Project Sheet

Beznau - Tiengen

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Key Information

Cross Border Project
AC transmission line
Upgrade

Under Consideration

Description

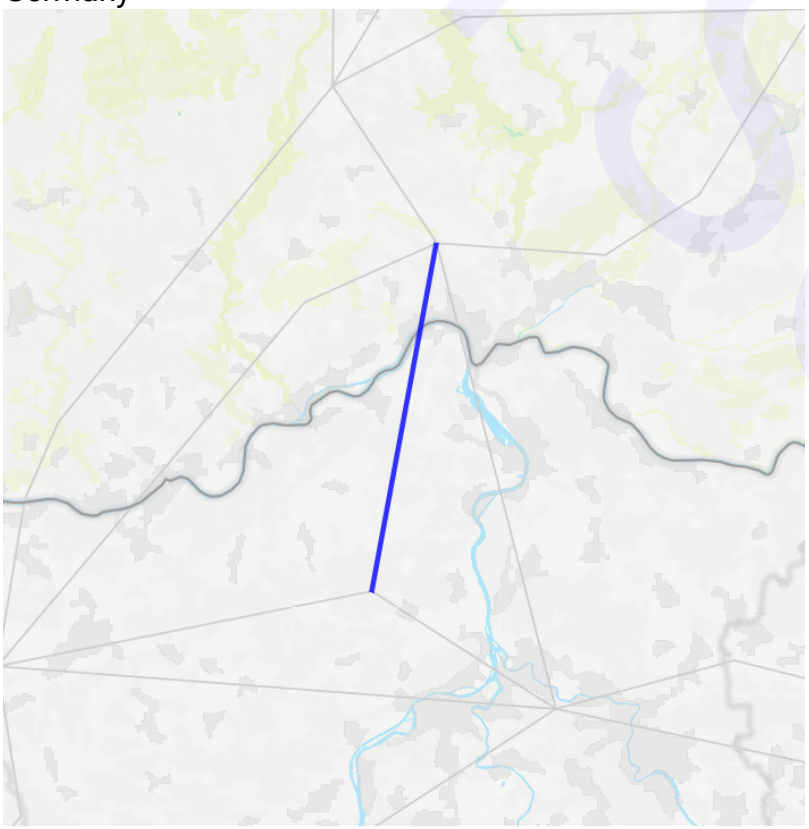
This project comprises the upgrade of a 220 kV crossborder line to 380 kV between the substations of Tiengen (DE) and Beznau (CH).

Project promoters

AMPRION
SWISSGRID

Countries

Switzerland
Germany



National development plan(s)

NDP1, Germany, Netzentwicklungsplan 2030 Version 2019, Project 204, p. 515

Additional information on the project

https://www.netzentwicklungsplan.de/sites/default/files/paragraphs-files/Basispraesentation_NEP_2030_V2019_2_Entwurf.pdf

The project was part of the previous TYNDP 2018, Link to the Website: https://tyndp.entsoe.eu/tyndp2018/projects/projects/231

Project sheet backlog

6 Nov. 2020 - Publication as part of the draft TYNDP 2020 package for consultation

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Project Description & Context

Project Investments

Main investment(s): This projects helps to increase the cross border capacity between Switzerland and Germany by upgrading an existing line from 220 kV to 380 kV including internal reinforcements.

Type of element	Total route length (km)	From substation 1	To substation 2	Present status	Commissioning year	Progress of the investment	Explanation in case of delay or reclustering
AC transmission line	11	Beznau (CH)	Tiengen (DE)	Under Consideration	2030	Investment on time	

Is the project in the reference grid?

No

System Needs addressed by the project

Project promoter(s) selected up to 4 system needs that are addressed by their project in a predefined list. Available needs ranged from reduction of price differentials between countries, improvement of system flexibility and stability, enabling cost-efficient connection of high volumes of RES, improvement of voltage stability...
As part of the TYNDP 2020, ENTSO-E released a study investigating cross-border system needs in the 2030 and 2040 horizons.

