Renew On Line 122  July-Aug 2016
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.

Contents

1. UK Developments
Capacity market broken? Hinkley too? Cheap solar and smart power

2. Global Developments
EU & the UK, US & Chinese progress, Russian prospects, CCS hopes

3. Forum
Renewable coal and oil, Urban energy, solar farms, 1970s are back

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 to it:

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 Palgrave book:
http://www.palgrave.com/page/detail/green-energy-futures-david-elliott/?sf1=barcode&st1=9781137584427


If urls open oddly, refresh or paste in your browser
1. UK developments

**Projected sources of energy generation in the UK**

![Chart showing projected energy generation sources in the UK.](chart_url)

*Source: Department of Energy & Climate Change (November 2015)*

**Is it really all still going to plan?**

DECC’s view last year (above), which the BBC labeled as ‘energy’ generation but is actually just electricity, shows unabated coal falling fast, though being partly replaced by coal and gas plus CCS (red). That’s now unlikely given the demise of the £1bn CCS competition. The big nuclear expansion also seems unlikely. So too, sadly, does the even larger (green) renewables expansion, given the cuts in support - they may slow it. In this chart, demand starts to rise again after 2025, presumably as the use of heat pumps and electric vehicles spread.

Storage hardly shows. However, the National Infrastructure Commission envisages a smart energy revolution which could cut demand and reduce cost, with smart grids, storage, demand response and supergrids balancing renewables flexibly: [www.bbc.co.uk/news/business-35722324](http://www.bbc.co.uk/news/business-35722324)

Will that be enough to deal with the shortfalls in renewables that seem likely? Probably not. As things stand, the UK may miss the EU imposed 15% - by - 2020 renewable energy target. But it evidently will not be in the EU by then! Leaving that aside, a gap seems to be likely-see Fact Check’s analysis: [https://fullfact.org/energy-bill/uk-making-good-progress-towards-its-2020-renewables-target/](https://fullfact.org/energy-bill/uk-making-good-progress-towards-its-2020-renewables-target/)

If the Hinkley project fails, as seems possible, taking with it the proposed follow-up nuclear projects, it could be much bigger. We need a Plan B, with a lot more renewables and no cuts, except in demand: [https://blog.energyinst.org/2016/03/04/renewable-energy-an-uncomfortable-position/](https://blog.energyinst.org/2016/03/04/renewable-energy-an-uncomfortable-position/)


P2G: [www.greenpeace-energy.de/fileadmin/docs/pressematerial/Hinkley_Point/20160121_Study_Windgas_HPC_English.pdf](http://www.greenpeace-energy.de/fileadmin/docs/pressematerial/Hinkley_Point/20160121_Study_Windgas_HPC_English.pdf)

*The UK plant margin may even go negative by the end of this year*, says National Grid:


And DECCs attempt to use the Capacity Market to stimulate more gas plant isn’t working:

[http://utilityweek.co.uk/news/Capacity-mechanism-isn’t-working-says-former-Npower-chief/12298326-VwD3s8dlldu](http://utilityweek.co.uk/news/Capacity-mechanism-isn’t-working-says-former-Npower-chief/12298326-VwD3s8dlldu)

Last words from Prof. Sir David MacKay, provocative to the end, but (see Forum) sadly now deceased:

Solar hits 10 GW but may slow

Solar PV has done very well, reaching ~10GW so far, but it may now slow as the cuts hit. Domestic solar PV installation rates fell by 75% after the 65% cut in FiT support:

But earlier this year, in a first, PV briefly supplied more power than coal and growth should continue in most sectors, e.g. see Solar Direct below. Certainly Solar Century is doing well:

Though not everyone loves large rural solar farms e.g. in Wales:

Wind hits 14 GW but may also slow

The March 2016 Budget allocated £730m for CfD auctions up to 2021. That’s for offshore wind (now at over 5 GW) and other less-established renewables (i.e. not including onshore wind and solar PV). But there will be a 4 GW cap on new contracts which means that only a third of the estimated 12 GW offshore wind pipeline to 2026 could be supported, if offshore wind were to win all the subsidy allocated, according to Bloomberg New Energy Finance. It added ‘The wording of the Budget implies that subsidy savings from auctions closing at below strike prices might not be re-allocated to fit in additional megawatts past the 4 GW mark’.

