EFFICIENT DECISION MAKING SUPPORTED BY ISO 55000

Oliver FÖRSTER
meliorate GmbH – Germany
oliver.foerster@meliorate.de

Markus ZDRALLEK
University of Wuppertal – Germany
zdrallek@uni-wuppertal.de

ABSTRACT

Expectations towards grid operators are very complex. At the same time the number of stakeholders is increasing and the different expectations are more and more conflicting with others'. Working in a dynamic environment (e. g. socio-demographic change, new energy flows) and having an investment need, resp. backlog, rational decision making becomes crucial. Hence a comprehensive methodology of decision making is needed. This is provided by the value-based asset management approach – standardised in ISO 55000.

INTRODUCTION

Expectations towards grid operators are very complex and the number of relevant stakeholders is increasing. A stakeholder or stakeholders, are "those groups without whose support the organization would cease to exist." [1]. Some stakeholders are obvious, such as capital providers, financing replacement or extension investments. Some are latent, such as citizens' initiatives, whose acceptance is required for many construction activities. The collectivity of all stakeholders can be compared with a political coalition [2]. Partners will join and remain in coalitions if the overall benefit is perceived positively. Once one coalition partner perceives his individual benefit as sustainably unsatisfying, this partner will leave the coalition on the next occasion. This paper describes stakeholders' requirements and the value based asset management methodology as a key to fulfil these requirements efficiently and effectively. The work of this paper was derived from several European consulting projects.

SITUATION AND CHALLENGE

As broadly discussed, grid operators' environment is changing significantly. Decentralisation of electricity generation, upcoming electrical mobility, successful launch of the heat pump technology as well as socio-economic and demographic changes (de-/urbanisation, de-/industrialisation) are common examples and lead to extension investments. Meanwhile (Western) European grid operators are facing plough-backs as technical equipment reaches its critical age (e. g. [3]). In other words, grid operators are currently taking massive strategic investment decisions that firstly will have a long-termed impact and – secondly – cause high follow-up expenditure for maintenance and removal in the next decades (Figure 1). At the same moment cost reductions are regulatorily induced while quality standards are set.

These strategic decisions shall be taken on an asset condition base and – more important – following realistic assumptions regarding the "real need".

Recently, grid operators improved a lot in evaluating individual conditions of assets. Automatic and manual condition measurement procedures have been ameliorated as well as the ability to forecast maintenance re-investment needs (e. g. [4]). Technical simulations support the identification and development of technical solutions. Assuming this technical progress, defining the "markets'" needs squeezes technical investment decisions much more than finding the "right" technical solutions.

Grid operators – being infrastructure providers – are usually situated in natural monopoly environments. In other words, no market signals, like users' price acceptance or quality preferences, can be utilised to establish a demand-like supply. Regulatory authorities will not be able to substitute market signals completely. Hence technical decision criteria in natural monopoly environments cannot come from the outside, but these market signals need to be defined "synthetically".

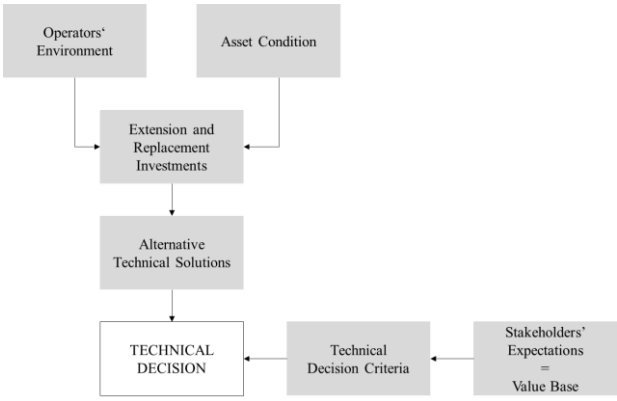

Figure 1 – Technical decision procedure

For answering the question "What is a good asset manager?" respectively "What is an appropriate infrastructure supply?" the stakeholder approach is the common methodology. The case in point is firstly whose support is essentially for infrastructure provision and secondly what exact consideration is expected by stakeholders. The conglomeration of all considerations defines the value base. It contains the minimum benefits given to all stakeholders to prevent their coalition exit. The value base is the general framework to establish technical decision criteria.

STAKEHOLDER GROUPS AND EXPECTATIONS

The identification and prioritisation of stakeholder groups are the first step in designing a comprehensive decision framework. In general, four stakeholder types can be distinguished. Following the "4-C" analogy each grid operator has stakeholders from the following groups (1) Clients, (2) Capital, (3) Colleagues and (4) Community (Figure 2).

