

2012 BPA Rate Case Customer Workshop

**TRM Billing Determinants Model
Documentation and Description
July 15, 2010**

TRM Billing Determinants Model Documentation and Description

The Tiered Rate Methodology (TRM) Billing Determinants model is a sub-routine of the larger Rate Analysis Model, but is housed in a separate Excel workbook to minimize both size and computational requirements of the core RAM model. The model draws from the “RAM Data Inputs Spreadsheet” data needed to compute all TRM relevant billing determinants required by RAM for ratemaking purposes.

Note: The model uses one non-standard Excel function called “eomonth”. For the model to work properly, users will need to enable the Add-in (under the menu “Tools”) “Analysis ToolPak.”

These inputs are pulled into 11 input sheets (shaded in Teal) as follows:

- 1) Init – the “Initialize” sheet which includes large RAM set variables, such as dates, diurnal, monthly, and annual hour computations needed for the rate period, as well as data input version control using time stamps. This sheet also includes several input items needed to tier rates. These include the complete list of preference customers having signed Regional Dialogue contracts, and subject to tiered rates. For each customer, the following information is included: Preference Customer Status (binary), Slice Product (binary), PNGC membership (binary), RPSA contract signed (binary), CHWM (continuous, aMW), Entity-associated NLSL amount for each year of the rate period (continuous, aMW), locked RHWM for when RHWMs are set through the RHWM Process (continuous, aMW), locked Gross Requirements (TRL – NLSL – Existing Resources) for Load Following customers as set in the RHWM process, Above HWM load for when Above HWM loads are set through the RHWM Process (continuous, aMW), Tier 2 election type relevant to the rate period (categorical variables ranging from 0 – no CHWM – to 1 – full Above HWM load served by BPA – to 5 – all Above HWM load served by New Resources *and allows for elections to differ in each year of the rate period*). For elections pegging a fixed amount of either Tier 2 or New Resource amounts, this fixed number is imbedded into additional columns for this amount in each year of the rate period. Tier 2 purchase types (tier 2 pool) are also included for each year of the rate period. The LDD eligible discount percent is included in the next column, and the IRD rate discount and irrigation loads in the following columns. The final columns include the model-computed Tier 1 percentage for RPSA computation purposes to allow for locked Tier 1 percentages as a result of completion of the RHWM process.
- 2) I_Slice – Two important feeds of data relevant to the Slice customer contract are pulled from the data input workbook into this input sheet for TRM calculations. First, the Slice percentage is brought in for the complete list of customers. Second, the monthly shape of the Block purchase for each Slice customer is included, with the total annual Block purchase amount divvied upon into monthly “bins” on a prorata percent basis, depending on the Slice customer’s election (net requirement, flat, etc...). These will be finalized in September 2011.

