

SAP Solution in Detail
SAP for Utilities



ENERGY DATA **MANAGEMENT**

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EXECUTIVE SUMMARY

With the energy data management capabilities of the SAP® for Utilities portfolio, SAP provides players in the deregulated energy market with a total solution that meets their needs for metering and measuring load shapes, settling energy quantities, managing schedules, and billing interval customers.

INTRODUCTION

The energy market is in flux. Before deregulation, vertically integrated utilities were the norm. One company covered most – or even all – levels of the energy value chain, including generation, transmission, distribution, and customer service. The separation of these levels, known as unbundling, is a legal requirement of energy market deregulation.

Unbundling results in the formation of new types of companies, such as distributors, energy suppliers, independent power plant operators, and regulated transport grid operators. These market players all require different information, and their systems process only the data needed for their own operational businesses. When necessary, they procure data that is collected or stored by other companies.

The new tasks performed by distributors in the deregulated energy market include:

- Managing suppliers, points of delivery, load profiles, and customers that have switched to another utility
- Managing grid customer contracts and supplier outline contracts
- Settling energy quantities based on analytical or synthetic procedures
- Calculating annual higher and lower energy volumes
- Providing data for suppliers, settlement coordinators, and settlement area coordinators

Energy suppliers also perform new tasks, including:

- Managing distributors, points of delivery, and load profiles
- Managing energy supply contracts and distributor outline contracts
- Creating load forecasts
- Calculating prices and quotations
- Preparing and delivering energy to customers
- Providing the technical framework for the energy supply
- Providing and registering schedules in a timely manner
- Exchanging and providing data for distributors and settlement coordinators
- Billing
- Processing and checking incoming bills for grid usage

Coping with these tasks requires an energy data management solution that separately maps these formerly bundled processes, provides the necessary data quickly and without error, and can process, format, and manage this data.

ENERGY DATA MANAGEMENT IN UTILITIES INDUSTRY

SAP offers companies competing in the deregulated energy market a standard customer information and billing system called SAP® Utilities/Customer Care System (SAP IS-U/CCS), a solution in the SAP for Utilities portfolio. SAP has considerably enhanced the energy data management (EDM) capabilities in the SAP for Utilities portfolio to map the processes resulting from new market rules in various countries, such as the German Associations' Agreement Regarding Electric Energy, EMG, ELOG, and so on. In particular, the EDM capabilities of SAP for Utilities are responsible for the management and processing of time series – load shapes and profiles and energy exchange prices, for example. Business and technical master data and the corresponding processes, such as supplier changes, are mapped in SAP IS-U/CCS.

As shown in Figure 1, the EDM capabilities of SAP for Utilities include the energy data repository, the settlement workbench, and real-time pricing and billing.

THE ENERGY DATA REPOSITORY: A CENTRAL DATABASE FOR ENERGY DATA

The energy data repository is a central database for storing all types of energy and energy-related data. It contains data that is entered at equal intervals – for example, the measured values from every 15, 30, or 60 minutes. Meter readings can also be entered into it. The repository has versatile functions that can import and check this data, create replacement values, perform calculations, and more.

THE SETTLEMENT WORKBENCH: SETTLEMENT AND SCHEDULE MANAGEMENT

Distributors can use the settlement workbench to settle the proportion of the total distributor load that originates from suppliers. As an example, SAP supplies templates for synthetic and analytical procedures that conform to the German Associations' Agreement Regarding Electric Energy. These functions form the basis for determining higher and lower volumes as well as follow-up billing by distributors.

Suppliers can use EDM functions to automatically create and send schedules. If necessary, they can also create and send schedules for subordinate distributors.

BILLING OF TIME SERIES: COMPLEX BILLING

SAP for Utilities provides functions for complex billing, such as real-time pricing or time-of-use pricing, that enable you to bill time series (from interval customers, for example). This billing is compatible with all contract types that refer to time series, including contracts for energy supply, grid usage, billing higher and lower volumes (deviation billing), and settlement processes.

