

Deutscher Solarverein e.V.

Aktionsbündnis für Klimaschutz ◊ Photovoltaikconsulting ◊ Einsatz regenerativer Energien ◊ Bürger-Solar-Kraftwerke ◊ Abwärmenutzung
◊ Dezentrale Energiesysteme ◊ KKW-Ausstieg ◊ Elektro/Luftdruckautos ◊ Das Projekt Sonnenbahn - Regenerative Energie für Millionen

The “SOLAR- ORBIT“ Project

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Please notice: This report relates to conditions in Germany.

The photovoltaic use of freeways and highways. Largest GREEN POWER plant of the world



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The consistent implementation of this project - the use of upper spaces of our freeways and highways for electric energy generation will cause the world's largest power plant, completely CO₂ - neutral and renewable. Furthermore, this huge plant will support us with vital energy-independence by sure.

Only in Germany, suitable seemingly roads add to more than 60.000km! Because of the following rain-dense roofing of the streets, they would be largely free of rain, ice and snow. Thus, smoothness by ice and rain, fog and sun-caused glare will massively be reduced Accidents caused by such situations will surely drastically reduced. This is a additional huge, economic and human advantage.

Side 1 Projekt SOLAR ORBIT

Calculation of Sizes and Performance of the SUN-ORBIT

The SOLAR ORBIT will - how the picture show - constructed with an overhang over the roadways. This results in a mean average width of about 30m per linear meter of a „normal“ 4-lane-roadway.

The usable portions of the road surfaces are estimated at about 50% of the highway, freeways and other appropriate state and local roads. A large part of course, drops out because of nearby trees, street locations, city environment, power lines, signage and other situations. Each used single kilometer yields about 30,000 km² photovoltaic surface. The available, useful-to-use area (see in my open internet script) is about 950km² in Germany.

The current and expected performance of photovoltaic modules and solar films such as the coming HELIATEK Photovoltaic Foils, revealed an efficiency of at least 10%. In 10 yrs. maybe the double.

This means, that per 1m² of roofed road surface, 100 Watt photovoltaic power could be generated easily. If we assume a gross rental of only 800 kWh per year (AT TGE RELATIV LOW GERMAN IRRADIATION CONDITIONS!) performance calculation of the SOLAR ORBIT - based on 1 KW-performance, is:

$950\text{km}^2 \times 1.000.000\text{m}/\text{km}^2 \times 100 \text{ Watt} = 95.000.000.000 = 95 \text{ GIGAWATT Plant Performance.}$
This gives the yearly electricity output of about 10 Nuclear- or Coal-Fired-Power-Plants!

In addition, approximately every 20 meters a (small) 5-10 kW wind turbine generates electricity. Based on the calculated lengths of about 30,000 km, an additional capacity of wind power results, of:

$30.000 \text{ km}^2 \times 50 \text{ pc./km} \times 7,5 \text{ kW in } \emptyset = 11.125.000 \text{ kW} = 11 \text{ GIGAWATT Wind-energy/year}$

In summary, a nationwide, self-sufficient, renewable energy generation capacity at present performance conditions of about 100 gigawatts could be available. The motto: highway can be more..

With an average power-plant earning of this low 800 kWh / kW, the resulting energy output p.a. is:

$100 \text{ GW} * 800 \text{ kWh/kW} = 80.000 \text{ Gigawatt-hours / year} = 80 \text{ Terawatt-hours (TWh) /year}$

This corresponds to the average annual consumption of private electricity from required by 20 million families. In other words, the entire private, today's electricity demand of Germany.

Calculation of Prices and Running Costs of the SOLAR - ORBIT - System

Except for the rent price factors for the highway landlords (their air(!) spaces)- which no one at moment will, or is able to answer, and an exact price for the pylons rope-foil-carriage-net, all costs are known well. After verbal statements, however, the carriage structure - especially with the application of the HELIATEK FOILS – should not exceed 1000 € / kW = per 100m² for 1 kW photovoltaic power performance . I.e, 1000 m. carriage-structure cost about 3m€ - imaginable at a mass production. (What an enormous push for he suffering european steel industry)

Calculation of Yield and Income of the SOLAR-ORBIT.