*Offshore wind still going ahead well: the final £2.6bn investment decision has been made by the SSE led consortium for the 588 MW 84-turbine Beatrice offshore wind farm off the Scottish coast

Tidal moves

Perpetus Tidal Energy Centre’s application had gone through. It’s for 30 MW grid-connected tidal energy system 2.5km off the southern tip of the Isle of Wight. It’s hoped construction will start next year and operation in 2018: http://perpetus tidal.com

In a poll for Tidal Lagoon Power, 83% of Tory MPs and 84% of Tory councillors were in favour of the plan to construct a £1bn 320 MW Swansea tidal lagoon. It’s still under review.

Biomass

There’s ~2 GW of biomass power now. And 5 GW(e) is in progress. The Renewable Energy Association says biogas could potentially produce the equivalent of >25% of Liquified Natural Gas (LNG) UK imports by 2035 - 40 TWh p.a. injected directly into the gas grid. ~50 biomethane projects were completed by end 2015 and 15 more are expected this year:

Green Syngas

ITM Power’s 1.5MW green hydrogen electrolyser on the Orkneys, will use power from the community wind project: http://www.itm-power.com

Vehicle to Grid

Nissan & Enel are launching a pilot 100 vehicle EV battery-to-grid project: http://eandt.theiet.org/news/2016/may/v2g-trial.cfm

Green gas for Leeds?

Hydrogen gas network plan for the city of Leeds.

All domestic gas boilers and cookers would be converted to run on clean-burning hydrogen under a proposal to make Leeds a ‘hydrogen city’. At a cost estimated by Northern Gas Networks of £2 bn, Leeds would be converted by 2025-30 and this could then be replicated in other major UK cities. Steam fed reformer plants around the city would convert methane from the national gas grid into hydrogen by removing the carbon using CCS.

A bold plan. CCS is untested on any scale, and, though hydrogen burns without creating CO2, domestic appliances would have to be modified to burn it rather than methane, as they were in the 1970s, when the UK switched from hydrogen-rich ‘town gas’ to methane-rich North Sea natural gas. But that would be less disruptive than installing electric heat pumps in houses for heating and upgrading local power distribution grids to cope with the large extra demand - houses already have gas grid links with modern plastic pipes able to handle hydrogen. But why not use AD biogas from domestic food waste for at least some of the feedstock? Or green gas from excess wind power?

Green energy output set to peak

So inflexible plant shut-downs may be needed:
Solar Direct - a cheaper option

Lightsource Renewable Energy, the UK’s largest solar energy generator, operating the largest portfolio of commercial scale solar photovoltaic (PV) assets, has written to Energy and Climate Change Secretary Amber Rudd to ask her and her Ministers to refrain from defending controversial subsidy cuts by ‘inaccurately’ citing the company’s plans to develop “subsidy-free” solar projects. DECC Ministers have recently highlighted Lightsource’s plans to build new solar projects without subsidy this year as evidence the industry can continue to prosper in the wake of steep subsidy cuts. But in fact this only works for projects that are directly connected to the company that uses the generated electricity through a ‘private wire’ connection. ‘This is a crucial distinction, because the economics and rationale for these types of solar PV projects are very different from projects that feed directly into the national electricity grid and provide green electricity to the wider British public’ (Solar Portal 24/3/16).

Solar farms which mostly sell electricity direct to the grid have to compete with the wholesale price of electricity, which is going down. But if the farms can sell direct to a customer via a private wire they are competing with the retail price of electricity, which is still going up. Solar panels on commercial roofs more generally sell electricity to the occupant in the commercial building. So with the ending of subsidies the return on investment for solar farms and commercial roofs can be increased by increasing the amount of electricity which is sold directly to a customer. For example a 100 kW community-owned solar array built by the Wadebridge Renewable Energy Network in Cornwall is now selling its electricity to the South West Water Nanstallon Sewage Treatment Works under a 20-year Power Purchase Agreement at a price that is cheaper than it would otherwise pay for its delivered electricity.

Public sector energy consultant Stephen Cirrell, speaking at the Solar Energy UK exhibition in Birmingham in October, said Councils have not been put off investing in solar by the recent subsidy cuts. They are simply adjusting the timeline for projects with many opting to wait it out for two years. Very few however are walking away from a commitment to pursue solar energy. Storage, private wires and falling costs of PV panels will all help to make solar economic for local authorities (Solar Portal 4/11/15).

