



## IRP INPUT PARAMETERS

### S6: Co-generation - IRP 2010 Input Parameter

Parameter	Co-generation																																																																																																																														
Parameter	Bagasse co-generation:																																																																																																																														
Value	<div>Sugar Cane Fibre Cost And Performance Summary (EPRI Executive Summary Format)</div> <table><tr><th>Technology</th><th>Cane Fibre</th><th>Cane Fibre (Felixton)</th></tr><tr><td>Rated Capacity MW net</td><td>52.5</td><td>49</td></tr><tr><td>Plant Operating Season per year - weeks</td><td>36</td><td>36</td></tr><tr><td>Plant Cost Estimates (January 2010)</td><td></td><td></td></tr><tr><td>Capex Rm</td><td></td><td></td></tr><tr><td>    Total Plant Cost Overnight ZAR/kW</td><td>21,318</td><td>9,429</td></tr><tr><td>    Lead Times and Project Schedule years</td><td>3</td><td>2</td></tr><tr><td>    Expense Schedule % of TPC per year</td><td>10%,30%,60%</td><td>33%, 67%</td></tr><tr><td>Fuel Cost Estimates</td><td></td><td></td></tr><tr><td>    First Year ZAR/GJ</td><td>57</td><td>57</td></tr><tr><td>    Expected Escalation</td><td>0%</td><td>0%</td></tr><tr><td>    Fuel Energy Content kJ/kg</td><td>6,850</td><td>6,343</td></tr><tr><td>Operation and Maintenance Cost Estimates</td><td></td><td></td></tr><tr><td>    Fixed O&amp;M ZAR/kW-yr</td><td>310</td><td>115</td></tr><tr><td>    Variable O&amp;M ZAR/MWh</td><td>18</td><td>5.9</td></tr><tr><td>Availability Estimates (during season)</td><td></td><td></td></tr><tr><td>    Equivalent Availability</td><td>95%</td><td>95%</td></tr><tr><td>    Maintenance</td><td>3.8%</td><td>3.8%</td></tr><tr><td>    Unplanned Outages</td><td>1.2%</td><td>1.2%</td></tr><tr><td>Availability Estimates (for the year)</td><td></td><td></td></tr><tr><td>    Equivalent Availability</td><td>66.0%</td><td>66.0%</td></tr><tr><td>    Maintenance</td><td>33.0%</td><td>33.0%</td></tr><tr><td>    Unplanned Outages</td><td>1.0%</td><td>1.0%</td></tr><tr><td>Performance Estimates</td><td></td><td></td></tr><tr><td>    Economic Life years</td><td>30</td><td>30</td></tr><tr><td>    Heat Rate kJ/kWh</td><td>19,327</td><td>26,874</td></tr><tr><td>Plant Load Factor</td><td></td><td></td></tr><tr><td>    Typical Capacity Factor during Season</td><td>71%</td><td>80%</td></tr><tr><td>    Typical Capacity Factor overall</td><td>49%</td><td>55%</td></tr><tr><td>    Maximum of Rated Capacity</td><td>100%</td><td>100%</td></tr><tr><td>    Minimum of Rated Capacity</td><td>22%</td><td>22%</td></tr><tr><td>Water Usage</td><td></td><td></td></tr><tr><td>    Per Unit of Energy L/MWh</td><td>217</td><td>217</td></tr><tr><td>Air Emissions kg/MWh</td><td></td><td></td></tr><tr><td>    CO2</td><td>2,129</td><td>2,807</td></tr><tr><td>    CO2 Net of renewable CO2</td><td>88</td><td>115</td></tr><tr><td>    SOx (as SO2)</td><td>0</td><td>0</td></tr><tr><td>    NOx (as NO2)</td><td>Negligible</td><td>Negligible</td></tr><tr><td>    Particulates</td><td>0.45</td><td>0.8</td></tr><tr><td>Solid Wastes kg/MWh</td><td></td><td></td></tr><tr><td>    Fly ash</td><td>81.7</td><td>113.6</td></tr><tr><td>    Bottom ash</td><td>27.3</td><td>36.8</td></tr></table>	Technology	Cane Fibre	Cane Fibre (Felixton)	Rated Capacity MW net	52.5	49	Plant Operating Season per year - weeks	36	36	Plant Cost Estimates (January 2010)			Capex Rm			Total Plant Cost Overnight ZAR/kW	21,318	9,429	Lead Times and Project Schedule years	3	2	Expense Schedule % of TPC per year	10%,30%,60%	33%, 67%	Fuel Cost Estimates			First Year ZAR/GJ	57	57	Expected Escalation	0%	0%	Fuel Energy Content kJ/kg	6,850	6,343	Operation and Maintenance Cost Estimates			Fixed O&M ZAR/kW-yr	310	115	Variable O&M ZAR/MWh	18	5.9	Availability Estimates (during season)			Equivalent Availability	95%	95%	Maintenance	3.8%	3.8%	Unplanned Outages	1.2%	1.2%	Availability Estimates (for the year)			Equivalent Availability	66.0%	66.0%	Maintenance	33.0%	33.0%	Unplanned Outages	1.0%	1.0%	Performance Estimates			Economic Life years	30	30	Heat Rate kJ/kWh	19,327	26,874	Plant Load Factor			Typical Capacity Factor during Season	71%	80%	Typical Capacity Factor overall	49%	55%	Maximum of Rated Capacity	100%	100%	Minimum of Rated Capacity	22%	22%	Water Usage			Per Unit of Energy L/MWh	217	217	Air Emissions kg/MWh			CO2	2,129	2,807	CO2 Net of renewable CO2	88	115	SOx (as SO2)	0	0	NOx (as NO2)	Negligible	Negligible	Particulates	0.45	0.8	Solid Wastes kg/MWh			Fly ash	81.7	113.6	Bottom ash	27.3	36.8
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	<p>The costs for Felixton above are included as an option, but limited to this specific instance/project. The generic cane fibre costs are included as options in the IRP with a potential of 1000MW as indicated by Tongaat in its submission.</p>																																																																																																																														