The yield calculation will be carried out in two ways, because in all probability, and given by the experiences made with politics, economy and society, the general stock model certainly needs time. In other words: Yet, our situation SEEMS not in bad enough...

In both models, the total running costs of the SOLAR ORBIT will be set to 10% of the earning: This costs are: Local distribution of energy, maintenance, refurbishments, insurance & plant management.

Calculation for a Private Investment. - First Variant : Equity & Loan. (Ren. Energy. Act - specific)

This is due to lack of precedents to be resolved, whether roof or reduced reimbursement for outside areas will come into play. Therefore, it is calculated with the safe open-land-space compensation. But even that is uncertain, since at the moment no one can say how much the EEG(REA) guarantees in three - four years per one kWh filled into the net. We assume this is at 25 cents / kWh.

But because of the huge dimensions of the SOLAR ORBIT, the EEG guaranteed electricity subsidies - at the expences to commonality - are not suitable or imaginable. So, this is more theoretically.... Furthermore, it is assumed that no rent is payable, because significant social benefit effects will happen, such as massively reduced accidents costs. (Proposal: Car insurances may/could pay that....)

Average building costs per kilowatt plant performance – turn-key - (modules & PV-Foil).....2.200€
Productions of kilowatt hours per year per kilowatt plant output averaged800
Renumeration in € / year from the per kW-plant performance averaged..... 200€
Less costs of 10% per kW of plant capacity, remains an annual income of.....180€
At interest rate of 4.5% and EC of 10%, gives a Payback (10J) (at 20 year contract) from153€
Pre-tax return p.a. (EEG sure) will be (excluding depreciation effects!) close to.....27€/kW

At equity of 200€/kW a yield of more than 13% annuady will result

2. Variation: As NATIONAL ENERGY-STOCK-MODEL hold by individual shares

The SOLAR ORBIT. Model of the largest, socially fair-minded civil photovoltaic plant in the world.

The generated electricity by the SOLAR ORBIT will be sold at the current common price minus all necessary costs, especially energy-carriage and distribution costs paid directly by the individual consumer. The previous opaque and monopolised structures of energy production and distribution by large, dominant corporations will be finished.

From that point of time, it will truly be the “Energy in Public Hands“.

Of course, everyone and all type of corporations are free to buy larger blocks of shares and thereby they will be able to provide their industrial customers with green, price stable electricity, if those haven’t take that into their own hands already by buying stocks too. But these blocks of stocks hold by the former energy producers should remain under the point of total control of border.

Stock holders will receive their yield from their shares AND a price guarantee, that fixes the price of the SOLAR ORBIT generated energy - except a small part due inflation of to maintainig costs.

If someone invests e.g. 10,000€ (for 5 kilowatts of power) in the SOLAR ORBIT STOCK he will receive continuous electricity for the actual price for e.g. 20 cents/kWh, plus a transfer-fee, plus taxes. This means for the SOLAR ORBIT shareholder a gross price for electricity of around 25 cents / kWh permanently! What a relieving situation! No more bad surprises caused by energy cost.

Economically, this model must - of course - calculated in a different way, because of a number of additional, very positive benefits for the entire society as climate-saving, export of new technologies creating new jobs and additionally, much reduced accident and and treatments costs. And better air.

Furthermore, it is THE PREPARATION for the inevitable next generation of electric vehicles. The script describes how technology may soon enable future induction driven electric vehicles WITHOUT OWN ENERGY, just by the SOLAR ORBIT ENERGY directly transferred to the car.

The resulting situation is so complex that only approximated values can be specified. In addition, the underlying period of 20 years are evaluated, which contains many more variables: General inflation, energy price inflation, Development of the performance of modules and films, technical progress, etc. Therefore, this "economic calculation" only can be an approximation. Nobody can predict developments over 20 years for sure.

Following calculation is done without financing, loans or similar.