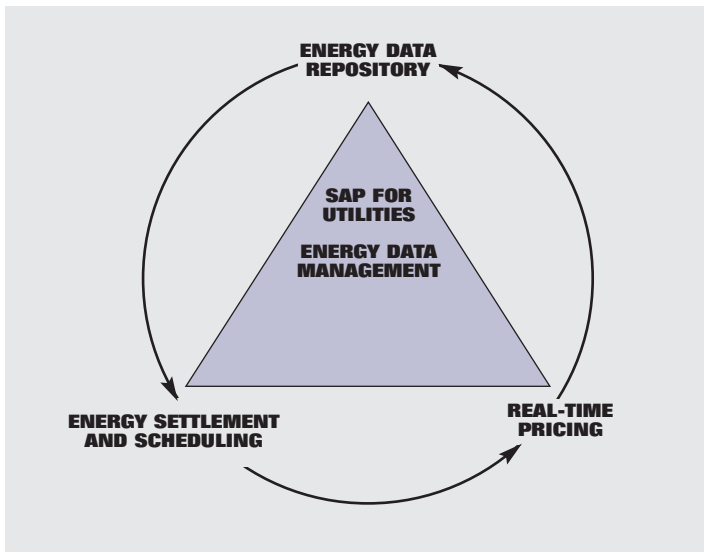


Figure 1: Energy Data Management in SAP for Utilities

CAPABILITIES OF THE EDM SOLUTION

DATA STRUCTURES FOR THE DEREGULATED ENERGY MARKET

The EDM functions of SAP for Utilities are based on the SAP IS-U/CCS data model, which provides the data structures needed to map business and technical processes in the deregulated market environment. Thanks to seamless integration in the SAP IS-U/CCS customer information and billing system, you can use EDM functions to map the secondary processes of the German Associations' Agreement Regarding Electric Energy.

BUSINESS PARTNERS AND SERVICE PROVIDERS

All external market players that have a business relationship with your company can be mapped in the system with their master data, such as name, address, and contact person. If you need to add attributes to business partners for controlling business processes, you can define these business partners as service providers. Your business partners may include energy or grid customers. Business partners defined as service providers may include suppliers, distributors, independent system operators, and settlement coordinators.

POINTS OF DELIVERY

A point of delivery (POD) is stored in the system as a central object and assigned using the data model. You can assign PODs to different structures depending on the country of location. SAP for Utilities supports and supplies the POD structure based on the German metering code, but you can maintain and assign POD structures for other countries.

SERVICES

Services provided by business partners, such as settlement coordination and energy supply, can be allocated to a POD. This ensures that agents retain an overview of the services provided for the POD by given service providers at given times. As a central data object, the POD is fully integrated into the data model. Services are also used to control settlement runs and in electronic data exchange.

CONTRACTS

Energy supply, grid usage, and outline contracts are managed together historically with their respective data. Contracts that are billed – such as energy supply and grid usage – can use the consumption billing capabilities of SAP for Utilities.

SETTLEMENT UNITS

SAP for Utilities can also be used to map settlement units. The historical relationships between settlement units and sub-settlement units are maintained and taken into account during settlement. A settlement coordinator and a supplier that

coordinates the settlement area are assigned to each settlement unit. The system automatically identifies the PODs that belong to the settlement units. On a daily basis, the system takes into account the suppliers to which the individual PODs are allocated, thereby observing which POD belongs to which settlement unit.

LOAD SHAPES AND LOAD PROFILES

SAP for Utilities can process measured load shapes as well as load profiles and their assignment to the data model (meters, installations, and so on).