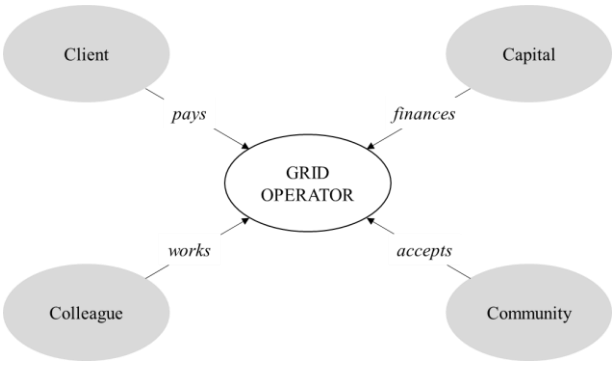

Figure 2 – Contribution of stakeholder groups

Clients

Clients are the most diversified stakeholder group. On the one hand, end clients – direct clients – are usually physically connected to the grid, decentralised consuming or supplying energy. This group is the originary grid user. They can be small private users or institutionalised organizations like generators or manufacturers. On the other hand, indirect clients act as agents, using the grid infrastructure like energy suppliers.

The second part of the client group usually is represented by governmental authorities. Grantors of distribution licences (e. g. German municipalities) are not necessarily clients themselves but they protect clients' interests – in the best case (e. g. infrastructure expansion). Regulatory authorities are also covering political and macroeconomic interests.

Recapitulatory in-/direct clients and authorities commission the provision of grid infrastructure. Their prime interest is price. Beside this they request quality standards regarding physical security, reliable supply, transparent behaviour, fast reaction and accuracy.

Once the group of clients do perceive the grid infrastructure as (too) high-prized or (too) low-qualified the stakeholders will start to search for alternatives or coalition exit. In the German distribution market this effect lead to an amplified licence competition as municipal licences are tendered every ten to twenty years.

Clients' interests usually are in direct conflict to capital interests.

Capital

Representatives of the capital group are investors and outside creditors. Investors can be either owner of the asset respectively parts of the asset or owner of the grid operating entity itself. Outside creditors will either comprehensively finance the asset base or concrete asset investment projects.

In general investors and creditors have value- and return-oriented interests. Usually appropriate return is the most important. The asset investment itself shall also fit to their risk portfolio. Generally, infrastructure investments are perceived as low-risk investments – meaning secure investments. For that reason, pension funds or reinsurances prefer to invest in grid operators due to the trustee security status. Secondly grid operation owners will protect the brand, e. g. bad reputation due to an outage.

Investments in energy grid infrastructure seem to be highly attractive for investors and creditors. Nevertheless, grid operators must prevent these stakeholders from considering a coalition exit. In energy concerns grid operators are competing with other value-chain steps (e. g. generation, trading) on investment budgets. Hence investment capital can be lost quickly.

Colleagues

Internal colleagues (employees) and external colleagues (contractors) are contributing by working. Some grid operators are already short in acquiring appropriate personnel. Qualification requirements increase in engineering as well as in operation due to more technical complexity and grid operators are competing intensively on the labour market. In this situation, a coalition exit must be avoided.

Wages and salaries are often not the most important interest of the colleague stakeholder group. Much more important are security of employment and personal development opportunities, which coalesce with trainings and career promotions. Also, transparency is often mentioned.

The most important interest in this stakeholder group is occupational health and safety. This contains technical equipment and trainings, but also the manageability of technical complexity. Strongly heterogenous devices combined with low familiarity with assets lead to dissatisfaction and causes coalition leaves. Hence technical decisions also must be taken under consideration of perceived technical manageability.

Community

Having a look on stakeholder management practice, the

community stakeholder group mostly is undervalued. Members of this group are all parties being able to (directly or indirectly) prohibit grid operators' activities. Electors, for example, significantly influence licensing. Citizens' initiative can unexpectedly evolve and impede technical projects. The "Not-in-my-backyard (NIMBY)" phenomenon describes people not accepting political decisions – especially regarding infrastructure projects [5].

The interests of these groups are very diverse, often driven by local issues. The common interests are transparency and participation regarding technical decisions. Although the accepting group of community stakeholders is rather intangible, a coalition exit is a high risk when taking technical decisions.

Stakeholder Management

It is crucial for grid operators to consequently observe developments in their stakeholder environment. Which new stakeholders occur? Which stakeholders vanish? How do stakeholders' interests change? Successful grid operators challenge their stakeholder analysis every one to three years. In case of conflict the interests of stakeholders need to be prioritised to allow rational technical decisions. Stakeholders' interests are prioritised by evaluating an individual stakeholders risk to leave the coalition. If for example the grantor of a licence is critical and the licence competition high, these interests shall be prioritised high. If the capital market is very liquid and financial investments in grid assets are perceived as being very attractive, investors' interests can be prioritised rather low.

