TOMATO:GSL

The Only Meaningful Alternative To Oblivion: Global Solar Link

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Goal of the Global Solar Link (GSL) is to create the data necessary for the world-wide interconnection of generation sites for solar electricity and areas of demand, for all users, 100% renewable in solar and wind, overcoming daily and seasonal mismatches in peak supply and demand, by means of power lines; hence the name Global Solar Link (GSL)

2022-02-24 Version 008 TOMATO:GSL

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Executive Summary

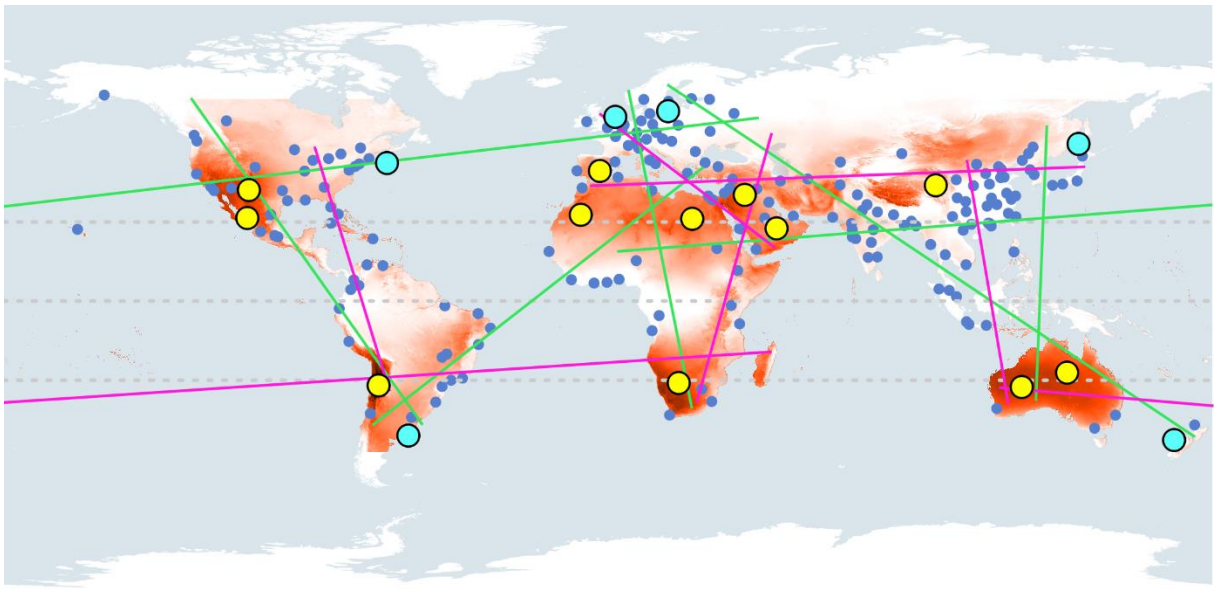

Figure 1: Schematic of the TOMATO:GSL. Solar Direct Normal Irradiance (DNI, red); solar power plant regions (yellow dots); offshore wind regions (light blue dots); population centers (blue dots); Grid A (green) and Grid B (magenta)

Climate change is here to stay. The temperature rise is a global problem, asking for a global solution. TOMATO:GSL offers this solution.

TOMATO:GSL's concept outlines a clear-cut, straightforward, blueprint plan countering the most pressing challenge of the climate crisis, which is cutting the CO_2-emissions to zero, by linking global installations of solar power plants to areas of demand by high-voltage direct-current power lines, thus overcoming the daily and seasonal mismatches between supply and demand, as well as developing the world in a sustainable and just way. A schematic is shown in Figure 1. Goal, plan, and means of the TOMATO:GSL are:

- The goal (clear-cut mission): provide a plan and the necessary data, free of vested interests, to keep carbon in the ground, run the world on 100% solar energy renewables (that does include wind, biomass and other forms of solar energy, as well as short-term (hourly or daily) storage solutions), and slow down global warming, in order to keep the earth habitable. In fact, make the world a better place with renewable energy accessible for all, and fortify the rights of humans, animals and nature.
- The plan (blueprint): 2022 Phase I Simulation; 2023 Phase II Dissemination; 2024-2039 Phase IIIa Solar Supply Construction, Phase IIIb Grid Construction, Phase IIIc Energy Economy Turnaround to Solar Electricity, in parallel.
- The means: immediately available, proven technology, for peak power transmission (solar power plants, demand turnaround to electricity, world-wide HVDC power grid to account for daily and seasonal variations in solar supply).

TOMATO:GSL, The Only Meaningful Alternative To Oblivion: Global Solar Grid.