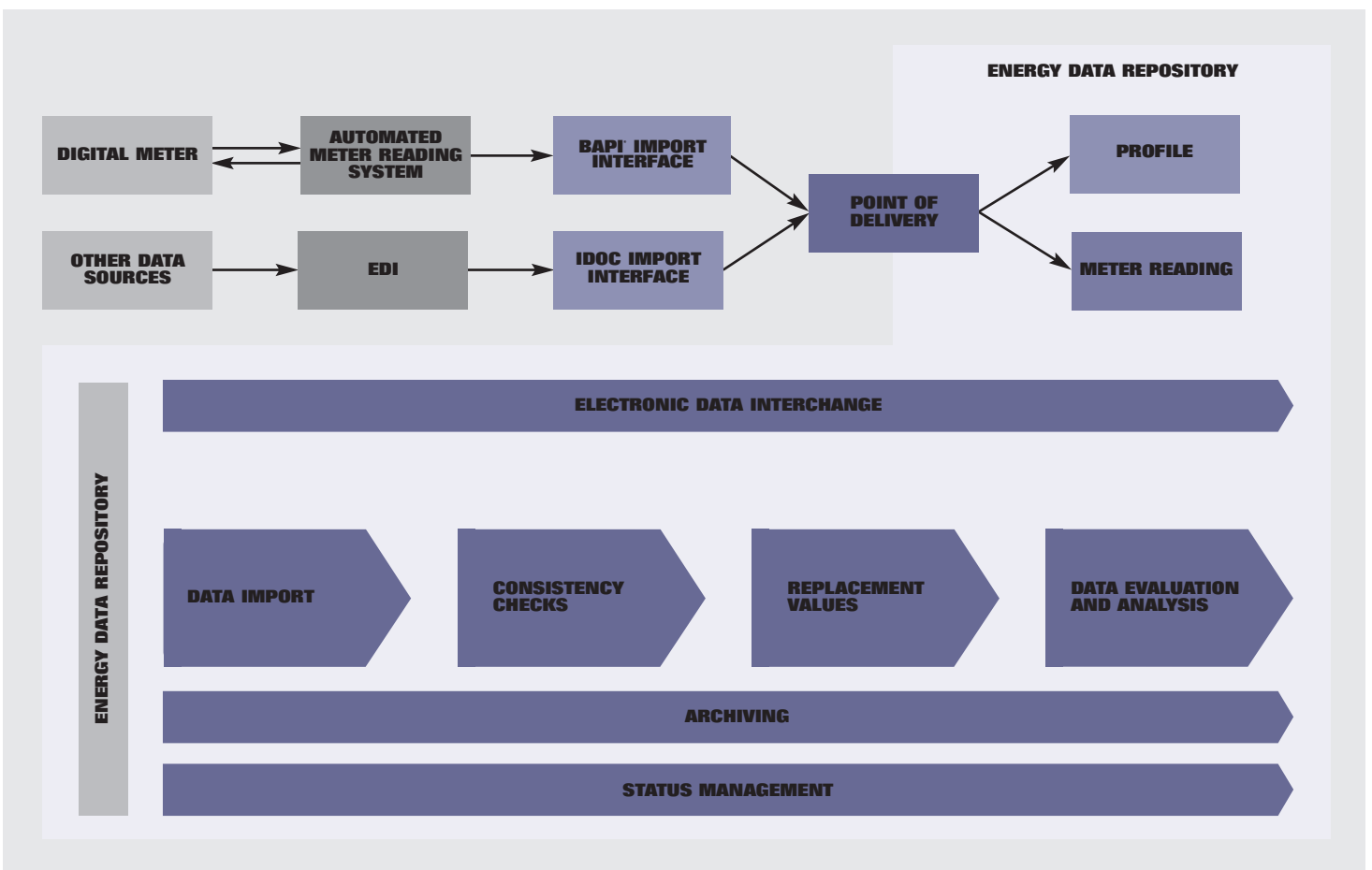


Figure 2: Functions of the Energy Data Repository

Standardized day load profiles can be stored in SAP for Utilities. Based on a factory calendar, these profiles can be summarized for an annual profile, and the resulting synthetic profiles can be standardized (to 1,000 kWh/p.a., for example). The solution can also account for dynamic modification factors. Dynamic modification factors based on the function of the German Electricity Association can be generated directly and stored as an independent profile. The solution considers them when it generates the synthetic annual profile. If required, you can implement other algorithms for determining dynamic modification factors.

The solution stores consumption factors for each synthetic load profile. These factors note the relationship between the standardized consumption and the actual measured consumption of non-interval customers. This consumption factor is updated automatically and saved historically when the consumption of non-interval customers is determined. Consumption factors are required for settlement, volume determination, and consumption forecasts.

SAP for Utilities can store several consumption factors per customer. This may be necessary if a supplier reports its own estimation of a customer's consumption to the distributor.

GRIDS

You can map grids and grid structures in the system and allocate the respective distributors to the grids. A connection to the regional structure means the grids and distributors can be identified automatically. The regional structure is always used in communication control for electronic data exchange.

THE CENTRAL ENERGY DATA REPOSITORY

The energy data repository, shown in Figure 2, is a central database in which you can manage all types of energy and energy-relevant data. It contains time-slice data – data that is entered at a time series of equal intervals .

