Opportunities and challenges arising from the transformation of the energy system from the point of view of the energy industry employees:

Is the transformation of energy industry jobs into “green jobs” succeeding?

How are the “traditional energy industry” jobs evolving in the transformation of the energy system? This is a key question for the some 200 000 employees in Germany. Starting from the identifiable trends of the transformation of the energy system, this article analyses the demand for jobs in the individual sectors of the energy value-added chain and announces the need for further research.

With the EU Internal Market Directives, politicians achieved the liberalisation of the formerly monopolised energy markets in Germany (1). Continuous job cuts in the German energy industry occurring between 1995 and 2005 were closely bound up with this. One in four jobs were lost during this ten-year period (see Table 1).

Table 1

Since 2005, the decline has eased off considerably – up to 2013 job losses came to a further four per cent or just under 9 000. The potential for rationalisation would appear to have been exhausted and in the meantime other priorities apply in the reorganisation of the energy industry. The Federal Government’s energy policy objectives of 2010 – before the events in Fukushima – clearly reflect these new priorities – the “greening” of the energy supply is to be completed by 2050.

For the remaining employees, the question arises of the future of their jobs in the context of the transformation of the energy system. If decentralised production supersedes central structures, if energy efficiency becomes ever more important so that less final energy is needed – won’t these effects necessarily lead to a reduction in employment in the traditional parts of the electricity, gas and district heating sectors?

And isn’t the writing already clearly on the wall: not least referring to the effects of the transformation of the energy system, RWE, e.on, Vattenfall and EnBW have presented

human resources plans which amount to five-digit job cuts in Germany. Is the consolidation of the level of employment in progress since 2005 therefore merely the “calm before the next storm”? Or is the reversal of the trend in sight: With the transformation of the energy system, won’t new jobs even be created? And calling for which skills? And in which undertakings?

Net job situation arising from the transformation of the energy system – state of research inadequate

A response seems promising from consideration of economic scenarios. Model simulations of the net job effects of an accelerated transformation of the energy system and their assignment to the individual economic sectors appear to be useful. In relation to the status quo (“do nothing scenario”), more ambitious scenarios for the implementation of the transformation of the energy system as a rule provide economic added value which also has a positive impact on the jobs trend over all economic sectors (3). The “bitter pill” for energy workers is that this increase in jobs for the most part occurs in categories outside the sector. “The positive impact on employment of an accelerated development of renewable energies (of up to 160 000 jobs after all in 2030 compared to the do nothing scenario) will occur first and foremost in the renewable energy sectors (i.e. production of the renewable energy plants, R.K.), although further jobs will also be created in some supplier industries, such as metal production and business-related services” (4).

But is the pill really so bitter for the employees in the energy industry? Part of the growth in jobs could nevertheless remain with the energy companies if they enter the fields of renewable energies and efficiency services? To answer these questions, the model calculations move within a too rough a grid admittedly determined by the statistical categories. For instance, in the accelerated expansion of energy efficiency by the year 2030 also investigated, approximately 130 000 additional jobs are recorded, notably in the fields of construction and business services (4). Employment in the statistically rigid unit “Energy and water supply”, on the other hand, explicitly declines by 3 000 to 4 000 jobs in the model only on account of increased energy efficiency – here the negative job effects arising from the corresponding decline in energy production and consumption are considered linearly.

It remains to be seen whether the developments within the energy companies are portrayed correctly by the statistical category “Energy and water supply”. This is in fact a very heterogeneous sector, distributed among the various stages of the value added chain: from production via grids to sales and energy services in direct contact with customers. From the statistical point of view, precisely those fields which benefit from the restructuring could be included **in the energy industry** here.

Attributing a “looser image” to the employees of the statistical unit “Energy and water supply” overall could even prove to be a hindrance to the transformation of the energy system if, namely on account of allegedly less promising career opportunities, highly qualified people turn their backs on the energy industry and are then not present to ensure the success of the transformation of the energy system.

New skills or additional skills – what does the transformation of the energy system need?

Another approach to the question of the fate of the energy industry jobs may promise to be more successful: it is a matter of determining the need for skills in a “green” energy future. Do the skills necessary in the future differ from those in the individual sectors of the traditional energy industry, and if so to what extent?

A study by the European Centre for the Development of Vocational Training (CEDEFOP) concluded: “Many of the skills needed for low-carbon jobs can be found in existing occupations. A balance of generic skills (for example autonomy and communication), generic green skills (such as reducing waste and improving energy and resource efficiency) and ‘topping up’ existing job-related skills is much more important to developing a low-carbon economy than more specialised, green skills.” (5)

By way of an example, CEDEFOP investigated a key occupation of the traditional energy industry, that of electronic and mechatronic technician. The conclusion is that after upskilling, workers with this training can in future also be employed in the new fields of work, for example as wind power service technicians.

