THE ENERGY AND WATER NEXUS: SERVICES WITH A GOOD MATCH
LA RELATION ENTRE L'ENERGIE ET LES EAUX: DES SERVICES HARMONISÉS

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Introduction
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The convergence of electricity and natural gas has been extensively analysed by scientists, politicians and energy companies over recent years. Today, it is common sense for electricity and natural gas businesses to have significant linkages and for main value drivers to coincide in some ways. In consequence, a 'new' strategy, in which a wide range of energy companies develop integrated electricity and gas businesses, is now accepted as a measure to improve efficiency and customer service.

But what about energy and water? Do energy and water businesses show analogies and convergences similar to those of electricity and gas businesses? This paper addresses these questions in three steps.

First, the technical linkages of energy and water are illustrated. Further, the value chains of electricity, gas and water industries are compared, from production, to sales and to customers (section 2).

Second, the value drivers and critical success factors of energy and water businesses are identified. In this context, special focus is placed on the analysis of the similarities and differences between energy and water (section 3).

Third, possible strategies for utility companies are identified. Here, the experience of RWE, with its integrated energy–water strategy, complements the analysis (section 4). The paper concludes with a summary and conclusions (section 5).

General overview of the energy water-nexus
Vue générale de la relation entre l'énergie et les eaux

1.1 Technical linkage of energy and water
Liens techniques entre l'énergie et les eaux

Water and energy are inextricably linked in their utilisation. Even from a purely technical perspective, they are linked by the water consumption of the energy system and the energy consumption of the water system.

On one hand, energy is required to produce and transport water. According to US Department of Energy data, seven percent of world energy consumption is dedicated to water supply. The extraction, distribution and use of water involve mechanical and electrical energy derived from all fuel types, both non-renewable and renewable (including human and animal power). For example:

- *Pumping and transportation*: Energy required for pumping water from source to tap can vary from less than 0.1 KWh/m³ to more than one KWh/m³. The energy needed for lifting and transporting water may represent less than 10 percent of domestic household energy consumption in the developed world but can be a significant cost burden for water customers in mega-cities of the developing world. For example, a mega-city of 10 million people can require

one billion KWh of electricity per annum to pump water from source to tap for all of its consumers. In developed countries, average power costs of water supply are in a range of three to five €cts/m^3, which represents about 20 percent of the direct (variable) costs of water treatment and supply.

- *Sewage treatment*: The energy needed depends on the chosen treatment process (simple filtration, ion exchange, ozonisation), which determines the resulting water quality. The energy costs for treating water and removing pollutants from wastewater have traditionally been lower than for pumping. This position is changing as more stringent water quality standards are set and more intensive processes adopted to reduce the land area required to treat water and wastewater.

- *Desalination*: The energy needed depends heavily on the chosen treatment process (reverse osmosis, distillation). On average, the total cost to produce one cubic metre of potable water is €cts50, of which one-third is amortisation and the rest is operation and maintenance (O&M), with energy consumption accounting for 60 to 70 percent of O&M costs. Approximately 3.5 KWh of electricity are needed to treat one cubic metre of desalinated water.

On the other hand, the water requirements of the energy system are manifold, for example:

- in conventional oil production, water is often injected into the reservoirs to increase the recoverable barrels of oil;
- water is directly used for power generation in hydropower stations;
- water is used for cooling purposes in fossil fuel and nuclear power plants;
- hydrogen – extracted from water and gas – is used in fuel cells; and
- in a future hydrogen economy, hydrogen will be able to be used as an energy storage and transportation medium.

In most countries, water usage in the energy industry is highest in electricity generation. In Germany, thermal power plants account for more than 70 percent of total water usage, according to official statistics. In the US, the share of power plants of total water usage is 39 percent. This is in the same range as the water usage by agriculture (40 percent). In the EU, the share of total water usage of power plants is similar to that in the US (40 percent). Regarding total water *consumption*, fossil fuel and nuclear power plants account for four percent of water used in the US. Thus, water consumption in thermal power plants is only slightly below household consumption (six percent) and industry and mining (five percent). By far the most important water consumer in the US is agriculture (81 percent).

Another very important water user in the electricity industry is hydropower. Hydropower is currently the most important renewable energy source (2.6 percent of all primary energy supplies). In some countries, such as Norway, hydropower can have a very significant share in total electricity generation – up to 100 percent.

