SETTLEMENT ESTIMATION GUIDE

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Contents

Version Release History

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1.0	27/11/2014	Sarah Eager	Published Document

1 Purpose

This document is a guide to help participants understand the Settlement Estimation process that the Australian Energy Market Operator (AEMO) performs for the purposes of doing prudential assessments for National Electricity Market (NEM) Participants.

2 Introduction

AEMO is responsible for monitoring and assessing the daily prudential position for each market participant in the NEM. This prudential process is in place to ensure that AEMO holds sufficient credit support to cover the liabilities of the Market Participants and minimise credit risk to the NEM as a whole.

AEMO monitors the prudential position for each market participant through their total outstandings. Total outstandings comprise all billable amounts yet to be settled up to, and including, the previous day. Where actual metering data is not available for calculations of these amounts, data is estimated.

This document describes the Settlement Estimations component of the prudential assessment.

3 Benefits to Participants

The Settlement Estimation process aims to provide Participants with the best estimate of the outstandings and minimise the likelihood that outstandings are over or underestimated. The closer the estimates are to the final amount the lower the credit risk to the market as a whole.

This document:

- Increases transparency of AEMO's process
- Allows a better understanding of the Settlement Estimation process
- Improves the level to which outstandings can be reconciled by Participants
- Improves the ability of Participants to recognise drivers impacting prudential position
- Helps Participants to better manage prudential risk

4 Settlement Estimation

Prudential assessments cover the outstandings period, which includes any whole days for which energy has been consumed but not yet paid. This includes days for which:

- A Final billing run has been performed, but billing amounts have not yet been paid (note that if the prudential date is a payment date, the week for which payment is due to be made is excluded from the prudential assessment on that date);
- A Preliminary billing run has been performed; and
- Other whole days (i.e. up to the end of the day before the prudential date).

It is by the settlement estimation process that the outstandings of those 'other whole days' are calculated.

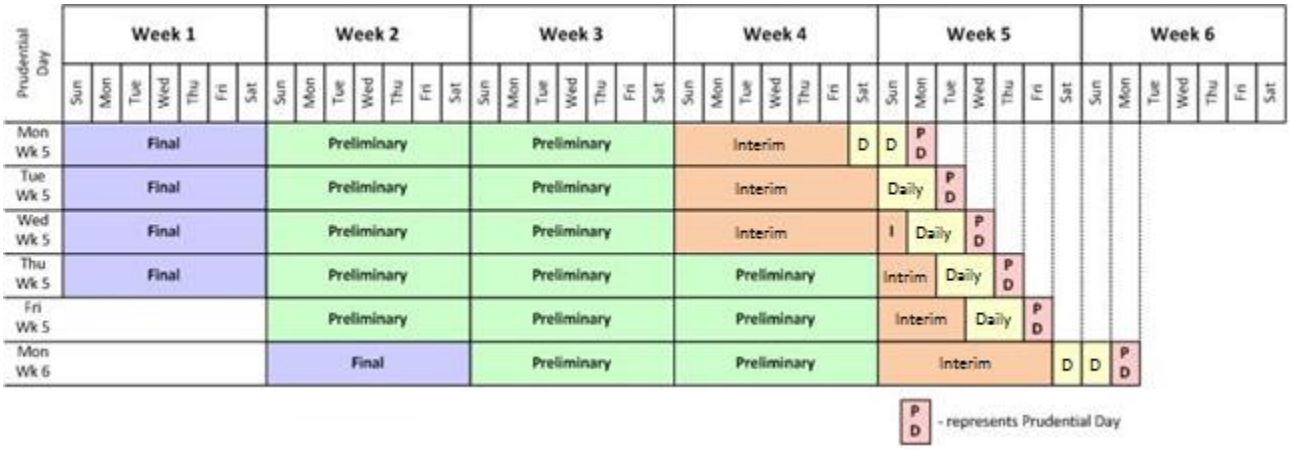
Each morning AEMO's Electricity Market Management System (EMMS) calculates a settlement estimate for the day before (D-1), called a daily estimate. The outputs of this estimate are currently available to participants via Settlements Direct and the EMMS Data Model, see Section 6 for more information on Settlements Direct.

EMMS also recalculates the estimates for days for which meter data has been loaded into EMMS overnight. These estimates are called interim estimates. These interim estimates replace daily estimates and are used to calculate the new outstandings amount. New meter data, sourced from

the Market Settlement and Transfer Solution (MSATS) system prior to the Preliminary run for the purpose of estimation, is referred to as INITIAL meter data.

An example of the days included in a prudential assessment for a given prudential day (PD) is shown in Figure 1. 'Interim' indicates days for which the prudential assessment is based on an estimate using INITIAL meter data. 'Daily' or 'D' indicates days for which the prudential assessment is based on a daily estimate.

