# Educational Tasks of Logistics in the Knowledge-Based Economy

Jan Bujko
*The International University of Logistics and Transport in Wroclaw, Poland*

Ayite Senah Ajavon
*University of Lome, Togo*

The aim of the article is to present adaptation of logistics information technology to the state's needs in the knowledge based society. This subject is closely linked to energy management, which must include power generation development models in countries. The essence of the presented considerations is to trigger changes in the reconstruction of the energy infrastructure - activate the PROSUMER value chain.

**Keywords:** logistics education, knowledge based economy, energy management.

## 1. ADAPTATION OF LOGISTICS INFORMATION TECHNOLOGY TO THE STATE'S NEEDS IN THE KNOWLEDGE BASED SOCIETY

Including the rules of functioning in the knowledge based society into educational programs operating is the new educational challenge. The global economic crisis has revived the discussion about market mechanisms - a question if market mechanisms failed (the control function) was asked. Thomas Kuhn[1] showed that it was the countries that failed as they have not created good regulations for the functioning of the effective world economy. Development of science occurs as a revolution, not evolution. This fact must be taken into account in programs supporting logistics. One should expect frequent changes of PARADIGMS, that is the commonly accepted concepts and procedures. The role of the state is to create good regulations. IT services will continue to vigorously develop, which is evidenced by the decision of Microsoft to transfer its manufacturing process of computers to China (Lenovo). Energy is the nerve of the economy and an important carrier of economic information. The present generation has consumed more energy than had been previously used in the history of the entire mankind. This means the need for drastic savings of the used primary energy resources. In the competitive economy the mission of corporate energy will be replaced by government responsibility for pro-innovative development of the country and its protection against scenarios which do not fit to what the world is doing. Polish system of support for renewable energy is the most wasted in Europe [7]. Although this system is currently consuming not less than PLN 6 billion per year (about 80% is additionally paid by the recipient due to "green" certificates and 20% are various support programs financed from public funds), Poland has not yet practically done anything for the development of the distributed energy. The participants of the Economic Forum in Katowice have assessed that by 2020 the RES market may create in Poland the value of PLN 26 billion. Effective support of manufacturing facilities of the economy is the duty of logistics. Adapting education of students of logistics to the needs of the knowledge based society determines the direction of changes.

