WWF

BRIEF

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GLOBAL NETWORK POLICY: PRINCIPLES FOR CLEAN ENERGY POLICY IN THE CONTEXT OF CLIMATE CHANGE

WWF supports the move to 100% clean and sustainable renewable energy, combined with large scale energy efficiency and conservation measures, by 2050. This position statement outlines the principles WWF believes should guide a fair and just transition to a society fully powered by renewable energy, including full access to clean energy by the poor in developing countries; the eventual phase-out of all fossil fuels; energy conservation and efficiency in all sectors of society; substantially enhanced research and development for material efficiency; the role of gas in a transition period; the risks and costs of nuclear energy; the need for sustainability criteria for hydropower and bioenergy; regional cooperation on and cross-border exchange of clean energy; the potential role of Carbon Capture and Storage (CCS); and the removal of all fossil fuel subsidies.

WWF believes that:

WWF strongly advocates for universal access to clean, fully sustainable, affordable and reliable energy for all people and maintains that many cost-effective, socially advantageous and technologically possible solutions are available to achieve this target.

WWF's goal is to limit climate change and to support the sustainable production and use of zero-emission energy resources in harmony with nature. We support UNFCCC agreements such as the Durban Action Plan (2011) to stay well below 2 degree Celsius global warming, and we support the position of the group of Least Developed Countries (LDC) and of the Association of Small Island States (AOSIS)

to not exceed 1.5 degree Celsius, compared to pre-industrial temperatures. This means that human-induced greenhouse gas (GHG) emissions to the atmosphere from all sectors must be reduced globally by 80% by 2050 compared to 1990 levels.

We recognize, however, that even an increase of 1.5 degrees will result in some large and disruptive climate impacts. Global warming of more than 2 degree risks many irreversible changes to life-sustaining ecosystems, to water and food security, to the physical integrity of coastal settlements and entire nations such as small islands. Poor and vulnerable communities, as well as already fragile ecosystems will be impacted most strongly.[1][2][3] This issue is not the subject of this document, but the point needs to be stressed that equitable solutions to loss and damage and enhanced adaptation policies towards a climate-resilient development are also needed in addition to urgent and speedy clean energy and climate mitigation actions.[4][5][6][7][8]

The energy sector which contributes almost 70% of all GHG emissions has many options for clean renewable technology alternatives and potentials, and thus it is well positioned to make the transition towards zero emissions. This is both possible and necessary to avoid dangerous climate change and eventually limit global warming to no more than 1.5 degree Celsius increase.

WWF recommends that:

In order to achieve the 100% renewable energy path to assist in limiting global warming to 1.5 degree Celsius, WWF urges governments to adopt and implement the following principles:

- **International and national policies promoting equity and fairness are preconditions for any credible policy on clean energy deployment.** Inequality occurs for example when countries historically responsible for significant emissions, or those with the capacity to act, fail to do so. Many fossil fuel subsidies in developing countries aimed to support primarily the poor effectively benefit much more the richer parts of society. Less than 10% of all fossil fuel subsidies reach the poorest 20% in developing countries.[9] Developed countries, the global affluent and the middle class can and must do significantly more than the poor for whom affordable clean energy access is critical for development. Domestic clean energy policies need to be designed to empower indigenous and local communities to access clean energy solutions. In developing countries suffering from a lack of sufficient access to energy, equitable clean energy policy must particularly empower women, the marginalized and vulnerable. In addition, equity in international climate negotiations requires more rapid, fair and sufficient climate finance support, which channel funds from richer to poorer countries. In particular, international high-emitting sectors that benefit from the lack of global price and carbon regulation, such as but not limited to aviation and shipping, need to pay a fair share toward providing climate finance and the development of clean energy. Fairness between nations should foster enhanced technology transfer, which is necessary to assist most countries in sustainable low- or zero-carbon development. Last but not least, based on socio-economic circumstances, countries will move with different

