Renew on Line 129
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Technology for a Sustainable Future

A bimonthly roundup of news and views on renewable energy developments and policies

Produced by NATTA, the independent Network for Alternative Technology and Technology Assessment.

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Renew was for many years produced by Prof. Dave Elliott and Tam Dougan, then based at the Open University, as a bimonthly NATTA membership subscription journal, with, after issue 100, a free shortened version, Renew on Line (ROL), also produced for NATTA’s web page. Now run by NATTA independently of the OU, ROL is currently delivered as Blog, and continues with the same numbering system. It includes a Forum section for commentary and feedback. An expanded version, called Renew, continuing with the old Renew numbering system, is also produced for use by students on relevant courses, on a course linked password protected subscription basis. Course leaders wishing to subscribe on behalf of their students should contact NATTA for details of charges. Students on the OU Renewable energy course T313 have access at:

www3.open.ac.uk/study/undergraduate/course/t313.htm

Send comments/contributions for the Forum section to NATTA at D.A.Elliott@open.ac.uk
Also see Renew Extra which is posted alternate months to the bimonthly Renew On Line at:

http://renewextra.blogspot.co.uk

For a full guide to NATTA’s various offerings, and access to our free annual end of year review, see: http://renewnatta.wordpress.com

Green Energy Futures  Dave Elliott’s book:


If urls open oddly, refresh or paste in your browser
One of National Grid’s new UK energy scenarios, with PV and wind capacity growing
In this one, self-generation by consumers plays a major role in a very decentralised mix, with renewables booming (63 GW of solar and 65 GW of wind on the system by 2050) and nuclear being cut back to 5 GW. In other scenarios it grows more (to 20 GW in ‘2 degrees’) and renewables less, but overall National Grid looks to renewable having 60% of total capacity by 2050, and distributed energy reaching 93 GW by then. Storage also builds up - to 42 GW in the above. [http://fes.nationalgrid.com/media/1253/final-fes-2017-updated-interactive-pdfs-44-amended.pdf](http://fes.nationalgrid.com/media/1253/final-fes-2017-updated-interactive-pdfs-44-amended.pdf)

By 2030
On current plans
Renewables 40%?
~140TWh at least, maybe more
Nuclear 30%?
~100TWh? But that assumes the all 16GW of new plant goes ahead. National Grid says that by 2030 50% of all UK electricity generation will be connected at the local distribution level. And if they are right then significant nuclear may just not fit. By 2050 who knows - near 80% renewables? Or more.. Unless CCS revives..

What will it cost?
It depends on which options we take

BEIS £/MWh data including storage costs

One thing you can be sure of - Energy Matters won’t like it!
Floating wind power

Five 6 MW Siemens Gamesa Renewable Energy floating turbines are being emplaced by Statoil in its Hywind project 25 km off Peterhead on the Scottish east coast, after having been assembled in Norway: www.bbc.co.uk/news/business-40699979 And soon we will see 10 MW more floating turbines off Dounreay and then a 48 MW scheme with (probably) Winfloat units at Kincardine, 15km off Aberdeen. www.theguardian.com/business/2017/jun/27/hywind-project-scotland-worlds-first-floating-windfarm-norway But RSBP has objected to the Hywind project…

Tidal stream power

Scotland continues to lead in tidal too

A 30 turbine tidal park off the coast of a Scottish island has been granted planning consent, the Scottish government has announced. The 30 MW West Islay Tidal Energy Park will be located around six km off the SW coast of Islay, led by Bluepower & DP Energy. 6 MW of MCT Seagen devices may be first in: www.power-technology.com/projects/west-islay-tidal-farm-scotland

Biomass uncertainties

The Energy Technologies Institute (ETI) suggests that combining waste and biomass for gasification can produce low-carbon energy in line with the UK’s 2050 carbon targets, while reducing the costs by more than 1% of GDP. Gasification can use a variety of feed stocks outside of ‘woody’ biomass and can convert the energy in solid fuels into gas, which can then be used to make electricity, hydrogen and even jet fuel. The ETI claims it would excel at a town scale, because locally-generated waste heat can also be added to district networks, adding heat & power for commercial operations. And they say ‘gasification projects with integrated syngas clean-up have the potential to be competitive with other sources of renewable power’, though ‘support will be required to enable their early deployment’. www.eti.co.uk/insights/targeting-new-and-cleaner-uses-for-wastes-and-biomass-using-gasification Bioenergy is also good for farmers says ETI: www.edie.net/news/6/ETI–UK-grown-biomass-can-support-farmers-and-deliver-carbon-savings/ However, the use of biomass from forests has become very contentious. The UK imports a lot from the USA for the Drax plant, but the US Natural Resources Defence Council has joined with others to claim that this undermines local carbon sinks. There is regulation, but NRDC says the Sustainable Biomass Programme standard ‘fails to provide robust, performance-oriented thresholds & protections. Under the standard, risk assessments can be conducted with a fundamental lack of objectivity, consistency, and connection to the management of actual source forests, and rarely require on-the-ground verification.’ It says it’s like letting the ‘fox guard the henhouse’, noting that self-assessment offers ‘virtually no requirements’ for on-site auditing. www.edie.net/news/6/UK-s-biomass-ambition--low-cost-solution-or-forest-full-of-loopholes/ Also RAeng: www.edie.net/news/10/Biofuels-needed-but-some-more-polluting-than-fossil-fuels--report-warns/

Hydrogen storage

The European Marine Energy Centre (EMEC) on Orkney has a 500 kW electrolyzer using excess power from its tidal arrays and from a local wind turbine. The H2 is fed to a fuel cell, but may later be used as ferry fuel. See IoP/Elliott on storage: http://iopscience.iop.org/book/978-0-7503-1531-9 Freebook

Nova is to test their tidal unit off Llyn in N.Wales; www.cnbc.com/2017/07/17/nova-offshore-windpark-60-meter-tidal-turbine.html

‘Innovation: explores tidal energy potential off north wales: www.penn-energy.com

Above: Scotrenewables 2 MW floating tidal stream turbine now on test at EMEC www.opusenergyblog.com/floatiing-tidal-turbine-off-orkney-islands-breaks-generation-records/

Hot rock
Cornish hopes www.theguardian.com/environment/2017/jul/16/groundbreaking-cornwall-geothermal-project-seeks-funds
Grid Balancing plans

National Grid is to totally overhaul its balancing services. The System Operator will start with frequency response services, pledging to have a new product in the market by March 2018. But that means there will be delay, with an expected second EFR capacity auction not going ahead: see Box. https://theenergyst.com/national-grid-plots-major-overhaul-of-balancing-services-with-frequency-response-first-to-change/ And http://renewbiz.biz/107451/uk-grid-plan-to-boost-storage/

UK Winter wind - sometimes higher than thought: www.metoffice.gov.uk/news/releases/2017/study-shows-potential-for-wind-energy-on-coldest-days

Green heat/hydrogen backed with £35m

New BEIS Minister of State Claire Perry has allocated £35m, from its Energy Innovation Programme, for smart heating systems and innovation using hydrogen as a potential heat source. £10m will sponsor the second phase of work by the Energy Systems Catapult on its Smart Systems and Heat Programme. It aims to help develop local energy plans alongside Local Authorities, and bring down the cost of energy bills, while supporting low carbon heating projects. A further £25m will be invested in potential uses of hydrogen gas for heating, the use of domestic gas pipes and innovative appliances such as boilers & cookers. www.gov.uk/government/news/governments-clean-energy-drive-invests-35-million-in-innovative-projects

