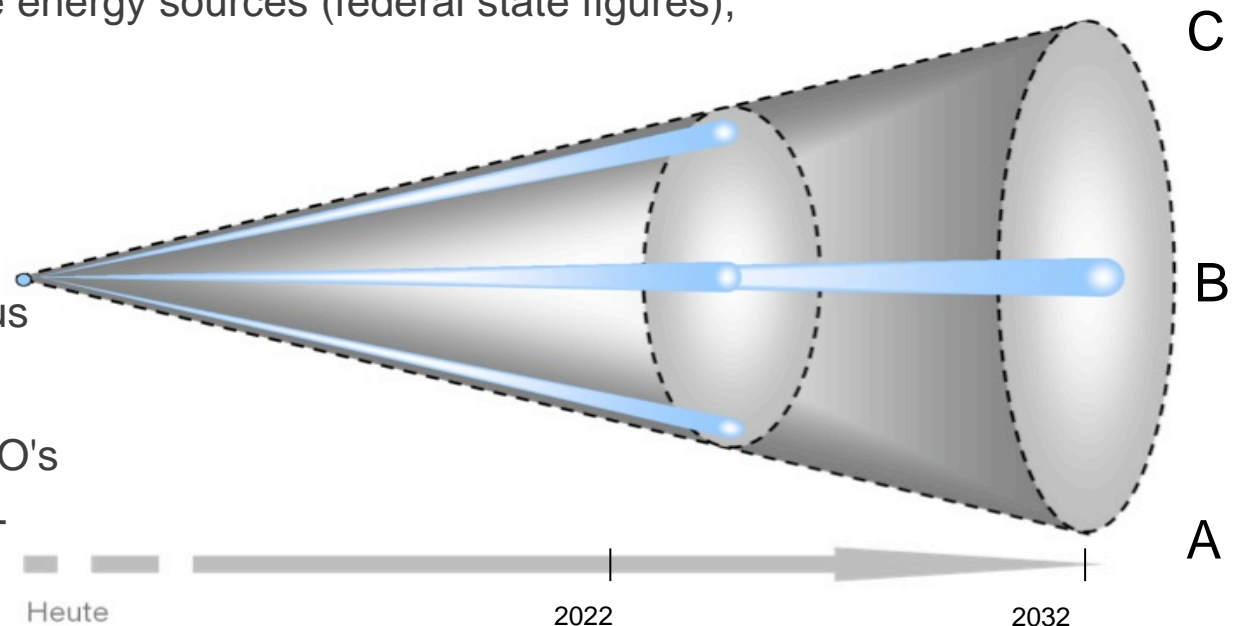
- **Scenario C**

Ambitious expansion of renewable energy sources (federal state figures), power plants as in B 2022

Leading scenario B 2022

...based on leading study of the BMU
...highly unlikely to contain superfluous measures

...results in the measures that the TSO's recommend as basis for requirement-oriented grid expansion



EXAMPLES OF REQUIREMENT-ORIENTED GRID MEASURES FOR FULFILLING THE TRANSPORT TASKS



380/220-kV- transmission **GRID**



OPTIMISATION

Power flow control

Temperature-dependent line operation

REINFORCEMENT

Upgrade to higher voltages (220 → 380 kV)

