



Net Power Generation Monitoring for the Orlen Group Power Plants

Presented by



ORLEN

Agenda

- About PKN Orlen
- Business Challenge
- The Solution
- Solving the Business Challenges



PKN ORLEN – international oil and energy company



ORLEN

- Integrated downstream assets in **three countries** in Central Europe



30 m tons throughput of various types of crude oil



Over **50 products** from refinery & petrochemicals sold in more than **80 countries around the world**



Over **2 700 fuel stations**

The largest retail network in Central Europe

1.4 m transactions per day



Loyal customer base



100 m boe

2P reserves in Poland and Canada



Over **20 th.**

highly-skilled employees



THE LEADER IN CENTRAL EUROPE

PKN ORLEN - energy sector



The second largest investor
in new power units in Poland
(more than 1000 MWe under
construction in 2016)



6.1 GWt*
Installed thermal
power



1.8 GWe*
Installed electric
power



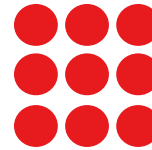
The largest industrial producer
of electricity and heat in Poland



~40 PJ
Annual heat
production



~7 TWh*
Annual electricity
generation



Integrated energy assets
in **9 locations**,
in **3 countries** of Central Europe



*Including CCGT Wloclawek and CCGT Plock. In 2016, electricity generation was about 2 TWh, installed power – 5.2 GWt and 750 MWe.

PKN ORLEN PI System



- Direct customer since: 2002 (user since 1998)
- PI Servers: Total 326,000 tags including 300 clients
- PI PVS is present in main locations

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PKN ORLEN Power Generation – The Challenge



- Common place for all real-time data to implement Net Power Generation Monitoring for the Orlen Group Power Plants
- On-line analysis of power plants performance
- Corporate level production and financial management

Agenda

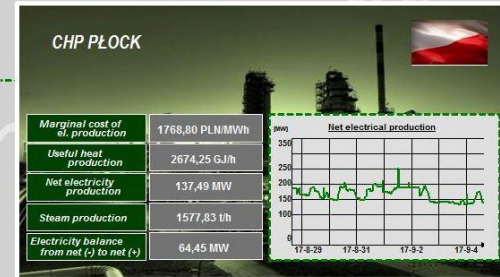
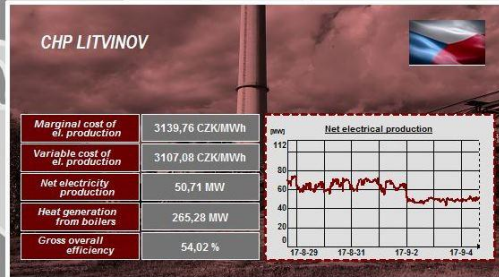
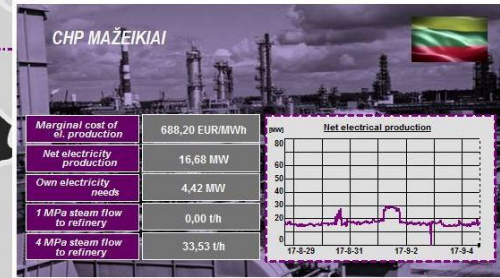
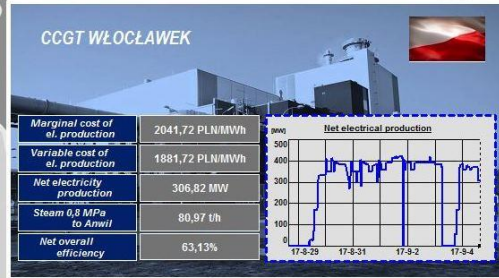
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Main graphic

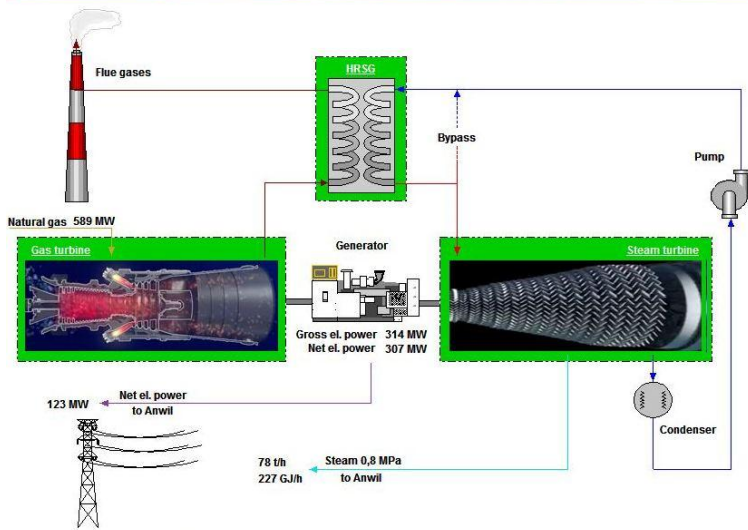
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PKN ENERGO