1 IPCC (2007), Working Group II: “Climate Change 2007 – Impacts, Adaptation and Vulnerability”; Cambridge University Press, New York
2 University of Copenhagen (2009): “Synthesis Report Climate Change”; Copenhagen
3 World Bank (2013): “Turn down the heat”, Washington
4 IPCC (2011), Special Report on Renewables: “Renewable Energy Sources and Climate Change Mitigation; Cambridge University Press, New York
5 Jacobson, M., Delucci, M. (2009): “A Plan to Power 100% of the Planet with Renewables”; Scientific American November 2009
6 WWF/ECOFYS (2011a): “The Energy Report – 100% Renewables by 2050”; WWF International, Gland
7 IPCC (2007), Working Group III : “Climate Change 2007 – Mitigation of Climate Change”; Cambridge University Press, New York
8 IPCC (2014) forthcoming, Working Group III : “Climate Change 2014 – Mitigation of Climate Change”

9 IEA (2011a): “Developments in Energy Subsidies”, in World Energy Outlook 2011; OECD Paris

speeds, different transition technologies and including some less clean energies in the next decades towards a fully renewably-powered society by mid-century.

- **The use of fossil fuels (coal, oil and gas) should decrease rapidly and be phased out in line with a pathway to 100% clean renewable energy by mid-century**. Based on a global carbon budget approach, the IEA suggests that maintaining a 50/50 chance to not overstep the 2-degree Celsius threshold, the world must retire and leave below ground more than two thirds of the present global fossil fuel reserves, particularly those with the highest carbon content such as coal.[10] This scenario remains true even if CCS is implemented on a large scale, irrespective of its costs and safety risks.[11] Unfortunately, the world is moving in the opposite direction. With unabated coal use growing very fast in some countries, particularly in developing Asia, and the recent growth in mainly OECD countries of carbon-intensive and environmentally detrimental tarsands, unconventional shale and conventional gas and oil, the world is further away from 'peak oil' or 'peak gas' than ever.[12] [13] Therefore, sustainable renewable energy investments, which despite remarkable growth in the last years only represent about one quarter of all energy investments,[14] must become the dominant source of all energy finance before 2030.

- **Provision of clean energy for the poor is crucial.** More than 3 billion people, mostly in the developing countries of Sub-Saharan Africa and South Asia, face energy poverty. They rely on traditional, very inefficient and polluting use of biomass for cooking and do not have any secure electricity supply. The negative impacts on livelihoods, forests, health, education, gender equality and overall development opportunities for the poor are huge.[15] Therefore, the need for immediate policy action to provide access to clean, renewable, reliable and affordable energy by 2030 in developing countries, is increasingly supported by major stakeholders and civil society. So far, high-upfront costs of renewable electricity, lack of financial schemes for the poor, lack of capacity building and training as well as prevailing fossil fuel subsidies still stand in the way. When removing those barriers most of the cost-effective options to provide universal energy access to the poor is through sustainable renewables.[16] Developing country policies to increase renewables, divest from fossil fuel dependence and overcome energy poverty need to look both at household-level energy needs as well as safe supply for industrial manufacturing and small business support. Erratic access to energy for manufacturing industries is often a major impediment for national development and trade, particularly in Africa.

- **Fossil fuel subsidies in all countries have to quickly transition into support schemes for clean energy, energy efficiency, and access to energy for the poor and other social benefits.** Globally, all fossil fuel subsidies including both producer and consumer subsidies, reduced domestic taxes on fossil fuels and proposed externalities amount to staggering $US 1.9 trillion annually, or almost 10% of all state budgets.[17] Fossil fuels subsidies receive five times more financial support each year than the present investments and support schemes for renewables combined. At the same time this flawed spending encourages continued utilisation of

