

A photograph of a building with solar panels on the roof, a modern light fixture, and a minaret in the background. The solar panels are in the foreground, and the minaret is on the right side. The light fixture is in the middle ground. The background shows a clear blue sky and some greenery.

An Energy Agenda for the G20 as if the Future Mattered

An essay by R. Andreas Kraemer

**AN ENERGY AGENDA FOR THE G20
AS IF THE FUTURE MATTERED**

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An essay by R. Andreas Kraemer

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CONTENTS

Context and Summary	7
Introduction	9
1. The global goals (or SDGs) and the G20 energy agenda	12
2. A positive energy agenda for the G20	13
Bring sustainable energy, namely electricity, to those currently without it	13
Improve energy efficiency & energy productivity (focus on “Nega-Watts”)	14
Accelerate energy system transformation	15
Focus on storage, including renewable-power-to-gas and power-to-liquid	16
Increase competition, especially in distributed power generation (prosumers)	17
Phase out nuclear power also by denying subsidies and removing privileges	18
Phase out fossil energy & lift the resource curse by cutting perverse subsidies	19
Leave coal, oil & gas in the ground, adopt laws to ensure that happens	20
Use government ownership & control of firms & resources in public interest	21
Share unavoidable costs of global overheating & acidification (soils & oceans)	22
Bind green & blue carbon via ecosystem management, not geo-engineering	23
Remove tariffs & non-tariff obstacles to energy-related trade & investment	24
3. Do no harm, G20: pitfalls and dead ends to be avoided	25
Don’t allow trade & investment regimes to create new rights to fossil resources	25
Don’t allow the G20 focus on large projects to lock in fossil technologies	26
4. Revising the G20 principles on energy collaboration	28
Media resources (a selection)	31

CONTEXT AND SUMMARY

At the end of 2015, the world is at a critical inflection point in an ongoing and irreversible process of disruption and reconfiguration of its energy systems. Drivers in this new Age of Energy Transformation include technological innovation and new business models changing the relative cost of various energy supply options. They extend from heightened concerns over the dismal economics and risks of nuclear power to the recognition that the continued use of fossil energies will make the planet uninhabitable for a large part of humanity.

It is now recognized that certain conditions — global overheating, ocean acidification and the disruption of the marine web of life, desertification of land and loss of fertile soil, and the loss of natural resilience as ecosystems become overstressed — all add to insecurity, tension in society, state failure, intra-state conflict which, in turn, can lead to civil war and even inter-state conflict or war. The growing possibility that one day human societies may be unable to adapt and would therefore be doomed to perish is dawning on more and more leaders around the world.

The G20 group of countries should fully recognize and help address these challenges more effectively, as other international organizations are doing. The adoption of the UN Global Goals or Sustainable Development Goals (SDGs) and the 2015 UN Climate Summit in Paris are two important responses to the multitude of threats, of which the prospect of run-away climate change appears to be the gravest.

Overall, the G20 position on energy is internally inconsistent: Its objectives are incompatible with one another as well as with other internationally agreed energy-related objectives, such as the United Nations Sustainable Development Goals (SDGs). The inconsistencies and incompatibilities need to be corrected to avoid the prospect of the G20 wasting time, money and effort to no avail. This requires not only corrections of current positions and policies, but also the avoidance of new “perverse policies” that would perpetuate or “lock in” fossil energy systems that do more harm than good, and should therefore be phased out as soon as possible.

This paper¹ provides:

- A brief overview of the SDGs as they pertain to energy in the wider sense;
- A positive agenda of what the G20 might and should focus on in the field of energy policy and energy system transformation;

1 Background paper for the event “Taking the G20 Agenda Forward” at the Center for Strategic and International Studies (CSIS), with the Heinrich Boell Foundation, North America Office, Washington, D.C.

- Some examples of pitfalls or “perverse policies” the G20 should avoid (as a negative agenda);
- A Critique of the G20 Principles on Energy Collaboration as adopted at the end of 2014.

It is thus meant to lay the foundation for a reflection and discussion on what the G20 might usefully do, and how it must change to achieve it.

INTRODUCTION

At the end of 2015, most energy continues to be wasted; the benefits of energy efficiency are not being harvested. Energy policy remains lop-sided in its focus on expanding supplies. This imbalance should be redressed and one of the best options, from a theoretical and practical perspective, is the reduction and abolition of all subsidies and privileges for energy production, conversion, and use. Subsidy reform, meaning rapid phase-out should start with fossil and nuclear energy, but also envisage the phasing down and out of support for renewable energies. Subsidies, if they continue to exist, should be reserved to promote energy efficiency.

New solar power and (onshore) wind power plants are now cheaper to build and operate than new coal or other fossil plants. In general, many renewable energies fluctuate in their availability and they benefit from measures to stimulate demand flexibility and storage. Cost reductions in storage and smart-grid technologies increase the opportunities for integrating renewable energies into existing grids and networks and the growth of renewables will create new business opportunities for energy storage and demand management. They are mutually reinforcing technologies.

The fact that the “green energy shift” is now driven by economics and is essentially self-sustaining will become ever more obvious over the next three years during the G20 Presidencies of China, Germany, and India. Even in the US, where the current fracking boom has resulted in record-low prices for fossil methane, renewable energy can out-compete gas-fired power plants. Nuclear power is clearly without economic justification, given the uninsurable operational and unfathomable business risks. As a matter of economic common sense, therefore, all new investment should go into expanding renewable energy systems, and no new investment should be made in fossil or nuclear energy.

Renewable energy generation is by its nature distributed so that renewable power generation — mainly from wind, solar, hydro, geothermal, and the oceans — or the harvesting of biogenic renewable fuels — in solid, liquid, or gaseous form, can take place closer to the points of consumption. This reduces the need for grid or pipeline capacity. Emerging technologies in (renewable) power-to-gas and power-to-liquid, even if not yet economically viable, offer the prospect of additional energy storage options and can even provide hydrocarbon molecules as feed-stock for the chemical industry. In renewable energy, investments thus come in relatively small lots and are often within reach of individuals, families, communities or local saving associations, even in less developed countries.

There are, however, a number of policies and measures still in place that induce investment flows into fossil (and nuclear) energy. Some of these are privileges, such as liability waivers or preferential tax treatment, while others are subsidies that, although they represent private gain for the recipient, result in an overall reduction in public welfare. Such subsidies, called “perverse subsidies” in economic jargon, should be removed without delay.

