

## ASSET MANAGEMENT RELOADED

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### ABSTRACT

*Transport and distribution grids represent the essential connecting link between new regenerative energies and increasing market demands. The asset management creates resulting strategic objectives and takes responsibility for the operational implementation. Success factors are the consideration of all relevant constraints and the apprehension of asset management as a holistic process. However in the more recent past a diversification into separate process steps can be observed which is often reflected in organizational structures. This paper describes an integrated approach of asset management linking new demands and well-known tasks. The Asset management process as well as associated tasks and methods are presented in the enterprise environment of a large distribution system operator. The principal idea of integration is introduced on different levels.*

### INTRODUCTION

So far electrical grids are designed for a distinct energy flow between voltage levels. The integration of new energy supplies such as renewable energies or decentralized micro CHPs requires turning away from historically grown premises and assumptions. In fact a definite readjustment of the strategic orientation of network structures and operation will be necessary.

Additionally increasing market demands on customer-specific information and control capabilities have to be handled by a fast-growing number of intelligent „smart“ measuring and communication systems. Asset management consolidates these partial competitive conditions in terms of new strategic approaches [1]. Present purposes like expansion grid planning or plant maintenance have to be integrated as well [2]. Regulatory demands deliver the revenue oriented principles translated by the asset management at optimal costs.

### LEVELS OF INTEGRATION

The increasing complexity of business environment for network operators demands appropriate solutions for detail questions. In recent years the required expertise lead to special concentration fields in the asset management. Examples are the plant asset management delivering optimized maintenance strategies or the asset simulation analyzing the impacts of long-term strategic options. These special tasks have to be regarded in the context of a holistic asset management process. Therefore the recent tendency of specialization should be complemented by a new tendency: integration of new themes and tasks in the

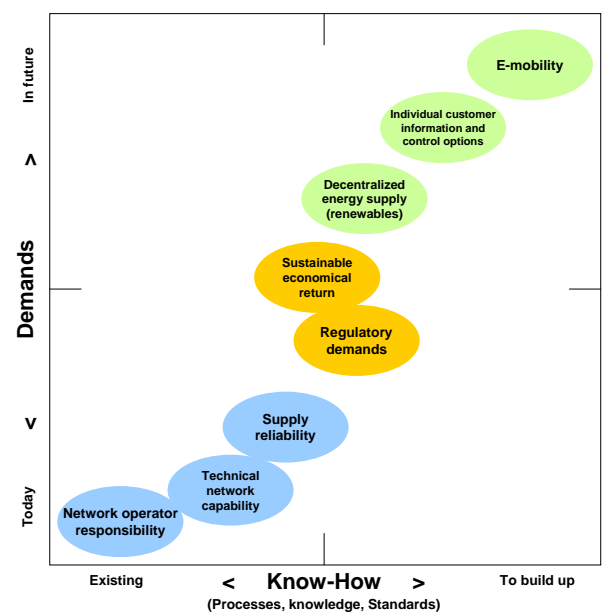
present entire process of asset management. The process of integration should proceed on several different levels including:

- Prospective and current demands
- Options for action
- Future and classical tasks
- Processual and methodical integration
- Organisational development
- Tools and data base

In the following these levels of integration are described by examples and practically oriented approaches.

### Prospective and current demands

In the past the network business demands were mainly driven by technical functionality (see ill. 1). The cost driven aspects of the business are still increasing. In the recent past the characteristic economical demands of the market are complemented by additional regulatory demands. In the near future additional external demands have to be handled. The increasing decentralized supply with preferentially renewable energies will have noticeable impacts on prospective network structures. Network customers will demand individual information and control options to answer the challenging request of energy efficiency. Electric vehicles represent a totally new class of electrical loads which have to be integrated into the existing load portfolio.



III. 1: New and existing network business demands

These demands require a continuous step-up of internal know-how. This know-how has to integrate possible solutions for new demands as well as to enhance the classical network operator skills.