1. Mission Statement TOMATO:GSL

The Global Solar Link (GSL) proposes a single, independent, supernational power grid, supplying solar electric energy to the world. This world-wide grid takes care of daily (East-West) and seasonal (North-South) variations in local solar irradiance, thus eliminating the need for large-scale seasonal storage (short-term storage might be economical). The global grid is making obsolete nuclear and fossil fuel-based back-up power plants. All fossil fuel-based energy sources will be replaced by solar energy generation, a proven technology, immediately available for roll-out. Households, businesses, industry, and transportation sectors will operate exclusively on electricity.

TOMATO:GSL designs the world-wide power grid in fast and efficient ways, offering a unique chance for global development. Rights of humans, animals and nature are protected in our plans. For the first time ever, a politically agnostic blueprint on how to keep all carbon in the ground will be presented.

TOMATO:GSL will support her partners in the planning of solar power plants, the dimensioning of the grid, and the necessary changes on the demand side. The latter changes are understood as technological changes towards electricity as the sole energy carrier.

2. Plan and Timeline

The Global Solar Link (GSL) invites non-corporate, non-local funding for Phase I of the project (Table 1), in order to simulate in a broad, yet comprehensive study:

- the load structure now and in the future in all regions of the world (the demand),
- the amount of solar energy renewables which needs to be generated in sun-rich locations (the supply), and
- the dimensioning, and approximate strategic routing of the transmission lines required to exchange the power daily and seasonally between regions of supply and demand (the grid),

resulting in the times and costs required to construct a global grid. Software and data required to conduct such a study are available. The study will aim to strengthen human, animal and nature's rights. Crucial to overcoming the climate crisis is international cooperation, and a just and globally inhabitable world.

Table 1: TOMATO:GLS - Phases

	TOMATO:GLS	Year																	
	Task	**2022**	**2023**	**2024**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**2039**
Phase I	Simulation of demand vs. solar supply; yielding grid capacity, routes, cost																		
Phase II	Dissemination of results, setting up team and partners																		
Phase IIIa	Construction of solar power plants (supply)			capacity 800 EJ/a															
Phase IIIb	Construction of grid lines and power electronics			result of simulation															
Phase IIIc	Converting the energy economy into renewable, electric power			industry, households, mobility: 100% electric															

Phase I will take less than one year. Partners are available; we expect funding in the range of one million Euro to suffice. Phase I will occupy the year 2022.

Phase II, throughout the year 2023, will see the dissemination of the blueprint information created in Phase I. All interested parties, such as governments and multi-national organizations will have access to the know-how of TOMATO:GSL. Construction of power lines may begin immediately, in the settings nations are responsible for. The bigger picture of what to build where, and what the benefits are, is yielded by the simulations authored by TOMATO:GSL; all local partners can know what to do.

TOMATO:GSL is not a construction consortium; TOMATO:GSL does not have any vested interest in the results obtained through its efforts. TOMATO:GSL will operate as a think tank, she will assist all parties involved against appropriate remuneration. The goal of TOMATO:GSL is not to further privatize proceeds from the exploitation of public goods (such as solar energy), but to set the world on a path towards survival by offering a clear, straight forward solution to the world's most pressing problem, the carbon-free generation of 100% renewable electricity with proven technologies available now, and beginning after only a minimum of planning.

Phase IIIa covers the construction of the power plants, fifteen years 2024-2039.

Phase IIIb covers the construction of the world-wide electricity grid, in the same fifteen years 2024-2039.

Phase IIIc covers the turnaround of the energy technology in all sectors and accompanies the Phases IIIa and IIIb on the economic level, all non-renewable power plants must be closed down, all vehicles, mobility, services, buildings, agriculture, and industries (demand sites) must be switched to 100% renewables by the year 2039.

3. The Challenge: Global Warming

There is not a lot of time. In particular, there is no time to wait for the results of basic research, nor for political bickering. TOMATO:GSL's plan will be a blueprint of what needs to be done, a solution with guaranteed technological feasibility. If we were to limit the global temperature rise to 1.5°C, with a confidence level of 67%, the remaining Carbon Budget is estimated to be 400 Gt CO_2. At annual emissions of 40 Gt CO_2, ten years remain (in a linear approximation of a business-as-usual scenario) [IPCC21]. Ten years is little more than a glimpse in the energy world.

Relative to conditions in 1750, today's atmosphere absorbs an additional three watts of power per square meter of Earth's surface (Figure 2). Emissions of greenhouse gases carbon dioxide, methane, nitrous oxide, chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), and hydrofluorocarbons (HFCs), measured as CO_2 equivalent, have risen by 47% between 1990 and 2020.

