The ongoing relocation of production sites, the change in the global population structure, the climate change as well as the foreseeable exhaustion of fossil fuels force industrialized countries to break new grounds in energy supply. Among others, this includes the definition of new regulations to guarantee the delivery of sustainable, secure and competitive energy in the future as well as to define ways on how to improve energy consumption of private households, the public sector and manufacturing companies.

During the last years several legal requirements have been enacted, such as the German Energy Savings Ordinance (EnEV) or the EU Energy Performance of Buildings Directive. These regulations are now to be implemented. Moreover, new technologies to reduce fuel consumption are developed. Managing energy consumption and power generation is as well affected by the transformation process in the energy market. The usage of more and more renewable energy sources requires already today a restructuring of the power system planning and in the supply of power and energy reserves.

The European Directive on Energy End-Use Efficiency and Energy Services 2006/32/EG as well as national regulations will change the energy market substantially. In the future, power supply companies are obliged to use intelligent power networks to provide more transparent and flexible utility billing data. Traditional Ferraris meters only measure total consumption and as such, provide no information of when the energy was consumed. The newly to be installed smart meters¹ provide an economical way of measuring additional information and communicating it via, e.g. the internet or powerline technologies, to the backoffice. This allows utility companies to introduce different prices for consumption, e.g. based on the time of day and the season.

By providing information to customers, utility companies assist a change in energy usage from normal consumer consumption patterns, either in response to changes in price or as incentives designed to encourage lower energy usage at times of peak-demand periods. Furthermore, traditional meter reading will become obsolete reducing effort of a manual meter reading.

Based on the European legislation smart meters shall have replaced the Ferraris meters in the EU by the year 2022. Due to this tight time frame utility companies are confronted with a Herculean task as millions of meters have to be exchanged within the next 10 years.

The following chapters will show how a mass roll-out of utility meters, such as electrical, water, heat and gas meters, can be efficiently planned and executed based on a standard SAP product. The given overview scenario is geared to a reduced deployment of software components. Objective of this approach is to keep the process as simple as possible. Assuming that the meter roll-out is rather a one-time process, it is important to keep an eye on investment costs on the one hand and the product launch as short as possible on the other.

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¹ A smart meter is an advanced utility meter that identifies consumption in more detail than a conventional meter; and communicates that information via some network back to the local utility company for monitoring and billing purposes. (Source: wikipedia.org)
Fact is, the exchange of the analog Ferraris meters with new digital meters is required by law and is one part of restructuring the national power grids.

The uniqueness of this task requires a detailed and exact process planning, because efficiency improvements resulting from a trial and error phase are not to be expected. Moreover, without planning it will be difficult to restrict losses resulting from process misapprehensions because a controlled roll-out process might not be started over.

All the more it has to be kept in mind that when starting to install intelligent meters utility companies will have to handle different meter types (digital and analog) as well as different communication media at the same time. As the new meter generation will be managed as part of an IT network, new technological knowledge has to be gained regarding the installation and operation of such smart meters. As of today, there are no empirical values as it comes to the time required for installation, availability of media for meter data transmission or meter communication. These data are only hypothetical.

Generally, there are two strategies to exchange old with new meters. On the one hand, utility companies can exchange a meter within the usual maintenance cycle. On the other hand, the exchange can be planned strategically and defined in a roll-out plan.

Due to the expected advantages resulting from the deployment of the new meter generation, the intended roll-out of meters in geographical areas to benefit as soon as possible from grid usage and particularly due to the above mentioned legally given tight time frame, it seems rather impossible to exchange meters in their usual maintenance cycle. Only a planned geographical mass meter roll-out can guarantee the in-time availability of the new meter reading system. Therefore, it is the recommended strategy requiring a one-time calculated investment.

To all intents and purposes it is assumed that positive effects will be recognizable shortly after the installation of smart meters and smart grids. However, prerequisites for a short-time product launch is an agreement on international standards and a coordinated approach within the next 10 to 15 years.

The upcoming meter exchange might be a starting point in revolutionizing the energy supply. Different standardization endeavors, such as from EPRI, NIST, IEC, OpenSG and others, have to be harmonized and filled with live when introducing smart meters to the market. But exchanging meters can only be the first step in the further development of smart grids and their deployment.