The technical linkage between energy and water is in some cases critical. For example, in developing countries, disruption of energy supply can lead to disruption of water supply for irrigation, drinking and sanitation. Vice versa, water can play a very critical role in energy supply. For example, in the summer of 2003, temperatures in Western Europe were at very high levels and rainfall was very low. As a consequence of the warm and dry weather, water levels in rivers fell and the temperature of river water increased significantly. Because of environmental concerns, some coal-fired and nuclear power plants had to reduce electricity generation, especially in France, Germany and Italy. The extraction of cooling water from the rivers and at the same time the discharge of hot water from power plants into rivers had to be reduced in

order to prevent damage to the river ecosystems. At the same time, electricity supply from hydropower plants and wind farms was at very low levels. The electricity supply in Western Europe was therefore very tight during that summer and electricity prices climbed to very high levels (e.g. in the German electricity spot market, the rate sent up to 500 €/MWh in certain hourly periods).

1.2 Integration of the energy and water business and the value chains
Intégration de la compagnie d'énergie et des eaux et des chaînes de valeur

The linkages between energy and water described above can be seen because energy is an input to water supply and water is an input to energy supply. From an industry point of view, engagement in both energy and water can mean the vertical integration of activities. For example, electricity consumption is a major cost driver of desalination projects and producing the needed electricity in projects' own power plants may offer a hedge against rising electricity prices.

On a company level, a second reason for the integration of energy and water businesses is diversification. In the developed world, the growth of energy consumption, and therefore market growth, is limited. Furthermore, energy markets have been or will be opened up for competition in a number of countries in the developed as well as in the non-developed world. The energy business therefore becomes more risky, with a number of consequences including higher capital costs for pure energy companies.

The water business, on the other hand, is characterised by a significantly lower degree of competition than is the liberalised energy industry. Regulated water business (serving the customers in a municipality) remains a utility with a stable and secure income stream. Further, the water business offers attractive growth opportunities, partly because of 'organic growth' (population growth, urbanisation, higher environmental standards), and partly because of a trend towards private sector participation (PSP) in some markets. In the regulated water market in the US, 'tuck-ins' (integrating smaller neighbouring water supply areas) or wastewater activities are examples.

Therefore, a water business may compensate for a partly stagnating energy sector. Additionally, the integration of energy and water businesses may improve the risk profile of utility companies because of the different risk exposures mentioned above. This is a reason why integrated energy–water companies have, in general, lower capital costs than pure energy companies.

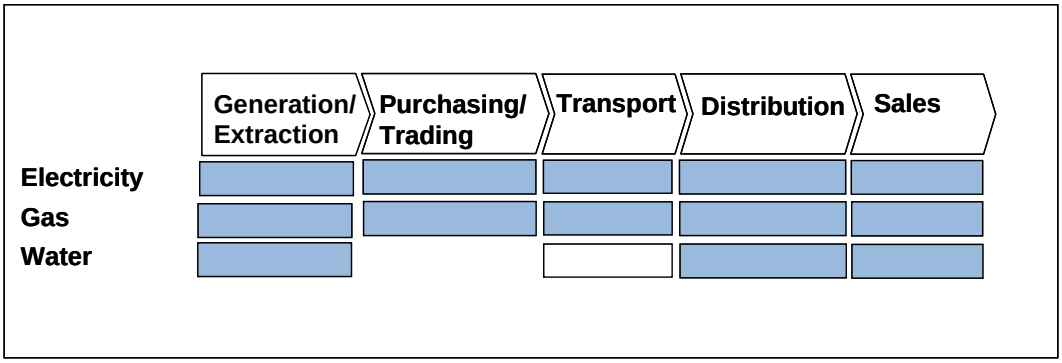
The third reason for integrating energy, especially electricity and gas with water activities, is the synergies along the value chain. Vertical integration and diversification, as described above, are mainly company-specific strategic aspects. This means that societies only benefit *indirectly* from energy–water integration via better prospects and stabilisation of the energy–water industry. In contrast, the realisation of synergies between energy and water activities is *directly* beneficial to both societies and energy–water companies. The same products and services are supplied to consumers using lower inputs of material, workforce and natural resources.

The benefits of joint electricity/gas and water activities can be found in:

- similarities in the value chains of the energy and water business (discussed below); and
- common value drivers in some parts of the value chain (discussed in detail in the following section).