Figure 1 Days included in a prudential estimate



The prudential calculation is done early each morning following the estimation process. In addition, there are several triggers for recalculation which ensure the latest prudential data is captured.

In the Settlement Estimation process EMMS estimates half-hourly energy for each participant. Based on this, EMMS calculates amounts such as value of energy, ancillary services payments and recovery, fees. This document primarily discusses the estimation of half-hourly energy. Once the energy has been estimated, the calculation of billing amounts in EMMS is via the same process applied for non-estimate billing runs.

4.1 Terminology

The following table summarises the terminology referred to in this document.

Table 1 Terminology

Term	Description
DAILY estimate	A settlement estimate run for the previous day. Referred to in EMMS as a DAILY billing run.
Interim estimate	A settlement estimate run for days for which INITIAL meter data was loaded into EMMS overnight. Referred to in EMMS as an INTRIM billing run.
INITIAL meter data	Meter data sourced from the MSATS system prior to the preliminary run.

4.2 Settlement Estimation Processes

The settlement estimation process for a given day is actually a process that involves three types of runs in EMMS, as outlined below:

1. Energy estimation run.
   This run calculates the half-hourly energy estimates. The calculation of estimates is detailed in Section 5.
2. Settlement run.
   Calculates the half-hourly settlement amounts (including value of energy, ancillary services payments and recovery, fees) based on the energy estimates.

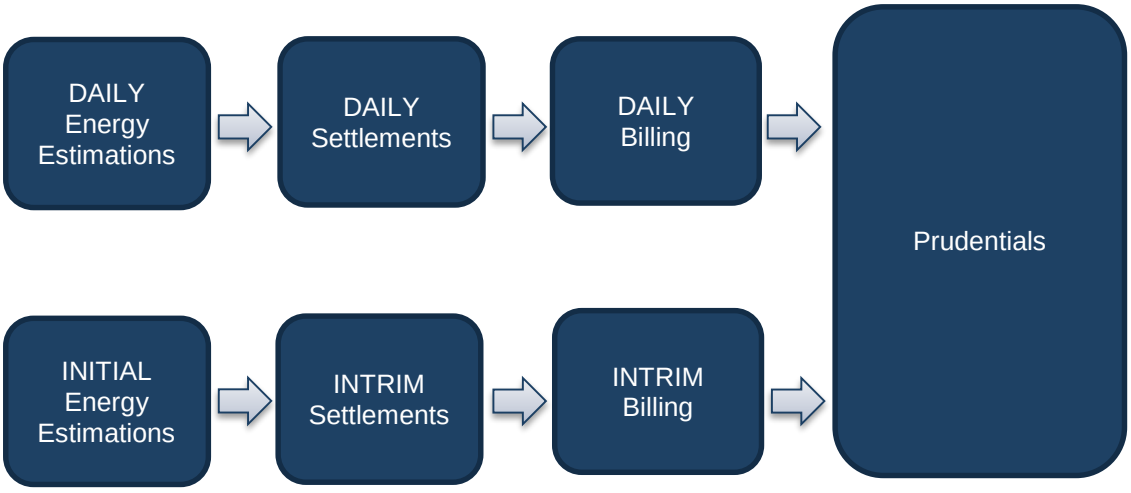
3. Billing run.
   Calculates the corresponding weekly billing amounts (settlement amounts aggregated up to a weekly basis).

Each morning EMMS follows this process to generate the DAILY estimate for the previous day, D-1. This process is also followed to generate INTRIM estimates for days for which INITIAL meter data has been loaded into EMMS.

Once the DAILY and INTRIM estimates have been generated, EMMS performs a Prudentials run.

The following diagram represents the settlement estimation process that is detailed below.

Figure 2 Settlement Estimations Process



See Section 6 for information on where the above data is published.

4.3 Days Included

Daily runs (estimation, settlements and billing) all cover the previous day, D-1. An example is shown in the diagram below for the prudential day Thursday in 2014Wk26. The daily run performed on that day includes only Wednesday in 2014Wk26.

Once the Daily estimate is complete a settlement run converts the half-hourly energy estimates in EMMS for each participant into settlement amounts.

The initial data is provided for (D-3) to (D-7) which means that the INTRIM estimate and settlements runs occur for (D-3) to (D-7). However, when the INRIM billing run is calculated it will be done for whole weeks - one or two depending on how many weeks the INITIAL meter data set spans. Each INTRIM Billing run will include all days in the week for which INITIAL data is, or has been, available.

For example, the diagram below shows the Billing runs conducted on the morning of Thursday in 2014Wk26, and the settlement days included in the runs.

