

# Reasons for hope in the face of climate change

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The Paris Agreement adopted the goal of limiting global warming to two degrees Celsius and recognised the need to actually restrict warming to 1.5 degrees. The recently released *Special Report of the International Panel on Climate Change* is an unambiguous wake-up call. The present trajectory is taking the world to warming by three degrees. There is no option but to get to a fossil fuel-free global economy at the earliest if human civilisation is to survive. Fortunately, technological breakthroughs make transitioning to a fossil fuel-free economy both feasible and affordable.

The cost of electricity from renewable sources such as solar and wind has fallen rapidly. They are now cheaper than electricity from conventional fossil fuels. Germany and UK get 38 per cent and 30 per cent respectively of their electricity from renewables. The discussion now is on phasing out the use of coal altogether for electricity.

There is legitimate concern on how to get electricity when there is no wind and no sunlight. There have been promising developments with batteries and other storage technologies. The most promising, according to many, is solar thermal, where solar energy is focused through large mirrors and the heat is stored in molten salt. This is then used to generate electricity round the clock from conventional turbines as in a normal coal-fired station. The Chinese, acting with strategic purpose, have just commissioned one 50 Mw plant and are developing 5000 Mw of such capacity.

Tariffs from such plants are now in the range of solar photovoltaic tariffs a decade back. With competition and volumes, one can reasonably expect designs and efficiencies to improve and prices to fall, as has been the experience with most new technologies. If storage on a large scale becomes a reality then all electricity needs of the world can conceptually be met from renewables. This would be a dramatic breakthrough. California, which has the fifth-largest economy in the world, has just enacted legislation to have fully fossil fuel-free electricity in the state by 2045.

Ships, automobiles and aircraft use petroleum as fuel, though trains usually run on electricity. Unless radical disruption occurs here, a fossil fuel-free economy cannot emerge. Though this is not yet happening, it could happen fairly soon. The electric vehicle has arrived. The battery technology for electric vehicles keeps getting better. Every major car company in the world is working hard to position itself for the transition to electric vehicles. Provision of charging infrastructure is the key and where the state takes the lead, change is swift.

Norway has shown the way with every third vehicle sold in the country now being fully electric or hybrid. Its target is for all

cars to be carbon emission-free by 2025. Enthusiasts of electric vehicles see them taking over global markets by 2030 on their own strength. The Chinese have taken a strategic call to become world leaders in electric vehicles and battery technology. They are now the largest manufacturers of electric vehicles, producing a million electric vehicles a year.

There are many who see a resource constraint at the global level in the availability of rare earths which are needed for the batteries in electric vehicles if these are to replace all the automobiles in the world. They see alternatives in biofuels, ethanol and methanol, as well as hydrogen cells, as zero carbon-emission energy sources for automobiles. These technologies have been demonstrated. There is naturally quite a journey from demonstration projects to large-scale commercial usage. Biofuel can be used in planes as well as ships. Transportation can then become fully free of fossil fuels. Biomass, biofuels and electricity can be made to provide the energy needs of most industries. Scandinavian countries are now evolving strategies to become fossil fuel-free economies by 2040-50.

Recent experience has shown that the best outcomes happen when state leadership drives competitive technological

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development and continuing deployment to have scale effects. This improves technology, and hastens a rapid decline in costs. Germany did this for the solar photovoltaic industry. Norway is doing this for electric cars now. German technologists did predict in the early 2000s that by 2015 solar power would achieve grid parity — that is, become commercially competitive.

This did happen. China has skillfully acquired world leadership in solar panel manufacturing. The Chinese state is pursuing global technological leadership in electric cars and solar thermal power.

But a global transition will not be easy. The conventional car industry is large and powerful. In the US, where it is the most powerful, there is the striking coincidence that the Republican Party and President Donald Trump are in complete denial of the disaster looming ahead from climate change. They are still acting to promote the fossil fuel industry. Even "green" Germany is finding it difficult to make a dent in the auto sector. Ultimately, political economy dynamics in each country will determine how things pan out.

India is succeeding in the deployment of wind and solar power. But it is yet to get its act together for electric vehicles, solar thermal plants, batteries and other storage technologies. It can choose to wait for the rest of the world to get ahead and then import and use these. It can also choose to leapfrog to the global frontiers in both usage and manufacturing. The choice is for India to make.

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