# Prosze przerczytać artykuł poniżej, przeczytać „Power revolution”, przegladnąć rozdział 2 z książki Solar power to the people a także wejść na stronę <https://ec.europa.eu/energy/en/topics/technology-and-innovation>

# Renewables growing fast, but not fast enough

10 Jul 2018 [Dave Elliott](https://physicsworld.com/author/david-elliott/)

[Courtesy: iStock/John Kelly](https://physicsworld.com/wp-content/uploads/2018/07/pylons-501773545-iStock%EF%80%A2John-Kelly.jpg)



The headline figure in REN21’s 2018 [review of the global status of renewable energy](http://www.ren21.net/status-of-renewables/global-status-report/) is that, in 2017, renewables supplied 26.5% of global electricity, which coincidentally was about the same as for the UK. The UK has now moved up to around 30% and that may well be true globally too. Certainly, REN 21 says that renewables’ share of final energy consumption has continued to grow globally, at around 5.4% averaged over the last 10 years for modern renewables, more for some technologies. By contrast, over that period, fossil and nuclear only grew by 1.6% and energy demand by 1.7%.

REN 21 reports that 178 GW of renewable power generation capacity was added in 2017. That was 70% of net additions to global power generating capacity in 2017, the largest percentage so far, bringing the global total to 2195 GW, with non-hydro renewable capacity (in all 1081 GW) likely to overtake hydro capacity (1114 GW) in 2018. Of the new capacity added in 2017, 159 GW was non-hydro renewables and 19 GW hydro. Overall, with hydro included, renewables accounted for 26.5% of total global electricity generation in 2017, up from 24.5% a year earlier, with hydro at 16.4%, wind 5.6%, bio-power 2.2%, solar PV 1.9%, and 0.4% for ocean power, concentrated solar, and geothermal combined.

In 2017, 52 GW of wind capacity was added, bringing the global total to 539 GW. But that was lower growth than in the previous year, due mainly to a slowdown in China, in part a result of problems with curtailment – about 42 TWh of wind energy was curtailed in China last year. Even so, at 19.7 GW, China was still the leader in new installations. Of the total global installed wind power, 18.8 GW was offshore, with nine countries adding 4.3 GW in 2017, led by the UK (1.7 GW), Germany (1.2 GW) and China (1.2 GW).

Solar photovoltaics (PV) have continued to expand rapidly, installing more capacity than any other power generating technology, and rising by 98 GW, about 33%, in 2017. That has increased the global total to about 402 MW. China led, with PV installations growing more than 50%.

However, while progress was good for electricity, REN 21 says “the power sector on its own will not deliver the emissions reductions demanded by the Paris climate agreement…to ensure access to affordable, reliable, sustainable and modern energy for all. The heating and cooling and transport sectors, which together account for about 80% of global total final energy demand, are lagging behind”.

That point is reinforced by REN21’s new adjusted figures for the total global renewable energy contribution, including biomass, which has only grown by 2.3% over the last decade, mainly since the use of traditional biomass, e.g. in China, has fallen, cutting global biomass’ growth rate to 0.2%. The result of that, and other changes, is that the estimated total global renewables share of final energy consumption was only around 18.2% in 2016, down from the 19.3% estimate in the 2017 REN21 review, with modern renewables now at 10.4%.

Seeking to improve that, REN21 looks at system integration, and better end-use efficiency, e.g. in heating and transport. Rana Adib, executive secretary of REN21 said: “We may be racing down the pathway towards a 100% renewable electricity future, but when it comes to heating, cooling and transport, we are coasting along as if we had all the time in the world. Sadly, we don’t.” REN21 said of particular concern was that global energy demand and energy-related carbon dioxide emissions rose for the first time in four years in 2017, by 2.1% and 1.4% respectively.

The International Energy Association’s [*Tracking Clean Energy Progress*](https://uk.reuters.com/article/us-iea-cleanenergy/few-energy-technologies-sectors-on-track-for-climate-goals-iea-idUKKCN1IO14U) review came up with a similar message, but reflecting the IEA’s wider set of technology commitments, including nuclear and fossil carbon capture and storage (CCS). While there was some good progress, energy efficiency improvements had slowed and progress on CCS had stalled. Progress in deploying onshore wind and energy storage had also slowed. Nuclear was also unlikely to meet the level envisaged in the IEA’s 2025 Sustainable Development Scenario. Overall, Fatih Birol, IEA head, said: “there is a critical need for more vigorous action by governments, industry, and other stakeholders to drive advances in energy technologies that reduce greenhouse gas emissions. The world doesn’t have an energy problem but an emissions problem, and this is where we should focus our efforts”.

