



Network  
Management

# Reference Example Distribution Energy Management in Turku Energia



ABB Automation



# Deregulated Electricity Market in Finland

The electricity market was deregulated in Finland at the end of 1995 and the customers can now freely choose their power suppliers. The local distribution network is separated from the energy business. The network operators transmit electric power on equal terms, regardless of where the power is purchased.

In the UK, the situation in the electricity market is different. In Finland distribution is still a monopoly, while energy supply is deregulated. The network operator has the responsibility for the acquisition of load data for all the customers in the network, focusing the customers' metering data on the right suppliers and delivering this data to suppliers and the national grid company.

At the moment only big customers may choose their supplier, but from September 1998 also small customers (<63A) will be able to do so. The balance calculation for these

small customers will be based on load profiles. Even so, the great number of household customers will make the balance calculation for the network operator arduous, and effective means are needed to make the meter data acquisition, the balance calculation and the data exchange automatic and flexible.

In the Nordic countries the data exchange is managed via EDIEL. EDIEL is an EDI-FACT-based standard for electricity markets.

Turku Energia produces, purchases and supplies both district heat and electricity. Turku Energia plays a very active role on the market, supplying electricity to several foreign networks. District heat production is often seen as an advantage for energy utilities, because combined production is very economical compared to pure condensed steam power production.

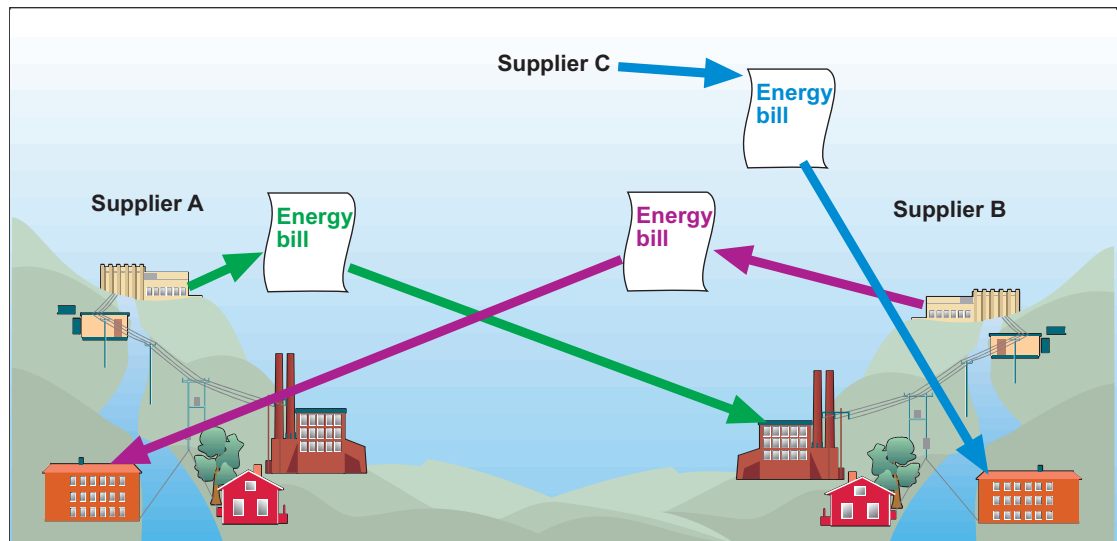


Figure 1. Distributed electricity market in Finland.

## FOCUS

ABB Transmit Oy has co-operated with the Technical Research Centre of Finland (VTT) and Turku Energia to develop an energy management product family. This

product family is called FOCUS, and it combines the real-time data and tasks of MicroSCADA to support functions for energy management.

FOCUS functions:

1. Meter data acquisition and reporting
2. Diversified balance calculation
3. Medium-term and short-term forecasting
4. Real-time estimation and control of sales and purchase balance
5. Technical contract management based on time and energy supplier
6. Interfaces to other information systems
7. Data exchange with market partners via EDIEL

Turku Energia's energy management system also includes an optimization module and a module for sales support made by VTT. These modules use the data available in the

relational database, and the output data produced by optimization and sales support is written to the relational database.

