

*Paper for discussion with the Egyptian Embassy to Germany, version of 15-08-2022*

## ***Solar Energy – a key to the technological and social modernization of the Arabian world ?***

### ***0. Introduction***

Climate change is a global problem and a real threat to Europe and North Africa. The latter is going to dry out, the former to be flooded. Together the regions could master this problem, if they would activate their resources and join forces. As pointed out in the recently issued “Arab Human Development Report”, the gap of societal and technological development between Arab and European (and other) countries is a block on the road to an efficient and balanced

co-operation between both regions. A common effort to tackle the global climate problem could give a push to societal, technological and industrial development of Arab countries, if they want so. After a brief analysis of some relevant deficits in the Arab countries development – as seen by a friend in Europe (I would be happy to receive suggestions for European deficits from Arabian point of view) - , a path towards a co-operative future is developed.

### ***1. Oil - Trojan Horse for the decline of Arab world ?***

Most of the Arab world dwells more or less on oil. Oil gives wealth and power to its leaders, without significant achievements by their peoples. Accordingly low is their development.

Oil yields lots of money with very little work – and with rather few jobs. Accordingly low is the development of industrial and educational infrastructure in the Arabian oil producing countries. And leaders of those Arab countries without oil seem to concentrate on hunting for this “jack pot” rather than pushing for social and technological development.

The ***jack-pot mentality*** makes Arabian peoples fall behind the development of most other ones on earth the more time is progressing. This decline is something for deep concern since the process of globalisation is putting all peoples on the same playground. What will be the role of Arabian peoples in the future world community? Knowledge and skills are getting increasingly important. But almost half of Arabs can't read or write, even though they do have letters since a few thousand years. How can they use computers if they can't read the instructions?

A political influence of the almost 300 Million Arabs on world affairs is almost invisible, as the development of the Israelian – Palestinian conflict shows. Since the end of the East-West conflict most of the Arab leaders are longing for support by the remaining superpower – to stabilize their ruling position from outside against possible internal democratic or religious developments. As compensation they guarantee the unrestricted access to their oil. This strengthens stagnation instead of development, resignation instead of strive for new horizons. Effectively, the ***oil is putting the Arab countries into the role of colonies of the superpower.***

Many of the young people feel this civilizational decline, national inferiority and their lack of personal perspectives. Their appreciation of the superpower is correspondingly. They don't see a future in their home countries and want to get away – to Europe. The more clever ones will manage: brain drain.

Unfriendly words? No - much worse: facts! More details are given in the United Nations „Arab Human Development Report 2002”, compiled by Arabian scientists, identifying 3 main deficits: freedom, empowerment of women, knowledge (see <http://www.undp.org/rbas/ahdr/english.html>).

Phrased in the language of sports: ***Most of Arabian peoples haven't got the skills to compete with the other teams of the global league of the 21<sup>st</sup> century.*** They are way behind in the development of scientific, technological and industrial standards, and of the societal institutions that could bring to action the creativity of their citizens. On top of the gap in levels of development there is a further one: in dynamics. Illiterism, degradation of women, and continued exclusion of citizens from political participation will make Arabian peoples to global losers.

In another language: we distinguish hotels of different categories, from 1 to 5 stars. Civilizations could be rated similarly. Most Arabian societies are on the way to a 1-star civilisation. Once they were having 5 stars.

Is this what people want? They will not be asked, they are not needed – power and wealth of their leaders is coming from oil. This imposed inferiority is not enhancing the pride of people.

At September 11<sup>th</sup> some underdogs slammed stones into the windows of a 5-star hotel.

## ***2. How can the Arab world become a respected global player?***

Globalization does not require that all peoples and cultures become alike. Globalization however implies that all will interact and communicate. The Arab peoples want to use modern technologies: cars, airplanes, TV, phones, computers etc. The Arab countries, however, are a white spot on the technological world map. What except for oil (and natural gas, phosphate, carpets, antiques and emigrants) do they offer? I see an unique opportunity for their development in their privileged access to solar radiation as an inexhaustible and environmentally friendly source of energy for humanity. To exploit it requires scientific, technological and industrial development, together with an involvement of large sectors of the population.

With this in mind I made during the discussion of a talk on "asymmetric conflicts", given at the German research centre for high energy physics Deutsches Elektronen-Synchrotron DESY and relating to 09/11, the following proposal for a way towards a better balanced relation between the Arab and the European world:

1. Germany, e.g. the research centre Deutsches Elektronen-Synchrotron DESY, will invite scientists from Arab countries to participate in the ongoing scientific research activities.
2. Arab countries invite Germany or competent German/European experts or companies, respectively, to assist in building up domestic competence for solar technology.

