

TSC CTDS



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Agenda

- About Unicorn Systems
- TSC initiative introduction
- CTDS application introduction

Unicorn Systems

- Largest Czech ICT vendor, founded in 1990
 - 6 development centers; branch offices in the CR, SR, and Ukraine
- Total turnover for 2012 amounted to 56.6 mil. EUR, of which 24 % came from energy and utilities
- 900+ employees, about 200 of them working in energy and utilities
- First energy project completed in 1999
 - Special focus on system and market operators
- Out-of-the-box products and custom software development
- Strong technological background
- Large international projects



TSC Initiative

- TSC = Transmission System Operator Security Cooperation
- Increase security of supply through intensified regional cooperation based on a Cooperation Platform and common remedial actions
 - Processes and definitions for operational forecast data (DACF/IDCF)
 - A unique merged dataset (based on individual TSO datasets) as input for grid security calculations
 - Execution of grid security calculations and provision of results
 - Definition of additional individual studies on the Cooperation
 - Platform on the basis of the unique merged dataset
 - Common daily evaluation of security calculation results, identification and coordination of remedial actions
 - Coordinated procedures in case of critical grid situations and remedial actions
- Joint office in Munich (opened 25. 10. 2013)
 - More on the web <u>http://www.tso-security-cooperation.eu/</u>

TSC Members



- 50Hertz (DE)
- Amprion (DE)
- APG (AT)
- ČEPS (CZ)
- ELES (SI)
- Energinet (DK)
- HOPS (HR)
- MAVIR (HU)
- PSEO (PL)
- Tennet (NL)
- Tennet (DE)
- Transnet BW (DE)
- Swissgrid (CH)

Covering area with more than 165 million European citizens in the heart of Europe

CTDS

- Common Tool for Data exchange and Security assessments
- Represents main TSC cooperation platform
- Key requirements:
 - Receiving receiving operational forecast data from all participating TSOs and adjacent (non-participating) TSOs
 - 25 individuals models for all 24 hours of next day (i.e. 600 a day)
 - Intraday updates, every hour, one hour before real-time, for the remaining hours of the day
 - Merging Merging input data into a unique dataset being the input for grid security calculations
 - 8000 busses and 12000 branches
 - Calculations grid security computation (N/N-1)
 - 6500 contingency cases simulated for each hour, computed within 20 minutes
 - Studies for further analysis over the common merged model
 - Integration platform for other functional modules

CTDS "Big Picture"



DACF process before CTDS



DACF process with CTDS



Goals of CTDS

- Avoiding risks in Central Europe
- Secure operation of interconnected grids
- Meeting cooperation requirements of European legislature
- No misunderstandings all TSOs can work with the same data and same analytical results
- Extension current DACF process to intraday level
- Handling of unexpected major changes in flows
- Faster alerting of TSOs and coordination of remedial actions
- Possibility to simulate impact of changes on complete grid model
- Secure and decentralized solution

Decentralized Solution



- CTDS User/Operator system installation at each participating TSO
- Administrator sites installations at two hosting sites
 - Active / Passive
 - Reliable data repository and central management – shared data
- Systems interconnected via Electronic Highway using Energy Communication Platform (ECP)