Once the billing runs are completed, including DAILY and INTRIM, prudentials aggregate the billing over the outstandings period and the daily prudential standings is produced for each Participant.

Table 2 Billing runs for settlement estimation

2014Wk25							2014Wk26						
				INITIAL data									
				D-7	D-6	D-5	D-4	D-3	D-2	D-1	PD		
Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat
INTRIM							INTRIM			DAILY	PD		

5 Estimations Hierarchy

Settlement estimates are calculated based on a hierarchy of available data as outlined in Table 3 below. This hierarchy is considered on a per-trading interval, per MeterEntity (National Metering Identifier (NMI) or Transmission Node Identifier (TNI)) basis. The estimation process calculates 'individual reads' energy for generator consumption and generation to a NMI level and 'aggregated' energy for customer energy and small generation aggregator (SGA) energy to a TNI level.

Table 3 Data hierarchy

Priority	Description
1.	INITIAL meter data if it is of sufficient quality; otherwise
2.	SCADA data (for generator energy, and for customer energy if there is a single financially responsible Participant at the TNI and a SCADA to TNI map*); otherwise
3.	INITIAL meter data; otherwise
4.	Scaled like day energy with region-scaling factors applied (for customer energy and generator consumption only)

* Note a SCADA to TNI map needs to be established in AEMO's systems.

The following table summarises the estimation method applied by energy type.

Table 4 Estimation method by energy type

Estimation Method	Non-Market Generator	Generator Generation (all except non-market)	Generator Consumption (all except Non-market)	SGA	Customer Energy	Regulated Interconnectors	MNSPs	Scheduled Loads
1. INITIAL data if quality		Y	Y	Y	Y	Y	Y	Y
2.a. SCADA		Y	Y	Y	Y	Y	Y	Y
2.b. Dispatch Targets		Y	Y					Y
3. INITIAL data		Y	Y	Y	Y			Y
4. Region scaled like day energy			Y		Y			
Zero estimate	Y	Y		Y				

(Y = If available and configured)

5.1 INITIAL Meter Data if of Sufficient Quality

INITIAL meter data for (D-3) to (D-7) is sourced from MSATS and loaded into EMMS on a daily basis.

Meter data is of varying quality, as indicated in MSATS by a data quality flag. The main values for the quality flag are as outlined below.

Table 5 MSATS meter data quality flags

Data Quality Flag	Quality	Notes
A	Actual	Resulting from a meter read.
F	Final substitute	Will not be replaced with Actual data in the future
S	Substitute	Substitute by MDP for a date in the past
E	Forward Estimate	Estimate by MDP for a date in the future
Z	Estimate	Estimate by MSATS for a date in the past

At the time of settlement estimation, Actual data would typically only be available for sites with remotely read interval meters. There may also be data substituted by Meter Data Providers (MDPs). For any NMIs for which there is no meter data in MSATS, the INITIAL meter data set will include data estimated by MSATS flagged as type Z.

EMMS will base its estimates for generator and customer energy on INITIAL meter data if it is available and high enough quality, as outlined in the following sections.

Generator Energy Estimates

INITIAL meter data is used as the first priority for estimating generator consumption and generation if at least 90% of the energy at the NMI is Actual (A). This assessment is done on a half-hourly basis.

Customer Energy and SGA Estimates

Customer energy and SGA data from MSATS is aggregated to a TNI level and INITIAL meter data is used as the first priority for estimating customer energy if at least 90% of the energy at the TNI is Actual (A). This assessment is done on a half-hourly basis. The decision whether to use the INITIAL meter data is made on a whole of TNI basis and, if the data is used, it is used for all energy at the TNI.

5.2 SCADA Data

Supervisory Control and Data Acquisition (SCADA) data is used as the second priority for estimating generator and customer energy if it is available.

Generator Energy Estimates

Generator data referred to in this document as ‘SCADA’ actually encompasses two forms of data (in priority order):

- SCADA data from AEMO’s energy management system (EMS), this includes real-time data from remote terminal units.
- Dispatch targets data, which are targets given by AEMO to providers of energy.

For both sets of data:

- Static regional scaling factors are applied to account for differences in the point of measurement of SCADA compared to meter data. AEMO reviews the static regional scaling factors annually and notifies participants when the factors change. Table 6 shows the static regional scaling factors effective from 7 July 2014 (rounded to 3 decimal places).

Table 6 Static regional scaling factor

Effective date	Region ID	Static regional scaling factor
07/07/2014	NSW1	0.952
07/07/2014	QLD1	0.964
07/07/2014	SA1	0.976
07/07/2014	TAS1	0.988

- If the SCADA or dispatch data value is negative then it is used as a generator consumption estimate.
- SCADA is used as an estimate when the INITIAL meter data has a zero value.