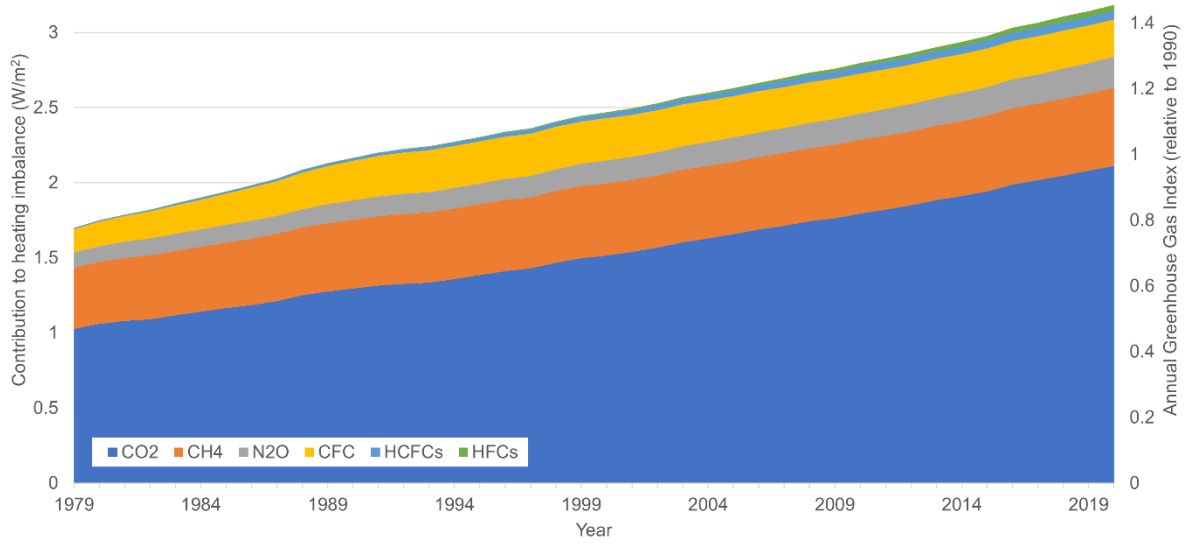

Figure 2: Heating imbalance caused by the major human-produced greenhouse gases, and Annual Greenhouse Gas Index (1990 = 1), graph by NOAA Climate.gov based on data from NOAA ESRL. www.climate.gov/news-features/understanding-climate/climate-change-annual-greenhouse-gas-index, see also gml.noaa.gov/aggi/aggi.html

The extraterrestrial solar constant is 1,365 W/m². Earth is a near-ideal blackbody absorber (and as described by Kirchhoff, for equal temperatures, a near-ideal emitter). About 1,000 W/m² reach the surface of the earth, and are emitted at a rate of >95%, unless absorption and emission happen at different temperatures. Radiation emitted at lower temperatures than the incoming sunlight is partly reflected back onto earth by greenhouse gases increasingly present in the atmosphere. This is the greenhouse effect causing global warming. This is where the above-mentioned 3 W/m² become important: they are a measure for the imbalance between absorption and emission. Earth ceases to be a blackbody, unhinging the temperature equilibrium on our planet.

Fortunately, solar radiation impinging on earth can be the solution to the anthropogenic concentration of greenhouse gases. Relying on solar energy allows us to cut most greenhouse gases, as we can replace fossil power generation by solar power plants.

4. Technology

a. Solar Resources

For the United States, [Denh08] estimate *the state-by-state per-capita "solar electric footprint" for the United States, defined as the land area required to supply all end-use electricity from solar photovoltaics (PV)* [… to be] *about 181 m² per person*.

Solar irradiance data can be precisely estimated from satellite and ground measurements. Web-based platforms allow access to comprehensive data of the solar (and wind) resources anywhere on the globe, as listed in Table 2. Visualizations of the solar irradiance data is given in Figure 3, to give an indication of the global distribution of solar resources.

Table 2: Databases on solar irradiance and wind speed data

European Union ec.europa.eu/jrc/en/pvgis, solargis.com/maps-and-gis-data/download/Europe	Data download, performance, meteorological year
United States power.larc.nasa.gov/data-access-viewer	Performance data
World Bank Group energydata.info, globalsolaratlas.info, globalwindatlas.info	Visualization and download of solar irradiance and wind speed data. The orography data is provided by NASA and Viewfinder Paramas, and the bathymetry data is provided by GEBCO. All other data available for download is property of DTU Wind Energy

