Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

On behalf of:

Federal Ministry for Economic Affairs and Energy

Energiewende Switch to the Future

New Business Models for Municipalities in the Electricity and Energy Sector

German Approaches

South African-German Energy Partnership

January 2017

Imprint

Commissioned by: **Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH**
South African-German Energy Partnership
Hatfield Gardens
333 Grosvenor Street
Pretoria 0028
South Africa
Contact: Tobias Zeller (tobias.zeller@giz.de)
Sofja Giljova (sofja.giljova@giz.de)
Aurelie Ferry (aferry@salga.org.za)

The South African-German Energy Partnership is funded by the German Federal Ministry for Economic Affairs and Energy.

Consultant: **GeoCode International UG**
Thal 19
94342 Strasskirchen
Germany
Contact: Dr Georgia Badelt (georgia.badelt@geocode-international.com)

Cover photo: **Frankfurt skyline © GIZ**

Design and layout by: **Twaai Design**

Published in South Africa - February 2017

New Business Models for Municipalities in the Electricity and Energy Sector

German Approaches

South African-German Energy Partnership

January 2017

Contents

List of Tables

List of Figures

Abbreviations

BDEW	Bundesverband der Energie- und Wasserwirtschaft (German Association of Energy and Water Industries)
CHP	Combined Heat and Power
CoJ	City of Johannesburg
EE	Energy Efficiency
EEG	Erneuerbare Energien-Gesetz (German Renewable Energy Act)
ERA	Electricity Regulation Act
ESCO	Energy Service Company
EU	European Union
FIT	Feed-In Tariff
GIZ	Deutsche Gesellschaft fuer Internationale Zusammenarbeit GmbH
GmbH	Gesellschaft mit beschraenkter Haftung (limited liability company)
GW	Gigawatt
ISO	International Organization for Standardization
kW	Kilowatt
kWh	Kilowatt-hour
MFMA	Municipal Finance Management Act
MW	Megawatt
NERSA	National Energy Regulator of South Africa
O&M	Operation & Maintenance
PV	Photovoltaics
RE	Renewable Energies
REIPPPP	Renewable Energy Independent Power Producer Programme
SA	South Africa
SME	Small and Medium-sized Enterprise
SSEG	Small-Scale Embedded Generation
ToU	Time-of-Use Tariffs
VKU	Verband Kommunaler Unternehmen e.V. (German Association of Local Utilities)

1. Background and scope of study

South Africa has a substantial renewable energy (RE) resource base, suggesting a significant potential role for RE in the country's power supply.

The Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) is a key instrument in promoting RE supply. Due to the highly competitive tender scheme of this programme, the tariffs for power from solar PV and other technologies declined sharply; thus directly competing with the Eskom average electricity tariff. On the other hand, Eskom tariffs have increased tremendously in recent years i.e. by 300% between 2007 and 2013.

The agenda for Small Scale Embedded Generation (SSEG) has been driven by some pioneering municipalities such as the City of Cape Town and Nelson Mandela Bay Metropolitan Municipality. In 2011 the National Energy Regulator of South Africa (NERSA) developed Standard Conditions for SSEG (<100kW) within municipal boundaries. However, the debate around the current legal aspects of connecting and feeding back into the national grid is still ongoing. The regulations have been developed but not yet approved.

Municipalities face significant challenges as electricity is sourced from Eskom and resold to end users with additional charges being applied. The rising end user prices are prompting some customers to either implement energy efficiency measures, reduce electricity consumption or to go completely off-grid. This directly affects the revenue from electricity sales for municipal utilities. The opportunity for electricity consumers to partially go off-grid and to generate their own electricity, e.g. by investing in rooftop PV, further affects the balance sheet of the municipalities.

The drop in electricity revenue is putting the traditional municipal business model under threat. New business models are needed to exploit the opportunities being presented by the changes taking place in the electricity sector.

In the framework of the South African-German Energy Partnership, it has been decided to have a bilateral dialogue on municipal business model approaches as response to the current challenges. The new approaches should also make it possible to seize the opportunities existing in renewable energy. This briefing paper provides an overview of how German municipalities/municipal utilities responded to the challenges of a changed market environment due to liberalisation of the energy market, unbundling, and increased shares of embedded generation facilities. The approaches are linked to the German legal and regulatory framework in the power sector. It is expected that an intensive dialogue will start on the development of new business models for South African municipalities. For that purpose, this paper also makes recommendations as to which players could be involved on the German side to share the lessons learnt with South African counterparts.

Besides comprehensive desk research, representatives of municipal organisations such as the German Association of Municipal Utilities (VKU) as well as various municipal utilities have been interviewed while preparing this paper. The aim of the interviews was not to perform a systematic empirical survey, but rather to gain a rough first-hand overview of the most common approaches and trends in the business strategies of municipal utilities in Germany.

2. Challenges for German municipal utilities

'Transition has become the rule' – this is the conclusion of a survey of municipal utilities in Germany conducted by the German Association of Energy and Water Services (BDEW) and the EY management consultancy in 2016.

There has been not one disruptive change but rather a continuous transition, which can be divided into 2 main phases: liberalisation and energy transition (Energiewende).

2.1 Liberalisation

A very important milestone of electricity market reform in Germany was the adoption of the German Energy Act (Energiewirtschaftsgesetz) in 1998. This law was enacted mainly to implement a single energy market in Europe. The national energy market had to become more competitive and the legislation was designed to ease entrance to the market for new suppliers.

Before liberalisation, which started in the late 1990s, there was no competition at all, i.e. the consumer had to buy power from the regional supplier and was clearly allocated to either a municipal utility or a supra-regional supplier. There were around 900 municipal utilities, which bought the power from one of the eight vertically integrated power supply companies or from a supra-regional supplier. The supply areas were clearly allocated to the eight vertically integrated companies.

Box 1: Key features of the German Energy Act, 1998

- End of the regional monopolies in which consumers could not choose their power supplier.
- Third party access to grid: A third party can sell power directly to a consumer; to wheel power through a distribution grid, it has to pay a fee to the operator of the respective grid.
- Until the 2005 amendment to the law, wheeling fees were negotiated (agreements between associations and distribution grid operators); according to the law as amended in 2005, the Federal Network Agency regulates grid access.
- Unbundling of production, transmission and distribution in accounting; after the amendment of 2005, suppliers with more than 100,000 customers had to also perform organisational unbundling.

2.2 Energy transition

Germany is increasingly moving away from centralised production, distribution of power from fossil fuels and nuclear energy towards a low-carbon economy based on renewable energy.

Box 2: Energy targets according to the German Energy Concept 2010 (amended in 2011)

- Reduction of CO_2 emissions by 40% by 2020 and by 80% by 2015 from the 1990 baseline.
- Phase-out of nuclear energy by 2022.
- Increase of RE share in final consumption from 12% (2011) to 18% in 2020 and 60% in 2050.
- Increase of RE share in power consumption from 20% (2011) to at least 35% in 2020 and 80% in 2050.
- Reduction of primary energy consumption by 50% by 2050 (from 2008 baseline); reduction of power consumption by 25%.
- Reduction of primary energy demand in the building sector by 80% by 2050.
- Reduction of final energy consumption in the mobility sector by 40% by 2050 (from 2005 baseline).

The ambition is to become one of the most energy-efficient and green economies in the world by 2050. The share of RE in final energy consumption is to reach 60%, while primary energy consumption is to be reduced by 50% (from the 2008 baseline). Between 2000 and 2015, the share of RE in gross power production had already risen from 7% to 30%. With 98 GW installed RE capacity, RE now contributes 48% to overall generation capacities and thus exceeds the contribution of fossil fuelled power plants.

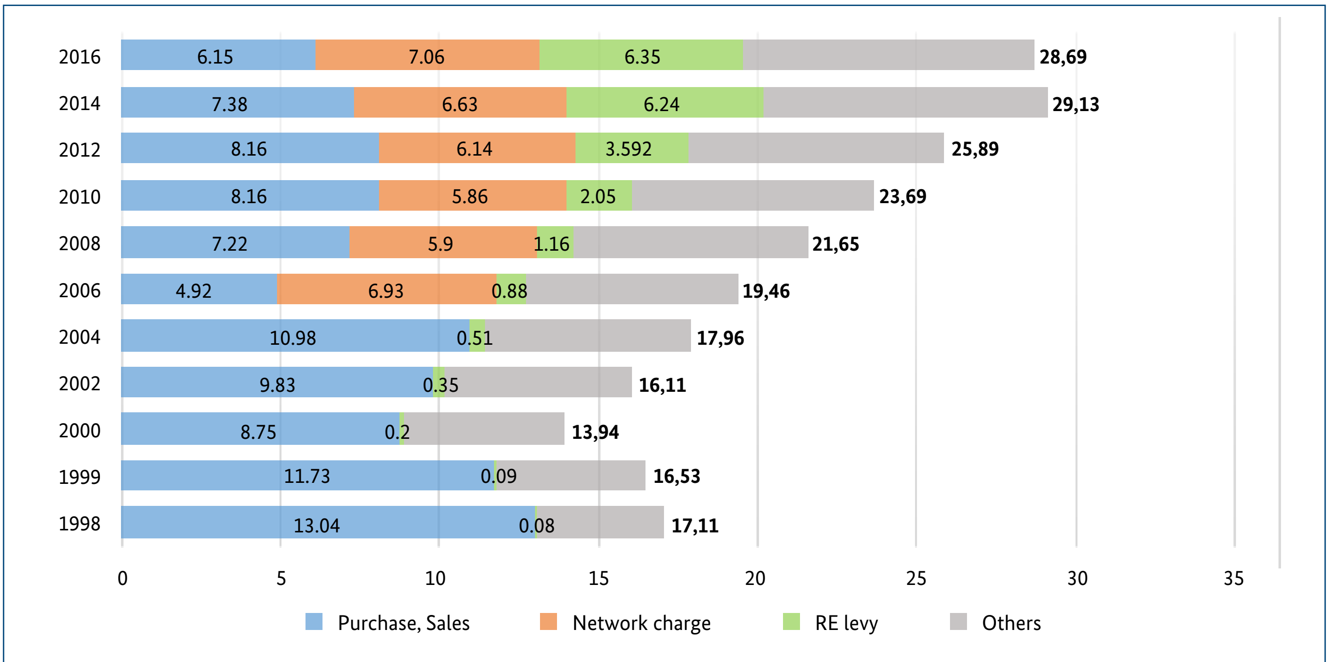
RE has been promoted for more than a decade in Germany; over the years the promotion and incentive schemes have been further developed and adapted to the changing energy mix and energy market. The Renewable Energy Act has been amended on a regular basis for that purpose. After the introduction of a Feed-in Tariff (FIT) scheme in 1991 (the first worldwide), the RE Act amendment of 2000 introduced the RE levy, through which the costs of the FIT are passed on to all power consumers. Since 2009, the government has sought to reduce the costs of RE roll-out. With the amendment of 2009, the FIT was reduced.