Greener gas: www3.imperial.ac.uk/newsandeventspggrp/imperialcollege/newssummary/news_19-7-2017-10-35-49

AD hits 750 MWe enough bio-power for 1 million homes

Biogas, produced by Anaerobic Digestion and fed to power plants, now generates 10.7 TWh per year, with load factors rising to 73% in 2016, up from 69% in 2015. www.renewableenergymagazine.com/biogas/anaerobic-digestion-ad-plants-now-power-over-20170706

..but CHP sidelined says ADE - 13 GW could be possible

The Government risks missing out on savings of £700m a year by sidelining combined heat and power (CHP) within the UK’s capacity market auction, according to the Association for Decentralised Energy (ADE). Around 2,000 factories and businesses have so far adopted CHP to cut an estimated £375m from their total annual bills. ADE says giving CHP the same support as gas plants could more than double its capacity from around 5.5 GW to 13 GW and encouraging a UK CHP boom would bring savings of £700m a year by 2030. It also can help with grid balancing. The UK uses CHP for only 6% of the energy mix but in EU countries including Denmark & the Netherlands it covers between 30-50% of energy demand: www.telegraph.co.uk/business/2017/07/04/uk-energy-scheme-miss-savings-750m-year-ignoring-heat/

Offshore wind ‘kills whales’ There have been reports of disturbance, even deaths www.thetimes.co.uk/article/windfarms-blamed-after-three-whales-die-off-suffolk-w99ntq28 Undersea noise may disorient them, and one report claimed that ‘the sheer loudness of the turbines can also maim and kill fish’. http://dailycaller.com/2017/05/22/offshore-wind-turbines-blamed-for-killing-family-of-whales/ Some may well be sensitive, but won’t oil tanker propeller noise be more of an issue? A more balanced assessment: www.carbonbrief.org/factcheck-whale-strandings-offshore-windfarms

UK Smart grid hitch

Full introduction of a new grid balancing system that will let National Grid make better use of demand-side response, small generators and new flexibility options has been delayed until at least 2018. When the software procurement was completed in 2010 it was expected to go live in 2013. The current balancing system is ‘essentially manual’, says National Grid, designed to control ‘a handful of coal units’. Now the system has hundreds of balancing units, some of them variable. But automation of dispatch has been delayed, partly due to rapid market changes since the system was designed: www.newpower.info/2017/05/essentially-manual-balancing-system-takes-the-strain-as-national-grids-new-dispatch-software-is-delayed-annf-2018/
UK Development overview

In 2016, renewable energy accounted for 8.9% of final energy consumption, as measured using the 2009 Renewable Energy Directive (RED) methodology. So the UK has now exceeded its third interim target; averaged over 2015 and 2016, at 8.5% against its target of 7.5%. Chart 1 shows current progress and all targets. In 2016, renewable electricity accounted for 24.6% of total power generation (using the RED methodology), renewable heat accounted for 6.2% of total heat consumption, and renewable energy for 4.5% of total transport energy. Onshore wind continued to be the leading individual technology for the generation of electricity from renewable sources during 2016, with a 25% share. Offshore wind’s share was 20%.


Next

Some see wind dominating, offshore especially, see left. With the marginal cost of wind electricity being close to zero at all times, the wind capacity that is needed in winter (when there is little sun) to meet most demand is likely to be able to deal with just about all power loads in summer with no extra generation or storage needed.

Under these conditions, it has been argued, adding a lot of solar PV would merely increase the total capital cost of the system, with no gain in system reliability or reduced fuel cost or reduced emissions. In such a system, the excess output that sometimes would be produced, at low demand times, from the large wind capacity needed to cope with high demand periods, would be stored, perhaps being (P2G) converted into hydrogen, to meet demand when there are lulls in wind. Some of the excess could also be converted to storable heat, fed when needed to district heating networks, this replacing gas. CHP plants might also initially be used for balancing - supplying power when demand is high and wind low, as shown above. But later on, as other less variable renewables like tidal power expand, the CHP plants might mainly produce heat. Balancing could also be achieved by export of surplus via super grids set against imports when there were wind lulls. So it’s very grid-based system. Led by wind.

A counter view is that low visual impact rooftop PV can avoid transmission grid losses and the need for extra grid links, by delivering power direct to users, and it is well matched to some summer daytime load e.g. aircon units. It is a much more decentralised approach. And if it is cheap, as it looks likely to be, then having unused capacity the rest of the time doesn’t matter much, with local storage in any case allowing for its energy to be used outside of sun-lighted periods. PV wins! The debate continues. See left for how BEIS see it - wind leads. But efficiency ought to play a bigger role, though who know about CCS and nuclear!

*National Grids new Consumer Renewables 2050 scenario has wind & PV capacity near equal - 65/63GW respectively

Above: the sort of view put forward by Dave Andrews/CEG
Energy Institute barometer reacts badly to uncertainty

The UK’s ambitious target of slashing carbon emissions by more than half within 13 years is at risk because of government dithering on energy policy, according to a membership survey by the Energy Institute (EI), the professional body for the energy sector. Its annual opinion Barometer found that four fifths of its members believe the UK is currently on track to miss the 2030 goal.

‘The mood among our members is that energy policy is on pause and ministers need to hit the play button’. The long delayed Carbon Plan is a key issue—see Box left. It was meant to emerge last year. Smaller issues include the fate of the Swansea tidal lagoon. The EI also highlighted the need to begin decarbonising heat for homes and business. It said the government had been slow to look at alternatives to natural gas. As a result, EI members thought the input from gas for heating would only decline modestly by 2030. Prof. Jim Skea, the EI’s president, said ‘It’s this gap on things like energy efficiency and a heat policy - that’s the real thing that will hold back investment and grow the uncertainty’. Uncertainty and delay are certainly killers


Ducking the RO and FIT - more cuts for renewables

The Renewables Obligation is on the way out, but meantime, big power users can avoid paying for it and the Feed-In Tariff: www.gov.uk/government/publications/renewables-obligation-and-small-scale-feed-in-tariffs-apply-for-compensation The CfD arrangements are a separate issue..

