

Open RBM Software Short Description:

Open RBM Software developed under FP7, EU funded project named SEETSOC is a tool of regional balancing mechanism with the goal of facilitating balance energy exchanges among the South East Europe TSOs.

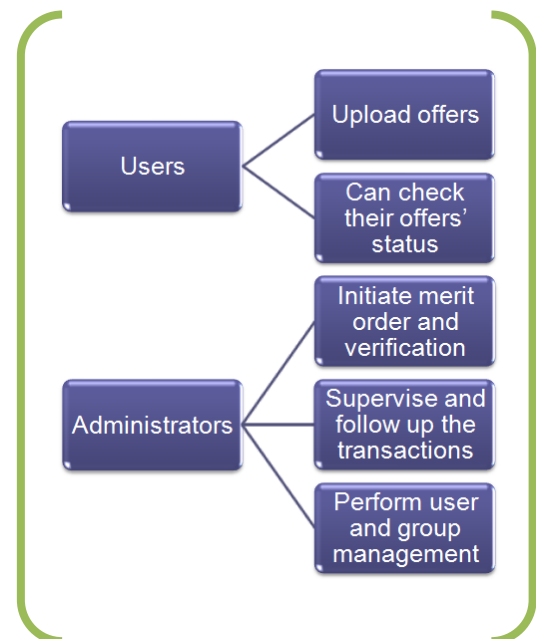
Open RBM software product has a modular design using standard and web-based interfaces, and can be accessed through web services for system users. It could also be a stand-alone application which can be installed anywhere within a TSO's operational network and can be integrated into existing Market Management Systems.

The offer client program is written in standard C++, using the Qt framework, a cross-platform application framework that is used for developing application software with graphical user interface (GUI). It makes extensive use of a special code generator (called the Meta Object Compiler, or MOC) together with several macros to enrich the language. It can also be used in several other programming languages via language bindings, runs on all major platforms and has extensive internationalization support. Non-GUI features include SQL database access, XML parsing; thread management, network support, and a unified cross-platform API for file handling. Distributed under the terms of the GNU Lesser General Public License, Qt is free and open source software. All editions support a wide range of compilers, including the GCC C++ compiler and the Visual Studio suite.

The server-side program is based on the web2py framework, which includes several Open Source modules for XML parsing, a comprehensive Database Abstraction Layer and support for automatic management and deployment of the applications.

Functions of Open RBM Software:

- Allows users to send and manage their offers
- Allows supervisors to
 - Gather and control offers
 - Compute merit orders and schedule deliveries
 - Follow up on the conclusion of the transaction
 - Generate settlement and billing data

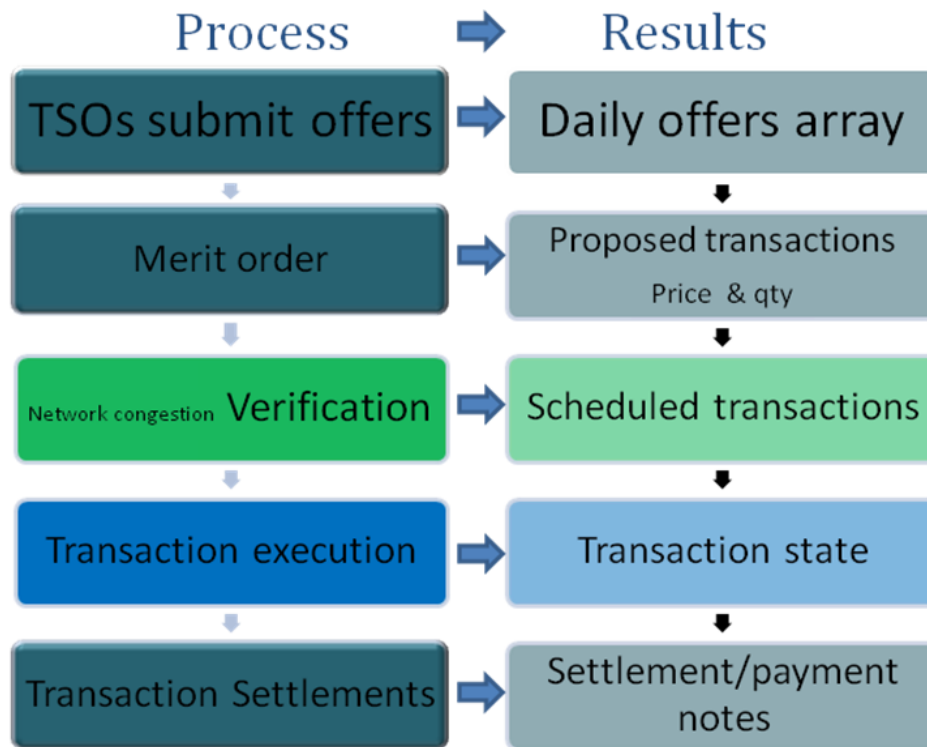


A three – step RBM process

Open RBM software determines the transaction volumes and payments resulting from the selected offers in a three – step procedure, namely:

- *Placing of offers* for each balancing interval and each BE type followed by their formal acceptance / rejection.