Many local authorities have been installing solar panels on social housing in their borough. For instance Warrington Borough Council has installed solar PV on over 3,000 social homes in an effort to tackle fuel poverty. Tenants receive some free electricity and the Council receives an income to pay for the panels from the feed-in tariff. Unfortunately, a lot of these schemes are now ending due to the reductions in feed-in tariffs. But the signs are that this will be just a short hiatus and soon schemes like the one in Warrington can be re-introduced across the rest of the UK. For instance a scheme run by Barnsley Council, which has also been suspended, expects to resume soon. A spokesperson said: ‘The price of panels and ancillary equipment is expected to fall over time and we will monitor this closely to see whether we can meet grid-parity or provide other funding options ... we are already looking at other low carbon technologies we could deploy to assist the projects aims of reducing fuel poverty, driving down the borough’s carbon footprint and saving money’ (Solar Power Portal 26/2/16).

This could include a battery storage trial, which will see homes in receipt of solar installations offered storage systems, boosting self-consumption.

A typical domestic solar installation today would be around 4 kWp, which would need 16 x 250 W panels and cost around £6,500. With a feed-in tariff of only 4.39p the economics would be challenging - it is going to take up to 15 years to get your money back. But by 2020 you can probably expect to get the same amount of electricity from 12 x 330 W panels at a cost of only £4,250. At this level the cost is beginning to look like it is worth doing without any subsidy. With only a small rise in the cost of electricity, this could pay back the cost in around 10 years with no feed-in tariff. To achieve this, the challenge will be increasing the amount of electricity used by the solar panel owners. This could be done by using heat storage or batteries, changing consumer behaviour and more use of electric vehicles.

From: NuClear news No.84, April 2016, which has all the refs and some other good analysis: www.no2nucelpower.org.uk/nuclearnews/NuClearNewsNo84.pdf Also http://www.solarpowerportal.co.uk/
It will all be fine!

The UK’s energy secretary Amber Rudd says that the lights would stay on if the Hinkley nuclear plant didn’t go ahead, as seems likely - see below and our Review later. In a letter to the energy and climate change select committee she said: ‘While we have every confidence the deal will go ahead, we have arrangements in place to ensure that any potential delay or cancellation to the project does not pose a risk to security of supply for the UK. I am clear that keeping the lights on is non-negotiable.’ She also said that while delays could risk the UK missing its targets to cut carbon emissions, and that alternatives could cost more, that would not represent a ‘significant increase’ in cost in the short term. Without Hinkley, energy security would come from the capacity market, with subsidised contracts to guarantee supply: www.theguardian.com/environment/2016/apr/19/minister-admits-lights-would-stay-on-even-if-hinkley-nuclear-plant-is-delayed

A bit odd for a Plan B: the capacity market was initially meant mainly for balancing and reserve capacity, not for bulk supply, and (see later) it’s not been very effective at getting new gas plants backed, if that’s what she means. Expanded CfDs for more renewables, reinstated for onshore wind & large PV, proper FiTs for micro PV, and support for tidal projects, would be better. Prof. Keith Barnham wants that and AD biomass too - and says the UK could get to 100% renewable electricity by 2029. Forget Hinkley! www.independent.co.uk/voices/the-government-should-scrappits-costly-hinkley-point-deal-and-accept-renewables-can-keep-the-lights-a7021196.html

**Plan A:** French economy minister Emmanuel Macron said EDFs much delayed Hinkley final investment decision may now emerge in September, but may be delayed further. There’s talk of a €3 bn French government bailout for EDF, but its finances have gone from bad to worse: http://www.bloomberg.com/news/articles/2016-04-25/edf-falls-after-announcing-share-sale-deeper-cuts-divestments

For an arguably better UK Plan B see: http://delliott6.blogspot.co.uk/2016/04/after-hinkley-plan-b.html

But by contrast here’s a rival near - 100% UK nuclear plan: http://esiamearns.com/decarbonising-uk-power-generation-the-nuclear-option/