As part of the DAILY estimate, SCADA data is used, if available, as the basis of the estimate for all types of generators excluding Non-Market generators.

Customer Energy Estimates

SCADA data will be used as the basis of estimates for customer energy if:

- There is only one financially responsible Participant at the TNI; and
- There is a SCADA to TNI map in AEMO systems.

The following notes apply:

- Static regional scaling factors are not applied.
- SCADA data is used as an estimate when the INITIAL meter data has a zero value, in a similar fashion to generator estimates.

SCADA data is loaded for all currently registered participants with SCADA to TNIs maps in AEMO's systems at the date for which the estimate is being performed.

5.3 INITIAL Meter Data

As a third priority INITIAL meter data previously rejected due to insufficient quality is used for settlement estimation.

5.4 Scaled Like Day Energy

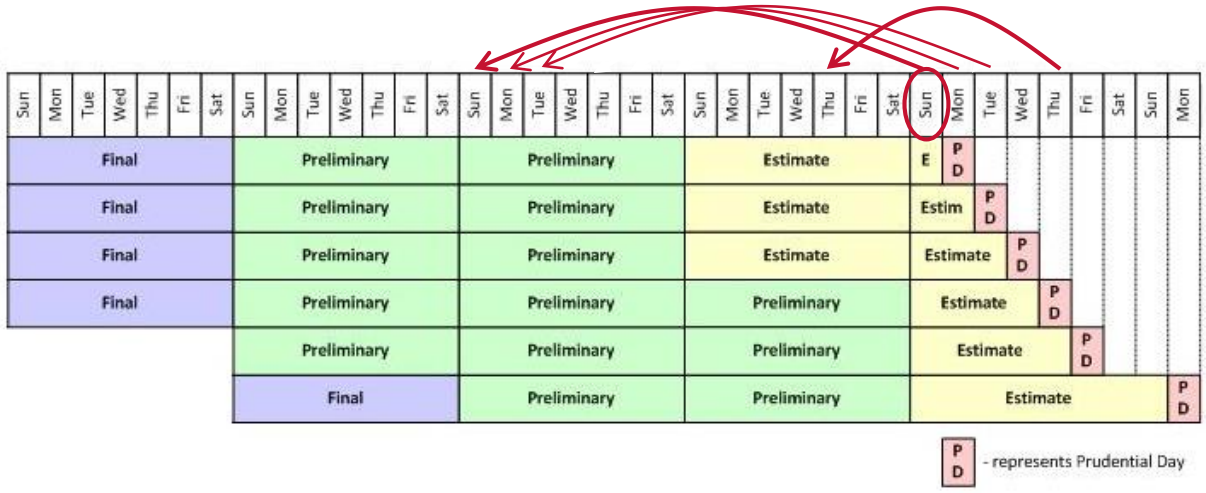
If no other data is available, the settlement estimate for customer energy will be based on scaled like day energy.

A like day is only selected from days for which Settlement statements have been posted, and the like day is determined as follows:

- For a business day, the like day is the latest same day of the week that is also a business day, i.e. a public holiday will not be used as a like day for a business day.
- For a weekend day, the like day is the latest same day of the week.
- For a non-business weekday, i.e. public holiday, the like day is the most recent Sunday.

The like day is determined for each region individually, taking regional public holidays into account

Figure 3 Like day selection



The half-hourly pattern of historical load by Participant at each TNI for a like day is scaled to create an estimate. A regional scaling factor is applied to the energy from the like day.

Participant Energy = Regional Scaling Factor x Like Day Energy

The region scaled like day energy will be used for estimation for customer energy and generator consumption. The regional scaling factor for a given trading interval is given by:

$$Regional\ Scaling\ Factor = \frac{Region\ Demand_D}{Region\ Demand_{LD}}$$

where:

- Region Demand$_D$ = Region demand for the trading interval in the settlement day being estimated.
- Region Demand$_{LD}$ = Region demand for the trading interval in the like day.

The region scaling factor is calculated taking intermittent generation into account.

Region-scaled like day energy is generally used to calculate DAILY estimates for customer energy where there is no TNI to SCADA map in AEMO's systems, since no INITIAL meter would be available at (D-1) and SCADA data is only available for Participants with a SCADA to TNI map in AEMO's systems. Region-scaled like day data would be used to calculate customer energy for an INTRIM run if there was a circumstance where no meter data was available.

Note that Generator consumption is based on region-scaled like day consumption if there is no consumption in the INITIAL meter data and the SCADA data. If the generator generation estimate is based on INITIAL or SCADA data, EMMS will still apply a region-scaled like day estimate for generation consumption if there was consumption on the like day.

