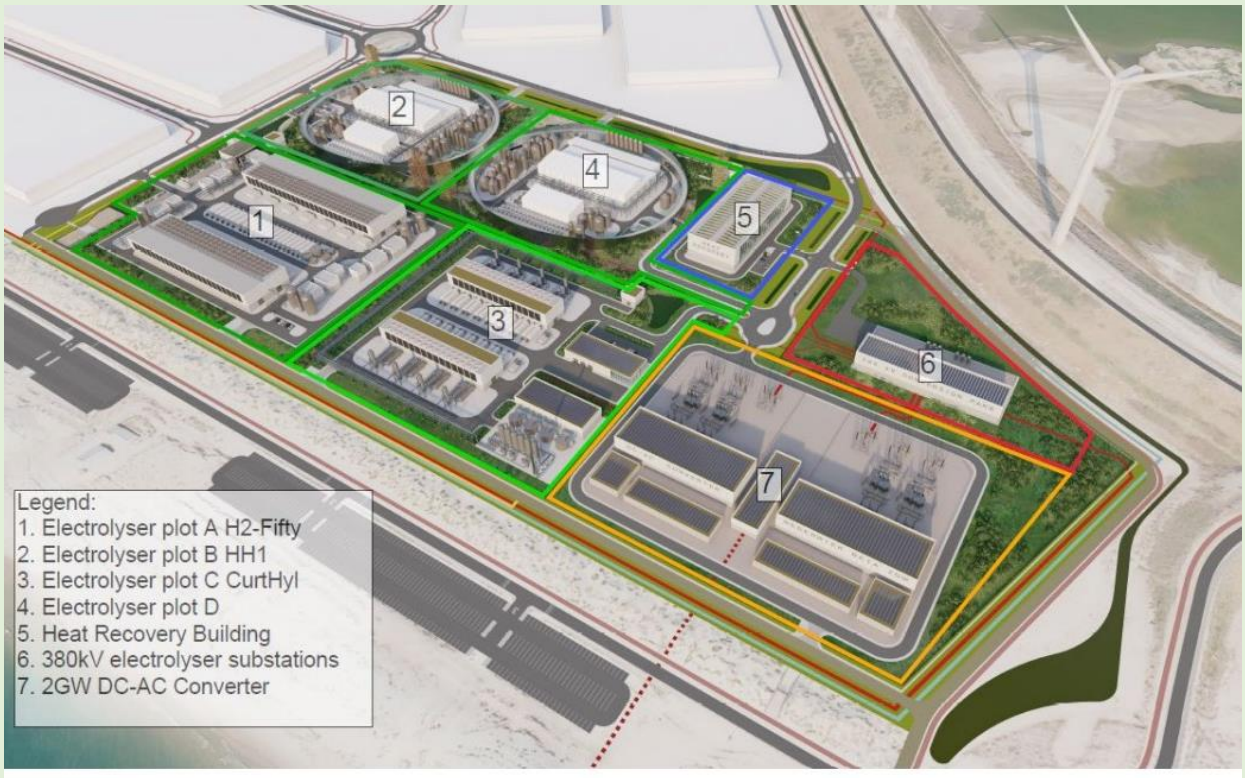
Green Hydrogen

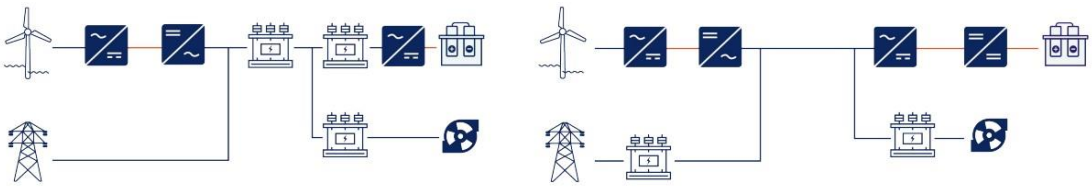
Electrical Converters



Artistic impression of power supply and green hydrogen production at a Conversion Park, Rotterdam Maasvlakte

