Rationalization of energy systems

My train of thought primarily includes individual aspects of rationalizing electric power supplying networks; however, the interdependence of these energy systems may also affect the system of gas supply.

A global or complex review of the electric energy system results in the following basic statements:

- The system input is production primarily performed in power stations irrespective of the power station's source of energy
- Connection between input and output is provided by the network
- Output is the consumer using the energy transported to the given location.

This classic model is logical but it only seems to be simple. It was an uncompensated system even at the time of its birth (its elements were only partially harmonized with each other), and this delicate (and unfortunately partial) balance has been expanded by further challenges in our age, the model structure has become more diversified, some elements have become better and more precise, yet some factors have occurred which are more difficult to handle than one would think.

One of the most exciting questions of energy production is the adjustment of alternative energy into the whole system, and the propagation of elements with great inertia. The co-existence and the ratio of these two greatly influence the predictability of the input side and its influence on the whole system, and it is not surely moving it in the positive direction.

Accordingly, the adaptability of the logistics system decays, the management and controlling of the system becomes more difficult, and it also has to adapt to the situation.

The system's stability is further impaired by the occurrence of micro-production on the customer side, producing the same effect – not per unit but on the whole – as the inflexibility of the meso- or macro-production.

There is a demand for solving the problem, it is continuously maintained by a basic question of electric power whether electricity cannot be stored or only in a limited amount, the energy produced and transported must be used in micro-seconds.

It is also apparent that there is a loss along the wires and other elements of the logistics system, increasing proportionally with the distance of transport. Electricity cannot be transported to immeasurable distances, and it is not worth it either.

There are gaps on the wall…

Let's inspect, including but not limited to, where those technical and economic restrictions are located in the system which prevent an optimum or near optimum system to provide electricity.

One of the greatest problems is that “common” production can only be taken into account in statistics, it affects production, economic plant size, the logistics system and even the consumer structure as all demands must be fulfilled in space and time. Actually, there are no halfway measures; everything is defined by the peak demand of the consumers…

This is not definitely economical; it is specifically expensive in many cases. Besides, it has unfavourable influence on the system control greatly deteriorating the total efficiency of the system. Let me highlight a few elements causing this or which may cause this:

- The changes in consumer demands in time are rather cyclic, which is not easy to track on the production side. This may have several reasons, but the most important ones are: the inflexible nature of the production system, special natural facilities. The inflexibility of the production system is a predictable, unfortunately necessary bad thing. One can do something against it, but the current political power is rather willing to take note of it than take any effective measures against it. Therefore, the system necessarily lives with it. Natural resources (e.g. sunshine) follow regular cycles not necessarily in step with demands, or it is stochastic (wind) which also does not follow demands, it has a “life of its own”. These two factors may partially compensate each other, however, practical experience shows that the system is rather willing to “swallow” overcapacity, i.e. finance the surplus. Germany declared that more than one fourth (26 %) of its energy production is produced from alternative energy sources, assuming that at least this amount of surplus of energy sources is maintained and financed, that is wasted.

- Energy strategy is a national issue, and the energy demand and energy source supply of the different countries is not identical. There are some social economies with determining energy dependence, in other countries there is a surplus, in a lot of cases international cooperation is a must both concerning energy sources and energy produced. However, this is not a simple or cheap solution, moreover, political aspects also strongly emerge – it is a delicate issue.

- Energy demand is neither uniform regionally, and the regional distribution of energy demand does not follow the regional shape of production, therefore, the logistics system also has to follow this, together with its additional elements.

- A new element the local micro-production of alternative energy sources occurred, the operation of which requires new technical solutions, and its technical-economical management is also a delicate issue from the aspect of both the service provider and the producer. It also affects the producer; therefore, it reacts on the structure of production and consumption as well. If it exceeds a certain limit of quantity it also induces quality changes.

- There are two crucial elements in the networks that is the internal resistance of the system and the inclination of electric power to transient phenomena, the management of which is also a complex issue to be solved.

These are all open questions waiting for a solution. There are known solutions but concerning their effectiveness and efficiency there is much room for improvement, so solutions more friendly for the user, more efficient, more effective need to and can be found than the current

one.

The purpose of the paper is to draw attention to a technical novelty which may be suitable of filling several gaps by solving a part of the issues.

The first and probably most important question is how to store electric power at least partially. There are several types of batteries and systems for this, however, the spread and use of these are greatly restricted by their economic efficiency with good effectiveness and elasticity the systems currently in operation are unsuitable or too expensive to work effectively and in a wide range.

The “partially” term is used as there is no need to store all the electric power produced by the existing systems. There is always consumption. At the same time, it is recommended to think about partial storage as these can help smoothen peaks and valleys, spatial cycles can be synchronized, and with a suitable storage device transient impulses may also be kept below critical values.

Finding a solution is a constant topic of research and development. At the moment one known system is working (in a restricted way), however, its price and efficiency is adverse. Besides, it uses highly dangerous materials.

