



1 February 2024

Towards net-zero emission of T&D grids



Carbon footprint reduction by re-utilization of existing assets

Net Zero Emission Grid



cigre

For power system expertise

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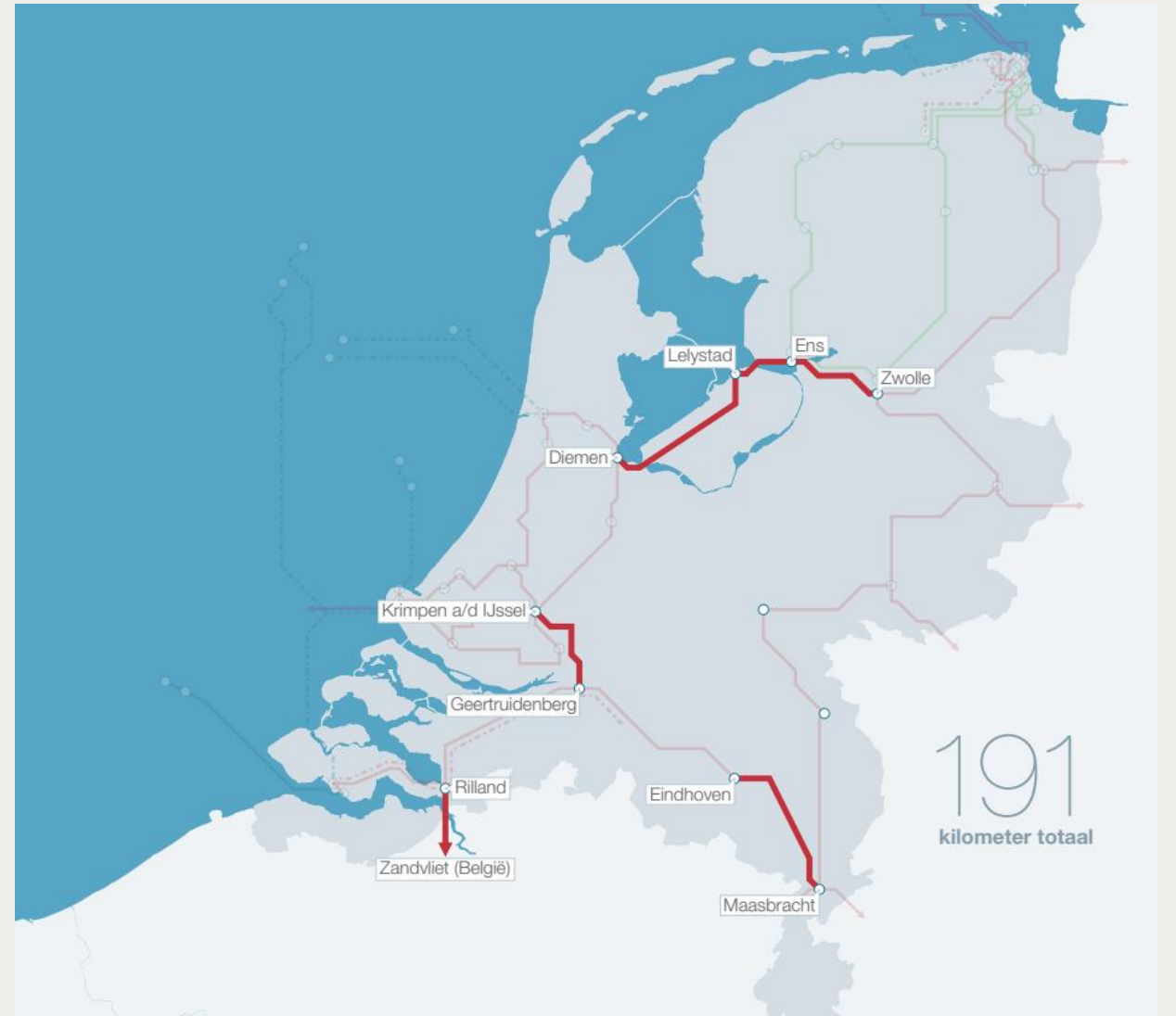
Content

1. Better Benutzen Project
2. Scope of work in the BB Project
3. CO2 savings
4. Conclusion



Beter Benutten Bestaande Project – A good Example

- Better utilization means increasing the capacity of an existing overhead line. This is done by replacing the existing conductors with new ones that can carry more power.
- TenneT is combining this work with major maintenance.
- The existing conductors were replaced by HTLS conductors. Besides replacing the conductors, a few steel members were modified and replaced; and a few foundations were reinforced.
- HTLS conductors can carry higher current.