In 2012, the RE generating companies gained the option to sell RE power on the electricity markets. The market price has been topped up by a 'market premium', calculated as the difference between the market price and a hypothetical FIT. Since 2014, this direct marketing of RE power on the electricity market is mandatory. The overall rationale of the last amendments was mainly to check the rising costs of RE promotion schemes. With the amendments of 2014 and 2016, the complete FIT has been replaced by competitive tendering with specifically allocated bidding windows, which will bring down the costs further.

Liberalisation and the 'energy transition' have several effects for municipalities:

- In general, municipal utilities were concerned about losing their customers. Although some thought that municipal utilities would 'die', in fact not much has changed thanks to rapid adaptation. Some merged with others and some have been sold to larger utilities. In the meantime there is a trend in which municipalities are purchasing back shares. At present, nearly 1,000 municipal utilities operate in Germany.
- Municipalities did lose customers to some extent in their supply region as the end customers could choose their supplier, but this had a smaller impact than expected. According to some municipal utilities interviewed in the course of this study, just 10% of the customers were lost. At the same time, these utilities were able to compensate the losses by gaining new customers outside their area. In the interviews it was highlighted that on average small-scale utilities lost much less customers than large-scale ones, which have more anonymous relationships with their customers and thus weaker customer loyalty and retention. Indeed, a larger-scale utility mentioned a loss rate of 20-25%.
- Almost 90% of the variable renewable energy systems (solar PV and wind) feed into the grid on distribution level. Municipal utilities as operators of the distribution grid thus face the challenge to ensure grid stability in cases where municipalities own the grid.
- The efficient operation of conventional power plants (such as highly efficient gas-fired power plants) is affected as their capacity is not optimally utilised. One reason is that grid operators have to give priority to feed in electricity generated from RE.
- The price of energy generation **decreased** sharply because of liberalisation and especially because of the increasing share of renewable energies. Levies and taxes **increased** greatly and made self-generation

Figure 1: Development and structure of the power tariff, households



Source: https://www.bdew.de/internet.nsf/id/9D1CF269C1282487C1257E22002BC8DD/$file/150409%20BDEW%20zum%20Strompreis%20der%20Haushalte%20Anhang.pdf competitive. Therefore self-generation based on renewable energies has become more competitive. This increase of self-generation threatens the classic business of municipalities of selling electricity. Directly after liberalisation, the prices for end consumers dropped by as much as 40%. However, this effect reversed very soon, especially due to the renewable energy levy (EEG-Umlage) designed to recover the costs of subsidising renewable energies (FIT).

As Figure 1 shows, the power tariffs for households doubled between 2000 and 2016: from 13.94 to 28.69 EUR ct per kWh. This increase mainly results from the RE levy, which makes up 22% of the total tariff nowadays, compared to 1.4% in 2000. The levy increased from 0.2 to 6.35 EUR ct per kWh between 2000 and 2016, while the price component related to the network charge and the costs of municipalities for purchase and sales of electricity only increased from 8.75 to 13.2 EUR ct per kWh during the same period.

- Driving digitalisation: In general, digitalisation means that all processes along the whole power supply value chain are facilitated and supported through a smart ITC infrastructure. This enhances overall efficiency in the power supply of municipalities, which is crucial in the context of a highly competitive environment.

  The increasing share of RE requires digital solutions. A digitalised power sector allows better synchronisation of power demand and supply, especially in consideration of fluctuating power production from decentralised renewable energy systems. An intelligent meter system and data management based on a smart ITC infrastructure makes it possible to manage flexible loads according to the availability of the power generated. Investment in major reserve capacities can thus be avoided.

3. Approaches

Generally, municipal utilities face the challenge of declining revenue from conventional sales of electricity, due to competition from 'external' suppliers and due to the increase of distributed renewable energy systems which convert power consumers into power producers ('prosumers'). At the same time new business opportunities arise from these changes. All utilities interviewed highlighted that considering the competitive environment in the German power sector, it is important for municipal utilities to position themselves as service companies in a way that differentiates them from other service providers on the market and to make this difference visible to their customers. Power is a commodity which 'cannot be wrapped', as one utility noted; demand is highly price-sensitive. Besides the careful design of tariffs, it is important to offer services associated with the commodity. The big competitive advantage which all municipal utilities mention, is that over the past decades they have established close relations with power consumers in the region and have detailed knowledge about their consumption patterns – and thus about the potential for optimisation using renewable energies and energy efficiency.

And indeed, 70% of utilities are aware that they have to extend the scope of their services linked to their conventional power sales business. This is the finding of a survey on behalf of Commerzbank and the University of Leipzig in 2014. At the same time, 79% of the utilities regret that highly efficient, flexible power plants become inefficient and uneconomic because of the growing share of renewable energy systems. Only half of the municipal utilities in this survey optimistically consider the transition of the energy sector (towards more decentralised renewable energy systems) as a chance to explore new market segments and business opportunities along the whole value chain of power supply.

In response to the liberalisation of the power sector and the growing competition from suppliers from 'outside', municipalities developed strategies to retain their customers. One crucial component of such strategies is to present the utility to the customer as a provider of solutions and services, not only as a seller of power/energy.

Most municipal utilities have established the following services.

In response to the 'energy transition', municipal utilities chose the following main approaches:

- Investment in RE
- Facilitating trade in flexible loads (supply and demand side)
- Stabilisation of the grid / smart distribution grid
- Energy efficiency services: energy audits, energy consultancy etc.
- Different forms of contracting:
  - Energy supply contracting: provision of on-site decentralised energy
  - Finance contracting: leasing of energy systems
  - O&M contracting
  - Energy performance contracting

The mix of approaches partly depends on the conditions in the respective area of the municipal utility, e.g.:

- the higher the proportion of tenants compared to owner-occupied homes, the larger the market for provision of on-site decentralised power to residential property companies/ facility management companies (energy supply contracting: provision of on-site decentralised energy electricity)
- the higher the proportion of commercial and industrial consumers, the more importance is attached to the provision of energy efficiency services
- the higher the share of RE in the region, the more priority is given to grid stabilisation services.

In addition, the strategy of the municipal utilities varies along 2 axes:

1. Providing the services and carrying out O&M by themselves or through external service providers
2. Degree of digitalisation

The various approaches will be described in the following chapters.

Table 1: Overview of German approaches

<table>
<tr><th>Approach</th><th>Short description</th></tr>
<tr><td>Contracting</td><td>Energy supply contracting: provision of on-site decentralised energy/electricity to tenants, also known as a ‘tenant power model’
The municipally owned power generation systems are installed in the vicinity of apartment blocks or commercial buildings (e.g. the solar panels are installed on the rooftop of the block). The utility plans, installs and finances the system. The energy produced (power, heat, cold, compressed air) is supplied to the tenants of these apartments or commercial facilities. Customers can be single commercial and industrial consumers, but also real estate/ property management companies with hundreds of tenants in one compound.

Finance contracting: leasing of systems
The municipal utility plans and installs as well as finances the power generation system. The systems are installed in the vicinity of the end customer who then, after a certain pay-back period of a lease, becomes an owner of the system. Installation and maintenance is usually performed in cooperation with local companies. The end customer has the right to use the system and operates it at own liability; he pays a fixed monthly fee to the municipality. The transfer of ownership to the customer is negotiated in the lease agreement.

O&M contracting
The municipal utility provides O&M services to the owners of the RE systems.

Energy performance contracting
The municipal utility plans, installs, finances and operates energy efficient systems. The municipal utility and its customer agree on energy savings targets; the utility is paid by the customer through the energy savings realised.</td></tr>
<tr><td>Energy efficiency services</td><td>In order to retain customers, the municipal utility provides:
• (Online) information about potentials, measures and corresponding promotion programmes or incentives (usually for free)
• Energy consultancy delivered by a customer service centre (usually for free for existing customers)
• On-site energy consultancy and energy audits (against fee)
• Renting out of measuring equipment (against fee)
• Initiating and coordinating energy efficiency networks/ learning platforms (promoted by German government; each participant has to pay a fee over 3 years)</td></tr>
<tr><td>Engagement in RE</td><td>Development of local RE
Municipality invests in local RE/EE projects and consumes the energy produced locally or uses the energy for direct marketing etc.

Investment in RE outside of municipal boundaries
Municipality buys shares in other energy companies.

Community investment in RE
Municipality motivates local communities to buy shares in local RE/EE projects.</td></tr>
<tr><td>Power trading and trading flexible loads</td><td>Dynamic power procurement: municipal utilities purchase power from various sources, directly from suppliers within and outside their regions, from the wholesale power markets etc. Procurement takes the changing prices into consideration and seeks to minimise power costs.

Power sales on electricity markets: municipal utilities facilitate:
• direct marketing of electricity from renewable energies on the electricity market
• selling flexible loads on the wholesale markets (including the intraday market)
• selling flexible loads on the balancing energy market</td></tr>
<tr><td>Stabilisation of the grid/ smart distribution grid</td><td>Municipal utilities invest, for instance:
• Smart meters, measuring devices in the grid (grid nodes)
• Integration of energy storage
• Integration of e-vehicles into the smart grid
• Virtual power plants</td></tr>
<tr><td>Cooperation schemes (as cross-cutting approach)</td><td>Municipal utilities cooperate with other municipal utilities to share the costs of metering and certain services such as billing, IT support and accounting.