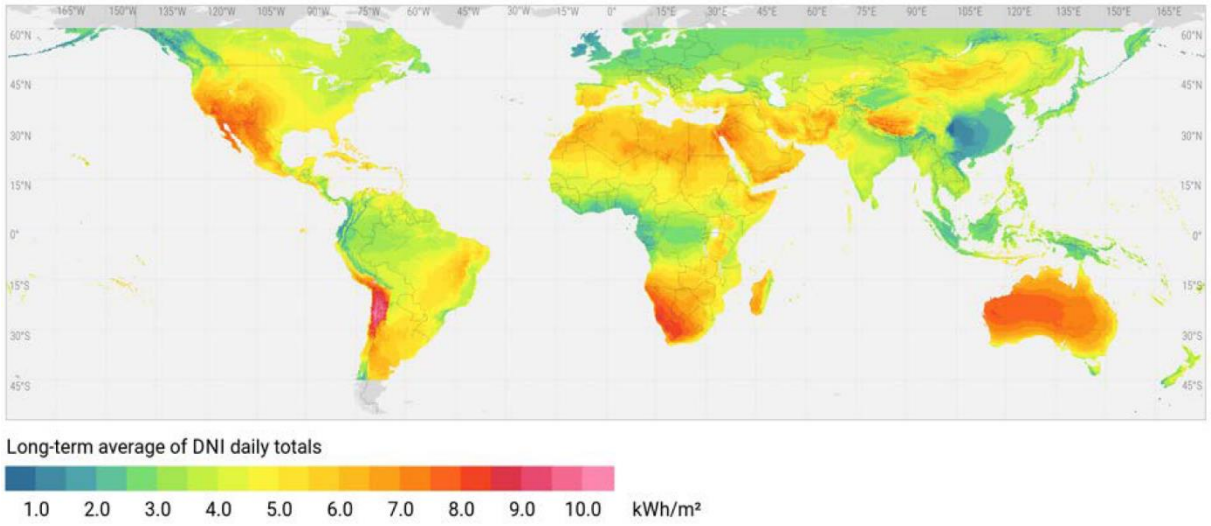

Figure 3: Long-term average of Direct Normal Irradiance (DNI) on surface normal to the sun [Worl19]

What size would a solar power plant be if it was to provide all power consumed on earth? In a high-level calculation, we estimate the required area on the globe to be 0.8% of the suitable area, or 0.25% of the earth's total surface. A quarter of a percent. That leaves room for any future increase in power consumption.

b. Solar Renewable Electricity Generation Cost

Power Purchase Agreements (PPA) for PV have recently been signed at record low prices:

- 0.01332 USD/kWh bid by Canadian Solar Libertador Solar Holding SpA for 2.31 TWh electricity from a PV project in Chile, said Chilean National Energy Commission (CNE)[1]
- 0.0104 USD/kWh Saudi Arabia's Acwa Power has signed the power purchase agreement (PPA) for the world's lowest solar tariff[2]

These prices are significantly lower than electricity generated from fossil fuels. Figure 4 shows the development of cost for generation of electricity from various renewable sources in comparison to

[1] 2021-08-31, www.pv-magazine.com/2021/08/31/chiles-renewables-auction-attracts-lowest-bid-of-0-01332-kwh

[2] 2021-04-10, energy-utilities.com/acwa-power-signs-ppa-for-world-record-solar-tariff-news111772.html

the fossil fuel cost range, for the decade 2010-2020 [IREN21]. Solar-based and wind-based generation dramatically decreased in cost.