- 3) I_SliceLDD – this sheet includes Slice customers only, and computes counterfactual Load Following billing determinants using the same model and data lagged by one year, but with Slice customers converted to Load Following in column AA of the initialize (Init) sheet. This is done to conform to the TRM for computing the LDD discount for Slice customers, as detailed in section 10. 2. 3 of the TRM (page 93).
- 4) I_T1SC – RHWMTier 1 System Capability is set in the RHWMTier 1 Process. The data inputs workbook feeds to the TRM workbook the relevant computation of RT1SC depending on whether the RHWMTier 1 Augmentation amount and T1SFCO have been locked (or not) depending on the point-in-time of the ratemaking process. These are brought in as two-year averages, annual figures for the RHWMTier 1 computation, and monthly/diurnal system shape for load shaping billing determinants. A process to modify the system shape for the different number of February HLH and LLHs during leap years is performed on this sheet.
- 5) I_TRL – the Total Retail Load is pulled from the data inputs sheet on a monthly/diurnal basis for each preference customer. Annual totals for each year of the rate period are aggregated into columns BE and BF.
- 6) I_CSP – Customer System Peak (one – hour peak as computed in Load Forecasting) is pulled from the data inputs workbook on a monthly/diurnal basis. Note: These inputs are not currently used in the demand billing determinant computation described below. These figures were well out of range from those predicted by historical data used in the Customer Demand Quantity (CDQ) calculations, and were producing unwieldy demand billing determinant amounts for many preference customers. Instead, these inputs are currently replaced by those in the “CDQLoadFactors” sheet, where load factors from historical data are used to estimate CSP for each preference customer. Pending improved modeling from Load Forecasting, this surrogate sheet will be replaced, and the CSP sheet used for demand billing determinants.
- 7) I_NLSL – this sheet pulls and aggregates NLSL loads on a monthly/diurnal basis from the SQL load/resource query associated with each Regional Dialogue customer.
- 8) I_CDQ – these Customer Demand Quantities are computed based upon historical data and written into the customer contract. Therefore they are unchanging, although they are fed into the model through the data inputs workbook. They are converted into megawatts, as opposed to kilowatts as written into the contract, for a consistent basis with other inputs/dependencies of the internal demand billing determinant calculations.
- 9) I_SuperPeak – Super Peak amounts (should customer elections warrant), are pulled into this sheet on a customer monthly basis from the data inputs workbook. If needed, they will likely be computed in a separate workbook or sheet.
- 10) I_CDQLoadfactors – this sheet has the load factors for each individual utility on a monthly basis used in computing CDQs. The sheet currently feeds the CSP computation sheet (discussed below), to provide reasonable CSP estimates on a monthly basis for computing the customer demand charge billing determinants on the Demand computation sheet (also discussed below). Currently, the model accommodates feeding the CSP computation sheet with either data from I_CSP or I_CDQLoadfactor in cell C5 of the initialize sheet (Init).
- 11) ER – Existing Resources as presented in Exhibit A are included in a monthly/diurnal format for each preference customer. These are aggregated into a “Total” annual amount

used for Gross Requirement computations necessary to determine TOCAs and Above HWM load.

Computations of TRM billing determinants needed for downstream systems and core RAM begin with the TOCA sheet (shaded in Rose). The TOCA sheet uses/computes the following information:

- Entity ID – the entity id numeric unique identifier for each preference customer.
- Preference Customer – the preference customer name.
- NOTJOE – a binary indicator variable drawn from the initialize sheet indicating if the preference customer is not a member of PNGC – not PNGC = 1 for this variable.
- JOE – a binary variable drawn from the initialize sheet indicating if the preference customer is one of the members of PNGC.
- CHWM – the CHWM aMW amount completed in the CHWM Process to remain fixed for the duration of the Regional Dialogue contracts. This is drawn from the initialize sheet.
- TRL – Total retail load is drawn from the TRL input sheet in the workbook for each of the preference customers, and separately displayed in two columns, one each for each year of the rate period.
- NLSL – New Large Single Load for each preference customer, for each year in the rate period, is draw from the initialize sheet.
- Existing Resource – Existing Resource amounts as presented in the Exhibit A of the Contract for each preference customer are drawn from the ER input sheet in this workbook. Two columns are given for different units, aMW and MWh.
- Gross Requirement – this is computed as $TRL - NLSL - ER$. Since Forecast Net Requirement, as defined in the TRM, is net of New Resource self-supply, and resource removal rights for New Resources are granted in the Regional Dialogue contracts, if the model on a prospective basis computed Above HWM load and TOCAs based upon the $\min(\text{Forecast Net Requirement}, \text{RHWM})$, TRL losses which would otherwise be accommodated by resource removal could lower the TOCA load below that which the customer would be eligible. To the extent that New Resources are more expensive than Tier 1 purchases from the Federal System, no customer is assumed to do take less Tier 1 energy than they are eligible. As such, the model on a prospective basis assumes that full removal would occur in the case that loads fall to the point where New Resource elections would otherwise reduce Tier 1 take. Two columns are given for different units, aMW and MWh, for each year of the two-year rate period.
- RHWM – computed as the prorated CHWM share for each preference customer, relative to the total of CHWM, applied to the RT1SC, and converted to an aMW amount. If the RHWM Process is complete, RHWM amounts are fed in to the initialize sheet, and the locked RHWM values are inserted into this column over the otherwise internally computed value.