In parallel, Ofgem has announced that the ‘embedded benefits’ payments for small generators to produce electricity at peak times will be slashed from £47/kW to between £3/kW and £7/kW over a three-year period. Ofgem claims that the current level of payment distorts the wholesale and capacity markets and costs customers around £370m a year. But its argued locally embedded generators do not need to use the transmission networks, and help lower consumer energy bills by reducing the need for new network infrastructure investments.

www.edie.net/news/6/Ofgem-condemned-for-slashing-subsidies-for-small-scale-energy-generation/

Tower fire Fact Check Cladding can help cut energy loss, but the disaster wasn’t due to green pressures: www.carbonbrief.org/factcheck-grenfell-tower-fire-and-the-daily-mails-green-targets-claim

In any case, retrofitting cladding to high rises may not be the best way to cut CO2 emissions from energy use - it can be more efficient to link them to district heating networks. Also see: www.theguardian.com/environment/2017/jun/29/failure-to-update-building-regulations-could-triple-heatwave-deaths-by-2040

Community energy- still small but growing

The UK’s community energy movement is now worth £190m, according to Community Energy England which said that 188 MW of local renewable capacity had been built, with at least 30,000 people having invested in local projects via 222 community energy groups across the UK - 186 of them being Community Benefit Societies, a form of co-op. Over 100 projects used PV (99 MW): https://communityenergyengland.org/pages/state-of-the-sector-report
A plague on all their houses..
For once the Global Warming Policy Forum get it right: ‘The need for low cost firm generation is not yet quite acute, but will become more pressing. With the market hemmed in by the punitive Hinkley contract on one side, and commitments to EU renewables targets on the other, government will choose to clear space with least effort. This could easily mean abandoning renewables to their fate by loudly declaring them a glorious success while quietly cancelling further support and allowing nature to take its course.’ Yes, that seems to be what is happening! GWPF may not mind that, though it says ‘supporters of wind and solar should be worried.’ But Hinkley will also undermine the prospects of further nuclear, which GWPF favour. And they say gas will get hit too: ‘so long as the UK continues to pretend to adhere to the renewables targets, the future market for electricity in the United Kingdom will appear so uncertain in scale and unattractive in character that there will be little appetite for investment in CCGTs’. They see it all as a ‘grim mess’: www.thegwpf.com/the-curse-of-hinkley-point/Hinkley gets even worse: www.bbc.co.uk/news/business-40479053 and www.theguardian.com/uk-news/2017/jul/03/hinkley-point-c-is-22bn-over-budget-and-a-year-behind-schedule-edf-admits Note that the new ~£20bn cost estimate excludes interests during construction, and also exchange rate changes, which EDF faces.

Will UK hit the 15% by 2020 target?
All this may mean the renewable energy target is missed: https://www.pv-magazine.co.uk/2017/07/03/uk-ministers-admit-country-has-work-to-do-to-meet-2020-goal-of-15-renewable-energy/ See Box right

Dodgy EROEI data: An FT piece by Prof. Michael Kelly claims that nuclear power has a ‘towering’ energy return on energy invested ratio of 70:1 which he sets against an estimated 2.5:1 for PV in Spain. The latter is it seems based on a 2012 study that was widely challenged, the former excludes the (large) energy costs of producing the uranium fuel: www.ft.com/content/1c849b9a-6486-11e7-8526-7b38dcaef614

Power demand is falling
Andrew Warren, British Energy Efficiency Federation chair, said that when the government first endorsed Hinkley Point C (HPC), it was projecting a rise in electricity consumption of 15% by now, whereas we are consuming 15% less than a decade ago. In other words, it made a 30% error. This is despite a 13% increase in GDP over the last decade. HPC is only due to deliver 7% of consumption, so wouldn’t need new plants to replace the gap left if HPC fails - there isn’t one. Much of the fall has been, and will be, from improved more efficient lighting.
Tom Burke of the E3G Consultancy said ‘If there is even a feeble effort to improve energy efficiency electricity demand will fall further below the 30% Andrew Warren has pointed out. This means that a future energy minister will face the daunting task of explaining to consumers why he or she is having to pay renewable generators to switch off cheaper electricity in order to take the expensive electricity we have already bought from HPC.’ www.no2nuclearpower.org.uk/nuclearnews/NuClearNewsNo97.pdf and www.theguardian.com/uk-news/2017/jul/05/nuclear-is-to-wind-as-betamax-is-to-netflix-why-hinkley-point-c-is-a-turkey


..and the official line
The government has been focused on Brexit and its fraught internal politics. So about all we’ve had on green energy supply has been this holding PQ response: ‘To increase the use of renewables for electricity generation, we have launched a second Contract for Difference allocation round for emerging technologies, which includes offshore wind. This auction is expected to take place in August with results being announced in September. No decisions have been taken on future Contract for Difference allocation rounds for onshore wind, solar and other established renewable technologies. We will set out details in due course. The Feed-in Tariff also remains open to small scale low carbon technologies such as wind power and solar photovoltaic.’ 3/7/17
www.parliament.uk/business/publications/written-questions-answers-statements/written-questions-answers-statements/2017-06-28/18866

V2G backed
The government backs £20m for vehicle-to-grid projects - so that plug-in electric vehicles can provide grid demand-response services. www.edie.net/news/8/uk-ploughs-20m-into-vehicle-to-grid-technology/
Ownership & control: Ecotricity and Good Energy, now part owned by Ecotricity, have been having a new spat:  [www.newpower.info/2017/07/blog-good-energy-and-ecotricity-battle-continues](http://www.newpower.info/2017/07/blog-good-energy-and-ecotricity-battle-continues) A new outfit may beat both: [https://purepla.net/](https://purepla.net/)

Solar heating
The uptake of solar thermal in the Renewable Heat Incentive has been slow, despite the return on investment for solar heat with RHI being typically 6-9%. See chart left.

Blame Games Continue
‘Green taxes’ will soon cost British households £149 a year, British Gas says as it blames government meddling for its 12.5% energy price hike adding £79 to average bills:  [www.telegraph.co.uk/news/2017/08/01/british-gas-says-green-taxes-will-cost-households-149-year-blames](http://www.telegraph.co.uk/news/2017/08/01/british-gas-says-green-taxes-will-cost-households-149-year-blames) They do admit that wholesale power costs have fallen, but don’t seem willing to note that this has been due, in part, to the arrival of low cost renewables. The price hike is actually about the same as the total green tax charges (13% of dual bills), which have supported programmes that have helped get the wholesale price down. As noted above, big energy users are ducking some of them, so in effect domestic consumers have to pay more…

People power
The Public Commercial and Services Union has a new booklet, ‘Just Transition and Energy Democracy’, which backs public ownership of most of the energy system - as in the chart left, from the ‘We Own It’ group. Corbyn put forward similar ideas. PCS backs renewables strongly, municipal projects especially, with strong worker and community participation, as proposed by the ‘1 million Climate Jobs’ campaign. It’s less sure about nuclear, but is anti shale gas fracking.  [www.pcs.org.uk/sites/default/files/site_assets/resources/green_workplaces/2017/Just_Transition%26Energy_Democracy—a_civil_service_trade_union_perspective.pdf](http://www.pcs.org.uk/sites/default/files/site_assets/resources/green_workplaces/2017/Just_Transition%26Energy_Democracy—a_civil_service_trade_union_perspective.pdf) In a 2013 YouGov opinion poll 68% wanted the power utilities nationalized.

EVs and the grid with all new cars to be non-fossil by 2040


With Electric Vehicle (EV) expansion now planned, some worry that the resultant power demand will be too much for the power grid - pushing up demand at peak times.