High-current and high-temperature stranded conductors

EXPANSION

Overhead line 380 kV electric lines

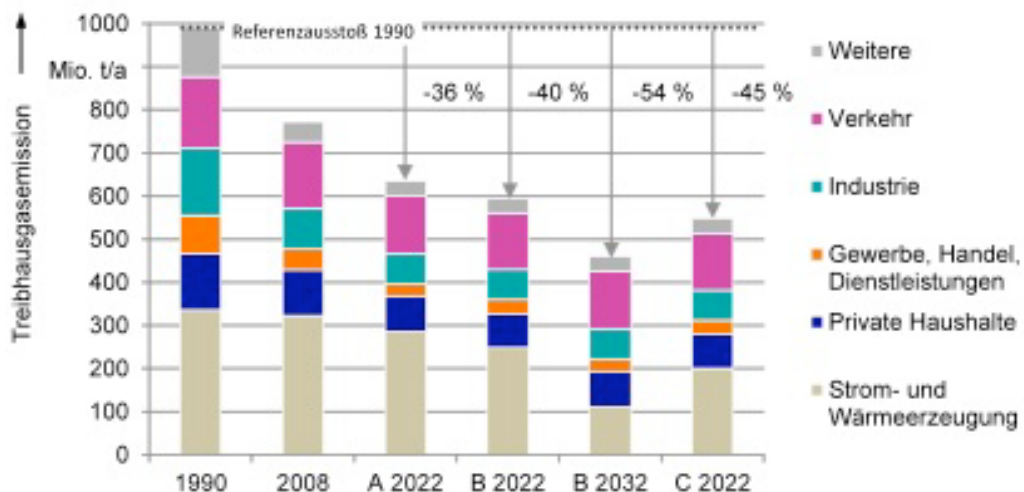
Overlay



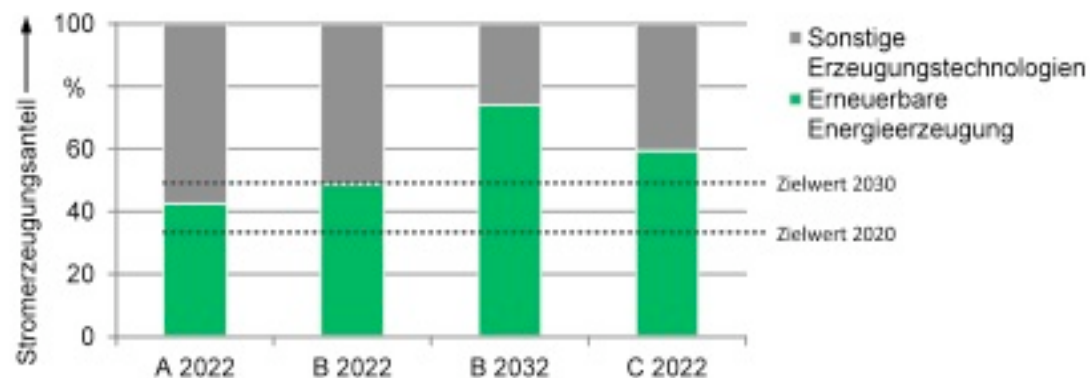
ACHIEVEMENT OF ENERGY-POLITICAL TARGETS

CO2 EMISSION / RENEWABLE / PRIMARY ENERGY USAGE

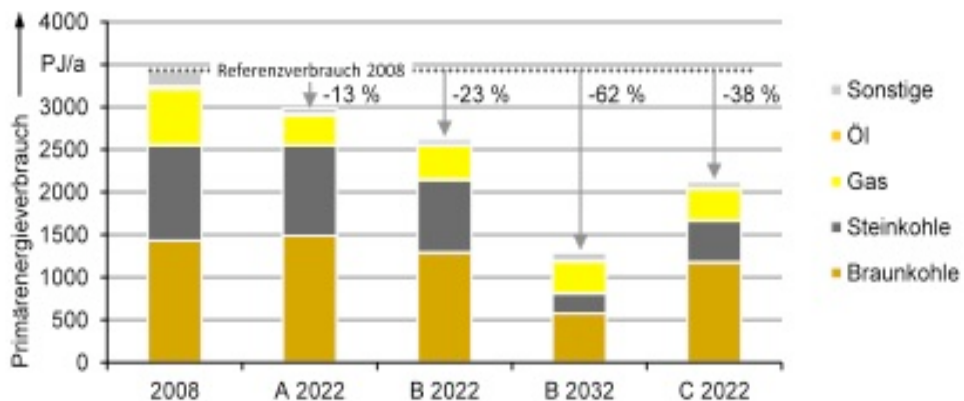
CO2 EMISSION



RENEWABLE



PRIMARY ENERGY CONSUMPTION



➔ Achievement of all energy-political targets, except in scenario A, in which some are narrowly missed