Average building costs per kilowatt plant performance – turn-key - (modules & PV-Foil).....	2.200€
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Ie: (analogous to investment in one of the usual photovoltaic systems): At an invested share capital of 2,200 € per kW around 8% annual return calculated are. Plus the right to subscribe for a freeze of the purchase price for electricity! BUT: this effect is phantastic!

At ONLY 5% (!) Energy price increase per year, electricity will cost in 20 years factor 2.6. In average this exponentially growing price is equal to 13% linear increase of costs per year. This compound-price development is inevitable. (1.05²⁰ is the same as 20 x 13%) However, this is an airy positive acceptance. In fact it will be at 8% per annum. Result is factor: 4.6! The average consumption per family in 2009 was 5 MWh per year at a price of 20 cents / kWh excluding taxes. The annual electricity bill of a family is at around € 1,000. But this amount of energy will cost at the assumed inflation in 20 years at least € 2,600. (Or even 4,600 € - would be closer to reality)

Judging from the recent values and definitely rather more rapidly rising energy prices, that mean for the 10,000 shareholders each year at least € 130 euros extra savings. This, of course is to add to the 8% base return on its share capital, because otherwise he would have to pay more each year by year for the same amount of energy.

The SOLAR ORBIT – Stockholder for ever is separated from this vicious cycle of dramatically decreasing primary energy sources and the possibility of emerging economies like China and India to pay more for energy as we will be able or like to do.

For the SOLAR ORBIT shareholders, the annual bill for this amount of electricity persists at 1,000 € per year! Only a small increase of the price due to the inflation of the maintenance and management costs will happen. A little in comparison.

The basic annual yield of 10,000 € purchase of shares is at 8% = 800 € PLUS: Additional each year, the increasing savings of about starting 100€ because of no more rising energy prices. (30€ were excluded as security from this sum, because of other inflation uncertainties.)

For the second year a return on equity of 9%. Will results. And 10% already in the Third. Exponentially calculated within 20 YEARS, the SOLAR ORBIT shareholder will obtain AVERAGLY 106,% plus the stable return of 8% = 114% p.a.. This is AVERAGLY 11.400 € from unique 10,000€ investment - almost a lifetime. This is, because in 20 years 1 kWh will cost 1,10€. Nothing can stop this developmen, beside: The end of inflation, a inventive solution for all our energy problems, or the sun stops shining. The economical profit over the time however, is far greater: Several hundred billions €.

- Significant reduction of cost of injuries, treatment, pensions, etc. This are billions
- Significant improved durability of the roads - no ice/salt-damages. Also billions
- Savings in removing snow and ice - no salt necessary anymore. - Tens of millions per year-
- A new, permanent export product "Made in Germany/Europe" – worth hundreds of billions.
- Several 100.000 new jobs in construction and export & tens of thousands in maintenance.
- A huge investment boost for the domestic industry. More potential than wind power.
- Massiv reduction and dependence on foreign, precarious energy imports.
- In summer, even energy in abundance for export. - Or "energy pricing actions."
- Great extra income by emissions-trading.

Prinzip of the storage of individual energy in households. – LUISA'S amazing performance effects.

(The name LUISA results from the German titel of an advice named:

Luftdruckspeicherung mit Integrierter Stromerzeugungs-Anlage. - Meaning:

Compressed-Air Storage with Intergrated Air-pressure driven Electric Generator

The central point is the idea:

Everyone, (this means „individual“ structures, like single households, aparterment blocks, residential objects, hospitals, schools, etc.) has to take care for a sufficient OWN reservoir of energy. This should be no more in total a function of the conventional utility companies.

It is like the fabolous German „LICHTBLICK“ concept, where in the first step 100.000 small VW gas-driven motors in single housholds will produce heat and electricity. On demand this great number of single block-heat and power-plants (as big as a chest-freezer) can switched togehter immediatly, representing the capacity of a BIG POWER PLANT, managed and telecontrolled by the energy authority. Possible millions of LUISA'S can act in the same way.