**Green heat: RHI changes**

Responding to the Government consultation on the reform of the Renewable Heat Incentive the Renewable Energy Association (REA) said that if the changes proposed were approved, the resulting collapse of the biomass heat industry would mean job losses and a significantly slowed rate of decarbonisation. Though UK progress had been limited, biomass represented 89% of the renewable heat in Europe and the REA worries about cuts in UK support levels, the new policies favouring heat pumps and shifting biomass feedstock eligibility away from energy crops to wastes: ‘We need a range of technologies to decarbonise a range of properties. Rural locations, for example, with no access to a gas network cannot be left behind. Biomass boilers are low-cost, provide significant carbon savings compared to oil boilers, and support the growth of healthy British forests. For many properties, biomass boilers are a pragmatic low-carbon alternative. It is distressing that the Government’s proposals would shutter this growing industry and would have us rely instead on largely untested technologies.’ But it welcomed the support for AD. Also see Imperial College’s input on green heat: http://provpol.com/wp-content/uploads/2016/05/Heat-infrastructure-paper.pdf REA: www.r-e-a.net

**Opinion survey** 81% back renewables in DECCs latest Public Attitudes Survey.

It also found that 70% saw a clear UK economic benefits from renewables, with 56% being happy with a large-scale project in their local area. Onshore wind had 69% of the public’s support, offshore wind 76%, and marine energy rose to 77%. Solar was at 84%, biomass 63%. Opposition to renewables was very low at 4%, with only 2% strongly opposed. Views on renewable heat were mixed, with poor awareness of the issues and options, and were fairly critical or unsure about the value of biomass boilers and heat pumps. 38% supported nuclear energy (1% less than last year) compared with 23% who were opposed. 36% were neutral. 31% opposed shale gas fracking, 19% supported it, most were don’t knows:


*Public support for Hinkley has fallen to 33% down from 57% in 2013, according to a YouGov poll for New Nuclear Watch Europe, a pro-nuclear group. Even Prospect magazine came out against it.
Capacity Market broken

Carbon Brief have looked critically at the Capacity Market, the UK system for seeking to ensure that there is enough capacity to meet demand by contracting with suppliers to be available when needed, and note that it has many problems:

‘The first is that it provides continuing subsidies to fossil fuel generators, and highly polluting diesel plants, at a time when the UK is trying to decarbonise its electricity system. Indeed the energy market now has two contradictory policies working against one another - the carbon price floor penalises coal-fired power stations at the same time as the capacity market rewards them. Decarbonising electricity will be even more important as the heat and transport sectors are increasingly electrified. The capacity market also awards payments to plants that would have been open anyway - in the first auction [see chart below], around a third of the plants which won contracts signaled they would have stayed open with no or very little payments. These windfall payments are arguably not the best use of bill payers’ money. The market is also focused on the needs of large fossil fuel and nuclear plants rather than new technologies which can reduce costs to bill payers by shifting demand. Such technologies can reduce the need to build expensive new power stations and the amount of time that the most expensive stations need to run.’

It suggests separate auctions for new and old capacity might help, along with emission criteria for projects. The government seem to now see the Capacity Mechanism as a way to get more CCGT gas plants built, so that might work, if they were willing to let higher cost new projects through (old fossil and nuclear capacity and diesel are cheaper), but as Carbon Brief says, it would be far better to promote more demand response. Certainly as more variable renewables come on line, something new has to be added to aid balancing.

See IPCC’s similar analysis - it too wants sub-auctions, CO2 limits with CCS for large gas plants and more, longer term, Demand Response contracts:  http://www.ippr.org/publications/incapacitated  Also see:  https://alansenergyblog.wordpress.com/2016/04/05/on-capacity-markets-not-working-its-worse-that-you-might-think/

CfD also gets worse: offshore wind project bared by delays:  http://realfeed-intariffs.blogspot.co.uk/2016/05/uk-renewable-energy-auctions-system.html

Energy intensive sector escapes green taxes

Steel and other energy intensive industries are to be exempted from extra green energy costs. Details of the plan have now emerged. The high energy using sector will no longer have to pay its share of the Renewables Obligation and Feed-in Tariff costs. This will save the sector around £390m p.a., when it comes into force, probably in 2017 and just in England and Wales. But this exemption will put around £5 p.a. on household power bills. Punitive…


http://www.theguardian.com/environment/2016/apr/05/green-policies-are-not-responsible-for-the-tata-steel-crisis - img-l

That’s not to say we don’t need steel, but energy costs are a problem. More steel ideas:

http://www.edie.net/news/6/Tata-Steel--Four-ways-to-resurrect-the-struggling-steel-industry