10 IEA (2012a): "Climate Change Mitigation and the 450 Scenario", in World Energy Outlook 2012; OECD Paris
11 IEA (2013a): "Existing carbon reserves and energy infrastructure lock-in" in Redrawing the Energy-Climate Map, IEA Special Report; OECD Paris
12 IEA (2012b): "Golden Rules for a Golden Age of Gas", IEA Special Report; OECD Paris
13 BP (2012): "Statistical Review of World Energy June 2012"; London
14 IEA (2012c): "Investments in oil and gas", "Coal markets", "[Power sector] Investments", in World Energy Outlook 2012; OECD Paris
15 IEA (2012d): "Measuring progress towards energy for all", in World Energy Outlook 2012; OECD Paris
16 IEA (2011b): "Energy for all" in in World Energy Outlook 2011; OECD Paris
17 IMF (2013): "Energy Subsidy Reform – Lessons and Implications"; Washington

polluting fuels.[18] This is money not spent for needed education, health care, sanitation, other social services and clean energy for all. Even the most ambitious renewable energy expansion scenarios project a future investment need the equivalent of only one third to one half of those subsidies annually.[19] Therefore, abolishing and transitioning those subsidies fully to all clean energy needs will still save the countries money for other social purposes.

- **All renewables, in particular hydropower and bioenergy, must be planned, developed and managed sustainably in order to avoid potentially adverse effects on livelihoods, water and food security, climate, biodiversity and ecosystems.** Social and environmental criteria should not be overruled by economic considerations. It is necessary to work with a variety of stakeholders from industry, finance, governments, NGOs and academia to improve the benchmarks of, and implement sustainability standards for renewable technologies and practices. For example, bioenergy should be used in industrial sectors like aviation where other renewable energy sources are not viable and by communities without access to affordable and sufficient other renewable energy alternatives. This bioenergy should be produced in line with WWF-supported standards and certification systems, have much lower overall greenhouse gas emissions than fossil fuels, not threaten food or water security, contribute to protecting biodiversity and support sustainable livelihoods.[20] [21] [22] [23] [24] Hydropower plants which are still the largest source of renewable electricity need to meet stringent environmental and social sustainability criteria. Hydropower projects -both existing and planned- at a minimum shall meet international good practice on all sustainability criteria agreed in the Hydropower Sustainability Assessment Protocol.[25] [26] Further, integrated land and ocean management is needed to secure sustainable development of marine renewable technologies such as offshore wind and probably in future marine sources of bioenergy such as algae to minimise impacts on biodiversity.

- **Strong energy efficiency and conservation measures are necessary to achieve a renewable energy future in the most cost-effective and environmentally friendly way.** There are constraints on the pathway to 100% renewable energy such as: limits on water and land availability for bioenergy and environmental and social limits for sustainable development options for new hydropower installations, or environmental constraints and supply bottlenecks on materials such as Rare Earth minerals needed for energy conversion technologies like wind and solar, or more copper for grid infrastructure, or lithium and cobalt for electric batteries when moving into renewable-based electrification of transport. Therefore energy efficiency and material efficiency will be needed to reduce energy demand while renewable energy grows.[27] Solutions exist in every

18 IEA (2011a): "Developments in Energy Subsidies", in World Energy Outlook 2011; OECD Paris
19 Eric Martinot for REN 21 (2013a) " Investment Futures" in Renewables – Global Future Report; REN 21 Paris

20 WWF (2013) forthcoming "Land Use Principals Living Forest Report (WWF 2012)
21 WWF/ECOFYS (2011a): "The Energy Report – 100% Renewables by 2050"; WWF International, Gland
22 WWF (2012a): "Sustainable Bioenergy" - http://wwf.panda.org/what_we_do/footprint/climate_carbon_energy/energy_solutions/renewable_energy/bioenergy/
23 WWF (2012b):" WWF bioenergy Position" http://awsassets.panda.org/downloads/final_bioenergy_policy__external__april_2012.pdf
24 WWF (2011b): "Forests and Energy" in Living Forest Report, Gland
25 WWF (2013a): "The Seven Sins of Dams Building", Gland
26 IHA (2011): "Hydropower Sustainability Assessment Protocol", London
27 WWF/ECOFYS (2013) forthcoming: "Critical Materials for 100% Renewables", Gland

sector to deliver substantive energy and material savings and their potential is still largely untapped.[28] [29] Mandatory and dynamically reviewed energy efficiency standards must be introduced in all major energy consuming countries and for all important energy-consuming products such as , for example for cars, lighting, domestic appliances, existing and new buildings.[30] [31] [32]

