ENGINEERING DEPARTMENT

Cooling and ventilation studies

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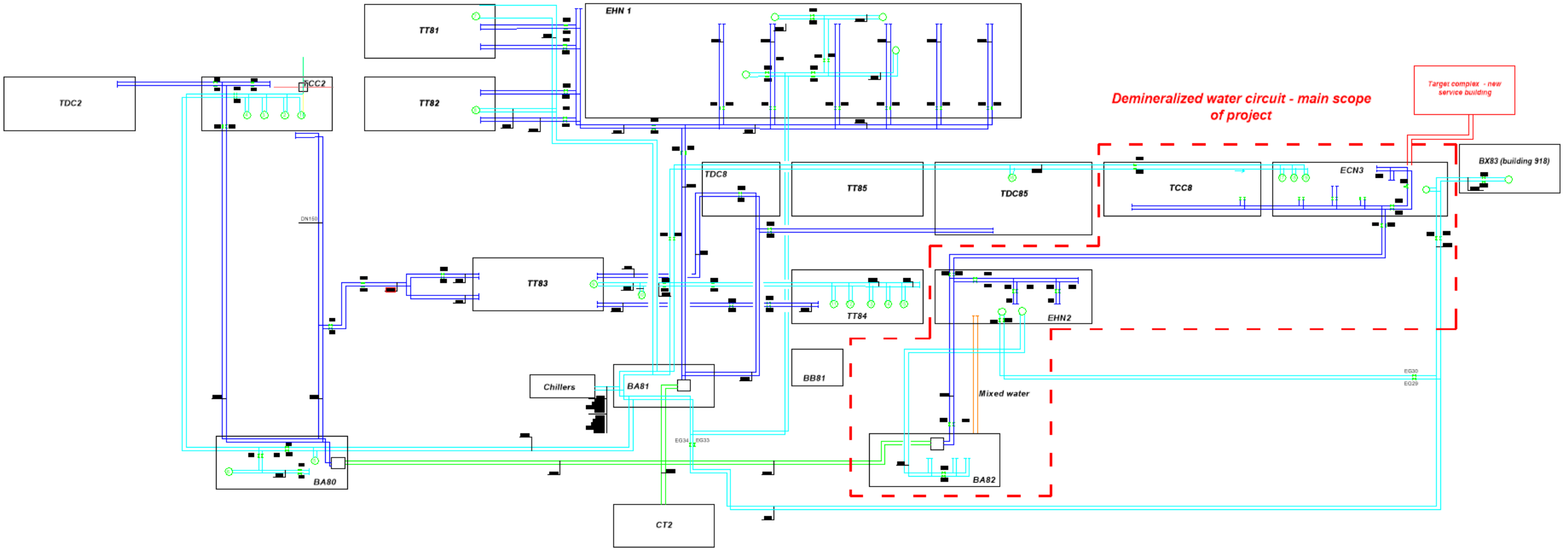
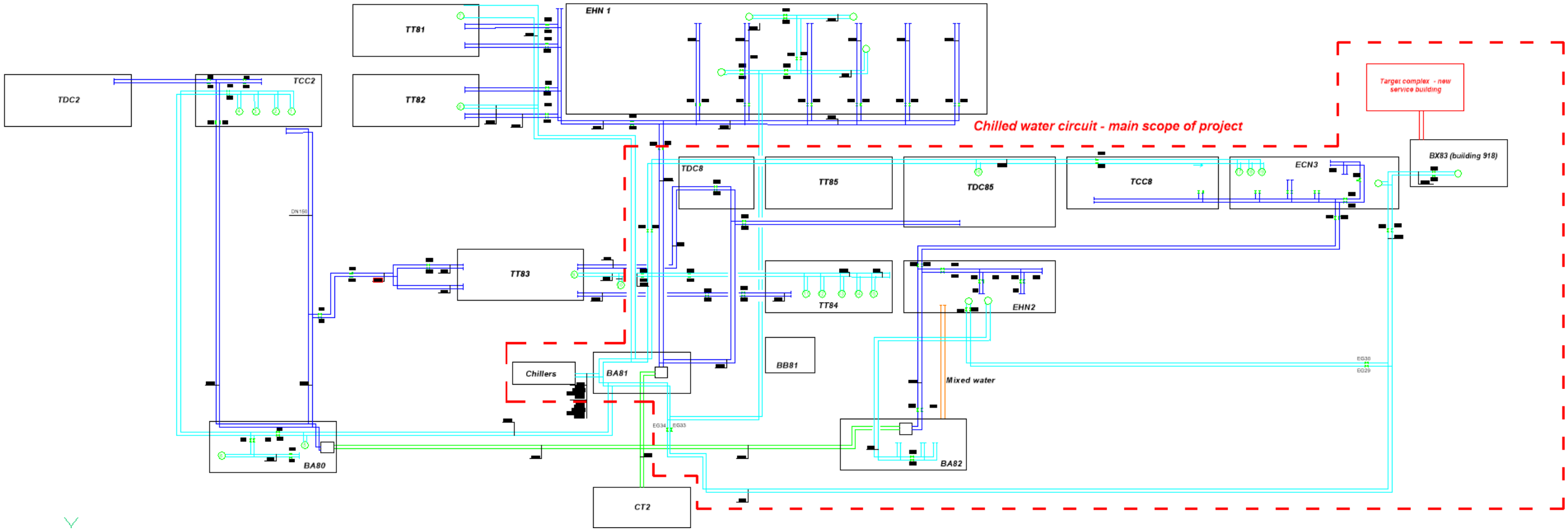
HI-ECN3 WP4 – TARGET COMPLEX – COORDINATION MEETING #8 – 30.01.2025.

