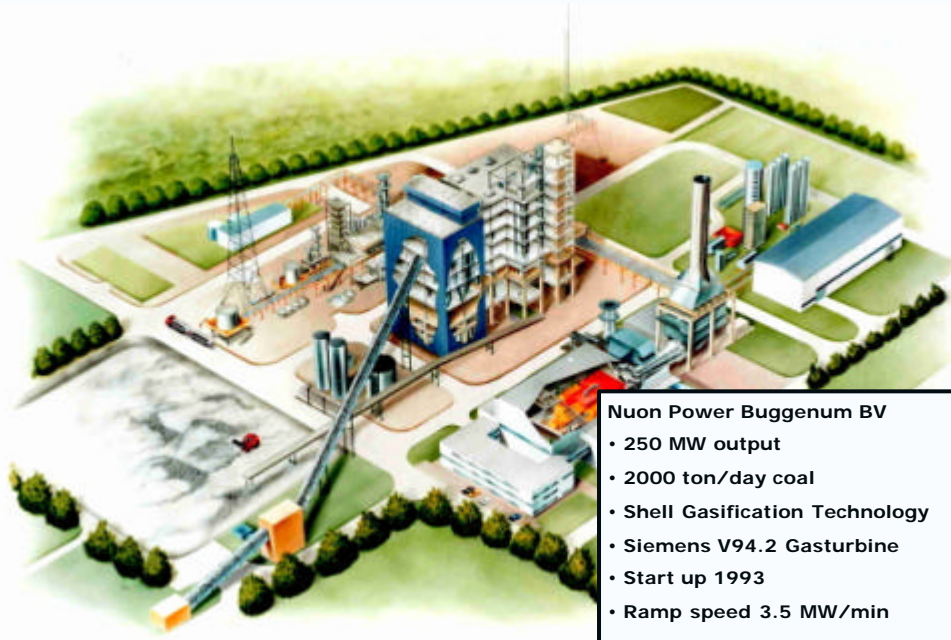




**Operating Experience  
at the  
“Willem-Alexander  
Centrale”**

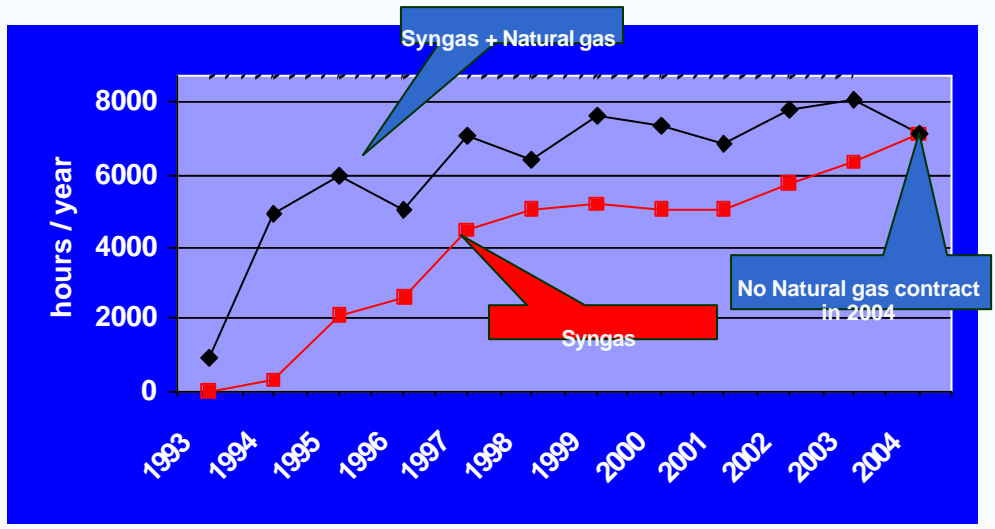
**Carlo Wolters**  
 Manager Operations  
 Nuon Power Buggenum BV  
 October 14<sup>th</sup> 2003

- 1. Plant data**
- 2. Operations 2002**  
 Pareto based analysis of forced outages
- 3. Operations 2003**  
 Pareto based analysis of forced outages
- 4. The Future**  
 Gasification of Secondary fuels