ROLE OF ISO 55000

Starting in the 1980s and 1990s the role of asset management especially regarding conflict of objectives came up. First on Dutch and British oil platforms a way to deal with conflicting objectives like safety, reliability and profit was needed. Later, after the privatisation of UK infrastructure, this discussion was extended to energy, water and rail infrastructure. Subsequently the idea of Value Based Asset Management was developed. The essence is to take technical actions/decisions only to fulfil stakeholder interests or – in case of conflicting interests – to fulfil the most important stakeholders' interests. In other words, every technical activity makes sense if it brings an appropriate value to stakeholders. Once an activity/decision does not create enough value to stakeholders it shall not be executed.

PAS 55 was originally produced in 2004 as the first public standard writing principles of value bases asset management in full. In the following, PAS 55 underwent a substantial revision with many contributors from various industry sectors in ten countries. PAS 55:2008 was released in 2008 along with a toolkit for self-assessment against the specification [6].

Starting in 2010, an ISO committee worked out three international standards (55000/1/2) [7]. It was launched 2014 after almost ten years of development. Currently, three standards have been published:

- ISO 55000:2014 Asset management – Overview, principles and terminology,
- ISO 55001:2014 Asset management – Management Systems – Requirements,
- ISO 55002:2014 Guidelines for the application of ISO 55001.

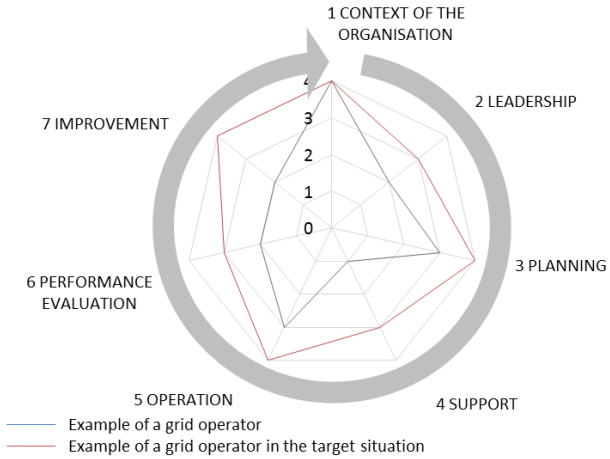

Figure 3 – Value based asset management cycle [7]

PAS 55 as well as the ISO 55000-series were success stories (Figure 3). The ideas are intensively in discussion through the entire energy grid industry. Grid operators all over Europe, North America, South-East Asia, Oceania and the gulf region orientate their organizations on the principles of value based asset managements as described in the international standards.

VALUE BASE, LINE OF SIGHT AND RISK MANAGEMENT

As discussed above, the essence of the value based asset management methodology is the stakeholders' interest. These interests culminate in the grid operators' value base, describing what value comes from assets towards the stakeholders. Hence, the methodology answers the question "value FROM assets?" not "value OF assets?".

The idea is that all decisions and all activities shall be taken value-oriented – including engineering and operation. Starting from the first technical sketch and ending at the operator's spanner. Between the value base as a top-management instrument and daily decisions/ activities shall be a line-of-sight. In other words, the line-of sight describes the management system to align all decisions/activities to one value base, which represents the

stakeholders' value expectations.

Value Base

Value bases usually do not have more than ten values describing all stakeholder interests as some values (e. g. transparency) are relevant for different stakeholder groups. The value base of each grid operator is individual but some elements are usually valid for most grid operators.

Financial values
Financial values are most obvious. They are relevant for capital stakeholders, but also for clients as these values directly determine the prices. Financial values can firstly be profit-and-loss-oriented. As value based asset management is asset-lifecycle oriented, these values should not be described in a short-term perspective. Nevertheless, in practice most profit-and-loss-values are written out in a one-year perspective (e. g. yearly return). Secondly, financial values can be financial worth oriented. It defines whether the financial asset worth shall be increasing, decreasing or stable.

Brand values
Brand values are most important for investors, especially owners of grid operation entities. It describes how the company's image shall develop. Outages for example have a negative influence on brand and image. Some grid operators measure this brand perception by analysing the operator's press reception.

Infrastructure development values
Licensor and community stakeholder groups have interest in quantity and quality of infrastructure development. Electricity grid operators for example shall connect new commercial areas very fast. Others shall provide future-oriented infrastructure using "smart grid technology". Infrastructure value can vary a lot, but these are central for keeping the public acceptance.