But this fantastic concept, has a serious, tragic disadvantage: It needs GAS - FOREIGN GAS... SOLAR ORBIT and LUISA don't: They only use the sun. One time builded, is energy forever.

The LUISA concepnt is equal to the fact, that 99% of all local „individual“ structures always will have a proven reserve of food. (Tragically, this is not true for a greater part of the individuals on Earth because of indigence, but it SHOULD...) We all - typically - own a fridge with food-reserves. So why not the same for the most essential electric energy? It will be very clever, save, independent, and will save a lot of energy. (But I learned: Only 3 percent of all people will act clever....)

Thus, the future storage of energy will be allocated in millions of small devices, so called LUISA. The first advantage is: No further need for very big, difficult to plan, land-eating and expansive energy storages as Pumped Storage Power Plants , huge (hot) battery-constructions, or whatever.

One individual LUISA unit must be able to store the individual energy demand for - let's say - one week . This applies for the most frequent situation: A 4-persons-houshold: Nowadays the average electric demand is at 5 MWh per year for a german houshold. This is about 15-16 kWh a day. Average consumption in one night is at 5,5 kWh. So, every user should achieve minimum 20 kWh per day: 15 kWh for the running use and 5 kWh for storage of what has been used in the night before.

But as air-compressing demands a lot of energy - with a loss factor of about 27%, (heat is generated) the true electric power demand will be at 22 kWh per day.

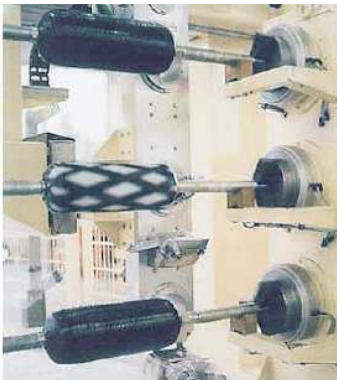
But in no case this compression-energy is lost!

The air-compression unit (it creates temperatures up to 150-250°C!) is sheated by a heat-exchange system, leading the „waste“-heat directly into the warm-water-storage of the user/unit/house. This will support us with warm water and heating, daily refreshed. This „value“ consequentially has to be subtracted from general heating costs. All delivered energy will remain in building. – Even more!

With this, entire system losses are about zero! - Even – and this is amazing - BETTER than zero, as one is free to use the expansion-chill (while LUISA is working and drives the generator) as well for free chill energy for cooling down temperated rooms or air-conditioning. This CHILL-amount naturally has the the same sum as the (stored) compression-heat before. Therby in total and at skilled applications, the individual performance will exceed 100% !!

This is no witchcraft. The simple reason is he same as with every common heat-pump: You will win 5 kWh of heat energy by the insert of 3 kWh electric energy....But the temperatur differences here are much bigger, causing much better performance.

It must be mentioned, that LUISA naturally can collect ANY type of electricity: cheap night power, the energy from an own photo-voltaic-system, wind-energy, exceding energy from a striling, etc...