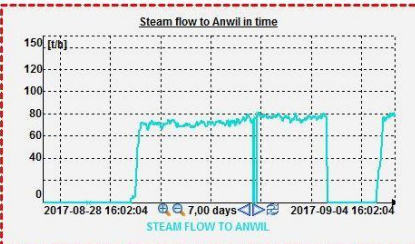
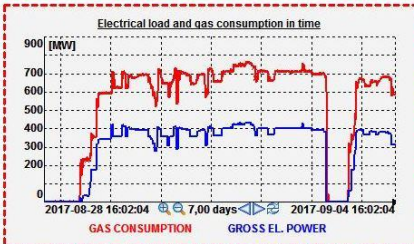
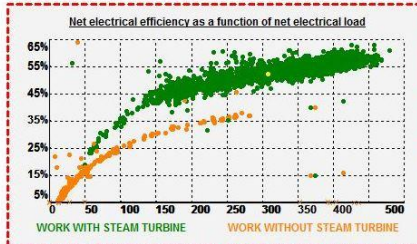
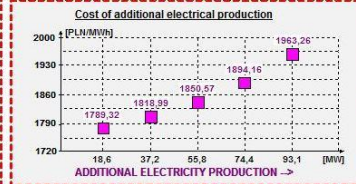
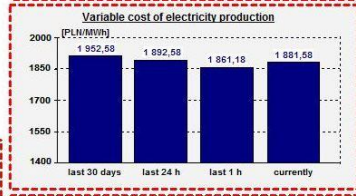
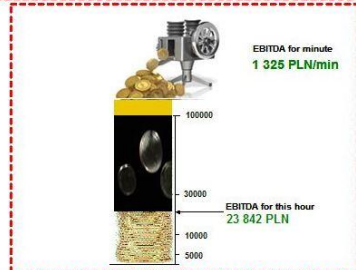
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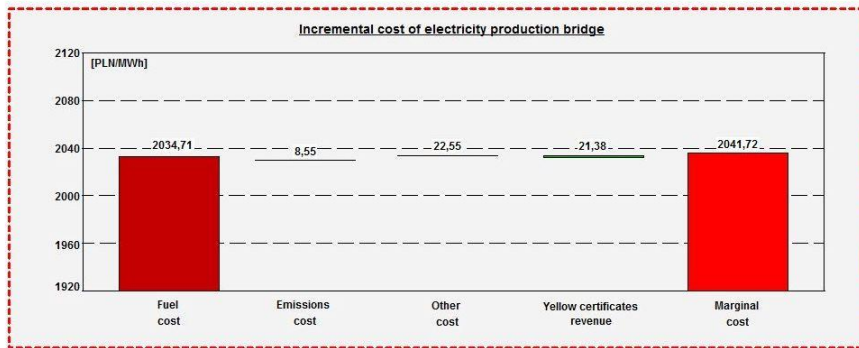