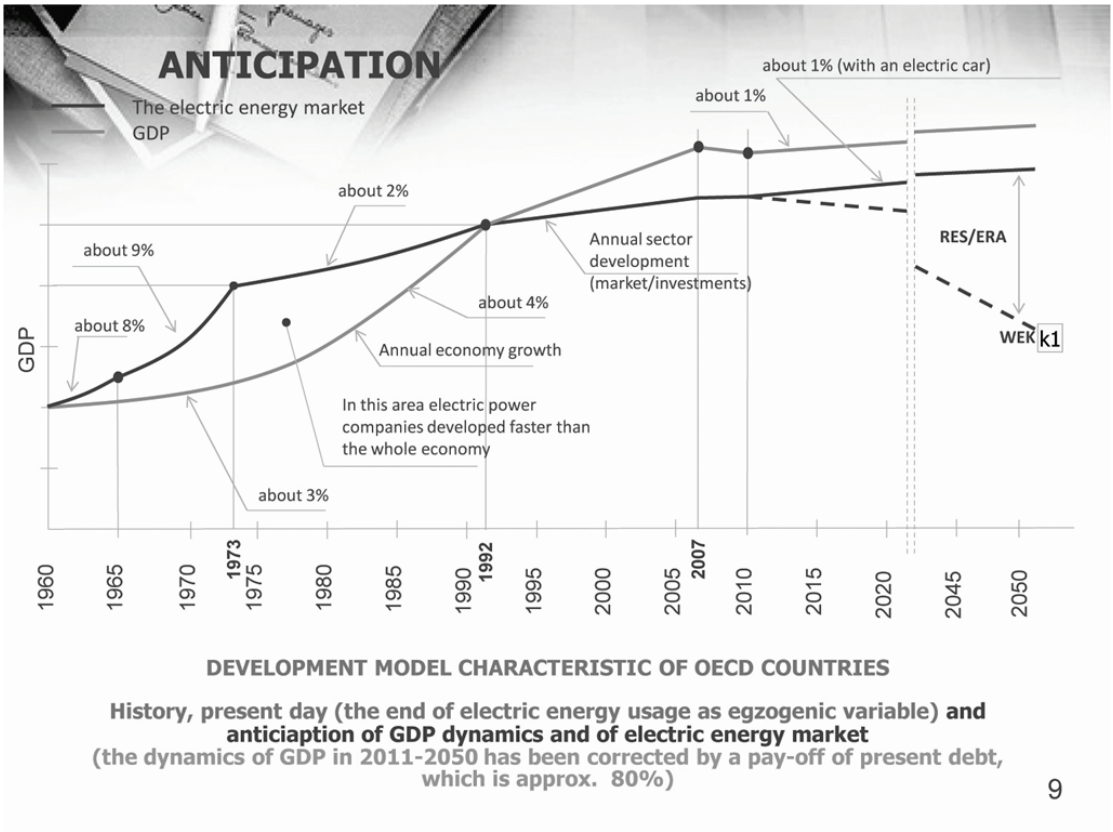
## 2. POWER GENERATION DEVELOPMENT MODEL IN THE OECD COUNTRIES

Countries are looking for modern sources of supply for their economies. The strategy in Germany assumes a reduction of its primary

[1] Thomas S. Kuhn Struktura rewolucji naukowych; publishing house ALETHEIA, Warszawa 2009.

energy market from fossil fuels by 50% and electricity market by 25% by the year 2050. Although energy consumption in Germany is lower than in Poland. In this situation if we want to improve competitiveness of our economy, we must apply radical regulatory mechanisms. An onerous remnant of the industrial model of energy functioning characteristic for the society are, not matching to the knowledge based society, political and corporate structures. Corporations demand that the state budget finance the investment needs not interfering with what the money is used for. The society cannot accept this because it will lose the competition. Moreover, in the knowledge based society more important than the manufacturing itself are the management mechanisms. The precondition for further civilization progress of societies is to accept the rational political idea. The support of such an idea depends on the level of public education. It is worth to present a historical review of the previously used technologies before pointing to directions of appropriate changes. For 100 years the consumption of electricity produced in power plants was the variable that explained the level of development of individual countries. In the modern world (based on knowledge), along with the new role of China, the most important explanatory (exogenous) variable is the number of people and the GDP.

Professor Jan Popczyk[2] pointed to the relationship between the current economic technology and social structures: state interventionism (characteristic for periods of large-scale technology development), corporationism (characteristic in periods of the formation of collective professional interests), subsidiarity (being the basic political system of the EU - supporting equal opportunities of regions) and liberalism (characteristic for periods of rapid increase of individual productivity of human labour). The presented picture shows the mechanism of a long-term erosion of the formula of public utility in infrastructural sectors. The dynamics of the growth of the demand for electricity in the years 1965 -1973 was 9% and the GDP growth was 3%. After the big blackout in the USA in 1965 enhanced investment programs were implemented; the growth in the energy sector was still significantly higher than the economic growth of about 3%; since 1973 until the end of the eighties of the last century (till the point of intersection of the power generation and economy growth curves), the dynamics of the development of power generation was reduced to about 1% at the maintained 4% growth dynamics of the economy. This was the result of allocation of




[2] Jan Popczyk, *Potrzeba otwarcia się energetyki na zmiany*. Energetyka Cieplna i Zawodowa no 6/2007.

economic resources taken from the supply side in power generation to the demand side represented by end users. The mechanism of reversal of the growth dynamics of the electricity market, i.e. its sales (demand) and the investments and the GDP is characteristic generally in infrastructural sectors. In the years 1973-1974, after the nuclear disaster at Three Mile Island, the stock market investors lost their confidence in power generation. There was a frantic search for innovative coal technologies. The Public Utility Regulatory Policies Act had already been in force. It was assumed that large-scale clean coal technologies had a great potential for innovation. However, it later turned out that the potential in the distributed energy, universalized - converged, was greater. The process of change of the development paradigm in the politicized energy must be considered not only in terms of a rational discourse but in terms of phenomena known in psychology.