Table 1: The SDGs or Global Goals as they Pertain to Energy (some are abridged)

Goal 1. End poverty in all its forms everywhere
1.4 Ensure equal rights to economic resources, access to basic services, ownership, property, natural resources, appropriate new technology
Goal 3. Ensure healthy lives and promote well-being for all at all ages
3.9 Reduce hazardous chemicals and air, water, and soil pollution and contamination
Goal 7. Ensure access to affordable, reliable, sustainable, and modern energy for all
7.1 Ensure universal access to affordable, reliable, and modern energy services by 2030
7.2 Increase substantially the share of renewable energy in the global energy mix by 2030
7.3 Double the global rate of improvement in energy efficiency by 2030
7.a Enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology
7.b Expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries and small island developing States
Goal 8. Promote sustained, inclusive & sustainable growth, full & productive & decent work
8.2 Improve productivity through diversification, technological upgrading & innovation, high value added, labour-intensive sectors
8.3 Promote development-oriented policies on the above
Goal 9. Build resilient infrastructure, promote inclusive & sustainable industrialization, foster innovation
9.1 Develop quality, reliable, sustainable & resilient infrastructure, including regional & trans-border infrastructure, focus on affordable & equitable access
9.2 Promote inclusive & sustainable industrialization, raise industry's share of employment & GDP
9.4 Upgrade infrastructure & retrofit industries, increase resource use efficiency, adopt clean technologies & industrial processes
9.a Facilitate sustainable and resilient infrastructure development in developing countries
9.b Support domestic technology development, research and innovation in developing countries
Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable
11.2 Provide safe, affordable, accessible & sustainable transport systems, expand public transport
Goal 12. Ensure sustainable consumption and production patterns
12.2 Achieve sustainable management and efficient use of natural resources
12.c Rationalize inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts, taking fully into account the specific needs and conditions of developing countries and minimizing the possible adverse impacts on their development in a manner that protects the poor and the affected communities
Goal 13. Take urgent action to combat climate change and its impacts
13.1 Strengthen resilience & adaptive capacity
13.2 Integrate climate change measures into national policies, strategies & planning

Goal 14. Conserve & sustainably use the oceans, seas and marine resources
14.3 Minimize and address the impacts of ocean acidification
Goal 16. Promote peaceful & inclusive societies, access to justice, effective & accountable institutions
16.5 Substantially reduce corruption and bribery in all its forms
Goal 17. Strengthen implementation and global partnership
17.6 Enhance cooperation on science, technology and innovation, knowledge sharing
17.7 Promote development, transfer, dissemination and diffusion of environmentally sound technologies
17.9 Enhance capacity to support national plans to implement all SDGs
17.13 Enhance global macroeconomic stability through policy coordination & coherence
17.14 Enhance policy coherence for sustainable development
17.16 Enhance global partnership, share knowledge, expertise, technologies and financial resources to achieve SDGs

1. The global goals (or SDGs) and the G20 energy agenda

Even before their formal adoption on 25 September 2015 by the United Nations General Assembly, the Sustainable Development Goals (SDGs) or “Global Goals” triggered high-level reflections on their implications for sectoral policies such as energy or natural resource management. This was in recognition of the SDGs universal approach and direct relevance for developed countries and the conduct of domestic policies, a significant departure from the previous Millennium Development Goals (MDGs).

Now that the SDGs or Global Goals have been adopted, they should trigger a review and revision of priorities and principles also in the G20, notably in the field of energy.

Table 1 provides an overview of the Global Goals and their sub-goals that relate to energy in one way or another. Goal 7 addresses energy explicitly, it is the “Global Energy Goal” (shown in red), and sub-goal 12.c also speaks directly to the energy sector in calling for a phase out of environmentally harmful subsidies for fossil fuels.

Many other goals and sub-goals relate to energy one way or another. Table 1 shows those where the link is relatively direct. There are other goals, such as Goal 6 to ensure availability and sustainable management of water and sanitation for all, which also has complicated, both positive and negative links to energy. All these merit attention in the future development of the G20 Energy Agenda.

2. A positive energy agenda for the G20

Much of the energy agenda of the G20 is either insufficient or leading policies in the G20 (and other) countries in the wrong direction. In summary, the world, including notably the G20, is still promoting investment in the wrong technologies. They are also hindering the development of the safer, cleaner and fundamentally cheaper alternatives. This is in spite of the urgent warnings of the dire consequences of continued extraction and use of fossil energy and the clear economic and security cost of nuclear power.

Section 4, “Revising the G20 Principles on Energy Collaboration,” of this paper shows how the G20 is pursuing the wrong agenda. The G20 group of countries now needs a new, positive agenda to facilitate energy system transformation, mitigate greenhouse gas emissions, and deal with the impacts and costs of already unavoidable consequences of climate change. Core elements of such an agenda are sketched in this section.

Bring sustainable energy, namely electricity, to those currently without it

Many parts of the world need more “modern” energy, meaning electricity. Electricity is a precondition for attaining higher levels of development, better health and education, and for reducing the disparities in standards of living that drive so much frustration, migration, and conflict.

In many G20 countries, public policies for energy sector development are still based on the outmoded philosophy or paradigm of “predict and provide”, meaning that energy demand, and especially electricity demand, is predicted over different time-scales and generation plants are then built and operated to meet that demand. The preferred supply option is then often large centralized fossil and nuclear plants that need to be linked with high-capacity, high-voltage and long-distance transmission grids to ensure security of supply to power users that are distributed and generally of much smaller scale than the power plants.

This approach logically leads to high cost, long lead-times, investment and technology lock-ins, overcapacity, and wastage. It also entails strategic, economic, and operational costs, risks, and vulnerabilities.

With today’s energy as well as information and communication technologies, modern energy is clean, safe and renewable, and increasingly cheap. Storage and smart-grid applications, such as flexible tariffs based on supply and demand on the grid in real time, are part of the solution. It is economically possible today to equip

small communities of users in poor countries with modern energy systems, without waiting for long-distance power lines to be laid. Energy development no longer needs central coordination but can happen at small- scale in many places, spontaneously and simultaneously.

This “soft path” for developing energy systems, described by Amory Lovins in 1976, is now a growing reality with a strong technology learning curve and significant economic, social, environmental and security benefits.² The world could move faster on this path, and the G20 can do much to accelerate the expansion of distributed energy supply and management systems.