Main Page



Input Files Monitoring

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10:30 CA n-1 124.6% 1 79.9% 90.0% 163.5% 92.7% 57.8% 11.1% 109.4% 1 </td <td>10.7</td> <td>bas</td> <td>e n-0</td> <td></td> <td>83.3%</td> <td></td> <td></td> <td></td> <td>57.0%</td> <td>74.9%</td> <td></td> <td>89.89</td> <td>67.6%</td> <td>40.9%</td> <td>57.8%</td> <td>56.9%</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	10.7	bas	e n-0		83.3%				57.0%	74.9%		89.89	67.6%	40.9%	57.8%	56.9%							
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	10:30	CA CA	n-1		124.69	6			79.9%	90.0%		163.	5% 92.7%	57.8%	111.19	6 109.4%							
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	11:3	0 bas	en-0		77.3%				59.0%	76.1%	6	89.89	67.6%	40.5%	57.8%	56.7%							
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		CA bas	n-1		224.0	6			57.0%	87.8%		103.	5% 93.8%	57.4%	57.9%	56.0%							
base n-0 77.7% 78 59.0% 76.1% 89.8% 67.6% 40.5% 57.8% 56.7% 1	12:3		n-1		124.69	6			79.9%	90.0%		163.	5% 92.7%	57.8%	111.19	6 109.4%						+	
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	12.3	bas	en-0		77.7%				59.0%	76.1%	6	89.89	67.6%	40.5%	57.8%	56.7%							
hase n-0 77.7% 59.0% 76.1% 89.8% 67.6% 40.5% 57.8% 56.7% 66.7% 66.7% 66.7% 66.7% 66.7% 66.7% 66.7% 66.7% 66.7% 66.7% 66.7% 66.7% 66.7% 67.8% 56.7% 111.7% 66.7% 67.8% 56.7% 111.7% 67.8% 67.8% 56.7% 111.7% 67.8% 66.7% 67.8% 56.7% 111.7% 67.8% 67.8% 57.8% 56.7% 111.7% 68.8% 67.8% 57.8% 58.3% 57.3% 57.3%		CA	n-1		124.69	6			82.1%	87.8%	6	163.	5% 93.8%	57.5%	111.19	6 111.79	6						
$\frac{1}{12:30} = \frac{1}{12:30} = $	14:3) bas	en-0		77.7%				59.0%	76.1%	6	89.89	67.6%	40.5%	57.8%	56.7%							
15:30 CA n-1 124.6% 102.5% 101.0% 163.3% 83.2% 54.1% 111.3% 12.5% Image: Constraint of the constraint of th		bas	n-1. en-0		81.0%				64.4%	74.4%		91.2	67.7%	39.3%	58.3%	58.0%							
base n-0 82.6% 82.6% 54.5% 74.9% 89.8% 67.6% 42.6% 57.8% 52.3% </td <td>15:3</td> <td></td> <td>n-1</td> <td></td> <td>124.69</td> <td>6</td> <td></td> <td></td> <td>102.59</td> <td>6 101.0</td> <td>%</td> <td>163.</td> <td>3% 83.2%</td> <td>54.1%</td> <td>111.39</td> <td>6 112.59</td> <td>6</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	15:3		n-1		124.69	6			102.59	6 101.0	%	163.	3% 83.2%	54.1%	111.39	6 112.59	6						
CA n-1 124.6% 77.8% 89.8% 163.5% 90.8% 60.0% 111.1% 106.0% 17:30 base n-0 CA n-1 82.1% 57.0% 74.9% 89.8% 67.6% 40.8% 57.8% 56.8% 60.0% 111.1% 100.4% 60.0% 111.1% 100.4% 60.0% 111.1% 100.4% 60.0% 111.1% 100.4% 60.0% 100.4% 60.0% 111.1% 100.4% 60.0% 100.4% 60.0% 111.1% 100.4% 60.0% 60.0% 111.1% 100.4% 60.0% 60.0% 111.1% 100.4% 60.0% 60.0% 111.1% 100.4% 60.0%	16:3) bas	xen-0		82.6%				54.5%	74.9%	5	89.89	67.6%	42.6%	57.8%	52.3%							
17:30 base n-0 82.1% 57.0% 74.9% 89.8% 67.0% 40.8% 57.8% 56.8% CA n-1 124.6% 79.9% 90.0% 163.5% 92.7% 57.7% 111.1% 100.4%		CA	n-1		124.69	6			77.8%	89.8%	6	163.	5% 90.8%	60.0%	111.19	6 106.0%							
	17:3	0 bas	en-0		82.1%	4 C			57.0%	74.9%		89.89	67.6%	40.8%	57.8%	56.8%						+	-
2	<	ICA		- ' ·	-124.0				13.370	50.0%			32.7%	37.7%							1		<u> </u>