BA82 building: Current cooling station



BA82 building: Current cooling station



BA82 building: Current cooling station

Demineralized water – Now, given by Users

							Cooling parameters									
WP related	Site	Building	Position / room	User (Dep/Group)	Equipment	Number of equipment	T_{in}	T_{out}	Flow / unit		Dissipated power / unit	Total dissipated Power	Pmax	Pressure drop	Total flow	Type of water
							(°C)	(°C)	(l/min)	(m3/h)	(kW)	(kW)	(bar)	(bar)	(m3/h)	
					Magnets											
MBHHE.X1010051	Prevessin	TCC8	ECN3	TE/MSC	PXMBHHEHWC	1	26	42	118	7.1	0.5	0.5	30	15	7.1	Demineralized
MBHHE.X1010054	Prevessin	TCC8	ECN3	TE/MSC	PXMBHHEHWC	1	26	42	118	7.1	0.5	0.5	30	15	7.1	Demineralized
MBHHE.X1010057	Prevessin	TCC8	ECN3	TE/MSC	PXMBHHEHWC	1	26	42	118	7.1	0.5	0.5	30	15	7.1	Demineralized
MCXCA.X1010011	Prevessin	TCC8	ECN3	TE/MSC	PXMCXCAHWC	1	26	48	11	0.7	18.1	18.1	30	15	0.7	Demineralized
MCXCA.X1010049	Prevessin	TCC8	ECN3	TE/MSC	PXMCXCAHWC	1	26	48	11	0.7	18.1	18.1	30	15	0.7	Demineralized
MCXCA.X1010059	Prevessin	TCC8	ECN3	TE/MSC	PXMCXCAHWC	1	26	48	11	0.7	18.1	18.1	30	15	0.7	Demineralized
MTR.X1010017	Prevessin	TCC8	ECN3	TE/MSC	SPMTR__HWP	1	26	35	66	4.0	33.0	33.0	30	15	4.0	Demineralized
MTR.X1010021	Prevessin	TCC8	ECN3	TE/MSC	SPMTR__HWP	1	26	35	66	4.0	33.0	33.0	30	15	4.0	Demineralized
MTR.X1010029	Prevessin	TCC8	ECN3	TE/MSC	SPMTR__HWP	1	26	35	66	4.0	33.0	33.0	30	15	4.0	Demineralized
MTR.X1010033	Prevessin	TCC8	ECN3	TE/MSC	SPMTR__HWP	1	26	35	66	4.0	33.0	33.0	30	15	4.0	Demineralized
QNL.X1010036	Prevessin	TCC8	ECN3	TE/MSC	SPQNL__8WP	1	26	46	28	1.7	14.0	14.0	30	15	1.7	Demineralized
QNL.X1010041	Prevessin	TCC8	ECN3	TE/MSC	SPQNL__8WP	1	26	46	28	1.7	17.8	17.8	30	15	1.7	Demineralized
QNL.X1010046	Prevessin	TCC8	ECN3	TE/MSC	SPQNL__8WP	1	26	46	28	1.7	14.0	14.0	30	15	1.7	Demineralized
QNL.X1010061	Prevessin	TCC8	ECN3	TE/MSC	SPQNL__8WP	1	26	46	28	1.7	7.8	7.8	30	15	1.7	Demineralized
QNRB.X1010005	Prevessin	TCC8	ECN3	TE/MSC	SPQNRB_8WP	1	26	47	27	1.6	3.6	3.6	30	15	1.6	Demineralized