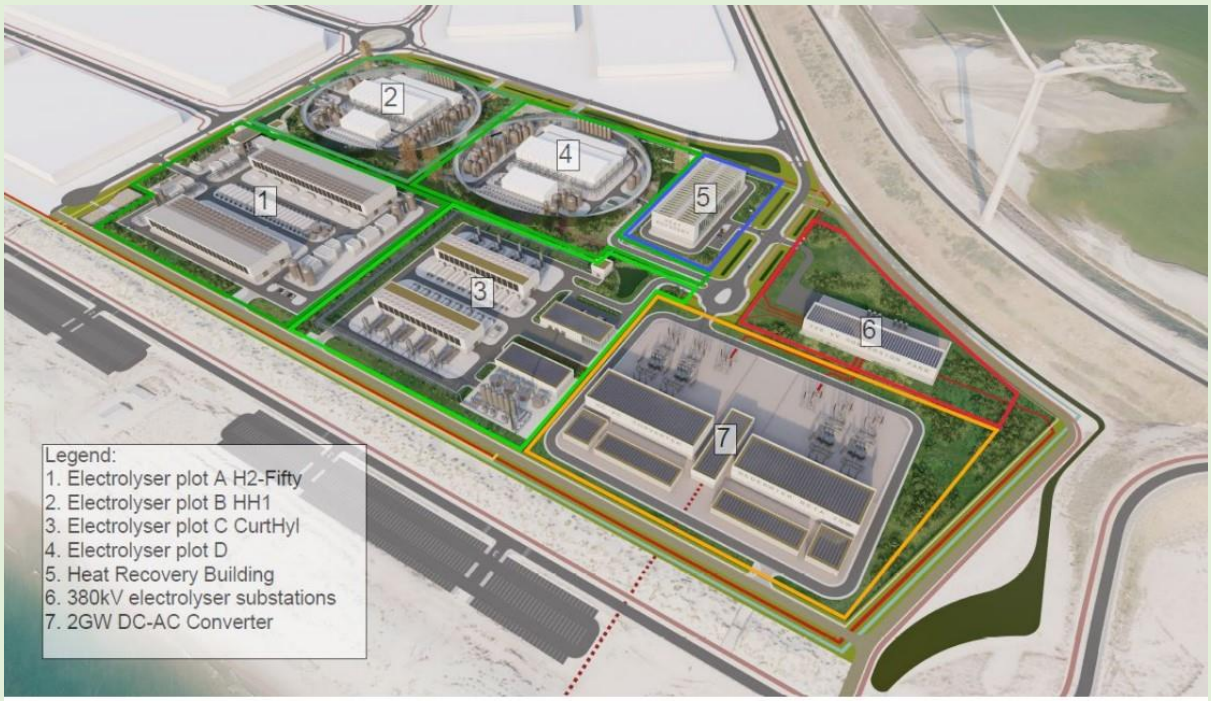
Institute for Sustainable Process Technology

