

## Cost of Unserved Energy (COUE) - IRP 2010 Input Parameter information sheet (Supply input)

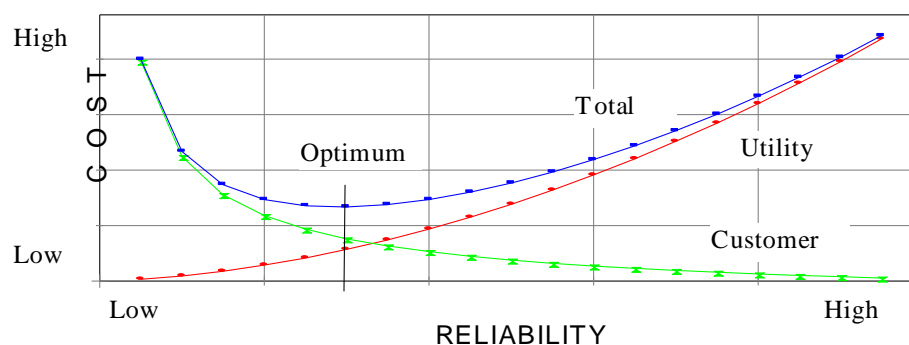
This sheet is to be used as the primary stakeholder engagement tool. This document provides the information that will allow the stakeholders to make a meaningful contribution to the IRP Input parameters

| Parameter         | Cost of Unserved Energy (COUE)  |
|-------------------|---|
| Purpose           | The COUE is the value (in Rands per kWh) that is placed on a unit of energy not supplied due to an unplanned outage of short duration. Optimal planning decisions would result from the power system planner balancing the total COUE against the incremental cost to supply the energy not served.   |
| Impact on the IRP | <p>Inadequate reliability of South Africa's generation, transmission and distribution system may lead to interruptions of the supply of electricity to customers; either randomly selected or specifically selected on account of their load management contracts with the System Operator.</p> <p>Reserve, redundancy and reliability standards, criteria and targets, will be selected primarily to <b>minimise the sum of the cost to the country of the energy supplied and of the cost to the customer of the energy unsupplied</b> as a result of equipment failure or system inadequacies.</p> <p>The economic evaluation of investments affecting the reliability of supply will take into account the cost to the customer of unsupplied energy, and its probability of occurrence.</p> <p>The diagram below shows the reliability cost to a utility and to its customers of various decisions affecting the reliability of the power supply, i.e. investment decisions, as a function of the reliability impact of these decisions. Each point of a curve corresponds to an alternative decision.</p> |



## OPTIMUM RELIABILITY

Reliability worth / cost



The minimum of the total curve yields the optimum decision and reliability level. At the optimum, a utility investment of one Rand to improve the reliability of supply will reduce the cost of unreliability to customers by one Rand.

This method can be applied in two ways. By applying this method a specific reserve margin can be chosen that is put in as a constraint in the planning optimization tool. Alternatively the planning optimization tool can use this method to decide on the optimum level and mix of plant to invest in.

The assumptions included in establishing the parameter values in this sheet

The COUE estimate is a number that will vary greatly amongst different customer sectors. . COUE is not a number that can be measured directly; rather, it is typically derived from customer research. Assigning a monetary value to COUE puts a shadow cost on the failure to serve energy. For some customers there is no price you can put on having the lights go out, e.g. critical health and safety facilities. The COUE is a difficult number to estimate since it varies greatly among customer load segments and the actual timing of unexpected interruptions.

Parameter Value

The cost of un-served energy (COUE) assumed is R 75/ kWh.

|  |   |
|--|---|
| <b>Range of<br/>Parameter<br/>Value</b>  | <p>A decade ago a range of R 3 to R17 / kWh (average R 10 / kWh) was used for the cost of unserved energy, based on a customer survey of 32 large industrial customers, performed in 1988 -1989 by the Marketing department of Eskom. A subsequent study led to the use of R 20 / kWh for the cost of unserved energy, which was roughly 150 X the cost of supply. A recent survey it has been recommended that the COUE be increased to R 75 / kWh, and this is the value that is currently in use.</p> <p>In the 2007 report determining an adequate reserve margin prepared for the National Integrated Resource Plan (NIRP) the sensitivity of the reserve margin to changes in the COUE was studied. High and Low values for COUE were calculated to be R 150 / kWh and R 35 / kWh respectively. These high and low COUE values were used as sensitivities to calculate the trade-off between reliability and total costs. The net effect of the COUE sensitivity on the reliability cost curve is that the reserve margin inflection point shifts by 1% downward for the Low COUE case and stays the same for the High COUE case. It can be concluded that the optimal reserve margin is relatively insensitive to the real value of COUE.</p> <p>An economic expression of COUE is to divide the country's GDP by the total electricity consumption. This method for determining COUE is internationally accepted as a minimum value for the parameter. For South Africa this method yields a COUE of about R 10/kWh for recent years.</p> |
| <b>Preconditions<br/>necessary to<br/>make possible<br/>for this<br/>parameter to<br/>be included in<br/>the IRP</b> | <p>Preconditions necessary for this parameter to be included in the IRP are:</p> <ol style="list-style-type: none"> <li>1. Acceptance by the DoE of the value of the cost of unserved energy to be used in the IRP.</li> <li>2. Regulations on dispatch need to be developed</li> </ol>   |
| <b>Parameter<br/>Owner</b>   | <p>NERSA</p>  |