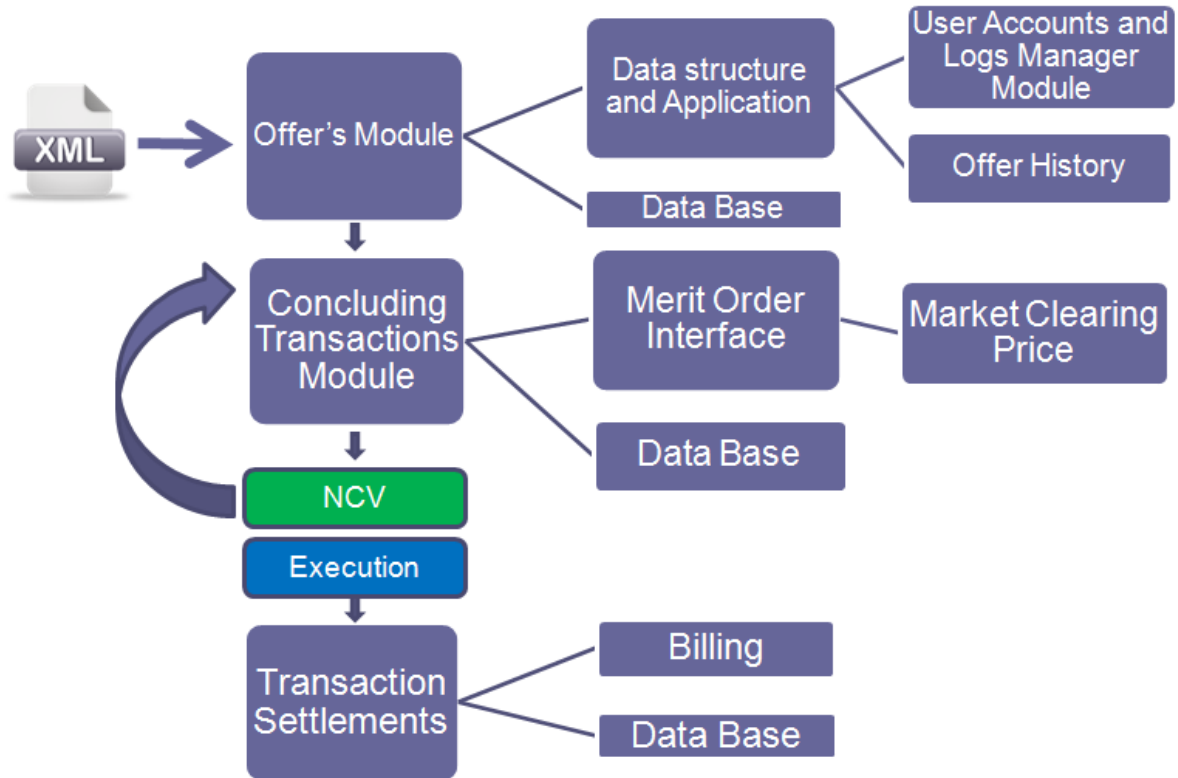
- *Offer selection.* A fixed and firm schedule bidding for the BE is carried out that ensures transaction selection and pricing, i.e. the establishment of RMBE clearing prices.
- *Transaction settlement.* The schedule is executed during the dispatching day (D). For each balancing interval, the imbalance quantity – price pair is established based on the final dispatch order for the BE purchase.



RMBE Transactions Steps

- Step 1:
 - validated and accepted bids are arranged in Merit Order (MO), separately for each regulation type and each hour of Delivery Day, as follows:
 - Buy MO - sell type bids, lowest to the highest price
 - Sell MO - buy type bids, highest to the lowest price
- Step 2
 - The **Line Overload Clearing (LOC) Module** is activated to mitigate congestion
- Step 3
 - The LOC module can either adjust or cancel certain sell and buy offers for minimum congestion cost
- Step 4
 - Ignored or constrained bids are registered in RBM data base.
- Step 5
 - If there are bids reduced or cancelled, go to Step 1.
- Step 6

■ Calculation and pricing of balance energy (RMBE Clearing Price)



Application Architecture

The application strictly follows the Model-View-Controller system for internal consistency, code reuse and ease of extension and maintenance. The models and the controllers can be reused for any application, and some of the functions are also exposed through web services.

Application Controllers and Views

There are 7 major application controllers, each with their well-defined functions.

Name	Functions	Depends on
appadmin	CRUD interface to the database. Used for debugging and some administration purposes.	-
concluding	Concluding transactions interface	-
default	First page shown to the user.	-
history	User history page	-
merit	Computation and committing of merit orders.	modules/merit.py modules/offer.py
settlement	Transactions settlement interface	-
upload	Uploading interface	modules/offer.py

Each of these controllers (with the exception of the settlement controller) has one or more associated views. The views only display static content or parameters obtained from the controller, which the controller passes when calling them.

Application Database

Web2py works with a Database Abstraction Layer (DAL) which can also handle table definition and creation.

Message format

The user exchanges information with the OpenRBM system using a standard-abiding XML format. The XML-formatted messages identify users and their bids, and are retained for reference and potential conflict resolution.

Outputs Open RBM Software

The tabular and graphical outputs address the following categories of information and reports:

- 24 day ahead and intraday RMBE transactions on Up- and Down- ward Energy Regulation, including the RMBE clearing prices.
- TSOs' imbalances and imbalance settlement prices.
- Report on manual changes and execution of the RBME transactions.
- Reports on the use of CB – ATCs for RMBE purposes and on congested RMBE offers.
- Settlements (invoices), payments and cash flow by a BEP (TSO) from or to the central counterparty.

The outputs can be displayed on the Report Manager Module and Market Information and Reporting Module which handle report creation in the following forms:

- Schedule Document (for cross – border power exchanges only).
- Acknowledgement Document.
- Anomaly Report.
- Confirmation Report.
- Intra-Day Report.
- Daily Report (the report must include all information about the balancing mechanism).
- Imbalance prices.

The reports would be shared with the stakeholders (TSOs) and with external customers, and will support the SCADA snapshots for archiving.