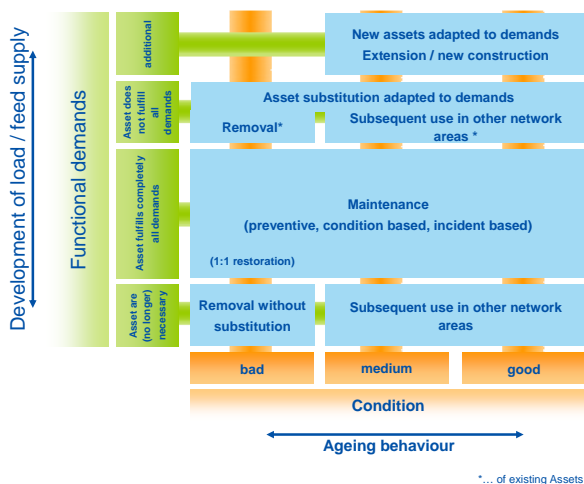
**Options for action**

Against the background of regulation the assumed economical optimization represents an essential challenge for the asset management. Unfortunately not all cost categories of network business can be influenced in a similar way.

As a general rule replacement and new construction are the largest cost categories. Network operators can control these investments to a large extent. Attention should be paid to the fact that a decrease of this cost category has direct impact on other cost categories. Decreased investments lead to ageing of the existing network and therefore to increasing operating costs in the long term.

The cost categories “maintenance” and “operation” are determined by internal personnel costs and hence the influence of network operators is very limited. Further cost categories “customer connections” and “third party actions” are externally driven with minimal influence on them. Control options for the asset manager are in development of optimal network structures and in deployment of maintenance strategies. These tasks are based on condition analysis and forecasts of load scenarios and feed supply.

As a consequence, the asset manager obtains several options for action claiming an integrated perspective of ageing behaviour and functional demands (see ill. 2).



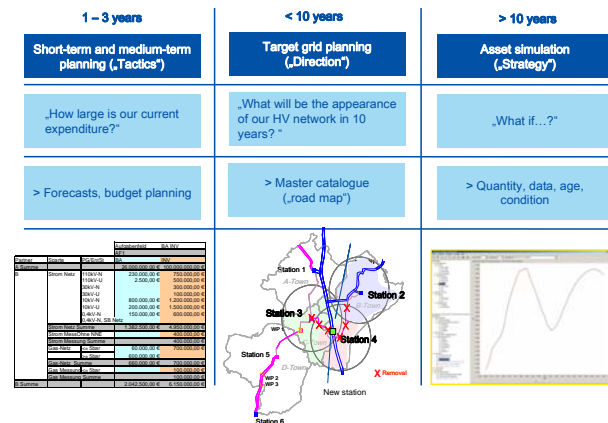
Ill. 2: Options for action of the asset manager

Analyses of load and feed supply developments lead to four different classes of functional demands on network structures. Depending on these demands as well as on asset condition there are several options for action

associated to the main sections “new construction”, “replacement” and “maintenance”. Merely the integrated perspective of functional and condition based demands results in the right option for action balancing all demands in a well-adjusted way.

**Future and classical tasks**

These options for action yield a short-term, mid-term and long-term direction of the asset management process:



Ill. 3: Direction of the asset management process

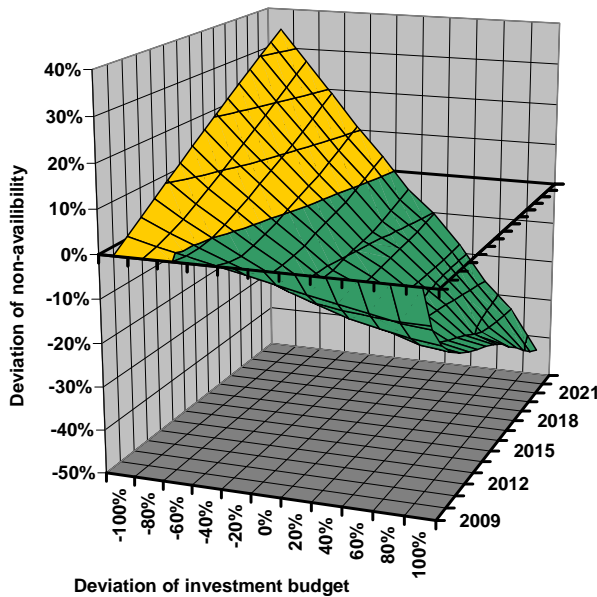
**Short-term and medium-term planning**

In the period of the next 1 to 3 years the tactically oriented tasks of budget planning determine the concrete projects which can be executed within the budget limits. Main drivers are questions about the current expenditure or about the investment rate. For the short term these problems sometimes totally affect the network business. These tasks have a long history in network planning and hence can be described as “classical”.