SAP for Utilities processes all types of primary time series, such as energy and demand time series, load time series (measured load shapes and analytical load profiles), schedules, and the results of calculations. It can also process all time series that cannot be directly allocated to the energy flow. Examples include price and currency time series, conversion factors (such as for gas billing), or weather data for load forecasts.

SAP for Utilities handles different divisions (such as electricity, gas, water, and district heating) and different time intervals (5, 10, 15, 30, 60 minutes, and so on).

IMPORTING TIME SERIES

SAP for Utilities has an open architecture. It contains predefined interfaces for common automated meter-reading systems. Data procured from electronic data interchange (EDI) formats, such as EDIFACT, ANSI X.12, or XML, is as easily adopted as data provided via a standard PC or OLE interface, such as Microsoft Excel.

MODIFIABLE STATUS MANAGEMENT

A status value is managed for each imported value belonging to a time slice. You can display status values in graphical or table form, and you are free to define how status values are defined and processed. Processes, such as billing, can block individual values or entire time series against additional modifications.

CONSISTENCY AND VALIDITY CHECKS

When time-slice values are imported, SAP for Utilities runs predefined consistency checks. These routines check the data entering the system and react with preconfigured measures, for example, by terminating the import. Individual checks, such as checks for exceeded value limits or already existing values, can be summarized in freely definable groups and allocated to time series as required.

REPLACEMENT VALUE HANDLING

If values are missing or incorrect, SAP for Utilities can create replacement values. Various replacement value procedures can be modified to meet your requirements. The replacement values provided by SAP for Utilities can be split into two general groups: procedures that recalculate the incorrect values and those that use values from other measurements or periods as references. Individual replacement value procedures can be grouped together and allocated to time series as required. In these replacement value procedure groups, you can control which procedure is used, depending on the priority of the procedure or number of missing values.

CALCULATING TIME SERIES USING THE CALCULATION WORKBENCH

The calculation workbench enables you to subject the time series stored in the system to additional processing. For example, you can determine the total consumption of an industrial customer that is supplied via more than one connection point.

The dependency between output and input values is mapped in a formula, which contains flexible calculation rules based on mathematical functional relationships. A formula is assigned to time series that were originally stored as input parameters. As the result of a calculation, the output parameter is also stored as a time slice. After a calculation run, you can use the results in subsequent processes, such as billing, settlement, or schedule creation. The calculation takes account of the status of the values.

SAP provides a number of predefined formulas, and you can create additional formulas as required. You can use the output parameters of formula calculations as the input parameters of new formula calculations. This enables you to create formula hierarchies as needed, which can be clearly displayed in graphical form.

During the next settlement run, the formula is calculated together with all the other formulas that were designated in the same way. Alternatively, each formula can be calculated individually. The system takes formula hierarchies into account when processing events that trigger calculations. To speed up the process, the calculations can be run in parallel calculation jobs and distributed over different servers.

EVALUATING AND FORMATTING DATA

You can visualize and evaluate time series using a variety of methods. SAP for Utilities provides graphical and tabular screen dialogs that you can use to create, display, or modify data.

The seamless integration of EDM capabilities into SAP for Utilities facilitates navigation through the datasets of the SAP IS-U/CCS data model. This enables you to select data using business objects that are linked directly to EDM objects. You can use logically connected filter functions to restrict the datasets displayed, and you can use sorting functions to filter the data.

Data can be transferred in table form to a spreadsheet program like Microsoft Excel so you can process the data in a familiar PC environment. Data that is modified in a spreadsheet program can be reloaded into SAP for Utilities. The solution checks user entries for correctness, and it rejects incorrect entries, which prevents inconsistent data records. If an entry triggers a system response, such as a status change, the results are updated and displayed in tabular and graphical form.

VERSION CREATION AND REVISION GUARANTEES

The solution automatically saves and logs changes to time-slice data. The resulting different versions of the time-slice data are historically managed. Each version is given an ID that specifies the reason for change, who made the change, and at what time the change was activated. This allows you to identify what data is active at given times, together with the status of the data and who changed the data.