Forms of cooperation include:
• Contract with another utility as service provider
• Shares in a joint company (with other municipal utilities)
• Investment in and operation of joint RE power plants</td></tr>
</table>

Source: GeoCode International UG

3.1 Contracting

3.1.1 Energy supply contracting: provision of on-site decentralised energy, 'tenant power model'

This model is one of the most common approaches of German municipal utilities and one of the first ones they implemented (most utilities interviewed even say THE first one). Energy supply contracting is a method and financial mechanism to support the enhancement of efficiency in energy supply and demand for selected customers. The municipality typically offers customised energy supply contracting packages that contain planning, financing, installing as well as operation and maintenance elements of an energy supply system (e.g. solar PV system) or an energy-consuming system (e.g. air compressor, boiler, lights etc.). The customer does not have any upfront investment costs, but just pays a fee for the service (e.g. an energy charge per kWh delivered or a fixed monthly rate).

For many of the utilities, decentralised energy provision seems to be the most profitable service which they can offer beside conventional sales of energy. According to a medium-sized utility with a strong focus on energy services, this type of model helped to compensate significantly the revenue losses through competition in power supply. According to a study by VKU (and Ecofys) the market volume for energy contracting amounts to EUR 3-4 billion and has the largest share in the overall energy service market in Germany.[1]

3.1.2 Finance contracting: leasing the system

The municipal utility as contractor is in charge of planning, installing and financing the system. The customer has the right to use the system and operates it at own liability (e.g. solar PV system with or without storage); he pays a fixed monthly fee to the service provider, i.e. the municipal utility. The transfer of ownership to the customer is negotiated in the lease agreement.

The consumer or system user can feed surplus power into the grid on the basis of fixed feed-in tariffs (for power from systems <10 kWp on residential homes or from systems <100 kWp on non-residential buildings).

3.1.3 O&M contracting

The energy consumer/customer is the owner of the system; the municipal utility is contracted to perform O&M.

3.1.4 Energy performance contracting

The municipal utility plans, installs, finances and operates energy efficient systems. The municipal utility and its customer agree on energy savings targets; the utility is paid by the customer out of the energy savings realised.

3.1.5 The way forward for contracting

Scope for the type of energy provided varies from utility to utility. However, the focus lies clearly on heat provision. In some cases up to 95% of the contracts are related to heat.

Over the past years some trends can be observed which imply a diversification of the energy services in contracting business, both in terms of energy services/technologies, variations of the business models and consumers. Some types of provision of energy services and pure contracting have been merged. The new services provided include:

- For larger energy consumers (in the commercial and industrial sectors), utilities have started to include lighting in their business. Here the utility modifies the lighting solutions, finances those changes and recovers the costs through a fixed monthly rate; the consumer has the full right of use of the lights.
- Compressed air, refrigeration and other cross-sectoral technologies (motors, air conditioning systems etc.): Compared to contracting for heat supply, contracts for supply of compressed air or refrigeration and other cross-sectoral technologies are offered by few municipal utilities. The reason is that it requires specific knowledge, which is not worth building in-house in all municipalities since the number of potential customers is limited in many regions. Large-scale companies have their own engineering and electrical departments and also good access to finance, while small and medium-sized enterprises are not so familiar with the contracting scheme, so that it requires a lot of time and personnel resources on the part of municipal utilities (as service provider) to build confidence and convince SMEs. Therefore, most utilities are not (yet) working on contracting for compressed air and refrigeration. The few utilities which provide contracting in these fields offer 2 schemes: either the payment of a fixed monthly fee or a combination of a service charge + unit price. According to a VKU study published in April 2014 there is potential for growth of business, especially if utilities cooperate with experienced partners (engineering companies etc.).[2]

[1] VKU and Ecofys (April 2014): Kommunale Energiewirtschaft. Umsetzungsmodell für Artikel 7 der EU-Energieeffizienzrichtlinie, Gutachten im Auftrag des Verbands kommunaler Unternehmen, p. 32

[2] VKU and Ecofys (April 2014): Kommunale Energiewirtschaft. Umsetzungsmodell für Artikel 7 der EU-Energieeffizienzrichtlinie, Gutachten im Auftrag des Verbands kommunaler Unternehmen.

- Electrical charging stations and boxes for electric cars: Some utilities offer to supply and install charging stations for electric cars, both for private households and companies which want to make such an infrastructure available to their employees. For the service package, which includes maintenance during the contract period, the customer pays a fixed monthly rate which not only recovers the investment costs but also includes the estimated power consumption. The power is supplied by the same utility.

Diversification of the target group:

- Most utilities also entered the contracting business with households or private homes. For this customer segment business also started with heating systems. This still forms the bulk of the business, although more and more utilities also provide a full solar PV package to the private consumer by installing, financing and maintaining it. Here, too, the private consumer is the owner of the system and benefits fully from net metering: he only pays a fixed monthly rate to the utility, which has the advantage of very predictable revenues. The package often includes a storage system. On the one hand, this increases the share of own-consumption of the household significantly (and thereby reduces consumption of grid power), but on the other hand it is better to retain the customer instead of losing him completely. Many utilities follow the rationale to be proactive and anticipate what the consumer is going to do and accompany that customer. In this context, it is important to be aware of and sell the competitive advantage of municipal utilities: compared to the engineering/installation companies on the market, utilities also bring expertise with regard to the metrological integration of a solar PV system in the power grid, and knowledge about the legal aspects of grid connection (including tax aspects) etc.

- Another new customer segment are developers, investors, residential property companies and property management companies in the real estate sector. The real estate company leases roof space, which is used by the municipal utility to install a solar PV system. The electricity is supplied to the tenants, who are however not obliged to buy from this source. The same scheme is applied to CHP for real estate customers: the CHP units are sized in a way that they cover the demand for hot water; the demand for heating is rather covered by additional gas-burning systems in the cold season. The contracting package is attractive to the real estate company, as it no longer needs to contract and mobilise the various suppliers such as heating installation company, fuel supplier, service provider for metering and billing etc. Instead, everything comes from a single source. The utility bills the tenants directly. For them the power from the embedded production facility is slightly cheaper, as there are no grid usage charges and, in addition, the 'tenant power' will completely (for power from systems <10 kW) or partly (for power from larger systems) be exempted from the Renewable Energy Act levy (from January 2017 onwards, according to the amendment to the Renewable Energy Act, July 2016).

In general, the scope of contracting and the extent of diversification depend on the size of municipal utilities, the energy consumption patterns along with the socio-economic and industrial structure in the respective region, and the mentality in the region of supply.

However, overall it can be summarised that contracting business has proven to be sustainable and is still growing. All utilities interviewed agreed on that. It is however expected that in future the business will be focused on energy supply contracting and finance contracting; energy performance contracting is expected to become a negligible niche, especially because of the challenge to agree with the respective customer on an energy consumption baseline and also continuously on the realised energy savings resulting from the energy efficiency measure(s) of the contractor.

3.2 Energy efficiency services

The municipal utilities interviewed emphasised that the market for energy efficiency services requires a regulatory framework suited to creating demand for such services. Although most investments in energy efficiency are paid back within a few years out of the energy savings achieved, willingness to invest is very low if there are no mandatory targets and/or incentives. This is especially true for areas with a higher proportion of tenants. The landlord has to pay for investments but does not benefit (the tenants pay less for power and heat).

The European Energy Efficiency Directive of 2012[3] requires EU member states to establish energy efficiency obligation schemes. According to this provision, energy distributors and/or retail energy sales companies are obliged to achieve savings of at least 1.5 per cent of their average annual energy sales to final customers during the period from 1 January 2014 through 31 December 2020, as compared to the three-year period prior to 1 January 2013. As an alternative to this

[3] Directive 2012/27/EU of 25 October 2012

mandatory energy saving scheme, strategic measures such as the introduction of energy and carbon taxes, tax incentives for energy efficiency investments, finance programmes, voluntary agreements etc. are accepted. Box 3 presents the path chosen by Germany to implement the directive; municipalities support the government in these efforts.

Box 3: Energy efficiency policy in Germany

Energy efficiency is the second pillar of the Energy Concept of the German Federal Government. There are clear targets such as reducing primary energy consumption and power consumption by 50% and 25% by 2015 from the 2008 baseline.

With regard to these targets, the **Government continuously promotes investments in energy efficiency**. In the **residential buildings** sector, the government gives loans at subsidised interest rates, fixed for at least 10 years, and with partial debt relief, depending on the energy efficiency level of the building. For investments in **energy efficiency in industry**, the government also gives loans, both for investments in replacing technologies and in new technologies (e.g. energy efficient energy generation, machinery, process cooling + heating, heat recovery, automation) and in buildings. Replacement investments have to result in at least 20% energy savings (compared to the average energy consumption over the last 3 years); new investments have to deliver at least 15% energy savings compared to the industry average.

Beside these investment incentives, the Government also gives **incentives to introduce certified energy management systems** (acc. to ISO 50001), such as (partial) exemption from the RE levy and from power and energy tax.

Apart from all these incentives, there are also **mandatory components within the policy framework** which raise demand for energy efficiency and services. With the amended Energy Efficiency Directive of April 2015, non-SMEs are obliged to perform an energy audit or, alternatively, to introduce an energy management system according to ISO 50001.

Municipal utilities offer a wide range of services relating to these elements of the energy efficiency strategy of the Federal Government. They include energy audits, energy consultancy and in general the provision of information about potentials, energy saving measures and associated promotion programmes and incentives. The services are provided through the internet, customer service centres and on-site. In addition to these individual services, municipal utilities also provide learning platforms, e.g. by initiating energy efficiency networks which help to exchange experience among network members and by organising training for local engineering and installation companies. Furthermore, utilities launch their own energy efficiency programmes e.g. for promoting the optimisation of heating systems or the switch to other technologies (such as gas burners, heat pumps and micro-CHP).

One particular feature in this context is participation in funding programmes. Municipalities are not allowed to benefit from or participate in most funding programmes for energy efficiency. The legislator assumes that they have no interest in selling less kWh and would not carry out the programmes properly.

Novel services include Smart Home solutions, which are increasingly offered by municipal utilities. These are individualised IT-based energy management devices which provide the opportunity to reduce energy consumption and energy costs, e.g. by programming the use of connected electrical equipment in consideration of ToU tariffs.