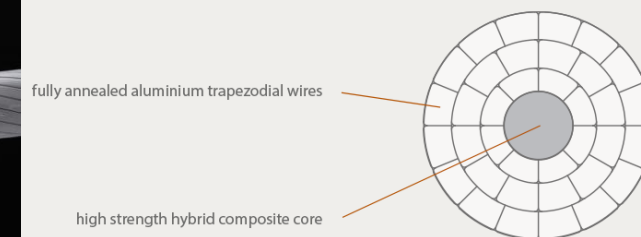


History and Background

- “Het koppelnet” was constructed to connect the power stations for more flexible operation of the power stations done by SEP (Samenwerkende ElectriciteitsProductiebedrijven) which is now TenneT.
- The first phase of the 380kV-grid was constructed between 1967 and 1972 and the second phase, the closure of the ring and two interconnectors, between 1986 and 1990.
- The first phase of the grid was equipped with three phase conductors consisting of a triple bundle of ACSR "SEP" conductors. The "SEP" phase conductors (similar to the "Drake" conductor) have a diameter of 27.9 mm and a weight of 1517 kg/km.
- With the growth of renewable energy production and also the intermittent nature of those resources, make it crucial for the grid to be ready.
- These generation fluctuations have a major influence on our electricity grid. The capacity of these connections must therefore be increased.

Beter Benutten Bestaande - A Good Example

- HTLS-geleiders are almost as thick and heavy as current conductors but with a higher capacity.
- Therefore, small adaption and modification might be necessary for the towers and foundations.



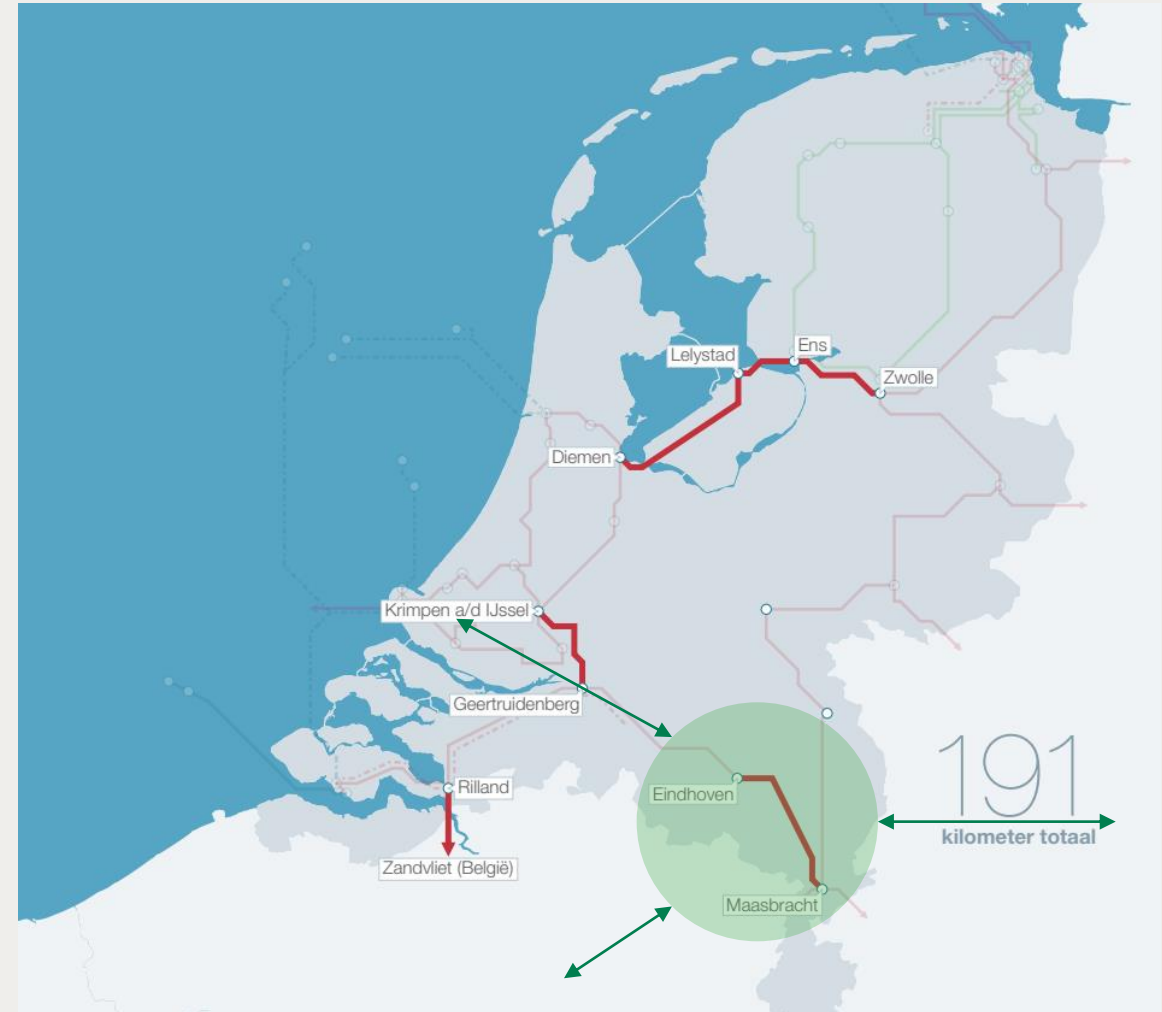
Parameter	ACSR Drake	ACCC Warsaw
Overall diameter	28.11mm	27.72
Mass per unit length (kg/km)	1628	1519
Rated tensile strength	139.92	158.7
Current rating	614	1112 @100C°