NEW INFRASTRUCTURE STRATEGIES

The roll-out process of smart meters may be divided into the following main phases:

1. Create work schedules as activity templates
2. Data clustering (installation locations)
3. Create planning templates to be copied for different planning scenarios
4. Group and roughly plan evaluated quantities (as to areas and time slices)
5. Generate orders
6. Order execution
7. Order confirmation

2. Smart Grids are networks to communicate and control power generators, provider, end-user and equipment. Smart Grids deliver electricity from suppliers to consumers using two-way digital technology to control appliances at consumers’ homes to save energy, reduce cost and increase reliability and transparency. A smart grid includes an intelligent monitoring system that keeps track of all electricity flowing in the system. (Source: www.wikipedia.de)

3. EPRI Electric Power Research Institute, NIST National Institute of Standards and Technology, IEC International Electrotechnical Commission, OpenSG (open Smart Grid) is an open platform to provide a cross-system communication of power grids from generation to end-user.
Good news first, the required process steps is baseline process knowledge that should be available in each and every utility company. Exchanging meters is a day-to-day business. The operating experience of this process has only to be adapted to a mass roll-out using IT tools and planning scenarios.

A similar approach can be found in the waste and recycling industry. Here, it is a (mass) service that has to be delivered, such as the collection of a certain type of waste in a defined area and on a defined date.

Besides the considered area, working and travelling processes are evaluated and key figures calculated. These key figures include among others the number of similar activities and the total working time of a team in a certain area.

Based on these key figures the dispatcher can calculate the resulting workload for each team.

The installation time depends on different parameters, such as the meter type, the communication media, the concentrator and the MDUS (Meter Data Unification and Synchronization System) of the technical infrastructure (AMI* system).

The installation of the meter itself can be executed by company-internal field service teams or it can be outsourced to specialized local service providers or the provider of the AMI system. In order to be always up-to-date on the project progress as well as to guarantee billing transparency, immediate feedback on the delivered service – internally or externally – is crucial.

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4. AMI Advanced Metering Infrastructure refers to systems that measure, collect and analyse energy usage, and interact with advanced devices such as electricity meters, gas meters, heat meters, and water meters, through various communication media either on request (on-demand) or on pre-defined schedules. (Source: wikipedia.org)
The following example will illustrate the necessity of a strategic installation planning. Based on the European directive analog meters shall be exchanged with smart meters until 2022. The example refers to the UK market and assumes the following numbers for meters to be exchanged in private households and small and medium sized companies:

The following table gives a rough assumption of the time required to install a new smart meter including preparation and confirmation of the exchange.

<table>
<thead>
<tr>
<th>Process Steps</th>
<th>Time in Minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation on-site</td>
<td>30</td>
</tr>
<tr>
<td>Configuration on-site or remote</td>
<td>10</td>
</tr>
<tr>
<td>Average travelling time</td>
<td>10</td>
</tr>
<tr>
<td>Documentation</td>
<td>5</td>
</tr>
<tr>
<td>Confirmation in back office and device management</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td>70</td>
</tr>
</tbody>
</table>

Assuming a daily average working time of 8 hours and 220 workdays per year you will need 3,361 FTEs (Full Time Equivalents) to execute this task. Reducing the exchange time to a period of 3 years this would amount to 11,203 FTEs.

Note that the above calculation is assuming an ideal work flow, i.e. it is assumed that the installation is done correct at the first time, there is only a single AMI system available, there is no employee turnover and therefore no fluctuation of installation knowledge, and the area to be equipped with new smart meters is homogeneous as it comes to meter type, settlement structure and transmission media.

Example Germany:
Experts have estimated that a meter exchange in Germany might provide a market volume of up to 7 billion Euro. There are 42 million electricity and 22 million gas meters to be exchanged until the year 2022. The utility company E.ON, one of the world’s largest investor-owned power and gas companies, has calculated that the network operators might have to pay up to 13 billion Euro to build up the new network including the network infrastructure, the communication system between meter and utility company and the information technology required to analyze and evaluate the collected data.

(Source: FAZ.Net)
The strategic route planning of SAP (Smart Meter Rollout – Backoffice Planning) will support you in a successful mass roll-out of smart meters. Keynote of this solution is, that the actual functional location is the relevant planning element. Planning the roll-out on order level would result in an enormous IT-system workload as each and every order is highly integrated into other components e.g. controlling, purchasing, contracting etc. Therefore, it is the functional locations that are to be planned at first.

These locations can be grouped in small manageable portions. And only after this planning has been finalized, the actual activities are allocated. The biggest advantage of this approach lies therefore in the lower impact on system performance.

This approach is already day-to-day business in other industries, such as the waste and recycling industry.

During the planning phase several planning scenarios can be created based on the following process flow (see illustration 1).

The calculation of the resources required to execute the exchange or installation of smart meters in one area is based on activity points. These activity points are defined per installation site and according to the expected working time. Based on the resulting key figures, the planner is able to evaluate and optimize the created scenarios before activation.