However, there have also been some more positive reports, mapping out a different, more optimistic view, with energy efficiency seen as key. Indeed, in its [Energy Transition Outlook](http://www.dnvgl.com/feature/energy_efficiency.html), the DNV-GL global consultancy company claims that efficiency will dominate so demand will fall. It says the energy intensity of the global economy, i.e. the energy used per unit of economic output, will improve more quickly than the rate of global economic growth in the next three decades. As a result, global energy demand will flatten for the first time in our post-industrial history.

This view is also central to a new academic study. Published in [Nature Energy](http://www.nature.com/articles/s41560-018-0172-6.epdf), the study claims that it is possible to reduce global energy demand so that by 2050 it falls to 245 EJ, around 40% lower than today, despite rises in population, income and economic activity. Using an “integrated assessment modelling” framework, it shows how changes in the quantity and type of energy services, affecting demand patterns, drive structural change in intermediate and upstream supply sectors. Overall it says that “down-sizing the global energy system dramatically improves the feasibility of a low-carbon supply-side transformation”. Its Low Energy Demand (LED) scenario meets the Paris 1.5 °C climate target as well as many sustainable development goals, without relying on negative emission techs.

One of the keys is seen to be smart digital IT-based energy systems. “The integration of multiple service functions in single devices (particularly smartphones) yields up to a 100-fold potential power saving while in use. Devices increasingly become ‘smart’ & interconnected, which opens up potential for controllability, system integration (including load management) and demand response.” That also helps with mobility services and transport while, overall, “energy intensity improves drastically due to the combined effects of electric vehicles and new organizational models of service provision, which include shared mobility”.

Energy and resource-use efficiency is upgraded in all sectors, cutting demand: “Industrial-process energy efficiency improves by one-fifth. The aggregate total material output decreases by close to 20% from today, one-third due to dematerialization, and two-thirds due to improvements in material efficiency. ‘Dematerialization’ describes a lower absolute material use due to increases in asset utilization, for example, shared-car fleets that require fewer cars. ‘Material efficiency’ includes light-weighting, for example, less material input per car”.

Changes in energy end-use drive a supply-side transformation, with “strong electrification of energy end-use, consistent with the narrative of pervasive digitalization and more versatile end-use technologies that are also non-polluting at the point of use. Over the longer term, hydrogen also increases its share of the final energy demand (in addition to its role for energy storage)”. Consistent with the LED scenario narrative, “granular energy-supply technologies, such as heat pumps, fuel cells and solar photovoltaics proliferate. Granularity, decentralization and variable renewables pose significant challenges for system management and balancing, addressed via ‘smart’ transformation of physical networks and control systems and scaled-up storage and load-management options”.

The study team admits that a massive effort would have to be made to bring all this to reality: there would have to be “rapid innovation, cost reductions and performance improvements from the widespread diffusion of granular end-use and low-carbon supply technologies”, that would require “sustained innovation policies aligned to credible efforts to stimulate market demand”, while regulators “need to ensure that space is opened up for new business models, digital integration and distributed service provision to overcome incumbents’ vested interests to slow structural change”. But it claims it is technically viable. If so, that’s a huge game changer, allowing renewables to deliver all that’s needed, and cutting emissions fast. Too good to be true? It certainly looks impressive, if a little fantastic. A vast series of technical fixes. See [Carbon Brief’s](http://www.carbonbrief.org/world-can-limit-global-warming-one-point-five-improving-energy-efficiency) review of the paper.

 But for very different views, see some of the oil company scenarios in my next post.

# Forward energy thinking on renewables and nuclear

18 Jul 2018 [Dave Elliott](https://physicsworld.com/author/david-elliott/)

There have been blasts of sense on UK energy policy from the National Infrastructure Commission (NIC), the government’s advisory body, and also from its advisory Committee on Climate Change (CCC), in relation to the relative prospects for nuclear and renewables.