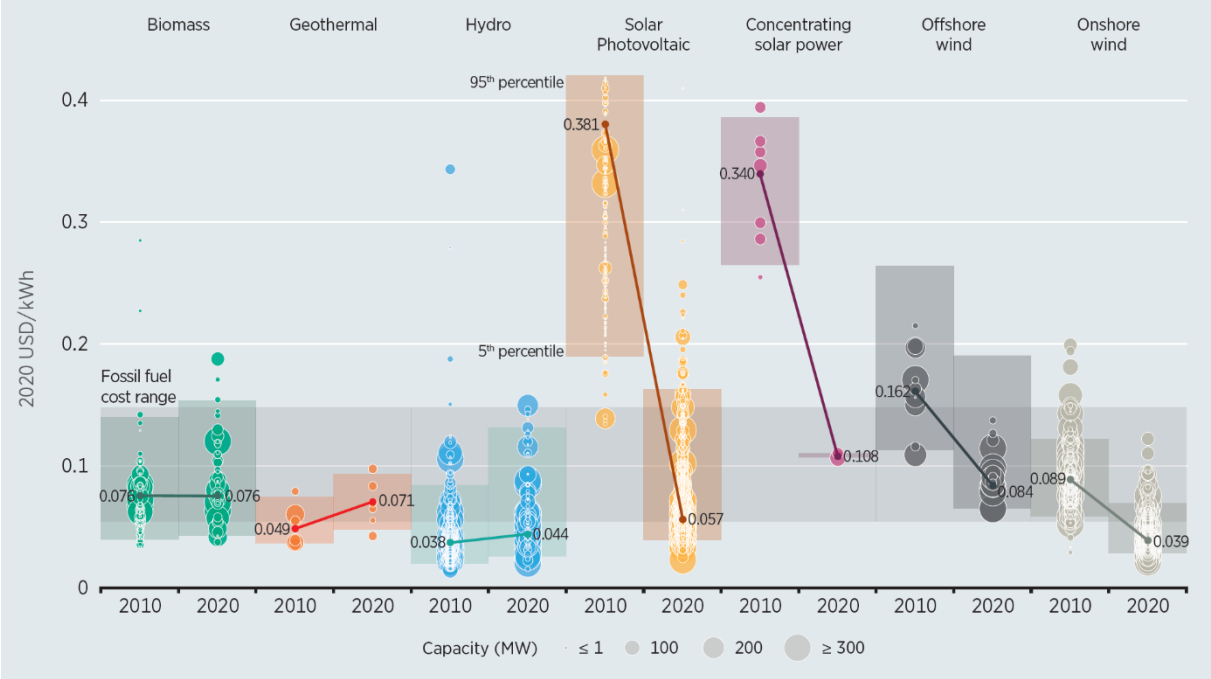

Figure 4: Development of global Levelized Cost of Electricity (LCOE) from newly commissioned, utility-scale renewable power generation technologies in comparison to the fossil fuel cost range, for the decade 2010-2020 [IREN21]

c. Electricity Demand

Global primary energy (all forms of energy, such as electricity, fuel, heat, firewood, etc.) demand amounts to about 165,000 TWh (equal to 165 10^{15} kWh, or 600 EJ, or 6 10^{20} Joule). The sun shines one hundred times more energy to the surface of the earth, about 8 10^{22} Joule. Approximately 10% of the solar incidence becomes wind.

d. World-Wide Electricity Grid

High-Voltage Direct-Current (HVDC) power transmission lines (existing and projected) are suited to transport electricity over large distances. HVDC cables are available as traditional overhead lines, and as undersee (submarine) version. Losses in HVDC transmission lines are given as 3.5% per 1,000 km of distance, or 5% per 2,000 km, both values for a 800 kV line with a 6.4 GW capacity. AC-DC-AC conversion is >85% efficient [Arde15].

An electricity grid requires power electronics and control. At least one multinational offshore wind farm project has been completed in 2021.[3]

Power lines capable of transporting 3 GW cost about 0.5 million EUR per kilometer for the cable alone.[4] The project will cost 1.6-1.8 bn US$.[5] These numbers are for a bid in September 2021, for a 900 km long 500 kV overhead transmission line (OHTL) between Egypt and Saudi.

[3] de.wikipedia.org/wiki/Offshore-Windpark_Kriegers_Flak
[4] 2021-09-16, energy-utilities.com/bids-in-for-major-line-of-saudiegypt-grid-news114214.html
[5] www.bloomberg.com/news/articles/2021-10-05/egypt-saudi-award-contracts-to-link-electricity-grids

Undersea cables like the North Sea Link between Great Britain and Norway cost 1.5-2 bn EUR for 740 km (project cost 1.7 million EUR/km, but for less power capacity),[6] consisting of two parallel cables à 525 kV, and power of 1,400 MW. The cable has been put into operation in 2021, its sister cable Viking Link between Great Britain and Denmark will become operational in 2023.

Current investment in power transmission in the world is roughly USD 75 bn per year, in addition to global investment in distribution amounting to USD 175 bn per year.[7]

High-voltage direct-current power line projects are shown in Figure 5.

Figure 5: HVDC transmission lines (existing and projected), en.wikipedia.org/wiki/List_of_HVDC_projects visualized using tools.wmflabs.org/osm4wiki/cgi-bin/wiki/wiki-osm.pl?project=en&article=List_of_HVDC_projects

There are announcements of several intercontinental transmission power lines with the intention to sell renewable electricity generated in solar-rich areas into industrial centers in the northern hemisphere (Table 3).

Table 3: Announced intercontinental transmission lines for solar electricity

Project	Source - Destination	Description	Link
Xlinks (announced 2021)	Marocco – Great Britain	10.5 GW generation, 3.6 GW transmission, 20 GWh of battery storage, 2x1.8 GW HVDC undersea cable. Losses 10-12%. Investment 21.3 bn EUR. Commissioning planned for 2027.	xlinks.co/morocco-uk-power-project, www.pv-magazine.com/ 2021/04/22/submarine-cable-to-connect-10-5-gw-wind-solar-complex-in-morocco-to-the-uk-grid
Sun Cable Australia ASEAN Power Link (AAPL)	Australia – ASEAN	>14 GW PV generation, 33 GWH battery storage, 3,800 km submarine + 750 km overhead 3.2 GW HVDC cable. Investment 23 bn EUR. Commissioning planned for 2027.	suncable.sg, www.pv-magazine.com/ 2021/08/26/sun-cable-plans-capacity-increase-for-worlds-largest-solarstorage-project

[6] www.statnett.no/en/our-projects/interconnectors/north-sea-link/
[7] www.iea.org/reports/world-energy-investment-2020/power-sector

(announced 2019)			
Antipodas (announced 2021)	Chile – Asia	15,000 km submarine 0.6 GW(?) HVDC cable. Investment 25 bn EUR(?)	www.pv-magazine.com/ 2021/11/15/chile-wants-to-export-solar-energy-to-asia-via-15000km-submarine-cable

Superconducting cables (rather than the industrial standard high voltage direct current (HVDC) are under development[8] for intercontinental projects.

e. Decentralization

Centralization issues related to the worldwide solar electricity grid may pose a risk to the acceptance of the idea of a Global Solar Link. An fictious interview:

Question 1: Why are you proposing a worldwide electricity grid?