QNRB.X1010009	Prevessin	TCC8	ECN3	TE/MSC	SPQNRB_8WP	1	26	47	27	1.6	14.5	14.5	30	15	1.6	Demineralized
QNRB.X1010013	Prevessin	TCC8	ECN3	TE/MSC	SPQNRB_8WP	1	26	47	27	1.6	8.1	8.1	30	15	1.6	Demineralized
MBHHJ.X1010249	Prevessin	ECN3	ECN3	TE/MSC	PXMBHHJHWC	1	26	42	118	7.1	147.1	147.1	30	15	7.1	Demineralized
MBXHD.X1010082	Prevessin	ECN3	ECN3	TE/MSC	PXMBXHDCWP	1	26	56	62	3.7	54.7	54.7	30	15	3.7	Demineralized
MBXHD.X1010085	Prevessin	ECN3	ECN3	TE/MSC	PXMBXHDCWP	1	26	56	62	3.7	55.5	55.5	30	15	3.7	Demineralized
MBXHD.X1010095	Prevessin	ECN3	ECN3	TE/MSC	PXMBXHDCWP	1	26	56	62	3.7	55.1	55.1	30	15	3.7	Demineralized
MBXHD.X1010098	Prevessin	ECN3	ECN3	TE/MSC	PXMBXHDCWP	1	26	56	62	3.7	55.1	55.1	30	15	3.7	Demineralized
MCXCA.X1010068	Prevessin	ECN3	ECN3	TE/MSC	PXMCXCAHWC	1	26	48	11	0.7	18.1	18.1	30	15	0.7	Demineralized
MCXCA.X1010102	Prevessin	ECN3	ECN3	TE/MSC	PXMCXCAHWC	1	26	48	11	0.7	18.1	18.1	30	15	0.7	Demineralized
MQNEG.X1010077	Prevessin	ECN3	ECN3	TE/MSC	PXMQNEGTWP	1	26	41	15	0.9	5.7	5.7	30	15	0.9	Demineralized
MQNEG.X1010079	Prevessin	ECN3	ECN3	TE/MSC	PXMQNEGTWP	1	26	41	15	0.9	5.7	5.7	30	15	0.9	Demineralized
QNL.X1010065	Prevessin	ECN3	ECN3	TE/MSC	SPQNL__8WP	1	26	46	28	1.7	5.4	5.4	30	15	1.7	Demineralized
MDXSS.X1010090	Prevessin	ECN3	ECN3	TE/MSC	PXMDXSSCWC	1	26	36	12	0.7	8.3	8.3	30	15	0.7	Demineralized
												696.4			**77.8**	
					Power converters											
RSM2	Prevessin	BA82	BA82	SY/EPC	RSM2	1	26	36	34	2.0	45	45	16	3	2.0	Demineralized
												45			**2.0**	
	Prevessin	ECN3	ECN3	TE/VSC	**Vacuum pumps**											
	Prevessin	ECN3	ECN3	TE/VSC	7 cryo pumps	7			0.15	0.009	0.10	0.73			0.063	Demineralized
	Prevessin	ECN3	ECN3	TE/VSC	1 big turbo	1			1.67	0.1	1.15	1.15			0.1	Demineralized
	Prevessin	ECN3	ECN3	TE/VSC	1 primary pump	1			3.33	0.2	2.31	2.31			0.2	Demineralized
												4.19			**0.363**	
	Prevessin			EN/EL	**Water cooled cables**							200			17.30	Demineralized
					EHN2/Amber facility							4000			105	Demineralized
											Σ	**4945.5**		**Σ**	**202.5**	