Improve energy efficiency & energy productivity (focus on “Nega-Watts”)

“The cheapest energy is the one that is not being used.” In general, the cost of saving energy is often lower, sometimes much lower, than the cost of producing or generating that energy. That makes energy efficiency, or “nega-Watts” (rather than Mega-Watts (MW)), the cheapest form of energy services, and improving energy productivity an effective and efficient strategy.

This is especially true for the electricity sector, not only because electricity is generally expensive and the most “noble” form of energy, but also because of specific characteristics of power supply systems. Power supply systems around the world, where they exist, are designed in order to provide sufficient generation and transmission capacity for the highest historical demand plus a margin for growth and safety. This is because the cost of utility electricity storage have hitherto been prohibitive and because of the “predict and provide” paradigm in the industry. In other words, the total system cost is thus determined by the highest demand peak observed or deemed likely in the short to medium-term future.

A conceptually simple way to cut the cost of maintaining existing power supply systems, avoiding upgrades, or reducing the cost of new electricity grids yet to be built is to “shave the peaks” (and “fill the valleys”) in the power demand curve. Conceptually, this can be done quite easily by providing incentives for power users to shift their demand in time, by only a few hours in most cases. Technically and economically, the stimulation of demand flexibility to obtain a demand response is cheap, quick and easy to do, especially with better smart energy systems becoming available at ever lower prices. The obstacles are political and ideological and the G20 could do much to overcome them.

One of the consequences of energy efficiency and improved energy productivity is lower turnover in the energy industry, with knock-on effects on GDP figures and tax revenue. The impact of flat energy demand curves, which are in contrast to past predictions of rising demand, is already affecting the economic performance of energy

2 Lovins, Amory (1975): “Energy Strategy: The Road Not Taken?”, in Foreign Affairs (October). <https://www.foreignaffairs.com/articles/united-states/1976-10-01/energy-strategy-road-not-taken>

companies and utilities and their ability to finance new investment. But the affected companies and their lobbyists are frustrating efforts to achieve energy efficiency as are many government ministries. Ministries of economic affairs and finance view GDP growth as a measure of their success and fear declining tax revenues from corporate taxes (on profits) and turnover (from sales taxes or value-added-taxes).

Policy-makers often overlook the fact that any money not spent on energy will be spent in other ways, so that the net effect on GDP growth and tax revenue need not be negative and may actually be positive. The G20 is perhaps the best forum internationally to address the misconceptions underlying the energy efficiency dilemma, namely that energy efficiency is hard to obtain even though, economically, it is clearly the most preferable way to decarbonize the global economy.

Accelerate energy system transformation

Because of the changing economics and relative costs of competing energy systems, energy system transformation — often referred to by the German term “Energiewende” — will occur at various speeds and from different starting points all over the world. Rather than putting obstacles in the way and slowing the transformation, the G20 should embrace, facilitate and accelerate it.

The main components of relevant strategies are:

- Accelerate the growth of distributed renewable energy & smart-grid technologies;
- Empower local communities to invest in distributed energy & storage systems;
- Enable load-based tariffs and smart grids to stimulate demand flexibility;
- Accelerate the transformation of existing energy infrastructure where it exists.

Depending on starting points, some countries must make investment in the construction of new energy systems in places where they have not previously existed. Here it is important that they do so based on the least-cost option on the path that maintains highest flexibility so that they can benefit from technology improvements and cost reductions. The cost of choosing the path of renewables plus storage in a flexible smart energy system is currently not higher and in future most likely much lower than choosing the fossil path.

Other countries may have existing but aging energy systems with pent-up re-investment needs. Such systems can be reconfigured to reduce overall capacity and cost by focusing on smart energy management and distributed generation. The cost of the transformation is likely to be lower than the alternative cost of rebuilding and revitalizing the existing energy system.

In between, there are countries with relatively recent investment in fossil and nuclear energy plants and the associated large long-distance high-voltage transmission grids. In such cases, the book value of the assets can be higher than their market value (where a market exists) or a fair value assessed on the future potential to earn revenue. Future revenue will diminish as low-cost renewables come into markets, which may be

shrinking as an effect of a drive for energy efficiency. In such countries, which tend to be market economies with well-developed financial sectors, energy transformation will entail a business transformation with write-offs, insolvencies, and unfunded legacy costs falling to governments and, of course, taxpayers.

Although the processes of energy transformation and their consequences are different in the various G20 countries, they will happen at the same time and influence one another. Overall, the transformation dynamics are not only self-sustaining but accelerating in all countries — G20 and non-G20. Rather than fighting to slow these inevitable and positive changes, as many of the G20 countries still do, the G20 should focus on exchanging information and improving the resilience of other sectors, from financial institutions to consumers, as they go through the energy transformation.

Focus on storage, including renewable-power-to-gas and power-to-liquid

Fossil energy is stored energy. That is one of its advantages.

- Coal, once mined, can be stored at very low cost almost anywhere from the mine head to any transshipment port or along the railway system, to on-site storage at power stations, or at industrial or heating plants. The cost of storage infrastructure is very small. Essentially, the production and consumption of coal do not have to match up in the short or even medium term.
- Oil is also relatively easy but more costly to store and - because of the higher cost of storage systems - be it in tanks, tanker ships, or underground caverns used for strategic reserve storage, capacity is relatively small. Production and consumption of oil must therefore be in balance in the medium term.
- Gas is more difficult to store than coal or oil, but it can be compressed so that the existing gas distribution systems, consisting mainly of pipelines, double as a storage system. In addition, purpose-built gas storage systems and gas fields close to the main centers of consumption add to storage capacity. Production and consumption of gas must be balanced in the medium term.

Compared to fossil energy, electricity has been difficult and expensive to store, although costs for battery storage are declining and are predicted to fall faster in the near and medium-term future as material sciences provide new insights and materials, and economies of scale and technological learning lower the costs of producing batteries. The G20 can facilitate and accelerate this process by providing a regulatory environment that is conducive to innovation and allows for the disruptions of incumbent and increasingly outdated businesses and the technical systems they operate.

Some of the most promising emerging technologies that would provide new options for energy storage, transport and conveyance are (various approaches in) the conversion of power-to-gas or power-to-liquid fuels or feed-stock for the chemical industry. The idea is simple: When there is insufficient demand, renewable wind or solar power, which

is fluctuating in availability irrespective of demand, is used to split water (2 H₂O) into hydrogen (2 H₂) and O₂. The H₂ is then combined with carbon from CO₂, which is taken from the atmosphere or the off-gas from combustion processes, to form first methane (CH₄) and then longer chains of alkanes and their derivatives.