## 3. ENSURING COMPETITIVENESS OF THE KNOWLEDGE-BASED ECONOMY

In the perspective: 2020-2030 (characteristic due to the solutions of the EU climate and energy package 3x20 - important from the point of view of the commercialization of clean coal technologies) and 2050 (necessary to be considered due to the U.S. (EU) political declarations concerning the construction of a hydrogen society - zero emission) will be clarified in a few years time. It will be decided by the results of the bailout for the U.S. economy in which the development of innovative energy, including doubling (just within three years) the production of energy from renewable sources, has the most fundamental importance. The ongoing economic crisis verifying American industry icons (Chrysler, General Motors) being the result of the biggest wave of innovation in history (late IXI century, early XX century) shows that it is not possible to maintain companies which are unable to permanently adapt to new conditions. The situation of power generation (in general) is from this point of view particularly difficult. The model of energy functioning adopted worldwide (large-scale manufacturing and mining (processing) technologies and network distribution and transmission systems) has caused the expansion of organizational structures and forms of management in the military direction. Currently, the range of innovation moves from the military to power generation area. Technologies, and especially the needs associated with the post-war reconstruction of economies were a technological continuation. The economies of scale have contributed, after the Second World War, fundamentally popularised the state interventionism: centralization in Italy, France and Great Britain.

The beginning of industrial civilization was the launched in the UK coal energy which have led to mining. The consequences of such a choice are still warning against long-term economic troubles arising from the adoption of a wrong strategy. British Coal which reached its peak in 1913 with annual mining amounting to 290 million tons of coal in 1920, employed 1.25 million employees. In 1985, when the mining industry still employed more than 220 thousand people, there was the world's heaviest strike, which was finally lost by the miners. Only then there was an effective, although extremely painful restructuring which lasted almost 10 years, involving privatization and full transformation into market oriented economy of mining in Britain. Great Britain started the movement in the entire Europe. (Poland, unfortunately, still has a large part of such restructuring ahead of it.) Currently, we are witnessing another aggressive struggle for fixation (stagnation) of mining, although innovative - better for the economy technologies are a strategic direction. They should be more forcefully exposed in a public discussion.

For 100 years consumption of electricity produced in power plants was the variable that explained the level of development of individual countries. In the modern world (knowledge based), with the new role of China, we should be guided by the needs of the knowledge based society and this is the course of education we need to develop. To properly analyze economic mechanisms a full internalisation of costs is necessary. The scale of the difficulties associated with it is not yet fully known to the world. An example is the internalization implemented in the UK, which resulted in bankruptcy of the company Nuclear Electric (2002).

Invention of a steam engine (Thomas Newcomen, James Watt) has increased individual (and social) performance in a step manner. This was the direct cause of birth of economic liberalism (individualism) and at the same time of modern economics. The turn of the XIX and XX centuries saw the career of oil and electricity which completely changed the way of functioning of the man and societies. The next stage of the progress was caused by military and war economy (this property is important if we consider that currently

the range of innovation is transferred from the military to energy area). Technologies used during this time and the needs associated with the post-war reconstruction of economies (economies of scale) have substantially accelerated the career of state intervention. Centralization in Italy, France and Great Britain can be an example. The next stage of development includes both nuclear power and theoretical basis of computerization (Alan Turing). This initiated computer and Internet innovation and the development of manufacturing technologies in the energy sector. We have entered the era of knowledge. In Europe increased the importance of subsidiarity (accession to the European Communities of such countries as Great Britain, Denmark, Ireland, Greece, Spain, Portugal, Austria, Finland, Sweden). The World Wide Web created by Tim Berners -Lee (1989) and the following evolutionary expansion of its functions, such as e-mail, opened the Internet revolution (1980). This was associated with the need to improve communication in a big research project involving thousands of scientists, conducted at the European Laboratory for Particle Physics in Geneva - CERN); New information technology has dramatically accelerated business processes (contracting and settlement of transactions).