Since the core processes of energy and water supply are relatively specific and complex, they cannot be globally equated with each other. Nevertheless, the principal steps along the value chain are similar. Electricity, gas and water all have to be produced, transported, distributed and sold to customers. Further, both gas and water have to be treated in order to meet the requirements of consumers and state authorities. In detail, the value chains comprise the following stages.

Figure 1: Value chain of the electricity, gas and water industry. Chaîne de valeur de l'industrie de l'énergie, du gaz et des eaux.



Generation/extraction: Electricity is generated in power plants using coal, natural gas, nuclear energy, water, wind and other energy sources as fuels. Natural gas production comprises exploration and appraisal of reservoirs, lifting of the gas from the ground and treatment (e.g. sequestration of water, sulphur.). Water has to be extracted from reservoirs, lakes and rivers and treated in accordance with prescribed water quality and customer requirements.

Purchasing/trading: Trading, defined as purchase and sale of bulk volumes of a product on a free market (trading means 'taking positions' in this context), exists in the energy industry, but trading of water does not exist at all. As a precondition for trading, the wholesale markets of a product have to be liberalised. In contrast to the energy markets, wholesale markets for water do not exist.

Transportation (long distance): Electricity produced by power plants is fed into a high- or medium-voltage electricity grid and transported to regional and local grids. Natural gas is transported in high-pressure pipelines or by ships in a liquefied physical condition (Liquefied Natural Gas, LNG). Transportation distances from gas fields to consuming countries can be several thousand kilometres. Water is transported in canals and pipes. Nevertheless, long distance water transportation is only relevant in some parts where there is water stress (e.g. in the US).

Distribution: Electricity is distributed to end customers regionally and locally using medium- and low-voltage grids (lines and cables). The distances are short in this case and the lines are less networked than in transportation. Natural gas and water are distributed by pipes to end users (medium- and low-pressure pipelines in the case of natural gas). In most cases, electricity cables and gas and water pipes have to be laid underground, for example under streets in cities. In some countries, municipal concessions must be acquired for laying cables and pipes.

Sales: Finally, energy and water are sold to customers. This includes marketing activities, metering and billing or collection. In most countries, energy and water companies have to acquire concessions and/or licences from the state in order to provide energy and water to end customers.

The decision as to whether the activities along the value chain are bundled or separated, and at either a market or a company level, depends on the degree to which wholesale and retail markets are liberalised. The water market is in most parts of the world not liberalised in respect to wholesale trading/sales and retail supply, because in general the whole water business is evaluated as a natural monopoly. Competition is restricted to the auctioning ('competitive bidding') of distribution and supply concessions, which include pricing terms, rules concerning water quality, and the number of customers connected to the grid. The water sector can be divided into a very important regulated and a less important unregulated part. The regulated water business comprises serving customers in a municipality under a concession. The unregulated business contains the O&M of municipal infrastructure or all activities based on industrial outsourcing.

Liberalisation and deregulation are much more advanced in energy markets in most parts of the world. Therefore, the activities along the value chain are conceptually separated from each other, taking the potential for competition into account:

- Potential competitive activities are generation, trading and sales, since no major barriers to market entry exist in these businesses. If the market is not distorted, no state regulation is needed.

- Non-competitive activities are distribution and in some cases transportation. Distribution and transportation are evaluated as natural monopolies. This means that a single supplier can provide services at lower cost than several suppliers can. Natural monopolies are normally regulated by state authorities.

Nevertheless, even if markets are in principle liberalised, unbundling is often not completely implemented if deregulation has been introduced stepwise or if governments do not want to give up synergies based on the integration of certain activities in the value chain. For example, the separation of distribution and sales is seen only in some of the countries that have liberalised their electricity and gas markets on the retail level. In the European Union, for example, distribution and sales activities have to be unbundled in the electricity and gas industry from July 2007. In most countries of the world, distribution is not unbundled from sales.

The main similarity along the value chain between energy and water is based on the fact that electricity, gas and water all are line-bound industries, in which grids, lines and pipes account for a significant share of the service. Furthermore, energy and water are both regarded as essential for economic development and social welfare. Because of these sensitive aspects, state regulation is very intense in all of these sectors, even after market liberalisation. In all three industries, it is common to regulate prices at least in distribution and transportation, but in many cases also at a product level. Furthermore, market access for new entrants is often restricted and regulated by state authorities, such as via concessions and licences.