According to a recent survey by the Working Group for Economic Utilisation of Energy and Water (ASEW) in which 12% of municipal utilities participated, more than 50% offer on-site energy efficiency consultancy, especially to public energy consumers and to industrial & commercial consumers; around 60% of the utilities also do audits.[4] More than the half of the utilities offer services with regard to energy controlling and the development of measuring and metering schemes, mainly for public and industrial & commercial customers. Innovative services such as 'smart home' solutions are provided or planned to be provided by 20% of the utilities, especially those with more than 50,000 connected customers. The number of utilities offering this service is rising.

For the provision of energy efficiency services the municipal utilities cooperate closely with local companies such as energy auditors and installation companies. Only medium-sized and larger ones have own teams of certified energy consultants and auditors. One prominent example is N-Ergie, the utility of the city of Nuremberg (N-Ergie Effizienz GmbH), which established a subsidiary for its energy services. It has its own qualified personnel to conduct

[4] ASEW and VKU, Entwicklung eines Portfolios von Energieeffizienzdienstleistungen fuer kommunale EVU-Kurzfassung, p. 8.

Box 4: Smart Home as a service of municipal utilities

Smart Home systems work on the basis of apps which allows a remote control of connected equipment, e.g. lighting and heating systems or other household equipment.

With regard to energy efficiency, the smart home app (via smartphone or tablet) can allow the consumer to create schedules for space heating, e.g. that the heating system heats selected rooms up to a certain temperature, and lighting schedules such that selected lights are switched on just before the customer comes home. The app also allows wide-ranging remote control, e.g. the customer can switch off the heating system if he left home for a holiday and forgot to turn it down. These are only a few of the many possible applications.

Many utilities already offer Smart Home systems to their customers. One prominent example is EWE with its 'smart living' system, https://www.ewe.de/privatkunden/effizientes-zuhause/mehr-moeglichkeiten/smart-living. EWE sells packages such as EWE smart living 'simple & secure' to households on a monthly fee basis. The packages include not only the app but also motion sensors and plug adapters, so that they can be remotely regulated, either automatically or manually. The user can create various scenarios. For instance, in the scenario for leaving the house, all connected electrical equipment is switched off (such as lights) and the temperature in selected rooms is reduced.

energy audits, to supervise the whole process of planning and implementation of energy efficiency measures and, finally, to operate any energy efficient systems.

N-Ergie pointed out that legal framework conditions such as mandatory energy audits for non-SMEs and tax breaks for the introduction of energy management systems are crucial to have a market for energy efficiency services. It also highlighted that municipal utilities have to think carefully about their competitive advantages on the energy service provider market. N-Ergie built very early knowledge and capacities in terms of innovative technologies such as micro-CHP systems and wood pellet heating systems. Many utilities, especially smaller ones, use white-labelled services provided by cooperative companies such as TRIANEL (see also chapter on cooperation schemes).

However, surveys in the past as well as the interviews in the course of this research clearly show that these services are not self-sustaining; the margin – if any – is very small. The services are mainly considered as an instrument for client retention and not as a business itself. One utility interviewed stated that the effort to provide energy efficiency services is not really worth it, and that for the purpose of client retention it is more cost-effective to improve the transparency of billing and to optimise media work. For N-Ergie Effizienz GmbH, too, various types of contracting generate the bulk of annual turnover (50% with contracting for residential property companies and 50% with commercial/industrial customers). As the profits from traditional power sales are shrinking, the scope for cross-subsidisation becomes narrower. Thus, if the services themselves are not self-sustaining, they should at least generate business in other fields. For instance, the consultancy services provided by the customer service centre of a utility for free should create demand for energy consulting on-site and this, in turn, should create demand for leasing an energy efficient boiler etc.

It can be summarised that the market for energy efficiency services is ready to be tapped, thanks to the legal framework and the incentive programmes which create demand for energy efficiency especially in the commercial and industrial sector as well as the real estate sector (residential buildings). However, the market is highly competitive in Germany, with plenty of architects and installation and engineering companies offering services such as energy consultancy and energy audits. Therefore, it is very difficult for municipal utilities to provide these services as a sustainable and profitable business. Nevertheless, such services (still) play an important role in maintaining customers and positioning utilities as overall service providers (instead of mere power sellers). In addition, they help to create business in the other fields (e.g. contracting).

3.3 Engagement in RE

In total, municipal utilities have a share of 12.3% in the national power generation market. The share of RE in the generation capacities of municipal utilities is still quite small (16%), but is increasing. With 44% of installed capacity at local level, CHP plants have the largest share. Although they are usually not based on RE, they contribute significantly to CO_2 reduction targets and to power supply security.

3.3.1 Local RE development

It must be stressed that the investment of municipal utilities in renewable energy capacities is in line with the macroeconomic requirement of minimising total power supply costs. According to a study by the Reiner Lemoine Institute the difference between the total power supply costs of a centralised and a more decentralised power production scenario is negligible. In the centralised scenario the power is produced at those sites with the best RE potential (best wind conditions, best solar irradiation conditions etc.) and therefore the generation costs are relatively low, but this advantage is compensated by the high costs of transmission (and storage). In the decentralised scenario, the RE potential is not always so good but the costs of transmission are much lower.

In general the study by the Reiner Lemoine Institute finds that the decentralised expansion of RE capacities delivers substantial macroeconomic advantage, partly because it allows a better integration of power, heat and mobility, so that energy efficiency potential can be exploited better. In addition, the decentralised scenario implies high regional value-added effects spread all over the country. The total direct added value due to RE is estimated to be EUR 16.9 billion (ZAR 260 billion) in Germany, of which EUR 11.1 billion (ZAR 170 billion) are classified as municipal value addition.

Municipal utilities increasingly invest in RE. In 2013, they invested in the installation of 730 MW new RE capacity (+32%). In 2014 they installed 700 MW and thereby increased their RE capacity to 3,700 MW (2014)[5], which is a rise of 23%. According to the VKU power generation survey, a further 942 MW of RE capacity was under approval and construction in 2014. In 2015 RE capacity increased by 7% to a total of 3,970 MW. These investments result in an increasing share of RE in local power generation capacity: in 2015 the share rose from 13.5% (2013) to 17% (see Figure 2).

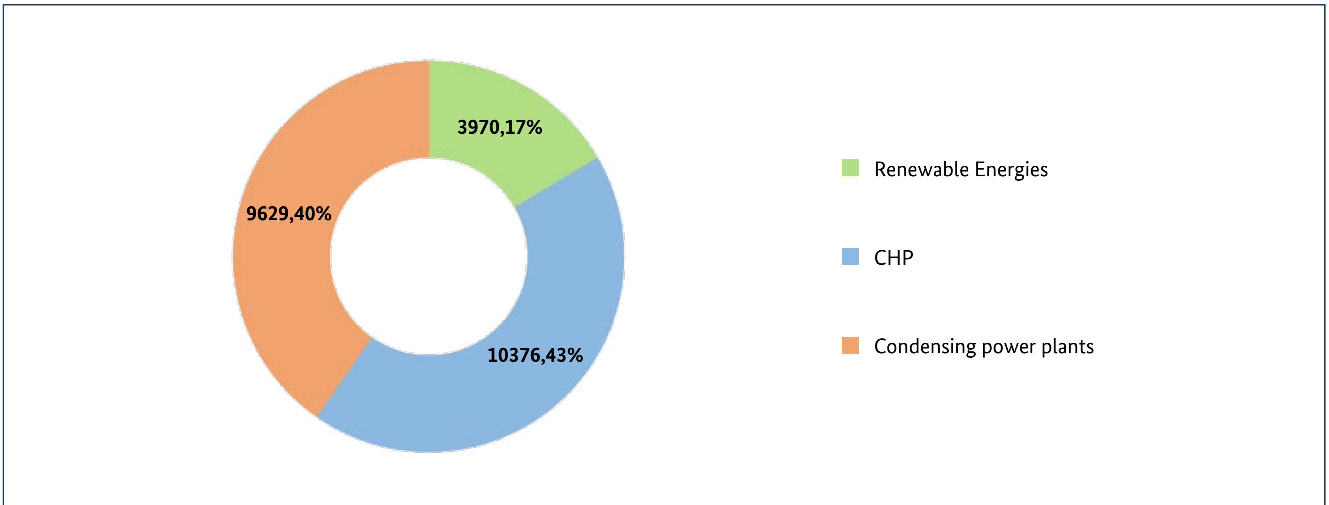
Some municipalities have very ambitious targets. For example, by 2025 the city of Munich wants to supply its citizens with 100% renewable energy. For that purpose, it launched in 2008 a campaign on 'Extension of RE' to which it allocated EUR 9 billion (ZAR 138 billion).

The Munich utility gives priority to generation facilities in the Munich region (e.g. 22 solar PV plants, 13 hydro power plants etc.), but it also invests in projects in other regions of Germany and Europe, as the regional potential is limited.

Some utilities, especially small and medium-sized ones, prefer to concentrate on RE projects in their region, to generate local value and to strengthen their reputation as a local player who contributes actively to the well-being of the region. One prominent example is the Allgaeuer Ueberlandwerke utility. As part of an innovative plan the Wildpoldsried municipality (around 2,500 inhabitants) served by Allgaeuer Ueberlandwerke set a goal of producing 100 per cent of its electricity from renewable energy by 2020. It happened much faster than planned. The town now has five biogas plants, almost 5 MW of solar PV, 11 wind turbines with a total capacity of more than 12 MW, a biomass district heating network, three small hydro power plants, and 2,100 square metres of solar thermal systems. As a result, the town produces 500 per cent more energy than it needs through renewable energy systems, and sells the surplus power back to the grid. All this excess renewable energy is bringing in over EUR 6.5 million (ZAR 100 million) a year in revenue.

Large utilities such as in Munich have built in-house capacities to develop RE projects, while smaller ones work closely with external project developers and partners. Many municipalities also have a stake in RE project companies for large-scale generation plants.