BA82 building: Current cooling station

Demineralized water – Future

							Cooling parameters									
WP related	Site	Building	Position / room	User (Dep/Group)	Equipment	Number of equipment	T_{in}	T_{out}	Flow / unit		Dissipated power / unit	Total dissipated Power	Pmax	Pressure drop	Total flow	Type of water
							(°C)	(°C)	(l/min)	(m3/h)	(kW)	(kW)	(bar)	(bar)	(m3/h)	
					Power converters											
	Prevessin	BA82	BA82	SY/EPC	RSM2	1	26	36	34	2.0	45	45	16	3	2.04	Demineralized
	Prevessin	BA82	BA82	SY/EPC	RPOLA.BA82.xx.xxxxxxxx	1			10	0.6	2.5	2.5			0.6	Demineralized
	Prevessin	BA82	BA82	SY/EPC	RPBOB.BA82.xx.xxxxxxxx	1			24	1.4	18	18			1.44	Demineralized
	Prevessin	BA82	BA82	SY/EPC	RPOLA.BA82.xx.xxxxxxxx	1			10	0.6	2.5	2.5			0.6	Demineralized
	Prevessin	BA82	BA82	SY/EPC	RPOLA.BA82.xx.xxxxxxxx	1			10	0.6	2.5	2.5			0.6	Demineralized
	Prevessin	BA82	BA82	SY/EPC	RPOLA.BA82.xx.xxxxxxxx	1			10	0.6	2.5	2.5			0.6	Demineralized
	Prevessin	BA82	BA82	SY/EPC	RPOLA.BA82.xx.xxxxxxxx	1			10	0.6	2.5	2.5			0.6	Demineralized
	Prevessin	BA82	BA82	SY/EPC	RPOLA.BA82.xx.xxxxxxxx	1			10	0.6	2.5	2.5			0.6	Demineralized
	Prevessin	BA82	BA82	SY/EPC	RPOLA.BA82.xx.xxxxxxxx	1			10	0.6	2.5	2.5			0.6	Demineralized
	Prevessin	BA82	BA82	SY/EPC	RPBOG.BA82.xx.xxxxxxxx	1			20	1.2	10	10			1.2	Demineralized
	Prevessin	BA82	BA82	SY/EPC	RPBOB.BA82.xx.xxxxxxxx	1			24	1.4	18	18			1.44	Demineralized
	Prevessin	BA82	BA82	SY/EPC	RPOLE.BA82.xx.xxxxxxxx	1			40	2.4	10	10			2.4	Demineralized
	Prevessin	BA82	BA82	SY/EPC	RPOLE.BA82.xx.xxxxxxxx	1			20	1.2	5	5			1.2	Demineralized
	Prevessin	BA82	BA82	SY/EPC	RPOLE.BA82.RSPARE1	1			10	0.6	2.5	2.5			0.6	Demineralized
	Prevessin	BA82	BA82	SY/EPC	RPOLB.BA82.RSPARE2	1			20	1.2	4.4	4.4			1.2	Demineralized
	Prevessin	BA82	BA82	SY/EPC	RPOLB.BA82.RQ.X061118.M	1			20	1.2	4.4	4.4			1.2	Demineralized
	Prevessin	BA82	BA82	SY/EPC	RPOLB.BA82.RQ.X0611105.M	1			20	1.2	4.4	4.4			1.2	Demineralized
	Prevessin	BA82	BA82	SY/EPC	RPOLC.BA82.RBV.X0611111	1			20	1.2	8.8	8.8			1.2	Demineralized
	Prevessin	BA82	BA82	SY/EPC	RPOLC.BA82.RBH.X061115	1			20	1.2	8.8	8.8			1.2	Demineralized
	Prevessin	BA82	BA82	SY/EPC	RPOLB.BA82.RBH.X0611101	1			20	1.2	4.4	4.4			1.2	Demineralized
	Prevessin	BA82	BA82	SY/EPC	RPBOF.RBXH.X0611125	1			20	1.2	36	36			1.2	Demineralized
	Prevessin	BA82	BA82	SY/EPC	RPOLC.BA82.RSPARE3	1			20	1.2	8.8	8.8			1.2	Demineralized
												206.0			**24.12**	
	Prevessin	ECN3	ECN3	TE/VSC	**Vacuum pumps**											
	Prevessin	ECN3	ECN3	TE/VSC	7 cryo pumps	7			0.15	0.009	0.10	0.73			0.063	Demineralized
	Prevessin	ECN3	ECN3	TE/VSC	1 big turbo	1			1.67	0.1	1.15	1.15			0.1	Demineralized
	Prevessin	ECN3	ECN3	TE/VSC	1 primary pump	1			3.33	0.2	2.31	2.31			0.2	Demineralized
												4.19			**0.363**	
	Prevessin			EN/EL	**Water cooled cables**							200			17.3	Demineralized
	Prevessin				**EHN2/Amber facility**							3300			105	Demineralized
					SHIP											
	Prevessin	ECN3	ECN3		opt. Muon spectrometer	1			583.33	35	450	450			35	Demineralized water
	Prevessin	ECN3	ECN3		Decay volume/vacuum	1			0.00			0			0	Demineralized water
												450.00			**35**	
					Target complex new service											
	Prevessin	New service building	Trolley area	EN/STI	Target	1	27	33.7	750	45.0	350	350		3.5	45	Demineralized
	Prevessin	New service building	CV room	EN/STI	Proximity shielding	1	27	30	96	5.76	20	20		1	5.76	Demineralized
	Prevessin	New service building	Auxiliary room	EN/STI	Magnetic coil	1	27	35.6	250	15.00	10	10		1	15	Demineralized
												380.00			**65.76**	
											Σ	**4540.19**			**247.54**	