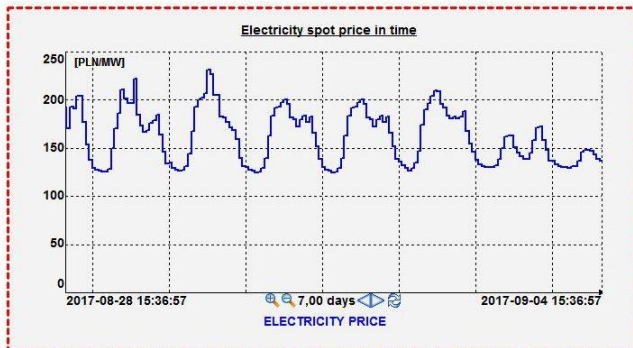
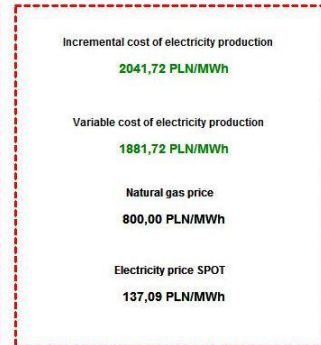
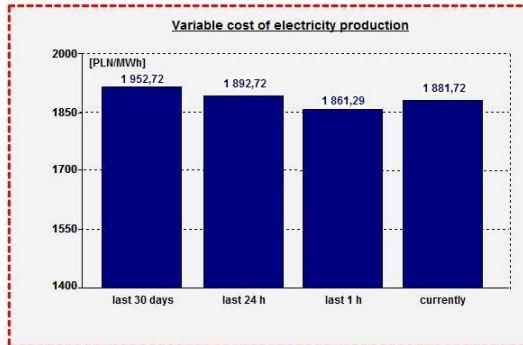
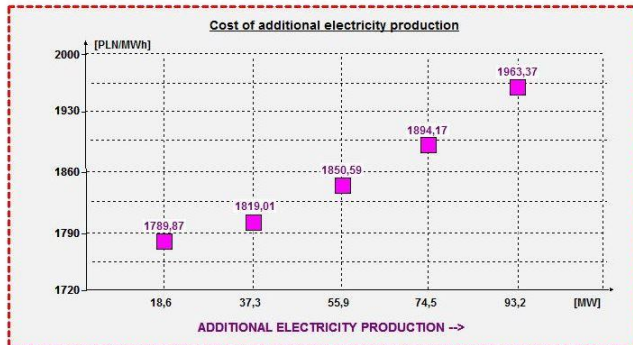
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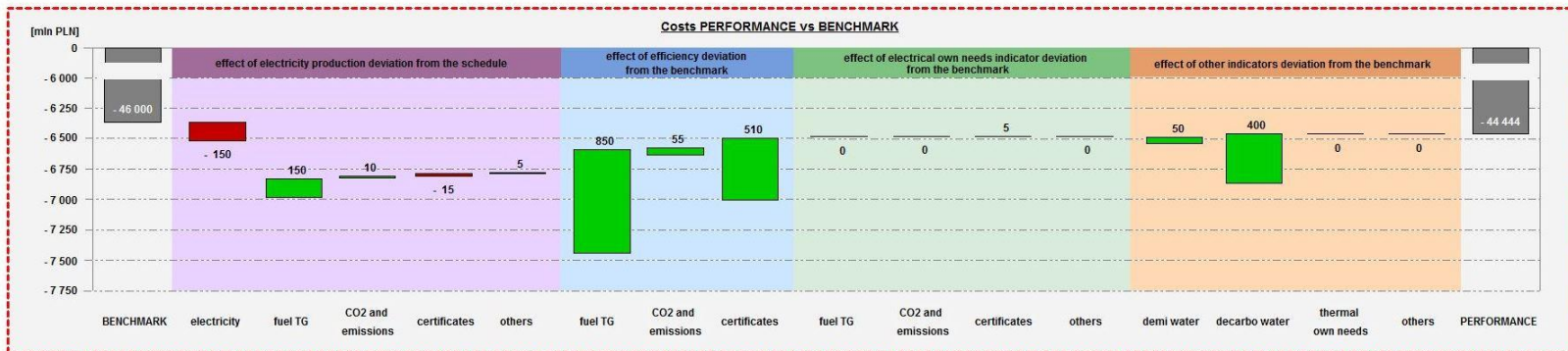