Beter Benutten Bestaande - Een geweldig voorbeeld

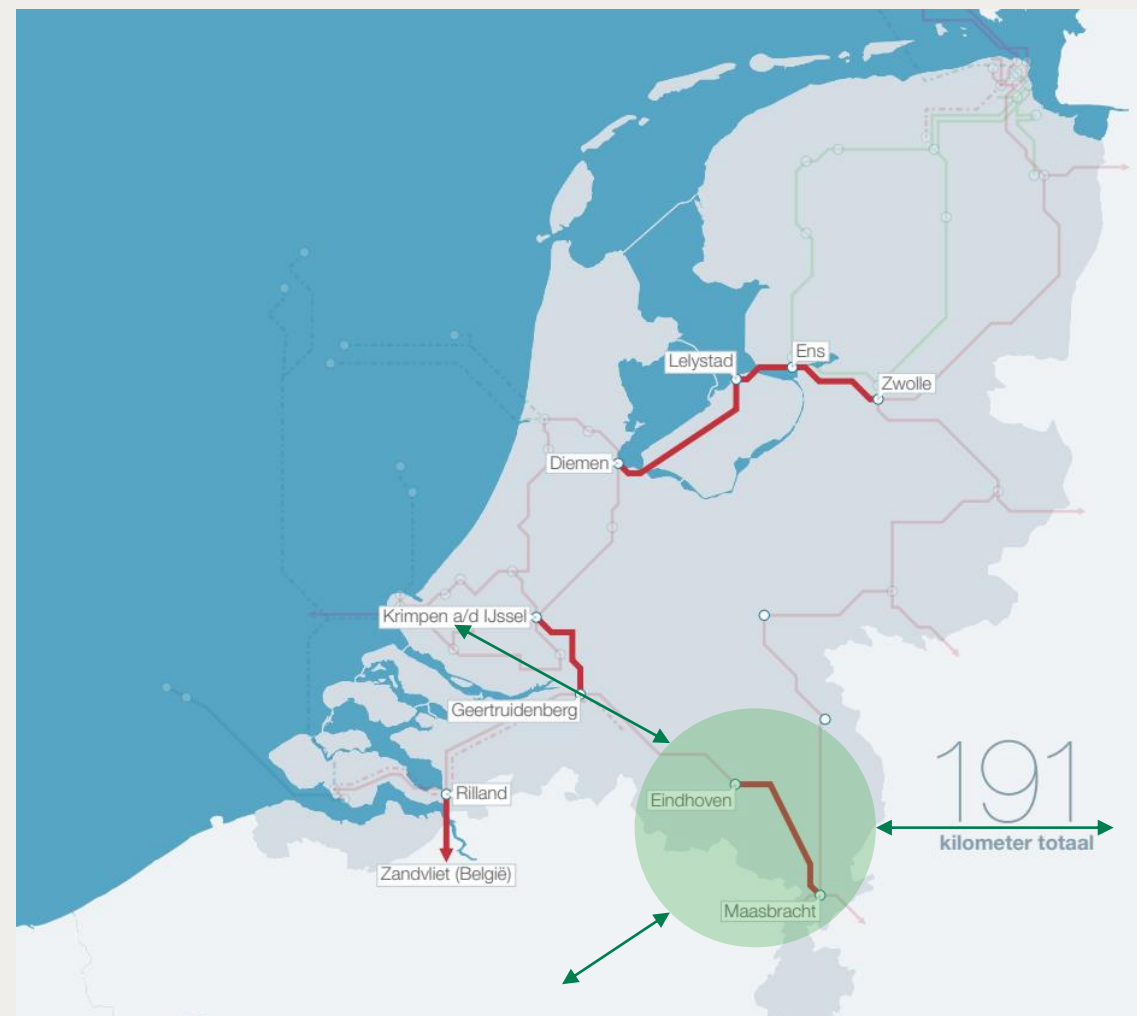
- BB Project has several transmission line routes.
- The list below shows the usual type of towers and approximate weight of them.