DC | New electrical layout and converters for GW green hydrogen plant

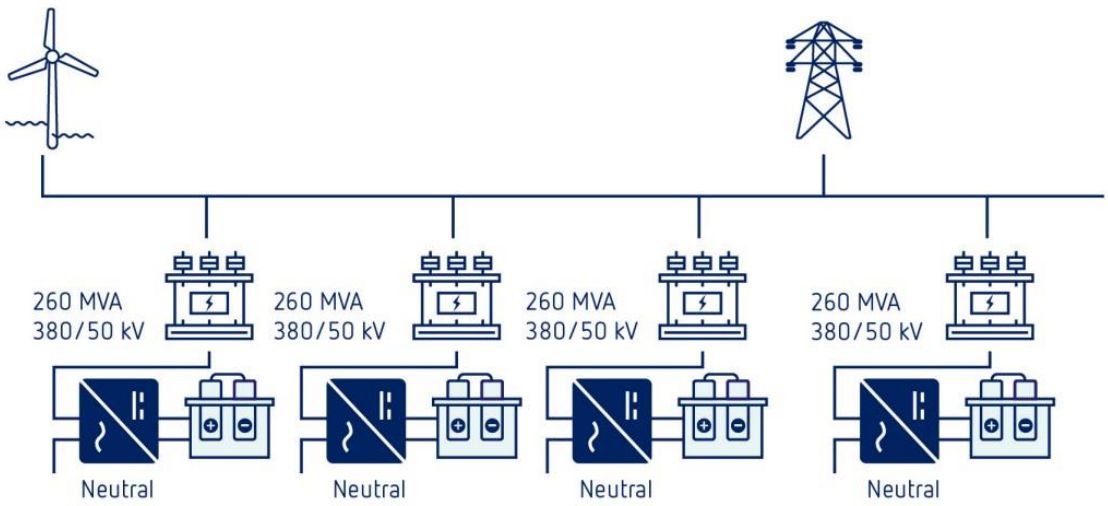


Hybrid electrical layouts with existing grid connection (left) and future connection with innovative converters (right) for a large scale green hydrogen plant with electrolysers and e-consumers

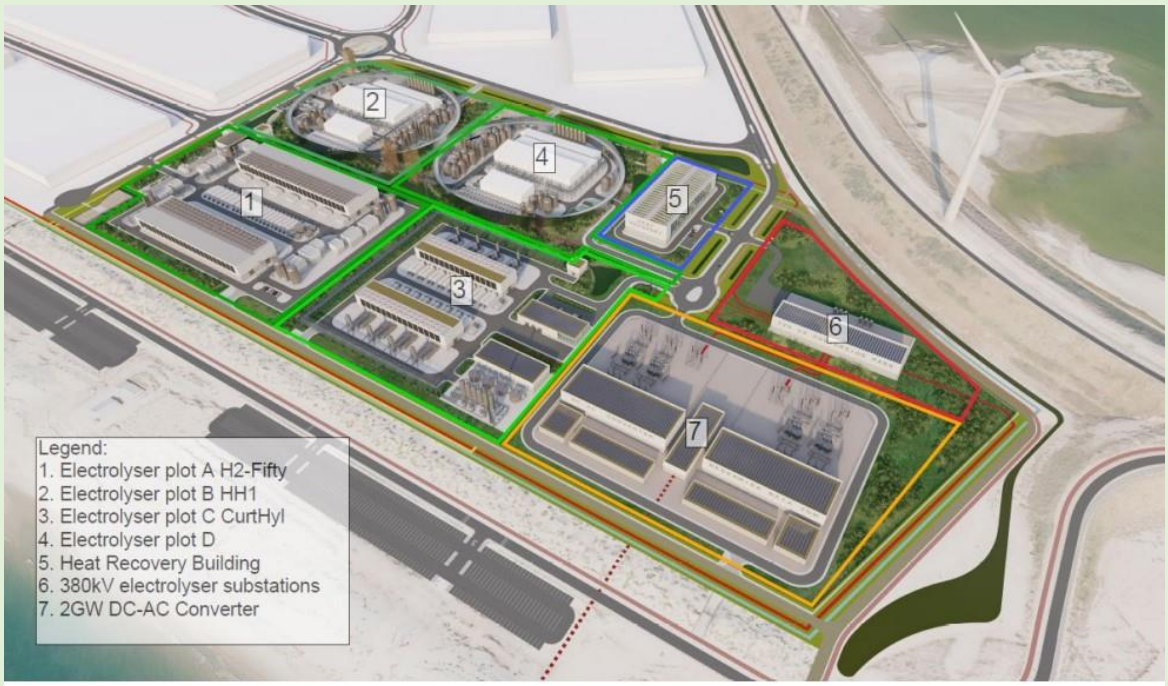
Charley Rattan Associates
Wind and hydrogen consultancy and training