National Grid highlighted the risk of large increases in peak electricity demand unless EV charging was carefully managed. Its annual report said that EVs could grow at twice the rate over the next 10 years compared to what had been expected the previous year, potentially to 9 million vehicles by 2030. In its most extreme scenario, with 23-25 million EVs in 2050, peak demand could be as high as 18 GW, although, if charging was well managed (and shifted to low demand times) it could be as low as 6 GW - about 10% of UK total peak demand on a cold day: [http://fes.nationalgrid.com/media/1253/final-fes-2017-updated-interactive-pdf-44-amended.pdf](http://fes.nationalgrid.com/media/1253/final-fes-2017-updated-interactive-pdf-44-amended.pdf)

See the chart below - from: [www.telegraph.co.uk/business/2017/07/29/electric-jolt-roused-big-oil/](www.telegraph.co.uk/business/2017/07/29/electric-jolt-roused-big-oil/)

![Peak demand from Electric Vehicles](chart.png)

10% by 2050 actually seems to be the emerging best guess (including from Cambridge Econometrics), depending on how many EVs are in use, assuming that charging is delayed (e.g. due to the introduction of a variable pricing regime or some other form of smart grid management) until later overnight and does not coincide with the evening winter peak heating times. A 10% extra peak, suitably delayed, should be relatively easy to meet from renewables, although there may still be some grid capacity limits in some locations, if green power is also still being used for heating then. That would also be true if nuclear electricity was used. Some of the media got sidetracked into that, claiming that there would be a need for many new nuclear plants: e.g. [www.dailymail.co.uk/sciencetech/article-4691314/Britain-needs-equivalent-FIVE-extra-Hinkley-Points.html](www.dailymail.co.uk/sciencetech/article-4691314/Britain-needs-equivalent-FIVE-extra-Hinkley-Points.html) However, as can be seen, if the EV charging demand peak can be delayed this should not be the case, although the use of non-electric green fuels would also help - e.g. biogas for transport and stored solar & biomass/biogas/syngas for heating. Interestingly, National Grid also see hydrogen possibly playing a large role in transport, more, in one scenario, than EVs. Certainly overall it looked to renewables booming, with the UKs renewable and distributed generating capacity maybe rising to a total of 93 GW by 2050. Good overviews: [www.carbonbrief.org/factcheck-how-much-power-will-uk-electric-vehicles-need](www.carbonbrief.org/factcheck-how-much-power-will-uk-electric-vehicles-need) and [www.carbonbrief.org/analysis-switch-to-electric-vehicles-would-add-just-10-per-cent-to-uk-power-demand](www.carbonbrief.org/analysis-switch-to-electric-vehicles-would-add-just-10-per-cent-to-uk-power-demand)

Also see: [http://realfeed-tariffs.blogspot.co.uk/2017/07/how-on-current-trends-peak-demand-for.html](http://realfeed-tariffs.blogspot.co.uk/2017/07/how-on-current-trends-peak-demand-for.html)


Innovation on storage/grid systems - A four-year £246m battery technology

UK resists EU energy saving plan

British ministers and officials have lobbied hard against a European Commission plan on energy efficiency, even though the rules might never apply to the UK, if it leaves the EU as planned in March 2019.

Brexit

‘Green Brexit’ Gove promises radical post-CAP changes:


‘Green Brexit’

And a ban on petrol & diesel car sales from 2040 - see EVs above. But his track record is patchy: www.independent.co.uk/news/business/comment/brexit-michael-gove-environment-green-subsidies-a7853266.html

UK-EU energy trading prospects

No changes?

www.desmog.uk/2017/05/10/what-does-future-hold-uk-eu-energy-cooperation-after-brexit

www.ukerc.ac.uk/news/the-eu-referendum-what-are-the-implications-for-uk-energy-policy.html

and http://fsr.eui.eu/event/impact-brexit-uk-european-energy-markets/

European wind co-operation could benefit all

So says a new Imperial College study. Co-author Dr Iain Staffell, from Imperial’s Centre for Environmental Policy, said: ‘Some weather regimes are characterised by storms rolling in from the Atlantic bringing high winds to northwest or southwest Europe, but these are accompanied by calm conditions in the east. Other regimes see calmer weather from the Atlantic and a huge drop in wind production in Germany, the British Isles and Spain. But at the same time, wind speeds consistently increase in southeast Europe, and this is why countries such as Greece could act as a valuable counterbalance to Europe’s current wind farms.’

The study notes that today’s wind farms are heavily concentrated in countries bordering the North Sea. This results in uneven wind electricity generation, because most capacity is installed in neighbouring countries with similar weather conditions. A further concentration of capacity in the North Sea region is planned in the near future, which will exacerbate the problems for Europe’s power system, say the researchers. However, if European countries were to co-operate and set up future wind farms based on understanding of the continent-scale weather regimes, fluctuations in future wind energy could be reduced. For example, the planned development around the North Sea means 100 GW (100 large power stations) would need to be turned on or off to balance out changes in wind power generation when the weather changes. With a more co-operatively designed system, this could be reduced to just 20 GW across the continent. The Balkans, Greece, western Mediterranean and northern Scandinavia are all potential ‘balancing’ sites. Lead author of the study Dr Christian Grams from ETH said: ‘Adopting the new knowledge would require a paradigm shift in the planning strategies of countries with wind power potential and more European collaboration’. And, we assume, extra/upgraded grid links - to handle the trade.

The researchers say that energy storage technologies, or other renewable energies, would not by themselves be able to close the wind capacity gap, and that distributed wind power is the best option. Current storage technologies are more suited to compensating for shorter fluctuations of a few hours or days, and in order for solar pick up the slack, solar energy capacity would have to be increased tenfold. Co-author Dr Stefan Pfenninger from ETH said: ‘The sun often shines when it’s calm, but in winter there is often not enough sunshine in central and northern Europe to produce sufficient electricity using solar panels’. www.nature.com/nclimate/journal/vaop/ncurrent/full/nclimate3338.html

Will the UK benefit from the EU Energy Union?

UK already out

Much of the EU’s Energy Performance Buildings Directive is going unenforced in the UK, says Andrew Warren, chair of the British Energy Efficiency Federation. For example, Article 9 sets a deadline for all new buildings to be ‘nearly zero-energy buildings’ by 2020; this includes all existing buildings undergoing major renovation. But, in 2015 all such requirements were abandoned (in England) by the then Chancellor of the Exchequer, George Osborne. Current building codes remain nowhere near zero-carbon. So the UK is already out! Business Green 31/7/17
Most of the 4.9 million tonnes of waste (by volume) will be low level, but most net radioactivity will be in the small (by vol) high level part. NDA doesn’t say, but a lot of this will be from the new plants.

https://nda.blog.gov.uk/2017/04/03/how-much-radioactive-waste-is-there/

Most new HLW will have to stay on site at reactors for maybe 100 years - no site for HLW disposal has been agreed & it will take the legacy HLW first. The Nuclear Decommissioning Authority is to spend £3.2bn on old plant decommissioning over the next 3 years but has had to meet £12.5m in legal costs for exiting a botched contract: www.world-nuclear-news.org/WR-UK-sets-out-decommissioning-plans-to-2020-10041702.html

Estimated cost for decommissioning Sellafield - £88 bn (undiscounted basis).

The UK’s exit from Euratom means that some EU wastes there will revert to UK ownership & responsibility. Or will it try to offload them? See Brexit Box above.