The possibility of generating solar electricity on earth depends on the geographical region and on the time of year. Also, the demand is not uniform around the globe either. Then, the solution for matching electricity demand worldwide with generation capacity out of solar energy from the plants installed in main insolated regions, comes with the implementation of a well-dimensioned electrical grid around the world.

Question 2: High voltage transmission lines carry a loss of 5% per 2,000 km (plus transformation losses). Is that contradicting the worldwide power grid, or is it part of your plan?

With existing technology, a scheme based only on centralized generation and a group of main transmission lines might not be the optimum because of technical reasons as the inherent losses associated to long distance transmission, or even strategic reasons as the possibility of ownership or control of the transmission lines. [...] Electricity out of photovoltaic solar technology has the advantage of being fully modular and able to generate electricity from few watts up to Gigawatts, allowing energetic independency at all levels of demand. In that sense, centralized (big plants in heavily insolated regions) should ideally be complemented with the maximum of local electricity generation and the dimensioning of the grid should take all those concepts into account.

Question 3: Conventional central power plants (such as nuclear power plants) may take advantage of the worldwide solar electricity grid. Could nuclear and solar power generation technologies become parts in the same puzzle or does your simulation suggest independence?

[Other sources of power generation like nuclear are to be considered] in the proposal of a global grid. Being able to transport electricity includes the possibility of using the newly created transmission capacity to move around the globe electricity obtained through different massive generation technologies (nuclear fission or the future nuclear fusion), both of them having the risk of radioactive byproducts. [Our simulations will determine to what extent nuclear could play in next generation's energy mix. Nuclear power supplies base-load electricity. Solar power transmitted by the worldwide grid are for peak power! Renewable base loads are supplied by locally installed solar power. Radioactive contamination makes nuclear inacceptable under animal/human/nature's rights.

[8] Supernode Ltd., www.supernode.energy

5. Social Integration and Business Model

a. Human, Animal and Nature rights

The concept of the Global Solar Link and its power grid is deeply supernational. Power lines may extend to every region of the globe, to collect solar supply, and to satisfy energy demand. Power lines can be constructed and routed in such a way that their adverse effects on the environment and communities passed can be small. Submarine and underground cables are an option.

Constructing long power lines which crisscross the globe must be planned, installed, and operated understanding local needs and observing rules:

- local power consumption to be satisfied first,
- feed-in tariffs guaranteed for power exceeding local demand, for those who live on the lands and seas providing the areas for solar power generation plants and transmission/distribution lines, through an international organization attached to the United Nations,
- clear and detailed documentation throughout the process of planning, installation, and operation,
- observing environmental racism,[9]
- subject to international jurisdiction with the rights of nature and any species[10] to sue.
  TOMATO:GSL is a global initiative; fully implemented, it will connect societies in real time.

The international team at TOMATO:GSL firmly believes in equality and transparency. Global challenges require global response. We know that technical expertise and financial strength are required and must be shared; we are convinced that all individuals on earth can gain from full solar electrification in terms of quality of life, and wealth.

TOMATO:GSL is not a zero-sum game, but a symbiotic game changer in the way we generate and consume energy.

b. Purpose and Business Model of TOMATO:GSL

TOMATO:GSL will grow a steward-ownership company. Based on an open-source software, we will program code good enough to be proprietary through quality, but still transparent for verification. With that data in hand, we create a large entity providing more detailed analyses to customers. The approach is multi-level, starting with Europe, adding Asia, and the world. We do include the hydrogen option, while it is not expected to be viable in the majority of application, it should be prepared for comparison.

TOMATO:GSL aims to grow, it will provide its investors with reasonable returns, its staff with earnings, and its customers with viable data and assistance. TOMATO:GSL will contribute to keep the

[9] *When you look at the most powerful predictor of where the most industrial pollution is, race is the most potent predictor*, Robert Bullard, a professor and a pioneer in the environmental justice movement, said. *Not income, not property values, but race. If you're leaving race out, how are you going to fix this?*
www.nytimes.com/2022/02/16/climate/climate-environmental-racism.html

[10] [Stil21] for a discussion of nature's rights and animals' rights

planet habitable beyond 2050, through building the informational base to provide 100% solar electricity to everyone. This is not altruistic, but for the common good.

c. Investment

TOMATO:GSL will start small. One million EUR will suffice to finance Phase I, including the simulation and three full-time positions.

d. Team

- Ana Rosa, expert on energy policy and photovoltaic technology based in Madrid
- Marlis, start-up manageress and networker in the communications industry, from Hamburg
- Ralf, solar optical technologist, energy engineer, and entrepreneur, from Munich

TOMATO:GSL welcomes professional team members and associates from all fields, and all corners of the world.

e. Operation, Product, and Market Implementation

TOMATO:GSL will operate like most technology start-ups, generating and securing knowledge, and marketing products derived from that knowledge.