Illustration 1: Schematic Process Flow
Each installation area can be divided into subareas. These subareas can be structured, e.g. as to the device types to be planned, the available regional structure, the network operator in this area etc. Planning areas can be depicted in different colors so that identification on a geographical map is made easier.

Editing area boundaries can be done directly on the integrated map as well making the handling of the software very user-friendly. Moreover, as GIS data from different providers can be embedded it might be possible to use already deployed map material.

Having activated the planning area, the service orders are then created in the SAP ERP system. This approach allows for a load balancing as planning areas can be activated step by step and during off-peak periods, e.g. during the night shift. Parallelization is conceivable, as well.

It is recommended to monitor the progress of order execution in an activated planning area with regards to time and effort. The performance analysis of an activated scenario enables the planner to draw conclusions for the planning of similarly structured areas and might be used to adjust these planning scenarios before activation. For example, it might be necessary to restructure a planned but not activated area as to its overall size or to order additional external support by service providers. Therefore, the planning approach based on a planning element allows for an improved planning even during the roll-out process.

The generated SAP customer service orders can then be completed based on the standard PM processes in the customer system. If such processes have not been defined yet, they can be implemented during the meter exchange process as well.
The customer service orders are processed commercially (SAP Material Management) on the one hand, and logistically on the other (SAP Smart Meter Roll-out – Backoffice Planning and Mobile Execution).

As already mentioned, order execution can be outsourced to external service providers or can be done by internal service teams. If the order execution is not outsourced, it is recommended to support the process with the operational route planning of SAP (Smart Meter Roll-out – Backoffice Planning) in combination with the mobile solution (SAP Smart Meter Roll-out – Mobile Execution).

Based on these solutions, orders can be directly sent to mobile devices making them immediately available in the field. This allows for the allocation of orders to service teams on a daily basis. Moreover, you might integrate an SAP HCM system already deployed in the company in order to check availability of employees when allocating orders.

Generated SAP customer service orders can be clustered and sent as daily routes to the mobile devices of a service team. Through a mobile client orders can be confirmed online, such as used materials and completed orders. The status confirmation then triggers the technical and commercial implementation of the meter and finalizes the activation of the meter in the backoffice system. These functions do not require the set-up or deployment of an SAP PI system.

Communication with the SAP ERP system in the backoffice is done via secure WebServices that are provided by the product add-on. Certainly, a manual order confirmation is possible as well using available SAP standard processes and functions.
The described solution has been developed in close cooperation between PROLOGA GmbH and SAP AG. SAP and PROLOGA can look back on a long and successful development partnership. Together, the companies have launched several industry solutions on international markets.

PROLOGA has leveraged its years of industry experience to develop best-in-class solutions that are applicable across industries. While SAP benefitted from the in-depth industry and process knowledge of PROLOGA, PROLOGA has found a reliable partner in SAP providing a sound and developable software platform.

During the last years both companies have successfully pursued an outside-in approach to ensure a wide customer approval of the launched products. Generalizable software components that have been tried and tested are pooled in an add-on package which is continuously being enhanced.

BENEFITS AT A GLANCE

- Depict all relevant information in one software system
- Generate reliable planning results with a minimum resource investment (with respect to time as well as to personnel)
- Smart planning strategy embedded to handle mass data planning
- Reduce commercial risks through optimization of device and work time management
- Access near real-time data to support timely management decisions
- Increase customer loyalty through a detailed planning of areas and therefore speed-up implementation of flexible tariffs
- Send out customer information letter with activation of planning scenarios
- Identify room for improvement during planning phase
- Increase customer satisfaction through improved need recognition
- Reduce errors in data acquisition and confirmation through deployment of mobile devices
- Integrate external service providers to execute meter exchange

STRONG PARTNERS

The described solution provides an end-to-end approach to realize a cross-departmental operational as well as strategic planning of a smart meter roll-out. The advantages of an IT supported roll-out planning with SAP are among others:

- Depict all relevant information in one software system
- Generate reliable planning results with minimum resource investment (with respect to time as well as to personnel)
- Smart planning strategy embedded to handle mass data planning
- Reduce commercial risks through optimization of device and work time management
- Access near real-time data to support timely management decisions
- Increase customer loyalty through a detailed planning of areas and therefore speed-up implementation of flexible tariffs
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- Integrate external service providers to execute meter exchange

„With the growing networking of business processes it seems only logical that these processes develop cross-industry standards, differentiated ‚only‘ by their distinctive features. Analog the order-to-cash process, this applies more and more for the planning of orders as well.“, Stefan Blum, Solution Manager of the industry solution SAP Waste and Recycling, SAP AG.