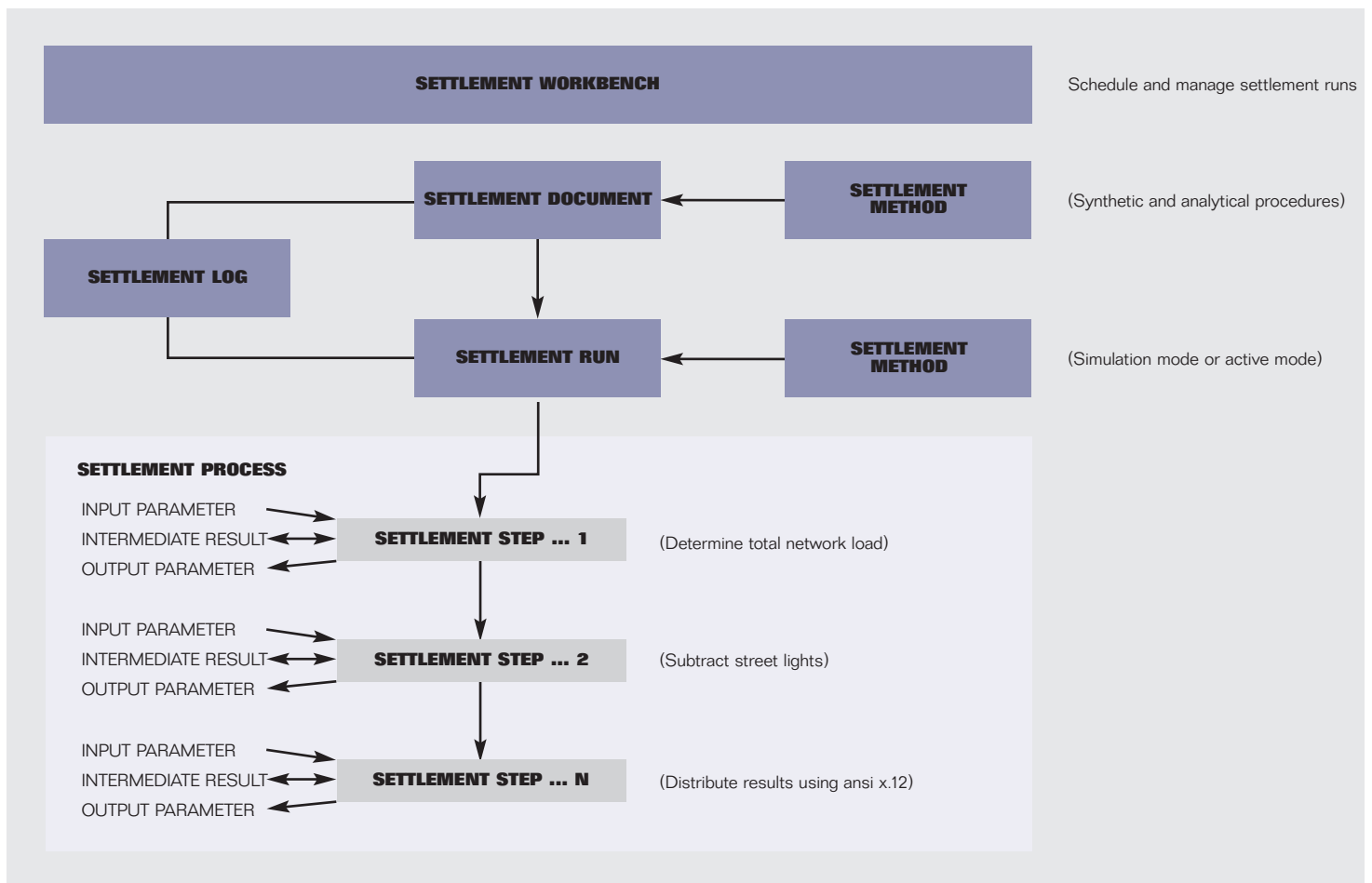


Figure 3: Settlement and Schedule Management

ARCHIVING

Time-slice processing results in the accumulation of large amounts of data. SAP for Utilities can be connected to external archiving systems so that only data of immediate importance needs to be stored. Archives ensure that you can access older data at any time.

You can specify a retention period for time-slice data in the operative system. The archiving run identifies data that has exceeded this period and moves it to the archive. The run also takes into account dependencies on other archiving objects, such as billing documents.

PUBLISHING DATA ON THE INTERNET

You can publish time-slice data on the Internet for use by external market players and customers. Access to this data is subject to authorization so that only authorized users can retrieve the data. This function uses SAP® Internet Transaction Server (SAP® ITS) and Internet Application Components (IACs) developed for time-slice access.