New plants

Given the company withdrawals, it’s time to give up, some say:


That’s mainly about Generation III reactors, which are clearly not doing well. Hinkley may be further delayed to a 2027 start: https://uk.reuters.com/article/uk-edf-hinkley-overun-idUKKBN19F0BF

And the GMB worries about Bradwell: www.gmbwalesandsouthwest.org.uk/news/caution-over-chinese-pop-up-nuclear-reactor And the Moorside AP1000 in Cumbria is paused, as is its grid link: http://corecumbria.co.uk/briefings/nugen

Some still look to Generation IV & Small Modular Reactors - but there’s slow progress. www.theguardian.com/business/2017/may/02/alarm-sounded-over-delays-to-develop-uk-mini-nuclear-reactors

However, even if work did start now, and bore fruit, the earliest startup would be 2027-8 for simple designs and the 2030’s for others. And to get economies of scale, many would have to be built: www.publications.parliament.uk/pa/id201617/idselect/idstech/160/16007.htm - _idTextAnchor048


Although it did note that, in the House of Lords on 24/4/17, Lord Prior had said: ‘we simply do not yet know whether small modular reactors will represent a cheap source of low-carbon energy for the future. We just do not know what the economics are… The only truthful answer at the moment is that the jury is still out.’ But it also said that ‘the UK nuclear sector, supplemented by SMRs, should be viewed as a strategic national asset’, provide cost effective programmes ‘both civil & military’, and ‘de-risking future defence programmes’, with SMR work sustaining ‘the UK nuclear defence supply chain’. A key driver may thus be support for, and technical links with, nuclear submarine propulsion system work*, as SPRU have claimed. https://sustainablesecurity.org/2017/04/12/is-trident-influencing-uk-energy-policy-part-2/

*Rolls Royce do some. They plan a 450 MW mini-PWR, with up to 7 GW installed in the UK: www.world-nuclear-news.org/NN-Rolls-Royce-elaborates-on-its-SMR-plans-1306171.html

Next ? Generation V - fusion: www.theengineer.co.uk/switch-flipped-on-uk-s-newest-tokamak-fusion-reactor/

PR spin apart, it’s even further off from reality, even if this concept works. And the UK is only one small player: www.theguardian.com/environment/2017/jul/25/google-enters-race-for-nuclear-fusion-technology
2. Global Developments

In a joint report the International Energy Agency and the International Renewable Agency present their views on how to comply with the Paris COP 21 aims. Trump aside! The IEA says that ‘limiting the global mean temperature rise to below 2°C with a probability of 66% would require an energy transition of exceptional scope, depth and speed. Energy-related CO₂ emissions would need to peak before 2020 and fall by more than 70% from today’s levels by 2050. The share of fossil fuels in primary energy demand would halve between 2014 and 2050 while the share of low-carbon sources, including renewables, nuclear and fossil fuel with carbon capture & storage (CCS), would more than triple worldwide to comprise 70% of energy demand in 2050.’

IRENA basically says that it can be done, with renewables and efficiency playing the main roles. Global energy-related carbon emissions could it says be reduced by 70% by 2050 and completely phased out by 2060. To help achieve this, the share of renewables in primary energy supply would need to rise to 65% in 2050 from 15% in 2015. In its REmap scenario, renewables supply 82% of electricity by 2050, and renewables and efficiency would meet 90% of emission reduction, with 10% achieved by fossil fuel switching and CCS. But CCS would be deployed exclusively in the industry sector. Very different from the IEA, which sees CCS playing a key role. IRENA also see nuclear as marginal: it would stay at the 2016 level, whereas the IEA has it expanding, though not much; renewables supply nearly 70% of global electricity. In either case, it’s a massive expansion. IRENA says by 2050 an extra $29 trillion of investment would be needed, equivalent to 0.4% of global gross domestic product (GDP). But it should provide stimulus that, with other policies supporting growth, would boost global GDP 0.8% in 2050. And it says ‘reducing the impact on human health and mitigating climate change would save between two - and six - times more than the costs of decarbonisation’.


LUT go for 100% Lappeenranta University of Technology in Finland max it!

Its ambitious study of global renewable potentials, with hourly modeling, says 100% by 2030 is technically viable and affordable, with surplus output stored or traded & used for balancing. That’s taking most things to the max: 100% by 2030 is really pushing it! www.neocarbonenergy.fi/EU: www.researchgate.net/publication/313403782_A_low-cost_Power_System_for_Europe_based_on_Renewable_Electricity A NE Asian extension, with HVDC supergrid links: www.researchgate.net/publication/280098413_North-East_Asian_Super_Grid_Renewable_energy_mix_and_economics and www.researchgate.net/publication/291556438_North-East_Asian_Super_Grid_for_100_renewable_energy_supply_Optimal_mix_of_energy_technologies_for_electricity_gas_and_heat_supply_options Not everyone is convinced that supergrid power trading like this will be viable - local surpluses may not match lulls elsewhere, but local storage and DSM may change that. Energy Matters had a go at dismantling it all. See the links in this riposte from LUT: http://euanmears.com/the-lappeenranta-renewable-energy-model-is-it-realistic-lappeenranta-responds/

REN 21 asked 114 energy experts from around the world if they thought we could get to 100% renewables globally by around 2050. Most (two thirds) said yes, but Indian and Japanese experts were less convinced: www.ren21.net/future-of-renewables/global-futures-report/

..and why we should aim for that

Some claim the climate models are not accurate. But it seems even early ones were quite good. IPCC: http://iopscience.iop.org/article/10.1088/1748-9326/7/4/044035 but Hanson (then at NASA) was a bit high: https://movhu.blogspot.co.uk/2015/10/hansens-1988-predictions-revisited.html and www.skepticalscience.com/Hansen-1988-prediction.htm But temperatures all go the same way - up: https://twitter.com/hausfath/status/847095273889312768?src=web
Next - on to 100%?

No way, says a new study by a group of mostly pro-nuclear academics, who look critically at some of the many 100% renewables global or regional energy scenarios that have emerged in recently.

24 were deemed to have forecast regional, national or global energy needs in sufficient detail to be considered potentially credible, but, on inspection, none were considered to have provided convincing evidence that basic feasibility criteria, in relation to energy supply reliability, grids &balancing, could be met. For example, 8 provided no form of system simulation while 12 relied on what were considered to be unrealistic forecasts of energy demand. In addition to feasibility issues, the study says ‘heavy reliance on exploitation of hydroelectricity & biomass raises concerns regarding environmental sustainability & social justice’. They also complain about the ‘explicit exclusion of nuclear power and fossil fuels with carbon capture & storage’ in many of the scenarios, and say ‘the early exclusion of other forms of technology from plans to decarbonize the global electricity supply is unsustainable, and arguably reckless’.

Overall ‘a 100% renewable electricity supply would, at the very least, demand a reinvention of the entire electricity supply-and-demand system to enable renewable supplies to approach the reliability of current systems. This would move humanity away from known, understood and operationally successful systems into uncertain futures with many dependencies for success and unanswered challenges in basic feasibility’, www.sciencedirect.com/science/article/pii/S1364032117304495


However, it seems very broad brush stroked and also selective: some scenarios they looked at (Jacobson et al) explicitly avoid biomass, some they don’t look at (e.g. ICL/ UKERCS system integration studies) go into great detail on grid balancing. And on hydro - well that’s in dispute (see below), though pumped hydro storage less so.