5.5 Interconnector Estimates

Estimates for regulated interconnectors are based on INITIAL data if available, otherwise on SCADA data.

For Market Network Service Providers (MNSPs), such as Basslink, estimates are based on INITIAL meter data if available, otherwise on SCADA data.

5.6 Scheduled Load Estimates

Settlement estimation for scheduled loads is a similar process to estimation for generators.

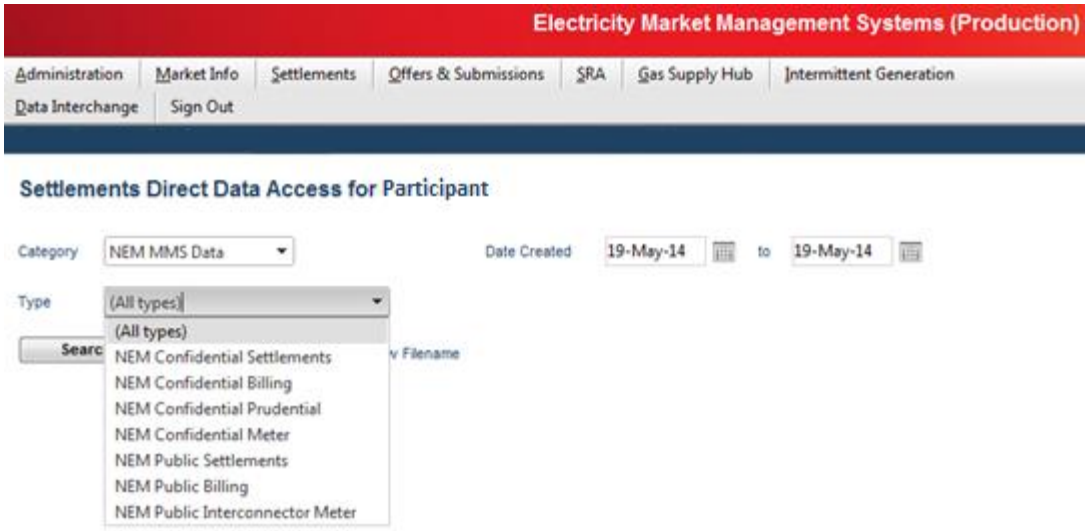
5.7 Settlement Estimation Triggers

Estimations automatically run every day. However additional estimation runs can be triggered for ad hoc events, such as in the event of a prudential call. This is where AEMO requests that MDPs submit their meter data earlier than normal, and additional special settlement estimations run will be performed to increase the accuracy of the estimates.

6 Settlements Direct

NEM Confidential Metering, Settlement, Prudentials and Billing data relating to Settlement Estimations is available in Settlements Direct via the 'NEM MMS Data' category, see Figure 4.

Figure 4: Settlements Direct Data Access for Participants



Not all Settlement Estimations data is published, as showing in Table 6.

Table 7: Published data summarised by run type

Run Type	NEM Confidential Meter Data	NEM Confidential Settlements Data	NEM Confidential Billing Data	NEM Confidential Prudential Data
Daily	Not published	Published	Published	Published daily. Prudentials is an aggregate of all of this information.
Interim	Not published	Not published	Not published	
Preliminary	Published	Published	Published	
Final	Published	Published	Published	
Revision 1	Published	Published	Published	
Revision 2	Published	Published	Published	