**Asset simulation**

Asset simulation as a relatively new but essential instrument for decision finding provides answers to typical “What if...” questions in conjunction with long-term strategies. In general asset simulation surveys periods of more than 10 years. The impact of current investment and operation budget decisions on future network structures and condition can be presented in a time-dependent way. Consequences of maintenance and restoration strategies can be derived in conjunction with time, duration and budget of project clusters. Due to sensitivity analyses the early detection and control of relevant risks is possible.

Limited budget can be allocated in an optimized way balancing technological, economical and risk-based criteria. Asset simulation supports compliance with supply reliability being part of regulatory demands in the near future. For instance ill. 4 presents the impact of decreased investments on supply reliability.



Ill. 4: Typical scenario analysis of asset simulation

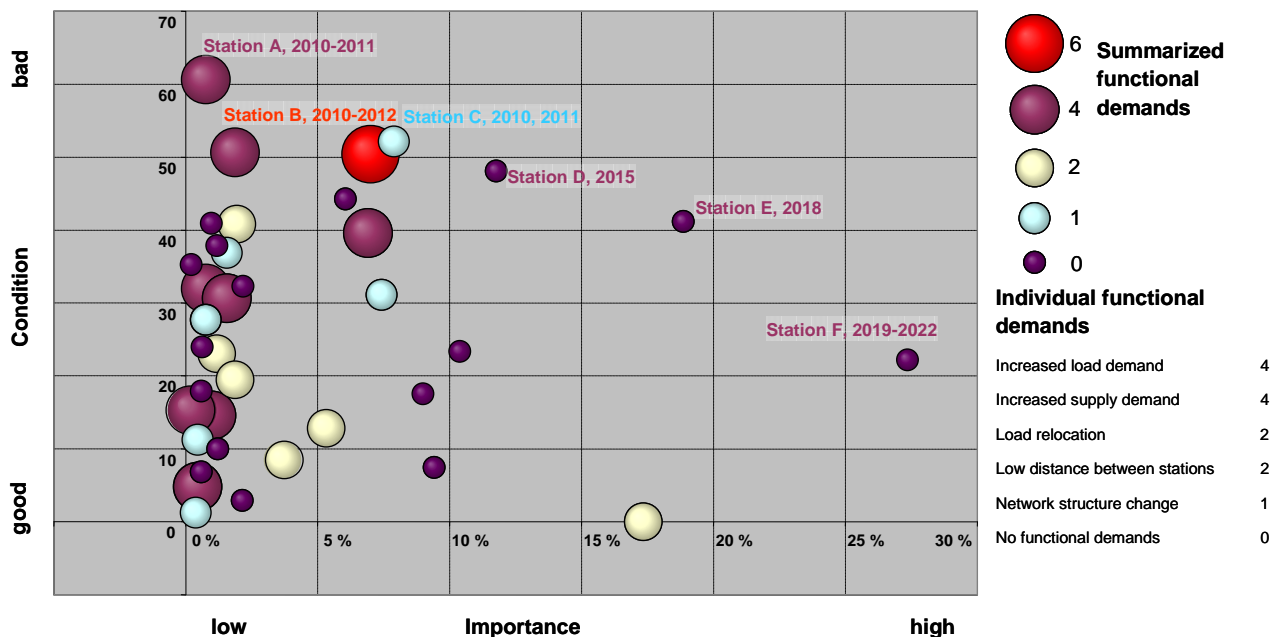
### Target grid planning

To bridge the temporal gap between these tasks the target grid planning covers a time period of about 10 to 15 years. This task provides a detailed master catalogue of concrete projects representing a “road map” from current asset structures towards a technical and economical optimized reference network structure. Internal and external, mainly customer and regulator driven demands have to be considered in a balanced way. Due to the projected time period the target grid planning is essentially based on forecasts and predictions.