## 4. NUCLEAR DILEMMAS

A recent decision of the Polish government on preparations for the construction of two nuclear power plants in Poland requires a comment. At a time when the world is preoccupied with an ongoing discussion about the dangers of nuclear power our government is taking a costly decision on preparations for the construction of power plants which will probably never gain financing from banking institutions. Budget financing is also excluded due to the EU regulations. The future will show. A more serious is the fact that the available technology is outdated and it means that we are going to repeat the mistake with the open-hearth pig iron technology at the construction of Huta Katowice. Explanation of the problem is generally known, so I return to the primary explanation. In the early 50's the choice of uranium was deliberately forced, which was more useful for military purposes [4], instead of, for example, thorium, more widely available in the environment and so cheaper and safer for exploitation - useless for terrorists and leaving no nuclear waste (half-life is approximately 14 billion years). The creator of the most commonly used Boiling Water Reactor, before he was fired from work (by President Nixon), argued (1973) that the thorium reactor technology is the future of the world. Currently, China is going to develop this technology - become the global leader of this technology by 2025. Hydrogen technology program in the United States is beginning to bring significant commercial results. NASA is manufacturing a series of several power generators with the capacity of 2MW based on the principle of low-temperature nuclear fusion. It seems that lack of a wide-ranging, competent discussion is the result of organized at the highest authority levels lobbying activities. The public should be informed about alternative possibilities to solve the energy problem for the benefit of national economy.

## 5. DEVELOPMENT OF THE GMINA (POLISH EQUIVALENT TO BOROUGH) ENERGY (BIOGAS)

**Agriculture in its history has not yet had such a chance of a qualitative leap [3].** The main driver of such changes is the development of manufacturing technologies and use of agricultural raw materials, including agricultural waste, for energy purposes. The revolution in agriculture is being carried out, and the sooner we join the European and global trend of these changes, the faster we will become the beneficiaries of these changes. In the post-industrial society (information, knowledge based) the monopoly of the man for the routine intelligence is taken over by the computer, important is the creativity oriented towards individualized human needs - quality of life and social awareness through political programs is focused on sustainable development, including that relating to agriculture and energy sectors. We are living in the times of great changes caused mainly by rapid development of information technology and continuous "energy" innovations [5]. What has already been accomplished in the field of renewable energy and pro-environmental activities - new energy generation technologies - in particular the use of biomass. So the revolution in agriculture seems to be the natural result of the energy generation revolution and the **biomass is likely to become the main XXI century source of energy**. The world leader in the development of renewable energy technologies is Germany, Denmark, Sweden, Japan and the USA but today China is becoming the market leader offering ready technologies developed by the mentioned countries. Biomass in

the structure of the use of energy from renewable sources now constitutes nearly 80%. Today the co-firing of biomass with fossil fuels is a cynical environmental fraud with simultaneous considerable financial support (pseudo-green-pseudo-certificates). Energy in any form (heat, electricity, cooling, transport fuel) is needed for life just like oxygen. According to the created energy policy, development of nuclear energy has been promoted for decades. But does it has to be so? Of course, energy security must be guaranteed, but with the energy produced **locally and used locally**. Civilization transformations have introduced the term PROSUMER. Although it is a universal term referring to any type of business activity, as regards the essence of the debate on the revolution in agriculture, this is an essential term whose implementation should be seen as an evolutionary process, requiring, however, changes in thinking (revolutionary) and, consequently, transformations in the energy sphere (evolutionary). Local manufacturing and use of energy should be a natural stimulator of the development of rural areas and as a consequence continuous improvement of the quality of life of rural communities. The rural gmina (Polish equivalent to *borough*) can manufacture energy (fuel) from biomass (in combination with other renewable energy sources) in the amount to provide for their own needs: the residents remaining under the responsibility of local public sphere governments units as also local companies, and also bringing measurable income to local manufacturers of energy (such a manufacturer of energy may even be a family farm). The gmina (Polish equivalent to *borough*) may have and administer its own (micro) power grids and implemented energy conservation systems. Today the mentioned items are becoming more and more common in countries such as Denmark (pattern of distributed energy sources with the central energy centres absorbing potential local supply constraints), Sweden (rationality of the energy use of biomass waste, including agricultural and food industry. Biogas becomes the primary municipal transport fuel, Germany (agricultural biogas, community power grids and local management) or Austria (agricultural biogas with cogeneration units implemented in the national energy system). Such an autonomous energy cell may be a part of a larger system, regional, macro-regional, national, continental and global. Every piece of information may be immediately forwarded to any place on Earth. **Energy, analogous to information, may be transformed into various forms of energy and transferred**. So local production and consumption of energy as part of a local network integrated with a power generation system is a rational way to develop energetically self-sufficient local communities. If we assume such a scenario of energy policy in our country (which today is dramatically different - as in fact it generates extreme energy dependence and as a consequence "energetic" social passivity of rural areas), agro-energy complexes should become the component of such a policy. Agro-energy complexes as an example of distributed cogeneration based on local and renewable energy sources" identify the energy function of agriculture. Implemented in rural areas they do not pose a threat to ecosystems, however, they provide the foundation for improving the quality of life for present and future generations, which in turn is a part of social objectives of sustainable development. Energy from biomass produced locally does not interfere with the production of agricultural raw materials for the purposes of fodder and food and in confrontation with the energetic use of fossil fuels it brings clearly positive benefits: (1) manufacture of energy fuels stimulates rural development, (2) sustainable agricultural economy with an extended spectrum of the plants grown allows to maintain biodiversity and increase agricultural income, (3) zero greenhouse gases emission balance means that the emission of such gases is environmentally neutral, (4) local energetic self-sufficiency is the guarantee of uninterrupted energy supply and ensures energy security. Creation of agro-systems promotes the creation of tens of thousands of new jobs in the local economy market.