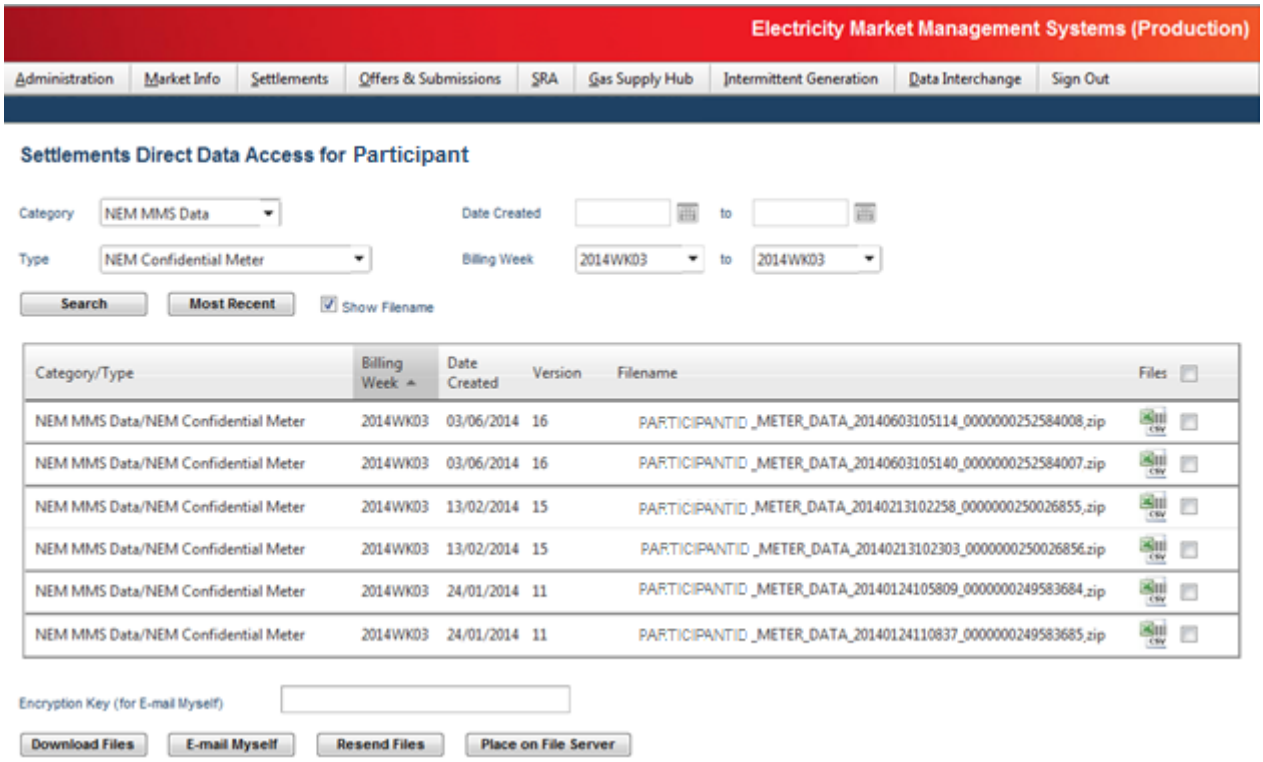
Some information relating to Settlement Estimations is not available to Participants; daily and interim metering; interim settlements and interim billing data is not published. At the June 2014 Settlement Managers Working Group (SMWG) a project to make available the interim information was proposed. Participants were asked to provide feedback on the usefulness of this data if it was made available, there was not sufficient interest from industry for this project to proceed.

NEM Confidential Meter

NEM Confidential Meter data is posted for whole settlement weeks in Settlements Direct for each posted Preliminary, Final and Revision run. Separate files are provided for customer and SGA data and generator data. These files contain meter data for all of a Participant's connection points for each trading interval in the settlement week.

No meter data is provided for the Settlement Estimation section of outstandings, i.e. there is no daily or interim information available.