BA82 building: Current cooling station

Demineralized water – Nominal values

	T_{in} (°C)	T_{out} (°C)	P_{max} (bar)	Pressure drop (bar)	Total dissipated Power (kW)	Total flow (m^3/h)	Type of water
Magnets	26	35-42-46-56	30	15	696.4	77.8	Demineralized
Power converters	26	36	16	3	45	2	Demineralized
Vacuum pumps					4.19	0.363	Demineralized
Water cooled cables					200	17.3	Demineralized
EHN2/Amber facility					4000	105	Demineralized
				Σ	**4945.59**	**202.46**	

Demineralized water - Future

		T_{in} (°C)	T_{out} (°C)	P_{max} (bar)	Pressure drop (bar)	Total dissipated Power (kW)	Total flow (m^3/h)	Type of water
1st cooling substation	Power converters	26	36	16	3	206	18.12	Demineralized
2nd cooling substation	Vacuum pumps					4.19	0.363	Demineralized
	SHIP					450	35	Demineralized
	Water cooled cables					200	17.3	Demineralized
	EHN2/Amber facility					3300	105	Demineralized
3rd. 4th, 5th cooling substation	Target Proximity shielding Magnetic coil	27	30-33.7-35.6			380	65.76	Demineralized
					Σ	**4540.19**	**241.54**	

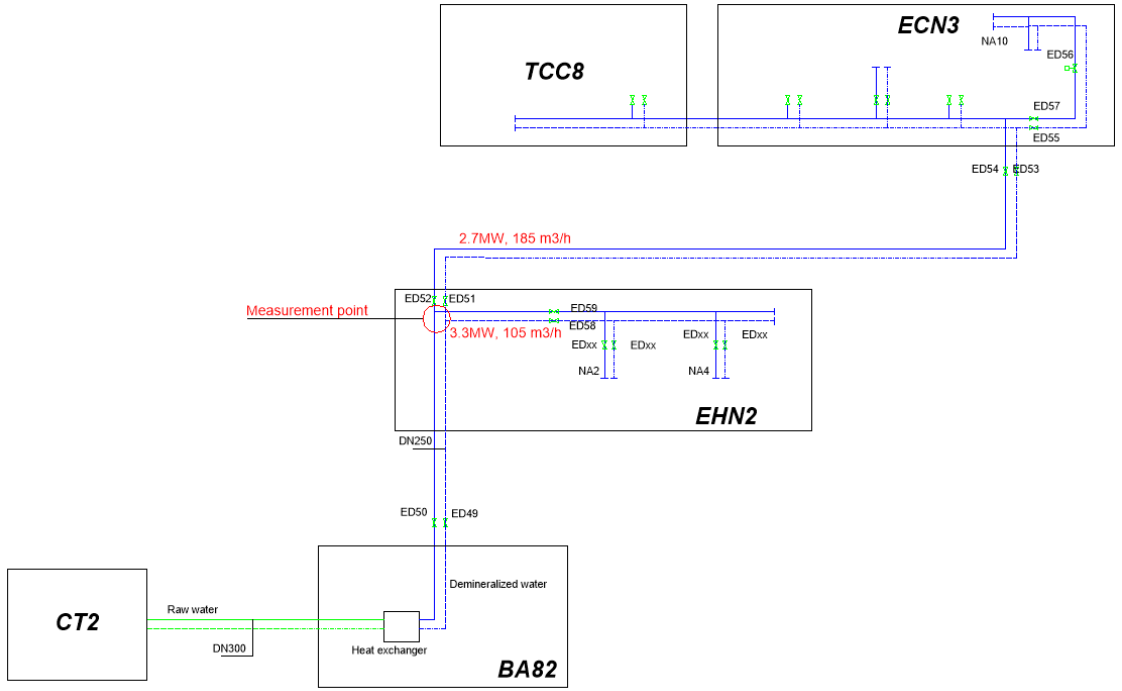
Current measurement:
Cooling capacity: 6.0MW
Flow rate: 290 m3/h

