

Demand (Energy & Maximum Demand) Forecast - IRP 2010 O Parameter Overview 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	Annual Demand Forecast (Energy and Maximum Demand)
Purpose	The electrical demand and energy forecast is the first and primary input into the IRP process that directly and significantly influences all other parameters.
Impact on the IRP	<p>The annual demand (Energy and Maximum Demand) forecasts are arguably the most uncertain input parameters and directly and significantly influences all the other IRP parameters.</p> <p>Underestimating demand results in supply shortages and ultimately forced power outages. However, over estimating demand will result in over investment in generation and ultimately even higher electricity prices.</p>
The assumptions included in establishing the parameter values in this sheet	<p>The demand forecast makes many assumptions on the future electricity requirements and demands by the electricity users. The forecast is done in two different ways, viz. electrical energy forecast and annual maximum demand forecast.</p> <p>The electrical energy forecast and the annual maximum demand forecasts are carried out in two interdependent processes. The development of these forecasts use various inputs, that need to be analysed, understood, discussed and fixed prior to the start of developing the forecast. The Key input assumptions are:</p> <ol style="list-style-type: none"> 1. Energy intensity of the economy (See Fact Sheets – Short and long term). 2. Weather patterns. 3. Efficacy of demand side initiatives to improve effectiveness of usage (See Fact Sheets on DSM, EE, DMP and self generation).

Parameter Value	<p>Energy Forecast</p> <p>The output of the forecasting process is the forecast total annual energy requirement for 20 years (including losses). The moderate load forecast is flanked by a high and low forecast, reflecting the cone of uncertainty. Each forecast is disaggregated to reflect the key building blocks, namely:</p> <ul style="list-style-type: none"> • Sales to Eskom’s customers – referred to as Eskom Market; • Sales within the Republic of South African market, in addition to sales to Eskom customers; • Sales to neighbouring countries and international customers; • Consumption by self- or cogenerating loads; and • Transmission and distribution losses. <p>The forecasts can be further disaggregated by economic sector.</p> <p>The forecast derived thus far has focused on the energy requirements of customers, but of the IRP defines the total quantity of energy to be generated, and therefore, it must include energy that is lost during the transmission and distribution process (an inevitable and unavoidable physical characteristic of power networks).</p> <p>Network simulation studies and the simulation of generation dispatch on the system, performed by Eskom’s Transmission Division provide the percentage by which energy sales must be increased to account for losses. Similarly, the Eskom’s Distribution Division will determine the percentage to be added for distribution losses, although its methodology is based on historic trends rather than network simulation, due to the complexity of the distribution network.</p> <p>In the interest of accuracy, two independent energy forecasts are developed, one by the System Operator and one by the CSIR (the application of a totally different methodology).</p> <p>The forecasting methodologies of these two entities can briefly be defined as follows:</p> <ul style="list-style-type: none"> • SO: a time series analysis of historic trends at individual customer and/or
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sector level, adjusted for non-repeatable events, is adjusted through expert knowledge and judgement for known and assumed parameters that will impact future electricity consumption.

- **CSIR:** an econometrics model utilising economic and demographic parameters has been constructed that calculates the forecast based on algorithms that utilise these parameters in the input function.

In order to compare the forecasts that will arise from the two methodologies, the same assumptions must be used in both forecasts.

The forecasts use various independent parameters to determine the electricity demand. The historic relationship between electricity demand and these variables is tested with the model being built from those variables that have a significant influence on electricity demand. These variables include the gross domestic product (GDP) of the economy – *the fact sheet on this parameter is documented separately*, the production from specific mining sectors, the production from the manufacturing sector, as well as general population growth, to name a few.

The two forecasts will be compared in detail. If there are significant differences, the underlying causes will be analysed. Should the differences be caused by valid information known or included in either the SO or the CSIR forecast, but excluded from the other forecast, then the relevant forecast will be adjusted to include the additional information. A probable country forecast will be presented to the DoE for approval.