## Real-time Network Energy Balance Monitoring

MicroSCADA collects data from the network and the processes, handles remote metering, offers connections to other systems and means for graphical presentations, on-line analysis and metering reports. The open FOCUS database may, for instance, include a calculator, time-series data of the whole energy management system and applications for forecasting. It also offers an interface to other systems. The co-operation between MicroSCADA and the FOCUS database consists of both real-time monitoring and applications on non-real-time basis.

The collected data by MicroSCADA is based on 3-minute values. This data is completed by forecasts for current hour. The forecasts are read to MicroSCADA from the FOCUS database. These measured values and forecasts are presented on the same screen either in graphical or in numerical form. This

type of presentation makes it possible to control the balance of both the network and the sales. The curves presented are:

- transmission, measured
- foreign sales in the network, estimated
- sales to foreign networks, estimated
- total sold load = transmission + sales in other networks - foreign sales, estimated
- the difference between measured/estimated values

The data stored in the FOCUS database is on one-hour basis, because one hour is the resolution used in the Finnish electricity market. Because of this, the estimates are shown for the whole hour. It is possible, though, to split the one-hour values into three-minute values using a typical one-hour profile and adapting the profile to the current hour load.

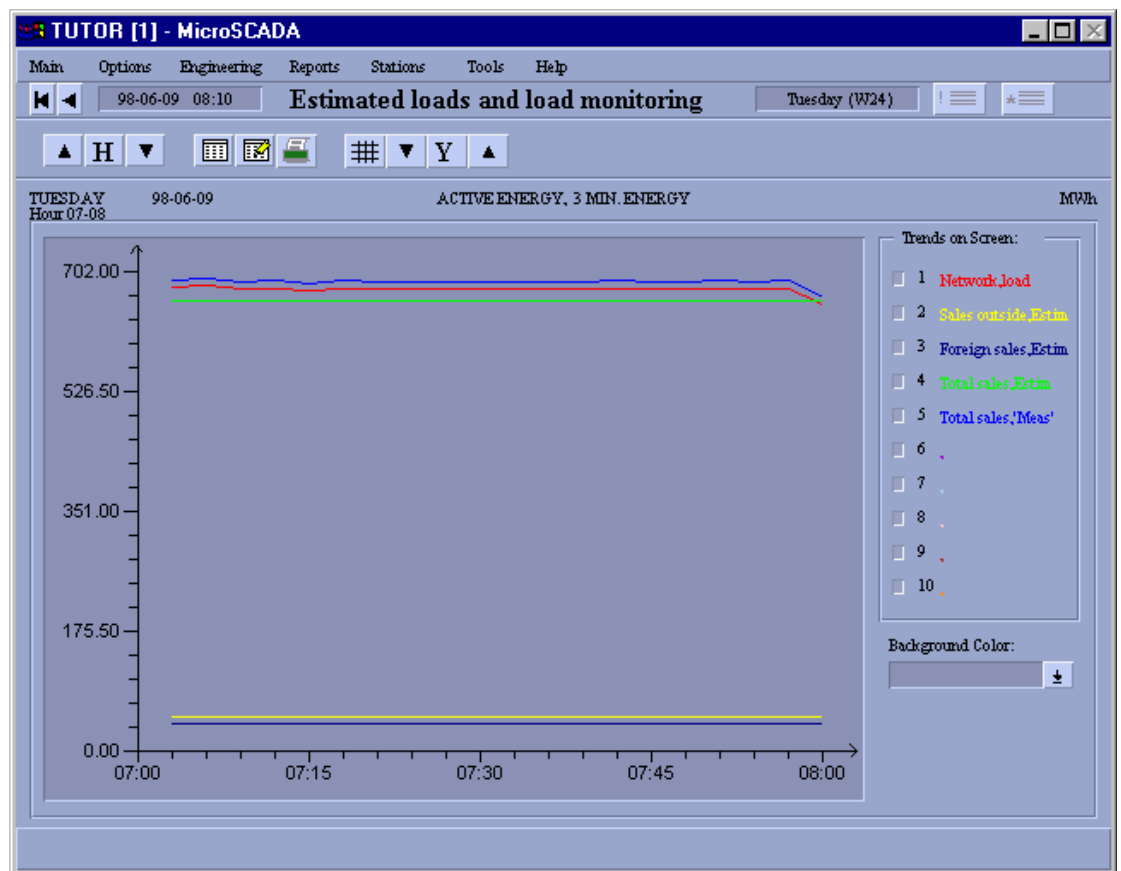


Figure 2. Real-time balance monitoring.