Figure 2: Breakdown of installed power production capacities of German municipalities, 2015 (in MW)



[5] VKU-Erzeugungsumfrage 2015

Table 2: Exemplary RE investments of German municipal utilities

Project	Municipalities involved
Borkum Trianel wind farm, offshore, 200 MW (first municipal offshore project), commissioned in Sep. 2015	33 municipal and regional utilities led by TRIANEL Erneuerbare Energien GmbH
Suckow onshore wind farm, 32.5 MW, commissioned in 2013	Suedweststrom with its 58 municipal utility shareholders; Suedweststrom bought the turnkey project
Kuelsheim wind farm, 2.4 MW	Cooperation: 50% municipal utility of Tauberfranken and 50% Thuega Erneuerbare Energien GmbH (own development)
Schipkau solar park, 10 MWp	TRIANEL EE won a contract for 18 MW solar PV in a first auction round in April 2015; the project was developed by bejulo GmbH and Procon Solar GmbH

Source: GeoCode International UG

Engagement in RE can take further, diverse forms. Firstly, it can mean just constituting a project company for the development, realisation and operation of one single project, or engaging in RE investments through cooperative companies such as TRIANEL, THUEGA and Suedweststrom in which municipal utilities are shareholders and which invest in RE as continuous business. Secondly the cooperation can have the purpose of just buying turnkey projects (such as the wind park in Suckow) or of jointly developing projects. In this context, it is noteworthy that cooperative enterprises such as TRIANEL and THUEGA often partner with external companies. For instance, Thuega Erneuerbare Energien GmbH had signed a cooperation contract with Energiekontor AG from Bremen with the objective to develop 50 MW wind parks in the federal state of North Rhine-Westphalia. By engaging in such cooperation municipal utilities wish to prepare themselves and gain competitive advantages for the upcoming RE capacity tender processes.

3.3.2 Investment in RE outside of municipalities through shares

The Munich utility goes one step further: it purchased a share of 30% in WPD Europe GmbH, one of the leading wind power project developers in Europe. Before starting the joint venture, the Munich utility had already bought some developed projects from WPD. Together with HEAG Suedhessische Energie AG (HSE) and Mainova AG (Frankfurt municipal utility) it acquired 9 wind parks from WPD in 2009.

3.3.3 Community investment in RE

Municipal utilities involve citizens in RE investments (usually in the range of EUR 1-10 million, mainly solar PV and wind parks). The scope of involvement of local citizens varies, from participation in the planning phase to selling shares, thus involving citizens or cooperatives in financing and operation. According to a survey, more than 90% of municipal utilities attach great or even very great importance to the involvement of citizens; 64% consider it crucial. 86% proactively choose a participatory and cooperative approach for their initiatives. A positive side effect of involving citizens is that local social structures (coherence in society etc.) are strengthened.

Table 2 gives just a few examples of local RE development.

3.3.4 The way forward for engagement in RE

To sum up, municipal utilities gain significant benefits from investment in RE:

- Revenue from marketing RE systems: Until the 2014 amendment to the Renewable Energy Act, utilities as investors in RE received a fixed FIT. Power from new RE systems (>100 kW) has to be sold directly, either on the energy stock exchange market or to a consumer. The direct marketing scheme is mainly direct marketing with a market premium; the premium is calculated as the difference between the average power price at the energy stock exchange in the respective month and the 'hypothetical' FIT for the specific technology.
- Direct local marketing of local green power (from specific plants and through the local grid) has become possible under the 2017 Renewable Energy Act. It allows labelling of the green power which is sold through direct marketing on the electricity markets topped up by the market premium. That does not mean that the locally produced green power can be sold as green power to the customers in the region. However, considering the rising demand for 'local green power' in Germany, municipalities can benefit from the marketing of their green energy.
- Customer retention: Involvement of citizens has the effect of stronger confidence of consumers in what the utilities are doing. The participation of people in

investment projects enhances transparency. If residents even become shareholders in the RE plant, they have a direct interest in buying the power.

3.4 Power trading and trading flexible loads

Along with the liberalisation of the energy sector, a marketplace was created in which utilities buy and sell energy. Energy trading takes place at exchanges, but also outside of them on a bilateral basis (in the OTC market). According to municipal utilities, the introduction of that electricity market was a 'real revolution' for the energy sector.

Box 5: The electricity marketplace

- In Europe there are more than twenty different energy exchanges. The most liquid exchanges are the European Energy Exchange (EEX) in Leipzig and the Nord Pool Spot / Nasdaq Omx Commodities in Oslo.
- The main markets within an energy exchange are the spot market for short-term trading, and the forward market, where the physical delivery of, for example, electricity or gas takes place at a future date.
- The majority of producers sell their electricity on the spot market, where short-term trading in electrical power is done via day-ahead auctions or intra-day trade.
- Day-ahead: During the trading process, electricity producers send their sale offers for the amount of electricity they are prepared to deliver at various prices during the 24 hours of the following day; electricity retailers must send their purchase orders, corresponding to the amount of electricity they believe customers will consume during the 24 hours of the following day, and the amount they are willing to pay.
- Intra-day: This market can be used to meet short-term electricity requirements or to sell short-term overcapacities. Participants in the market can buy up to 45 minutes before every hour electricity for the specific hour. This market operates 24/7 without exceptions.

The most important trading activity of municipal utilities is generation procurement and portfolio management. While in the past utilities signed long-term supply contracts, the electricity market now allows a smart procurement strategy which takes advantage of price developments and changes over the day (at intervals of 15 minutes) and, thus, helps to optimise energy costs.

As energy trading requires a lot of detailed knowledge about the markets and their mechanisms, only less than 10% of municipal utilities are directly active on the market. Instead of building up an own team of 5-10 people for energy trading, it is more cost-effective for most of the utilities to outsource procurement and portfolio management to an external service provider. Large municipal utilities or cooperation companies of utilities offer such services.

Examples include TRIANEL (a cooperation of 56 municipal utilities), MVV trading (a subsidiary of the Mannheim utility MVV) and Suedweststrom. The business model of these external providers is a profit-sharing scheme. Usually the model includes a relatively low basic flat service fee and then a share of the profit generated through the trade. The bulk of trading activities derive from procurement and portfolio management. However, service providers such as MVV Trading note that direct marketing of renewable energies and the sale of flexible loads both on the spot market and the market for balancing energy are increasing. Overall, power trading is a business unit which is gaining importance in the service portfolio of municipal utilities.

Demand for direct marketing is rising due to the amendments to the German Renewable Energy Act, according to which power from systems of larger than 100 kW must be sold on the electricity market. Via external service providers, the municipal utilities sell the power, initially mainly from their own RE assets and in the meantime also from other suppliers of the region. Sales of flexible loads, e.g. from the demand side, play a crucial role in adapting power demand to the fluctuations in power supply resulting from the high share of intermittent production sources (wind, solar PV parks). Power demand for chilling/cooling but also for water heating can be shifted easily, e.g. a cold storage can be cooled down at off-peak times below the required temperature, so that it need not be cooled during the power demand peak. This avoided load can be marketed. Usually it is sold on the energy balancing market, but currently the prices on that market are quite low due to a high supply, so that traders are going more and more to the electricity spot market to sell it.

The marketing of demand-side flexible loads is generally still very limited: one challenge is that larger power consumers with such flexible loads are still reluctant to allow utilities to (remotely) control their demand load, even if this is done on the basis of clear agreements. However, utilities which are actively involved in power trading are certain that manufacturing plants and their processes will be designed in the future in a way that allows the sensitive control of power loads.

3.5 Grid stabilisation and smart distribution grids

With an increasing share of variable RE in the distribution grid, the stabilisation of the grid becomes more challenging. Before investing in expensive grid extension, it is more cost-effective to explore the potential to make the overall grid smarter. Pilot projects and studies have shown that through smart grids, load forecasting and exploration of flexible loads, RE systems can be integrated smoothly and the capacities for grid connection of further RE systems can be doubled, without extension of the grid.[6]

3.5.1 Smart metering

The backbone of a smart grid is an intelligent metering infrastructure and an advanced ICT infrastructure. An intelligent metering infrastructure comprises smart meters both at the connection point of the power consumer and in the grid (at central nodes etc.). Smart meters at the connection point of the customer can measure the power demand at short intervals. This makes it possible to assess the respective load profile of single consumers and provides the basis for load management. That management can be done by the consumer or by the grid operator. The load profile and consumption pattern can easily be visualised and gives important hints to the consumer on how to save energy costs. At the same time, the information about the load profile can be read by the grid operator, who can then analyse the options to remotely control loads or shift loads of various kinds of customers.

Municipalities are involved in smart metering by facilitating the installation of the systems as well as investing in smart meters themselves. The business rationale is to improve the data basis for load management (including load and demand projections etc.), which overall makes the management of the power supply more efficient.

The municipal utility EWE AG, which installed smart meters in 650 households, experienced that power consumption went down by 20% at times of high prices (low availability of power in their virtual power plant) and increased by 30% at times of low prices.

Smart meters in the grid itself automatically send real-time information to grid operators about network utilisation and allow automated control, e.g. in case of bottlenecks and failures in the grid. They are part of any intelligent network control infrastructure and network operating equipment. For German municipal utilities smart meters in the grid have

Box 6: The Wildpoldsried Energy Village

Background:
The town generates power from renewable energy sources which is 5 times higher than the town's demand. Power is generated by five biogas plants, almost 5 MW of solar PV, 11 wind turbines with a total capacity of more than 12 MW, a biomass district heating network, three small hydro power plants, and 2,100 square metres of solar thermal systems. The majority of the PV systems in the town are on private residences – about 200 homes now have rooftop solar. Nine municipal buildings including the primary school, recycling facility and sports centre also have PV systems. The electricity generated from the solar, wind and biomass facilities is sold to AÜW under a fixed-price 20-year power purchase agreement (PPA).

IRENE Project, 2011 – 2013

- Sponsored by the German Ministry of Economics and Energy (BMWi)
- **Partners:** Allgaeuer Ueberlandwerke (AÜW) as municipal utility, SIEMENS, RWTH Aachen and University of Kempten
- **Scope:**
  - 200 selected metering points with intelligent metering technology enable grid load monitoring and real-time intervention; variable local transformer stations offset voltage fluctuations.
  - Self-organising energy automation system with a software newly developed by Siemens (SOEASY): Optimised timing of power production from a large number of RE sources (solar PV, wind, biogas), power consumption and storage, in consideration of weather, electricity prices, power quality and other factors.
  - Integration of electro-mobility into smart grid: 40 electric vehicles were made available to private and business customers. They can also be used as a power reservoir when there is a surplus of electricity, which can then be fed back into the grid at times of peak demand.
- **Main conclusions:** Active distribution grids with real-time measurement and control can save significant costs in grid extension, and can help to increase the grid's capacity for renewable feed-in considerably. An efficient and stable control of a smart grid is possible without a complex smart metering infrastructure.