Common success factors and synergies in the energy and water industry

Facteurs de succès communs et synergies dans l'industrie de l'énergie et des eaux

1.3 Identification of common success factors along the value chain

Identification des facteurs de succès communs au fil de la chaîne de valeur

As explained in the previous section, the value chains of the electricity, gas and water industry show significant similarities. Nevertheless, whether energy and water services prove to be well matched depends on the similarities and differences in

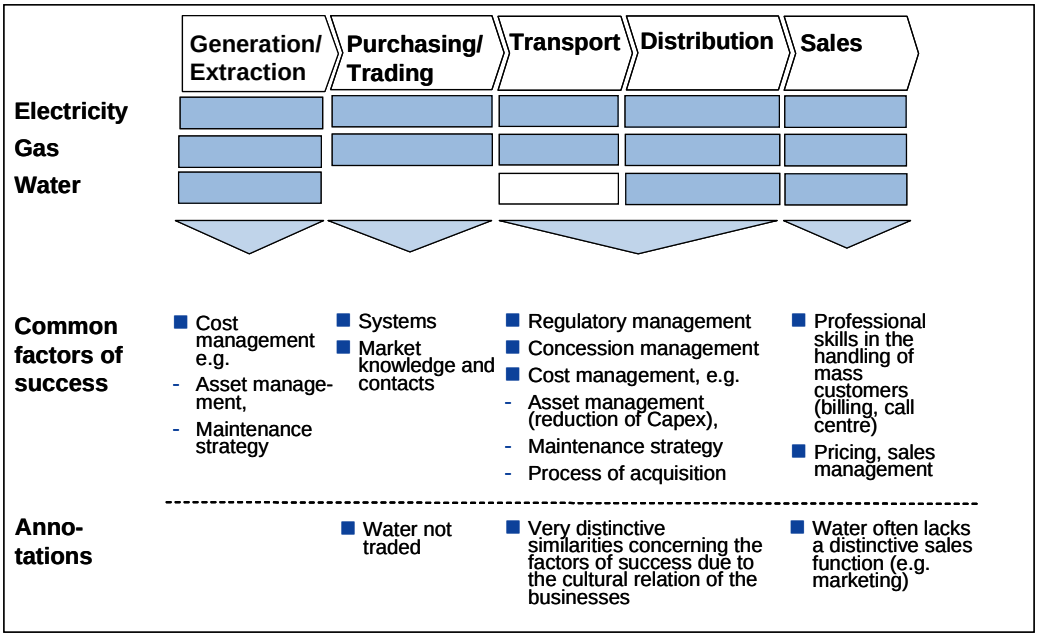
respect to the underlying success factors of the businesses and to the extent to which similar success factors are linked.

Analysis of the processes along the value chain shows that common success factors between energy and water exist, especially in:

- generation/extraction;
- distribution and; and
- sales.

The other stages of the value chains – purchasing/trading and transportation – reveal only minor common success factors.

Figure 2: Common success factors along the value chain.
Facteurs de succès communs au fil de la chaîne de valeur.



Generation/extraction: Common success factors can be observed particularly in asset management capabilities and the application of maintenance strategies. For example, part of ongoing optimisation is the development of procedures and rules for decisions, for example on replacement or maintenance of assets. In the fields of generation and extraction, the optimisation of cost management processes is very important due to the capital intensity of these businesses.

Distribution: Distribution and, in most countries, sales activities are regulated by state authorities due to the fact that distribution is regarded as a natural monopoly (see section 2.2). Therefore, dealing with the regulatory environment is an essential success factor for energy and water companies. In order to secure supplies and deliver benefits to both consumers and the energy and water industry, it is fundamental that consumers, companies and regulators find common views on regulatory issues and problems such as the quality of supplies, permitted revenue and rates of return for companies, and procedures for customer complaints. In this context, the energy and water industry must provide information to the public and to state authorities on the preconditions necessary to attract investments; operate the businesses efficiently; and secure energy and water supplies in the short and the

long-term. Regulatory management is therefore a critical success factor for the company's business as well as for social welfare.

Furthermore, in countries such as Germany, companies have to obtain concessions from municipalities or other state agencies in order to begin energy and water distribution. Concession management can be a very challenging task in the energy as well as in the water industry, and in developed and non-developed countries. Successfully approaching municipalities for water or energy concessions (supply areas) is based on similar skill sets. Hence, know-how and experience can be shared in this field.

Asset and cost management (e.g. asset management, maintenance strategy) are both critical success factors in energy and water distribution because of the capital intensity of the businesses. Asset and cost management procedures are in principle identical, apart from the types of lines and pipes in the case of capital expenditure management. The same holds for maintenance strategies for optimising operating costs under a given regulatory regime (see above). Shared field-force management of gas, water and electricity assets can help to increase efficiency, improve customer service and reduce inventory costs significantly.