Variable cost of electricity production		Incremental cost of electricity production			
1881,58 PLN/MWh		2041,58 PLN/MWh			
Net el. power	307 MW	Net el. power to Anwil	123 MW	Gas consumption	589 MW / 58000,00 m ³ /s
		Net el. efficiency	52,10%	Steam to Anwil	78 t/h / 227 GJ/h
		Net overall efficiency	62,96%		

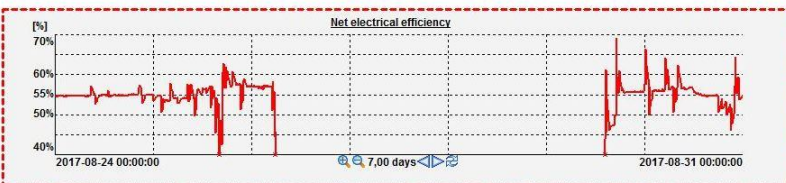
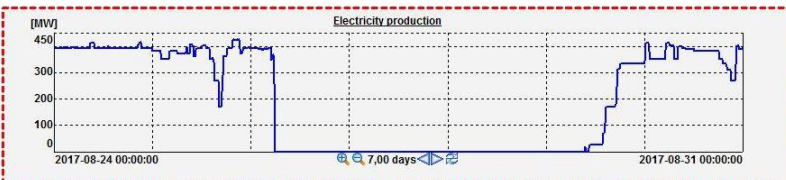
	Technical indicators			
	last 30 days	last 24 h	last 1 h	currently
Gross el. production	234 039 MWh	7 534 MWh	314 MWh	314 MW
Net el. production	228 869 MWh	7 366 MWh	307 MWh	307 MW
Net el. production to Anwil	74 745 MWh	652 MWh	123 MWh	123 MW
Natural gas cons. LHV	421 669 MWh	13 602 MWh	587 MWh	589 MW
Gross el. efficiency	49,06%	55,26%	53,59%	53,29%
Net el. efficiency	48,08%	49,66%	52,24%	52,10%
Gross overall efficiency	56,01%	57,13%	63,83%	64,15%
Net overall efficiency	55,76%	53,89%	62,84%	62,96%







Lp.	KPI	UOM	Performance	Benchmark	Current
1	Net overall efficiency	%	100 %	100 %	63,2 %
2	CCGT availability	%	100 %	100 %	-
3	Electricity production deviation from the schedule	%	0 %	0 %	-
4	Steam production for Anwil	t/h	100 %	100 %	80,9
5	Cogeneration support level	%	100 %	100 %	28,3 %
6	Electrical own needs	%	100 %	100 %	2,33 %
7	Thermal own needs	%	0 %		0,046 %
8	Demi water consumption indicator	m3/t	100 %	100 %	1,163
9	Decarbo water consumption indicator	m3/MWh	100 %	100 %	1,150
10	Ammonia unit consumption	%	0 %		-
11	Water losses in boiler cycle	m3	0 %		13,2
12	Lossess and differences on steam transition	%	100 %	100 %	-3,980 %