- TOCA – because the Forecast Net Requirement and RHWMM are set in the RHWMM Process (with only a couple of circumstances where Forecast Net Requirement revised depending on load changes prior to each year of the rate period, and with adjustments following different rules depending on whether the customer is a Slice/Block or Load Following), if RHWMM is locked, the TOCA is predefined as of the RHWMM Process. Therefore, TOCAs determined in the RHWMM Process flow through to this input column to allow for RHWMMlock treatment, where appropriate.
- Above HWM load – computed as the amount a preference customer’s Gross Requirement exceeds its RHWMM. Exclusion of New Resources in the Gross Requirement calculation is also important here, because New Resources are those used to serve Above HWM load. If Forecast Net Requirement were used in this computation, an under-forecast the amount of Above HWM load would result due to the customers New Resource election. Two columns are given for different units, aMW and MWh, for each year of the two-year rate period. If the RHWMM Process is complete, Above HWM load amounts are fed in to the initialize sheet, and the locked Above HWM load values inserted into this column over the otherwise internally computed value. To accommodate proper PNGC treatment of Above HWM loads which are less than 1 aMW, and the option for self-supply customers to serve all of their Above HWM load *even when* it is computed to be < 1 aMW, Above HWM load in aMW is computed in two steps on an annual basis, before being converted into MWhs. The grayed-out columns fill-in (either drawing from locked values on the Init sheet, or internally computing them for when RHWMM process is not yet complete) all Above HWM loads regardless of whether they are < 1 aMW, or sum the PNGC set of Above HWM loads regardless of whether they are < 1 aMW for the PNGC (in aggregate). The second set of Above HWM load columns convert the grayed out columns into zero if the resulting computation (or pull) is < 1 aMW, *unless* the customer is PNGC (in aggregate), or the election type is 5 (whereby that customer is a self supply customer, ordinarily designated as 4, but has also elected to serve all of the Above HWM load through NR, *even if* that Above HWM load is < 1 aMW). This ensures that Above HWM load assumptions for PNGC include all Above HWM load for each individual PNGC customer regardless of whether it is less than 1 aMW, as well as blocks the omission of < 1 aMW Above HWM loads from load shaping billing determinants when they are elected to be served through New Resource self-supply.
- TOCA – the TOCA is the

$$\min(\text{Forecast Net Requirement, RHWMM})/\sum\text{RHWMM}.$$

However, as previously mentioned, because resource removal rights are granted in the Regional Dialogue contracts, we take this formula as the

$$\min(\text{Gross Requirement, RHWMM})/\sum\text{RHWMM},$$

for each relevant year. In the case of slice customers, the Annual Net Requirement forecast happens after the RHWMM process. If the RHWMM process forecast predicted a slice customer’s load below their RHWMM, for purposes of the computation of that customer’s TOCA, Forecast Net Requirement is essentially unlocked, even though the RHWMM process is complete. However, for Load Following customers, Forecast Net Requirement is set in the RHWMM process. Therefore, for TOCA computation purposes,

Gross Requirement is lockable for Load Following customers, but is allowed to float for slice-block customers when RHWM is locked.

- Slice % - this is the Slice percentage from the Slice customers contract.
- Non-Slice TOCA – the non-Slice TOCA is the total TOCA for the customer minus its Slice percent. This is computed for each year of the two-year rate period.
- Avg Non-Slice TOCA – taken as the average of the non-Slice TOCA over the two-year rate period.
- T1 Percentage – computed for the RPSA/REP process using the percentage of the participating COUs qualifying retail load that is Tier 1, because exchangers are not allowed to include New Resource costs in the ASCs. This percentage is computed for each year of the two-year rate period.
- LDD adjTRL/RHWM – to prevent biasing customers who are eligible for the Low Density Discount on a portion of its net requirement sales toward purchasing Tier 2 from BPA (where they would receive the discount on Above HWM), instead of self supply (where they would not receive a discount on Above HWM load), TRM outlines an adjustment factor to eligible LDD percent. This adjustment scales up the percentage, applied to its Tier 1 purchases, to reflect any Tier 2 purchases they could otherwise make. This is the ratio of Gross Requirement to RHWM for each year of the two-year rate period, and is equal to 1 if the Gross Requirement is less than RHWM.
- Applicable LDD – the last two columns compute the product of the eligible LDD percent (from the Init sheet) and the LDD adjustment factor computed in the previous two columns.