Load Flow Results

🔲 Load flo	w report 1	5.03.2	010 22:30	(DACF)												
<u>File V</u> iew <u>H</u>	elp															
) 🗃 🗙			22:30 15.3.2	2010 🔽 🖨 🔷 © LF 🛛	CA 👍											
🛹 Lines	3 <mark>Ε</mark> Transfo	rmers	X Nodes	Tie-lines Bilateral exch	anges Calc. detai	ls										
			♣											Y	X 114	19 / 11419
Subst. 1	Subst. 2	Order	Status	Name	Opt. name	TSO	Un[kV]	Imax[A]	load[%] 🗸	I[A]	P1[MW]	Q1[MVar]	th1[deg]	P2[MW]	Q2[MVar]	th2[deg 🔺
LI 220	XLI_SO2	1	real (in)	OLIENN2_XLI_SO2_1	261	AT	220	750.0	110.92	831.9	-342.3	-3.3	-5.62	333.9	-33.0	-12.9
XLI_SO2	SOVER220	1	real (in)	XLI_SO2_ISOVVA2_1	OV2215 1	IT	220	750.0	110.70	8 30. 3	-333.9	33.0	-12.97	326.2	-66.0	-19.9
HELM 380	HELM 380	Х	real (in)	D2HELM1_D2HELM1_X		D2	380	600.0	97.39	584.3	-409.1	26.5	28.48	408.9	-25.4	28.2
FBOLL52	FTERRA2	1	real (in)	FBOLL52_FTERRA2_1	BOLL561TERRA	FR	220	889.0	96.44	857.3	-353.1	12.7	-4.62	344.8	-44.7	-11.0
RICEN220	IGADM12	1	real (in)	INOMM12_IGADM12_1	MM2L16 1	IT	220	535.0	96.13	514.3	-202.6	73.9	-21.04	202.3	-40.6	-21.3
PAKS 400	PAKS 400	Y	equiv (in)	MPAKS_1_MPAKS_1_Y		HU	380	743.0	91.79	682.0	491.0	-80.8	6.42	-491.0	80.0	6.5
PAKS 400	PAKS 400	1	equiv (in)	MPAKS_1_MPAKS_1_1		HU	380	743.0	89.42	664.4	478.0	-80.7	6.42	-478.0	80.0	6.5
AVOI_220	WOI_220 1 real (in) FAVOI52_FAVOIN2_1 AVOI561AVOIN FR 220 900.0 85.91 773.2 -316.4 25.6 -2.42 316.4														-21.5	-2.6
AVOI_380	FCHIN21	1	real (in)	FAVOI51_FCHIN21_1	AVOI571CHIN2	FR	380	1580.0	82.42	1302.2	897.7	-116.0	4.50	-897.8	121.9	4.6
MAAD 220	WHAV 220	1	real (in)	D2MAAD2_D2WHAV2_1	BLAU	D2	220	2052.0	81.53	1672.9	678.8	-31.3	25.71	-679.3	26.1	26.1
BEE4	TRE4	1	real (in)	ZBEE141_ZTRE141_1	E403	PL	380	1500.0	81.18	1217.7	-824.0	256.6	29.06	818.6	-269.1	26.3
ROGNA220	FRQROU2	1	real (in)	FROGNA2_FRQROU2_1	ROGNA61RQROU	FR	220	1160.0	80.57	934.6	373.1	-26.1	-20.50	-377.0	3.7	-16.4
HEYD 380	OVEN 380	1	real (in)	D2HEYD1_D2OVEN1_1	1	D2	380	1440.0	80.40	1157.8	-816.7	108.4	20.52	816.1	-109.9	20.1
PAKS 400	PAKS 400	Z	equiv (in)	MPAKS_1_MPAKS_1_Z		HU	380	837.0	80.12	670.6	482.6	-80.7	6.42	-482.6	80.0	6.5
REALT220	FSEPTE2	3	real (in)	FREALT2_FSEPTE2_3	REALT63SEPTE	FR	220	1160.0	78.68	912.7	-365.6	21.8	-20.72	364.7	-26.8	-21.7