*Wind turbines use more steel/MWh eventually generated than nuclear, and producing it uses a lot of energy, but there are alternatives emerging, including small more energy-efficient smelters using induction heating and new stronger/cheaper materials like graphene and concrete/plastic composites. Tidal systems also use steel and it’s interesting that the search for a potential buyer for the Port Talbot steel plant included the involvement of an Indian company that saw the proposed Swansea Tidal lagoon as an important part in any deal: www.constructionnews.co.uk/10005169.article So steel can be useful! But this maybe overdoes it: https://theconversation.com/nine-ways-steel-could-build-a-greener-economy-57506

Housing sector looses target

The Zero Carbon Hub, established as a public/private body in 2008 to help translate the government’s 2016 zero carbon target for all new homes, shut up shop in March. During its operation, it supported house builder delivery of the zero carbon homes’ programme and oversaw the introduction of higher house energy efficiency standards. But industry funding has been withdrawn following the government’s decision not to pursue the zero carbon target. An archive remains at: www.zerocarbonhub.org


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**Smart Power - some movement**

The government welcomed the National Infrastructure Commission report ‘Smart Power’ as ‘an opportunity to transform the future of the UK’s electricity sector and will implement the commission’s recommendations, subject to any necessary consents and assessments’. It ‘agrees with the commission that more interconnection is in the interests of consumers, will make an important contribution to security of supply and can help integrate more clean energy into the energy system. The government also agrees that investment decisions should sit primarily with the private sector. The government believes a mix of short and long interconnection links remains appropriate. For longer interconnection links, the government is particularly interested in projects that can provide reliable, clean power, which naturally complements the developing generation mix in the GB market. The regular UK-Norway energy dialogue continues.’ It said it had ‘previously stated that an increase of 5GW of additional interconnection capacity could be considered beneficial to GB consumers. Given evidence provided by Ofgem and the commission, the government now supports the market delivery of at least 9GW of additional interconnection capacity, believing this to be beneficial to consumers. The government’s assessment of the level of beneficial inter-connection may rise further as more potential projects are assessed later this year.’

Costly stuff...

The government also welcomed the commission’s recommendation on storage and agreed that ‘storage has the potential to deliver a more secure and cost efficient energy system’. But it says ‘Storage can perform many different roles in the energy system and this can lead to complexity in commercial as well as regulatory arrangements. Wherever possible, the government wants storage technologies to compete with each other and with other providers of flexibility to drive down costs in the energy system.’ It says it will work with Ofgem to deliver greater regulatory and legal clarity for storage. And also in relation to demand flexibility, while ‘views on process changes to the capacity market will also be sought’. Fine, and there’s to be ‘at least £50m’ for this smart stuff. But that’s tiny!


*National Grid* is already moving in this direction; http://www.renewableenergyworld.com/articles/2016/05/trend-toward-energy-storage-for-frequency-regulation-in-uk-will-continue-ihh-says.html
All Energy: an ecumenical approach?

The All Energy Conference in Glasgow, despite its title, usually focuses on renewables, but also, some feel provocatively, has of late also included sessions on nuclear. At this years gathering, Labour’s former shadow energy minister Tom Greatrex, now chief executive of the Nuclear Industry Association, said that the UK nuclear industry was moving from ‘making a case’ to the start of delivery. But he also said that ‘the scale of the challenge we have in our future energy generation is so huge that it needs pretty much every tool in the box’. So we had to move away from ‘people advocating their own technology by denigrating others’. The energy debate has ‘been very focused on the technology vs technology perspective’, in part ‘driven by old well-established prejudices that some people have about particular sources of energy. The challenge is to get beyond that, to have that wider more thoughtful, more logical debate. We’ve seen in the last six years 24 GW of capacity that’s gone offline most of that is thermal - some of it nuclear - but mostly thermal. It has got to the end of its life. Over the next 10 years, a whole load more will. It can’t all be replaced by renewable generation.’ Make of that what you will! Must we really back everything?

http://www.energyvoice.com/events/all-energy-2012/108865/energy-2016-scrutiny-uk-energy-mix-embraced/

At the All Energy conference the Renewable Energy Association’s CEO Nina Skorupska indicated the strains that are facing renewables in the UK. She said the number of people employed in the UK renewables industry, currently 117,000, may fall over the coming years due to continued policy uncertainty: ‘It may be painful and some companies have already left the scene. There may be a few years of looking over our shoulders enviously at other countries. We need to get back to innovation and find new business cases. The subsidies era may be coming to a premature and abrupt end but the need for renewables has not.’