Need		How the project addresses each need (explanation provided by the project promoter(s))
	Infrastructure to reduce price differentials between EU and/or non-EU countries	This project contributes to lowering the price differentials between Switzerland on the one hand and Germany and Austria on the other hand.
	Infrastructure to address system adequacy deficiencies and/or mitigate the risk of power failures.	This project contributes to the adequacy in view of the nuclear phase-out and the development of renewables and pump hydro storage devices.
	Infrastructure to facilitate and accommodate future scenarios, cross-border flows or loop flows.	This project is located in a highly meshed part of the transmission grid and therefore helps accommodate such flows.

Interconnection targets

In 2017, the Interconnection Target Expert Group proposed alternative indicators to the 15% interconnection criteria for every country and electrified island with a new methodology developed collaboratively between the European Commission, ENTSO-E, ENTSOG, industry, universities and other experts. The methodology is based on three indicators:
1. Price differential between EU countries, with an objective to reduce it below 2 EUR/MWh
2. Ratio between nominal transmission capacity and installed RES capacity, with a target of past 30%
3. Ratio between nominal transmission capacity and peak load, with a target of past 30%

The following maps show the ITEG methodology applied to the TYNDP 2030 scenarios, with the 2020 grid.

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Project Assessment

Transfer capacity increase (National Trends 2025)

	Border	A B	B A
Transfer capacity increase (in MW)	Switzerland - Germany	100	600

CBA results

ENTSO-E has assessed the benefits delivered by each project in 2025 (scenario National Trends 2025) and in 2030 (three scenarios: National Trends, Distributed Energy and Global Ambition). Indicators B1 to B6 were computed by ENTSO-E, while promoters had the possibility to compute and submit so-called project-level benefits (B7 to B10). The benefits must be understood as benefits for Europe as a whole, not for the promoters of the project.
Results are presented per scenario.

Central scenario: National Trends

National Trends is the central policy scenario of the TYNDP2020, designed to reflect EU member state's National Energy and Climate Plans (NECP), in line with the requirement to meet current European 2030 energy strategy targets.

			Comparison of the COP21 scenarios with NT2030 average result		
	NT2025	**NT2030**	**DE2030 is < or > than NT2030**	**GA2030 is < or > than NT2030**	

Increase in socio-economic welfare

B1 Annual Socio-Economic Welfare (SEW) increase (M € / year)	max average min	26 16 10	40 32 24	<	<	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	max average min	5 2 1	17 12 7	<	>	ENTSO-E assessment
B1_RES Annual Socio-Economic	max average	11 9	26 25	<	<	ENTSO-E assessment

Welfare increase resulting from RES integration	min	7	23			

Reduction of CO2 and GHG emissions

B4 Non-CO2 emissions (kg/year)

B4a Nitrogen oxides	average	-136	-290	n/a	n/a	ENTSO-E assessment
B4b Ammonia	average	1	9	n/a	n/a	ENTSO-E assessment
B4c Sulfur dioxide	average	-39	-135	n/a	n/a	ENTSO-E assessment
B4d Particular matter 5	average	1439	-1592	n/a	n/a	ENTSO-E assessment
B4e Particulate matter 10	average	2	4	n/a	n/a	ENTSO-E assessment
B4f Non-methane volatile organic compounds	average	1452	-1559	n/a	n/a	ENTSO-E assessment

B2a Annual CO2 variation from market simulation (ktonnes / year)	max average min	-45 -101 -208	-267 -443 -590	>	<	ENTSO-E assessment
B2a_€ Annual Societal cost variation resulting from CO2 variation from market simulation monetised (M € / year)	CO2 price 60€/ ton 100€/ ton 189€/ ton	4 8 17	14 32 71	< < <	< < <	ENTSO-E assessment
B2b Annual CO2 variation due to network losses (ktonnes / year)	average	126	78	n/a	n/a	ENTSO-E assessment
B2b_€ Annual Societal cost variation resulting from	CO2 price 60€/ ton 100€/	-5 -10 -21	-3 -6 -13	n/a	n/a	ENTSO-E assessment

CO2 variation from network simulation monetised (M € / year)	ton 189€/ ton					

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)	max average min	214 177 141	703 652 581	<	<	ENTSO-E assessment
B3a Connected RES (MW)	-			n/a	n/a	ENTSO-E assessment