General Note: The computation sheets (shaded in Rose) following TOCA are formatted in exactly the same format, with customers listed in exactly the same order. This was done to minimize the need for lookups, allow for relative cell referencing, and a modicum of transparency in cell-level formula complexity. Customer order is defined on the initialize (Init) sheet in column X and Y, with this order preserved through all computation (Rose colored) sheets.

- 12) AboveHWM – this sheet takes the annual Above HWM load (MWh) columns from the TOCA sheet and distributes across the monthly/diurnal bins for each customer assuming the Block shape. Both individual and aggregate PNGC amounts flow through into this sheet, such that PNGC can be treated in aggregate for Load Shaping and Demand billing determinant computations, and individually for LDD computations.
- 13) TRL – this sheet pulls for each customer the relevant rate period two-year set of Total Retail Loads from the I_TRL sheet.
- 14) NLSL – this sheet pulls for each customer the relevant rate period two-year set of New Large Single Loads from the I_NLSL sheet.

- 15) Existing – Existing Resources, as shaped and listed in Exhibit A, are fed into this sheet from ER in a monthly/diurnal format, and replicating the order of customers used for relative cell referencing (described in the general note above).
- 16) Self-supply – Depending on the individual customer elections to serve Above HWM load (there are four election periods for the regional Dialogue contracts), some, all, or none of its Above HWM load will be self-served through specified or unspecified New Resources as identified in the Regional Dialogue contracts. Elections are fed into the TRM Billing Determinants Model on the initialize (Init) sheet in columns AX and BC. There are five election types: 1) All Above HWM load is served through Tier 2 purchases (either STR or LGR; vintage will be added as needed), 2) A fixed amount of Above HWM load is served through Tier 2 purchases from BPA, while the remainder is met through New Resource self supply, 3) A fixed amount of Above HWM load is served through New Resource self supply, while the remainder is met through Tier 2 purchases from BPA, 4) All Above HWM load is served through New Resource self supply, and 5) All Above HWM load is served through New Resource self supply, *including Above HWM load < 1 aMW*. This sheet takes the Above HWM load calculation from the TOCA sheet, references the election pulled from the initialize (Init) sheet election for the applicable year, and assuming a flat Block shape, distributes the self supply portion of Above HWM load for each customer across the monthly/diurnal periods. If the customer has elected either option 2 or 3, the specific pegged amount (delineating between fixed and floating methods of service) are brought into the model in columns BD and BI of the initialize (Init) sheet.
- 17) Tier2 – this sheet computes the amount of Above HWM served by BPA based on customer election flowing through from the initialize (Init) sheet. See item 16 above.
- 18) Tier2 STR – customers have the option to choose between LGR and STR Tier 2 pools in serving its Above HWM load. These selections are made in the election process, and flow from the initialize (Init) sheet, columns BJ and BO.
- 19) Tier 2 LGR – see item 18 above.
- 20) SystemShape – System Shape Load is the non-Slice TOCA for each customer times the Tier 1 System Shape monthly/diurnal values together comprising the RHWM T1SC. Therefore, for Slice customers, the total system shape load is achieved from adding Slice take (on SliceTake) and System Shape Load for the Block purchase. Under TRM, Block purchasers pay load shaping charges only on its Block purchases. The purpose of this sheet is to compute the Tier 1 Block amount for Slice customers, which is subtracted from the Block Tier 1 amount to determine load shaping billing determinants on the LoadShp sheet (see below).
- 21) Tier1 – Full monthly/diurnal Tier 1 purchases are computed for each Load Following customer (taken as TRL – NLSL – Existing Resources – Above HWM load). For Slice customers, Tier 1 Block load is taken to be the $[\min(\text{Gross Requirement, RHWM}) - (\text{Slice \%} * \text{T1SS})] * \text{monthly shaping factors}$ input into the model in I_Slice * the applicable HLH/LLH split for the monthly/diurnal bin. The Block shape is defined in the Contract, and will be determined in September 2011.

