

Standardization of TenneT 110/150 kV AC cable systems – One step closer to “Zwaardere belastingen”

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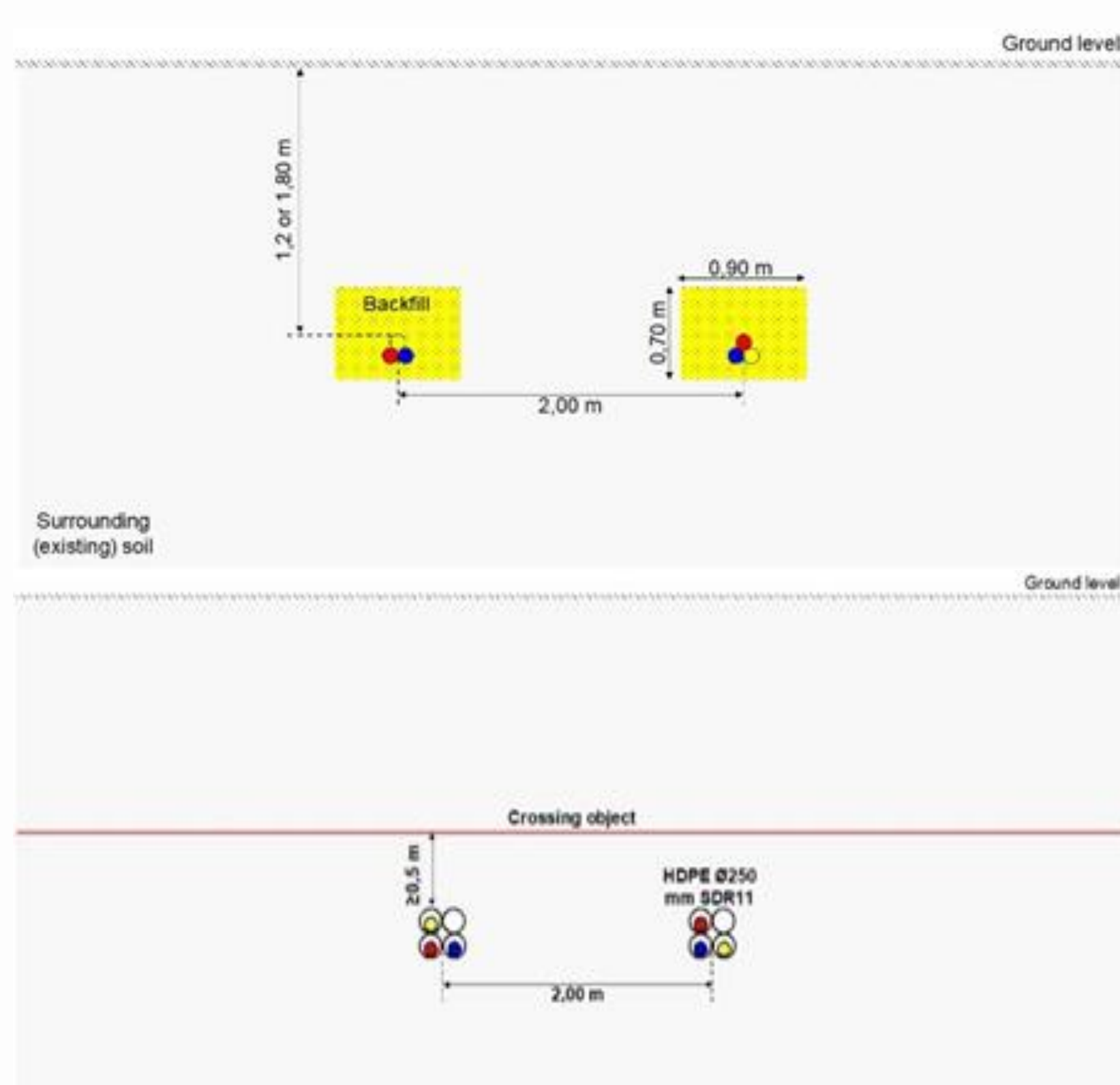
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Introduction

- TenneT, as one of the largest North West European energy transition investors, recently announced the rapid change in Energy infrastructure needed as part of their “Target Grid 2045” strategy
- A strategy requiring more than a 1000 km new HV and EHV cable systems in the Netherlands in the coming years
- A strategy that allowed an opportunity to standardize and optimize the TenneT 110/150kV cables system approach used in new projects