Impact on grid losses

B5 Variation of network losses (GWh / year)	average	273	315	n/a	n/a	ENTSO-E assessment
B5_€ Variation of network losses monetised (M€ / year)	average	8	5	n/a	n/a	ENTSO-E assessment

Security of supply

B6 Annual reduction in Energy Not Served (MWh / year)	max average min		586	n/a	n/a	ENTSO-E assessment
B6_€ Annual Socio-Economic Welfare increase resulting from reduction in Energy Not Served monetised (M€ / year)	average	n/a	5.86	>	n/a	ENTSO-E assessment

Scenarios: Distributed Energy & Global Ambition

DE and GA are two scenarios created in line with the COP21 targets to understand the impact on infrastructure needs agains different pathways reducing EU-28 emissions to net-zero by 2050. For these two scenarios, projects were assessed with a subset of CBA parameters.

		DE2030	GA2030	

Increase in socio-economic welfare

B1 Annual Socio-Economic Welfare (SEW) increase (M€ / year)	average	25	32	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	average	11	16	ENTSO-E assessment
B1_RES Annual Socio-Economic Welfare increase resulting from RES integration	average	17	22	ENTSO-E assessment

Reduction of CO2 and GHG emissions

B2a Annual CO2 variation from market simulation (ktonnes / year)	average	-210	-454	ENTSO-E assessment
B2a_€ Annual Societal cost variation resulting from CO2 variation from market simulation monetised (M€ / year)	CO2 price 60€/ ton 100€/ ton 189€/ ton	1 10 29	11 30 70	ENTSO-E assessment

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)	average	345	516	ENTSO-E assessment
B3a Connected RES (MW)	-			ENTSO-E assessment

Non scenario-dependent indicator(s)

B8.0 Stability (Transient, Voltage and Frequency Stability)	Transient stability	Voltage stability	Frequency stability	
380 kV Grid Reinforcement Beznau - Tiengen (AC line high temperature conductor/ conductor replacement (e.g., duplex to triplex))	-	-	0	Qualitative assessment by ENTSO-E based on information on the project technology provided by the project promoter(s). This indicator is not dependent on scenarios or time horizons.

Sensitivity Study: Current Trends

'Current Trends' describes a future where the energy transition is slower than planned.

	CT2030	

Increase in socio-economic welfare

B1 Annual Socio-Economic Welfare (SEW) increase (M€ / year)	average	19	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	average	5	ENTSO-E assessment
B1_RES Annual Socio-Economic Welfare increase resulting from RES integration	average	12	ENTSO-E assessment

Reduction of CO2 and GHG emissions

B2a Annual CO2 variation from market simulation (ktonnes / year)	average	-195	ENTSO-E assessment
B2a_€ Annual Societal cost variation resulting from CO2 variation from market	CO2 price 60€/ ton 100€/ ton 189€/	6 14 31	ENTSO-E assessment

simulation monetised (M€ / year) ton		

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year) average	223	ENTSO-E assessment
B3a Connected RES (MW) -		ENTSO-E assessment

Residual impact

Information on the residual impact of the project was provided by the project promoter(s).

Residual environmental impact

Investment	Investment status	Distance (km)	Type of sensitivity

Note based on CBA Guideline 3.0: Given that the actual route of the project might not be defined due to the low degree of maturity of its investment(s), an environmental assessment is not yet available.

Residual social impact

Investment	Investment status	Distance (km)	Type of sensitivity

Note based on CBA Guideline 3.0: Given that the actual route of the project might not be defined yet because of the low degree of maturity of its investment(s), a residual social impact assessment is not yet available.

Project Costs

The project costs were provided by the project promoter(s).

	CAPEX (Meuro)	Uncertainty range (%)	OPEX
1282. 380 kV Grid Reinforcement Beznau - Tiengen	58	10%	0.304
Total	58		0.304

Explanation provided by the project promoter on the CAPEX uncertainty range:

1282 Uncertainty range is needed due to uncertainties in material costs, permitting issues and unknown final routing in case of project in early planning status.