Masttype	Aantal masten (gewicht tonne)
S+0	73 (23)
HA+0	8 (36)
S+12	7 (28.6)
S+3	7 (23.8)
S+0 T3	4 (20)
HB+0	3 (39)
HC+0	3 (42)
S+0 T1	3
S+15	3
S+9	3
EA+0	2 (36.5)
HA+0 T1	2
S+0(TC)	2
S+6	2
WA+0	2 (38)
EHV Portaal 1	1
HB+0(TC)	1
MBT Portaal	1
S+0(C)	1
S+0(XC)	1
S+0(XC) T1	1
S+15 T1	1
S+6 T3	1
S+9 T1	1
S+9(C)	1
S+9(TC)	1



List of modifications

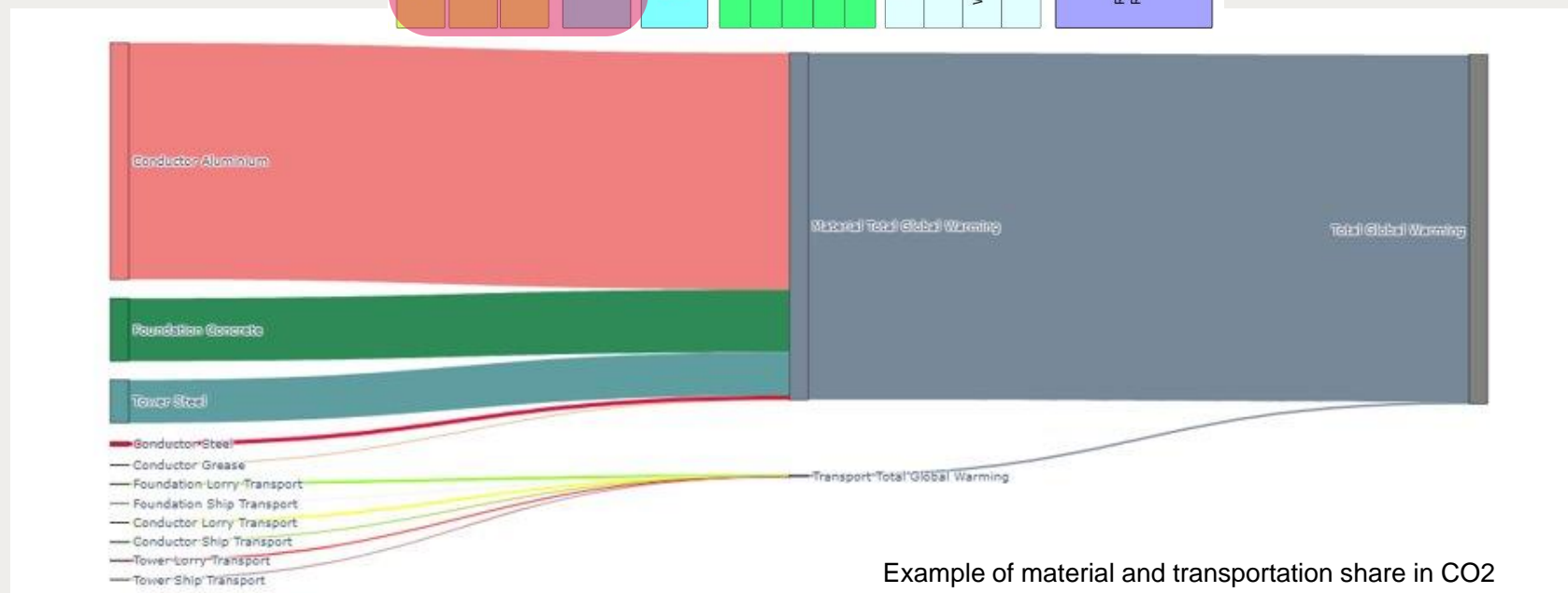
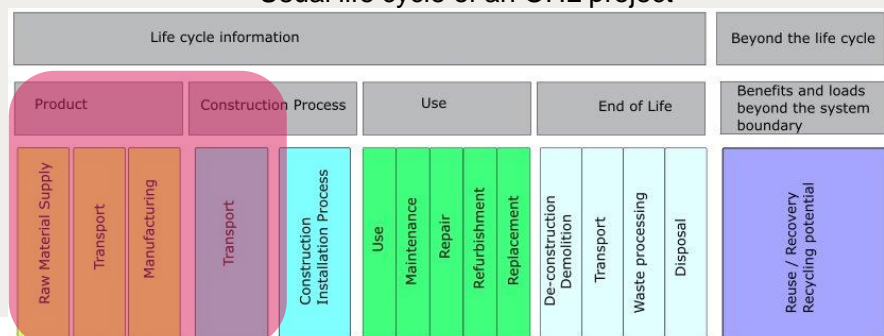
- For many towers there were no adjustments or limited adjustments (bolts and attachments)
- Angle towers had the most adjustments (braces)
