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**Energy for tomorrow**

Perspectives of the transition to a post-fossil economy

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## **Energy is a question of regulative ethics**

The intercourse with energy imprints the development of the energy and of the society. It therefore is not only a technical economic question, but also a question of policy and of regulative ethics. A la longue justice and prosperity can only be secured if the carbon based metabolism of the industrial societies will change drastically. Thus the standard of progress is displaced: In future it will be measured essentially by the improvement of the CO<sub>2</sub> balance sheet and by new ways of the intercourse with energy.

The surveyor's pole is high: If it is supposed that the energy hunger will have doubled globally until 2050 and by reason of protecting the climate the emission of CO<sub>2</sub> should be reduced by at least 80% the reduction want would be around the factor 10.

Here the protection of the climate can enter a future-resistant alliance with economic thought. For the dawn of the fossil era has already begun. "The time of cheap and abundant energy comes to the end. It is the beginning of the transition of the fossil era to a post-fossil age, a transition which will be in the same measure fundamental and decisive as it was the by fossils imprinted industrial revolution of about more than 200 years ago".<sup>1</sup> The change to the solar energy and resources basis will have pioneering importance for the future safety of the world society whose effects in depth, breadth and distance will only be comparable with the importance of the industrial revolution.<sup>2</sup> Only an economic globalization based on solar energy will be ecologically resistant. There exists, however, an important problem of transition: The introduction of regenerative energies does not keep pace with the growing demand of energy throughout the world. The difference between the utilization of regenerative and fossil energy is growing in favour of the latter.

But for the mankind, particularly for the development of the countries of the Global South, the fossil civilization model is an energetic impasse, out of which only one path exists: the linking of social and technical innovations or a permanent development with clear priority of regenerative energies.<sup>3</sup> But it must be kept in mind that the isolated exchange of certain components of the fossil energy structure by regenerative energies does not suffice because these ones need other structures and developments of civilization. The provisioning of energy therefore never is purely or primarily an ecological matter, but a fundamental structural question with considerable consequences for development and prosperity.

By virtue of the various contexts of provisioning with energy, overcoming of poverty and of safety the energy issue is a first-class challenge also for Christian social ethics. It is today a determining area of activity of global justice. The Encyclical *Caritas in veritate* here urgently appeals for growing efficiency in

dealing with energy, for the development of regenerative energies and for the improved access of poor countries to energy (no. 49). Shall these impulses become effective, they must be developed on the level of regulative ethics.

Within the ethical political discussion of the question of energy there are three determining justifiable approaches and objectives: 1. Protection of the climate and of the environment, 2. safety of provisioning and avoidance of political dependencies, 3. long-term advantages of competition and cost. Despite much overlapping there exists between these three aspects a tension which actually seems to be unsolvable and results in different priorities. Therefore a consistent weighting, classification, linking and demarcation of the different aspects and areas of activity is an original task, in order to confer safety of orientation to the many actors in their respective weighting processes of decisions concerning energy-technique. Safety of provisioning, profitability and compliance with the environment can be defined as the triangle of a persistent energy policy aimed at.

Up to now energy and raw material are dealt with in business economics only as a problem of cost. They are regarded as being in principle available and reduced to a question of price or dealt with as a problem of specialists of ecological technique. By tradition only labour and capital are looked at as structurally important factors. Today this is no longer considered as an appropriate theoretic model. For the decision for a defined basis of resources is under the structural aspect to the same degree determining for the economic and social development like the distribution of labour and capital. Because of the close relationship between energy provisioning and social structures the energy issue is not only a mission for ecological and technical specialists but of regulative political steering. Finally the high unemployment will not be overwhelmed without a change of energy provisioning. For cheap energy does not charge the climate, but will result incessantly in replacing handicraft by machines. Moreover, the unilateral charging of labour compared with the energy and resources factor favours production in masse and the mentality of jettison.

Due to the dependencies politically difficult to calculate and to the danger of not foreseeable external shocks the energy prices on the world market are jumping. The consequence thereof is that adaptations via market signals for the very important and long-term investments necessary in the area of energy techniques do not function sufficiently under the aspects of business economy. Security of provisioning requires political framework instructions. This applies especially with regard to the brakeless energy hunger of the Asian states. Positively said: technological leadership in the energy market becomes more and more the decisive factor of competitive advantages and export chances. At the same time innovative energy technique is a contribution to the safety and peace policy, because it reduces the dependency upon the gas and oil exporting countries. In

order to link efficiently strategies of climate protection, provisioning safety and competitive capacity it is not sufficient to await the progress of international agreements; the dynamics must proceed from a consistent energy policy of the national states.