The task of target grid planning works with several different tools enabling the integration of the different perspectives “technical efficiency”, “economy” and “supply reliability” [3]. These tools are closely connected and based on a common data base (see below). Besides the above-named project catalogue the target grid planning also provides control instruments to support investment strategies. Hence adequate interfaces between grid planning tools and asset simulation tools are the essential base of a practical integration of tasks.

Target grid planning combines the functional demands of network customers (load and supply), network structure modifications due to historic network construction and also condition based demands. Ill. 5 presents a characteristic diagram of importance and condition to give a priority for substation maintenance measures. In conjunction with target grid planning this diagram is modified by adding functional demands where the diameter of a circle shows the sum of them. For instance an increased load demand or supply demand provides a sum of 4 points showing the need to extent or rebuild the substation. This demand is independent from the condition or asset age structure but essential for an entire priority list of concrete projects.

Hence the well-known condition and importance based priority task is added by a “third dimension”, the functional demands. Neither an isolated maintenance centered priority nor a network structure centered approach gives an optimized priority of measures. The integration of both perspectives gives a comprehensive answer to the priority problem.



Ill. 5: Integration of different demands

### **Processual and methodical integration**

These described asset management tasks should not be carried out separately. Smart organizational solutions can minimize the communication effort of separate teams. Additional success factors are a unified data base and efficient links to other key players like regulatory management, network service providers and network customers.

Asset management based results always imply feedback of the entire process. So adequate communication of results is a mandatory attribute for successful asset managers. This fact is essential for internal communication as well as for communication with the above-named external key players. Regulatory demands have to be modeled by means of company-wide economical models including both costs and revenues in equal measure. The asset management will take the responsibility for the cost-based parts of these models.

The technical results of target grid planning are not only a road map for investments but also a precondition for maintenance and operation. For instance the conclusion to relocate a substation due to functional demands implies a considerable effect on maintenance measures in existing substations. This decision results in the fact that just absolutely essential measures will be processed over the remaining period. Extensive restoration measures (e.g. of switchgear buildings) will so be avoided. Without the knowledge of target grid road maps the operation personnel has to call back the asset management. Otherwise there will be uncertain or even wrong decisions for maintenance tasks. Hence an intensified process integration based on communication and coordination provides self-contained action all-around the network company. Extensive queries will be minimized and personal responsibility of all staff members will be enforced.

### **Organizational development**

The organizational mapping of these processes and tasks can be provided in various ways. The necessary communication between all parts of this "asset management network" is a key factor for a successful organization. Hence a "lean" organization provides the possibility of "short ways" between the tasks. Integration means reasonable arrangements of closely related tasks. The resulting organization depends primary on the dimension of the network quantity and the necessary amount of staff.

### **Tools and data base**

The described integration of tasks and processes needs a common basic data base to succeed. All assets and their relevant details should be documented in a similar way. This essential data collection includes relevant technical and economical attributes as well as information about condition, importance and reliability.

Processes and tasks are supported by more and more sophisticated tools necessarily based upon this collective data base. Internal networking of different tool boxes will be supported by an increasing demand of cross-company integration. For instance the essential communication between asset simulation tools and regulatory oriented tools should be mentioned at this point.

In the recent past academic activities raise hope to develop tools for automated network optimization and long-term decision finding: asset management "at your finger tips". Regarding the obtained results and comparing them with "conventional" planning results result in the conclusion that today these promises cannot be fulfilled completely.

Tools can excellently support the creativity and experience of asset managers but they cannot substitute these attributes. The experienced engineer will be the essential key factor for a successful asset management. Tools can facilitate the process of decision finding, shorten process periods and allow room for well-founded analyses.

### **CONCLUSION**

The current and especially future demands on network structures provide an increasing complexity of asset management tasks and tools. Hence the asset manager will have to review constantly his own processes. A key factor for a successful asset management will be the integration of well-known "classical" tasks and newly developed methods to answer future market demands. Integration will be proceeded on different levels and should lead to a well-balanced development of future network structures. All necessary activities should be focussed on an experienced asset management staff using enhanced and well-founded tools.

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