- It was limited to 2% weight gain
- Few foundations required heavy concrete blocks or reinforced concrete.



Methodology for calculating CO₂ emissions

- Using open source data and focusing on possible material source and transportation methods.

Usual life cycle of an OHL project



Example of material and transportation share in CO₂

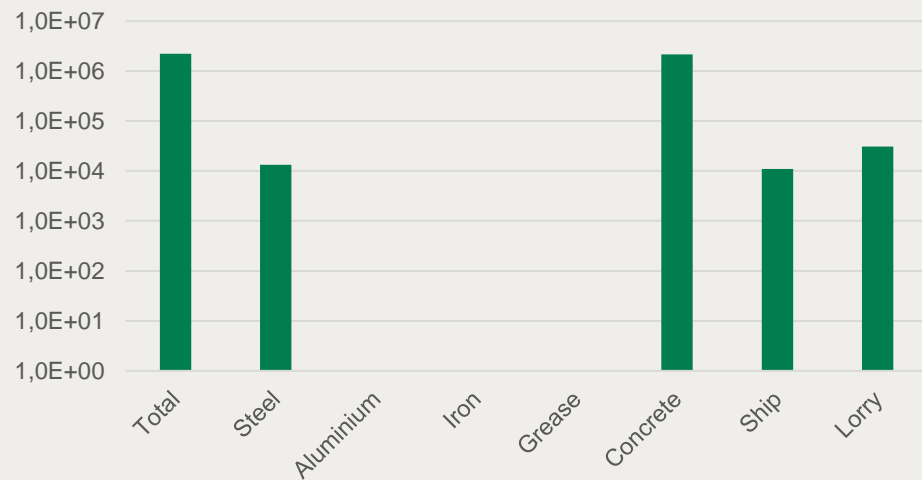
Scenarios

- The current modifications to towers, conductors and foundations are compared with the situation if all towers, foundations and conductors were replaced.