The products are gaseous and liquid fuels, which can be integrated in existing infrastructure that is a legacy of the fossil oil and gas industries. Power-to-gas and power-to-liquid technologies are expected to be cost-competitive as soon as the penetration of renewable energies is such that there is “surplus” renewable power often and long enough to operate the conversion plants 1000s rather than 100s of hours in a year.

This is just one example of an emerging energy conversion technology that will facilitate not only storage but also the continued use of existing infrastructure and thus will not be “sunk” and economically obsolete. There are others, and more are likely to emerge. The G20, in addition to its work on renewable energies (with IRENA) should focus also on energy storage options.

Increase competition, especially in distributed power generation (prosumers)

The environmentally damaging, dangerous and uneconomic fossil and nuclear energy systems are characterized by their centralized and in many cases oligopolistic or monopolistic structure, as well as by their embeddedness in corporatist webs of business and government institutions. In the case of nuclear power, this extends, as a rule, into the military security apparatus of government. The industries and individual businesses thus often enjoy very strong sources of political and financial support that enables them to defend the status quo and resist change so as to maintain their economic stranglehold and continue to extract rents from the wider economy even though they produce no net benefit to society.

Increasing competition is thus an obvious avenue to facilitating the transformation towards low-carbon, cheaper, more reliable and sustainable energy supply systems. In the EU, the experience with unbundling vertically integrated energy utilities has been generally good and may be instructive, even though its application in the EU remains imperfect and sometimes half-hearted.

Facilitating new entrants to the market is another important way to increase competition in the energy sector. In the case of grid-based energies (mainly gas and electricity but also heat where local or regional distribution systems exist), entry to the market effectively means connection to the existing grid as an essential infrastructure that cannot easily be duplicated.

In the case of the German Energiewende, the physical grid connection for new, independent generators of renewable power was guaranteed, with an obligation imposed on grid operators to make those connections. The economic access to the market was guaranteed by granting priority to renewable power over fossil and nuclear power. The priority for renewable power is important and should remain in place as long as there is nuclear or fossil power to replace, but the priority loses its justification and

becomes operationally impossible when the grid reaches 100% renewable power.

Guaranteed connection and priority access to the market are important components of feed-in tariff systems, and they may be needed to maintain competitive pressure even if the third component of feed-in-tariffs may no longer be needed. The third component is the guaranteed price for or a “market premium” over market prices for renewable power produced and delivered to the grid. It may no longer be needed as solar power and onshore wind have reached cost parity with new coal, gas and nuclear power plants, and are even displacing output from existing fossil and nuclear plants.

With distributed renewable power generation as well as smart grid and energy management systems, which are now available even for small energy systems in residential buildings, every energy consumer may now also become an energy producer, morphing into what is known by the neologism “prosumer”. Prosumers are a new competitive force; they range from large industrial companies, which may at the same time be swing consumers of energy and electricity generators providing grid back-up capacity, to individual households with solar panels or small wind turbines, battery storage and perhaps a bio-gas driven combined heat-and-power plant..

Prosumers can switch their roles as consumers and producers and thus help stabilize the market as well as the physical flows on the grid. They are also often highly responsive and can compensate for the generally much slower reactions of large fossil and especially nuclear plants. They also allow for many different technologies in differently sized installations under different ownership and business models to coexist and compete in the market, producing beneficial portfolio effects that the monolithic fossil and nuclear industries cannot match. Their competitive strength is a force for good that all G20 countries should stimulate.

Lessons learned, both positive and negative, in all G20 countries should be shared so that good and best practice can be replicated (with adjustments as may be necessary), and the repetition of mistakes can be avoided.

Phase out nuclear power also by denying subsidies and removing privileges

The world does not need any more expensive and dangerous nuclear energy. Apart from the essentially uninsurably high risks and unresolved legacy issues, nuclear power is simply too costly and slow to build to be part of the solution for climate change.

There never has been an economic justification for nuclear power, there is none now, and thanks to the Hinkley Point C affair in the United Kingdom there is no denying the fact that there will be no sound economic rationale for the foreseeable future; the technology is a waste of money, money that produces higher benefits faster when invested in renewable electricity generation.

In addition, the world is already paying an enormous security policy price for nuclear power, and will do so for a long time to come. This price is a consequence of the active proliferation of nuclear technology expertise, materials and equipment. While, in the past, nuclear technology spread mostly among state actors or state-controlled

businesses, there are an increasing number of private businesses in the nuclear industry. This tends to accelerate proliferation and increase the risk that non-state actors, such as terrorists, avail themselves of nuclear bombs, including “dirty bombs” (even if there are no “clean bombs”).

Absent any rational business case for nuclear power, only one or more of the following factors can explain the building of new plants:

- Collective economic delusion,
- Corruption, as large-scale investments make large kick-backs possible, or
- (Unstated) Military purpose and intent.

The G20 should admit the errors concerning nuclear power and proliferation, call them “costly mistakes”³, commit to investing in renewable energies and smart grids, phase out nuclear power, initiate negotiations to amend the Nuclear Non-Proliferation Treaty (NPT) and the Statute of the International Atomic Energy Agency (IAEA), and thus, in the interest of reducing the high security policy price of nuclear power, change the context for dealing with governments with aggressive nuclear programs.

In addition, the various international agreements that limit cross-border liability for damages resulting from nuclear accidents should be annulled. They provide an unjustifiable privilege to the builders, owners, operators and insurers of nuclear power plants at the expense of the victims of any accidents.

Phase out fossil energy & lift the resource curse by cutting perverse subsidies

The world does not need more fossil energy, meaning coal, oil and “natural” gas (i.e., fossil methane). It already has too much, has used too much, and cannot afford to blow more carbon into the atmosphere, be it as carbon dioxide, methane or some other greenhouse gas. Most fossil resources must “stay in the ground”. Financial markets now recognize this and the capital value of fossil energy companies has declined accordingly. Some of those companies have already gone bankrupt and more will probably follow.

Fossil energy brings the resource curse to those countries and peoples where coal, oil or gas is being extracted. Fossil energy resources are at the origin of much hardship, instability, and armed conflict, and even wars. The faster fossil energy is phased out, the sooner the resource curse will be lifted from those affected. Much the same argument can be made in economic terms in relation to developed countries that may be affected by the “Dutch disease” as a somewhat milder form of the resource curse.