The Blewin battery system is more favourable concerning both costs and technical parameters, however, the commercial production is not resolved yet, and the demands cannot be fulfilled on the whole on a small-scale level. Lead is thought to be dangerous as well, however, in this form and with the technical solutions applied this danger is reduced to a minimum in our case.

Based on measurement results the system, besides its low costs, is capable of storing specifically high energy density, and it also has some technical properties which offer a better solution than parameters continuously challenged in case of several current battery systems.

These are:

The Blewin system is based making the internal resistance of batteries the possible smallest, a value close to the optimal value. This can be achieved by optimizing the internal structural elements, from the selection of the suitable material to the new production technology, and this is the return for all these.

In detail:

- The battery cells are made up of pure lead manufactured using a custom technology more efficient than before, the number of grids built in each cell is optional according to the function. The mass holding capacity of the grids is outstanding, their optimized shape excludes local heating-up, and pure lead is an excellent attenuator, and due to its cleanliness it is resistant against intercrystalline corrosion.
- Custom cells allow for building batteries of optional voltage, the cells are connected outside the cells. Its economic efficiency is (also) supported by the fact that cells can be replaced, repaired.
- There is no surplus heating-up during charging-discharging, therefore there is no acid

fume emission.

What is its benefit?

- The most important change differing from everything previous is the increase in current density, which on the consumer side is manifested in extremely fast charging and discharging without load-sensibility. This results in unconventional parameters, but it also has secondary and tertiary returns as it has extreme transient-tolerance, it is insensible to extreme charging and discharging.

- Due to selecting the correct material it is insensible to internal corrosion, consequently, its lifetime is outstandingly long. Another positive effect to be mentioned of correct material selection is its extremely high recycling ratio, which also highlights it among the existing systems.

Batteries of the Blewing system offer a solution to partial storage of electricity, with an acceptable price-value ratio and satisfactory lifetime.

Besides, it can also provide such beneficial properties having a significant influence on the whole system which in case of batteries offered on the current technical level could not even occur as a demand.

How can it be utilized and set in a system?

- The simplest solution is the local storage of the energy produced. Irrespective of what facility the electric power was produced by (small wind power plant, solar panel, micro CHP) it can be stored and used “in-house”. The energy supply of a private home can be efficiently resolved using the Blewin battery system.

- Energy storage of micro-communities, and the energy storage of establishments can be implemented using a similar principle with a minimum integration intervention.

- Regional coordination is somewhat more complicated, but it can still be resolved. This presumes that the system input and output are definable and those technical and economic benefits can be defined which are provided by the coordinated system for both sides.

- A little bit different and closer, more complex coordination is required by integrating the previously mentioned levels into a complex system. It is unimaginable in practice without the active cooperation of the service providers. This is only a question of decision as the benefits included are apparent.

- It is perceptible that increasing the level of integration points towards the complex “smart grid” system, which can be well founded by the Blewin system.

Two sets of questions are outlining motivating the establishment of such systems:

- A uniform system of several Blewin batteries results in such a transient tolerance which has been unknown for the current networks.

- Charging cycles organized well and the discharge cycles “arranged” and coordinated with it can show significant smoothing during network loads, that is it has an effect as

a virtual spot-power plant was operating, the network capacity is better utilizable, extreme situations are avoidable. This appears at the consumer in a way that the installed storage capacity is not filled at the peak period on high price, but with more favourable conditions.

Those mentioned above relate to technical and economic benefits achievable by batteries installed stably.

What happens if a Blewin battery is put in a vehicle?

- There is no need to prove that it can work as a starter battery to start internal combustion engines as batteries manufactured with worse parameters and using much more outdated technology start engines perfectly…

- In order to have the voltage level in a vehicle leave the charm of 12V and to have a "more usable" (implicitly higher) voltage level in vehicles a change in attitude would be necessary. When it came into question before the incapacity of the industry torpedoed it. Now the opportunity is given.

- The question of driving is much more exciting irrespective of the design. Without providing an electrochemical or atomic explanation it can be admitted that today the principle "many a little makes a mickle" is working but neither its effectiveness nor its efficiency are satisfactory. Besides, the future of the technical solutions spreading today (actually, Li-ion batteries) is totally blurred, from a finite amount of raw material no products can be recycled, therefore it is definitely a dead-end.

  No wonder that today approximately 10% of the recyclable energy can be stored, which is a tragic level of efficiency. Furthermore, it is unduly complicated and expensive. Much more indices are achievable by adapting the Blewin system. Its spread should be taken into account as an essential element of recuperation systems.

Further special fields of use may also arise, primarily in case of emergency technology (emergency power supply, railway, airport safety mechanisms, etc.), and also military engineering can use Blewin basis as a foundation for valuable technological solutions.

However, it would be better if neither emergency, nor military use did not occur, but it remained the subject of peaceful and useful utilization…

There are steps to make and with the Blewin system we know in which direction and how.