FMOUIS2	FTERRA2	1	real (in)	FMOUIS2_FTERRA2_1	MOUIS61TERRA	FR	220	889.0	78.52	698.1	278.7	-48.1	-13.10	-280.7	40.9	-11.0
GRANZ220	FZGRA62	1	real (in)	FGRANZ2_FZGRA62_1	GRANZ61ZGRA6	FR	220	1337.0	76.75	1026.2	-424.7	-18.7	-5.71	418.9	-15.3	-10.9
AVOI_380	FCHIN21	2	real (in)	FAVOI51_FCHIN21_2	AVOI572CHIN2	FR	380	1700.0	75.93	1290.8	888.7	-123.4	4.50	-888.8	128.7	4.6
FRAN.P2	FRANCE2	1	real (in)	FRAN.P2_FRANCE2_1	RAN.P61RANCE	FR	220	260.0	75.92	197.4	80.0	9.5	-10.77	-80.0	-8.0	-10.7
BOG 2	CPC2	1	real (in)	ZBOG422_ZCPC422_1	4020	PL	220	800.0	75.25	602.0	234.6	7.1	22.15	-237.3	-19.6	26.7
HAMN 220	STDE 220	1	real (in)	D2HAMN2_D2STDE2_1	ROT	D2	220	626.0	75.06	469.9	-188.1	8.4	26.76	186.0	-12.8	23.3
CPC 2	MIK2	1	real (in)	ZCPC422_ZMIK422_1	4011	PL	220	1062.0	74.04	786.3	310.8	23.4	26.76	-316.1	-53.5	33.4
MVAV 220	MVAV 220	1	real (in)	IMFTV12_IMFZV12_1	VV2193 1	IT	220	800.0	73.40	587.2	-237.3	42.2	-20.52	237.2	-42.9	-20.7
REALT220	FSEPTE2	1	real (in)	FREALT2_FSEPTE2_1	REALT61 SEPTE	FR	220	1160.0	72.72	843.5	-337.9	19.9	-20.72	337.1	-24.7	-21.7
IMTJT12	LEYNI220	1	real (in)	IMTJT12_ILEYTA2_1	TT2215 1	IT	220	280.0	72.52	203.1	-83.5	-0.7	-5.76	82.8	8.4	-7.9
FP.ORG 2	FRQROU2	1	real (in)	FP.ORG2_FRQROU2_1	P.ORG 61 RQROU	FR	220	889.0	72.23	642.1	-259.6	20.2	-14.27	257.4	-27.0	-16.4
SIEM 220	LBEC 220	1	real (in)	D2SIEM2_D2LBEC2_1	BLAU	D2	220	950.0	71.97	683.7	-265.7	83.2	30.36	265.5	-48.0	30.0
KUMM 220	STDE 220	1	real (in)	D2KUMM2_D2STDE2_1	GELB	D2	220	626.0	71.83	449.7	-178.1	20.7	25.20	177.0	-22.8	23.3
FMOUIS2	FP.ORG 2	1	real (in)	FMOUIS2_FP.ORG2_1	MOUIS61P.ORG	FR	220	889.0	71.40	634.7	-253.1	47.7	-13.10	252.0	-51.2	-14.2
EDC380	EEM380	1	real (in)	NEDC381_NEEM381_1	EEM-EDC3801	NL	380	1425.0	71.24	1015.2	-700.0	0.0	13.19	699.9	-1.7	13.0
IPMLV52	IST4VC2	1	real (in)	IPMLV52_IST4VC2_1	VV2M10 1	IT	220	784.0	70.75	554.7	-221.4	31.1	-23.54	221.3	-28.6	-23.6
FDEPHT2	PRAGN220	2	real (in)	FDEPHT2_FPRAGN2_2	PRAGN62DEPHG	FR	220	690.0	69.78	481.5	185.6	-74.5	-16.53	-185.6	74.1	-16.4
XLA_KU2	кинмо	2	real (in)	XLA_KU2_D4KUHM2_2	HOTZ	D4	220	1200.0	69.34	832.1	283.3	-188.3	-2.92	-283.9	186.2	-2.4 🕶
•	ı		ı		1	1										
											/ris/tm	DDR 1255	8/lf_report/20	0100315 22	230 E01 UX	LE BRTdb

