Securing Shares of the Future:
With Well-Founded Decisions.

TIME SERIES MANAGEMENT
KiTSM INSIDE
TIME SERIES MANAGEMENT

DISTRIBUTION | SALES | TRADE | INDUSTRY
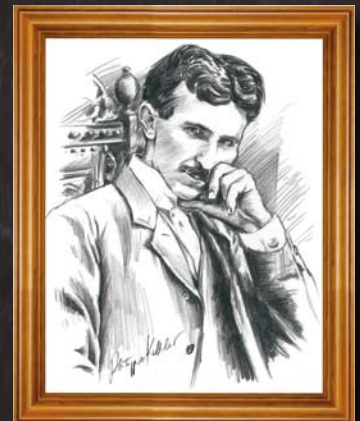
" I do not rush into actual work. When I get a new idea, I start by building it up in my imagination.

Nikola Tesla | Electrical inventor and constructing engineer

KISTERS
Pioneering Technologies.

Competence rather than magic.

When Nikola Tesla demonstrated the results of his inventions to his friends, they tended to regard him more as a magician than as a physicist. At least this is how it must have seemed to everyone who laid eyes on the first practical fluorescent light tubes in Tesla's laboratory. Even more so when it became apparent that they had no electric current connection, but rather fluoresced in the presence of an electromagnetic alternating field of a Tesla coil without any wires. Nowadays nobody regards this lighting device as magic, but Tesla's innovation is and remains highly relevant wherever bright lighting and low power consumption are required.

Knowing the future
State-of-the-art forecasting, trained for peak performance.

BelVis PRO enables the use of the whole world of algorithmic processes to create high-quality prognoses in energy management. Thus it secures a broad range of tasks in energy sales, distribution and trading, whose success depends on the right look into the future. In the core of BelVis PRO, powerful methods and comprehensive load profile libraries ensure excellent result quality and unparalleled computing speed. Intuitive user guidance guarantees easy handling. Users will be able to fully focus on their actual tasks and turn forecasts into profit. Whether it is load and sales forecasts or price and consumption forecasts, BelVis PRO provides an indispensable and reliable tool for optimum operational efficiency.

Integrated Success

Knowing future energy requirements is key to profitability in energy sales, distribution and trading. BelVis PRO generates the probable load profile or price as a time series using its task-oriented user interface and based on a variety of influencing factors.

Time periods and patterns can be configured as desired. E.g. when used for sales forecasts BelVis PRO builds on the customer contract data and automatically generates the structures, individual prognoses and subtotals relevant for customer prognoses on all levels, such as networks, distributions and balancing groups. In this BelVis PRO works together with the BelVis Energy Data Management tool. Data and application integration with the BelVis Energy Data Management (EDM) and BelVis Portfolio Management (PFM) modules offers optimum operational efficiency. With its easily configurable interface connection to existing metering, EDM, CRM and billing systems BelVis PRO can also be used as an independent forecasting tool.

BelVis PRO –
Prognoses for All Purposes

BelVis PRO forecasts are based on an algorithm library which represents and creates state-of-the-art technologies including:

- fuzzy and neuro-fuzzy logic
- ANN (Artificial Neural Networks)
- ALN (Adaptive Logic Network)
- ARMA, ARIMA, ARIMAX
- similar-day profile methods
- multivariate linear regression
- Kalman filter
- exponential smoothing

The implementation quality of the methods leads to excellent forecast results at top computing speed. Some special Artificial Neural Network methods have been patented by KISTERS and so have potential for further

performance enhancement. The main areas of application for BelVis PRO are:

- administration of load profiles for individual customers, consumer groups, and total network loads
- integral generation of forecasts, separated into balance areas, for use in portfolio and schedule management
- generation of schedule profiles incorporating calendar-based constraints
- power price forecast for EEX and OTC market products
- creation of single customer or cluster forecasts

Neural analysis methods can also assist in the calculation of robust price forecasts for energy products at trading locations. Factors such as primary energy costs, available plant capacities, network constraints, energy demand, product-specific volume of trade, and specific events can be incorporated.

Integrated Efficiency

The integrated use of BelVis PRO and BelVis EDM brings distinct advantages to routine applications. These include:

- working on the joint BelVis EDM database
- using the central BelVis user administration facility (profiles, users, clients), plant diary and calendar function
- the BelVis import/export methods, including the general import facility, which allows input of any conceivable ASCII data source
- creating forecasts, separated into balance areas, directly on the basis of customer contract data by generating a forecast topology
- direct utilisation of the EDM capability for forecast rollout for non-metered customers and inclusion in the generic subtotals separated into balance areas

- simplified configuration of the forecasting methods
- direct use of the wide range of capabilities of the BelVis time series graph
- automated forecast calculation reacting to changes in influencing variables.

Calculating Forecasts

This can be done using the arithmetic basic functions. Load time series, also nested, can be selected from the stored collection as operands. Using the parallel forecasting option substitute forecasting methods can be configured. With this option various methods can be used to create and evaluate any number of forecasts.