In the developed world, there is in some countries little scope for organic company growth in the energy and water industries (see section 2.2). Acquisition of local or foreign companies is, in these cases, an opportunity to kick start growth, integrate businesses and improve efficiency. In this context, the process of acquiring other companies and assets is a critical factor in financial success. Information on potential company and asset sales, including privatisation procedures, on the political framework and on local culture is needed for company expansion abroad. Activities in one utility sector (e.g. water) in a certain country can be a head start for expansion in other utility sectors (e.g. electricity and gas business). Experiences and know-how gained in foreign markets can to some extent be transferred from energy to water and vice versa.

Sales: Energy and water are mass products. Millions of customers are supplied with electricity, gas and water. Therefore, competency in handling mass customers (customer relationship management, CRM) is an important success factor for energy–water companies. CRM in energy and water affords, in principle, identical approaches to customer care, billing systems, call centre operation and metering etc., despite the fact that differences exist regarding technical equipment (e.g. metering).

Where energy and/or water markets are liberalised, regulation of the businesses is reduced or abolished and sales activity becomes a key success factor. Pricing and sales management (marketing activities, customer information etc.) become essential for gaining and keeping customers. Nevertheless, since water markets are mostly not deregulated, especially at the sales level, sales management is much less important in water than in electricity and gas.

1.4 Operational synergies along the value chain
Synergies fonctionnelles au fil de la chaîne de valeur

The above analysis indicates that the energy and water industries share several success factors along the value chain. Therefore, combined energy–water companies should be able to create substantial synergies between energy and water activities. On an operational level, the energy–water nexus exists regarding:

- cost synergies (reduction of costs due to shared services);
- customer services (e.g. common branding, cross-selling); and
- project management (e.g. combined desalination and energy projects).

Cost synergies can be generated by co-ordination of shared activities in energy and water. Also, optimisation processes can be structured equally across the whole group. Finally, superior systems, best practice and knowledge management regarding cost optimisation can be transferred from energy to water and vice versa.

Best practice transfer and knowledge management can also enhance company performance in customer services. Furthermore, common branding (implementation of common brands for energy and water products) can increase the visibility of the energy–water company in the market. Finally, cross-selling of energy and water products is an option in a competitive market in order to deliver additional value to customers and increase market share.

Synergies in project management can be generated, especially if energy and water projects are realised jointly. Desalination is a good example of common project management. The construction of desalination and power plants is in most cases done jointly since desalination is very energy intense (see section 2.1). Even if there is no direct linkage of energy and water projects, experience in project management can be shared between these industries.

The operational synergies of energy and water can be clearly identified by investigating the stages along the value chain which incorporate common success factors. In respect to distribution, for example, energy–water companies can implement:

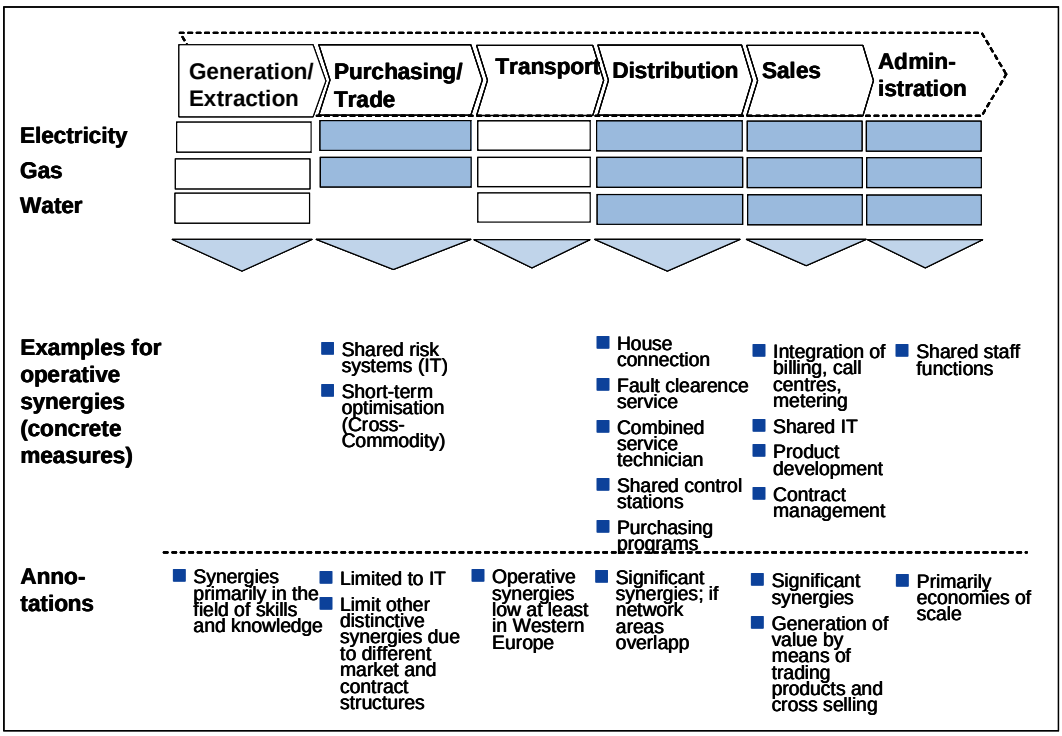
- shared procurement activities;
- shared control stations or fault clearance services;
- integrated network planning and development;
- co-ordination of bidding for network and supply concessions;
- shared network inspections (multi-skilled field force management);
- simultaneous execution of construction works and shared excavation work for underground lines and pipes; and
- shared assignment of construction companies.