### **Epochal change for a post-fossil prosperity model**

There are three potential strategies for the change of the energy provisioning: 1. Substitution of fossil energies by regenerative energy sources. 2. Growing efficiency by technical innovations and structural changes, 3. Change of the consumption model and value preferences especially in the global upper and middle class to the benefit of prosperity models with light resources. Sufficient alterations can only be achieved if all three dimensions are simultaneously started and if synergies are consequently used as it is shown in the following with above all the example of generation and consumption of current. For this sector is especially apt to illustrate synergy possibilities, reciprocal blockades and far-reaching social effects of structural decisions in the energy area.

#### *Change of perspectives for efficiency strategies orientated towards application*

The EU urges to reduce until 2020 the emission of greenhouse gas by at least 30% as compared with 1990. As a contribution thereto the coalition Treaty of the German Federal Government provides for doubling until 2020 the energy productivity as compared with 1990. Such signals from Europe would be decisive for the process of forming consensus on the global level. In the long-term view, however, this is only the entry into more far-reaching innovation requirements.

Though there are good reasons to give priority to strategies orientated towards efficiency: The importance of their potential contribution to resolve the climate and energy problem is estimated to about 40%<sup>4</sup>. The required expenditure with regard to the economic cost, to the research want as well as to the political conflict potential is according to actual knowledge clearly lesser than with regenerative energies or big technical solutions. Considering the earth-historical dimensions which are perceived in the change of climate, we need a revolutionary increase of the energy efficiency for mobility, heating of buildings, consumable goods and manufacturing processes. The possibilities are manifold: heat restraint with buildings, consequent use of departing heat with water and consumed room air, more efficient internal combustion engines, development of light motor cars, realimentation of break energy, substitution or recycling of energy intense raw material, as well as energetic discharge through biotechnological production of raw materials.

The efficiency in the application of energy was up to now hardly perceived as a business area for bidding enterprises or as cost advantage for consumers. The

struggle for the technological leadership is imprinted by a concentration of the starting points and the financial resources on the side of the bidders, whilst the grandees who reduce the want of energy are scarcely pursued in the area of innovation policy. But just here exist possibilities at especially favourable cost and sparing resources<sup>5</sup>. Reasons for the negligence are amongst others the big number of actors and the intransparent multitude of measures which, each taken as single, have small results. This seduces to “small part” solutions which under political and economic aspects are not considered as being serious. There are, however, indicators of the potentials in this area, if the measures are linked, the barriers of communication are overwhelmed and routines of decision, priorities as well as preferences are adapted accordingly. The discovery of lucrative solutions in efficiency needs a combination of technical, entrepreneurial and social innovation as well as of modified user customs. This complex scope of interdisciplinary energy research has been neglected in Germany for a long time. Despite a clear increase in the past years France and Japan, for example, spend, compared with the gross inland product, the double respectively the threefold amount.

#### *Substitution of fossil energies by regenerative energies*

With regard to the regenerative generation of current Europe stands actually at the separation point of the development. There is the choice between on the one hand the so-called island solution and on the other hand a high technical compound project under the name of Desertec as headline.

The generation and utilization of current by means of solar and wind energy can be achieved independently from the net or in small nets, as it is shown by pocket calculators as well as by projects within the development cooperation (for instance the Solar Home System which supports the Grameen Bank by Yumus, winner of the Nobel Price for Peace). The advantages are obvious: technique adapted to the specified features of the location and the consumers which can be introduced subsequently, low cost because the high building and maintenance expenses for the high tension nets and the considerable circuit faults are suppressed, independence because the hitherto existing oligopoly of the big public utilities is breaking.

As counter-model is proposed the model “super smart grid”, including Europe, North Africa and the Near East. Because always anywhere the sun is shining (but above all in Southern Europe and in North Africa) or because the wind is blowing (above all on the coasts) and because always anywhere current is consumed, a big and “intelligent” compound system can despite all fluctuations always reliably bring together offer and demand. Operated would be above all high technique solutions such as wind parks and solar thermic power-stations

which must be connected with new high tension circuits. – The collateral effects with regard to the development policy for North Africa could be important.

Independent from the decision to be taken which actually rather tends to the second approach it is important to stronger develop forgotten traditions (for instance a construction style typical for the climate and thus for the region) and the today often improved technical possibilities to directly use solar technique (for example glass techniques). As in the area of room-heating waste is especially high, houses with low or passive energy consumption are very important<sup>6</sup>.