- **A future sustainable renewable energy system needs to be based mainly on electricity.** Liquid and gaseous fossil fuels dominate almost two thirds of our energy supply, mainly in transport, heating of buildings and industrial processes. Electricity, however, is inherently the most efficient energy carrier. Clean, renewable energy options are abundantly available for electricity such as wind, geothermal and solar but to a much lesser extent for replacing fossil fuels such as with liquid biofuels in the transport sector. Therefore, in combination with energy efficiency, electric public and private transport systems need to replace fuels wherever possible.[33] Fuel use is also very prominent in buildings, mainly for heating, which have a very long turnover time. Therefore, energy conservation and efficiency is fundamentally important in this sector to reduce and eventually eliminate oil and gas needs. Pioneering highly-energy efficient buildings already today source remaining heat supply with geothermal heat pumps or direct electric power. Hot water supply will be based increasingly on solar-thermal heating systems and is increasingly cost-effective in many regions.[34] Renewable bioenergy fuels need to be limited to energy end-use sectors where no other alternative exists to replace fossil fuels momentarily such as in the transport sectors of aviation or shipping or for hot steam demand in heavy industrial processes like steel and cement production. For the non-energy related process emissions CCS will be required.

- **An efficient, economic and sustainable clean energy system needs centralised and large as well as decentralised and small electricity supplies.** Any clean energy solutions that are economically, socially and technically feasible in the respective context of nations need to be supported. In many cases in developing countries and rural regions, off-grid and mini-grid solutions for electricity services are the best, cost-effective options, and among those solar PV is mostly the best option already.[35] [36] [37] [38] [39] Similarly, also in developed countries increasingly self-generation for instance through roof-top solar is central part of the solution.[40] For other parts of society, such as for large industrial consumers and densely populated urban regions grid-based and large power solutions such as windparks, concentrated solar power, sustainable hydro and geothermal are the best options.

- **Targeted innovation, research and technology development are crucial to address constraints to achieve 100% renewable energy.** Significant improvements are needed in areas such as energy efficient products, industrial processes, transport systems and buildings; energy storage; conversion efficiency of renewable technologies; CO2 re-use with renewable power-to-gas systems; smart grids and load management; next generation clean

28 WWF (2013b): “Climate Solvers” http://www.climatesolver.org/innovations/energy-access.
29 WWF (2013c): “The 3% Solution” http://www.the3percentsolution.org
30 IEA (2013b): “Energy Policies to keep the 2 degree target alive” in Redrawing the Energy-Climate Map, IEA Special Report; OECD Paris
31 REEEP/ECOFYS (2008): “Global Status Report on Energy Efficiency”, Utrecht
32 BPIE (2013) : http://www.bpie.eu/
33 WWF/ECOFYS (2011a): “The Energy Report – 100% Renewables by 2050”; WWF International, Gland
34 REN21 (2013a): “Solar Thermal Heating and Cooling” in Renewables 2013 – Global Status Report, REN21 Paris
35 Bloomberg New Energy Finance (2011): “Power to the people?”, London
36 REN21 (2013b): “Rural Renewable Energy” in Renewables 2013 – Global Status Report, REN21 Paris
37 Barefoot College (2013) : http://www.barefootcollege.org/
38 Fakir, S. (2012) : ”The G-20s Energy Infrastructure Plan for Africa”; Heinrich Boell Foundation, Capetown
39 IEA (2011b): “Energy for all” in in World Energy Outlook 2011; OECD Paris
40 German Government (2013);”Climate Protection and Growth – Germany’s Path into the Renewable Energy Age”, Berlin

and highly efficient bioenergy sources; material efficiency and re-use, as well as new product development to replace high-carbon and energy-intensive materials such as PVC, steel and cement. Global research and development efforts for these innovative technologies have to triple by 2030.[41] [42]