Such coordinated actions could help Germany in its efforts to speed up the reduction of global greenhouse gas emissions, and could help the Arab world to gear up for the world of 21<sup>st</sup> century.

The Egyptian Ambassador to Germany, Mohamed Al-Orabi, and the President of the German-Egyptian Society, Hani El-Nokraschy, reacted immediately.

## ***3. An alliance for sustainability between Europe and Arabian countries***

In view of beginning climate change with its threatening implications the rapid replacement of coal, oil and natural gas as dangerous source of energy by environmentally clean renewable energies has become one of the most pressing issues for humanity. Being aware of the expectation that progressing global warming may raise the oceanic water table by several meters within a few centuries, the exist-

**Science line:** On April 8<sup>th</sup> they visited DESY to explore the possibilities for scientific co-operation. DESY is a world wide leading institution for research in the field of basic constituents and forces of matter. The research work is putting the highest requirements to the technological means and the scientific level. The research teams are composed by scientists from all over the world. The global nature of this kind of research was a driving force behind the creation of the world wide web.

In a first step students and individual young scientists from Egypt should be invited to join research teams working at DESY. If then, after return, those Egyptian scientists could continue to collaborate with research teams at DESY from Egyptian scientific institutions, they wouldn't have to leave the country. To this end, Egypt would have to establish appropriate domestic educational and research institutes. Education, academic and scientific life in Egypt could take advantage from this program.

**Solar line:** On June 15<sup>th</sup>, by an initiative of the Hamburg Climate Protection Foundation HKF, and on invitation of the Egyptian Ambassador, European and Arabian experts met in the Egyptian Embassy to talk about options for a German-Egyptian or better for a European-Arabian co-operation in the field of solar energy. Presentations and discussions were focussing on bringing together the excellent Egyptian solar radiation conditions and solar technologies developed in Europe. The most advanced solar thermal technologies would allow to generate electricity at the Gigawatt scale, to desalinate sea water for Millions of people, to cool buildings, to produce electricity for export to Europe, to provide water for irrigation, and to generate industrialisation. The cost for solar energy, i.e. for financing and operating solar collectors, would not be higher than costs for energy from oil at 20 - 25\$/barrel. At the end of the day, the Ambassador proposed to organize a follow-up meeting to continue these discussions.

tence of Alexandria, Port Said and the Nile delta is threatened. The continuous reduction of rainfalls in the Maghreb region and in southern Europe during the last 2 decades are evidence that climate change is already started. Sahara is moving north, to extend into Maghreb and southern Europe. They literally are going to dry out. Middle Europe receives more

heavy rainfalls and storms. In other words: Europe and North Africa are facing a **second bill** for the oil:

***The bill on environmental damages will make oil&consorts to the most expensive sources of cheap energy available today.***

The Arab countries contribute only 4% to the worldwide emissions of greenhouse gas carbon dioxide. How can they ever bring about a reduction of 40% or more, as required? Well, they are in a unique position to do so. Since they supply almost 1/3 of the worldwide oil, it is in their hands to raise the oil price to a level that is clearly above solar energy costs, say to 30-40\$/barrel. Then the required transition would start immediately.

**Already now**, with modern solar collectors as developed in Europe, manufactured at low cost countries in Arabia, used at proper solar locations in Arabia, **electric power could be produced by solar energy at lower cost than by oil at a price in the range of 20 - 25\$ per barrel.** Within 10 years of growing collector production, the break even value might come down to 10 – 15 \$/barrel.

Under these circumstances it would be a money saving measure in North Africa to substitute oil by solar energy in existing thermal power plants. But much more important: **the climate threat to North Africa could be removed if some Arab countries would begin to prepare for export of solar electricity to Europe as replacement of part of the fatal fossil fuels deliveries.** The resources are at hand: the sun is radiating energy as in 1,5 Million barrels of oil onto each square kilometre of desert, year by year. The deserts provide enough space for solar collectors to power all Europe: a solar field of 70km by 70km would be sufficient. There is more than enough space in North Africa to generate clean and inexhaustible solar electricity and solar hydrogen to power and fuel the whole world. Electricity could be transmitted to Europe with losses at around 12%. The waste heat from electricity generation could be used for operating large scale desalination plants. **Clean electricity for Europe, fresh water for North Africa and ecological security for both could be co-generated.** With 10% of EU electricity an annual ten Billion Euro export value and 10 Billion m<sup>3</sup> of fresh water could be co-generated. The technologies are ready to go.

There are further benefits: **Production of such solar collectors is possible in North Africa and could create a solar industry** as driving force for

general technological and industrial development. In this sense, **solar energy is environmentally and socially friendly**, while oil is a threat to environmental and social developments.