TOMATO:GSL's products are tailored information packages. Work in Phase I will create descriptive data of a global, high-level electricity grid with locations for solar power plants. This data will be further detailed in subsequent studies for customers on various geographic levels, including proposals for actions in construction of solar plants and power lines.

Once fossil fuels have been completely replaced by solar power throughout the world, the business model of TOMATO:GSL may be applied to fields like biodiversity, or microplastics, where global communication is essential, and local actions are required.

The markets for TOMATO:GSL's products are global, regional, and local entities operating in the energy market now, and in the future. These are utilities, EPCs (engineering, procurement, and construction companies), network operators, multinational organizations, governments, financial institutes, and investors.

We expect that markets for our product are further developing from current isolated studies into full-fledged large-scale activities, once the pressure on implementing climate-saving measures intensifies.

f. Legal Structure

The legal structure of TOMATO:GSL follows her purpose. TOMATO:GSL's legal structure is steward ownership. TOMATO:GSL as an entity will not be available for sale. Thus, we can prevent results being bought and subsequently shelved, or vested interest to be introduced into TOMATO:GSL's goals. Realizing a conventional exit can be difficult but might be realized by means of ordinary and preferred shares, foundations, statutes, or equivalent.

Founders agree to commit their expertise and time into a long-term venture aiming to achieve a global social transformation, rather than pushing for a short-term commercial exit.

6. Myths Debunked

a. 'Nuclear fusion power generation could be an option'

Nuclear fusion has on 5 Sep 2021, for the first time created a magnetic field, at 20 Tesla strong[11] enough to generate twice the power than it consumes (a Q-factor of two, simulated[12] earlier). Fusion technology has been under development for several decades. The chief executive of CFS, the company developing the fusion reactor is cited[13] that the deployment of commercial fusion at gigawatt scale won't happen "until the later half of the 30s at the earliest".

Nuclear fusion, just like the established nuclear fission, concedes a problem with radioactive waste.[14]

b. 'Nuclear fission has come a long way'

The planning horizon for nuclear power plants is long; risks limits public acceptance, and insurance remains low

c. 'Hydrogen might be a green solution'

Most hydrogen is 'grey'; it is created by steam reforming of natural gas. It is possible to split water into hydrogen and oxygen by electrolysis. Once electrolysis is powered by renewable sources, hydrogen is called 'green' hydrogen. Until hydrogen-based electricity is available at the consumer, it needs to be split from oxygen (using renewable power), compressed, transported, and converted into electricity. These process steps are energy-intensive, the efficiency of the process chain is around 15-40% [Egel21]. The question arises why hydrogen is created if the initially used renewable electricity can be transmitted by power line to the user, resulting is a higher overall efficiency, and solving the storage issue, too.

If burned in combustion engines, hydrogen will emit nitrogen oxides NOx.

Hydrogen could be a solution for the final 10%, i.e. for some industrial processes, very limited mobility applications (shipping), and short-term storage.[15]

The results of our study will be an optimization between global grid and local storage; our study will include hydrogen as energy carrier. This optimization has not been done anywhere.

d. 'Direct Air Capture (DAC) may work eventually'

Direct Air Capture (DAC) is a technology capturing CO_2 from the air, compressing it, and storing it below the surface of the earth, where is potentially solidifies (mineralizes). The process is known as

[11] news.mit.edu/2021/MIT-CFS-major-advance-toward-fusion-energy-0908
[12] news.mit.edu/2020/physics-fusion-studies-0929
[13] www.rechargenews.com/transition/bill-gates-backed-nuclear-fusion-pioneer-we-can-fill-the-gaps-left-by-wind-and-solar/2-1-887576
[14] world-nuclear.org/information-library/current-and-future-generation/nuclear-fusion-power.aspx
[15] www.linkedin.com/pulse/clean-hydrogen-ladder-v40-michael-liebreich

carbon sequestration. A first experimental plant[16] has opened on Iceland. The plant is capable of capturing 4,000 tCO_2 annually, offsetting the emissions of about 870 cars.[17] With an estimated 1.4 bn cars[18] on the roads of the world DAC is certainly at the infant stage.