Large hydro meets strong resistance

Large invasive hydro power is not the way ahead say green NGOs: www.theguardian.com/environment/2017/apr/04/green-groups-condemn-un-plan-to-use-136m-from-climate-fund-for-large-dams


Climate change Wild fires are getting worse around the world: www.dw.com/en/how-climate-change-is-increasing-forest-fires-around-the-world/a-19465490
Will and should renewables continue to enjoy ‘must take’ preferential grid access advantages? 

EU league table update - near 17% overall

The next battle - priority dispatch

EU Share of energy from renewable sources overall in 2015

Chart left: % of gross final energy consumption

Key: ‘NA’ Data not available/not applicable

At 53.9% of energy from renewable in its gross final consumption of energy, Sweden had by far in 2015 the highest share, ahead of Finland (39.3%), Latvia (37.6%), Austria (33.0%) & Denmark (30.8%). At the other end of the scale, the lowest proportions of renewables were registered in Luxembourg & Malta (both 5.0%), the Netherlands (5.8%), Belgium (7.9%) and the UK (8.2%).

Each EU Member State has its own 2020 target. The national targets take account of different starting points, renewable energy potential and economic performance. Among the 28 EU Member States 11 have already reached their national 2020 targets: Bulgaria, the Czech Republic, Denmark, Estonia, Croatia, Italy, Lithuania, Hungary, Romania, Finland & Sweden. Moreover, Austria & Slovakia are about 1 percentage point from their 2020 targets.

At the opposite end of the scale, the Netherlands (8.2 percentage points from reaching its national 2020 objective), France (7.8 pp), Ireland and the United Kingdom (both 6.8 pp) and Luxembourg (6.0 pp) are the furthest away from their targets.

The next battle - priority dispatch

Will and should renewables continue to enjoy ‘must take’ preferential grid access advantages? 

We want low carbon power, and this promotes it, but rivals like nuclear don’t like it!
EU energy and emissions progress

Energy use from renewable energy systems (RES) has risen to 16.7% of Europe’s total, up from 15% in 2013 (see above), and accounts for 77% of the continent’s new power capacity. That has helped Europe to cut its fossil fuel consumption by 11% since 2005 and greenhouse gas emissions by about 10% in 2015. The European Environment Agency says: ‘Most of these changes took place in energy-intensive industrial sectors under the EU Emissions Trading Scheme (ETS), as the increase in renewable electricity decreased the reliance on fossil fuels and contributed roughly three quarters of the estimated total reductions attributed to RES use’: [link]

However, it says much more needs to be done in all sectors. Progress was patchy across countries (see chart above), and across sectors. ‘National RES deployment since 2005 has led to the largest reductions in domestic fossil fuel use and avoided GHG emissions in Germany, Italy & the United Kingdom in both 2014 and 2015. In relative terms, Sweden, Denmark & Finland were the top three ranked countries in terms of substituting fossil fuels and avoiding greenhouse gas emissions in proportion to their domestic fossil fuel use and emissions.’ Even so, only about 18% of all final energy consumed for heating and cooling came from renewables in 2014 and only 6% of transport fuel, transport emissions being a key problem most places. See Germany below.

German transport emissions rise

Although its climate & energy polices have helped it to cut overall emissions by 27.6% in recent years, Germany’s CO2 emissions have recently risen by 0.7%, according to a study by Arepo Consults for the opposition Green party. A key reason was rising emissions in the transport sector, the Greens said. The Federal Environment Agency had reported a 3.4% rise in 2016 - partly because of an increase in freight traffic, which grew by 2.8%:
[link]

New pumped hydro storage project in German mine

A 200 MW rated pumped hydro storage system is to be developed using an old coal mine in Germany:
[link]

However, some old pumped hydro storage plants are having problems competing with cheap renewables:
[link]

Germany reroutes power via Polish & Czech grids -with, it’s claimed, dire results:
[link]

Norway wont have enough hydro spare

Some see Norway becoming a hydro battery for the EU, e.g. for Germany, but Norway may need all its lake/reservoir capacity for itself: [link]

EU Energy co-ops

The European Federation of Renewable Energy Cooperatives represents 1,240 initiatives and 650,000 citizens, investing €2 bn in 1 GW of renewable projects, with a combined turnover of up to € 950m p.a.: [link]
USA struggles under Trump


They included a 69% cut for the DoE’s Office of Energy Efficiency and Renewable Energy, and a 31% cut for the EPA. Trump also mounted legislative attack on the Clean Power plan and on the ‘social cost of carbon’ methodology. That was widely attacked as environmentally irresponsible: [www.edie.net/news/9/EU-leads-attacks-on-Trump-s-rollback-of-Obama-climate-policy](http://www.edie.net/news/9/EU-leads-attacks-on-Trump-s-rollback-of-Obama-climate-policy)

It’s certainly all impacting on the market - some solar companies are failing, though this may be part of wider boom-bust cycle: [www.renewableenergyworld.com/ugc/articles/2017/03/15/residential-solar-a-buyers-market.html](http://www.renewableenergyworld.com/ugc/articles/2017/03/15/residential-solar-a-buyers-market.html)

Similar market pressures apply to wind on and offshore:


Nor is geo-engineering, which he may also back - post Paris exit!: [www.theguardian.com/environment/true-north/2017/mar/27/trump-presidency-opens-door-to-planet-hacking-geoengineer-experiments](http://www.theguardian.com/environment/true-north/2017/mar/27/trump-presidency-opens-door-to-planet-hacking-geoengineer-experiments)

Though there was a win on methane! [www.reuters.com/article/us-usa-congress-idUSKBN18620F](http://www.reuters.com/article/us-usa-congress-idUSKBN18620F)

But the US now joins Syria & Nicaragua outside the Paris accord, even if Pittsburgh deferred!

**USA’s exit from the Paris accord**

Trump said ‘the United States will withdraw from the Paris climate accord’, but will ‘begin negotiations to re-enter either the Paris accord or a really entirely new transaction on terms that are fair to the United States’. The rest of the world was horrified, but the exit will take 3 years to enact and signs are that a revamp/renegotiation isn’t on the agenda. Meantime the rest of the world seems likely to just get on with it - with China and the EU in the lead. Many US companies, states and cities will also carry on with their green energy plans - Pittsburgh too!


And the US will stay in the game globally, US Energy Secretary Rick Perry said on June 1st: ‘the United States will continue to be actively engaged in the development of global energy and the world leader in the development of next generation technology. That is exactly why I am traveling to Japan and China to discuss the benefits of all forms of energy, including nuclear, fossil, LNG and renewables. I also plan to discuss technological advances such as carbon capture (CCS) that can leverage the abundant resources we have available in an environmentally responsible way. The United States will continue to be a leader in energy technology, development, and delivery. We will serve as an example to the rest of the world on how to achieve economic, energy, and environmental goals simultaneously.’

Evidently it wants to exploit its large coal & gas reserves to the full, but how much CCS will be taken on board is unclear. Same for nuclear. The reality is that renewables are booming. So US emissions may still fall to some extent, despite the exit from the Paris accord, but less, with coal filling in. The exit also means it can stop donating money to the linked Green Fund - so far the US has released $1bn of the $3bn it promised. Not so good for poor countries reliant on aid to try to deal with climate change. Or for the planet - with the US no longer operating within the emission reduction targets set by the Paris accord. All very worrying. But Trumps wild card solar wall along the US Mexico border idea may yet fly!