## Automatic Balance Calculation Completed by Forecasts

The balance calculation must be done once a day by the network operator. The energy data is sorted so, that all the suppliers get the measured load data of their customers in the network. In the FOCUS system this calculation is supported by the following means:

- technical contract management
- calculator
- graphical presentation of balances
- forecasts and estimates
- data exchange via EDIEL

In the technical contract management, the contracts in the network area are defined by the customer, the supplier and the validity time of the contract. All the contracts defined in this module are updated according to the balance calculation, i.e. if a customer changes its supplier, the change will be taken into account automatically when calculating the

balance for the former and the new supplier. Contract management doesn't deal with money, but the validity time of the contract and the partners of the contract.

The network operator may freely choose the balances he wants to. There are no limits for the amount of calculated balances, and the calculator can be used as a very diversified tool for different views of the events in the network. The calculations can be based not only on measured values, but also on estimations and forecasts.

All the balances can be presented graphically and also reports using balance calculation data are available. The measured data can be sorted in several time zones so that, even though no money is dealt with in the system, a base for tariffs is available as time- and energy-based data.



Figure 3. Graphical presentation of balance calculation.

The forecasts are used especially when, for some reason, measured data is not available. The estimated value is used in the balance

calculation as a "best guess". It's very important for the supplier to get estimated data instead of no data at all.

## EDIEL

EDIEL is an EDIFACT-based standard used in the Nordic countries. The advantage of EDIEL is that all the partners get energy data in the same format. The medium used is FTP or .x400. In the FOCUS system, the energy data is received from the database and formed to messages, which are sent to all the suppliers and the national grid company once a day. The data received by EDIEL is fed straight to the database, and is usable in all the applications at once.

The EDIEL messages are sent automatically, and in the event of a failure an alarm is

given both in the EDIEL mail box and in the MicroSCADA system. The EDIEL messages are configured when a new partner is included. For every partner there is a message configuration. There is no limit for the number of partners.

The configuration is easy and takes very little time, and once the configuration is made, the messages are automatically sent. The data source can be MicroSCADA, a database, etc. The installation and implementation may take one day. Compared to manual management of the data received, EDIEL is often considered to be the only way to manage this data.

## Interfaces

The FOCUS system has an open database and offers several interfaces to other information systems and applications. The Technical Research Centre of Finland (VTT) has developed an optimization module for the system. This optimization is based on a mathematical method, which splits a given energy demand into its power components, so that the operational costs are minimized. Using the energy demand forecast, the optimization gives guidelines for how to produce and purchase the forecasted amount of energy.

In combined heat and power production systems, it is quite a complicated task to decide how to produce two different energy products

with different demands in the same production units. The optimization module is able to take into consideration all the influences at the same time.

As the result of optimization, the production and purchase dispatch divided into different components and operational costs are given. Also the marginal costs of losses are available.

The optimization module uses the FOCUS database, and the results of optimization are a basis for not only purchase and production, but also for sales offers, risk management, etc.