3 “We will look back and think that nuclear was a expensive mistake”, Paul Massara, chief executive of RWE NPower, one of the UK’s big power generators, as quoted in Pratley, Nils, and Sean Farrell (2015): “Planned Hinkley Point nuclear power station under fire from energy industry”, in *The Guardian*, 9 August 2015. <http://www.theguardian.com/environment/2015/aug/09/planned-hinkley-point-nuclear-power-station-energy-industry> (The original article in the Sunday Times is behind a pay wall.)

In spite of the social and environmental harm they cause, fossil energies still enjoy very large subsidies. Estimates range from hundreds of millions of USD (OECD) in direct subsidies to 5.3 trillion USD according to the IMF's calculations which include social and environmental costs borne not by the fossil industries but by government budgets, the general public, and in some cases future generations.⁴

On paper, the G20 is committed to fossil fuel subsidy reform, but “[t]he G20 effort to advance [fossil fuel subsidy] reform suffers from the lack of an established definition of what constitutes a subsidy, which makes the assessment of public support and cross-country comparison very difficult.”⁵ There are inventories or “mappings” of fossil fuel subsidies, on the supply and the demand side, so starting the cutting and abolishing does not have to await the outcome of more research. Also, there is no need for an agreed definition, plan of action or timetable; each G20 country can act alone. There are benefits from cooperation and coordination as these can speed the removal of distortions to international competition, reduce the risk of countervailing action against persistent subsidies and thus protect freedom of trade and provide a supporting framework for resolution of domestic political conflict.

Leave coal, oil & gas in the ground, adopt laws to ensure that happens

Leaving coal, oil and gas in the ground is necessary to maintain the Earth's climate in a balance that allows human society to thrive or even to survive. It requires significant corrections in the economic and financial system in the short run. The G20 would be a good forum to address the financial, monetary and economic consequences of deflating the “fossil bubble”. This bubble consists essentially of two parts.

- One part of the fossil bubble is the fossil carbon in the ground, or “found assets”. These are often owned by private or government-owned businesses and reflected in their balance sheets and, if publicly traded, their stock-market valuation. These assets will continue to decline in value and eventually become economically worthless.
- The “built assets” of the fossil energy industry are the other part of the fossil bubble. These are technical installations and buildings largely above ground in the form of production infrastructure, pipelines, refineries, storage systems, tanker rail cars, tanker trucks and ships, distribution systems such as filling stations for cars, gas supply networks in towns and cities, etc. Some of the upstream built assets will become worthless, but have a residual value as scrap. Some of the downstream assets may continue to be useful for handling biogenic carbon-containing fuels (from wood pellets to biogas) or carbon fuels synthesized from renewable energy through emerging power-to-gas and power-to-liquid energy conversion technologies.

4 [IMF Working Paper](#), “How Large are Global Energy Subsidies?” May 2015.

5 Bárány, Ambrus, and Dalia Grigonyté (2015): “Measuring Fossil Fuel Subsidies”, ECFIN Economic Brief, Issue 40, March 2015. www.ec.europa.eu/economy_finance/publications/economic_briefs/2015/pdf/eb40_en.pdf

There is no escaping the prospect that economically large assets will become stranded or sunk and have to be written off balance sheets. Stock-market valuations already reflect this in part, but there is still a large fossil bubble to deflate. The bursting of any bubble, even if excess valuations were only on paper, has financial and economic knock-on effects which need to be anticipated and mitigated. This might best be done in coordination among the economically most important countries. Therefore, the G20 is an obvious forum to initiate and facilitate this coordination, from the adoption of political principles to details such as accounting and valuation rules.⁶

Use government ownership & control of firms & resources in public interest

Many of the world's fossil energy resources that need to stay in the ground, are owned and controlled by governmental bodies, including government-owned firms. For the most part, because of their public ownership, such resources do not contribute to the "fossil bubble" in financial markets and economic risks associated with its deflation. Privately owned resources are much riskier than publicly owned resources.

On occasion, privately held assets can be brought into government ownership at low cost. Bankruptcies of coal companies in the last few months provided such opportunities, as will future bankruptcies in the fossil industries.

To ensure that such assets, notably the underground "found assets", are not used in harmful ways, they should be retired and transferred into a public trust and protected from extraction in perpetuity. For a transition period of a few years, some fossil resources would still need to be extracted and brought to market. The duration of the transition period should be as short as possible and the total carbon volume that would be burned should be as small as possible, as any additional carbon in the atmosphere or the oceans harms the public interest.

While action in this field can and should be taken by national or even regional governments, international exchange of "good" and "best" practice and policy coordination would facilitate progress. The G20 could be a useful forum in this respect. Recognizing that the G20 includes petro-states — notably Russia and Saudi Arabia — as well as members where fossil industries hold sway over government and policy development, it may be advisable to develop a flexible format for implementation. Such a format could allow those G20 countries willing to move forward to do so in a form of "enhanced cooperation" that should, as a matter of principle, be open for laggards to join later, and perhaps allow for the cooperation with other, non-G20 countries.

⁶ See the speech of Mark Carney, Governor of the Bank of England, at Lloyds of London. <http://www.bankofengland.co.uk/publications/Pages/speeches/2015/844.aspx>

Share unavoidable costs of global overheating & acidification (soils & oceans)

Past activities have caused unavoidable costs associated with global overheating, desertification of land and the degradation of soils, and acidification of the oceans. Responsibility for such costs lies with those who caused past emissions, notably the industrialized countries, but the costs also affect other, developing countries that have not contributed to historical emissions.

Recognition of the mismatch between historical emissions on the one hand, and current and future exposure to the consequences of higher carbon levels in the atmosphere and the oceans on the other hand is the foundation of any agreement on the sharing of the unavoidable costs. Much of the rhetoric around the sharing of the burden and “climate finance” is currently framed around as “North versus South”.

Notwithstanding moral justifications of such a framing, the G20 should take an objective look at the human and economic costs, and where and when they are most likely to occur. This may well reveal that

- Costs in terms of human suffering will occur mainly in less developed countries, especially those with warmer climates today, and those with weak or failing governments. Prolonged droughts and heat waves are likely to stress water and soil resources, which lowers water and food security, while more frequent and more extreme weather events are likely to erode physical, social and governance infrastructure. Conflicts are likely to be aggravated directly or indirectly by the effects caused by carbon emissions. Some small island states and low-lying countries will cease to exist and be unable to continue as viable states.
- Economic costs in the form of lost infrastructure are more likely to affect developed countries, and the developed parts of developing countries and emerging economies. Much transport, industrial, energy, urban and defense infrastructure in coastal areas and along low-land river systems, worth trillions of dollars or Euros, will literally become sunk, and whole ports, industries and cities are likely to need repeated relocation (essentially migrating up the river systems).