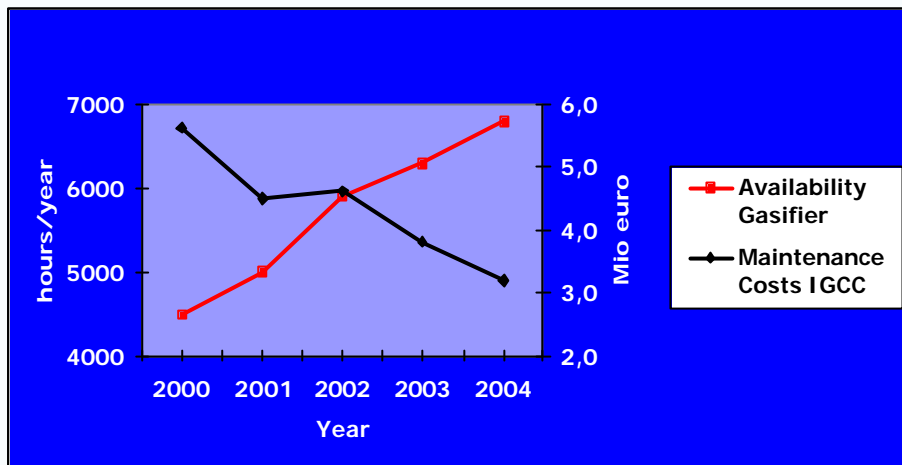


- Nuon Power Buggenum BV
- 250 MW output
- 2000 ton/day coal
- Shell Gasification Technology
- Siemens V94.2 Gasturbine
- Start up 1993
- Ramp speed 3.5 MW/min

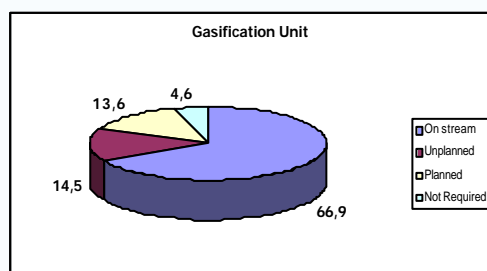
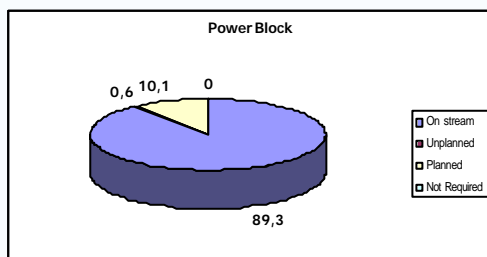
### Operating hours (1993-2004)



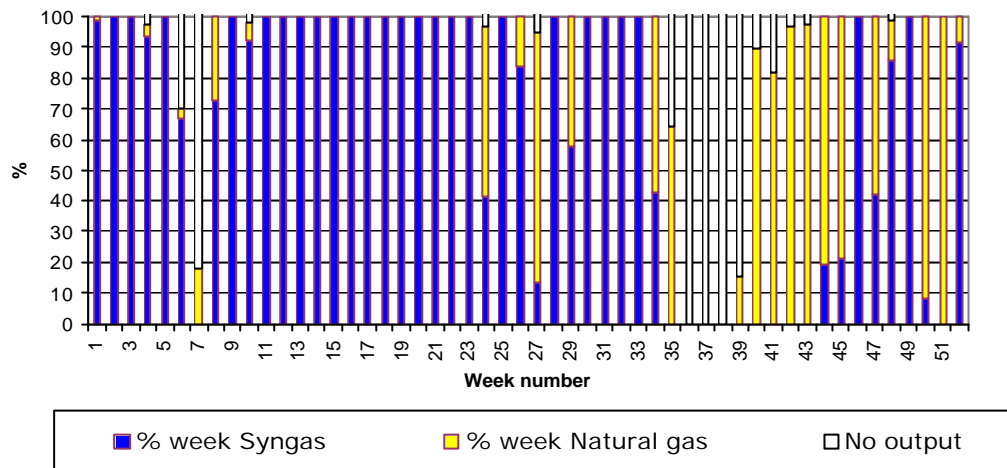
## Availability and Maintenance Cost (excl. shutdown cost)



## Operating statistics 2002



## IGCC Availability 2002 Syngas / Natural gas in % per week



## Performance WAC

	real 2002	real 2003*	last estimate 2003
Availability GT:	89.3 %	94.8 %	95.9 %
Forced Outage Rate:	0.6 %	1.1 %	1.0 %
Availability IGCC:	67.3 %	64.6 %	72.5 %
Forced Outage Rate :	18.4 %	25.4 %	19.3 %