Reliability values
Energy grids shall function uninterrupted but this maximum target must be phrased more accurate. Reliability and quality targets can only be point targets, but never extreme targets. Grid operators need to define "red lines" for the acceptable number and duration of interruptions. The value uninterrupted infrastructure/ energy access is mostly relevant for industrial clients and regulatory authorities.

Safety values
Safety values also cannot be extreme targets but only point targets. It defines an acceptable level of safety issues from the perspective of clients and colleagues (e. g. "xy working days lost, but no casualties"). One determinant of safety in operation can for example be the heterogeneity resp. manageability of technical devices. The more manageable acquired technical devices are, the higher the value is spent to colleague stakeholders.

Job attractiveness values
Decisions regarding engineering and operation of assets influence job attractiveness and colleagues' satisfaction. As discussed before manageability of devices and skill level often is influenced by technical decisions. Also, technical decisions such as make-or-buy will influence the perceived value spending.

Responsibility values
Licensor and community stakeholder groups expect infrastructure providers to strengthen society's interests. This can for example be ecological responsibility, innovation, local rootage or employment of challenged persons.

Transparency values
All stakeholder groups expect transparency and – to a certain extend – opportunities to participate. Technical decisions must be able to be objectively re-enacted. For this purpose, a transparent line-of-sight and a rational asset risk management is needed.

Line-of-sight and Risk Management

The line-of-sight contains all instruments to align all decisions/activities on the one value base. This contains decision rules and instruments, handbooks, manuals, process descriptions, etc. Key is to clarify why things are aligned with the value base. Why is an inspection interval, a grid extension, acquisition of new safety shoes, a construction site information aligned with the value base? Installing a comprehensive line-of-sight essentially means leadership.

To align technical decisions with the value base, an asset risk management should be set-up. In this circumstance risk means a negative deviation of necessary value spending. Once stakeholders perceive the spent value as inappropriate, they will consider a coalition exit. Following the stakeholder definition as somebody "whose support the organization would cease to exist", a coalition exit would endanger the grid operator's existence in a whole. From this perspective, inappropriate value spending is the grid operator's key risk.

As a first step, risks – equally to inappropriate value spending – should be identified. For example, could possible outages endanger license or tariff negotiations or damage the corporate brand? Could construction sites in rush-hour traffic endanger the public acceptance? The identified risks will be prioritised concerning the relevant stakeholder's exit probability.

Secondly, possible measures to mitigate the identified risks should be developed. Only measures mitigating an identified risk should be taken, all other measures must be

avoided. The measure – or variants – should be evaluated concerning the risk mitigation/value spending. The more coalition exit risk per money unit a measure can induce, the higher it is to prioritise.

Using a comprehensive, value based asset risk management guarantees transparent, documented and stakeholder decision taking as prescribed in the norms PAS 55 and ISO 55000.

SUMMARY AND OUTLOOK

Expectations towards grid operators (e. g. regarding price/costs, quality/reliability, extension and replacement) are very complex. At the same time the number of relevant stakeholders, having concrete interests in the outcome of grid operation (clients, investors, authorities, public) is strongly increasing and the different expectations are more and more conflicting with others. On the other hand, the impact of a changing environment (e. g. regulation, technique) is very dynamic and will even be more complex soon.

Currently, grid operators face a lot of important strategic technical decisions with long-lasting consequences. This is a result of a high need of asset replacement and network extensions resp. technical restructuring (e. g. end of the bath-tube-curve, new energy flows because of sociodemographic change and increasing decentred electricity generation).

On the other hand, grid operators are improving a lot in understanding individual assets' conditions, asset ageing, maintenance needs and expected residual lifetime. These questions can more and more be answered objectively supported by stochastic analysis and asset simulations.

As a complication, rational decision making – esp. regarding (re)investment and maintenance – is becoming more complex and a strategic factor for future success. Efficient decisions need to

- take the weighted interests of critical stakeholders ("value base") into account,
- include all relevant and existing data regarding asset conditions – as well as collected as simulated data – to have an objective picture of risks and investment/maintenance needs,
- contain a portfolio of appropriate technical measures and
- are objectively transparent and comprehensible, even for non-technically educated stakeholder groups.

The question comes up, how grid operators can define and implement instruments of decision making about planning, prioritisation and execution of investment and maintenance measures – in an objectified and cost-efficient way.

The value based asset management approach, which has been formalised by ISO 55000 gives a comprehensive answer on this question. It defines how to identify stakeholder expectations and transfers this into a risk management system to evaluate investment and maintenance programmes. ISO 55000 is the successor of PAS 55, the Asset Management Standard defined by BSI. More and more it is becoming the best practice for Asset Management of Central European grid operators.

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