Chilled water – in progress
Mixed water needs – no need so far

BA82 building: Current cooling station

Demineralized water – measurement results

	Total cooling Power (kW)	Total flow rate (m^3/h)	Type of water
ECN3, TCC8 branch: Magnets, Power converters, WC cables, vacuum pumps, NA62 experiment	2700	185	Demineralized
EHN2/Amber facility	3300	105	Demineralized
Σ	**6000**	**290.00**	



Current measurement:
Cooling capacity: 6.0MW
Flow rate: 290 m3/h

BA82 building: Current cooling station

- **Current status:**

  - Demineralized water: We will have enough power & flow rate in future

  - Chilled water: collected data, 4.35MW maximum power, nominal 4.4MW;

    Additional chilled water needs in future:
    - Berylium facility: 200kW
    - New service building: 250kW

  - We have to “recover” 450kW from the chilled water loads, NA62 experiment 2 AHUs will be removed, mixed water circuit to be removed, total capacity to be recovered about 150kW

  - Maximum capacity (4.35MW) happened only once

  - 46 times (hours) we had capacity more than 3.9MW

  - Mixed water: no needs so far

- **Preparing for the TCC on cooling meeting – status for 5th cell of CT2, presenting results of consumption analysis, requests from Users side, strategy for implementation of HI-ECN3**
- **User requirements’ document – in progress**