The chance of regenerative energies consists in integrated strategies of use, for example by the combination of wind power-stations and biogas-stations which in the case of calm start automatically. Regenerative energies have potentially an advantage of profitability, because their chain of use is considerably shorter. But in order that the regenerative energy techniques become profitable a quality jump in the energy storage is particularly necessary, so that fluctuations of energy generation can be balanced, but also to become independent – from the net – according to the respective concept. It therefore is deplorable that during decades the storage technologies have been neglected. More or less rapidly the following concepts above all could be developed to market maturity: electro-chemical (for example accumulators of lead acid), electro-static (supercondensers), electro-mechanic (flywheels, compressed air), electro-dynamic (superconductive magnets), chemical (hydrogen) or thermic (hot-water tanks, magnesium hydride). Besides therefore are discussed actually pumped storage power stations in a very controversial manner, because they represent a grave interference into the nature.

### *Sufficiency*

The substitution strategy must be accompanied by a sufficiency motion in order to reduce energy consumption as a whole. Models of sufficiency are often connoted in a negative manner. Their efforts to achieve a possible low consumption of raw materials and energy are sometimes only misinterpreted as renunciation of consumption, self-restriction or asceticism. But many empiric proofs from different European countries show that they must in no way result in such consequences, but with regard to employment and to many indicators of living quality they offer more favourable conditions than undifferentiated models of growth<sup>7</sup>. The objective “energy sparing” is a most interesting area of innovation for the economy. As the revenue was reached up to now in a supraproportional measure by increasing turnover, a sufficiency model requires also structural reforms in order to exhaust all potentials of attractiveness.

Moreover, sufficiency requires the development of a new consciousness of responsibility of the consumers as also of the producers who with their products

and their publicity clearly influence the behaviour of the buyers and thus a progressive change of the values, of the products and the entrepreneurial strategies as well as of the styles of living. Finally is concerned the definition and the organization of a new ecological prosperity model. Here also the cooperation of the churches is intensely requested. The biggest sparing potentials result today from room-heating and from the organization of the mobility.

### **Where does conduct the “bridge” nuclear energy?**

On 28<sup>th</sup> October 2010 the German parliament has decided with the majority of CDU/CSU and FDP that the working time of the seven nuclear power-stations built before 1980 is lengthened by 8 years and the working time of the remaining ten nuclear power-stations by 14 years. On 8<sup>th</sup> December 2010 the Federal President has signed the corresponding modification of the atom law. But the lengthening of the working time of the nuclear power-stations is a high political risk. Already in its approaches it has resulted in a revitalization of the anti-nuclear power motion and is rejected by the majority of the Germans according to inquiries. The breach of the atomic consensus as anchored legally in the atom law 2002 endangers the trust in the reliability of politics and its independence upon the lobbyism. Due to the fact that on 28<sup>th</sup> February 2011 five federal states have brought an action against this legal amendment with the Federal Constitutional Court the business enterprises lose the safety planning which is especially important in the energy sector.

There are however arguments, to be taken serious, for the orientation change within nuclear policy: protection of climate, socially and economically convenient energy prices and lower dependence upon foreign countries. Moreover, already the coalition treaty refers to high standards of safety of the existing nuclear power-stations as well as to the nuclear merger (fusion) as a “new environment-friendly and safe energy source” which has to be opened by research (p. 34). For each of these arguments exist different perspectives and opinions which are discussed hereafter.

#### *Nuclear energy does not contribute efficiently to the protection of the climate*

Of decisive importance is the question which contribution nuclear energy can render to the protection of the climate. Today 16% of the worldwide current generation originate from nuclear power-stations<sup>8</sup>. Since 2002 the portion of nuclear energy in current provisioning decreases throughout the world and will be further reduced in the future decades solely because of the long period of planning and construction. Therefore, alone by quantitative reasons nuclear energy cannot render a decisive contribution to the global CO<sub>2</sub> reduction. Moreover, it is often ignored that nuclear energy is not at all exempted from

CO<sub>2</sub>: in the so-called foregoing chain, in generating uranium, transportation as well as in construction and decomposition of the power-stations are produced considerable emissions.

Thus there does not exist – as many people think – a worldwide “renaissance of the nuclear energy”, but only a renaissance of the discussion of the nuclear energy. According to the “World Policy Statement of the Nuclear Industry 2009” there is worldwide want of production capacities, technical staff and capital so that in the next years and decades must be taken into account a clear reduction of nuclear energy which can only be delayed or bridged by massive lengthening of the working time of the power-stations<sup>9</sup>.