\* Data through October 5<sup>th</sup>, 2003

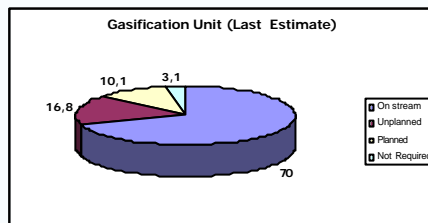
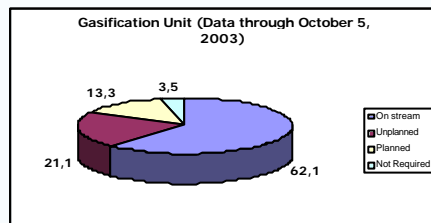
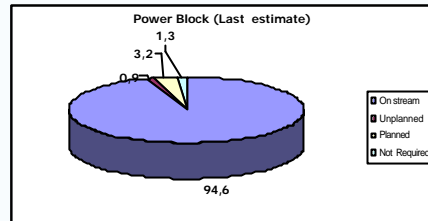
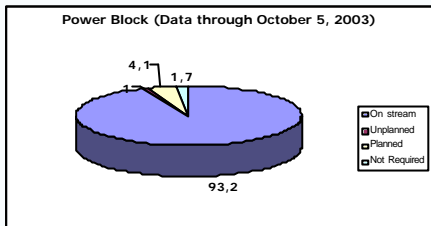
## Results from Pareto analysis, 2002

Problem	Percentage	Actions
Overhaul to late	(36%)	New maintenance approach
Syngas cooler pipes	(26%)	Improved repair + vibrations control ('03)
Drain blockages ASU	(11%)	Improved operations + mole sieves ('02)
Slag bath circulation	(9%)	Improved pipes installed
Powder coal dust filter	(7%)	Improved modification procedure
<b>Total</b>	<b>(89%)</b>	<b>(100% = 1354 h)</b>

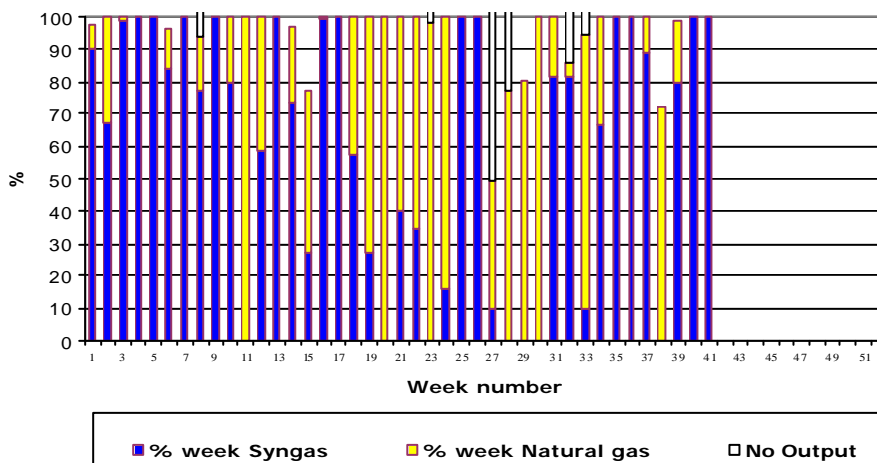
## Slag bath circulation



## Operating statistics 2003



## IGCC Availability 2003 Syngas / Natural gas in % per week

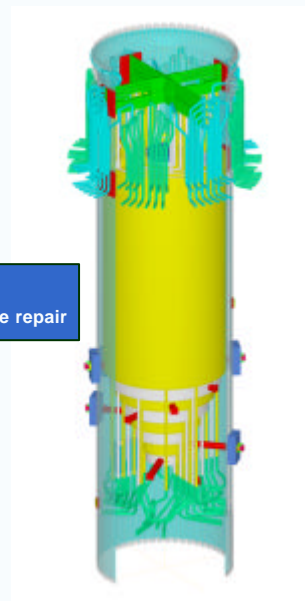


## Results from Pareto analysis, 2003

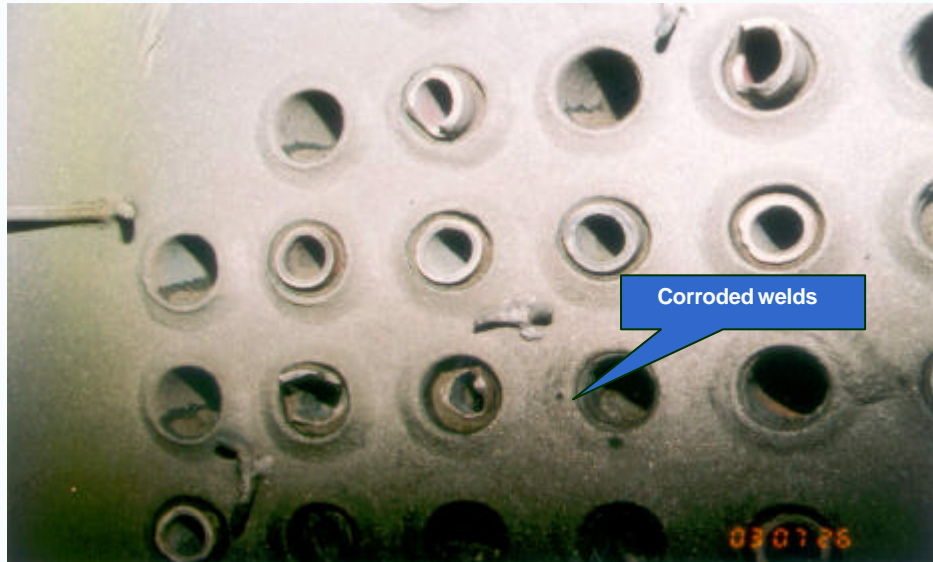
Problem	Percentage	Actions
Leakages Claus	(42%)	New design tube sheet
Syngas cooler pipes	(27%)	Improved repair + vibrations control
ASU valves + LOX Quality	(16%)	Improved operations + mole sieves
DGAN quality trips	(8%)	Improved ASU control
<b>Total</b>	<b>(93%)</b>	<b>(100% = 1410 h)</b>