[6] BMWI, May 2014: Smart Energy made in Germany. Erkenntnisse zum Aufbau und zur Nutzung intelligenter Energiesysteme im Rahmen der Energiewende, p. 3

become effectively standard, but the overall smart design of the distribution grid still has a lot of optimisation potential, as it is reflected by many pilot projects on that issue.

3.5.2 Integration of energy storage systems

Besides smart meters, storage plays an increasingly important role in a smart grid. Storage facilities can store the power from RE systems (solar PV and wind) when the power is not needed, and can provide that power at times of power demand when the sun is not shining or the wind is not blowing.

Nowadays, most municipal utilities offer not only solar PV systems but also battery storage units to their customers, based on the contracting/lease scheme as described in the section on contracting. However, the market for storage only takes off very slowly – battery storage is still quite expensive. On the other hand, according to most utilities this will change quickly along with fast declining costs. Therefore, most utilities are seeking to be already active and sell storage options in order to have a pioneer advantage when the market really takes off. It is better to be at the forefront of technology supply before competitors come to serve the customers. Secondly, the grid-stabilising effect of storage is highly appreciated by grid operators.

For municipal utilities, storage does not only play a role at the level of customers. With a view to their grid-stabilising effect, the integration of commercial large-scale battery storage systems is being tested. Two pilot projects are noteworthy:

1. **WEMAG municipal utility:** The 5 MWh lithium-ion facility that WEMAG commissioned in Schwerin, Germany, in 2014 is Europe's largest commercial battery power plant. The facility is essentially providing the same level of **frequency control** as a 50 MW conventional turbine. The WEMAG battery plant serves a grid area where 80% of power already comes from wind and solar generation. The power is **sold on the primary frequency regulation market**; revenues over the past 1.5 years were much higher than expected. Currently, the plant is being upgraded to acquire the **capability of black-starting the grid** after a power cut and, thus, to replace WEMAG's current black-start diesel generators.

2. **MVV municipal utility power bank for storage on location:** The basic idea of this power bank is to manage the flow of electricity and to balance supply and demand, as in the case of a real bank which manages the flow of money. Compared to the WEMAG approach, the primary objective is not to sell the power on the energy balancing market, but to facilitate the local consumption of electricity in the area where it is generated, so that the strain on electricity grids is eased and transmission losses are avoided.

How it works: In a district, surplus electricity generated by solar PV or CHP systems at 14 participating households and 4 businesses is stored and then fed back into the grid when needed. The participants are connected to the storage facility via an internet-based 'Energy Cloud'. This means that all participants always have access to their 'Electricity Accounts'. The project provided participants with tablet computers granting them access to their own generation and consumption data and their electricity accounts for the duration of the project.

The pilot project has been running since December 2014. The system has proven to be stable. Thanks to the storage, the level of own use in the participating households and businesses has increased significantly. As the load during the day is low, the bulk of the solar power can be stored and, thus, can cover at least a part of the peak household consumption in the evening.

One important objective of the project is to test the operation of a district storage system as business model. The challenge is that the renewable energy levy and the network surcharge apply to the power from the storage, as it is distributed via the grid, while in case of individual storage the power is exempted by 40% from the RE levy and completely exempted from the network charge. It has to be tested whether the cost advantages of large-scale district storage (EUR 800 per kWh vs. EUR 2,000) can offset the mentioned charges/taxes and to what extent power banking services via district power storage could be a sustainable business for a municipal utility such as MVV. Beside the economic aspects, such a business would allow keeping regular contact with consumers/prosumers and can be considered as a further instrument for client retention.

3.5.3 Integration of electric vehicles into the smart grid

Germany has set itself the goal of becoming the lead market and provider for electric mobility by 2020 as part of its long-term zero emission mobility vision. One million electric vehicles on the road by 2020 – that is the bold aim of Germany's 'National Electro Mobility Development Plan'. To achieve this target, a suitable power supply infrastructure has to be built and business models have to be developed. Municipal utilities can play a significant role in this context.

An electric vehicle charging station infrastructure will allow power generation, grid load and power consumption to be harmonised. Indeed, through smart ICT-based load management the e-vehicles can be charged at times when a lot of RE is available but the general energy demand is low (e.g. in the morning hours) and at times of peak energy demand electric vehicle batteries can be discharged and the power fed into the grid. This is how e-vehicles can be integrated into the power grid as mobile power storages and thus contribute to increased medium- to long-term grid stability.

Municipal utilities have already started to provide services related to e-mobility, as mentioned above in the context of contracting (contracting or leasing of charging stations etc.). Many utilities also set up a public infrastructure of charging stations in which users pay a fee per charging hour (with special customer card) or pay a flat rate per month to the utility. Utilities such as Augsburg also offer to lease e-bikes and e-autocycles against a fixed monthly leasing fee for 1 or 2 years.

The integration of e-vehicles into the grid is, however, still at the pilot and testing stage. There are many projects in which municipal utilities are actively involved. One is the 'econnect' project. Running from 2012 to 2016, the project was partly funded by the German Ministry of Economics and Technology under the umbrella of the 'ICT in electromobility' programme.[7] In the project 7 municipal utilities together with 11 partners from industry realised projects to test the integration of e-vehicles into the grid, looking at a range of modalities. For instance, the municipal utility of Osnabrueck tested the integration of public e-busses and e-car sharing models into the grid by measuring the impact on the grid and its quality of supply (voltage, amperage etc.). The municipal utility of Aachen worked on the load management of e-vehicles, i.e. to assess whether the power from private residential solar PV rooftop systems is enough to charge private e-cars in the morning hours, when the sun is shining but energy demand is not so high, and whether the local grid is strong enough to charge e-cars in the evening at peak demand times.

3.5.4 Virtual power plants

Virtual power plants are a more comprehensive approach of municipalities to stabilise the grid. These bundle medium- and small-scale power-producing and power-consuming units. All units are operated through the Virtual Power Plant's central control room while remaining independent in their ownership and governance. The objective is to smartly distribute supply and demand and to profitably trade the generated and consumed power.

Usually distributed conventional power systems (such as small CHP plants) and renewable energy systems are bundled; in more advanced projects, flexible loads on the demand side as well as storages are integrated. The systems form an integrated virtual network and are centrally and remotely controlled. The business for the municipal utilities relates to various services:

a. The aggregated power can be sold on the electricity market (day-ahead / intra-day etc.); the power from the renewable energy systems can be sold in the framework of the direct market premium scheme.

b. The aggregated power or parts of the cumulated power can be sold on the energy balancing market: The virtual power plant aggregates the electrical output from a multitude of plants and makes this supply available to the transmission system operator.

c. The power from the virtual power plant is regionally dispatched and thus contributes directly to the synchronisation of supply and demand in the region.

Through such virtual bundling the producers and operators of distributed power (e.g producers of solar PV) can gain an additional profit (e.g. thanks to sales on the energy balancing market), which is then shared with the municipal utility as operator of the virtual power plant (profit-sharing model).

A few years ago, the approach of virtual power plants was still in the pilot phase through, for instance, the BMWi funded EEnergy Programme, which included six projects in various regions.[8] One project, E-Intelligence, an initiative of the EWE AG municipal utility, created a marketplace in which two cold storage houses, a wind park, a solar PV system, a waste water treatment plant, a CHP unit and a public swimming pool in the town of Cuxhaven were inter-connected and formed a virtual power plant. One finding was that thermal-electrical energy systems such as cold storages can indeed be integrated successfully as energy storage systems. At times of lower power tariffs the company cooled down its cold room to create a cold-buffer, so that at times of higher power tariffs the refrigeration unit could be switched off. Over one year, 6% of electricity costs were saved.

However, experience shows that it is not so easy to gain reasonable profits with virtual power plants. Those relying heavily on sales of power from the virtual power plant to the control power market face declining margins due to declining prices on that marketplace. For instance, the virtual power plant of THUEGA (with a cumulated capacity of 200 MW), which aggregated 50 power producers ranging from 0.5 to 5 MW to sell power on the energy reserve market, was closed in November 2015 because of the too low prices on the market.

---

[7] http://www.digitale-technologien.de/DT/Navigation/EN/Foerderprogramme/IKT_fuer_Elektromobilitaet/ikt_fuer_elektromobilitaet.html: 18 projects with a total investment sum of EUR 140 million were funded with EUR 77 million.

[8] BMWI, May 2014: Smart Energy made in Germany. Erkenntnisse zum Aufbau und zur Nutzung intelligenter Energiesysteme im Rahmen der Energiewende.

Therefore, the WALLDORF pilot project of BEEGY, a joint venture of the large municipal utility MVV with partners (see also Box 7), integrated many upstream services around the bundling of power producers, such as the provision of solar PV systems.

3.6 Cooperation schemes

The willingness of municipal utilities to cooperate is generally very high. According to a study by PwC in 2009, 70% of all utilities have expressed a clear interest in cooperation schemes with other utilities. The most important motivation is to reduce the costs of energy supply with regard to competition on the liberalised energy market and the risk that customers can switch to other suppliers. Other main reasons are to gain know-how in a new field and to optimise investment costs.

Box 7: The electricity marketplace

- **BEEGY is a joint venture of four companies:** MVV as municipal utility and initiator, BayWa RE as one of the largest solar PV wholesalers, Glen Dimplex as Irish manufacturer of electrical heating and cooling systems with intelligent storage, and GreenCom Networks as software company.
- **Background:** MVV did not have enough in-house capacities and considered it quite difficult to develop them, as it is a very long and challenging internal change process to make employees think positively about the new energy market and its opportunities. MVV therefore prefered to partner with external stakeholders.
- BEEGY sells and finances solar PV systems (including storage); the customer pays a fixed monthly rate and is owner of the system (leasing scheme).
- Excess generated power is fed into a district power storage system, which balances the power supply and demand in the district. Use of the storage is priced at a monthly rate which the customer pays. If the consumer needs power additional to what the solar PV system provides, he gets it out of the storage.
- Besides the distributed solar PV system and the district storage, the virtual power plant comprises 2 CHP units and also heat pumps as flexible loads. The customers include 200,000 households, a school and a hotel.