Here is a unique opportunity for the countries from Morocco to the Emirates: They do have the best solar locations in the world, yielding the highest energy outputs from collectors. Several countries are at close enough distance to one of the largest electricity markets in the world, the European Union. In a national or in an All-Arabian effort and in close co-operation with Europe they could establish an **Arabian Solar Industry** with the following features:

1. Production of solar thermal collectors that deliver energy cheaper than from oil, within 4 years.
2. Acquire competence for a key technology of the future.
3. Develop an attractive product for export to the many Billion Euro market of clean energy for Europe.
4. Replace the rapid exploitation of finite fossil fuel resources by constructing and operating solar equipment, i.e. by human labour.
5. Create jobs in Arab countries.
6. Terminate the ongoing preparations for flooding of Alexandria, Port Said and Nile delta, and for extending Sahara into the Maghreb and southern Europe, via climate change.

Switching to solar energy will be of far reaching implications for the near and the long term future of Arab countries, and for their relations to the neighbour Europe. The EU is already quite actively pursuing the change-over to clean electricity, but importing solar electricity from North-Africa is not yet on the agenda. At present the EU is concentrating on their "domestic" resources like wind and bio mass. But the pace of transition is much too slow – climate change is progressing. Therefore, a coordinated effort of the 2 regions, in a kind of **alliance for sustainability**, could be very beneficial for both sides, and for the whole of humanity. If there was a Common Market for renewable energies which would allow EU and North-Africa to co-operate for solar energy "**as if there were no borders**", the greenhouse gas reduction goals as proposed by the IPCC could be achieved in time.

A sustainability co-operation is of fundamental importance for the future of both regions, for ecological security and for their political relations. Therefore, the decision on this matter must not be given to some capital investors pursuing their private eco-

nomical interests. ***Since North-African countries are going to be the early victims of climate change, their political leaders are challenged to take action.***

#### ***4. Building solar equipment as boost to development.***

Oil divides the Arab world. It is a "horizontal" divide into oil exporting countries and into have-nots. The former ones are further "vertically" divided into circles "owning" the oil wells and into the remaining population. The use of solar energy would not necessarily create such divides. All countries have excellent radiation and all parts of population could participate in its production and benefits. While oil is freezing Arab countries as low developed in the world, production of solar energy requires development of people and industry. The cost for solar energy is money for labour to build collectors.

With regard to the European market North Africa can achieve a very strong position by combining the better solar radiation conditions and the lower labour costs for producing solar collectors. This is the

more an advantage the more they build the solar equipment themselves. This requires a "vertical" involvement of population, from all levels: engineers and entrepreneurs, workers and investors, institutions for research, development, education and production facilities. It needs an intense import of knowledge (not: of equipment) from Europe. There are plenty of Arab students in Europe who could facilitate the required knowledge transfer by returning from Europe to their home countries: brain *gain* instead of brain drain. It could create a boost to the development, similar as the Manhattan and the Apollo Programs did to the US.

***Where is the Arabian Wernherr von Braun to make solar energy an export product of Arabia?***

#### ***5. A practicable strategy for Arab countries***

Many Arab countries could make themselves to leading producers of solar electricity and solar hydrogen, worldwide, and stretch their oil reserves into the future. How could they get going in this direction. Here I will outline a way that any country could go immediately.

1. Realize this is to the benefit of the country, and not of a foreign investor.
2. Keep in mind: oil&gas are the cheapest energies with the largest damage potential.
3. Evaluate presently available solar collector technologies for steam turbines, and choose the 2 most promising ones.
4. Get offers for 10 - 50 MW power plants.
5. **Commit yourself to power purchase agreements that cover the production costs of this electricity.** They will be higher than for power from the cheapest fossil plant that you could build instead, but they are an investment for a better future.
6. Have the 2 solar power plants built without delay. (It may take 2 years.)
- 7.

8. Mix solar and conventional electricity costs. (Egypt has a total of 65 TWh/a, Morocco: 15 TWh/a). The 2 solar plants will deliver about 0.3% additional power. If solar needs 5 cent/kWh in addition, **average electricity costs will rise by at most 0.015 cent/kWh** (Morocco: 0.06cent/kWh).
9. After 1 year of operation, decide for the technology of the next solar power plant of 200 MW.
10. Repeat 4 – 8 correspondingly for the 200 MW plant, but require more than 70% of solar parts to be from domestic production.

Within a few years solar energy can beat the price of oil. With this market introduction strategy any Arabian country can get its hands on a technology to tap the unlimited and inexhaustible solar energy in its deserts. Big advantage can be taken from substantial European advance developments. The proposed strategy is along the lines of the very successful German way for cost reduction of wind energy and for creating the important new wind turbine industrial sector.

***Which Arabian leader will take leadership in modernizing the Arabian world for a sustainable future?***