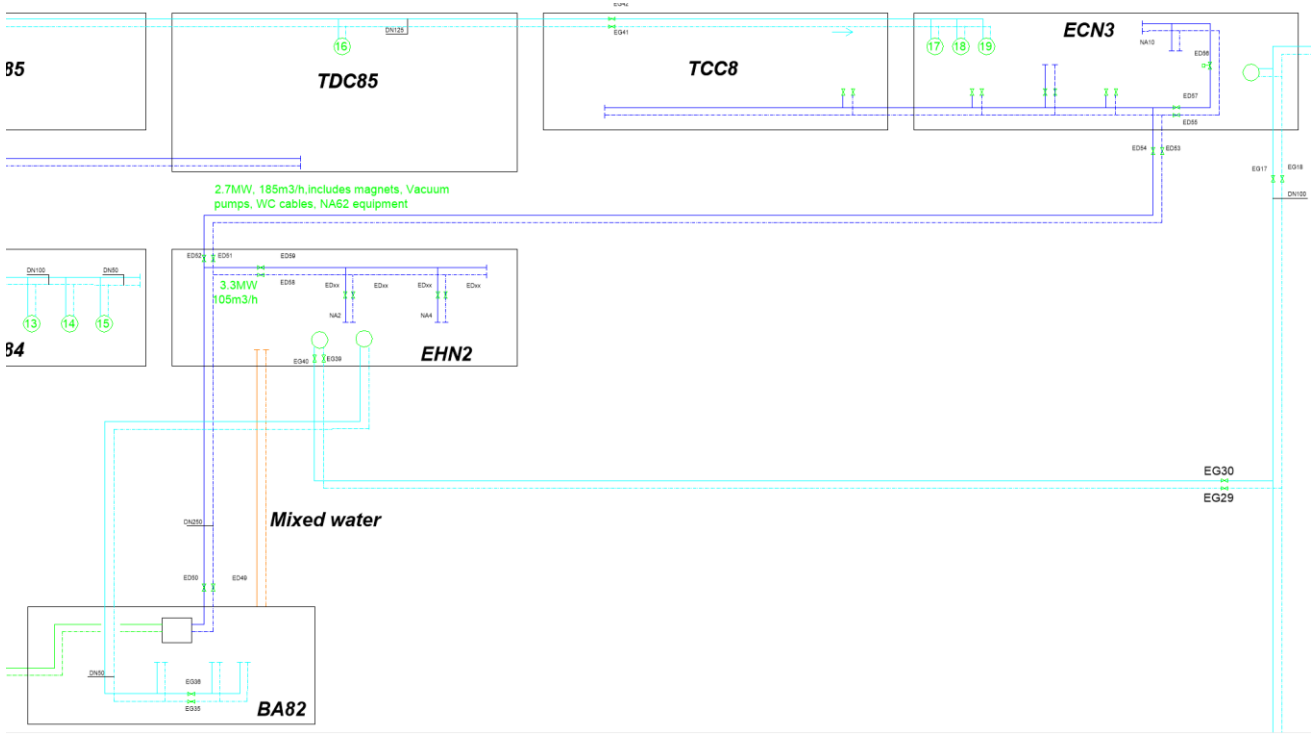
BA82 building: Current cooling station

Demineralized water – Nominal values

	Total dissipated Power	Total flow	Type of water
	(MW)	(m^3/h)	
ECN3, TCC8 branch: Magnets, Power converters, WC cables, vacuum pumps, NA62 experiment	2.7	185	Demineralized
EHN2/Amber facility	3.3	105	Demineralized
Σ	**6**	**290.00**	

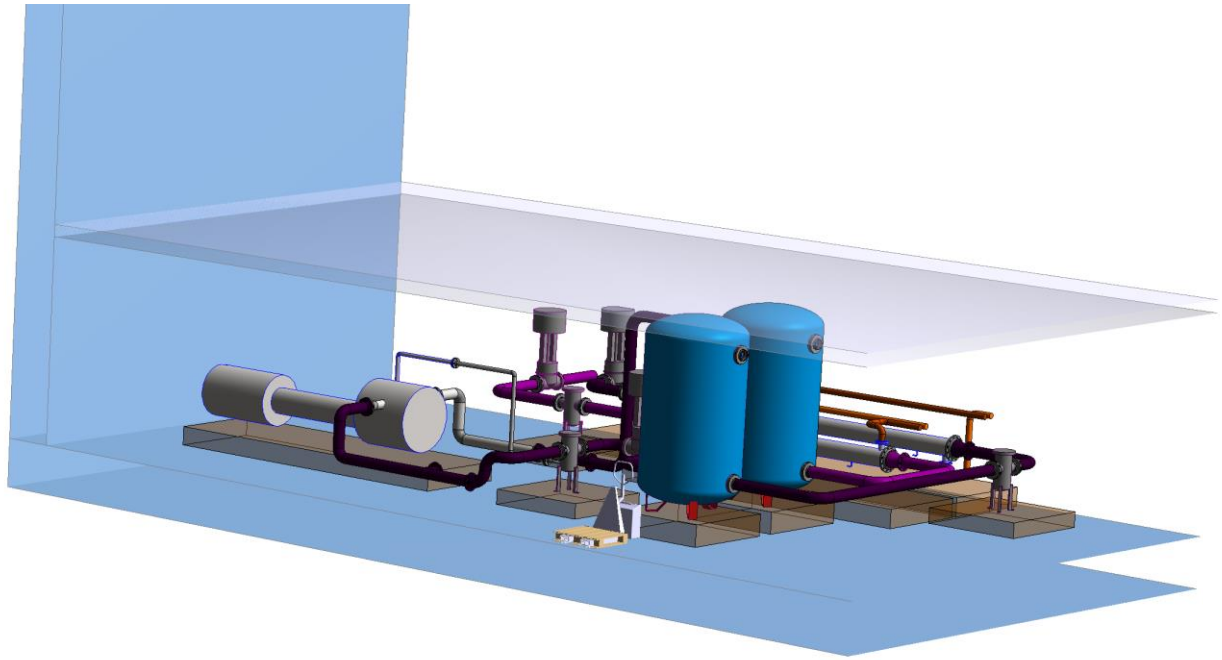
Current measurement:
Cooling capacity: 6.0MW
Flow rate: 290 m3/h