Regarding sales business, important synergies can be realised at the commercial level in the form of branding and cross-selling of energy and water products (see above). These synergies are based on optimised customer services. Cost synergies can also be realised in the sales business on a technical level by:

- integrating billing, call-centres and metering for joint utilisation;
- standardising IT platforms; and
- sharing product development and contract management.

Regarding energy–water company overheads, administration can be organised more efficiently primarily because of economies of scale achieved by pooling back office functions. Key to this is the centralisation of super-ordinated functions such as human resources management and accounting (back office functions).

Figure 3: Operational synergies along the value chain. Synergies fonctionnelles au fil de la chaîne de valeur.



Especially high synergies in distribution and sales can be achieved by combining network services for gas, electricity and water to the same customers in the same regional supply areas. In Germany, these synergies have long been developed on a local level by several hundred municipal utilities. Most municipal utilities supply electricity and water jointly to their local customers (especially households, commerce and small industry). Additionally, some of them supply natural gas to their clients. Therefore, the integration of energy and water businesses is not new in Germany (and in some other countries).

Nevertheless, this kind of integration has, to date, mostly been restricted to the regional and local level. Utility companies acting on a national or international level have in most cases disregarded the energy–water nexus to now, because the advantages of energy–water integration seem to be less obvious at first glance. The following section gives reasons for revising this point of view. Taking the experiences of RWE into account, it will be seen that energy–water companies acting internationally can realise significant benefits from integrating energy and water businesses.

RWE business model and practical examples
Modèle de compagnie RWE et exemples pratiques

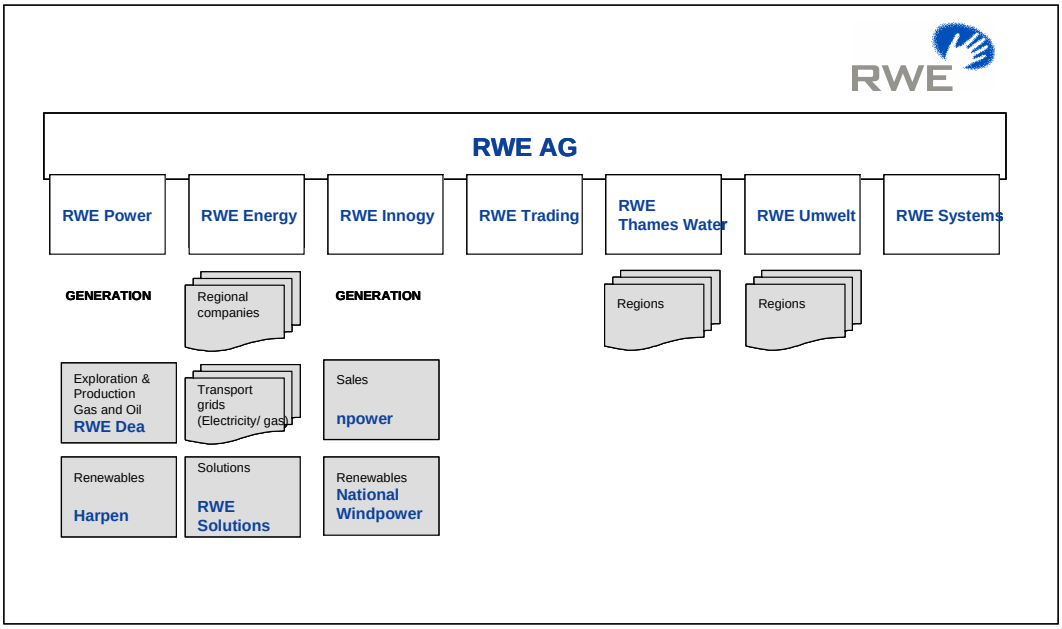
1.5 RWE business model
Modèle de compagnie RWE