SETTLING ENERGY QUANTITIES AND CREATING SCHEDULES

SAP for Utilities supports distributors during settlement. All the initial data required for settlement can be stored in the central database, or it can be determined there (using formula calculations, for example). SAP provides synthetic and analytical procedures that meet the requirements of the German Associations' Agreement Regarding Electric Energy. Suppliers can use SAP for Utilities to create and send schedules automatically.

THE SETTLEMENT WORKBENCH

You can use the settlement workbench to manage, schedule, test, execute, and log settlement runs. The settlement workbench manages settlement documents that contain the basic data of the settlement runs. This data can include the time of settlement, the settlement period, settlement mode, or the units requiring settlement.

Each settlement run is executed according to a predefined settlement procedure. A procedure is divided into individual steps that can be processed sequentially or in parallel. The synthetic and analytical settlement procedures provided by SAP meet the requirements of the German Associations' Agreement Regarding Electric Energy.

SETTLEMENT MODE

SAP for Utilities uses two settlement modes:

- Simulation mode. A settlement document is simulated, and the settlement results can be saved and evaluated. However, the data is not made available to the relevant market players (suppliers, settlement coordinators, and so on).
- Active mode. Settlement is executed and the results are saved and sent to the relevant market players. If required, the settled data records can be locked against additional changes.

If errors occur during a settlement run (due to missing initial data, for example), the data records can be recalculated any number of times. Only the unsuccessful settlement steps are run during a recalculation, which reduces the duration of a recalculation run to a minimum.

You can display settlement results in graphical or table form.

DETERMINING ENERGY VOLUMES

Settlement entails determining the volume of energy for each supplier that is used by a customer over the settlement period. Both the interval energy quantities of interval customers and the synthetic load profiles of non-interval customers must be taken into account for each period.

The EDM functions use the existing SAP IS-U/CCS database. Using either the services belonging to the point of delivery (POD) or the existing energy supply contracts, SAP for Utilities can allocate the PODs per day to the respective suppliers. The total of all the energy withdrawals belonging to the suppliers is collected in the settlement unit of each respective supplier.

In processes such as move-in, move-out, and supplier changes, SAP IS-U/CCS accounts for supplier restrictions to the POD on a daily basis. In addition, each time a non-interval customer is billed using synthetic load profiles, the solution updates the current and estimated annual consumption in the form of consumption factors. In this way, the system can identify which supplier was responsible for the energy supply of a given POD on a daily basis. The POD can be used to determine the corresponding load shapes and non-interval customer consumption, which can be updated in the settlement unit.

The EDM functions use the processes described above to access the current dataset. This enables SAP for Utilities to identify the energy quantities requiring settlement at their source: the customer information and billing system. As a result, interval data can be settled accurately using the most up-to-date dataset for the settlement period – without using of interfaces.

EXCEPTION HANDLING

If individual settlement steps cannot be successfully processed or if processing is incomplete (as a result of incorrect or missing data, for example), exception handling can be triggered for each settlement step. Exceptions (also called alerts) can be output as warnings or error messages. Warnings provide information to or require confirmation from users, while error messages terminate the settlement run.

Each exception can have an individual response in the form of additional processing, such as an e-mail notification to the responsible agent or a workflow step.

SETTLEMENT DOCUMENTATION AND LOGS

Settlement runs use a wide range of documentation and logs. You can view the status of an entire settlement run, as well as the status of individual settlement steps, at any time. The runtime required for each settlement step is constantly specified. You can use a graphical tool to see which settlement steps have been run, as well as the status of each step (successful, terminated, and so on).

These documentation and logging tools guarantee the maximum level of transparency about the settlement procedure and the processes within it. The tools also provide extensive information about the data that is sent to other market players.

PROVISION OF DATA

You can send settlement results to the market players that require them (suppliers, settlement coordinators, and so on). Several data formats, such as EDIFACT and XML, are supported. The intercompany data exchange (IDE) function of SAP for Utilities sends the data.

MODIFICATIONS AND ENHANCEMENTS

The EDM settlement procedures have been developed as a building block system that allows individual settlement steps to be combined with SAP business workflows or executable programs to run a settlement procedure that fully meets your requirements.

