Eskom

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NUCLEAR-1 NPP
EIA CONSISTENT DATA SET

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REVISION	DESCRIPTION OF REVISIONS	APPROVAL	DATE
0.1	DRN sea water temp inc = 13°C. JB change efficiency of AP1000		

KEY WORDS	DATE OF LAST REVIEW: N/A
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	NOTE – These dates can be changed without affecting the revision status of the document

Nuclear-1 Consistent Data Set

	Unit	Envelope
Auxiliary Steam Boiler		
Auxiliary Steam Boiler (x3)	t/h	32
Diesel Storage Tanks (x2)	m³	230
Chlorination		
CRF (Main Cooling Water)		
Normal Operation-Continuous	mg/kg	2.00
Shock (3x/day for 15 min)	mg/kg	4.00
Continuous consumption rate	kg	13 565
Shock consumption rate	kg	848
Total consumption rate	kg	14 413
SEN (Aux Cooling Water)		
Normal Operation-Continuous	mg/kg	2.00
Shock (3x/day for 15 min)	mg/kg	4.00
Continuous consumption rate	kg	656
Shock consumption rate	kg	41
Total consumption rate	kg	697
Civil Works		
(Existing landscape)		
Maximum height above MSL	m	14
Minimum height above MSL	m	6
Sand removal for Construction	m³	15 000 000
Finished Terrace above MSL	m	10
Demineralisation Plant		
Units	ea	2
Capacity per unit	m³/day	2 000
Conductivity of water	S/cm	0.2×10^{-6}
Silica SiO_2	g/l	20×10^{-6}
Sodium	g/l	1×10^{-5}
Suspended solids	g/l	50×10^{-6}
Desalination Plant		
Type		Reverse Osmoses
Will the sea water needed be taken up through the uptake pipes used for cooling water?		Not initially. Will later be incorporated when the intake basin is complete
What input volume of water will be needed and how does it compare to the uptake of cooling water	m³/day	9000 maximum = 0.14% of intake
Output of plant (earth works)	m³/day	3x 3000
Output of plant (Construction)	m³/day	1x600
Output of plant (operation)	m³/day	2x2000
Will the desalination plant run continuously?		It will run constantly during earth works. Only one unit will run during construction and the operation of the 3 units will alter during operation
What is the volume and chemical composition, salinity, PH and temp of discharged water?		The effluents of reverse washings in the water will be directed to the collection sump the mixture of water and chemicals shall then be directed by means of pumping to a neutralisation pit. Discharge at ambient
Brine		
Input	ppm	35 000
Output	ppm	59 000
Diesel Generators		
(Per nuclear unit)		
Emergency Diesel Generators		
Number of generators	each	4
Output Capacity	MW	8
Diesel storage arrangement		Run at rated power for 72 hours
Testing hours per week	h	2.00
Station black-out Diesels		
Number of generators	each	2
Output Capacity	MW	003