The extent of the reserves of uranium is discussed controversially. A prognostic analysis of 2009 estimates a statistic extent of 50 years. For the merging energy (fusion energy/power) in which the coalition treaty sets so many hopes, up to now new ecological and technically convenient perspectives do not exist. Its favouring includes the danger that resources are withdrawn from research and from the introduction of regenerative energy techniques, and thus necessary permanent structural modifications are excluded.

#### *Safety of provisioning and profitability*

Safety of energetic provisioning is a high social good. Hereto nuclear energy renders a contribution. Under this aspect the German Energy Agency (dena) warns without nuclear energy a current gap of about 16 gig watt is to await for 2020. This prognosis is however contested. In the first place it is decisive how the consumption of current will further develop, if it increases, as dena assumes, or if the consumption is reduced as it is hoped and requested be reasons of protection of climate. Secondly much will depend upon the quickness with which the development of the power-heat cogeneration and the regenerative energy will progress. If one unfavourably assumes a further want of current there will be the risk that our society due the high dependence upon energy will be manoeuvred into a provisioning crisis. Then nuclear energy appears to be the smaller evil. It is however also the ethical-political mission to avoid such dilemma in looking forward.

The question of costs of the nuclear energy – their calculation fluctuates between a few cents and 2 Euro per kilowatt-hour – is above all a question how to include the foregoing investments of research, the various costs of safety and the subsequent costs of removal. In the past such costs have been largely carried by the state, as the provisioning with energy was considered as public mission. With regard to the investments of research and marketing of regenerative energies and techniques of energy sparing Germany has in the last decade recovered in many respects, for example the Law on Regenerative Energies (EEG) which finds worldwide imitation – but Germany is still far remote from

supporting the history of nuclear energy at the same degree. As regards justice between the different energy systems already nowadays an increase of the coverage total of the liability insurance of nuclear power-stations to a total appropriate to a potential damage is ethically indispensable. This should become effective internationally because also the neighbouring countries would be hit by a reactor explosion. This proposal is a liberal solution which gives the producers and the clients freedom of choice but internalizes the costs and therefore says the truth.

### *Valuations of nuclear energy in ecclesial view*

The critical consideration of nuclear energy has a strong tradition in the Christian churches: Thus the Synod of the Evangelical Church in Germany (EKD) has taken on 4<sup>th</sup> November 1987, under the influence of Tschernobyl, the resolution: “The not safely controllable danger of the actual generation of nuclear energy is not compatible with the biblical mission to build and to conserve the earth”. An expert text of the German Episcopal Conference states somewhat more prudently, but finally also critically: “It is to be doubted if the nuclear energy is a continuously supportable solution (for the climate problem), because the stocks of uranium must also be imported and are limited, but above all because nuclear energy is linked with serious risks and with not resolved subsequent problems (amongst others for the interim and the final storage), problems which by reason of justice between the generations cannot simply be charged to the forthcoming generations. It violates the principles of provisioning and of proportionality”<sup>10</sup>. Nuclear energy appears at present attractive above all because its presumed renaissance diverts from the deeper located challenge of a transformation of the prosperity model.

The big hopes on nuclear energy are largely disenchanted. It is necessary to terminate with nuclear energy. By reason of the predominant urgency of the climate problem the termination should, however, not be compensated by the construction of carbon power-stations. This proceeds from the ethical responsibility rule of minimizing negative collateral effects. The ending of nuclear energy must become the entrance into a permanent provisioning of energy. Due to the lane dependence of developments the lengthening of the working time of existing nuclear power-stations makes difficult the reconstruction of the energy market. But if one uses the in this way gained financial margins in fact for an investment impulse in favour of the reconstruction of the energy system and for overwhelming old front positions, Germany will have excellent chances to become worldwide a pioneer of a climate convenient adaptation of the energetic metabolism of the society.

## **Areas of activity within energy policy**

Only if we as a whole consume less energy the portion of fossil energies in the energy mix will sink in a reasonable space of time. Therefore energy sparing must have structural priority against measures protecting the climate taken by the producers. The chances of separating the economic development from the growing energy consumption are – under technical aspects – good. But up to now the separation does not succeed sufficiently, because the discharges are largely compensated by a continuously growing of the turnover as well as of the level of demand. The growing want of consumption and mobility does not show any aspect of saturation and pushes energy consumption upwards. Therefore the disposition of human beings in the well developed economies to cooperate by their demand and by their personal life style, by their consumption model and value orientation to the realization of energy policy, is today a decisive area of practicing global justice. The offer of goods and services is long since so differentiated that every citizen can daily take decisions which encourage the transition to a post-fossil prosperity model. The consumer behaviour is “policy with the shopping basket” and millionfold voting on that what is produced and how it is produced.