In its new [National Infrastructure Assessment](http://www.nic.org.uk/assessment/national-infrastructure-assessment/low-cost-low-carbon/), the NIC said the government “should not agree support for more than one nuclear power station beyond Hinkley Point C before 2025”, since their cost seemed unlikely to fall, while renewables were getting cheaper and could prove a safer investment. The CCC, in an annual [progress report](http://www.theccc.org.uk/publication/reducing-uk-emissions-2018-progress-report-to-parliament/), although more circumspect on nuclear, said, while Hinkley was going ahead, “limited progress has been made with other new nuclear projects”, and concluded that “if new nuclear projects were not to come forward, it is likely that renewables would be able to be deployed on shorter timescales and at lower cost”.

There does seem to have been a shift in view. Whereas a decade ago few thought that renewables could be affordable and play a major role in electricity generation, the NIC said that the sector had undergone a “quiet revolution” as costs have fallen. It suggests that by 2030 a minimum of 50% of power should come from renewables, up from about 30% now, and calculates that the average costs for a 2030-50 scenario with 90% renewables and less than 10% nuclear would be slightly less than for a scenario with 40% renewables and around 40% nuclear. It adds “the higher cost of managing the variable nature of many renewables (‘balancing’) is offset by the lower capital cost, which translates into lower costs in the wholesale market”.

 The NIC looks to wind and solar PV playing leading roles, both being “allowed to compete to deliver the overwhelming majority of the extra renewable electricity needed as overall demand increases, with measures to move them to the front of the queue for Government support”. The CCC, however, complains that, given the block on access to the Contract for Difference (CfD) support system, at present “there is no route to market for cheap onshore wind”. It’s the same for large-scale PV solar. The fact that these options are now cheaper seems to have been used as an excuse to remove access to the CfD market, without which, even if they get zero subsidies, they are finding it hard to expand.

The NIC wants a revamp of the CfD system, with “technologies that have recently become cost competitive, such as offshore wind”, moved to the “Pot 1” category of “developed” options, from the Pot 2 category of “still developing” options, following the next CfD auction, which is set for the spring of 2019. It says “Pot 1 should be used for the overwhelming majority of the increase in renewable capacity required”. It seems to suggest that onshore wind should be re-included: it is in Pot 1, but is being treated as an outsider. The NIC doesn’t look much at Pot 2 options, which include wave and tidal power, except to say that some support should be offered “especially where they are likely to be able to contribute to the reduction of system costs in future”. However, it suggests that tidal lagoons are unlikely to be cost-effective or a significant option (see my next post), but nevertheless says tidal power “should be allowed to compete on an equal basis with other technologies for Contracts for Difference”.

[Advertisement](https://oasc-eu1.247realmedia.com/5c/physicsworld.com/article/L16/1015025095/Middle/IOPP/SciNews-MID-MPU-Lakeshore-RoS-May18/mt_Lakeshore_BN_0318_300x250_v2.jpg/6c5a7a434a5672366a376f41424b3266?x)



One of the NIC’s main concerns, however, seems to be to slow down nuclear aspirations. Sir [John Armitt](http://www.theguardian.com/uk-news/2018/jul/10/nuclear-renewables-are-better-bet-ministers-told), NIC’s chair, said: “We’re suggesting it’s not necessary to rush ahead with nuclear. Because during the next 10 years we should get a lot more certainty about just how far we can rely on renewables. One thing we’ve all learnt is these big nuclear programmes can be pretty challenging, quite risky – they will be to some degree on the government’s balance sheet. I don’t think anybody’s pretending you can take forward a new nuclear power station without some form of government underwriting or support. Whereas the amount required to subsidize renewables is continually coming down. We’ve seen how long it took to negotiate Hinkley – does the government really want to have to keep going through those sort of negotiations?” By contrast, he says, renewables offered us a “golden opportunity” to make the UK greener and make energy affordable.

That applied to heat as well as electricity. The NIC says the government needs to make progress towards zero carbon heat by establishing the safety case for using hydrogen as a replacement for natural gas, followed by trialling hydrogen at community scale by 2021 and then, if all is well, a trial to supply hydrogen to at least 10,000 homes by 2023, including hydrogen production with carbon capture and storage (CCS). In parallel the NIC says, by 2021, the government should establish an up-to-date evidence base on heat pumps performance within the UK building stock and the scope for future reductions in the cost of installation.