Figure 5: NEM Confidential Meter data



NEM Confidential Settlements

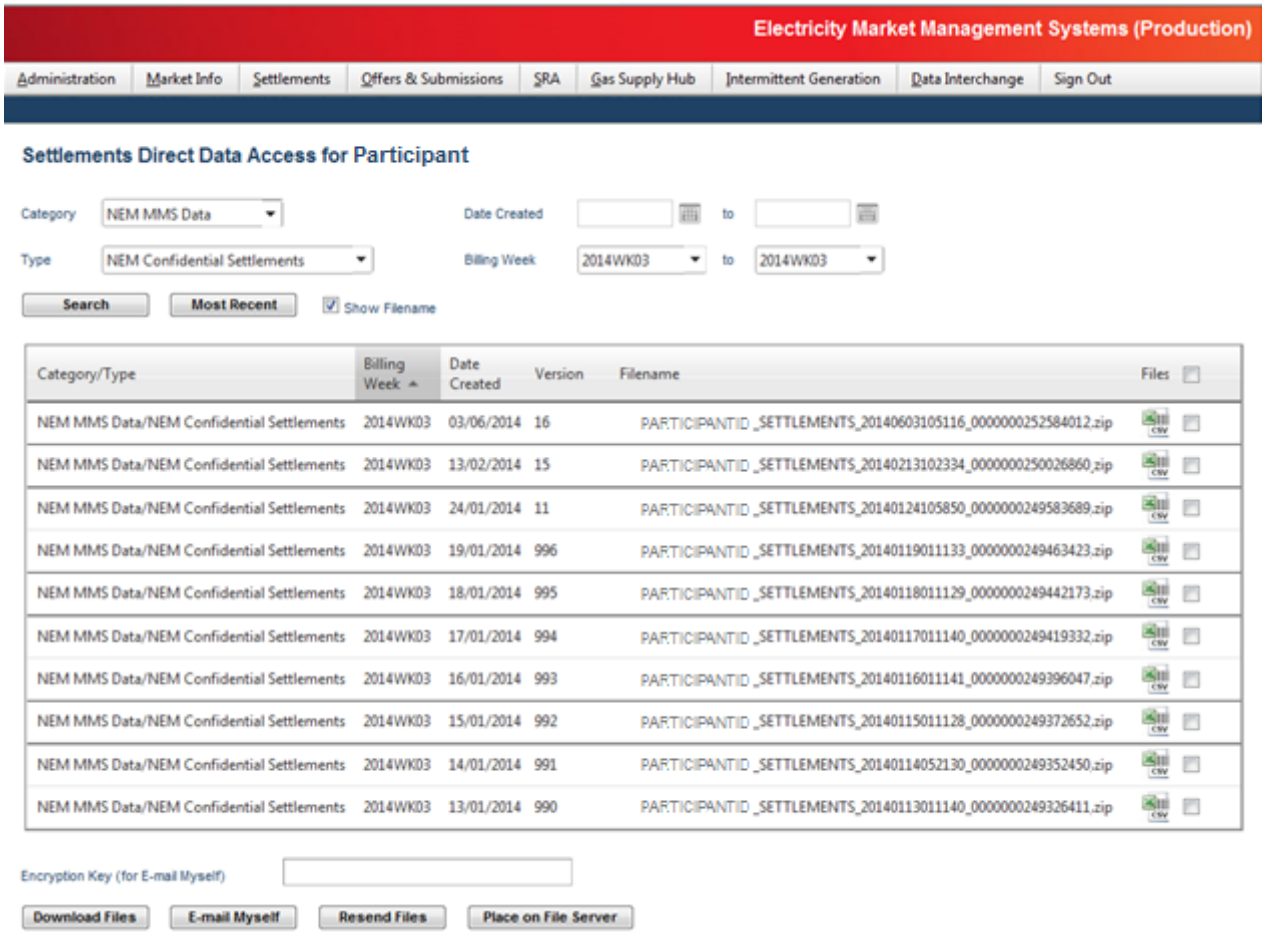
NEM Confidential Settlements data is posted for whole settlement weeks in Settlements Direct for each posted Preliminary, Final and Revision run. Daily settlement estimates are also published at D+1, with version number 990 (Sunday) to 996 (Saturday).

The daily file includes settlements data for each trading interval for each connection point, generation point and SGA point, named CPDATA, GENSET and SMALLGENDATA respectively. The daily file contains data for (D-1), for example data for Sunday 12 January 2014 was published in Settlements Direct on 13 January 2014 in daily settlements file version 990. The files are named as follows “PARTICIPANTID _SETTLEMENTS_DATETIME_IDENTIFIER.zip”.

As part of AEMO’s 6 monthly data model release NEM MMS Data files may have being updated, e.g. an extra column is added. Participants need to subscribe to these new file formats via the Settlements Direct Subscriptions service otherwise the data files on Settlements Direct will be published in the old file format and end with “_LEGACY.zip”, this naming convention is applied retrospectively to published files.

No settlements data is provided for interim runs.