Table 2:

Can the results be generalised? There is little empirical material available on this subject. Nevertheless, there are many arguments in favour of the following hypothesis: "The demand for skills will also change. This can already be expected because the sectoral structure of employment is changing and the skills needs differ in the sectors. Furthermore, there will be a change in the skills needs in the sectors most affected. Already on account of the high level of innovation in new energy technologies, it can be assumed that the skills needs will increase overall." (6) It must be considered that in general "sector-specific top-ups to traditional vocational training" will become necessary. And these are supplied at the highest quality by the traditional energy suppliers.

Transformation of the energy system – with the employees of the energy industry?

The question remains of the future employer. Following the relevant further training, will employees possibly be able to continue to operate within their acquired core skills but in the traditional energy industry too? This question is inextricably linked to the question of the role of the traditional energy companies in the transformation of the energy system.

As everyone knows, a great deal is still unclear regarding the course of the transformation of the energy system. Despite this, so much seems to have been established: it is not the replacement of the traditional production and distribution system with its companies by a brand new system with new corporate players based on renewable energies which is right at the top of the agenda of the transformation of the energy system, but rather, conversely, the incorporation in the system of the volatile renewable energies deriving from wind and photovoltaics, with their fundamentally different feed-in behaviour, is emerging as the key challenge of the transformation of the energy system (7). This means however that in the future too there is in all probability a need for the know-how and skills of the present energy suppliers and their employees.

Nevertheless, to what extent is still an open question. Further information is obtainable only from concrete consideration of the individual sectors and stages of the value-added chain.

Electricity generation

A key concern of the transformation of the energy system is the replacement of the traditional nuclear, coal-fired and gas-fired power plants by renewable energies. It is predominantly older power plants with a total output of 12 200 MW and a correspondingly larger workforce which will already leave the grid by 2018 (8). It is to be assumed that here the bloodletting will be considerable – it could be that a majority of the approximately 50 000 jobs still currently existing in the large power plants will be lost. It is true that conventional power plants will also continue to be needed in the future to even out the fluctuations in load caused by the volatile feed-in of renewable energies, but their number will probably fall further and they will be operated increasingly with gas as it is more flexible. However, gas-fired power plants specifically need fewer staff to operate than coal-fired power plants. Nevertheless, there are also contrary trends: cogeneration plants (CPs) are expected to increase in importance in the future, as decentralised balancing and control energy, but which at the same time can be used highly efficiently in the production of heating and cooling. The Federal Government target is not without reason to expand the share of CPs from the present 15% to 25% of electricity generation by 2020. It is not for nothing that the statistics record an increase in employment in recent years in the supply of heating and cooling energy (see Table 1), which is closely linked to CPs.

For the remaining staff in the power plants, there is a distinct increase in requirements with the new irregular operation. The necessary continuous control of output depending on the emergence of renewable energies requires precise knowledge not only of the load behaviour of their own power plant, but also of how the complementary renewable energies react. On top of this, there are additional tasks: for instance, a large number of power plant operators have already proceeded to transfer decisions on optimised power plant control to the operating staff, depending on the possibilities of prompt marketing in the case of volatile electricity prices. A corresponding demand for initial and further training should be considered in the energy companies' human resources plans.

And what about the renewable energies? Here is not the place to reproduce the discussion on gross and net effects of the production and marketing of the renewable energy plants (see disagreement between (9) and (10)). However, it is of interest for the question under examination that these detailed studies establish a large number of secure long-term jobs in

maintenance and operation of the decentralised renewable energy plants, with a rising trend. There were already 75 800 such jobs in 2011. (9) And here, according to the key example of electronic and mechatronic technicians referred to above, existing employees in traditional generation could definitely find new fields of work on a lasting basis after upskilling. Certainly outside the energy companies as well. Nevertheless, conversely, if the energy companies decide to invest in renewable energies, there is no reason for outsourcing as the know-how is often to be found in-house.

Electricity grids

The German electricity grid is currently 1.78 million kilometres long – of which 35 708 kilometres belong to the extra-high voltage grid, 76 279 kilometres to the high voltage grid, 507 210 kilometres to the medium-voltage grid and 1 164 012 kilometres to the low-voltage grid (11).

About half the electricity supply employees work in the grids, predominantly in maintenance and operation. Will this situation continue?

In the meantime, there is no doubt that the electricity grids are the bottleneck for the transformation of the energy system. The Federal network development plan 2014, which is currently in the process of being approved, provides in total for an increase in extra-high voltage cables of some 3 500 kilometres.

Under the transformation of the energy system, the distribution grids are also assigned new tasks; they must be developed in the short term for the connection of the renewable energies. And they have to be converted in the medium and long term into so-called “smart grids”, which are able to provide the necessary load reconciliation of a large number of different decentralised input sources in the context of virtual power plants. The study carried out by the German Energy Agency dena (12) has quantified the need for expansion (see Table 3).