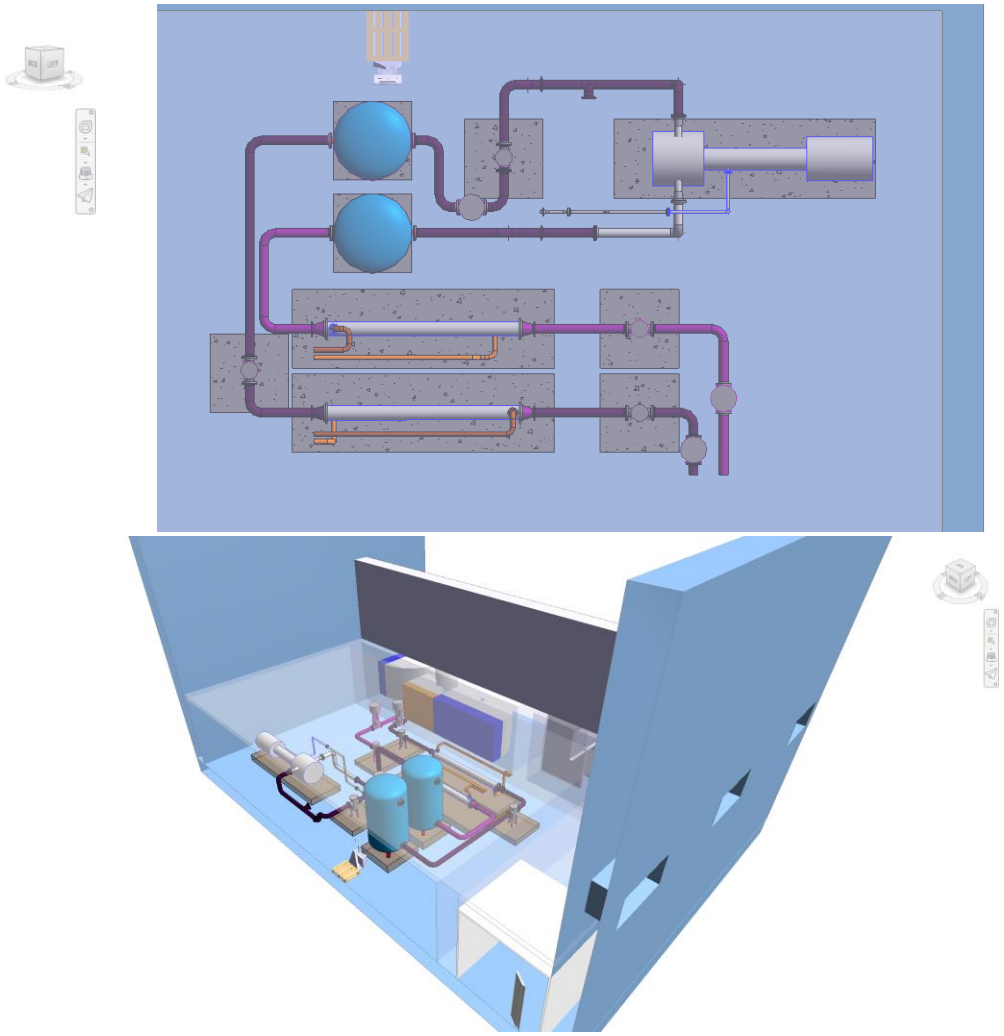
Demineralized water - Future



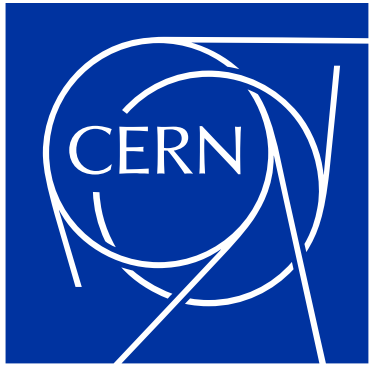
Pending final verification BA82 stations for EHN2, TCC8 and ECN3 have sufficient power and flow rate

New service building: Integration model





Current status: enough space for all the skids



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