RWE looks back on a hundred years of supplying customers with energy and water services. In the fiscal year 2003, RWE employed 127,000 people and generated group sales of €43.9 billion. Supplying 160 billion kilowatt hours of electricity annually, RWE ranks number two in Germany and number three in Europe. As a water supplier, RWE is number one in Germany. The company also supplies gas equivalent to around 300 billion kilowatt hours annually.

In 2003, the RWE Group realigned its structure to meet rising customer demand in the context of increasing competition in Europe's energy markets. Key challenges

were deregulation, internationalisation and getting as close to the customers as possible, wherever they were.

Figure 4: Organisational structure of the RWE group. Structure organisationnelle du Groupe RWE.



RWE Thames Water is the management company for RWE´s international water operations. In the other regions of Germany and parts of Eastern Europe service is guided by RWE Energy and its network of local energy companies, which provide an integrated energy and water offering to customers.

RWE Energy, based in Dortmund, bundles the integrated sale of electricity, gas and water in a total of twelve regions in Germany and continental Europe, backed by some 43000 employees in Germany, Austria, the Czech Republic, Hungary, Slovakia, Poland and the Netherlands. In Germany and in many parts of continental Europe, RWE Energy's customers are able to obtain all energy and water services from a single source. With annual revenues of approx. €20 billion, RWE Energy is a first point of contact for all questions related to energy and water supply.

RWE has taken steps to align its sales organisation with the needs of its market and customers. Regional companies are responsible for the operative business of RWE Energy in Germany and abroad in order to enhance the capability to deal with local market challenges in an appropriate way. This means shorter decision paths, integrated concepts, and concentrated competencies with added efficiency.

The bundling of sales activities guarantees that the customers receive a comprehensive range of utility products and services and ensures that the integrated business model, ‘One face to the customer’ is strategically implemented and rigorously furthered, not only in Germany but also internationally. The structural streamlining leverages considerable synergy, making the company leaner, faster and closer to the customer locally.

1.6 Practical examples
Exemples pratiques

4.2.1 Integrated energy and water offerings of RWE Solutions and RWE Thames Water
Offres d'intégration de l'énergie et des eaux par la solution RWE et Thames Water
RWE offers, via its affiliate RWE Solutions, comprehensive infrastructure management for all steps of the value chain and over the entire lifecycle of industrial plants, including on-site electricity generation or water treatment as outsourcing concepts. This allows RWE Solutions' customers room to pursue their activities.

A recent example of energy–water integration is the multi-utility alliance of Diageo and RWE. The London-based company Diageo, established by the merger of Guinness and GrandMet six years ago, represents internationally known brands of spirits, e.g. Johnnie Walker, Smirnoff, J&B and Baileys, and beers, e.g. Guinness, Harp Lager, Beamish and Murphy. The most important and most popular beer type is without doubt Guinness Draught. The top-fermented beer with the distinct dark colour is produced in the Park Royal Brewery in the west part of the UK capital. This large-scale brewery, built in 1936 as the first Guinness brewery outside Ireland, exclusively supplies the UK market.

Park Royal has reduced its management cost and important parts of its production cost. As an additional measure, the utility supply is now being permanently optimised with an exemplary outsourcing approach. The aim is to roughly halve its energy consumption of 200 megajoules per hectolitre to a 'best in class' level of 100 MJ/hl, and to simultaneously reduce further the utility process cost. In pursuit of this aim, Diageo Great Britain concluded a 15-year multi-utility alliance with RWE which made RWE responsible for the total energy and media supply and the operation of the utility infrastructure on a contracting basis at Park Royal from 1 October 2002. This partnership, exactly tuned to the requirements of the customer, was initiated by RWE Solutions UK.