## 6. REQUIREMENTS OF THE EU TOWARDS LOCAL SELF-GOVERNMENTS

Currently the parliament are finishing work on the amendment of the "Energy Law" that will define the requirements towards the gmina self-government as defined in the Act of 8 March 1990 on Local Government. The catalogue of the gmina's tasks provides [6] for the obligation to **"supply electricity, heat and gas..."** Unfortunately, local governments are more comfortable with using the competence of subordinate enterprises, thus limiting the sovereignty and economic development of their regions. A well known, funded by a consortium of gminas and business enterprises, Energy

Programme for Wrocław unfortunately has not been systematically developed and the initiative has been wasted. **An inevitable, in the near future, structural reconstruction of the end markets of electricity, heat and transport fuels** will take place under the influence of two technologies: heat pump and electric car and will be supported very strongly by the existing EU regulations, and in particular by the Directive 2009/28/EC. The reconstruction will increase the demand for electricity from renewable sources.

## 7. CONCLUSIONS

The essence of the presented considerations is to trigger changes in the reconstruction of the energy infrastructure - activate the PROSUMER value chain. We should not ignore the example of reconstruction of the power industry in Germany - ENERIEWENDE.

## REFERENCES

[1] Bujko J., Radzio I., Tabaka J.: The Tasks and structure of the CENTREL – UCPTE Energy Accounting and Control Centre (EACC) In Warsaw. 1998 Session Papers, 39 Group- Power System Operation and Control, 37th CIGRE Session, Paris 30.08-5.09 1998.

[2] Bujko J., Malko J., Weron A., Weron R.: Electricity market and tools for financial risk management In Poland. A case study. CIGRE 2000. Paris.

[3] Prof. **Janusz Gołaszewski1** Centrum Badań Energii Odnawialnej Uniwersytetu Warmińsko-Mazurskiego w Olsztynie janusz.golaszewski@uwm.edu.pl

[4] Prof. Egil Lillestol – badacz związany z CERN (Europejską Organizacją Badań Jądrowych), emerytowany profesor fizyki University of Bergen w Norwegii, specjalizuje się w nowych technologiach jądrowych, m.in. z użyciem toru.

[5] Prof. Toepler Klaus, Dyrektor Instytutu Zrównoważonego rozwoju w Poczdamie;

[6] Kasprzyk B., Prawo energetyczne w gminie, Termedia Poznań 2004;

[7] Popczyk J., Nowa Struktura technologiczna inwestycji energetycznych, Rynek Energii 2011/1;

**Jan Bujko**
**The International University of Logistics and Transport in Wroclaw, Poland**
**jan@bujko.pl**