The fields of cooperation are generally those where utilities do not have core competencies, such as metering and shared services. 'Shared services' are the internal corporate services which the utility provides to its units or subsidiaries; they include billing services, IT support and accounting. While in the fields of shared services and metering nearly 70% of the utilities interviewed have or plan to have a cooperation, the areas of sales and distribution are considered to be the domain of the utilities, where they have their core competency and are not so open for cooperation with other utilities. Medium-sized and large utilities are also open to cooperation, again primarily in the fields of metering and shared services (80-90%), followed by trade, a field in which more than 60% of the utilities surveyed are active without really having a core competency.

Against that background, it is not surprising that on average 60% of the utilities have had experience at least once in cooperating with other utilities; for large-scale utilities horizontal cooperation has even become a common approach: 91% have already cooperation schemes.

Despite their openness and willingness to engage in cooperation, municipal utilities want to maintain their independence. For that reason, loose cooperation with external service providers is much more common than settin up a joint venture or another joint legal entity.

Table 3 gives a brief overview of existing cooperation forms.

The table shows that municipal utilities can not only profit from optimised cost structures through buying services from external professional providers, but also gain the opportunity to pro-actively build up services adapted to the changing requirements on the energy market in order to offer these services to other utilities.

In consideration of the growing complexity of the energy market (e.g. due to short-term electricity markets and smarter grids in response to the increasing share of intermittent RE), it is expected that cooperation schemes will become more and more common. According to a survey by PwC, more than 60% of the utilities think that cooperation with other utilities will determine the future landscape in the sector.

Table 3: Cooperation schemes of municipal utilities

Cooperation scheme	Description	Examples
Contract with another utility as external service provider	• Some utilities have positioned themselves as early movers by building up special know-how which they also offer to other utilities • Most common services: Trading (both procurement and access to electricity markets for selling power); shared services such as IT support	Subsidiaries of **large-scale municipal utilities**, e.g. MVV Trading etc. **Smaller utilities**, e.g. the municipal utility of Herborn (10-500 consumers), have extended the scope of their shared services step-by-step, according to the growing requirements of clients: ▶ Service provider with data centre ▶ Consultancy in processes such as billing and controlling ▶ Training courses etc.
Shares in a joint company (municipal utilities as shareholders	• Municipal utilities are shareholders of a joint company • In some cases such as THUEGA, the company holds (minority) shares in the municipal utilities • Providing services, especially in energy trading (procurement and selling) and shared services such as metering and energy data management	**TRIANEL, Thuega, Suedweststrom etc.** TRIANEL: • 54 utilities as shareholders; each utility stays completely independent • Focus: trade/procurement and RE project development • Very strong in RE investment; own project development team • For each RE investment, each shareholder can decide whether he wants to be shareholder of a project company • Shareholding utilities have to purchase a defined number of services per annum • Provision of energy efficiency measures: offer of white-labelled solutions; costs for service development are distributed over shareholders THUEGA: • 100 municipalities as shareholders; THUEGA is also (minority) shareholder in municipal utilities • Scope: Shared services, especially metering and energy data management (own subsidiary for these services), market trading platform (own subsidiary, syneco) with access to electricity markets, workshops, individual consultancy on procurement, negotiates framework contracts for hardware such as street lights in the name of their participating utilities etc.; RE investments (currently 229 MW, mainly wind)
Cooperation with non-utilities	• Very often to test approaches, models (e.g. research projects) • Extent of cooperation varies, usually project-related cooperation	**BEEGY:** Joint venture of four companies with the MVV municipal utility as initiator; the partners are a solar PV wholesaler, a manufacturer of efficient heating and cooling systems and a software company

Source: GeoCode International UG

4. Closing remarks

Similar to the situation of South African municipal utilities given current technological developments, German municipal utilities face the risk of declining revenue from traditional power sales. In the course of liberalisation of the European power sectors in the late 1990s, German municipal utilities had to make many efforts to retain their customers who were allowed to choose their supplier. The utilities lost their supply monopoly and had to develop strategies to remain competitive. The heavy promotion of RE through the German Government again challenged the municipal utilities, as residential as well as commercial and industrial power consumers invested in their own power generation systems (e.g. solar PV rooftop systems), which again implied a loss of power sales for the utilities. In that situation, German municipal utilities searched for new business models.

Numerous opportunities were seen in the field of renewable energy. German municipalities started to invest increasingly in RE, mainly to feed into the grid and then to profit from the FIT. By 2015, municipal utilities had installed nearly 4,000 MW of RE capacity; the share of RE in local power generation capacity reached 17% in that year. The investment models vary from investing in the system as single shareholder, investing together with local citizens or organisations of citizens (such as energy cooperatives) and other partners, to buying shares in RE systems (wind, solar) outside of the region. According to the current German Renewable Energy Act as last amended in 2016, municipal utilities either sell the power from RE systems on the power exchange market or sell the power as 'green power' directly to consumers in the region.

Other business models aimed to retain customers. Many energy services were developed, mainly involving contracting and energy efficiency services. Energy supply contracting means that a utility plans, invests/finances, installs and operates the energy system (heat, power) and sells the energy at a unit price to the consumer. Contracting has proven to be the most promising energy service, especially because its scope is continuously extended. While contracting initially focussed largely on heat supply systems for institutions such as hospitals, public indoor swimming pools etc., power supply systems (e.g. solar PV rooftop systems for residential and office properties with many tenants) are now offered. In the case of properties with many tenants, the consumers benefit from lower power tariffs as the power is partly exempted from levies and taxes. Energy efficiency services such as provision of information about energy-saving measures, energy audits, consultancy on energy controlling and energy management etc. are less self-sustaining branches of business, but help to establish an image and reputation as an energy service provider, to retain customers and sell more profitable services such as contracting.

Further new business approaches of municipal utilities had the objective to further stabilise the grid and avoid expensive extension of the grid infrastructure. Many of these approaches are still at the testing and piloting stages. One innovative and promising approach is to invest in district storage systems and sell storage services, both to 'prosumers' (energy consumers with own power generation systems for self-consumption) and to the electricity markets (e.g. the balancing power market). 20% of municipal utilities with more than 50,000 customers offer or plan to offer storage services. However, in Germany the market potential is still limited due to the regulatory framework, especially due to the levies and fees which make the power from district storage systems quite expensive compared to the power from individual storage.

Other innovative approaches and energy services which utilities already provide or plan to offer with the main purpose of stabilising the grid are virtual power plants, smart home solutions and services related to e-mobility. 70% of interviewed utilities with more than 50,000 customers offer or are going to offer e-mobility services, including investing in charging infrastructure and leasing of e-vehicles and of charging stations.

The applicability of the German approaches to South Africa has to be analysed carefully in consideration of the very specific structure, organisation and regulatory framework of the power sector in the country. Key questions include:

- **Different forms of contracting: How does the law consider the contracting model** under which an utility plans, invests, installs and operates a power system on a certain property (e.g. a solar PV rooftop system) to generate and sell the power to the customers on these premises (either a single consumer or many tenants of a property)?

- **Engagement in RE: To what extent does the current legislation allow municipalities to invest in renewable energy systems?** In this context the various avenues and purposes of investment have to be taken into account: investment in RE for own use, i.e. on the premises of public municipal institutions for self-consumption; investment in RE for use in the local area of the municipality, i.e. for selling to various customers in the area; investment in RE to sell it to the national grid.

- **Energy efficiency services:** To what extent does energy efficiency policy in SA create demand for energy efficiency services such as consultancy, audits, energy controlling and energy management, DSM programmes (e.g. switching from electric heaters to gas heaters at concessional conditions)? Are there any mandatory targets? Any incentive programmes? To what extent does the current power tariff policy and scheme provide an incentive to invest in energy efficiency (e.g. reducing demand at peak times as municipalities have to pay high prices to Eskom while they cannot transfer these higher costs to all customers)? How can energy efficiency services can be provided in a sustainable, commercially viable way?

- **Storage (e.g. on district and quarter level):** Is storage considered by law as investment in generation or rather in grid stabilisation? What are the costs of utility-scale power from storage compared to power from individual storage? Are there any levies and fees on storage power compared to power from individual storage?

- **E-mobility services:** Leasing/renting-out of e-vehicles (e-bikes, e-autocycles, e-cars etc.) and the provision and operation of charging stations. What is the policy of SA on electro-mobility?

New, suitable business approaches and models for SA have to be developed with careful consideration of the present capacities of the municipal utilities.

The South African-German Energy Partnership is a good platform to learn from the experience gained in Germany. At the end of the day however, South African stakeholders will have to develop sustainable approaches and business models on the basis of the specific framework in their country.

5. Sources: Bibliographies and interviews

Bibliographies

ifeu and LBD (September 2014): Energieeffizienz als Geschäftsmodell. Studie im Auftrag von Agora Energiewende. www.agoraenergiewende.de

BDEW and EY (June 2016): Stadtwerkestudie- Digitale Geschaeftsmodelle. Digitalisierung in der Energiewirtschaft

BDEW (2016): Erneuerbare Energien und das EEG: Zahlen, Fakten, Grafiken, https://bdew.de/internet.nsf/id/20160222-energie-info-erneuerbare-energien-und-das-eeg-zahlen-fakten-grafiken-2016-de?open&ccm=500010045

BDEW (November 2010): Effizient, wirtschaftlich, oekologisch: Energie-Contracting

BMWI, May 2014: Smart Energy made in Germany. Erkenntnisse zum Aufbau und zur Nutzung intelligenter Energiesysteme im Rahmen der Energiewende.

Commerzbank (September 2014): Herausforderungen von Stadtwerken aus der Energiewende

DB Research (July 2012): Energiewende fordert Kommunen und Stadtwerke,

Ethekwini Municipality (July 2013), Legal Potential to implement a 20 year PPA at a Municipal Level

GIZ (2016), The Role of Municipalities in Renewable Energy Generation. DISCUSSION PAPER, Draft January 2016

GreenCape (2016), Utility scale Renewable Energy Sector–2016. Market Intelligence Report

PriceWaterhouseCoopers (PwC) (2009), Kooperation von Stadtwerken – ein Erfolgsmodell? Bedingunngen und Erfolgsfaktoren von Stadtwerke-Kooperationen.