Diesel storage arrangement		Run at rated power for 24 hours
Testing hours per week	h	2.00
Diesel storage tanks	kl	1 000
Dose Rates		
Radiation Worker		
Normal Operation		
(For Power Station)		
100m	nSv/h	0.30
300m	pSv/h	27.00
1000m	pSv/h	0.20
Incident Conditions		
100m	nSv/h	2.50
300m	nSv/h	0.20
1000m	pSv/h	1.60
Public Radiation		
(For Power Station)		
Normal Operation	mSv	0.10
Incident and Accident	mSv	10.00
Electrical and Thermal Characteristics		
(per unit)		
Gross Electrical Output	MWe	1784
Net Electrical Output	MWe	1650
House Load	MWe	134
Thermal Output	MWth	4616
Efficiency	%	35.75%
Availability	%	91.5%
18 months	%	91.5%
First 2 years	%	
Power Factor at Gen Terminals		0.90
Employees on Site		
Please note that this will be the maximum number of employees per group. The peak will not be at the same time for all groups		
Eskom Project Staff		140
Consultants		40
Vendor Staff		2 172
Vendor Construction Workers		5 000
Eskom Operation Staff		1 385
Helicopter Landing Pad		
Landing pad planned on site	Yes / No	Yes
Aviation fuel storage tank	m³	5
Housing		
Staff Village		
General Facilities		
Land Requirement	ha	44.2
Recreation Club	m²	2 600
Indoor Sport & Function Hall	m²	1 600
Shop	m²	2 500
Medical Clinic	m²	600
Entrance Security Building	m²	200
Workshop & Stores	m²	400
Kitchen & Dining Room	m²	1 400
School for Expats	m²	3 600
Primary School	m²	2 000
Secondary School	m²	2 200
Tennis Courts 4 off	m²	800
Squash Courts 3 off	m²	150
Rugby 2 off	m²	14 000
Soccer 1 off	m²	14 000
Swimming Pool 1 off	m²	400
Basketball 4 off	m²	400
Parking 270 cars	m²	5 608
Vendor Staff		
Land Requirement	ha	89.5
Total Vendor Construction Staff	ea	2 172
4 Bedroom Houses		
Qty	ea	540
Size	m²	180
Stand Size	m²	500
3 Bedroom Houses		
Qty	ea	345
Size	m²	142
Stand Size	m²	450
2 Bedroom Houses		
Qty	ea	307
Size	m²	123
Stand Size	m²	400
Single Accommodation Units		
Qty	ea	980
Size	m²	66
Stand Size	m²	100
Eskom Project Personnel		
Land Requirement	ha	12

Total Eskom Project Staff	ea	140
Consultants	ea	40
4 Bedroom Houses		
Qty	ea	18
Size	m²	180
Stand Size	m²	500
3 Bedroom Houses		
Qty	ea	50
Size	m²	142
Stand Size	m²	450
2 Bedroom Houses		
Qty	ea	45
Size	m²	123
Stand Size	m²	400
Single Accommodation Units		
Qty	ea	67
Size	m²	66
Stand Size	m²	100
Consultants		
Qty	ea	40
Size	m²	66
Stand Size	m²	100
Eskom Staff		
Land Requirement		65.7
Senior Managers (E band)	ha	
Qty	ea	1
Size	m²	220
Stand Size	m²	1 000
Managers (M Upper)		
Qty	ea	9
Size	m²	190
Stand Size	m²	800
MMM		
Qty	ea	280
Size	m²	175
Stand Size	m²	600
Artisans		
Qty	ea	310
Size	m²	75
Stand Size	m²	300
Artisans		
Qty	ea	400
Size	m²	50
Stand Size	m²	300
Construction Camp		
Land Requirement	ha	50.9
Housing		
Workers on Site	ea	5 000
% local	%	25
Workers Require Housing	ea	3 750
12 bed Units Required		
Qty	ea	250
Size	m²	122
8 Bed Units Required		
Qty	ea	94
Size	m²	92
Support Facilities		
Laundry	m²	66
Parking (25% of Residents)	m²	25 313
Canteen	m²	3 686
Lapa with TV	m²	80
Liquor Outlet	m²	184
Bus Terminus	m²	25 313
Admin Office	m²	80
Clinic	m²	600
Sewer	m²	2 000
Recreation Facilities		
Tennis (40x20) 4 off	m²	800
Soccer (110x75) 2 off	m²	14 000
Rugby (144x70) 1 off	m²	9 000
Swimming Pool (15x15) 1 off	m²	400
Basketball (20x20) 4 off	m²	400
Parking (28x40)	m²	17 692
Hydrogen Plant (H2)		
H_2 Plant / Unit	Nm^3/h @ 25E	15
4 x Storage Tanks	Nm^3	30
Intake / Outfall Structure		
Intake		
Distance off shore	m	1000 to 2000
Number of Tunnels	ea	1 or 2