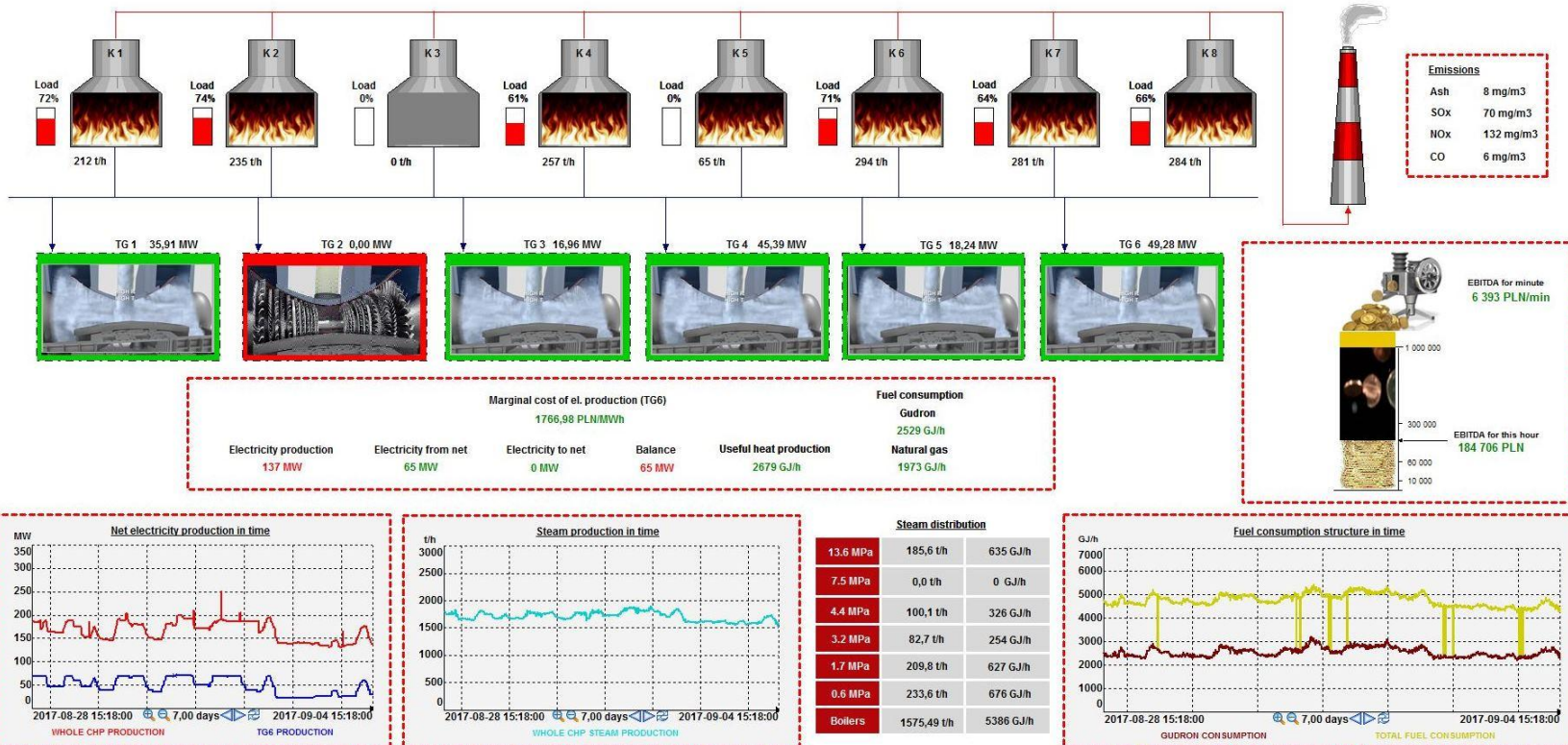


Plock



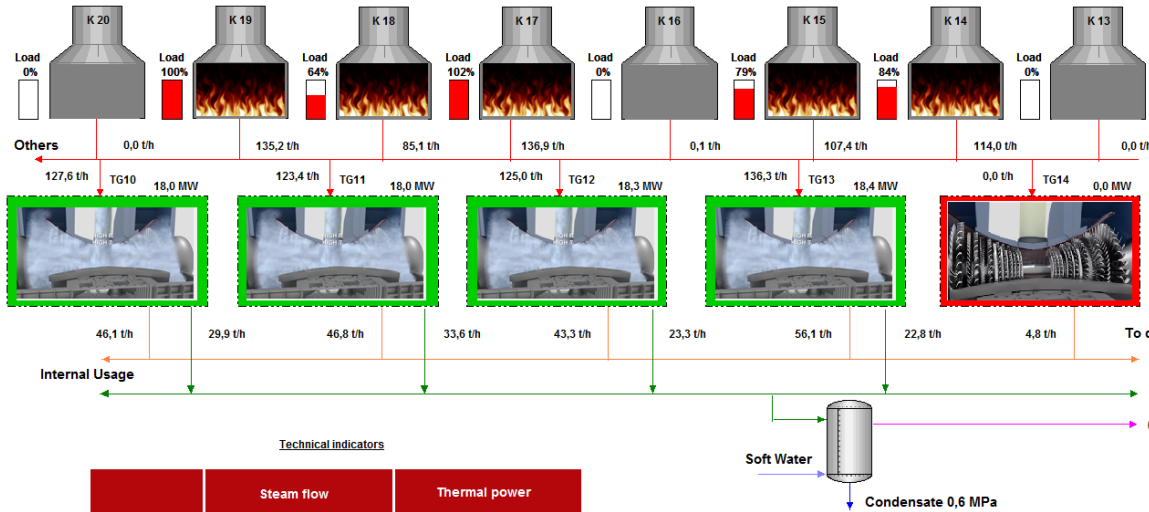
Exit Main graphic Trade

CHP Plock

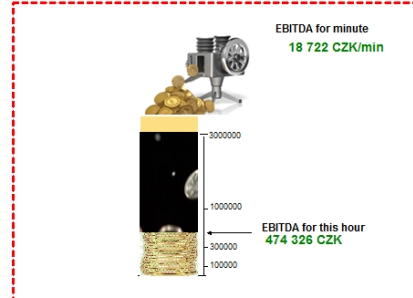


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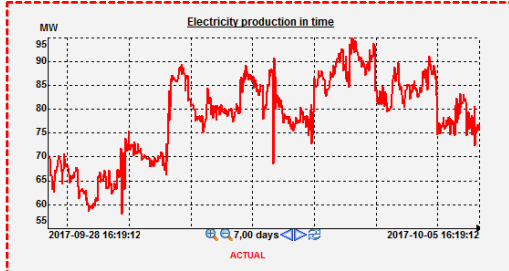
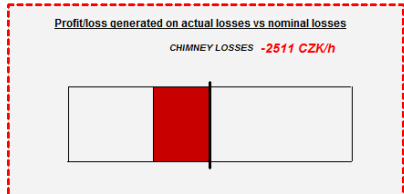