Given the complexity and importance of dealing with the unavoidable economic and human costs of past carbon emissions, the G20 would be a useful forum for exchange and coordination, not only for improving the performance of domestic policies within G20 countries, but also for avoiding duplication and conflicting approaches in helping other countries as they address those costs.

The agreements reached at the UN Climate Summit in Paris in December 2015 on climate finance as well as on loss and damage provide a useful framework for addressing some of the issues. Beyond honoring financial pledges, the G20 should promote and pioneer work to fulfill the framework.

Bind green & blue carbon via ecosystem management, not geo-engineering

As the earth, marine and climate sciences tell us, humanity has little time left to slow global warming and avoid run-away global overheating. Some say that it may be too late already to stop ocean acidification from reaching the point where it disrupts the marine food webs. In fact, humanity might lose one very important source of protein, which will put even more stress on land-based agriculture and animal husbandry at a time of desertification and accelerated coastal land loss. The world needs a “global domestic policy” and institutions to ensure the fair sharing of resources to feed its growing population.

Some say that the world can get out of the conundrum through geo-engineering or climate engineering and that some of the options currently being investigated will be cheap and effective. Apart from many scientific, technical, economic, legal, moral and ethical questions that are yet unresolved, there would be a need for new global governance institutions for collective decision-making on the deployment of any such engineering approaches. At present, the issue of geo-engineering mostly serves to distract attention from solutions that are more realistic and already attainable today.

Better solutions, in addition to mitigating greenhouse gas emissions and accelerating energy system transformation, are the sequestration of carbon from the atmosphere to bind it in organic molecules produced by photosynthesis. The main approaches to managing natural ecosystems are not only relatively inexpensive, but also produce many co-benefits, which sometimes even outweigh the short term costs. Examples are:

- Afforestation and reforestation (of former forest land) as well as avoiding deforestation;
- Protection and expansion of mangroves (which also provide coastal protection from sea surges in extreme weather events);
- Grassland management designed to maximize production of organic matter in soils;
- Protection of carbon sequestering wetland and “re-wetting” former wetlands that have been drained;
- Protection and revitalization of underwater kelp forests in coastal areas.

The advantages of these options for society and the environment are that they are inexpensive and produce many co-benefits, and that they essentially lack any downside risks. They constitute “no regrets” options for addressing the climate challenge.

Their disadvantage from a business point of view is that they are not “appropriable” (i.e., there is little that can be patented or otherwise protected as intellectual property to produce a revenue stream and rent in the long run) and do not present many options for capital formation and deployment. The disadvantage for ministries of economic affairs and finance is that the benefits are not produced by humans or man-made capital assets, but by ecosystems. This production is not captured in GDP and cannot be taxed.

The G20 should cooperate to give value to ecosystem services of this kind and to adopt policy principles and administrative practices to counteract the bias towards inferior technical fixes over superior ecosystem-based solutions.

Remove tariffs & non-tariff obstacles to energy-related trade & investment

Tariffs and non-tariff barriers continue to hinder trade in energy related goods and services. Much can be done within the framework of existing agreements in order to remove tariff and non-tariff obstacles to efficient trade in energy-related goods and services and to facilitate direct and portfolio investment in energy efficiency and renewable energy supply. Here are a few examples:

- Facilitating trade in environmental goods and services, e.g., abolishing tariffs of up to 23% on electrical goods (between the US/Canada and the EU) needed for renewable energy and smart grid. This may be achieved perhaps through changes in the Environmental Goods Agreements (EGA).
- Abolishing restrictive local content requirements (for industrial goods), e.g., for building energy-efficient electrical light railway transit systems in North America. Perhaps this could be achieved by amending the Government Procurement Agreements (GPA).
- Facilitating the use of process and production standards in determining sustainability or related biogenic energies or levels of production-related emission factors. Perhaps this could be achieved through the International Energy Charter (IEC).

The rules for calculating the percentages of local content are often skewed in that they include only the up-front investment cost of installations with long economic and technical lives, rather than the economic impact over their lifetime. For instance, photovoltaic panels imported from China may make up 30 to 50 percent of total upfront investment in a solar power installation, but less than 1% of the economic value of the power it generates over its lifetime. Local content rules should be linked to life-cycle assessments of costs and benefits.

3. Do no harm, G20: pitfalls and dead ends to be avoided

The positive energy agenda for the G20 sketched in the previous section contains many references to existing and harmful policies and practices in the G20 countries. They don't need to be spelled out again here. However, there are examples of pitfalls and dead ends that are less obvious but that are nevertheless worthy of attention.

One is the danger that “perverse property rights” are newly created, rights that will make it more difficult for future governments, even future generations to adopt and implement policies for the global good. Most relevant in this regard are new property rights to underground fossil resources, which would constitute the ultimate lock-in of existing and unsustainable practices and patterns in the energy sector.

Another example is also concerned with such lock-ins of technology through large infrastructure projects taking years to plan, finance, build, and then to operate and depreciate to recover the investment over decades. Large projects create path-dependencies expressed in concrete, and so they are usually supported by the cement and construction industries as well as the fossil energy lobby. The G20 should purge “perverse projects” from its portfolio and agenda.

Don't allow trade & investment regimes to create new rights to fossil resources

Recent international agreements on and negotiations of trade and investor protection, e.g., the Transatlantic Trade and Investment Partnership (TTIP), show a clear intention to obtain recognition of new private property rights and have them protected for foreign direct investors as well as portfolio investors. The current focus emphasizes protecting investors that hold or intend to hold assets with presumed or pretended values that may be affected by regulatory action.

The risk here is that new private property rights to fossil resources are defined and protected. The protection is intended, in the interest of investors and the fossil energy industry, to cover not only outright expropriation through nationalization or other forms of ownership changes. It is also meant to provide redress in cases where regulation, such as climate protection policies, reduces the value of fossil resources and (future) profits that may be earned from them. The desire even extends to achieving the right to compensation for the value of any assets that may become stranded as policy-induced dynamics effectively obviate the need and the market for fossil energies.

