

ELECTRICITY NETWORK - MV											
Date of factsheet	21-1-2021										
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Sector	Infrastructure										
ETS / Non-ETS	Non-ETS										
Type of Technology	Network										
Description	A medium voltage (MV) network distributes power from the transmission system to the end-users. The MV lines range typically from 10 to 70 kV and 1 to 100 MW. Users that demand high amounts of power (400kW-5MW) can be connected directly to medium voltage [1]. Nevertheless, the distribution system will have a final voltage step down to deliver electricity at 400V. Typically medium voltage networks are composed of overhead lines. A single line describes a transmission or distribution cable connecting two points in the network, which has a specific rated capacity and unit costs.										
TRL level 2020	TRL 9 Commercial technology										
TECHNICAL DIMENSIONS											
Capacity	Functional Unit		Value and Range								
			Min		2030			Max			
Potential			Current		2030			2050			
			Min	Max	Min	Max	Min	Max	Min	Max	
Market share	%		-		-			-			
			Min	Max	Min	Max	Min	Max	Min	Max	
Capacity utilization factor	1.00										
Full-load running hours per year											
Unit of Activity											
Technical lifetime (years)	40.00										
Progress ratio											
Hourly profile											
Explanation	Non-OECD countries are expected to account for the majority of investments in transmission and distribution networks. Investments are required for grid expansion and to enable consumers to access electricity. In total, the length of the global transmission and distribution network is expected to increase from 25 Mkm in 2012 to 93 Mkm in 2035 [4].										
COSTS											
Year of Euro	2015										
Investment costs	Euro per Functional Unit		Current			2030			2050		
	mln. € / km		0.11	0.27	0.11	0.27	0.11	0.27	0.11	0.27	
Other costs per year	mln. € / km		-			-			-		
			Min	Max	Min	Max	Min	Max	Min	Max	
Fixed operational costs per year (excl. fuel costs)	mln. € / km		-			-			-		
			Min	Max	Min	Max	Min	Max	Min	Max	
Variable costs per year	mln. € /		-			-			-		
			Min	Max	Min	Max	Min	Max	Min	Max	
Costs explanation	Costs are based on cables designed to operate at 50 kV. The cost is calculated as the average cost between different network types such as rural and densely populated areas. The cost is calculated as the mean value between rural, dense and city areas. The cost shown is for a cable with a rated power of 50 MW. For the 50MW the costs are calculated as the average of two cable types with different cross-sections, i.e. 240 and 630 mm ² . Over the last years, prices have stabilized. Thus it is assumed that the medium voltage lines costs will remain similar. Increasing the operating voltage to 60kV can decrease the costs by a factor of 0,9 [1].										
ENERGY IN- AND OUTPUTS											
Energy carriers (per unit of main output)	Energy carrier	Unit	Current			2030			2050		
	Main output:		-0.99			-0.99			-0.99		
	Electricity	PJ	-0.99	-0.99	-0.99	-0.99	-0.99	-0.99	-0.99	-0.99	
	Electricity	PJ	1.00			1.00			1.00		
	Propane	PJ	Min	Max	Min	Max	Min	Max	Min	Max	
Energy in- and Outputs explanation			-			-			-		
			Min	Max	Min	Max	Min	Max	Min	Max	
Distribution systems account for the majority of the total transmission and distribution losses. Failure problems in distribution networks occur more often than transmission. Because of the configuration of MV networks which have more lines, these are more vulnerable to weather conditions, and other external events. The energy loss is similar in developed countries, i.e. around 5%, with the same infrastructure and population density [4]. For the Netherlands, distribution losses are about 4% [4], from which a part is due to cable losses and transformer losses. Cable losses represent <1% since most of the losses in the distribution network are in the transformers.											
MATERIAL FLOWS (OPTIONAL)											
Material flows	Material	Unit	Current			2030			2050		
			-			-			-		
			Min	Max	Min	Max	Min	Max	Min	Max	
Material flows explanation											
EMISSIONS (Non-fuel/energy-related emissions or emissions reductions (e.g. CCS))											
Emissions	Substance	Unit	Current			2030			2050		
			-			-			-		
			Min	Max	Min	Max	Min	Max	Min	Max	
			-			-			-		
			Min	Max	Min	Max	Min	Max	Min	Max	
Emissions explanation											
OTHER											
Parameter	Unit	Current			2030			2050			
		-			-			-			
		Min	Max	Min	Max	Min	Max	Min	Max		
		-			-			-			
		Min	Max	Min	Max	Min	Max	Min	Max		
		-			-			-			
		Min	Max	Min	Max	Min	Max	Min	Max		
Explanation											
REFERENCES AND SOURCES											
1 Energinet (2017). Technology Data – Energy transport.											
2 CE DELFT (2017). Net voor de Toekomst.											
3 PBL's ENSYSI Model Database.											
4 CEER (2017). CEER Report on Power Losses.											
5 IEA (2014). ETSAP. Electricity Transmission and Distribution.											
6 The World Bank. Electric power transmission and distribution losses.											
7 G. Celli et al (2017). Containment of power losses in LV networks with high penetration of distributed generation.											