Figure 6 NEM Confidential Settlements



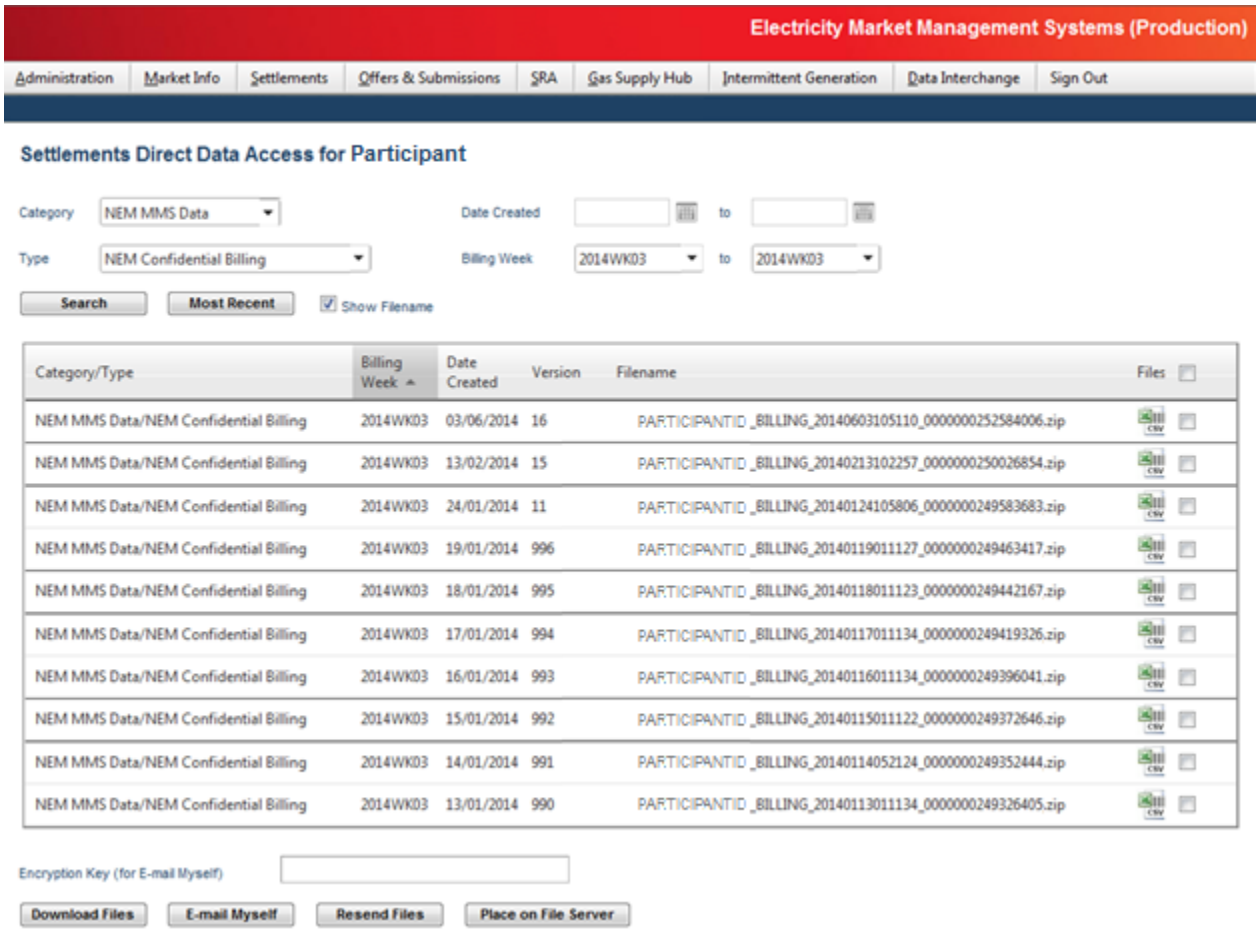
NEM Confidential Billing

NEM Confidential Billing data is posted for whole settlement weeks in Settlements Direct for each posted Preliminary, Final and Revision run. Daily billing estimates are also published at D+1, with version number 990 (Sunday) to 996 (Saturday).

The daily file includes aggregate billing data for each connection point for (D-1), for example data for 12 January 2014 was published in Settlements Direct on 13 January 2014 in daily billing file version 990. The files are named as follows “PARTICIPANTID _BILLING_DATETIME_IDENTIFIER.zip”. As discussed above they may also end with “_LEGACY.zip”.

No billing data is provided for interim data.

Figure 7: NEM Confidential Billing



NEM Confidential Prudential

NEM Confidential Prudential files are published daily and aggregate the data from settlement estimation and any other billing runs,such as Prelim and Final, in the outstandings period.

7 Further Information

For further information about AEMO's Settlement and Prudentials please visit www.aemo.com.au or contact AEMO's Information and Support Hub.

For details on the definition of terms in the Settlements Direct files see AEMO's MMS Data Model document

Appendix A Special terms

Special Term	Explanation
BILLINGDAYTRK table	An EMMS table that identifies the billing run numbers and settlement run numbers.
BILLINGRUNTRK table	BILLINGRUNTRK identifies the Statement type (i.e. Status of PRELIM, FINAL, REVISE) and date of the BillRunNo posted, per WeekNo. This provides a further extension of tracking data from the BILLINGDAYTRK table.
D-1	Relative to the prudential date (D). D-1 is the prudential day minus one day.
D-3	Relative to the prudential date (D). D-3 is the prudential day minus three day.
DAILY estimate	A settlement estimate performed each day for D-1
DAYTRACK table	DAYTRACK identifies the actual settlement run processed for each settlement day. Settlement run is in the column EXPOSTRUNNO. Generally, the number of the settlement run used in the latest statement is the maximum number.
EMMS	Electricity Market Management System
EMS	AEMO's energy management system
Generator Energy	Generator consumption and generation
Individual reads	Energy for generator generation and consumption
INITIAL meter data	INITIAL meter data is a combination of actual, substituted, and estimate meter data from MSATS. It is pushed across from MSATS to EMMS daily.
MDP	Meter Data Provider
MNSP	Market Network Service Provider
MSATS	Market Settlement and Transfer Solution
NMI	National Metering Identifier
PD	Prudential Day
TNI	Transmission Node Identifier