SAP provides preconfigured settlement procedures, but you can reconfigure them at any time to meet your changing needs. You can also modify the individual settlement steps or develop your own steps. SAP for Utilities ensures that all kinds of settlement procedures can be efficiently mapped in the system.

HIGHER AND LOWER VOLUME DETERMINATION

All settlement procedures operate on the basis of estimated consumption values. Once actual customer withdrawals have been determined, you can compare the values with the energy feeding of the supplier. The resulting higher or lower volumes must be determined per customer and supplier, and billed to the supplier.

You can think of higher and lower volume determination as an additional settlement process. For each customer, the actual withdrawals and the energy feeding registered by the supplier are stored separately as consumption factors for the standardized synthetic annual load profiles. The higher and lower volumes determined for each supplier are billed and invoiced using real-time pricing (RTP) functions.

SCHEDULES

Suppliers can use the settlement workbench to create schedules and send them to settlement coordinators. The technical infrastructure described in the section on settlement procedures is used in this process. The schedules are created in a series of individual steps, ending with the dispatch of the schedule to the settlement coordinator. The process can be fully automated. If required, schedules can also be created and sent to subordinate distributors.

When creating schedules, SAP for Utilities uses the synthetic profiles as a way to determine the energy-feeding volumes for non-interval customers. In the case of interval customers, SAP for Utilities can either create simple consumption forecasts itself, or it can access load forecasts from external forecasting systems.

BILLING ENERGY LOAD SHAPES

The EDM functions of SAP for Utilities support billing in SAP IS-U/CCS. This means that SAP IS-U/CCS can bill all kinds of rates and energy products based on measured time series. The solution can bill for all types of contracts that refer to measured load shapes or load profiles, such as energy supply, grid usage, deviation billing, and settlement processes. All the amounts billed using consumption billing can be invoiced to the respective business partners.

Suppliers can use the EDM functions to bill energy supply contracts. This applies especially to bulk buyers of energy that are generally equipped with an interval meter. Suppliers responsible for settlement area coordination can use EDM functions to check the billing of balance deviations (performed by the settlement coordinator) from their own settlement units.

EDM functions allow you to determine the settlement deviation by comparing the energy-feeding volumes of the settlement units with the withdrawal volumes and then valueate the deviation with volumes and prices in accordance with the German Associations' Agreement Regarding Electric Energy. This process also accounts for carry forwards and tolerance levels.

Distributors can use EDM functions to bill their grid customers. The energy volumes entered into the higher and lower volume determination functions can be billed to the supplier. Settlement coordinators can use EDM functions to determine and bill the settlement process of the supplier's settlement units.

BILLING ENERGY EXCHANGE AND INDEX PRICES

Energy products and rates that are based on fluctuating energy exchange or index prices – hourly values, for example – can be processed using the EDM functions. The measured load shapes and the exchange or index prices are held in the energy data repository. Each hour, the billing run valueates the measured volume of the load shape using the price specified for that hour. Volume deliveries, partial deliveries, or any value limits can be taken into account.

BILLING CONSUMPTION VALUES IN TIME SEGMENTS

SAP for Utilities can summarize the measured values for time series according to previously defined time segments and valueate them with an individual price for the time slice. A simple example of this is to divide the load shape of an interval customer into on- and off-peak periods and then valueate these periods with the corresponding on- and off-peak prices.

You can use EDM functions to define any number of more complex time segment structures and hierarchies. For example, on- and off-peak prices can be determined for weekdays and weekends, as well as for summer, winter, and transitional periods.

BILLING SPECIAL AGREEMENTS

Special agreements can be stored and billed in SAP IS-U/CCS. Special agreements must be predefined and activated by the user for the required periods.

ADDITIONAL PROCESSES FOR IMPLEMENTING NEW MARKET RULES

This document does not discuss additional processes for new market rules. To map these additional new processes, other areas of SAP IS-U/CCS and the complete SAP for Utilities portfolio are used. These are mentioned briefly below.

SAP INTERCOMPANY DATA EXCHANGE (IDE)

SAP has enhanced SAP IS-U/CCS to process cross-company business processes. IDE functions allow data to be received from and sent to other market players. As a rule, standardized formats are used for electronic data exchange, such as EDIFACT, ANSI X.12, and XML. However, e-mail and Microsoft Excel are also commonly used.