Diameter of tunnels	m	5 to 10
Structure at Intake		1. Letterbox. 2. The design can also include a vertical tube extending approximately 3-5m above the sea bed to prevent the drawing of large quantities of sediment.
Depth of Tunnels	m	Approximately 30
Spoil		Placed in Rock Retaining Wall and unsuitable material to be used to level HV yard. Any additional will be transported to a suitable approved location off site
Outfall		
Outfall type		Can be off shore via tunnels or out flow like Koeberg.
Tunnel alternative		
Number of tunnels	ea	3 to 4
Diameter of tunnels	m	approximately 3
	m	approximately 500
Depth of Tunnels	m	approximately 5
Gas Turbines		
General Specifications		
Gross Output Power (2off)	MW	25.30
Gross Efficiency	%	34.00
Fuel mass flow	kg/s	1.74
Exhaust Gas		
Exhaust gas mass flow	kg/s	85
Exhaust gas temperature	℃	538
Gas Composition		
N_2	%Vol	74.80
O_2	%Vol	13.90
CO_2	%Vol	4.20
H_2O	%Vol	6.20
Ar	%Vol	0.90
SO_2	%Vol	0.00
Noise		
Average sound attenuation @ 1m from the package and 1,5m above ground	dB(A)	85
After additional sound damping	dB(A)	80
Investment		
Eskom portion of investment in RSA		
1980's	%	40
1990's	%	
2000's	%	
2010's	%	
Noise		
Noise emission data of machinery, piping, ductwork and other services and ancillary equipment in the form of one-octave or 1/3rd octave frequency band sound power levels together with the source of the data.		
Have any noise measurements been taken by the vendors for different distances from the plant. If so such measurements would be required.		
Gas Turbine Noise Level		
Average sound attenuation @ 1m from the package and 1,5m above ground	dB(A)	85
After additional sound damping	dB(A)	80
NNR Requirements		
Zones		
Exclusion zone	km	Note: These figures will be determined by the NNR after a full examination of the safety case
Evacuation zone	km	Note: These figures will be determined by the NNR after a full examination of the safety case
Time to evacuate site	h	Note: These figures will be determined by the NNR after a full examination of the safety case

Non-radioactive releases		
Operational Phase		
Emissions will be calculated for:		
Emergency generators (if any);		
Vehicle emissions; and		
Any other source of significant air emissions.		
Dispersion modelling require		
Emission information of emergency generators and other process emission sources (if any) include:		
Stack		
Gas		Ventilation
Location of release point;	ft	Next to reactor
Height of release above ground;	m	96.00
Vent tip diameter;	m	3.00
Gas exit volume	m³/min	
Exit gas velocity (normal)	m/s	5.80
Exit gas velocity (outage)	m/s	6.35
Exit gas temperature (winter)	℃	Ambient
Exit gas temperature (summer)	℃	Ambient
Gas Turbine Exhaust Gas		
Exhaust gas mass flow	kg/s	85
Exhaust gas temperature	℃	538
Gas Composition		
N_2	%Vol	74.80
O_2	%Vol	13.90
CO_2	%Vol	4.20
H_2O	%Vol	6.20
Ar	%Vol	0.90
SO_2	%Vol	0.00
Whilst it is not believed to be a significant source, vehicle impacts will be included and will require the road layout design, number of vehicles and time schedules		
Nuclear Fuel		
Enrichment of fuel (by weight)	%	4.95
Rods / Assembly	each	265
Assemblies / load	each	241
Fuel active height	m	4.20
Fuel assembly pitch	m	0.215
Mass of fuel rod	kg	2.80
Mass of assembly	kg	780
Total assembly mass in reactor	ton	187.98
Duration of fuel in reactor	months	18
Spent fuel over lifecycle (Approx)	ton	1 880
(Approx)	m³	468
Nuclear Waste		
Low level waste / year	Steel drums	470
Mass of steel drums (approx)	kg	50-100
Intermediate level waste / year	Concrete	160
Intermediate level waste / year	ton	6.3
Number of trucks to transport the low and intermediate level waste / year	each	The existing Eskom lorry / trailer at Koeberg can take 80 steel drums at a time plus 3 concrete drums. We transport at our own and Necsa's convenience to ensure it is optimised for both parties. As there is a lot of storage space, when and how often we transport is not an issue. We stay away from school holidays and rainy season as part of the road is not tarred.
Primary Energy		
Eskom coal usage	ton/MWh	0.56
Quantity Surveying		
(per unit)		
Concrete	CY	