Contingency Analysis Results

Contin	ngency analysis r	eport 22.03.2010 16:3	O (DACF)												PX
	<u>n</u> eip K 🛛 🔜 🗍	16:30 22.3.2010	⊑≱ ⊙ LF @ (A 6											
	<u> </u>	Contingency case	s						Load flow: CKC	СН_1_ССНD1_2					
overvie		AA	7	209 / 209	🛹 Lines	3E Transfo	rmers	🗙 Nodes							
ases (Case name	Elements 35 o	p Sev.OL !	5ev.V ev.HIB 🔨 🔺				AA						V ¥ 1	13/13
о скос	CH_1_CCHD_1_2	CKOCH_1_CCHD_1	0.00	0.00 3.	Subst. 1	Subst. 2	Order	Status	Device name	Device opt. name	TSO	Un[kV]	Imax[A]	Load / BC dev. [%] ▽	I[A]
CA ca	ase 13	D2KRI_1_D2RAI_1_1	0.00	0.00 1.9	BE2	NHG 2	1	real (in)	D8BE_2_D8NHG_2_1	303	D8	220	900.0	125.6/+61.0	113
Скос	CH_1_CCHD1_2	CKOCH_1_CCHD_1	0.00	0.00 1.9	NHG 2	VIE2	1	real (in)	D8NHG_2_D8VIE_2_1	304	D8	220	900.0	115.8/+87.5	104
CBEZ	2_1_CBAB_1_1	CBEZ_1_CBAB_1	0.00	0.00 1.8	HELM 380	HELM 380	х	real (in)	D2HELM1_D2HELM1_X		D2	380	600.0	99.9/+1.1	59!
SE CPRE	E_1_XPR_ET1_1	CPRE_1_XPR_ET1 1	CBAB 1 1 (CZ)	0.00 1.1	DRE_RE1	RE4	Z	real (in)	DRE_RE1_D8RE_1_Z	414	D8	380	2520.0	97.6/+6.4	2451
CHRD	D_1_CREP_1_1	CHRD_1_CREP_1		0.00 1.1	DRE_RE1	RED 380	2	real (in)	DRE_RE1_D2RED_1_2	414	D2	380	2520.0	97.4/+6.4	245
ССНД	D_1_CCST_1_1	CCHD_1_CCST_1_1	0.00	0.00 1.1	DRE_RE1	RE4	1	real (in)	DRE_RE1_D8RE_1_1	413	D8	380	2520.0	97.3/+6.5	245
CHRA	A_1_CHBM_1_1	CHRA_1_CHBM_1	0.00	0.00 1.1	DRE_RE1	RED 380	1	real (in)	DRE_RE1_D2RED_1_1	413	D2	380	2520.0	97.2/+6.5	2449
CKRA	A_1_CPRN_1_1	CKRA_1_CPRN_1_1	0.00	0.00 1.	CRN4	MIK4	1	real (in)	ZCRN441_ZMIK541_1	H001	PL	380	1660.0	94.8/+35.0	1574
) 원 전 CPRN	N_1_CREP_1_1	CPRN_1_CREP_1_1	0.00	0.00 1.!	XPE_PT2	PT 220	1	real (in)	XPE_PT2_D2PT_2_1	258	D2	220	1178.0	93.2/+29.1	1097
La CHRD	D_1_CREP_1_1	CHRD_1_CREP_1_1	0.00	0.00 1.1	SP 220	XPE_PT2	1	real (in)	OPETER2_XPE_PT2_1	258	AT	220	1178.0	93.0/+29.0	109!
	/H_1_CEDU1_1_1	CSLVH_1_CEDU1_1	0.00	0.00 1.1	BE2	PAS2	1	real (in)	D8BE_2_D8PAS_2_1	305	D8	220	900.0	92.4/+58.9	831
- CSLV	/H_1_CEDU4_1_1	CSLVH_1_CEDU4_1	0.00	0.00 1.1	PRE4	XPR_ET1	1	real (in)	CPRE_1_XPR_ET1_1		CZ	380	2265.0	90.7/+31.1	2053
CSLV	/H_1_CEDU2_1_1	CSLVH_1_CEDU2_1	0.00	0.00 1.1	XPR_ET1	ETZ 380	1	real (in)	XPR_ET1_D2ETZ_1_1	442	D2	380	2265.0	90.5/+31.1	2049