This concern is not abstract, but has a foundation in current industry positions

and arbitration cases. The position of Chevron on TTIP states quite clearly, for instance, that they regard a right to explore an area for hydrocarbons as a legally enforceable promise to also allow exploitation of any identified reserves. That right to exploitation includes the right to bring product to market. As a result, Chevron argues that any policy or regulatory measure that prevents the bringing the product to market (market denial) or that impairs profits should be treated as an expropriation of assets and fully compensated. The basis for such compensation, in the eyes of the industry, should be future expected profit (or even revenue). Climate protection policies that reduce the market for fossil energy would constitute such an “expropriation” and result in compensation being payable, if the industry’s position is reflected in the investor protection clauses of the agreement. In a current case, Lone Pine Resources Ltd. vs. The Government of Canada, a US investor in the Canadian Province of Quebec is trying to obtain compensation with arguments along these lines.

Once accepted and established, such new private property rights form a trap for governments. Either they refrain from regulation — making it impossible to enact effective policies and laws to address the challenges of global overheating, desertification and ocean acidification — or they regulate and suffer the consequences: payment of very significant levels of compensation. The legal precedent can be found in the compensation paid to British slave-holders after the abolition of slavery.

In the 1970s, when faced with coordinated demands by business and industry for government, not industry, to pay for the cost of pollution control, governments were convened by the OECD in order to adopt the polluter-pays-principle as a cornerstone of modern environmental policy. Without this principle — particularly its agreed definition and coordinated application throughout the OECD member countries (and beyond) — environmental protection policies could not have been enacted and the progress in environmental protection, although limited and wholly insufficient to this day, could not have been achieved.

As noted above, business is attempting to establish newly defined, much extended property rights to underground “found” fossil energy resources that cannot be taken away without full compensation. In response, the G20 governments should convene to agree and adopt legal and policy principles that maintain the right to and practical possibility of legislating rules for climate protection and decarbonization that protect the public interest. It may be as simple as stating unequivocally that the polluter-pays-principle also applies to carbon pollution, and that no one has or can have the right to pollute and thus harm others, other countries or future generations.

Don’t allow the G20 focus on large projects to lock in fossil technologies

One of the main vectors of cooperation in the G20 is large projects, which employ large amounts of capital, take a long time to realize, require the cooperation of several countries, and thus suffer from aggregated business and political risk, which may be shared and reduced through cooperation among the G20 countries.

By their nature, such projects often lock-in current and even outdated technologies and create path dependencies that frustrate efforts to bring about transformations. This is especially true for energy-related projects and transport projects with implications for energy use.

Some large projects — or mega-projects — may themselves become obsolete before their completion because of the effects of global overheating. This can be expected in coastal regions as these may be inundated sooner rather than later because of sea-level rise. As the sea level rises, the water will rise also in river deltas and slow-flowing lowland rivers. Water-levels will make it necessary to relocate energy, transport, industrial and urban structures, and to relocate repeatedly over decades and centuries to come. This will not only require investment capital but also shorten the time horizon for infrastructure investment.

The need for repeated relocation has inescapable implications beyond the individual projects. The G20 should address the systemic changes required to shorten investment horizons and deal with physical structures that need to be taken down rather than be abandoned to the elements.

Large investments are also required to expand renewable energy supply and energy efficiency efforts. However, investment in these areas comes in much smaller lots; there are no mega-projects but only large clusters of multiple small and medium size projects in energy efficiency and renewable energy supply (unless someone still wants to propose new large hydropower dams). Instead of focusing on mega-projects, investment needs to be organized not for projects but for programs that facilitate multiple projects. The current framing of investment facilitation in the G20 does not adequately address the possibilities of program financing as an alternative to large-project financing.

4. Revising the G20 principles on energy collaboration

G20 action on energy is meant to follow the G20 Principles on Energy Collaboration of 16 November 2014. The commitment by the leaders of the G20 countries to cooperate in implementing the principles is based on a “common understanding that the international energy architecture needs to reflect better the changing realities of the world energy landscape”. Yet a reading of the principles shows that they were already out of touch with reality at the time of adoption. In late 2015, as trends in the energy sector have advanced further, the principles are even less in tune with realities of the energy landscape and are also clearly inconsistent with other agreed policy objectives, such as the Global Goals or the outcomes of the UN Climate Summit in Paris at the end of 2015.

Table 2: G20 Principles on Energy Collaboration (of 16 November 2014)

Sharing a common understanding that the international energy architecture needs to reflect better the changing realities of the world energy landscape, we, the leaders of the G20 countries, agree to work together to:
(1) Ensure access to affordable and reliable energy for all.
(2) Make international energy institutions more representative and inclusive of emerging and developing economies.
(3) Encourage and facilitate well-functioning, open, competitive, efficient, stable and transparent energy markets that promote energy trade and investment.
(4) Encourage and facilitate the collection and dissemination of high quality energy data and analysis.
(5) Enhance energy security through dialogue and cooperation on issues such as emergency response measures.
(6) Rationalise and phase out inefficient fossil fuel subsidies that encourage wasteful consumption, over the medium term, while being conscious of the necessity to provide targeted support for the poor.
(7) Support sustainable growth and development, consistent with our climate activities and commitments, including by promoting cost-effective energy efficiency, renewables and clean energy.
(8) Encourage and facilitate the design, development, demonstration and widespread deployment of innovative energy technologies, including clean energy technologies.
(9) Enhance coordination between international energy institutions and minimise duplication where appropriate.
www.g20.utoronto.ca/2014/g20_principles_energy_collaboration.pdf

Every single one of these nine G20 Principles on Energy Collaboration is either unclear and potentially misleading, or outright misguided. As an ensemble, they are locking the G20 onto an unsustainable path in its collaboration on energy:

- (1) The first principle focuses on “access to affordable and reliable energy for all”, leaving out “sustainable”, “clean” and “safe”. The omissions reveal that the conceptual flaws in the other principles are not coincidental but the consequence of intellectual limitations.
- (2) Making “international energy institutions more representative and inclusive of emerging and developing economies” may be a worthy goal but only if and as long as the representatives of those emerging and developing economies and institutions are not captured by incumbent utilities and fossil and nuclear energy interests.
- (3) Encouraging and facilitating “well functioning, open, competitive, efficient, stable and transparent energy markets that promote energy trade and investment” would require first and foremost the abolition of environmentally harmful subsidies and privileges because they distort competition, frustrate efficiency, aggravate environmental and social risks that can cause instability, stimulate in the lack of transparency, and distort trade and investment flows, thus locking in harmful technologies and production and consumption patterns (see also point 6 in this list). As long as “perverse subsidies”, as they are called in the jargon, persist, markets for energy carriers, goods, services, and investment cannot be fully open, competitive or efficient.
- (4) The collection and dissemination of high-quality energy data and analysis should focus, as a matter of priority and urgency, on progress on the removal of energy-related harmful subsidies and privileges, such as liability caps and waivers (which underpin otherwise uneconomical nuclear power), or exemptions from environmental laws and regulations (which currently facilitate the growth of fracking for fossil methane, a powerful greenhouse gas).
- (5) Dialogues and cooperation to enhance energy security should primarily focus on systematic improvements in energy security and not be restricted to “emergency response measures”. The energy security benefits of diverse and distributed renewable energies should be discussed, understood and maximized through coordinated principle-led action by G20 leaders.⁷

Security benefits may be obtained also by phasing out fossil energies, because doing so would lift the “resource curse” from producing countries, with its attendant impact on state stability and human security, as well as the “Dutch disease” with its negative impact on economic development, sustainable growth and economic security. G20 dialogues and cooperation should also address the high price of the lack of such security related to nuclear power and the proliferation of nuclear expertise, equipment and materials, including to rogue states and potentially criminal non-state actors, such as terrorists.

- (6) The G20 language on rationalizing and phasing out “inefficient fossil fuel subsidies that encourage wasteful consumption, over the medium term” reveals the misguided nature of energy-related thinking and policy planning in the G20. The wording implies, wrongly, that there are or can be efficient fossil fuel subsidies. The focus on

⁷ See Frank-Walter Steinmeier (2015), Opening Speech at the Berlin Energy Transition Dialogue, Berlin, 26 March 2015. www.energiewende2015.com/wp-content/uploads/2015/03/150326-Berlin-Energy-Transition-Dialogue-Rede-BM-Steinmeier.pdf (in German).

subsidies that “encourage wasteful consumption” would, again wrongly, imply that there are no production-related subsidies that should be phased out. The language can be read to mean that supply-sided subsidies for expanding production of fossil energies are somehow efficient and should not be phased out.

The insertion of “in the medium term” is an obvious indication that the G20 leaders do not intend to address subsidies for fossil fuels anytime soon. The currently low prices of coal, oil and gas present an opportunity to phase-out consumption-related subsidies at little or no economic or political cost, and to set countries on a positive fiscal path when energy prices should rise again in the future.

- (7) The term “sustainable”, which would have been appropriate as part of the first principle, appears as “sustainable growth and development”, a phrase that is normally associated with “non-inflationary” growth (i.e., growth that is sustainable within the narrow confines of monetary policy). This constrained meaning of “sustainable” (in the monetary-policy sense), which must mean “non-inflationary growth,” would indeed need to be monitored and verified to be “consistent with our climate activities and commitments”. “Sustainable development” in the normal meaning of the phrase is, by definition, consistent with climate protection goals and commitments.

Furthermore, as long as production and consumption patterns are unsustainable, as they clearly are in the fossil and nuclear energy sectors, growth cannot be sustainable unless it is part of a rapid, transformational shift in energy systems. In such systems, growth increases while the intensity of unsustainable fossil and nuclear energy systems declines. The principle concludes by mentioning “renewables and clean energy” — phrasing that reveals that the G20 leaders have bought into the false narrative that there are clean forms of energy that are not renewable. The wording is usually employed to justify the use of nuclear energy and coal in combination with carbon-capture-and-storage (CCS), an unproven and at present uneconomical approach. Neither of these is “clean.”

- (8) Given the language in the first 7 principles, the focus on “innovative energy technologies, including clean energy technologies,” needs clarifying and refining.
- (9) While enhancing “coordination between international energy institutions” to “minimize duplication” seems uncontentious, the risk of capture by fossil and nuclear interests needs to be considered and mitigated.

Clearly, the G20 Principles on Energy Collaboration need to be reviewed and revised, not only in view of the new realities and trends in the energy landscape but also in the light of increased urgency of action to combat climate change and ocean acidification, and the broader agenda adopted through the UN Global Goals.

The regular review of climate protection measures agreed at the UN Climate Summit in Paris at the end of 2015 provide a useful framework for the G20 to develop and maintain leadership in the transformation of energy systems worldwide.

Media resources (a selection)

<http://www.independent.co.uk/environment/wind-power-now-the-cheapest-source-of-electricity-but-the-government-continues-to-resist-onshore-a6685326.html>

<http://www.bloomberg.com/news/articles/2015-10-23/wind-energy-cheaper-than-natural-gas-for-xcel-ceo-fowke-says>

<http://www.bloomberg.com/news/articles/2015-10-21/for-nuclear-s-cost-u-k-could-have-six-times-the-wind-capacity>

<http://www.pennenergy.com/articles/pennenergy/2015/10/report-wind-power-less-expensive-than-coal-and-natural-gas.html>

<http://www.bloomberg.com/news/articles/2014-04-16/new-wind-solar-power-cheaper-than-nuclear-option-study-shows>

<http://reneweconomy.com.au/2015/solar-and-wind-substantially-cheaper-than-nuclear-even-in-uk-10393>

<http://www.agora-energiewende.de/en/press/press-releases/detail-view/news/klimaschutz-wird-mit-erneuerbaren-deutlich-preiswerter-als-mit-atomkraft>

<http://www.theguardian.com/environment/2015/may/18/fossil-fuel-companies-getting-10m-a-minute-in-subsidies-says-imf>

<http://www.e3g.org/news/media-room/japan-isolated-as-usa-leads-the-way-in-g7-move-beyond-coal>

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ECOLOGY

An Energy Agenda for the G20 as if the Future Mattered

This article lays the foundation for a reflection and discussion on what the G20 might usefully do, and how it must change to achieve it. Policy recommendations include shifting funds and privileges away from fossil fuels and nuclear power to the development and acceleration of the safer, cleaner and fundamentally cheaper energy alternatives. While pursuing this policy agenda, the G20 should avoid commitments to infrastructure projects that create path-dependencies on fossil fuels and grant new land-use rights for this industry. Beyond taking these actions in 2016, the G20 Principles on Energy Collaboration must change to be in line with realities of the current energy landscape and agreed policy objectives like the Global Goals or the outcomes of the UN Climate Summit in Paris at the end of 2015.