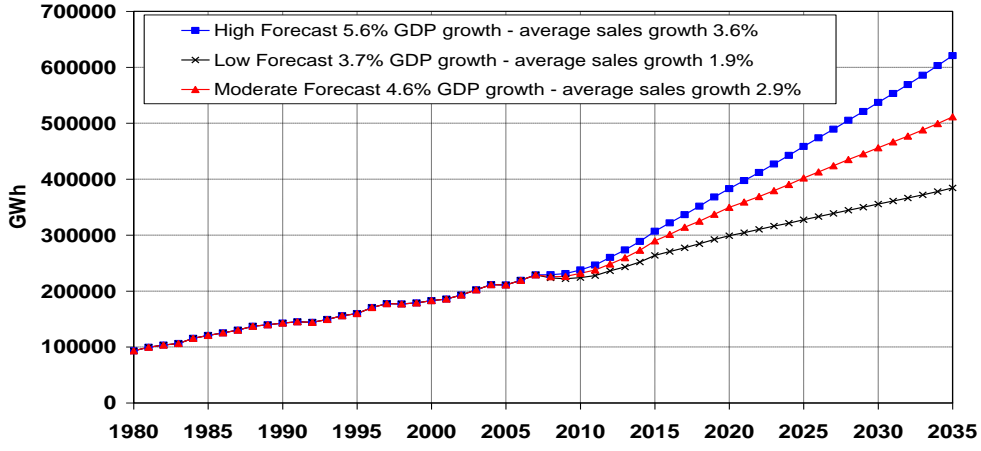
Annual Maximum Demand

The Official energy forecast is used as one of the major input into the hourly maximum demand forecast model to generate annual maximum (peak) demand forecast.

The other major inputs to the hourly maximum demand forecast model is the electricity demand profiles. These profiles are developed from the historical customer electricity usage and modelled according to determine the expected demand profiles per sector using load research models and expertise.

For this IRP process, in the interest of accuracy, the system profile model and sectorial

	<p>profile models will be used. The forecast results will be reviewed and a consensus annual maximum demand forecast will be approved by DoE. This annual maximum demand forecast will be regarded as an official forecast to be used in the IRP process.</p>
<p>Range of Parameter Value</p>	<p>These Forecasts are trend lines and are inherently very uncertain since there are many uncertain future variable factors for example, weather, economy, social factors and many others that will affect the actual energy requirements.</p> <p>In order to ensure a robust generation plan, sensitivity analysis is done around the possible variables in the assumed parameters, and in addition to the moderate forecast, two further sets of forecasts are constructed, namely, high and low forecasts.</p> <p>The intent is that, regardless of the combination of outcomes on the unknown and uncertain parameters, the high and the low forecasts should never be breached. This will provide the generation capacity planner with the cone of uncertainty within which generation capacity must be planned and provision must be made for contingencies.</p> <p>The IRP process uses a range of sustained low and high, long-term electricity demand forecasts. Within this range of uncertainty, a moderate forecast was developed from a detailed interrogation of the electricity market by sector relating to moderate commercial and weather conditions. Further an analysis is conducted in conjunction with audits on historical projections to determine an upper and lower bound to the moderate forecast. The upper and lower bounds are derived from statistical analysis of historical data detailing spurious excursions from previous moderate forecast positions.</p> <p>In order to ensure a robust generation plan, sensitivity analysis is done around the possible variances in the unknown and assumed parameters, and in addition to the moderate forecast, two further sets of forecasts are constructed, namely, high and low forecasts.</p> <p>As an example, figure 1 below shows the LT forecast for the moderate, high, and low forecasts that were completed in November 2008.</p>

	<p style="text-align: center;">ISEP12 - National plus foreign electricity sales forecasts</p>  <p style="text-align: center;">Figure 1: High, low, and moderate energy forecast finalised in November 2008</p> <p>The annual maximum demand forecast is also presented in a form of a cone similar to figure 1. The unit measure for the annual maximum demand forecast is in MW.</p>
<p>Preconditions necessary to make possible for this parameter to be included in the IRP</p>	<p>Preconditions necessary to make possible for this parameter to be included in the IRP are:</p> <ol style="list-style-type: none"> 1. Government approval of the final Demand (Energy & Maximum Demand) Forecast - IRP 2010 Input Parameter information sheet. 2. Energy intensity parameter (Separate fact sheet) 3. GDP – Responsibility National Treasury
<p>Parameter Owner (Source)</p>	<p>System Operator (SO) Forecasting Department.</p>