



## Distribution Infrastructure - IRP 2010 Input Parameter information sheet

This sheet is to be used as the primary stakeholder engagement tool. This document provides the information that will allow the stakeholders to make a meaningful contribution to the IRP Input parameters

Parameter	Distribution Infrastructure
Purpose	<p><b>NB: Due to time constraints Distribution Costs will not be an input consideration to this IRP 2010 plan.</b></p> <p>Notwithstanding expansion of generating capacity generally has a knock-on effect on both the Transmission and Distribution systems, which need a corresponding increase in capacity in order to deliver the additional electricity to the end user.</p> <p>Any planned increase in centralized generating capacity will require a relatively fixed corresponding investment in the distribution infrastructure, a cost component which, must be considered as part of the total IRP cost. The expenditure is needed in order to ensure the absorption any additional energy as well as maintain a reasonable security of supply within the Distribution environment.</p> <p>For the purpose of definition, this parameter may have two components-</p> <ul style="list-style-type: none"><li>a) A relatively fixed cost that applies to expansion of centralized generation connected to the national transmission grid.</li><li>b) A variable cost in the case of Distributed Generation resources, that depends on the size and location of the resource.</li></ul> <p>(Note: The location of any new centralized generating plant will largely determine the cost of the corresponding Transmission</p>



	<p>investment.</p> <p>Transmission costs are therefore variable and technology / project specific and are treated as a separate parameter or are included in cost estimates of the particular technology or project.</p> <p>Similarly, Distributed Generation off-take costs that are incurred at the Distribution Network level are project location dependent.)</p>
<b>Impact on the IRP</b>	<p>This Distribution 'linked investment cost' has an impact on the initial price cone projections of the IRP, in the same way that the initial capital cost of new generating plant influences the price projections.</p> <p>In the case of traditional, centralized generation expansion, Distribution investment is technology and project independent and may be considered a fixed, Rand per kVA cost.</p> <p>In the case of urban distributed generation resources Distribution cost may be reduced as the additional capacity, can usually be directly absorbed by adjacent loads, obviating the need for substation infrastructure expansion.</p> <p>An IRP that favours distributed generation, either operated as peak-opping or base-load co-generation plant, would reduce the need for Transmission and Distribution investment, provided the location is chosen appropriately. (Examples – gas fired co-generation plant established in metropolitan industrial zones or open cycle gas turbine peak-opping plant connected within Metropolitan areas)</p> <p>In the case of rural distributed generation resources, the cost may increase significantly in order to deliver the power to remote load centres. (Examples – wind turbines, typically operated at Medium Voltages -11 to 132kV, or small scale photovoltaic farms &lt; 10MW)</p> <p>The parameter ultimately impacts on the affordability of the IRP, and is sensitive to the mix between centralized or distributed</p>



	<p>energy sources.</p> <p>In particular, the IRP's gas turbine 'plant mix' has the potential to minimize Distribution investment by locating such plant within Metropolitan areas, provided fuel supply infrastructure exists.</p>
<b>Assumptions included in establishing the parameter values in this sheet</b>	
<b>Parameter Value</b>	<p>Distribution network investment to accommodate additional load may manifest itself in three ways:</p> <ul style="list-style-type: none"><li>• (A) Investment in new substations and infrastructure to service new areas</li><li>• (B) Replacement or refurbishment of existing substations and infrastructure to strengthen the network's capacity.</li><li>• (C) Investment in demand side management systems (DSM) to improve the network load factor and optimize the existing network utilization.</li></ul> <p>a) is relatively straightforward to estimate, as the cost of transformers, switchgear and cable as well as the physical planning parameters such as the average distance between distribution substations is known.</p> <p>b) can in fact often cost more than a) depending on what distribution components can be re-used going forward. Unfortunately, in the South African Municipal distribution environment, the average age of existing equipment is in excess of 30 years, and cannot be re-used. Inclusion of the refurbishment cost in the IRP may be viewed as an opportunity to replace the ageing municipal infrastructure going forward, essential to providing a reasonable security of supply for municipal consumers.</p>



	<p>'Smart grid' coupled with time or demand differentiated tariffs is an emerging technology aimed specifically at achieving c) above - a greater throughput of energy (kWh) on an existing distribution network while limiting the instantaneous maximum demand for power to within the technical constraints of the network (kVA). These systems have a high 'capex offsetting' value for distributors and can have a significant impact on limiting corresponding Distribution investments while generation capacities may even drastically be increased.</p> <p>Such systems also have the potential to support connection of distributed Renewable Energy resources, an important aspect if the IRP includes incentives to drive a significant uptake for example of grid-connected roof-top photovoltaic systems that use the grid as a night time energy store. (At present, the REFIT does not accommodate RE systems smaller than 1 MVA. It must be noted however, that distributors are seeing more and more requests for permission to grid-tie PV systems, and the possibility of a significant uptake of these systems cannot be ignored)</p> <p>The parameter can be expressed as a relatively fixed, Rand per kVA value.</p> <p><b>At present, the value is in the order of R 8 000 per kVA, and is significantly about a third of the current generation cost estimates of R 28 000 per kVA.</b></p>
<b>Range of Parameter Value</b>	<p>The parameter is subject to inflationary pressures as well as a fairly strong dependence on the state of the world economy, since energy demand remains directly proportional to economic development and population growth across the globe.</p> <p>With nations competing for limited quantities of resources such as copper, aluminium and transformer core steel, prices can vary by</p>



	<p>tens of percent year on year as economies rise or fall and demand for these commodities follows the economic climate.</p> <p>As the world is presently in a recessive state which seems to be bottoming out, the outlook over the next 3 years points to an increase in distribution equipment costs above general inflation rates.</p> <p>There is also an element of foreign exchange rate variation that can have a significant impact on this parameter.</p> <p>The overall variability of this parameter could be as high as 30% in short-term (3 year) time scales.</p>
<p><b>Preconditions necessary to make possible for this parameter to be included in the IRP</b></p>	
<p><b>Parameter Owner (Source)</b></p>	<p>The Electricity Distribution sector, with direct influence from the Electricity Regulator (via tariffs)</p>