CKRA	4_1_CPRN_1_1	CKRA_1_CPRN_1_1	0.00	0.00 1.											
CCEB	3_1_CHBM_1_1	CCEB_1_CHBM_1	0.00	0.00 1.1											
CCHD	D_1_CCST_1_1	CCHD_1_CCST_1_1	0.00	0.00 1.1											
CC ST	_1_CTYN_1_1	CCST_1_CTYN_1_1	0.00	0.00 1.1											
СКОС	CH_1_CETEM_1_1	CKOCH_1_CETEM_1	0.00	0.00 1.1											
скос	H_1_CETEM_1_Z	CKOCH_1_CETEM_1	0.00	0.00 1.1											
CBAB	B_1_CEME3_1_1	CBAB_1_CEME3_1	0.00	0.00 1.1											
CBEZ	2_1_CNEZ_1_1	CBEZ_1_CNEZ_1	0.00	0.00 1.1											
CTYN	1_1_CKRA_1_1	CTYN_1_CKRA_1_1	0.00	0.00 1.1											
CVYS	SH_1_CEPOC_1_Y	CVYSH_1_CEPOC_1_Y	0.00	0.00 1.1											
CVYS	SH_1_CEPOC_1_Z	CVYSH_1_CEPOC_1_Z	0.00	0.00 1.!											
CHRD	D_1_CCHR_1_1	CHRD_1_CCHR_1	0.00	0.00 1.1											
скос	CH_1_CCHD_1_2	CKOCH_1_CCHD_1	0.00	0.00 1.1											
CCHR	R_1_CPRE_1_1	CCHR_1_CPRE_1_1	0.00	0.00 1.1											
CNEZ	_1_CKRA_1_1	CNEZ_1_CKRA_1_1	0.00	0.00 1.!											
CHRA	A_1_CETU2_1_Z	CHRA_1_CETU2_1	0.00	0.00 1.!											
CREP	P_1_CCHD_1_1	CREP_1_CCHD_1_1	0.00	0.00 1.!											
CVYS	5_1_CVYSH_1_Z	CVYS_1_CVYSH_1_Z	0.00	0.00 1.!											
CVYS	SH_1_CEPOC_1_1	CVYSH_1_CEPOC_1_1	0.00	0.00 1.!											
CPRE	_2_CMIL_2_1	CPRE_2_CMIL_2_1	0.00	0.00 1.1											
CTYN	1_1_CECHV_1_Z	CTYN_1_CECHV_1_Z	0.00	0.00 1.!											
CMIL	_2_CTAB_2_1	CMIL_2_CTAB_2_1	0.00	0.00 1.1											
CREP	P_1_CKOCH_1_1	CREP_1_CKOCH_1_1	0.00	0.00 1.!											
CA ca	ase 11	OWESTT2_0ZELL_2	0.00	0.00 1.:											
соро	_2_CCST_2_1	COP0_2_CCST_2_1	0.00	0.00 1.!											
CBEZ	2_1_CBAB_1_1	CBEZ_1_CBAB_1	0.00	0.00 1.1											
СОРО	D_2_CSOK_2_1	COP0_2_C50K_2_1	0.00	0.00 1.!											
CHRD	D_1_XHR_RO1_1	CHRD_1_XHR_RO1	0.00	0.00 1.!											
CHRD	D_1_XHR_RO1_Z	CHRD_1_XHR_RO1	0.00	0.00 1.! -											
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/ris/tmp/DDP_20304/ca_report_orig/20100322_1630_F01_UX_CA_RPT.db

Geographical Presentation



- Load
- Ulevel
- Topology
- Phase angle
- Severity index
- Voltage

Substation Detail



Trend Analysis

Trend Analysis For A Day

Date 22.03.2010 📅 Display

Display Configuration

Trend overview