Forecast and Influencing Factors

The influencing factors considered by BelVis PRO can be freely configured. The number of influencing factors in a forecast is generally not limited. Based on current practice, the effects of the following variables are included in making the sales forecast:

- calendar-related criteria:
  day of metering (time of year),
  type of day (weekday),
  public/school holiday,
  summertime/wintertime,
  special events (regional peculiarities)
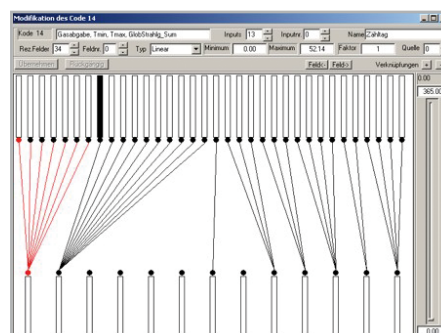
Graphics editor for the manipulation of influencing factors

- weather-related criteria:
  temperature (daily high and low), intensity of light or cloud cover, humidity, prevailing wind, wind speed, wind direction in any time resolution

- customer group-related criteria:
  production schedules and ripple control programs

Configuration Client

To apply alternative methods and to perform statistical evaluations of forecast results, the influencing factors relevant for the forecast are set, and the forecasting model is trained, with the help of the integrated Configuration Client. The training process involves referring back to past input data and results for the load profile and automatically modelling the process behaviour under the influence of various factors. The resultant load profile forecast is shown against the actual known variations and the identified forecast errors. After the training process BelVis PRO calculates, with a view to potential cost and time savings, the importance of each influencing factor and the number of factors that must remain below a specified maximum mean forecast error. The system is configured to use load profiles and influencing factors in such a way that ensures that individual error values do not corrupt the results. In the event of changes in the sales or consumer structure (e.g. seasonal variations in consumption patterns) the system is retrained to take account of the changes.

The extremely high operating speed allows the system to be retrained without any disruption to the operation. For a 365-day forward forecast with 15-minute intervals the computation time required by BelVis PRO on ALN networks is less than one second!

Load Profile Library

Forecasts can be made for new load-profile metered customers with no history of load metering on the basis of their customer group profile. Such group-based profiles are stored in the load-profile library as standardised profiles taken from representative load curves of various customers with a metering history, and from the effects of influencing parameters e.g. as a neural network.
Once history data starts to accumulate for these individual customers then this initial neural network is individually retrained step by step, factoring in the customer's data, and thus gradually increasing the forecasting accuracy.

Prognosis Cluster

With its cluster analysis function BelVis PRO supports finding and marking self-similar days or customers into clusters. The degree of the desired self-similarity can be defined during the analysis (various methods can be selected, e.g. „complete ward").

This method can be used e.g. to group thousands of customers in a few clusters to then forecast only a few groups instead of thousands.

Ensemble Forecast

Today's weather-related service providers offer, in addition to mean temperature or global radiation, enclosing confidence levels. For example, for a weekly network load forecast BelVis PRO can, based on this forecast, generate the mean value and a resulting confidence level.
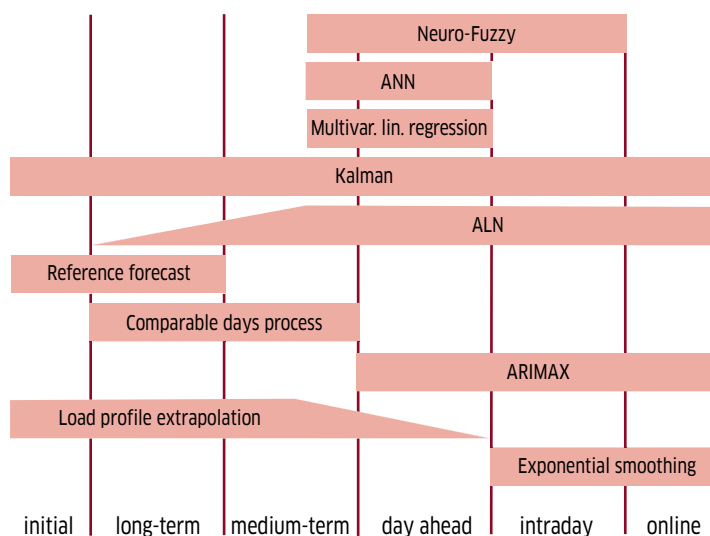
The solution of an old problem.
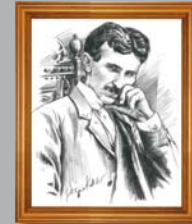
Scientists and inventors had been struggling with the problem of measuring time accurately for centuries. That was until Nikola Tesla developed a new type of reciprocating generator.

The impressive valve-free, single cylinder machine used compressed air or compressed steam, and was remarkable for its exceedingly constant rotation speed. This gave Tesla the idea of connecting the generator to a 60-cycle multiphase system so that time could be correctly measured wherever alternating current was available.

Thus Tesla conceived the template for today's electronic watches.

Forecast methods and their best range of application

Forecast methods and their best range of application

KISTERS
Pioneering Technologies.