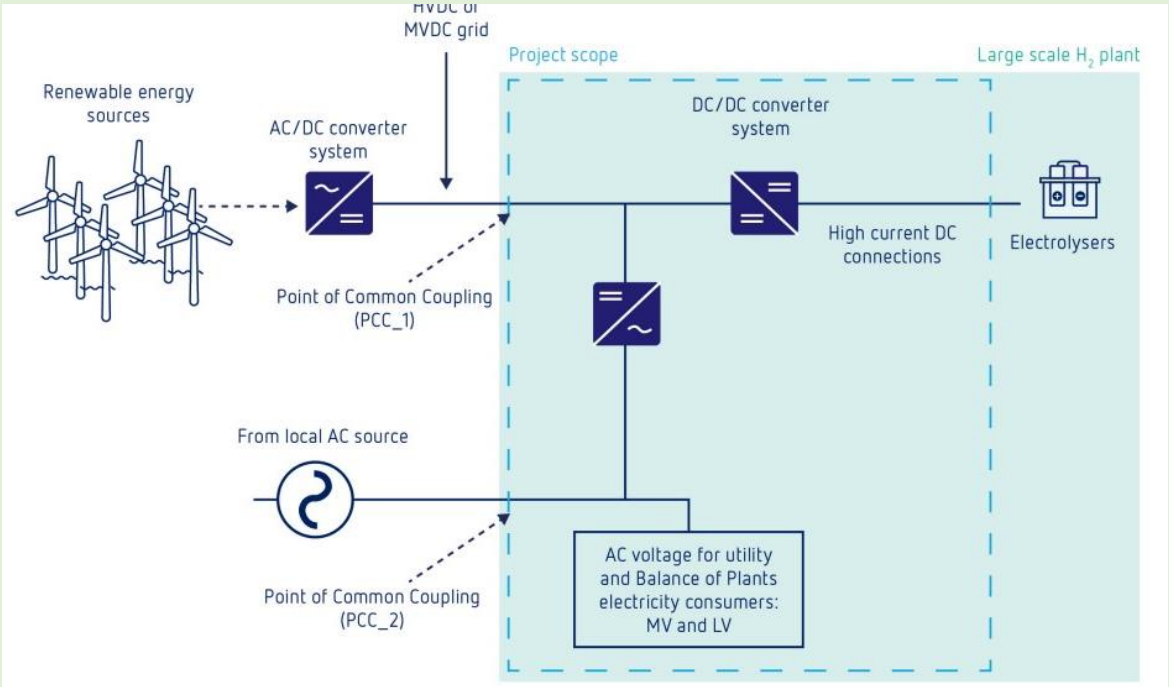
Artistic impression of power supply and green hydrogen production at a Conversion Park, Rotterdam Maasvlakte



. New electrical layout with proposed power converter scheme for a large-scale green hydrogen plant

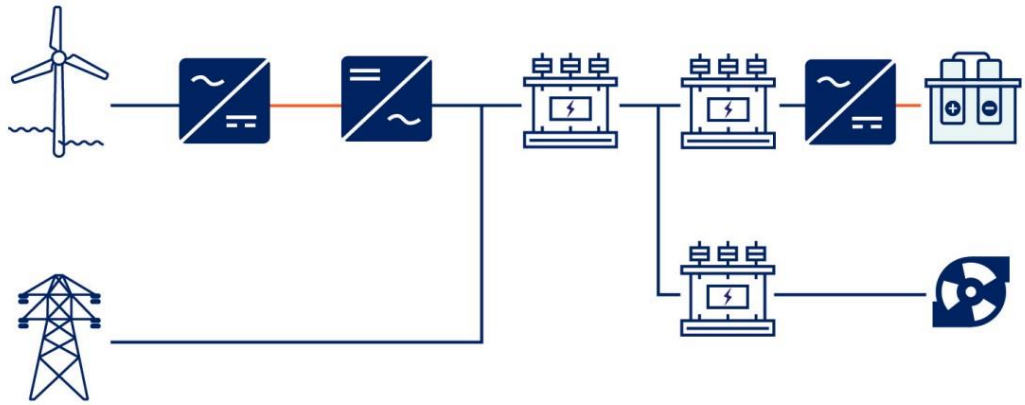


Artistic impression of power supply and green hydrogen production at a Conversion Park, Rotterdam



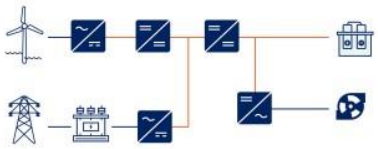
. Off-grid and grid connection of a large-scale green hydrogen plant

