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METHODOLOGICAL NOTE

Seasonal adjustment of electricity generated and available for distribution

November 2015 to October 2016

Methodological note for the seasonal adjustment of electricity generated and available for distribution

This document provides a brief explanation of the seasonal adjustment of electricity generated and available for distribution. The electricity available for distribution comprises electricity generated (produced) and electricity inflow into South Africa less electricity outflow from South Africa (exports) and electricity consumed in power stations and auxiliary systems.

Monthly and quarterly time series are often characterised by considerable seasonal variations, which might complicate their interpretation. Such time series are therefore subjected to a process of seasonal adjustment in order to remove the effects of these seasonal fluctuations.

Statistics South Africa (Stats SA) uses the X-12-ARIMA to estimate the trend, seasonal and irregular components as well as length-of-month, trading-day (TD) and Easter effects.

The time series for electricity generated and available for distribution was adjusted for TD (with leap year), LOM and Easter effects, as shown in Table 1.

X-12-ARIMA is a seasonal adjustment program developed at the United States Bureau of Census. The program is based on the Bureau's X11 algorithm. It incorporates regression techniques and also ARIMA modelling to improve estimation of the different time series components. Indirect seasonal adjustment was applied for electricity available for distribution while the direct approach was adopted for the components. To improve the quality of the seasonal adjustment process, the span used in identifying the parameters was split into two intervals:

- January 1985 to December 2002; and
- January 2003 to October 2015.

The identified parameters will be fixed for a period of one year and revised on an annual basis.

Table 1 below shows metadata for the individual components of electricity available for distribution. For each component the following is given in the table below: decomposition scheme, ARIMA model, presence of seasonality, Easter, length-of-month and trading day effects, Henderson and seasonal moving average filters, and outliers.

Table 1: Metadata for electricity generated and available for distribution for the period January 2003 to October 2015

	Decomposition scheme	ARIMA model	Presence of seasonality	Presence of Easter effect	Presence of length-of-month and trading day effects	Henderson filter	Seasonal movement average filter	Outliers (AO, LS, TC)
Total electricity generated	Multiplicative	(0,1,1)(0,1,1)	Present	Easter (1)	Length-of-month	13	3x5	LSDEC2008
Electricity consumed in power stations	Additive	(1,0,0)(0,1,1)	Present	Not significant	Trading day	13	3x5	None
Electricity inflow into South Africa	Additive	(1,0,0)(0,1,1)	Present	Not significant	Length-of-month	13	3x5	None
Electricity outflow from South Africa	Additive	(0,1,1)(0,1,1)	Present	Not significant	Not significant	13	3x9	TCAUG2015
Total electricity generated (Eskom)	Multiplicative	(0,1,0)(0,1,1)	Present	Easter (1)	Length-of-month	13	3x5	None
Electricity consumed in power stations (Eskom)	Additive	(1,0,0)(0,1,1)	Present	Not significant	Trading day	13	3x5	None
Electricity inflow into South Africa (Eskom)	Additive	(1,0,0)(0,1,1)	Present	Not significant	Length-of-month	13	3x5	None
Electricity outflow from South Africa (Eskom)	Additive	(0,1,1)(0,1,1)	Present	Not significant	Not significant	13	3x9	TCAUG2015

Definitions:

Additive decomposition – An additive decomposition is appropriate if the magnitude of the seasonal fluctuations does not vary with the level of the series. Under the additive decomposition scheme, the original series (Y) is expressed as Y = T + (TD + S) + I, where T = trend, TD = trading-day effect, S = seasonal component and I = irregular component.

Multiplicative decomposition – The multiplicative decomposition is usually appropriate for series of positive values where the size of the seasonal oscillations increases with the level of the series. The original series (Y) is expressed as Y = T * (TD * S) * I.

Additive Outlier (AO) – This refers to unusually high or low singular values in the time series.

Level Shift (LS) – This refers to an abrupt but sustained change in the level of the time series.

Transitory Changes (TC) – This refers to a series of outliers with transitory effects on the level of the series.

Easter effect – The Easter holidays may regularly affect economic activity before, during or after the holiday period. Unlike other public holidays which occur on the same date each year, the dates for Easter are not fixed and may occur in March or April. Such an effect, if it is present, is known as the Easter effect.

Trading-day effect – An effect associated with the composition of the calendar. For example, different months have different numbers of working days and also the number of specific days of the week can occur in differing frequency in the same month over different years. Days of the week can have different levels of activity.

Length-of-month effect – An effect arising from the fact that some months are longer than others e.g. 28, 29, 30 or 31 days.

Seasonal adjustment approaches – In seasonal adjustment, the direct approach refers to the adjustment of a total (aggregate or unadjusted components), and the indirect approach is the aggregation of seasonally adjusted components to obtain a total.

Trend component – An estimate of the local level of the series derived from the surrounding recent (a year or two) observations. The trend is generally fairly smooth and includes movements and cycles longer than a year.

Seasonal component – An estimate of effects that are reasonably stable in terms of annual timing, direction and magnitude. Possible causes include natural factors (the weather), administrative measures (starting and ending dates of the school year), and social / cultural / religious traditions (fixed holidays such as Christmas).

Irregular component – An estimate of any effect not included in the trend-cycle or the seasonal effects (or in estimated trading-day or holiday effects). Its values are unpredictable with regard to timing, impact and duration. It can arise from sampling error, non-sampling error, unseasonal weather patterns, natural disasters, strikes, etc.

Parameters – This refers to the decomposition scheme, ARIMA model, seasonal moving average and Henderson filters, outliers and trading-day, Easter and length-of-month regressors.