The big picture - costs are falling fast
Wind & Solar Power Are Now Cost-Competitive

Capacity Auctions

The cost data above comes in the main from competitive capacity tenders/auctions - a system that’s been used a while in the USA, but is now used increasingly around the world as FiTs are ended. That does not mean there are not still subsidies and other forms of support for renewables and other options e.g. capacity credits, loan guarantees, CfD strike prices above market prices, but some renewables are heading for zero subsidy. Here’s coverage of a recent US auction round:

www.greentechmedia.com/articles/read/pjms-capacity-auction-a-poor-showing-for-nuclear-and-demand-response

China lambasts US cuts more coal

It saw Trumps clean energy cull as ducking out of global leadership, but warned that ‘no matter how hard Beijing tries, it won’t be able to take on all the responsibilities that Washington refuses to take’.

www.theguardian.com/world/2017/mar/30/climate-change-china-us-selfish-trump-coal

And it reaffirmed its view after the US exit from the Paris accord. China is certainly doing its bit - its leading on renewables and is also shutting coal plants:


www.power-eng.com/articles/2017/05/china-suspends-more-coal-development-in-29-provinces.html

Meanwhile, PV is looking good: www.bbc.co.uk/news/business-40341833

Though its growth is slowing: www.scmp.com/business/article/2088905/china-erect-fewer-farms-generate-less-solar-power-2017

Russia slow change 52 GW Hydro

Nuclear is its main growth area, though some new renewables may start to grow a bit soon, to 4.5%, but from a very low (<1 GW) base - see Russia’s plan in the OECD World Energy Outlook 2011. Fossils remain dominant.

Japan could get 35% of its power from renewables by 2030, says an IEEFA report: http://ieefa.org/ieefa-report-renewables-path-japanese-energy-security-post-nuclear-era/

It reached 72GW at the end of 2016

India Fossils give way renewables

MW annual additions - coal v renewables

Sources: CEA, MNRE, Bridge to India research

Wind over 31GW PV solar over 10GW Total renewables over 93GW

www.windpowermonthly.com/article/1429951/record-one-year-capacity-increase-india
African renewables can expand

A new assessment by the U.S. Department of Energy’s Lawrence Berkeley National Laboratory has found that wind and solar can be economically and environmentally competitive options in Africa and can contribute significantly to the rising demand, which could triple as African economies develop.

Ranjit Deshmukh, one of the lead researchers of the study, said that ‘wind and solar have historically been dismissed as too expensive and temporally variable, but one of our key findings is that there are plentiful wind and solar resources in Africa that are both low-impact and cost-effective’. He added ‘Another important finding is that with strategic siting of the renewable energy resource and with more energy trade and grid interconnections between countries, the total system cost can be lower than it would be if countries were to develop their resource in isolation without strategic siting’.

The Berkeley Lab study uses multiple assessment criteria, including locational factors, with opportunities for grid balancing via trade being seen as important: many countries in the South and East have wind and solar potential several times greater than their expected demand in 2030 and by ‘prioritizing wind and solar projects for regional energy trade, policymakers and financiers can increase their cost-competitiveness’.

Ethiopia leads in Africa  It beats Egypt and South Africa

With 99 million inhabitants, Ethiopia is one of the poorest nations in the world, but its total renewable energy capacity jumped from 697 MW in 2008 to 4,188 MW in 2016, over 10% of Africa’s total generation capacity of 38 GW. South Africa had similarly jumped from 838 MW in 2008 to 4,064 MW in 2016. Egypt has stayed at just over 3 GW. Edies noted that Ethiopia ‘was among the most daring signatories of the Paris Agreement, committing to cut carbon emissions by 64% by 2030. It is already 100% powered by renewable energy, but the Government continues to position clean technology and green innovation as key economic drivers. It has already ploughed billions into hydropower megaprojects and is now gearing up to become the wind power capital of Africa, with its second Growth and Transformation Plan, a five-year strategy to reduce poverty and spur national development - pursuing an increase of wind energy output from 324 MW in 2015 to more than 17 GW by 2020.’

‘Wasted millions’  Ethiopia has been one of the recipients of climate related aid.

It included funds for a wind project. But the Telegraph has challenged the use of this type of funding - which it puts at £2bn globally so far, with the UK providing £268m for the £630m Scaling Up Renewable Energy Project (SREP) which is said so far has only yielded 276 MWh.
High problems around the world

Problems in France
Low: http://euaneuarn.com/the-french-nuclear-crisis-did-europe-dodge-a-bullet/
Stand off: EDF refused to shut down the Fessenheim plant as requested by the government. The delayed Flamanville start up may mean that, under the 50% nuclear cap policy, it doesn’t have to.

Portugal v Spain
Spain wants to extend the life of a nuclear plant near the Portuguese border by ten years, but needs a waste dump there to do so. Non-nuclear Portugal is opposed: www.theportugalnews.com/news/almaraz

Big issues in Japan

Delays in China
Its versions of the EPR and AP1000 have met with construction problems www.chinadialogue.net/article/show/single/en/9341-China-s-nuclear-roll-out-facing-delays

It’s been suggested that this may slow the overall programme: www.bloomberg.com/news/articles/2017-02-20/china-nuclear-ambitions-seen-stalled-by-next-generation-reactors

South Korea
gets 40% of its electricity from coal, 30% from nuclear, 20% from gas. But after safety scares and Moon’s recent election, plans for 11 new nuclear plants by 2029 were halted and one old unit is being closed. Others may follow, in a slow phase-out, while renewables may supply ~20% by 2030, with new coal plants halted: www.world-nuclear-news.org/NU-Koreas-nuclear-phase-out-policy-takes-shape-1906174.html

India

Russia
Nuclear dominates in its plan for new energy - see chart above. It’s looking to niche markets: its 70 MW Akademik Lomonosov floating nuclear plant (pic right) may be ready in 2019.

USA X-energy
plans pebble bed hi-temperature reactor: www.world-nuclear-news.org/NN-Xe-100-HTGR-moves-to-conceptual-design-1703177.html A long shot...

TVAs’s SMR plan hits problems: www.power-eng.com/articles/2017/05/tva-s-plan-for-smr-runs-into-snags.html

Nuclear lobby


3. Forum  Odds and ends for you to chew on

Grid defection - OK for some?