. Illustration of layout for advanced GW green hydrogen plant 2030

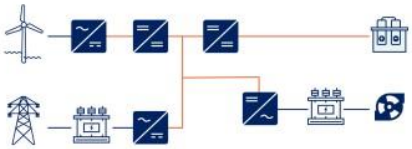


. Electrical layout with grid connection for a large scale green hydrogen plant

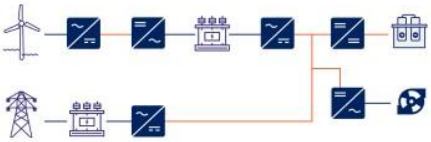
Option 1:
HVDC/MVDC, MVDC and LVDC/LVAC distribution



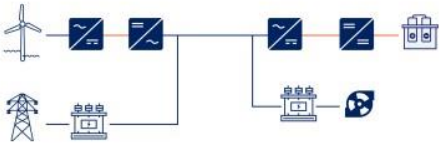
Option 2:
HVDC/MVDC, MVDC and LVDC distribution



Option 3:
MVAC/MVDC, MVDC and LVDC distribution



Option 4:
MVAC/MVDC, MVDC/LVDC distribution

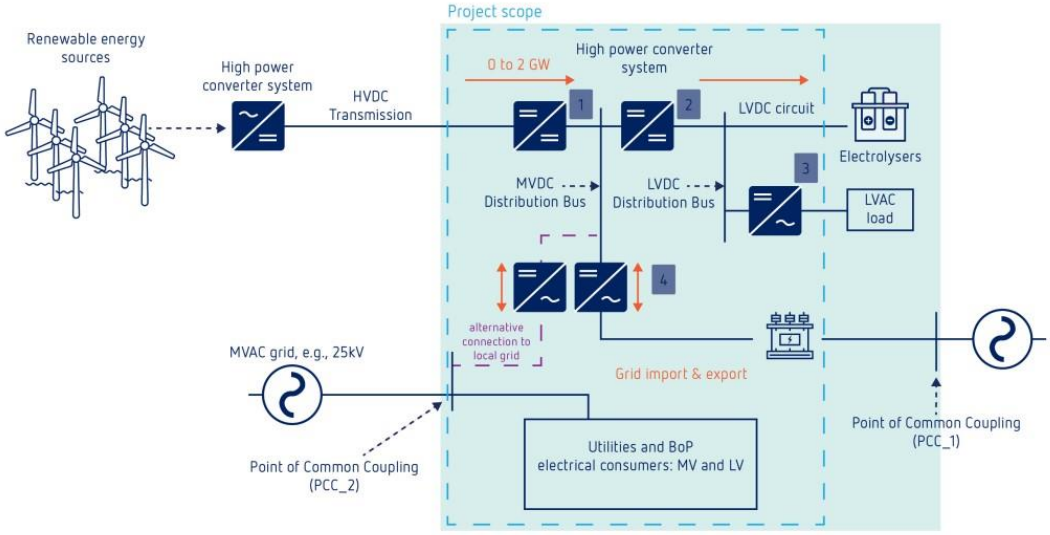


. Different hybrid options for electrical layout of a large scale green hydrogen plant

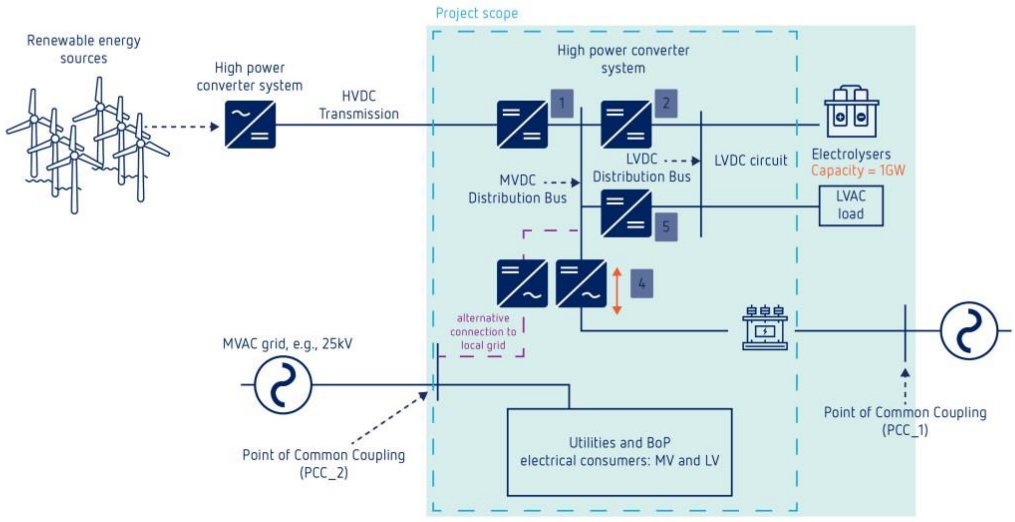
. Maturity level (TRL) of the different converter technologies