- **Consumption patterns of the global rich and middle classes need to be in line with a 'One Planet' Living.**[43] Resulting from economic growth and wealth global middle classes in industrialised and developed countries alike may grow from presently 1.8 to 4.9 billion people by 2035 and increase disposable income.[44] In addition to policy actions, legislation and efforts by governments on energy and material efficiency and on renewables, quantity may outnumber quality of consumption. Therefore, lifestyle changes by the globally better-off are an increasingly fundamental part of the equation to a sustainable zero-carbon society. These changes include all sectors of consumption from substantially less meat consumption to reduce pressure on natural and arable land to modal shifts in transport behavior such as promotion of public transport and less flying. Maintaining our present land-use and meat-rich diets particularly in OECD countries will not permit sufficient sustainable biofuels to replace oil in some sectors and will have additional negative impacts on climate and biodiversity.[45] The concept of 'shrink and share' for the global middle classes is paramount to allow legitimate growth, well-being and decent lifestyles for the global poor allowing humanity's footprint to stay within planetary boundaries ; resource availability, as well as biodiversity protection.

- **Phase out inherently risky, costly and inflexible nuclear power.** Hundreds of thousands of tons of high- and medium-level radioactive waste currently are not stored in safe geological repositories for the thousands of years it takes to lose toxic radioactivity.[46] Costs of nuclear construction, decommissioning, and waste management have sky-rocketed in the last decades in many countries and have led to a decrease in global nuclear power supply already before Fukushima.[47] Nuclear power is also an inflexible electricity source. It cannot be ramped up or down quickly as part of a dynamic energy mix and so it is incompatible with a modern, highly efficient renewable-energy led electricity system with growing amounts of wind and solar in particular.[48]

- **Gas may be relevant as a transition fuel but should be curtailed eventually. Fugitive methane emissions must be addressed immediately.** When burned, gas is much cleaner than oil and coal in terms of carbon and other air pollution. In some cases gas will act as a short term transition fuel to support expansion of renewables, and phase out dirtier fossil fuels. However, if left to scale up together with the advent of new and large shale gas resources in many parts of the world, we risk a long-term infrastructure lock-in of emissions intense gas, which will delay renewable deployment and make it impossible to stay within the permissible global cumulative carbon emissions budget to meet the climate challenge.[49] [50] Moreover, uncertainty about fugitive methane emissions associated with extraction and shipping of gas to point of use raises significant questions about whether natural gas provides any climate benefit, even in the short run.

41 WWF/ECOFYS (2011a): "The Energy Report – 100% Renewables by 2050"; WWF International, Gland
42 WWF/ECOFYS (2013) forthcoming: "Critical Materials for 100% Renewables"; WWF International, Gland
43 WWF 2013: http://wwf.panda.org/what_we_do/how_we_work/conservation/one_planet_living/
44 UNDP (2013): "Human Development Report 2013"; New York
45 WWF/ECOFYS (2011a): "The Energy Report – 100% Renewables by 2050"; WWF International, Gland
46 IAEA (2008): "Estimation of Global Inventories of Radioactive Wastes and other Radioactive Materials"; Vienna
47 Schneider, M., Froggart, A., Hazemann, J. (2012): "World Nuclear Industry Status Report"; London, Paris
48 IEA (2011c): " Harnessing Variable Renewables", OECD Paris
49 Levi, M. (2013): "Climate Consequences of Natural Gas as a Bridging Fuel", in Climatic Change online 3. Jan. 2013
50 IEA (2012b): "Golden Rules for a Golden Age of Gas", IEA Special Report; OECD Paris

At a minimum we encourage the use of best available technology to take steps to contain fugitive methane emissions.[51] Potentially high methane emissions at source and the huge freshwater demand of shale gas add to strong criticism that hydrological fracking for shale gas is not an environmentally friendly solution.[52] Any gas use, whether shale or conventional gas in a transition period needs to be part of an overall long-term decarbonisation strategy towards 100% renewables.