René Engelke and Markus Graebig (2013): Der Status Quo innovativer Geschäftsmodelle bei Energieversorgern, in: Energiewirtschaftliche Tagesfragen, 63. Jg. (2013) Heft 11

Reiner Lempine Institut (2013), Vergleich und Optimierung von zentral und dezentral orientierten Ausbaupfaden zu einer Stromversorgung aus Erneuerbaren Energien in Deutschland, Stand 21.10.2013.

VKU and Ecofys (April 2014): Kommunale Energiewirtschaft. Umsetzungsmodell für Artikel 7 der EU-Energieeffizienzrichtlinie, Gutachten im Auftrag des Verbands kommunaler Unternehmen

VKU et al.(June 2016), STADTWERKE UND BÜRGERBETEILIGUNG. Energieprojekte gemeinsam umsetzen

VKU (2015), Direktvermarktung von Strom aus Erneuerbaren-Energie-Anlagen unter Berücksichtigung der EEG Novelle 2014. Merkblatt 01/2015.

VKU (2015), Hintergrundpapier zur Zusammensetzung und Entwicklung des Strompreises in Deutschland, 09.12.2015.

VKU (June 2015), ENERGIESPEICHER IN DER KOMMUNALWIRTSCHAFT. Marktüberblick

VKU (2016), Erzeugerumfrage, http://www.vku.de/index.php?eID=tx_nawsecuredl&u=0&g=0&t=1479415926&hash=e4ee462cc0490412551fe028b072c168aabe7924&file=fileadmin/media/Dokumente/VKU2017/2016.09_Facts_Figures_VKU-Erzeugungsumfrage_2016.pdf

Interviews

Table 4: List of interviews

Institution/ Company	Contact
Organisations	
VKU **Verband kommunaler Unternehmen e.V.** **(German Association of Local Utilities)**	**Michael Wuebbels** Deputy Managing Director VKU, Energy Department +49 30 58580-140 Ms Wagner/ Assistant of Mr Wuebbels
BDEW **Bundesverband der Energie- und Wasserwirtschaft** **(German Association of Energy and Water Industries)**	**Dr Jan Witt** Head of Department Energy Efficiency Tel.: +49 30 300 199 1370 Jan.Witt@bdew.de Kathrin Bleibaum / Assistant of Dr Witt
GEODE **European association of private and public energy distribution companies (electricity and gas)**	**Dr Goetz Bruehl** Managing Director, municipal utility Rosenheim Ulrike Willenbrink/ Assistant +49 (0)8031 365-2501 u.willenbrink@swro.de
Companies/ Municipal utilities	
EWE AG	**Christian Arnold** Programme Director, ENERA Project +49 441 4805-5114 Christian.Arnold@ewe.de
MVV Trading GmbH	**Matthias Wendel** Managing Director, MVV Trading GmbH 49 (0) 621 / 290 2526 matthias.wendel@mvv.de
MAINOVA	**Klaus Schwanz** NetzWerkBox Head of Department Key Account Management +49 (0)69 / 213 – 82811 k.schwanz@mainova.de
N-Ergie	**Johannes Heinze** Managing Director N-ERGIE Effizienz GmbH, +49 911 80216200 johannes.heinze@n-ergie.de
RheinEnergie AG	**M. Boguschewski** Team lead Energy Services +49 (0)221 178-4040 m.boguschewski@rheinenergie.com

SWM-Stadtwerke Muenchen	**Paul Kerber** Office manager of the Sales MD Erna-Maria Trixl +49 89 2361-9108 kerber.paul@swm.de
Stadtwerke Schwaebisch Gmuend	**Jan-Raphael Vogt** Head of Energy Services +49 (0)7171 603 - 81 04 jan-raphael.vogt@stwgd.de
Stadtwerk Aschaffenburg	**Dieter Gerlach** Managing Director +49 6021 391-390 dieter.gerlach@stwab.de
Stadtwerke Rosenheim	**Dr Goetz Bruehl** Managing Director Ulrike Willenbrink/ Assistant +49 (0)8031 365-2501 u.willenbrink@swro.de
Stadtwerke Neumuenster	**Dietmar Hirsch** Energy service sales 04321 202-2165 d.hirsch@swn.net
TRIANEL GmbH	**Sven Becker** Managing Director s.becker@trianel.com **Elmar Thyen** Head of Corporate Communication, Sales & Marketing +49 241 413 20-134 e.thyen@trianel.com
BEEGY GmbH	**Dr Christian Feißt** Managing Director +49 (0) 621 /3001160 christian.feisst@beegy.com

6. Annex

1. Milestones of the Renewable Energy Act

- **Electricity Feed-in Act, 1991** *(first green electricity feed-in tariff scheme in the world):*
  - **Introduction of feed-in tariffs (in % of power tariff)** for electricity from renewable energy sources.
  - Grid companies obliged to connect all renewable power plants, to grant them priority dispatch, and pay them a guaranteed feed-in tariff over 20 years. While the Electricity Feed-in Act did much to promote wind power, the installed capacity of *photovoltaic* installations remained low.
  - Feed-in tariffs coupled to the electricity price ⇨ too volatile to ensure investment security.

- **First Renewable Energy Act (EEG), 2000:**
  - Granted priority to renewable energy sources over conventional power.
  - Purchase obligation by law.
  - Technology-specific feed-in-tariffs (FIT) for power from wind, solar PV, biomass, landfill and biogas from wastewater treatment and from geothermal sources; the feed-in tariffs decrease at regular intervals to exert a downwards cost pressure on plant operators and technology manufacturers. This decrease, known as **'degression'**, applies to new installations.
  - The new tariffs **were specified in absolute terms** and were no longer tied to the prevailing electricity price. This made the repayment of investments very predictable. In addition, the FIT was based on **cost-recovery plus profit** and increased substantially. Consequently, photovoltaic remuneration rose from 8.5 EUR ct per kWh to a maximum of 51 EUR ct per kWh.
  - **Costs for FIT are passed on to all power consumers (Renewable Energy Levy or EEG surcharge)**.

- **Amended Act, 2004**
  - Renewable targets now defined in the Act for the first time: 12.5% for the share of renewable energy in gross final electricity consumption by 2010 and at least 20% by 2020.
  - Tariffs for biomass, photovoltaics and geothermal energy increased.
  - **EEG surcharge can be substantially reduced for electricity-intensive industries** (> 10 GWh/a; electricity costs 15% of gross value-added) under the 'special equalisation' scheme ⇨ reduction of burden on electricity-intensive industries from the rising EEG surcharge, for the sake of competitiveness on international markets.

- Amended Act, 2009
  - **Adaptation of FIT scheme to development of installed capacities based on the various renewable energy sources:** photovoltaic tariffs were reduced, tightening of degression for PV, support of wind power e.g. through increase of tariff, repowering bonus, and early-starter bonus for investments in offshore wind systems.
  - Introduction of a 'green power privilege' (Grünstromprivileg), which exempted electricity suppliers with a minimum quota of renewables from the EEG surcharge under certain circumstances.

- **Amended Act, 2012**
  - Introduction of the **concept of a market premium**: Power from renewable energy sources can be sold directly on the electricity markets (optional); the grid operator tops-up that price by paying the difference to the hypothetical feed-in-tariff (market premium).
  - Grid operators can **limit the feed-in of photovoltaics in times of grid overload**, with plant operators receiving compensation for their loss of revenue.

- **Amended Act, 2014**
  - **Mandatory direct marketing:** operators of new plants have to market their electricity themselves and receive the market premium from the grid operator to compensate for the difference between the fixed EEG payment and the average spot price for electricity.
  - Transition to **an auction system** for power from most renewable energy sources by 2017, covering wind power, photovoltaics, biomass (including cogeneration), hydroelectricity, and geothermal energy: Specific deployment corridors now stipulate the extent to which renewable electricity is to be expanded in the future and the funding rates will no longer be set by the government, but will be determined by auction.
  - The new system is being rolled out in stages, starting with ground-mounted photovoltaics.

- **Amended Act, 2016**
  - **Definite shift to competitive bidding or auction principle for selected technologies** such as onshore + offshore wind and solar energy; for wind and solar systems >750 kW and for biomass projects >150 kW there will only be auction rounds. To take part in the auctions, bidders must fulfil technology-specific criteria and make security deposits to ensure that winning projects are realised quickly.
  - **For projects below the above thresholds, there will be a fixed FIT and mandatory direct marketing on the electricity exchange market (with market premium).**
  - For self-consumption projects, there will principally be a reduction of the RE levy by 60%; power from systems of 10 kW and below is exempted completely from the RE levy.
  - **No double burden anymore for power from (district/quarter) storage.**
  - **Better conditions for tenants' electricity supply projects:** The law gives the government power to enact secondary legislation, which the federal government must then implement. The goal is to exempt projects in which tenants of multi-family buildings draw energy from on-site installations from having to pay the full EEG surcharge, specifically 50% instead of 65% for power from systems >10 kW. Power for tenants from on-site installations <10 kW is exempted completely from the RE levy.
  - Introduction of a **system of regional green electricity labeling:** In the future, energy supply companies may disclose to their customers their specific regional supply sources of wind, solar and biomass energy production. For this purpose, a system of certification by the German Environment Agency is established. For power bearing a regional green electricity label, the market premium will be reduced by 0.1 EUR ct per kWh.

2. Promotion schemes for energy efficiency in buildings in Germany

Box 8: Promotion of energy efficiency in buildings

Approach:
- Higher energy efficiency means higher bonus
- Neutral in technologies, no promotion of selected technologies ⇨ most cost-effective measures can be realised
- Quality assurance through 'approved' energy experts (planning, implementation and random inspection)

Energy efficient construction loans (residential buildings):

Financing of new buildings which are more energy efficient than the reference building which meets legal requirements:
- Financing of up to 100% of construction costs (max. loan of EUR 100,000)
- 10-20-30 years credit period with up to 2-3-5 years grace period with fixed interest rate for at least 10 years
- Partial debt relief: 5% for a building with a primary energy demand of 55% compared to the reference building, 10% for a building with a primary energy demand of 40%.
- Subsidised interest rates

Energy efficient rehabilitation loans:
- Grants for investments: the higher the energy efficiency of a rehabilitated building, the higher the grant (e.g. up to EUR 30,000 per housing unit for buildings with an energy demand of 55% compared to the reference building)
- Eligible investment costs up to EUR 100,000 per housing unit