Nr.	Electrical layout	Option 1	Option 2	Option 3	Option 4
#	Converter type	HVDC/MVDC. MVDC and LVDC distribution	HVDC/MVDC. MVDC and LVAC distribution	MVAC/MVDC. MVDC and LVAC distribution	MVAC/MVDC. MVDC-LVDC distribution
1	HVDC/MVDC	-	-	NA	NA
2	MVDC/LVDC	0	0	0	NA
3	LVDC/LVAC	0	NA	NA	NA
4	MVAC/MVDC	0	0	0	NA
5	MVDC/LVAC	NA	0	0	NA
6	MVAC/MVDC	NA	NA	0	0
7	HVDC/HVAC/MVAC	NA	NA	+	+

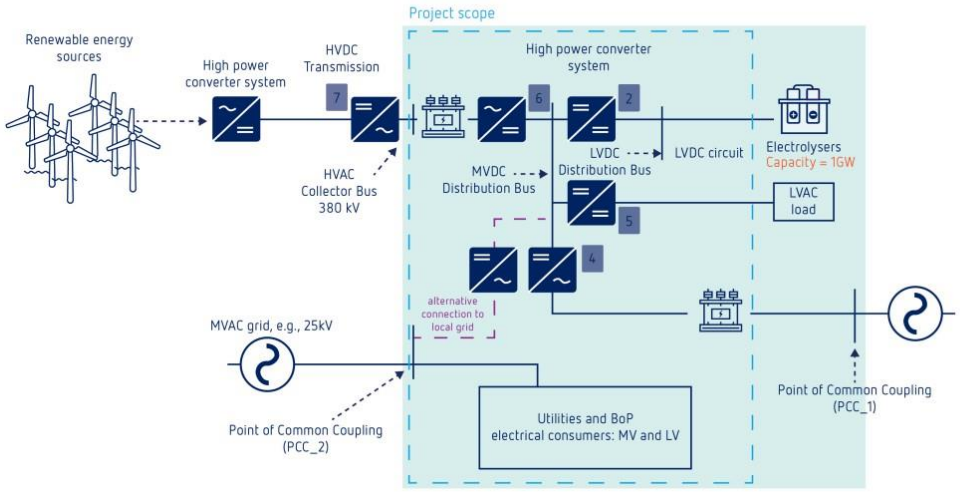
Option 1: HVDC / MVDC, MVDC and LVDC / LVAC distribution



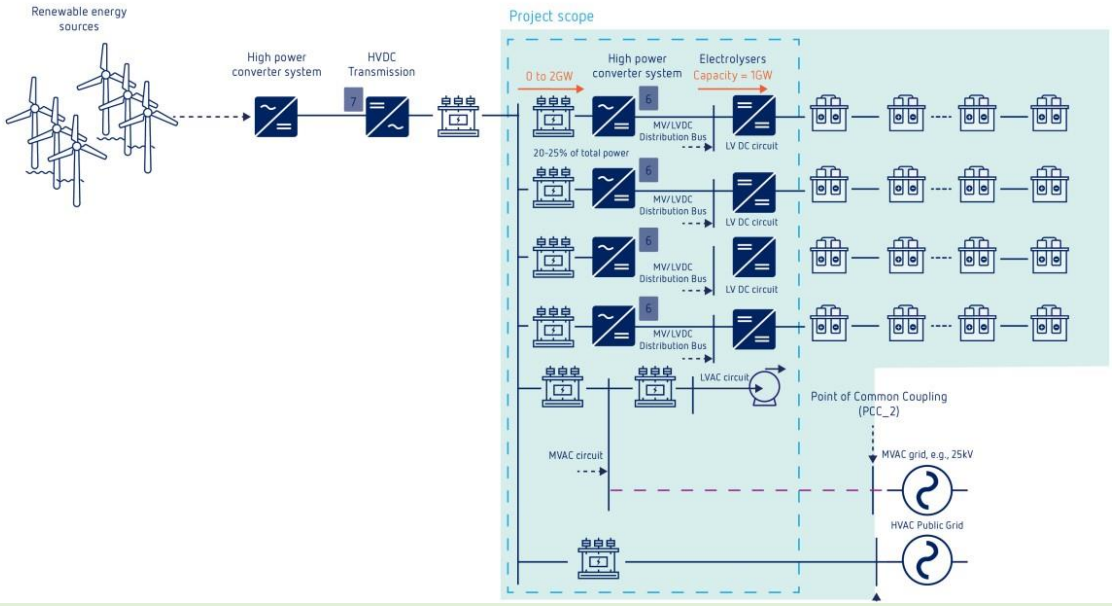
Option 2: HVDC / MVDC, MVDC and LVDC distribution