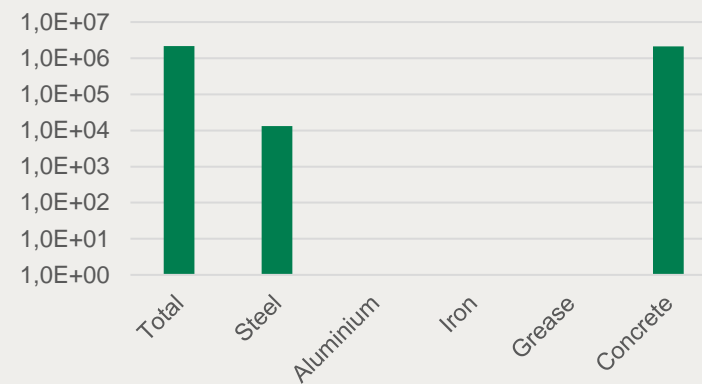


Potential CO2 Saving

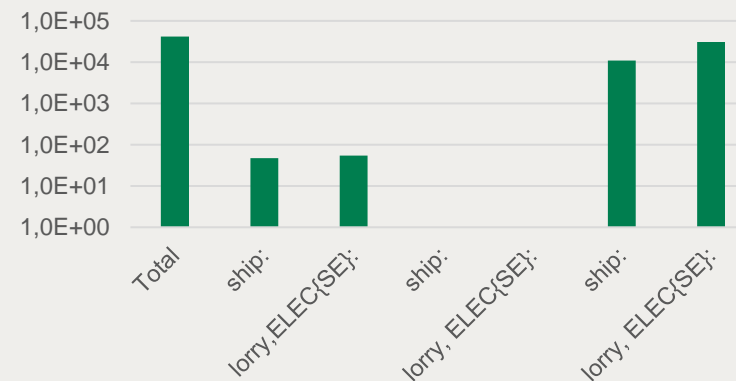
CO2 Saving in Total



CO2 Saving in Material

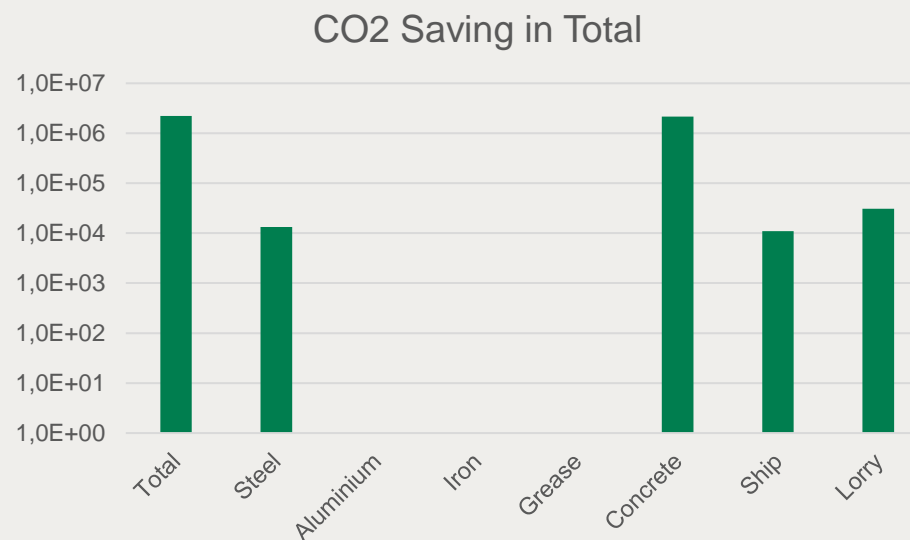


CO2 Saving in Transportation



Conclusion

- TenneT efforts to upgrade the existing overhead lines and minimizing CO2 is successful by utilizing the existing assets for high electricity transportation.
- Material is the biggest CO2 source at the Capex stage, and these efforts lead to successful emission reduction.



Thank you
DNV and TenneT



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