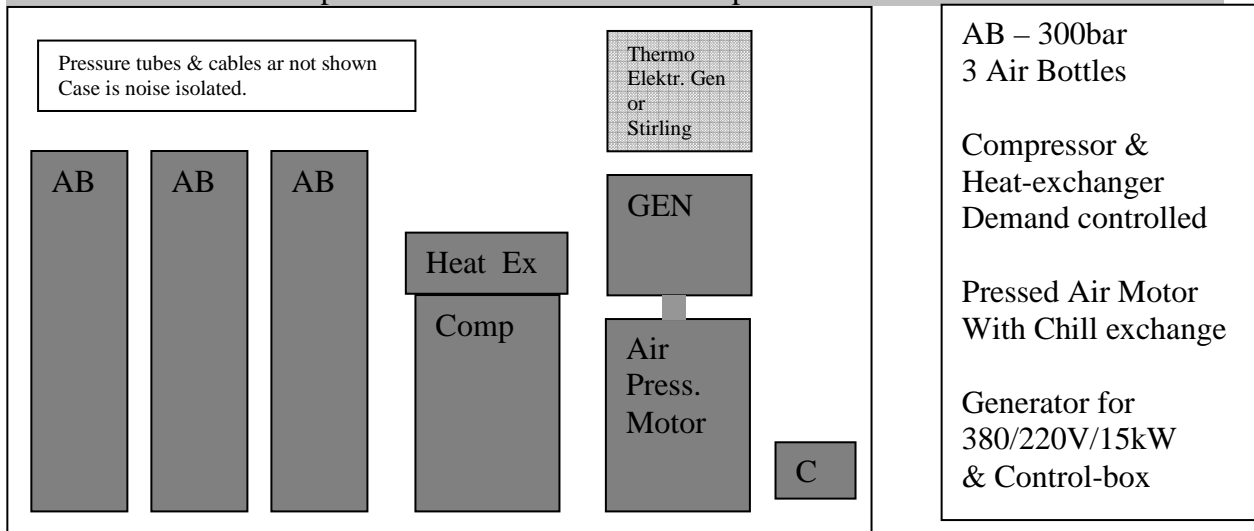
Additionally the entire LUISA can be made with standart products, most proven and well known since a long time, beside the electronic control and the new generation of Kevlar-coated air-pressure bottles. See picture left. The production of those important devices already happens.

They are the core of the coming generation of air-pressure-vehicles. I estimate a mass-production price for one LUISA at 3-5.000€

Analogous to existing air pressure cars equipped with three bottles of compressed air 30 liters / 300 bar or 90,000 liters of compressed air, it anticipates, that the electric energy for the compression - will be at 17 kWh for one complete filling of LUISA. According to current energy prices about 3.50€

If one subtracts the energy for compression, about 13 kWh of energy reserve will remain. Of course, no one expects, this stored energy will completely be consumed in one night - thus LUISA represents an energy reservoir for 2-3 nights. Furthermore: Capacity expansion is very cheap.

Draft of the LUISA components – most is standard – all packed into the size of a chest-freezer.



Thus, the for the night required SOLAR ORBIT energy - to refill LUISA - will cost about 1 Euro.

Six millions of home-based small LUISA – Systems, can store or collecte the energy – capacity of about 100 GWh, (the power of one hour, while SOLAR ORBIT is full working) generated totally clean. Available and tele-contolled by a supervising and managing authority this european-wide energy net will demand. Lacks or peaks in the net can equalizised immediatelly very cheap and easy. This should be realised within one to two decades, and because a big production capacity actually is variant in the automobil-industry. Producing millions of LUISAS would be a fantastic substitution.

Europe-wide application of the SOLAR ORBIT would be, due to the higher solar irriddation in the South, save approximately 200-300 nuclear or coal-fired power-plants. Worldwide unimaginable...

The cumulative savings of CO₂ could be for the entire German SOLAR ORBIT at 48 million tonnes per year: The European SOLAR ORBIT may save more than 100 million tons.

The cumulative costs of the SOLAR ORBIT according to recent prices are estimatd at 200-400 billion € (with the additional energy infrastructuæ). It may be realized in 20 years or sooner.

The essential SOLAR ORBIT Nation- and Europe-wide presence. Thus, no big, specific power distribution network will be needed. The SOLAR ORBIT IS THE NETWORK. – This is a strong contrast to the far away DESERTEC. And: SOLAR ORBIT is completely invulnerable on terrorist attacks or sabotage. It is like a huge FRACATL SYSTEM without any vulnerable sides. If one would cut it into 100 pieces, 100 small SOLAR ORBIT's will continue to generate (local) energy eternally. But we always have to realise, that winter requires additionally sources as wind-energy e.g. On the other hand, when the North of Europe is under snow, the more productive South is mostly free. Perfect basis fort the EUROPEAN SOLAR ORBIT NET [ESON]. (Again: The system IS the net).

FURTHERMORE THE SOLAR ORBIT IS THE GIFT to our poor children overwhelmed by our debts. The radioactive mountains and caverns, emitting death for a million years, surely are not....

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