For the time being the energy efficiency concerning consumption and decisions is rather a criterion of second order. Thus for example an electric apparatus bought today consumes, as an average, 32% more energy than economical models with the same function. Here better client information through understandable trademarks, legal instructions (Japanese top-runner model) as well as financial incentives for bidders of efficient energy services could bring motion in the market. The common use of goods (for example car-sharing) can discharge the environment and the portemonnaie. Contracting models are also a proved instrument for opening up systematically sparing as business area. Sometimes sparing is a lucrative source of energy. Permanent sparing is not a luxury for better times, but a question of reason and of quality consciousness. Many products are manufactured by using considerable resources and energy, but often have only a short useful life, because in the case of damages repairing is very expensive. As described above, this enormous waste has its structural cause in the unilateral division of the factoring costs between labour, capital and energy.

In Germany 31% of the final energy consumption are wanted for room-heating, two thirds of which for private households. The for new constructions prescribed low energy houses spare up to 30% as compared with the average heat consumption in old buildings. The rate of the energetic optimization in the case of restoration of old buildings is low (about 30%). After market usual economic depreciation many measures are peripheral as regards profitability. Here a relatively small elevation of the promoting programme of the Kreditanstalt für

Wiederaufbau (KfW/Credit Institute for Reconstruction) on CO<sub>2</sub> could help to overcome the threshold. The obligatory introduction of an “energy passport” for the energetic total balance sheet of every building which must be presented in the case of letting or sale will contribute to better take knowledge of the higher value due to suitable investments. Even if in the building sector quick successes cannot be realized due to the long investment cycles, this sector is meanwhile part of the assets of the German energy and climate policy.

The situation is different in the traffic sector: Today the traffic contributes for one fifth to the CO<sub>2</sub> emission in Germany. According to the forecasts of the Federal Government this rate will grow to 25% in 2015. Especially drastic is the growth of the air traffic, the patronage of which cannot be justified under the aspects of theoretical justice and climate policy. At least for intra-German flights could be levied a kerosene tax and abolished for all flights the exoneration from the value added tax. Due to the high growth rates the traffic is one of the main reasons of the foreseeable failure of the objectives of climate protection in Germany and in many other industrial nations.

Therefore one should welcome the EU law project to introduce for motor cars value limits for the emission of carbon dioxide of 120 g CO<sub>2</sub>/km for newly admitted cars from 2012 onwards (this equals about 5 litres). However, the rule that 10 g can be achieved by mixing biogas has considerable ambivalent consequences, for example the conflict between tank and dish or the extensive clearing of rainy forests. It is the logical continuation of the path which the Association of the Car Industry has promised by a voluntary self-commitment to 140 g CO<sub>2</sub>/km from 2008 onwards, but has not adhered to up to now. Savings exceeding these limits will only succeed if behaviour changes too and if mobility is not defined by the size of the action radius but by the ability to reach the objectives, which rather proceeds from a reasonable social functional mixture than from further acceleration.

## **Outlook**

The formation of social consensus in energy policy is aggravated by a series of inconsistencies, for example the lack of a clear scenario for the ending of the use of nuclear energy with regard to the question how the generated gap of want should be filled up climate compatibly, how the required safety-technical know-how for the further operation can be maintained and how the removal can be resolved.

The success of climate policy will decisively depend on the fact if we succeed to help emerging countries like China and India to jump or to shorten the energy intense phase of development. A further condition for a “clean development” is verification of the promotion projects of the World Bank with regard to their climate compatibility, in order to avoid that the efforts to protect the climate are

impeded by “fossil” development projects. Energy poverty has paralysing effects on almost all areas of the social life. The reliable, payable as well as the nature and wealth compatible provisioning of poor people with energy wants a combination of technical and cultural intelligence and has a key importance for overcoming worldwide poverty.

Throughout the world the regeneration and the completion of the power-station parks are one of the central areas in which the transition to a post-fossil industrial structure must be concretized. Within the generation of current carbon will still play an important role during the next decades. Thus in the centre comes the question if this can be achieved climate compatibly with the help of the separation of carbon dioxide (CCS). This technical solution path is, however, linked with many ambivalences<sup>11</sup>.

The change of the perceivable energy provisioning is not only a technological change. The question is not simply to replace one energy carrier by an other, but important are new models of operating business, of mobility and residing structures. Whoever is adapting to the change in time, will also have multiple chances.

## Footnotes

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