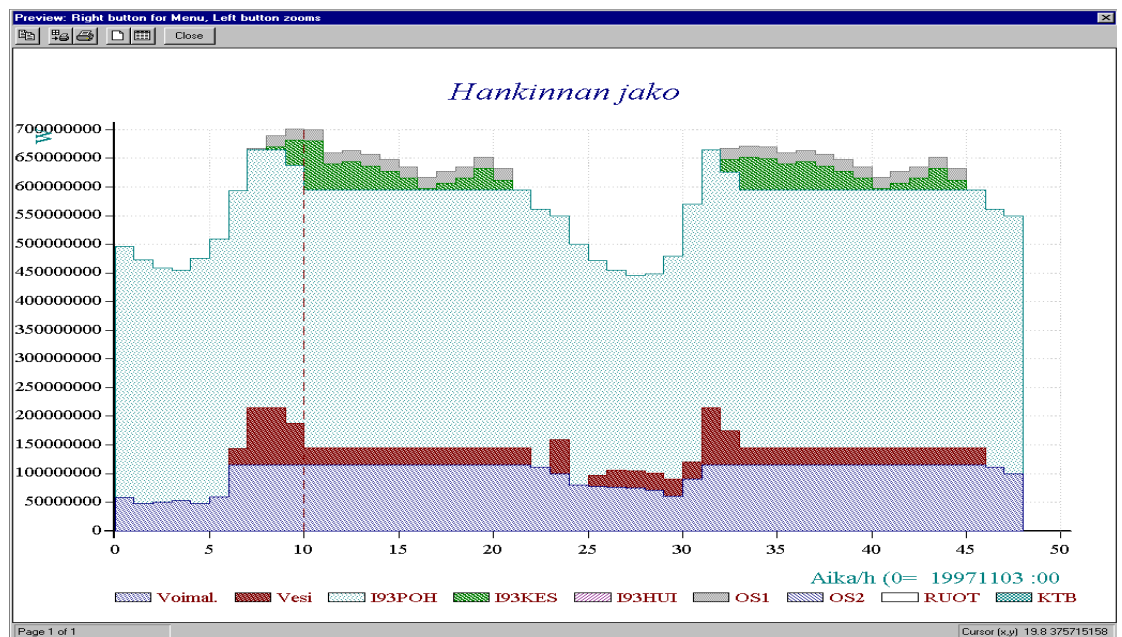


Figure 4. Distribution of energy production and purchase.

Interface to metering and network control systems are a basis for measured data management. In Turku Energia there is a S.P.I.D.E.R. SCADA network control system, and Melko metering system. The data from these systems is fed into the database via MicroSCADA.

One very important interface especially for forecasting is the interface to the Finnish

Meteorological Institute. New weather forecasts are received every three hours via e-mail, and these forecasts are fed to the database, where they are needed as input for load forecasting.

The open database also allows other applications to be combined, such as CIS, connection to a pool, data files, programs, etc.

## Electricity & District Heat



Figure 5. Turku Energia delivers electricity and heat.

Turku Energia has one power plant, which produces both district heat and electricity. This

kind of production is a typical form of production in Finnish cities, and though it is an economical way of production, it complicates the competition on the electricity markets. In practise, district heat production and distribution is a monopoly, and the production of district heat may be of enormous advantage for utilities producing heat.

Even though Turku Energia has its own energy production, it purchases both electricity and district heat from other suppliers.

The optimization module of the energy management system also takes into account district heat production and purchase.

## CUSTOMER REPORTING SUPPORT: "R@portteri"

Turku Energia is the first energy company in Finland to offer its customers free reports via Internet. The reports of "R@portteri" are available for the customers that are measured

on one-hour basis. These reports provide almost real-time information of the customer's electricity expenditure. The reports are a valuable basis for planning and monitoring the use of electricity.

**Käyttötietojen haku**

ajankohtaista Tämä on vain asiakkaillemme  
 tuotteet ja palvelut tarjottu raportointipalvelu.

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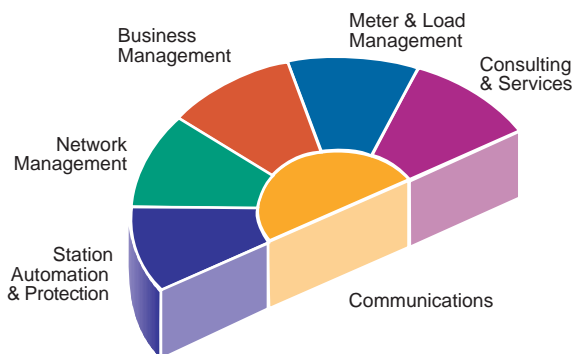
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**Turku Energia**

Figure 6. Internet interface for downloading customer-based real-time energy report.



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ABB Substation Automation Oy

P.O.Box 699  
FIN-65101 VAASA  
Finland  
Tel. +358 10 224 000  
Fax. +358 10 224 1094

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