	m³	289 000
Concrete pouring per day	m³	1 000
Concrete Reinforcing	TN	
	t	39 500
Structural Steel	TN	16 770
	t	15 213
LB Pipe	foot	230 082
	m	70 129
Cable	foot	3 645 018
	m	1 111 001
Terminations	ea	158 252
Sand removal	m³	15 000 000
Bedrock	m³	6 000 000
Balance of Plant Estimates		
For Thyspunt		
Concrete	CY	142 122
	m³	108 660
Concrete Reinforcing	TN	7 458
	t	6 766
Structural Steel	TN	1 432
	t	1 299
Small Bore Pipe	foot	42 114
	m	12 836
LB Pipe	foot	537 777
	m	163 914
Conduit	foot	1 250 841
	m	381 256
Cable	foot	2 975 342
	m	906 884
Terminations	ea	22 025
Radioactive Releases		
Routine radioactive emissions from the vent stack Anticipated Operational Occurrences (AOO) as these are typically anticipated to occur with a frequency of more than 1 in 100 years.		
Accident scenarios		
Nuclide source term for routine emissions. If accident scenarios (e.g. AOO) are to be simulated, then we also need those source terms.		
Source terms for both Areva and Westinghouse designs, [The source term includes a list if nuclides (Bq/annum) and an emission frequency]		
release data for each design and scenario (i.e. routine & upset):		
location of release point;		
height of release above ground;		
oven tip diameter;		
exit gas velocity; and		
exit gas temperature.		
Primary Energy		
Eskom coal usage	ton/MWh	0.56
Reactor pressure vessel		
Design pressure	bar	167
Design temperature	℃	351
Reactor power	MWth	4616
Coolant Pressure	Mpa	15.50
Hot leg temperature	℃	330.00
Cold leg temperature	℃	295.20
Seismic		
Peak Ground Acceleration (PGA)		
Horizontal		0.25
Vertical		0.19
Sewer		
People during construction	ea	8 000
Water consumption / person / day	l	120
Sewer plant to treat 70% (rounded)	m³/day	750
Waste Water Treatment Plant		
From buildings		SEO/SHE & HX
Potentially active waste (SEK/KER): 6 tanks	m³	750
Potentially active waste TER: 2 tanks	m³	750
Water Consumption		
Construction		
(For Power Station)		
Construction Camp	m³/year	365 000
	m³/month	30 000
	m³/day	1 000
	m³/s	0.012
Site preparation	m³/year	3 285 000

	m^3/month	270 000
	m^3/day	9 000
	m^3/s	0.104
Construction on Site	m^3/year	584 000
	m^3/month	48 000
	m^3/day	1 600
	m^3/s	0.019
Operation		
(For Power Station)		
Total Cooling Water Flow	m^3/year	2 396 736 000
(Reactor Coolant Flow rate	m^3/month	196 992 000
	m^3/day	6 566 400
	m^3/s	76.0
Sea Water Temperature Increase	℃	12
Fresh Water	m^3/year	2 190 000
	m^3/month	180 000
	m^3/day	6 000
	m^3/s	0.069
Demineralised Storage Tanks	m^3	4x2 200m^3+ 2x800m^3
Potable Water Storage Tanks	m^3	2x9 000m^3
Fire Water Storage Tanks	m^3	2x1 800m^3
Wind		
Plant design parameters to wind		
Diesel Buildings	m^3/s	50
BOP	m^3/s	43
Conventional Island	m^3/s	50

Other Data

Expected Load Demand

Area Description	2007	2008	2010	2012	2014	2017	2020	2025	2027
Southern Grid (Western Cape) (MW) (12% average)	1508	1668	2536	3411	3718	4238	4455	5154	5245
Western Grid (Eastern Cape) (MW) (3% average)	3991	4222	4467	4727	5002	5295	5605	5934	6283

Transmission Losses

(Difference between Bravo at Kendal and a Nuclear Plant of approximately 3300MW at the following sites

Input Station	MW	3300	%
Bantamsklip	MW	293	8.9
Duynefontein	MW	275	8.3
Thyspunt	MW	351	10.6

Transport of Fuel
Transport Cost of reload

Koeberg		
Europe to Cape Town	Rand	3 600 000
Cape Town to Duynefontein	Rand	400 000