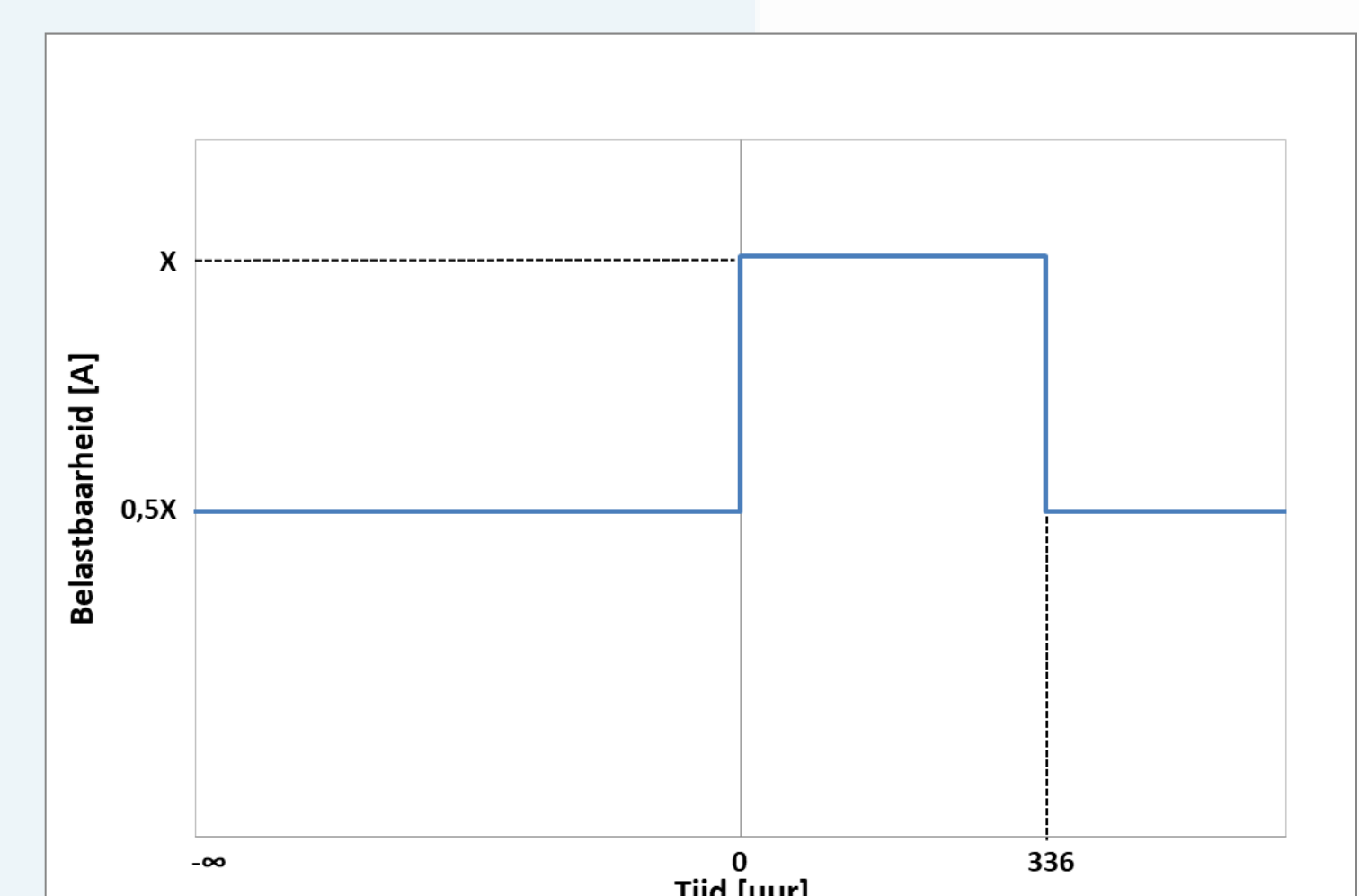
Standardization design

- Connection between two substations
 - Longer cable sections (less joints)
 - Optimized cable power rating
- Selection of 3 cable conductor sizes
 - Cross bonding systems
- Cables layed in trefoil arrangement
 - N-1
- TenneT Cable System specification



Cable rating optimization

- The calculation approach is based on the maximum use of the cable rating
- IEC 60287 Continuous pre-loading and IEC 60853-2 Cyclic loading for 2 weeks
 - Achieved highest loading for horizontal drillings
- Uprating of 2x pre-loading achieved and aligns well with N-1 contingency



- A suitable calculation software was selected to achieve a good fit for the large number of variations and corresponding ampacity calculations

Standardized conductors and the corresponding “Max Limit” result

Conductor	Nb of parallel circuits	Standard current / power					
		A		MVA @110kV		MVA @150kV	
		Per circuit	Total	per circuit	Total	Per circuit	Total
1600Almil	1	≤1200	≤1200	≤229	≤229	≤312	≤312
	2	≤1155	≤2310	≤220	≤440	≤300	≤600
	3	≤1140	≤3420	≤217	≤652	≤296	≤889
2500Almil	1	≤1402	≤1402	≤267	≤267	≤364	≤364
	2	≤1345	≤2690	≤256	≤513	≤349	≤699
	3	≤1325	≤3975	≤252	≤757	≤344	≤1033
3500Almil	1	≤1620	≤1620	≤309	≤309	≤421	≤421
	2	≤1540	≤3080	≤293	≤587	≤400	≤800
	3	≤1520	≤4560	≤290	≤869	≤395	≤1185