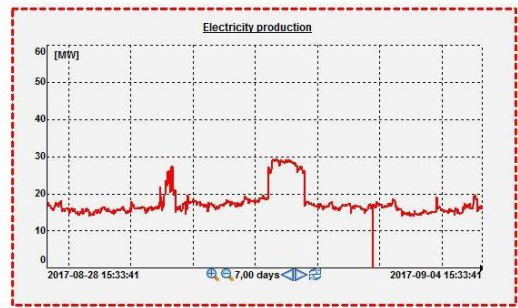
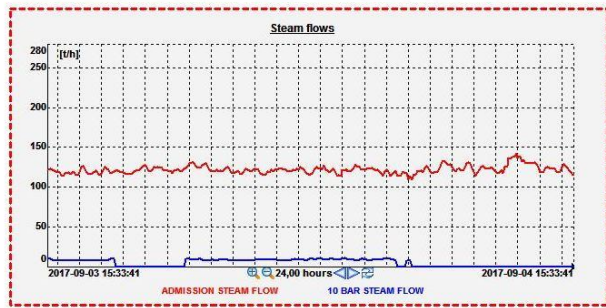
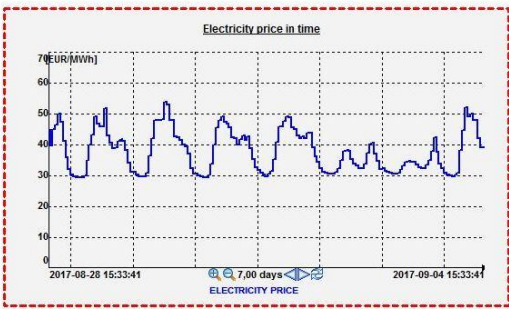
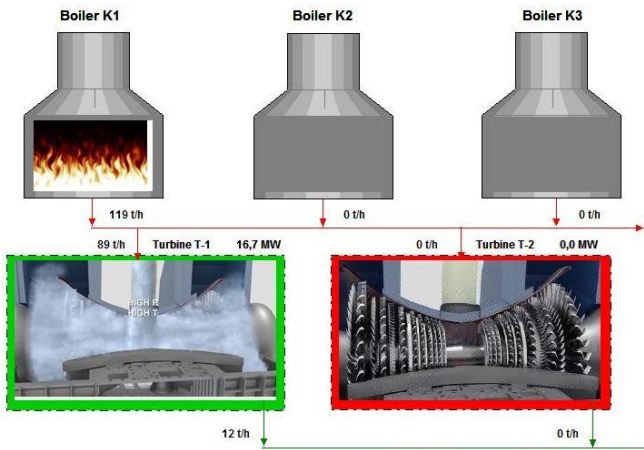
Variable cost of electricity production		Marginal cost of electricity production		
3453,85 CZK/MWh		3439,57 CZK/MWh		
Electricity power	Heat production from boilers	Overall efficiency	UPE	E KVET
76,30 MW	414,83 MW	47,53 %	9,87%	21,95 MW



Technical indicators

	Steam flow	Thermal power
24 bar steam	121 t/h	111 MW
6 bar steam	0 t/h	0 MW
0,35 bar steam	47 t/h	34 MW





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PI as useful communication platform with the potential of new users

- Common platform with the business information of the energy segment
 - Monitoring of the technical and economic performance of the energy assets
 - Expansion of the group of users in the company – managers, traders
-

PI as Business Intelligence tool

- Deep analysis of the historical data to build the mathematical models of the installations
 - Online analysis based on the advanced algorithms in AF
 - VBA to make the graphic layer more attractive
-

PI as catalyst for automation

- Automatic generation of the recurring reports – saving time and human resources



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감사합니다

Danke

谢谢

Merci

Gracias

Thank You

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Dziękuję

Obrigado