If you live in sunny Hawaii, then fully offgrid PV solar with batteries may be economic compared with grid power. But maybe not for the rest of us: see the comments: [https://energyathaas.wordpress.com/2017/04/10/renewables-dis-integration/](https://energyathaas.wordpress.com/2017/04/10/renewables-dis-integration/)

![Storage dissed](Image)


Energy Storage on film Geoffrey White has assembled a list of good you tube videos on electricity storage:

1. NEC batteries ‘Energy Storage for the Grid’ 12/03/2015 5.52mins [https://www.youtube.com/watch?v=WH3r0Ybuk0U](https://www.youtube.com/watch?v=WH3r0Ybuk0U)
2. Tipple-flow batteries ‘International energy storage markets’ 01/08/2015 10.27 mins [www.youtube.com/watch?v=g9quRh1QUJE](http://www.youtube.com/watch?v=g9quRh1QUJE)
3. Danielle Fong CAES ‘A new chapter in energy storage’ 27/11/2017 12.27 mins [www.youtube.com/watch?v=VYmVanjB](http://www.youtube.com/watch?v=VYmVanjB)
4. ‘Highview Power Storage’ cryogenics - Highview site visit 03/02/2014 4.05 mins [https://www.youtube.com/watch?v=767y5ViGurA](https://www.youtube.com/watch?v=767y5ViGurA)

Trump Digs Coal but Kentucky Coal Mining Museum in Benham, owned by SE Kentucky Community & Technical College, is switching to solar power to save money. The museum, which memorializes Kentucky’s history in coal mining, is modernising with a new form of cheaper energy. There’s also a new solar project planned for an old Kentucky coal mine site: [https://thinkprogress.org/kentucky-coal-mine-solar-farm-a5d10d6526bb](https://thinkprogress.org/kentucky-coal-mine-solar-farm-a5d10d6526bb)

**Wyoming**, the largest coal producer in the US, is already among several major coal-producing and Trump-voting states that are actually leading in adding new renewables capacity: [www.ucsusa.org/clean-energy/increase-renewable-energy/momentum](http://www.ucsusa.org/clean-energy/increase-renewable-energy/momentum)

But in terms of jobs, the transition from coal to renewables won’t be easy - some skills aren’t transferable: [https://energyathaas.wordpress.com/2017/04/17/benefiting-from-green-jobs/](https://energyathaas.wordpress.com/2017/04/17/benefiting-from-green-jobs/)

![Goodbye to coal](Image)

The sun may not always be our friend!

![Too much US PV](Image)


![DALE](Image)

In search of optimal supply

PV solar arrays are angled to get the maximum sun - and that works well at equinox times when cooler temps also aid cell efficiency. But angling West to get the late evening sun may match to demand better at other times. Though shifting to PVT may change all that.

**Wind** is stronger in winter, but access to offshore sites is harder, so repair down-time can rise. More reliable direct drives may avoid that. Also UK wind variations offshore are less than was thought, so output may be more: [www.windpoweroffshore.com/article/1429109/lower-uk-wind-variability-cuts-project-lcoe](http://www.windpoweroffshore.com/article/1429109/lower-uk-wind-variability-cuts-project-lcoe)

## Comments welcome

**DALE** - a new global Distributed and Local Energy outfit: [http://martinot.info/dale/](http://martinot.info/dale/)
Solar push - fines for non-compliance

In Kenya a law requires owners of residential & commercial buildings, with hot water needs over 100 litres per day, to include solar water heating systems in their designs, but take up has been slow. So now stiff fines are being imposed for non-compliance. The law also prohibits electricity distributors from connecting non-compliant premises, but Kenya Power has defied this, saying it’s the county government’s job to ensure building plans comply with solar rules:

Stealing the sun PV solar systems seem prone to theft in some parts of the world.

For example, in Africa, according to the Washington Times ‘on a continent where a third of the population lives under the official U.N. poverty line, solar power users need to hire armed guards to prevent the coveted panels from being stolen’. It quoted Maria Vanderwalt, who runs a small winery near Cape Town. Three years ago, she had converted to solar power. ‘It was a wonderful 10 months, though on cloudy days we used a diesel generator. Then one night, a truckload of robbers arrived with guns, tied up my staff and took the panels and half my batteries. We’re now back on the grid.’ It said ‘her tale is common across Africa, Asia and even Brazil. In the rural districts near Mumbai on the west coast of India, nearly 2,000 villages and smaller settlements were electrified for the first time in 2012 using solar power, some of it funded by aid projects. Since then, nearly all the equipment has been broken or stolen.’

EAC on development UN-backed Sustainable Development Goals (SDGs) were agreed in 2015 and set targets to end extreme poverty, tackle climate change & reduce inequality globally by 2030, this offering significant economic opportunities. There are aid programmes, but a report the UK House of Commons Environmental Audit Committee (EAC) claims that the UK Government has done little to promote public awareness of the SDGs, or apply them within the UK. It’s chair said ‘Ours is the generation which can end poverty and ensure that our children inherit a fairer, healthier and more sustainable country. That is what the Global Goals are all about. As the UK leaves the EU, the Government has a once in a generation opportunity to use the Global Goals to forge a cross-party consensus on sustainable development in the UK. However, the Government seems to regard the Goals as a developing world issue and has no clear plan to implement them domestically.’
www.publications.parliament.uk/pa/cm201617/cmselect/cmenvaud/596/596.pdf Progress is certainly slow:
www.edie.net/news/7/-/Time-for-a-step-change---Research-finds-slow-corporate-progress-on-SDGs/
The USA’s exit from the Paris climate accord and the linked £100bn green fund won’t help…

Renewables hit by US nuclear subsidies New York and Illinois have approved as much as $10bn in subsidies to keep struggling reactors open for the next decade. Ohio, Connecticut & New Jersey are debating whether to do the same. But renewable energy operators including NRG Energy Inc. & Invenergy LLC say keeping nuclear plants open will leave grids awash with excess power, leaving little demand for new wind and solar farms:
But Poland hopes a nuclear power station may allow it to continue using the European Union’s biggest coal deposits to fuel the bloc’s biggest eastern economy. The country, which gets more than 80% of its electricity from coal, may use a pledge to build its first nuclear power plant as a bargaining chip in key talks with the EU on planned climate regulations:
While Russia is to help Iran build 2 nuclear plants www.rt.com/business/385394-russia-iran-nuclear-power-plants/

New Network The Energy and Social Science Network (EASSN) is an interdisciplinary academic forum for discussion of how social & technical issues related to both energy production & consumption interact:
www.jiscmail.ac.uk/EASSN

Drawdown plan for climate clean up www.drawdown.org
Climate changes

![Graph of temperature changes over time]

We hit 410 parts per million of CO₂ recently...

...up from 280 ppm in pre-industrial times

Nuclear promotion

A new, long, partisan and somewhat overwhelmingly chaotic video selling thorium/molten fluoride salt reactors: www.youtube.com/watch?v=H6mhw-CNxaE


Nuclear promotion

Russian style: Rosatom says the World Nuclear Association’s global aim to add 1000 GW of new nuclear by 2050 is fully achievable and ‘perhaps modest’: www.world-nuclear-news.org/C-Russia-urges-more-ambitious-nuclear-capacity-target-27061701.aspx


The report quotes George Monbiot, Mark Lynas and Chris Goodall as UK pro-nuclear greens*. But see Monbiot’s earlier views on the Sense about Science group: www.monbiot.com/2003/12/09/invasion-of-the-entryists/

Stair case warming

Same climate data, different interpretations

- El Niño/La Niña events define phases in apparently erratic CO₂–led temp. rise processes (a), so it slows for a while then resumes at a higher level. In one version of this so called ‘stair case’ view (b), that’s mostly about solar heat that gets collected up in the ocean depths and then released by El Nino turbulence, until its drained and stops for while. But its hard to see CO₂ not being the main driver for the ever upward 40 year on progressive temperature rise:

http://euanmearns.com/the-stair-case-hypothesis-an-alternative-explanation-for-the-recent-global-warming/

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