- 22) LoadShp – these are the customer specific monthly/diurnal load shaping billing determinants, computed as the difference between Tier 1 load and the System Shape Load (only for the Block purchase for Slice/Block customers, full purchase for Load Following customers). PNGC pays load shaping in aggregate. As such, billing determinants are zeroed out for each member of PNGC, and flow through only for PNGC in aggregate.
- 23) CSP – demand charge billing determinants for each Load Following customer are computed as $CSP - aHLH - CDQ - SuperPeak Credit$. Demand is paid on Tier 1 only. However, since the CSP forecast is for the entire TRL 1-hour peak, Tier 1 HLH energy, Above HWM load, and Existing Resource supply need to be subtracted from CSP to arrive at the correct Demand billing determinant for Load Following customers. The above formulation is modified as follows: $CSP - Tier1 aHLH - Above HWM load - Existing Resources - CDQ - Super Peak Credit$. The CSP sheet allows for customer specific monthly/diurnal customer system peak based upon CDQloadfactors (historical data) or the CSP forecast from the Load Forecasting group depending upon the election on the initialize (Init) sheet.
- 24) CDQ – Customer demand quantities for each customer computed prior to the implementation of Regional Dialogue contracts using historical actual data to grandfather in (at least at the start of the contract) demand billing determinants which are roughly 9% of load. This sheet draws these values from the I_CDQ which are imported from a separate model.
- 25) SuperPeak – though no customers have signed up for this yet, there is a placeholder in the model.
- 26) Demand – the customer demand charge billing determinant is computed using relative references to CSP, Tier1, AboveHWM, CDQ and SuperPeak sheets. Because PNGC pays the demand charge based upon aggregate load, individual members are zeroed out (as are LLHs). In addition, because the system currently does not produce a PNGC diversified CSP amount, a 0.90 factor is applied to CSP for PNGC, which is a changeable input on the initialize (Init) sheet.
- 27) LDD – because the LDD discount needs to be applied to all Tier 1 rates, and since Slice customers should receive equivalent discount treatment as Load Following customers, LDD computation by individual customer is complicated by 1) computing an adjustment factor for Tier 1 to the customer-specific eligible LDD %, and 2) counterfactual treatment of Slice customers as Load Following customers. This sheet computes billing determinants necessary to apply the LDD discount. There are remaining changes necessary to the model to accommodate PNGC treatment with respect to the LDD discount in aggregate, versus applying them specifically to each customer, because PNGC pays demand charges on diversified load, whereas the model currently grants to each customer within PNGC the LDD based upon undiversified load. The methodology to be implemented is still under construction. *A remaining issue is making sure that Exhibit A resources are lined up for PNGC individual member amounts and aggregate amounts on a monthly/diurnal basis.*
- 28) RAM Market price Inputs – These are needed from the REP template output

- 29) RAM Rates from Cost_Allocation_TRM are fed into this sheet for use in the REP output sheet.
- 30) Exports to RAM are provided on this sheet. Two years are provided at a time; iterating the model sequences in two year increments on the init sheet allows for easy extraction of 6 years of billing determinants.
- 31) REP_template – this sheet provides customer-by-customer outputs needed for ASC computations in the REP program.
- 32) RiskMod_template – this sheet outputs summary information needed for risk analysis.
- 33) Validation checks are currently under development. An additional check already identified is verifying the that net requirement forecast equals the sum of SliceTake, Tier1 Load, Load Shape, and Tier 2 Load on a monthly/diurnal and annual basis.
- 34) Update log reports changes and updates to the model over time.