- **Only after all other options including energy and material efficiency and clean renewable energy deployments have been exhausted, has Carbon Capture and Storage (CCS) a limited role to play, subject to truly safe geological CO2 storage. CCS has a larger role in reducing non-energy CO2 emissions from industrial processes.** Given its presently high costs and prevailing geological uncertainty CCS is unlikely to reduce emissions at scale in the energy power sector, and it too will need to be replaced by renewables by 2050. Although, from a climate safety perspective, CCS may have a complementary role as an immediate retrofit for existing fossil-fuel fired power stations prior to 2050.[53] [54] CCS also may play a role in the future for sustainable biomass power for 'negative' carbon emissions as assessed by the IPCC to help to stay well below 2 degrees Celsius. But this must be based on environmentally and socially sound biomass practices. However, for high-carbon and energy-intensive industrial processes such as steel and cement, where there is presently no other alternative to decarbonise the sector even after high material and energy efficiency achievements, environmentally safe CCS is needed as soon as possible

- **Among bordering nations and regions strong energy planning and co-operation is necessary.** Regional and cross-border electricity grid connections are necessary to supply countries or regions unable to produce enough renewables to meet their domestic needs. Population density, distance, financial capacity, and access to efficient resources (for instance sufficient wind speeds, available free space, solar radiation etc.) will affect the speed and extent of take up of domestic renewable energy. Therefore, cross-border exchange of clean renewable energy and the necessary infrastructure is pivotal for most efficient, cost-effective and reliable power supply for grid-based electricity.

- **In order to achieve 100% clean renewable energy by 2050, governments should set respective targets and implement policies to facilitate this equitable transition to an economy based on clean renewable energy and energy efficiency.** These policies need to include but are not limited to ambitious, predictable and reliable long-term financial support schemes such as feed-in-tariffs for renewables to generate investment security, energy-efficiency standards, carbon pricing, regular monitoring of success and domestic compliance regimes. This will help to create policy certainty for continued growth of renewable energy and energy conservation investments while pricing greenhouse gas emissions. Governments must further ensure a level playing field by abolishing fossil fuel subsidies without harming the poor; internalizing resource and environmental externalities and supporting clean energies for the poor. And they will need to act quickly – so that we can eliminate the threat of dangerous climate change.

51 IEA (2013b): "Energy Policies to keep the 2 degree target alive" in Redrawing the Energy-Climate Map, IEA Special Report; OECD Paris
52 WWF (2013d): WWF Position Paper on Shale Gas" http://wwf.panda.org/?208954/wwf-position-on-shale-gas-in-the-eu
53 IEA (2012a): "Climate Change Mitigation and the 450 Scenario", in World Energy Outlook 2012; OECD Paris
54 IPCC (2014) forthcoming, Working Group III : "Climate Change 2014 – Mitigation of Climate Change"

WWF will work with governments, international organizations, local communities, business to:

WWF will work closely in alliances with like-minded organizations, governments, businesses, trade unions, scientists, Civil Society Organisations, regional and local communities and other bodies to foster our 100% renewable energy vision. WWF will continue to advocate for governments and pivotal financial institutions to shift away from fossil fuel subsidies and instead invest billions of dollars required for transitioning to 100% clean renewable energy until 2050. For a just transition, WWF will also work with stakeholders in fossil-fuel producing countries as well as emerging economies to explore avenues to diversify their economies and help plan their development for a non-fossil fuel world.

Field examples

In addition to its policy work, WWF is already active in the field working with key stakeholders to provide clean energy and access to energy for the poor.[55] WWF is currently working in a number of Sub-Saharan African and Asian countries on larger clean energy field projects and often in close conjunction with a focus on sustainable livelihoods, forest and ecosystem protection. WWF has recently signed an agreement with Barefoot College /India to promote off-grid solar electricity development for the poor and focussing particularly on training for women in India and Africa.[56]

55 WWF (2013d): Energy and Development - http://wwf.panda.org/what_we_do/footprint/climate_carbon_energy/energy_solutions/renewable_energy/bioenergy_access/

56 http://wwf.panda.org/what_we_do/footprint/climate_carbon_energy/energy_solutions/renewable_energy/sustainable_energy_report/?207917/indian-scheme-turning-grandmothers-into-solar-engineers-in-madagascar

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Why we are here
To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

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