So the UK government is backing both main horses in the green heat race – green gas, in the form of hydrogen, and electrification, via heat pumps. Though oddly there was no mention of the third possible option, local green heat networks, something the government is beginning to take seriously, at long last starting up its £320m heat [net support programme](https://www.gov.uk/government/news/new-central-heating-for-cities-to-help-reduce-energy-bills.). That, admittedly, is small, but the Department for Business, Energy and Industrial Strategy ([BEIS](http://www.gov.uk/government/uploads/system/uploads/attachment_data/file/691643/Heat_Network_Case_Study_Brochure.pdf)) has claimed that heat nets could expand from only supplying 1% of building heat demand now, to meet 17% of heat demand in homes and up to 24% of heat demand in industrial and public-sector buildings by 2050. So it’s an odd infrastructure omission by NIC. Maybe since it is only relevant to urban/industrial areas, whereas gas and electricity reach all consumers.

The NIC also wants the government to move more on what is done with this energy once it’s delivered – cutting energy waste. It wants the rate of installations of energy efficiency measures in the building stock to rise to 21,000 measures a week by 2020, “maintained at this level until a decision on future heat infrastructure is taken”. It says that policies to deliver this should include allocating £3.8 billion between now and 2030 to deliver energy efficiency improvements in social housing.

**[READ MORE](https://physicsworld.com/a/renewables-growing-fast-but-not-fast-enough/)**

**[Renewables growing fast, but not fast enough](https://physicsworld.com/a/renewables-growing-fast-but-not-fast-enough/)**

That’s a quite ambitious series of proposals. But, as the CCC makes clear, the UK does need to get moving on the heat side, as well as on power and transport, if it is to meet its climate targets. The NIC says “highly renewable, clean, and low-cost energy and waste systems increasingly appear to be achievable”. It notes that its modelling “has shown that a highly renewable generation mix is a low-cost option for the energy system. The cost would be comparable to building further nuclear power plants after Hinkley Point C, and cheaper than implementing CCS with the existing system. The electricity system should be running off 50% renewable generation by 2030, as part of a transition to a highly renewable generation mix”.

That’s a pretty good package, at least for starters. Though [Richard Black](https://www.businessgreen.com/bg/news/3035610/forget-your-plans-for-a-fleet-of-new-nuclear-stations-nic-tells-government), from the Energy and Climate Intelligence Unit, claimed that, if the nuclear programme is slowed as NIC suggests, even with a 50% renewable contribution by 2030, the UK will miss its non-fossil energy target. So it would need more than 50% renewables. That depends on what happens to power demand. If the “decarbonisation by electrification” programme is slowed (not so many heat pumps), then power demand would no doubt continue to fall, as it has been over recent years. So there would be less need for new nuclear or extra renewables. But there would then be a need for green gas or green heat networks, or both. Biogas from farm and home waste anaerobic digestion is one obvious source in either case, but may be limited, so a bit of solar heat and geothermal heat fed into heat networks would also be useful. As well as biomass used in combined heat and power (CHP) plants.

Interestingly, a new study for the CCC from [Imperial College](http://www.theccc.org.uk/wp-content/uploads/2018/06/Imperial-College-2018-Analysis-of-Alternative-UK-Heat-Decarbonisation-Pathways-Executive-Summary.pdf) looks at hydrogen gas grids and also domestic electric heat pumps and says that a hybrid mix may be the least cost option, with the “hydrogen alone” route being the most costly. Oddly, as with the NIC study, and also the new set of fascinating scenarios from National Grid in its [Future Energy Scenarios](http://fes.nationalgrid.com/media/1363/fes-interactive-version-final.pdf) series, there’s not much on heat grids or CHP. And one version of the hydrogen route they all look at relies on CCS to limit emissions, since the feedstock source is fossil fuel. They also look at the alternative carbon-free route, “power to gas” conversion of surplus renewable electricity to hydrogen, via electrolysis. It’s more expensive than the fossil route, but it avoids costly and as yet unproven CCS. With 50% of variable renewables on the grid (or 75% in one of National Grid’s scenarios) there would certainly often be plenty of surplus output.  Though some of that would perhaps be better used for (later) power generation to balance lulls in renewables. But there may be enough for both uses – heat and power. Lots of possible paths ahead then, and maybe a bit of a squeeze – though that could perhaps be avoided if the blocks on PV solar and onshore wind were removed.

This post replaces one promised on oil company views. That will follow, but after another intervening post – on the tidal lagoon decision.