INVESTMENT IN BASIS FOR SUCCESSFUL ENERGIEWENDE

Investment requirement over 10 years: Eur 19 - 23 billion

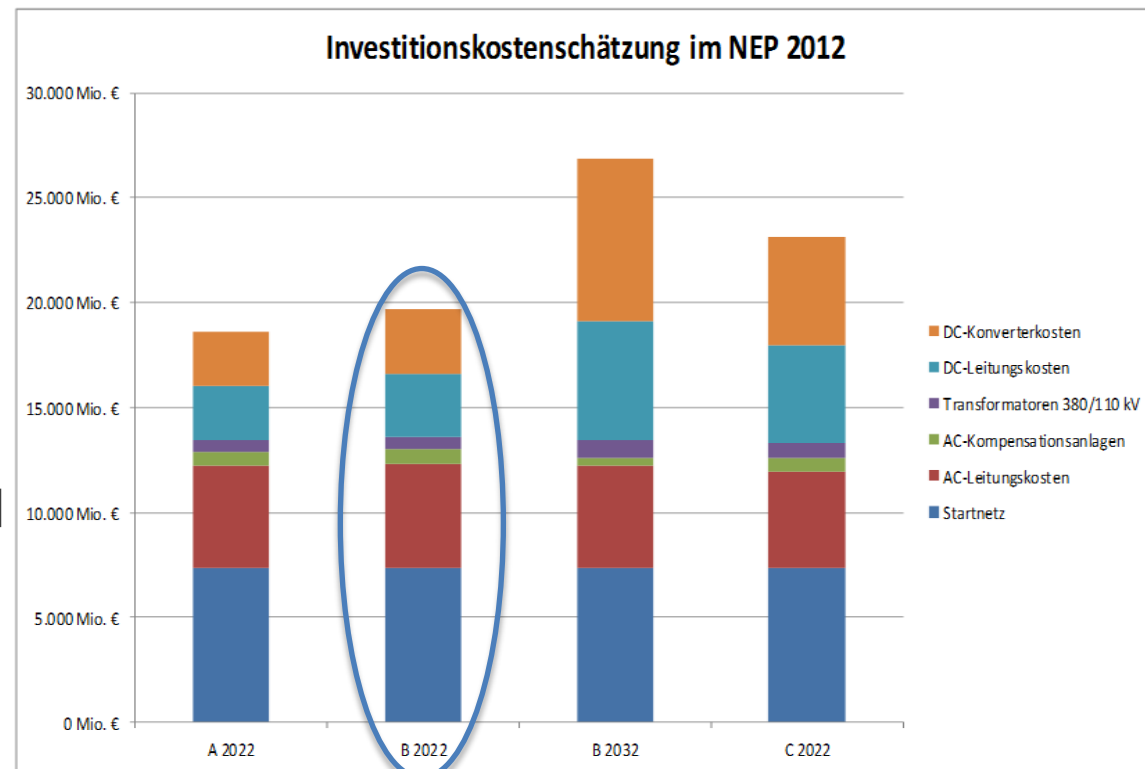
- Outlook for B 2032: Eur 27 billion
- Part of cost of Energiewende, the basic requirement for its successful implementation

High cost of failing to implement the investments

- "Redispatch" costs
- Shutdown of renewable energy act plants
- Market splitting

Other grid developments required

- Expansion of distribution grids
- Expansion of offshore connections





SCENARIO A 2022 INCLUDING START GRID



Optimization in existing routes

- New AC construction in existing routes: 2,800 km
- AC enhancements and AC power circuit systems on existing routes: 1,400 km
- DC power circuit systems: 300 km

Grid expansion in new routes

- AC route construction: 1,700 km
- 4 DC corridors
- Transmission capacity: 10 GW
- New DC route construction: 1,800 km

- **Estimated investment: Eur 19 billion**



SCENARIO C 2022 INCLUDING START GRID



Grid development in existing routes

- New AC construction in existing routes: 2,700 km
- AC enhancements and AC power circuit systems on existing routes: 1,200 km
- DC power circuit systems: 300 km

Grid expansion in new routes

- AC route construction 1,700 km
- 4 DC corridors
Transmission capacity 18 GW
- New DC route construction: 2,400 km

**Generation
close to the
coast:
54 GW**

**SCENARIO B 2032
LEADING SCENARIO – OUTLOOK**
Including Starting Grid



Optimization in existing routes

- New AC construction in existing routes: 3,100 km
- AC enhancements and AC power circuit systems on existing routes: 1,100 km
- DC power circuit systems: 300 km

Grid expansion in new routes

- AC route construction 1,600 km
- 4 DC corridors
Transmission capacity 28 GW
- New DC route construction: 3,100 km