SAP for Utilities supports electronic data interchange for a wide range of data and processes. Examples include supplier changes, meter readings and consumption values, energy supplier and grid usage bills, and electronic payment management.

SAP BUSINESS WORKFLOW

SAP Business Workflow is a tool that flexibly models total-enterprise and cross-company business processes. It is used, for example, to map settlement procedures and supplier changes.

SAP FOR UTILITIES: THE EDM SOLUTION FOR THE DEREGULATED ENERGY MARKET

Through the seamless integration of EDM functions in the SAP for Utilities portfolio, SAP can offer a universal, integrated solution for energy companies in deregulated energy markets with mySAP™ Business Suite. Above all, the SAP for Utilities portfolio provides a solution that is independent of any operating system, database, or hardware manufacturer.

SAP for Utilities is a standard, international solution that can be adjusted to fit any country's specifications. Companies that are active in more than one country can operate models for different countries concurrently in a single system.

EDM functions available in previous versions of SAP IS-U/CCS have been enhanced considerably in the latest version. The EDM functions of SAP for Utilities secure the investments that customers have made in their IT infrastructures. The seamless integration with SAP IS-U/CCS means that redundant data storage and high-maintenance interfaces between systems are now outdated. Based on established software technology, EDM functions have an open system architecture and defined interfaces to external market partners and systems. Strategic cooperation with market leaders in automated meter-reading systems guarantees absolute investment security.

SAP for Utilities is an open system with a wide variety of data import and export options. Existing SAP technology is used almost exclusively for this, including Business Application Programming Interfaces (BAPIs), Intermediate Documents (IDocs), and so on. SAP for Utilities is delivered with an implementation guide that relates the core EDM functions to the individual needs of the utilities industry, and contains step-by-step instructions for configuration. This ensures that EDM functions are implemented quickly on your system.

Information and applications are only a mouse click away. As with all other mySAP Business Suite solutions, SAP for Utilities contains extensive online documentation and help functions. And there is a group of trained implementation partners who can help you with the initial start-up phases.

THE RIGHT SOLUTION FOR TOMORROW – AND TODAY

The move toward deregulation leaves the energy markets in a constant state of change. This means that companies must be able to constantly change, adjust, or rethink their internal workflows. SAP will continually update the EDM functions in the SAP for Utilities portfolio so that the solution can keep up with the latest demands of deregulated energy markets.

With the SAP for Utilities portfolio, SAP offers a total solution for companies competing in deregulated energy markets. With its newly enhanced energy data management capabilities, SAP for Utilities flexibly and completely maps the processes resulting from the new market rules in various countries.

It contains a central, total-enterprise database that stores all types of energy and energy-related data, with emphasis on data that is entered at equal time intervals, such as load shapes or energy exchange prices. Preconfigured data interfaces enable automated meter-reading systems. The solution has functions for importing and exporting data, conducting consistency checks, and conducting replacement value procedures. It also has a wide range of options for displaying, changing, and evaluating data. Formula allocations allow mathematical calculations to be performed on the datasets. And when they are no longer required for frequent use, datasets can be archived.

Distributors can use the EDM functions of SAP for Utilities to settle the proportion of total loads that originate from the supplier. Synthetic and analytical procedures are provided that meet the requirements of the German Associations' Agreement Regarding Electric Energy. The settlement functions also form the basis for determining higher and lower volumes and for billing by distributors.

Suppliers can use the EDM capabilities to automatically create and send schedules. If required, schedules can also be created and sent to subordinate distributors. Real-time pricing functions enable time series to be billed. Suppliers can use these functions to bill innovative energy products based on measured load shapes. Special and spot deliveries can also be modeled.

Distributors can use EDM functions to bill for grid usage. The energy volumes entered in the higher and lower volume determination functions can be valued using real-time pricing functions and then billed to the supplier.

The solution is based on established software technology, and SAP will continually enhance it to meet the changing requirements of the deregulated energy market. The SAP for Utilities portfolio has an open system architecture and defined interfaces to external systems. The EDM functions of SAP for Utilities are available right now, and can be modified easily to meet the requirements of the regulatory environment in which you operate.

You can rely on the SAP for Utilities portfolio to meet your needs in a changing and challenging energy environment – efficiently, dependably, and flexibly.

To find out how SAP for Utilities can help your company streamline its EDM processes, go to www.sap.com/utilities.

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