RWE Solutions supplies the brewery with the secondary raw materials steam, compressed air, treated water, nitrogen and carbon dioxide and disposes of the wastewater with the support of the sister company Thames Water. Special Service Level Agreements define the quality, quantity and availability of the required media. On the basis of the co-operation contract, RWE acquired all utility auxiliary installations and distribution systems on the site, including those for electricity, natural gas and water. The operating and maintenance personnel for these installations were made available by the Thames Water service subsidiary Engenica, which also took over the Park Royal personnel employed in the energy area. The primary raw materials, electricity and natural gas, are procured by RWE Solutions and supplied by the sister company Innogy. The water supply is from Thames Water, another business procured by RWE Solutions.

Diageo and RWE Solutions have recently concluded a second multi-utility alliance for the Great Northern Brewery in Dundalk (Eire). The Park Royal contract, previously unique in the UK industry, was adapted to suit the circumstances there and put into effect on 14 January 2003 for a period of 15 years.

4.2.3 Synergies between RWE Thames Water and RWE Innogy
Synergies de RWE Thames Water et RWE Innogy
RWE was able to increase potential synergies between its UK businesses RWE Innogy and RWE Thames Water. This lifted their earnings from the €50 million expected when the acquisition was planned to €80 million and then to a projected €100 million by 2006. The continued expansion of a shared service centre, which was set up at the beginning of 2003, was the main reason for the growth in synergy. IT, purchasing, human resources, finance and facility management were placed under the centre's supervision from the beginning. Its tasks have been expanded to include legal issues, auditing, insurance and environmental management.

RWE also plans to pool key back office functions for customer service with RWE Thames Water within npower, which is the subsidiary responsible for energy sales. By taking this step, RWE not only seeks to cut costs but also to tap additional cross-selling potential. Incidentally, background conditions for this are much more favourable in the UK than in Germany at present.

5. Summary and conclusions

Résumé et conclusions

In Germany, the integration of the energy and water business has been achieved over several decades on a local level by several hundred municipal utilities. Hence, the integration of energy and water is not new on a regional and local level. Nevertheless, utility companies acting on a national or international level have in most cases disregarded the energy–water nexus, because the advantages of energy–water integration seem to be less obvious at first glance. The assessment of the experience of RWE suggests that this judgement could be revised; delivering energy and water jointly can add value to larger companies also.

From a company perspective, the integration of energy and water businesses is combined with a number of advantages. Since energy is an input to water supply and water is an input to energy supply, the integration of energy and water means reduction of risk exposure, especially if one commodity plays a significant role in the overall production costs of the other commodity (e.g. energy costs in desalination). Another reason for integrating water and energy is the diversification of company businesses. Growth opportunities (because of dynamic markets) and stable income (because of regulation) in the water industry might offset both low growth rates in some energy markets in the developed world and the higher risks in a more deregulated and therefore more risky energy business. This strategy might lead to improved company growth perspectives and lower capital costs. The third reason for energy–water integration is synergies of energy and water activities. Cost savings (reduction of costs due to shared services), enhanced customer services (e.g. common branding, cross-selling) and integrated project management (e.g. combined desalination and energy projects) can provide higher efficiency and more value to customers.

Combined energy–water companies need to develop the energy–water nexus carefully in order to create additional value. Management resources, administration, organisational processes (e.g. planning and maintenance procedures and the handling of mass customers) and IT systems have to be integrated, especially on the distribution and sales level. Knowledge and best practice transfer from energy to water and vice versa needs to be organised in order to optimise processes and systems. Learning is essential in the energy and water industry as in all other industries. The approach to the customer must be streamlined and the concept of ‘One face to the customer’ introduced. Last but not least, a close regional focus for activities, even in an international context, should not be lost because operational synergies are the highest if network services for gas, electricity and water are combined and products are sold to the same customers in the same regional supply area.

Energy and water businesses are services with a good match provided that companies manage the energy–water connection efficiently and that the political and regulatory framework allows for energy–water integration on a company level. In this case, energy–water integration can be beneficial to both energy–water companies and customers and societies. Societies benefit *indirectly* from energy–water integration via better prospects and stabilisation of the industry. Secondly, and more important, societies benefit *directly* from energy–water integration because of the realisation of cost synergies and enhanced customer services. The same products

and services are supplied to consumers using lower inputs of material, workforce and natural resources. Politicians, customers and companies should think in partnership about the future prospects of integrated energy and water supply.

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