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	<p>Forestry waste and municipal waste co-generation are included as generic options in the IRP, based on costs from the EPRI report. There is no limit to these options.</p> <p>Industrial co-generation (other than bagasse, forestry waste and municipal waste): In the absence of approved profiles and costs industrial co-generation will not be included in the IRP model. Co-generation may be able to fill generic capacity requirements determined as the outcome of the IRP.</p>	
<b>Rationale</b>	<p>Ideally a feasibility or market sounding would be undertaken to investigate the potential for co-generation in the South African market. This may be undertaken as part of the feasibility process following the conclusion of the IRP. If the outcome of the feasibility supports the development of co-generation projects this will replace alternative capacity sources, potentially base-load or mid-merit.</p>	
<b>Responses to Public Inputs</b>	<b>Summary of specific comments</b>	<b>Response</b>
	2000 MW looks very conservative. How was this figure arrived at? (90x2030, CJN!-WC)	There is limited information on the true potential for co-generation. Information has been forthcoming from the sugar milling industry on bagasse potential, but the remainder is pure guesswork.
	The improved uptake of cogeneration under the regime of a COFIT has to be estimated as an IRP input parameter. (ACMP)	Noted.
	The technical estimates for cogeneration potential in South Africa appear reasonable. However, questions can be raised as to how much of this can be counted on being implemented, and within what timeframes. Since most co-generation projects are generally self-dispatch, they are not a reliable resource to the System Operator in terms of ensuring the necessary system reserve margin and reliability. (CIC)	Dispatchability by the System Operator should not impact on the perceived reliability of a generator. Under appropriate pricing mechanisms this capacity should be available over the appropriate periods as much as any dispatchable plant.
	With or without financial incentives, the full 2 000 MW should to be included in the IRP2 before any plans for new generation capacity are finalised. (Energy Caucus)	Generic options are included where costs are known. Industrial co-generation options have not been included due to a lack of cost estimates.
	More co-generation will be available if a COFIT tariff structure is released for co-generation. (Exxaro)	Noted.
	Should be a more integral part of the IRP, incorporating past initiatives that haven't got off the ground such as the Pilot National Cogen Project and Cogeneration Feed-in Tariffs. Incentives are required, which needs to give premium on current Eskom Mega flex tariffs. (IES)	Noted. See above for explanation of modelling in IRP.
	Recognition of and compensation for cogeneration potential is essential to the feasibility of many IPPs. (Mbani Wesizwe)	Noted.
	With increased electricity prices, cogeneration will be implemented more and more as an option in developing new industries. (Private-WB)	Noted.