Table 3

The rationalisation effects in the grid, associated with staff cuts, occurred mainly in the first years of regulation. They are largely exhausted. It is therefore to be assumed that for operation and maintenance of the additional grids, additional employment is also to be

generated accordingly. Among the transmission systems operators, this is already reflected in recruitment: for instance, the number of employees at Amprion rose between 2010 and 2012 by 50, to more than 900 now. (13). On the basis of the calculated need for new capacities by 2030, 8 000 to 10 000 additional jobs would be a plausible estimate. Added to this is the high innovation factor in the conversion of the grids. The average skills level could also rise if it is a matter of being able to carry out the conversion to “smart grids”, especially in the IT sector. It is therefore to be surmised that the need for initial and further training of employees will also grow in the future.

Sales and energy services

Energy services will play a far more important role than hitherto in the portfolio of the energy companies – as a supplement to the present retail sales activities, such as in Key-Account, which today already employs approximately 50 000 people. And the skills level could rise: anyone who, for example, in future processes offers of contracting services should, in addition to basic commercial skills, also master certain basic technical skills up to initial counselling on efficiency potential. The assumption here is that there could not only be a moderate increase in the number of employees, but above all that the likely requirements will also become more heterogeneous, with a trend towards additional skills.

There is also much to be said for assigning a decisive role to the sales departments of the energy companies in the implementation of the new design of the energy market (14). Also the charm of the present decentralised model of a capacity market (15) largely consists in it being possible for the management of the “secured capacities” essentially to be carried out by the sales departments of the energy companies. Here too, it is to be assumed that a large number of highly skilled jobs may be created if this model of the capacity market were to be achieved.

Conclusion

Due to the key requirement for the success of the transformation of the energy system of integrating the volatile renewable energies in the system, the jobs in traditional core sectors of the energy suppliers could even be increased in number and skills level. There is much to suggest that the requirements regarding employees’ skills will increase, because the

processes are becoming more complex and demanding. There is a need for comprehensive empirical investigations which examine these hypotheses in respect of all stages of the value-added chain.

Notes:

(1) Bontrup, Heinz-J., Ralf M. Marquardt: Kritisches Handbuch der deutschen Elektrizitätswirtschaft. Berlin, edition sigma, 2010.

(2) Destatis, Energie- und Wasserversorgung, Monatsbericht Beschäftigte, Wiesbaden 2014, www.destatis.de

(3) e.g. explicitly in Lehr, Ulrike, Christian Lutz and Philip Ulrich: Gesamtwirtschaftliche Effekte energie- und klimapolitischer Maßnahmen der Jahre 1995 bis 2011, UBA-FB 001670, 2012.

(4) Lehr, Ulrike, Christian Lutz and Martin Pehnt: *Volkswirtschaftliche Effekte der Energiewende: Erneuerbare Energien und Energieeffizienz,* Osnabrück, Heidelberg 2012, p. 7.

(5) CEDEFOP: Skills for green jobs. CEDEFOP Briefing note, July 2010, p.1.

(6) Blazejczak, Jürgen, Frauke G. Braun, Dietmar Edler and Wolf-Peter Schill: Ökonomische Chancen und Struktureffekte einer nachhaltigen Energieversorgung. In: DIW Wochenbericht 20/2011, *Chancen der Energiewende*, Berlin, p.15.

(7) Forum für Zukunftsenergien (Ed.): *Lösungsansätze zur Realisierung der Energiewende*. Berlin, 2013.

(8) Bundesnetzagentur (Federal Network Agency), List of Power Plants, 2014, www.bnetza.de

(9) O'Sullivan, Marlene, Dietmar Edler, Thomas Nieder, Thorsten Rüther, Ulrike Lehr and Frank Peter, Bruttobeschäftigung durch erneuerbare Energien in Deutschland im Jahr 2011 – eine erste Abschätzung. Stand: 14. März 2012. Research projects of the Federal Ministry for the Environment, Nature Conservation and Reactor Safety (0324052B).

(10) Institut der deutschen Wirtschaft Köln (IdW): Erneuerbare Energien – Nur scheinbar ein Beschäftigungswunder. Iwd No 35 of 1 September 2010.

(11) BDEW, Bundesverband der Energie- und Wasserwirtschaft: BDEW-Fakten: Deutsches Stromnetz ist 1,78 Millionen Kilometer lang. Press release of 22 March 2010. http://www.bdew.de

(12) German Energy Agency dena: dena-Verteilnetzstudie. Final report, 2012. http://www.dena.de.

(13) WAZ, 4.8.2012

(14) Noske, Harald: Strommarkt-Design - ein Blick zurück nach vorn. In: Forum für Zukunftsenergien (Ed.): *Lösungsansätze zur Realisierung der Energiewende*. Berlin, p. 137.

(15) enervis/BET/VKU: Ein zukunftsfähiges Energiemarktdesign für Deutschland. Sigillum-Verlag, 2013.

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