Option 3: MVAC/MVDC, MVDC and LVDC distribution

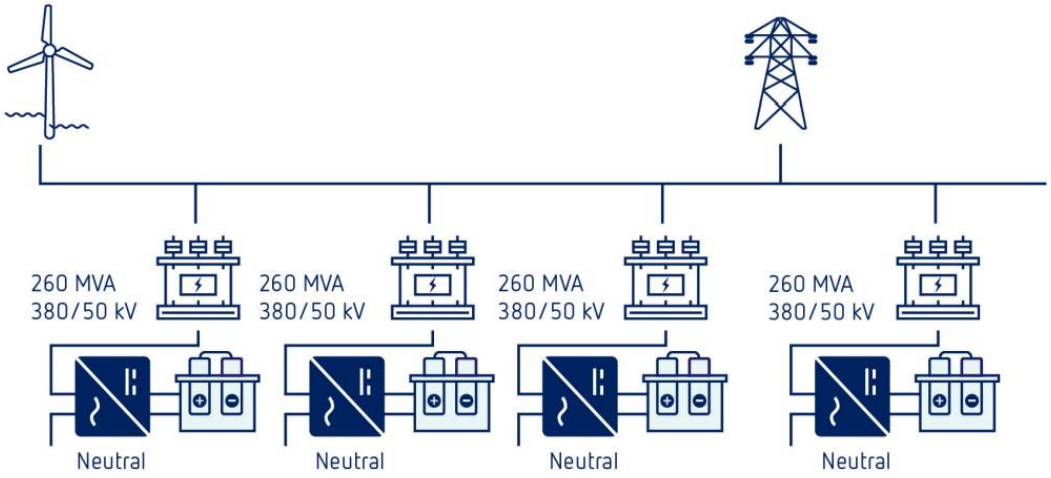


Option 4: MVAC/MVDC, MVDC/LVDC distribution



Qualitative assessment of the options with electrical layout and converter topologies

Electrical layout	Option 1	Option 2	Option 3	Option 4
Maturity (Table 1)	-	-	0	0
Evaluation criteria	HVDC/MVDC. MVDC and LVDC distribution	. HVDC/MVDC. MVDC and LVAC distribution	MVAC/MVDC. MVDC and LVAC distribution	MVAC/MVDC. MVAC and LVAC distribution
Efficiency	0	0	-	+
Reliability	0	0	-	+
Footprint	0	0	-	+
Harmonics & filtering	0	0	0	0
Personal safety	0	0	0	0
Total Costs of Ownership	-	-	0	+



New electrical layout with proposed power converter scheme for a large-scale green hydrogen plant

. Electrical performance conventional and new electrical layout and converter topologies

Electrical layout	Conventional	New
Evaluation criteria	Based on GW design[14]	New layout (option 4) and converter design
Efficiency [15]	97.94%	98.68%
Reliability	0	+
Footprint	0	30% reduction of electrical plot
Harmonics emissions	0	80% improvement
Power factor	STATCOM required	No additional compensation needed
CAPEX and OPEX	0	t.b.d.

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Hydrogen Networks

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