• **Estimated investment: Eur 27 billion**

OVERVIEW OF SCENARIOS



	Start grid topology	Scenario B 2022 (leading scenario)	Scenario A 2022	Scenario C 2022	Scenario B 2032 (leading scenario - outlook)
Optimization in existing routes					
New AC construction in existing routes	1000 km	2800 km	2800 km	2700 km (Δ:-100 km)	3100 km (Δ:300 km)
AC enhancements and AC power circuit overlays on existing routes:	400 km	1300 km	1400 km (Δ:100 km)	1200 km (Δ:-100 km)	1100 km (Δ:-200 km)
DC circuit overlay systems:	-	300 km	300 km	300 km	300 km
Grid expansion in new routes					
New AC route construction	1000 km	1700 km	1700 km	1700 km	1600 km (Δ:-100 km)
4 DC corridors					
Transmission capacity	-	10 GW	10 GW	18 GW (Δ:8 GW)	28 GW (Δ:18 GW)
New DC route construction	-	2100 km	1800 km (Δ:-300 km)	2400 km (Δ:300 km)	3100 km (Δ:1000 km)
Estimated total investment	Eur 7 billion	Eur 20 billion	Eur 19 bill. (Δ:Eur -1 bill.)	Eur 23 bill. (Δ:Eur 3 bill.)	Eur 27 bill. (Δ:Eur 7 bill.)
Power generation close to coast	-	32 GW	27 GW (Δ:-5 GW)	44 GW (Δ:12 GW)	54 GW (Δ:22 GW)

Δ in relation to scenario B 2022

ROUTES AND INVESTMENTS IN ADDITION TO START GRID

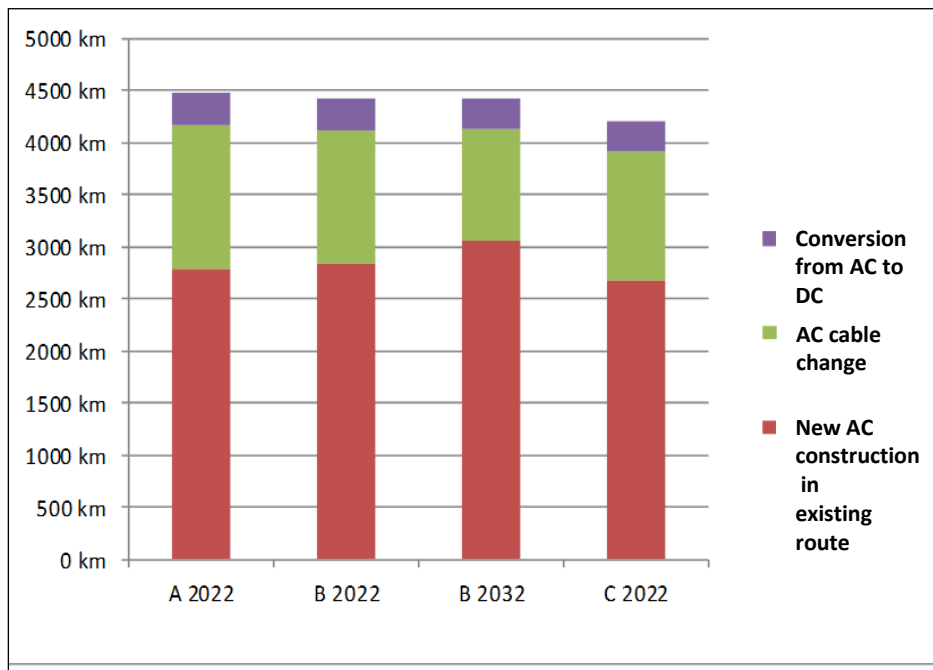


	Start grid	Scenario B 2022 (leading scenario)	New in scenario B 2022	New in scenario B2032
		Incl. start grid	Additional to start grid	Additional to start grid
Optimization in existing routes				
New AC construction in existing routes	1000 km	2800 km	Δ: +1800 km	Δ: + 2100 km
AC enhancements and AC power circuit overlays on existing routes:	400 km	1300 km	Δ: +900 km	Δ: + 700 km
DC circuit overlay systems:	-	300 km	Δ: +300 km	Δ: + 300 km
Grid expansion in new routes				
New AC route construction	1000 km	1700 km	Δ: +700 km	Δ: + 600 km
4 DC corridors				
Transmission capacity	-	10 GW	Δ: +10 GW	Δ: +28 GW
New DC route construction	-	2100 km	Δ: +2100 km	Δ: +3100 km
Estimated total investment	Eur 7 billion	Eur 20 billion	Δ: Eur +13 billion	Δ: Eur +20 billion
• Δ in relation to start grid				



LENGTH OVERVIEW OF THE FOUR SCENARIOS

Grid optimization in existing routes



Grid expansion in new routes