There are fundamental thermodynamic constraints in the DAC process. Carbon dioxide is comparatively rare in air, and its density is low. Collection and compression require about 284 EJ, or 448 EJ, which equals 8.8 GJ/tCO_2, or 14 GJ/tCO_2 captured, respectively.[19] Global energy use from fossil fuel is 462 EJ (2020). The sequestration of the CO_2 created by burning fossil fuels would require nearly as much energy as the amount of energy created in the first place. Generating this amount of electricity by renewable sources would solve the challenge of *100% renewable*, all by itself.

e. 'We are too many'

One of the strongest myths prevalent is the notion that population growth and the associated increase in energy consumption would make futile any effort to generate these growing needs of energy. Demographics is a very well researched area, and scientists are sure that the population growth will decrease with the increase of wealth. There has been no exception to this rule of the *demographic transition* [Pont21], with very high probability resulting in a stabilization of the absolute number of people on earth by 2100.

Figure 6 shows the world's population and global births, as projected by the United Nations Department of Economic and Social Affairs, Population Dynamics. The number of births is forecast to reduce by the year 2040, with the result of a stabilizing global population by 2100.

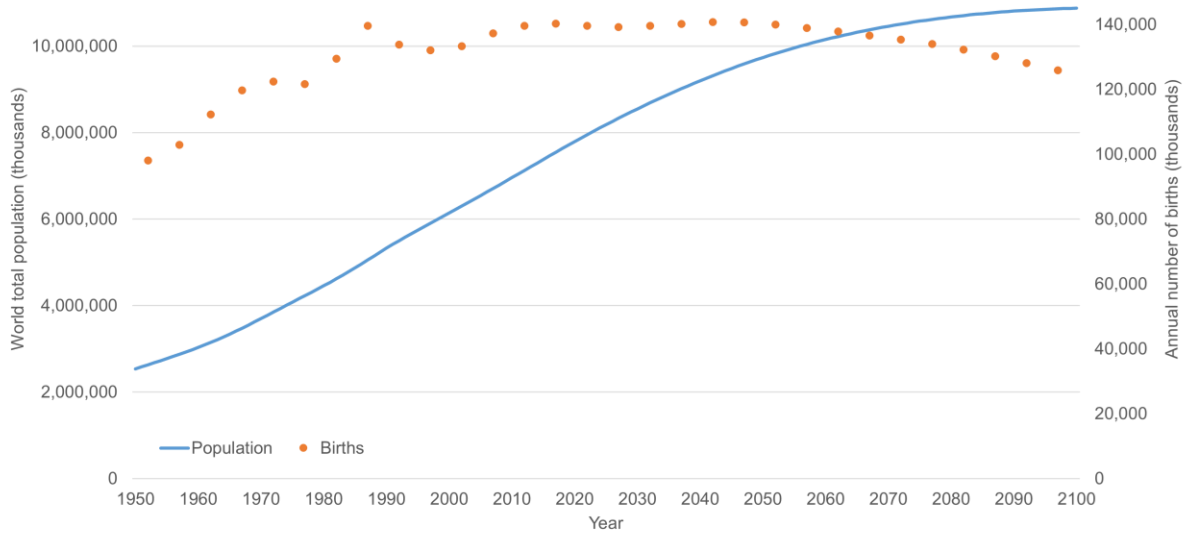

Figure 6: World total population as of 1 July of the year indicated (blue line); and annual average number of births over a five-year period (orange dots). Data are presented in thousands. https://population.un.org/wpp/Download/Standard/Population

[16] climeworks.com/news/climeworks-launches-orca
[17] www.rechargenews.com/energy-transition/the-amount-of-energy-required-by-direct-air-carbon-capture-proves-it-is-an-exercise-in-futility/2-1-1067588
[18] www.carsguide.com.au/car-advice/how-many-cars-are-there-in-the-world-70629
[19] www.rechargenews.com/energy-transition/the-amount-of-energy-required-by-direct-air-carbon-capture-proves-it-is-an-exercise-in-futility/2-1-1067588

7. Conclusions

TOMATO:GSL stands for a novel approach in investment and start-up culture, which may be called benign, inclusive, and agnostic.

Benign in that it doesn't require exploitation of natural resources or amassing of data compromising privacy. Nor does TOMATO:GSL squeeze supply chains to be able to offer its product. The resource, solar energy is abundant, and all participants may gain, from power generation, to transmission, to the use of renewable electricity.

Inclusive in that TOMATO:GSL actively considers human, animal and nature's rights. And agnostic in the sense that TOMATO:GSL is politically agnostic, above all national or ideological differences.

TOMATO:GSL will succeed because it is The Only Meaningful Alternative to Oblivion. Erecting a Global Solar Link is a major step, and likely a necessary step, on the way to keep a habitable planet Earth. We don't believe to be more clever than others, but we are convinced that we can offer a blueprint of the elimination of anthropogenic CO2-emissions into the atmosphere, starting immediately with proven technologies, and concluding within a reasonable time frame of fifteen years.

8. Acknowledgements

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