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## Syngas cooler



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### Successes 2002/2003

- ✧ Max load from 210 to 230 MW to 245 MW
- ✧ Control power from 2 to 3.5 MW/min
- ✧ 4 records regarding running hours
- ✧ 2001 list of large technical problems solved
- ✧ Cost reductions O&M



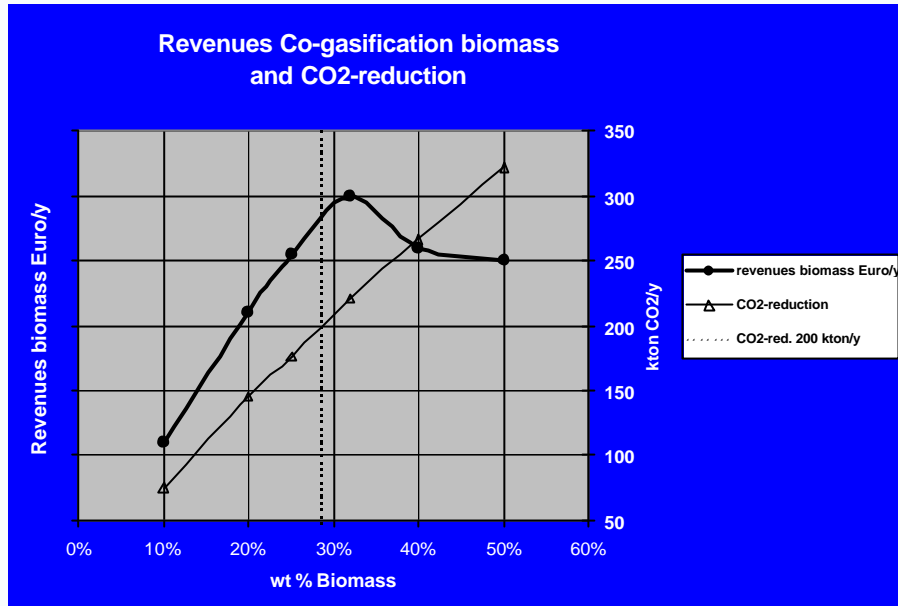
## Biomass Project Issues

- Board decision
- Subsidies (MEP)
- CO<sub>2</sub> emission trade
- Permitting
- Availability biomass
- Technology

## Secondary fuel types planned:

(Coal feed	: 400 kton/y)
Wood	: 120 kton/y
Sewage Sludge	: 50 kton/y
Coffee	: 10 kton/y
Rice	: 5 kton/y
Chickenlitter	: only as back up

Carbon Black  
 Pet Cokes  
 Plastics (thermally stable above 130 degr. C)  
 Orimulsion  
 Residual oil



## Test program

<u>Fuel</u>	<u>2001</u> <u>(ton)</u>	<u>2002</u> <u>(ton)</u>	<u>2003</u> <u>(ton)</u>
Sewage sludge	2.300	1.824	1625
Chicken Litter	800	391	0
Wood	130	49	500
Paper pulp	<u>1.000</u> 4.230	<u>59</u> 2.383	<u>1600</u> 3.725

MAX: 12,5% co-gasification tested.

## Gasification: good market position for waste streams, examples:

- Wood dust (demolition wood) from woodboard industry may contain up to 1 ppm Mercury. PC plants are not allowed to handle this in the Netherlands
- Landfill in most of Europe is no longer allowed for waste streams with more usefull purpose as of 2005.
- Mercury emissions (kg/y) with 100 kton/y Sewage sludge:
 

- WAC	1,2
- SNB Moerdijk	3,1
- Conv. Coal Power plant	12 - 30
- ENCI (cement industry)	36 – 60