Project Sheet

Lake Constance East

Project type	transmission
Project id	263
Created by	
Created on	Feb 11, 2021 11:42:25 AM

Index

Key Information 3
Description 3
Project Description & Context 5
Project Investments 5
System Needs addressed by the project 6
Interconnection targets 6
Project Assessment 10
Transfer capacity increase (National Trends 2025) 10
CBA results 10
Central scenario: National Trends 10
Scenarios: Distributed Energy & Global Ambition 13
Non scenario-dependent indicator(s) 14
Sensitivity Study: Current Trends 14
Residual impact 15
Project Costs 15

ENTSOE

Key Information

Cross Border Project
AC transmission line
Mostly New

Under Consideration

Description

This project increases the capacity between CH and its neighbours DE and AT. This enables to connect large renewable generation in Northern Europe to consumers and pump storage devices in the Alps, thus noticeably increasing the mutual balancing between both regions.

Project promoters

SWISSGRID
VUEN

Countries

Austria
Switzerland
Germany

National development plan(s)

https://www.swissgrid.ch/dam/swissgrid/projects/strategic-grid/sg2025-technical-report-de.pdf , Switzerland, 2015 - NDP VUEN, Austria, NDP Nr. 4/2019, 16, http://www.vuen.at/

Additional information on the project

This project further integrates Alpine storage and pump storage power plants.

Project sheet backlog

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

ENTSO-E

Project Description & Context

Project Investments

Main investment(s): Voltage increase of all existing lines to 380 kV (without an increase of the line cross-section) and 2 new 380/22'0 kV transformers in Bürs

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	1	Rüthi	Border area (DE-AT)	Under Consideration	2035	Investment on time	

Other investments

Description	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
Integration of the new 380 kV tie-line Rüthi (CH) - Meiningen (AT) through optimisations between Rüthi and Mettlen, Rüthi and Bonaduz and the construction of a new 380 kV substation and a new 380/220 kV transformer in Rüthi.	AC transmission line	1	Rüthi	Mettlen & Bonaduz	Under Consideration	2035	Investment on time	

Reason for investment clustering

The clustering of investments Rüthi - Bonaduz/Mettlen and Vorarlberg enables to show the full benefit of both investments (one investment cannot perform its intended function without the

realization of the other investment).

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.

ENTSOE

ENTSOE

ENTSOE

Project Assessment

Transfer capacity increase (National Trends 2025)

	Border	A B	B A
Transfer capacity increase (in MW)	Austria - Switzerland	100	200
Transfer capacity increase (in MW)	Switzerland - Germany	600	250
Transfer capacity increase (in MW)	Austria - Germany	1000	1000

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.

Because its planned commissioning date is in 2035 or later, this project has only been assessed in the 2030 scenarios and based on a subset of CBA indicators.

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	22 21 20	79 74 70	>	<	ENTSO-E assessment
B1_CO2 Annual Socio-Economic	max average	9 7	30 25	>	>	ENTSO-E assessment

Welfare increase resulting from CO2 emissions reduction	min	5	20			
B1_RES Annual Socio-Economic Welfare increase resulting from RES integration	max average min	14 13 12	43 42 37	<	<	ENTSO-E assessment

Reduction of CO2 and GHG emissions

B4 Non-CO2 emissions (kg/year)

B4a Nitrogen oxides	average	N/A	-276	n/a	n/a	ENTSO-E assessment
B4b Ammonia	average	N/A	53	n/a	n/a	ENTSO-E assessment
B4c Sulfur dioxide	average	N/A	51	n/a	n/a	ENTSO-E assessment
B4d Particular matter 5	average	N/A	6532	n/a	n/a	ENTSO-E assessment
B4e Particulate matter 10	average	N/A	41	n/a	n/a	ENTSO-E assessment
B4f Non-methane volatile organic compounds	average	N/A	6591	n/a	n/a	ENTSO-E assessment

B2a Annual CO2 variation from market simulation (ktonnes / year)	max average min	-221 -298 -375	-703 -891 -1074	>	<	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	11 23 49	29 64 143	< < <	< < >	ENTSO-E assessment
B2b Annual CO2 variation due to network losses	average	0	0	n/a	n/a	ENTSO-E assessment

(ktonnes / year)						
B2b_€ Annual Societal cost variation resulting from CO2 variation from network simulation monetised (M € / year)	CO2 price	60€/ ton 100€/ ton 189€/ ton	0 0 0	0 0 0	n/a	n/a	ENTSO-E assessment

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)	max average min	273 263 254	1176 1062 964	<	<	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	N/A	0	n/a	n/a	ENTSO-E assessment
B5_€ Variation of network losses monetised (M€ / year)	average	N/A	0	n/a	n/a	ENTSO-E assessment

Security of supply

B6 Annual reduction in Energy Not Served (MWh / year)	max average min		N/A	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	N/A	>	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	79	70	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	average	40	35	ENTSO-E assessment
B1_RES Annual Socio-Economic Welfare increase resulting from RES integration	average	32	35	ENTSO-E assessment
Reduction of CO2 and GHG emissions				
B2a Annual CO2 variation from market simulation (ktonnes / year)	average	-757	-989	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	5 36 103	25 64 152	ENTSO-E assessment
Integration of renewable energy sources				
B3 Annual avoided curtailment (RES integration) (GWh / year)	average	580	796	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	
Rüthi - Bonaduz/Mettlen (New AC line)	++	++	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.
Vorarlberg (New AC line)	++	++	0	

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	32	ENTSO-E assessment
B1_CO2 Annual Socio-Economic Welfare increase resulting from CO2 emissions reduction	average	11	ENTSO-E assessment
B1_RES Annual Socio-Economic Welfare increase resulting from RES integration	average	20	ENTSO-E assessment

Reduction of CO2 and GHG emissions

B2a Annual CO2 variation from market	average	-396	ENTSO-E assessment

simulation (ktonnes / year)			
B2a_€ Annual Societal cost variation resulting from CO2 variation from market simulation monetised (M€ / year)	CO2 price	60€/ ton 100€/ ton 189€/ ton	13 29 64	ENTSO-E assessment

Integration of renewable energy sources

B3 Annual avoided curtailment (RES integration) (GWh / year)	average	364	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
Rüthi - Bonaduz/Mettlen	Under Consideration	0	
Vorarlberg	Under Consideration	0	

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.

Project Costs

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

	CAPEX (Meuro)	Uncertainty range (%)	OPEX
1258. Rüthi - Bonaduz/Mettlen	71	10%	0.35
1583. Vorarlberg	300	10%	1.5
Total	371		1.85

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

1258	unknown outcome of the tendering process
1583	The uncertainty range is due to uncertainties in material costs, permitting issues and unknown final routing.

ENTSO-E