http://renew.ebiz/102542/painful-future-for-uk-green-jobs/

SmartestEnergy took a more optimistic view. It said independent generators now supply 7.6% of UK power, having invested over £376m in commercial-scale projects last year, adding 2.4 GW of new renewable capacity. Its CEO said ‘traditional electricity supply companies are in no shape to deliver the change that is needed. The Big Six are suffering in this low-carbon transition - share prices and dividends are falling, companies are laying off staff and some are even breaking themselves up. These incumbents are slow moving, beset by problems, and lack funds for investment.’ By contrast, ‘the energy entrepreneurs are small, nimble and innovative. They have attracted a global pool of capital to invest in Britain’s renewable capacity and are taking advantage of technologies like wind and solar which are rapidly coming down the cost curve. They are starting to invest in battery storage which will play a key role in our future energy system and offers exciting new business opportunities.’


Responding to the late Prof Sir David MacKay’s final video, in which he was dismissive of solar PV in the UK, and backed nuclear, Leonie Greene, head of external affairs at the Solar Trade Association, commented: ‘There is striking consensus now in the energy industry about the shape of a clean energy system and it is smart, highly distributed, much more active on demand-management and centred around consumers who may also be producers. The technological challenges Professor MacKay defined are readily surmountable and the plummeting costs of renewables are our best hope of averting dangerous climate change.’

www.solarpowerportal.co.uk/news/industry_responds_to_sir_david_mackay_comments_on_uk_solar_potential_7582

National Grid’s role challenged The Energy Select Committee calls for a new independent body so as to avoid potential conflicts of interest in system planning and operation:


Local Project news An invaluable weekly UK micro-project round up: www.microgenscotland.org.uk
UK policy uncertainty undermines investment

According to Ernst and Young, the UK’s ranking in the global renewables market has fallen, from second in 2007, to thirteenth in 2016, due to a series of unexpected green policy U-turns and the on-going uncertainty surrounding the role of renewables in Britain’s energy mix, with a major report from the Energy and Climate Change Committee (ECCC) recently warning that the Government is ‘denting’ investor confidence in the UK renewables market. http://www.edie.net/news/10/uk-renewable-energy-sector-attractiveness-on-a--landslide/ and http://www.edie.net/news/11/ECCC-MPs-warn-of-dented-investor-confidence-over-UK-energy-policy/

A report from the Green Alliance, Greenpeace, RSPB, WWF and others also warned that the UK was ‘going backwards’ on low-carbon energy policies and risked missing out in the global market: http://www.edie.net/news/11/uk-Government-must--ride--low-carbon-wave-or-be--swept-away--/

In its 2016 annual review the Renewable Energy Association said: ‘The industry was blindsided this year with over a dozen sudden and severe policy changes’, and ‘many businesses have been left reeling and deployment has begun to slow’: http://www.r-e-a.net/news/strong-renewable-energy-growth-threatened-by-recent-policy-changes

It says about half the 35,000 solar workforce has been cut as a result: http://www.theguardian.com/environment/2016/jun/10/uk-solar-power-industry-job-losses-government-subsidy-cuts-energy-policy

And there may be worse to come, with a new grid tax being proposed, which would hit domestic PV, already hit by FiT cuts, hard: www.telegraph.co.uk/news/2016/05/29/households-could-be-charged-annual-insurance-premium-for-access/

Though it’s surely reasonable for PV prosumers to pay their share of grid/balancing costs, it may just feel like the utilities are clawing back lost profits as they lose control of the market.

*The GMB Union*, which you might expect would be resisting job cuts like this, sees it very differently - it’s come out against over-reliance on wind which they say is often low, but it didn’t provide any evidence of resultant blackouts: http://www.gmb.org.uk/newsroom/low-wind-days

* Cross porpoises Plans go awry as policy confusion hits home: there’s been a delay to Hornsea 2 offshore wind farm and the (still) proposed CCS pipeline, but fracking is allowed: http://www.bdb-law.co.uk/blogs/planning-act-2008/702-electricity-generation-energy-round/

* A test of the Capricorn tidal project on the Firth of Forth is also hit by planning/Crown estate conflicts: www.thecourier.co.uk/fp/business/business-news/191824/forth-wave-power-bid-blocked-by-legal-threat/

Brexit will mostly make it all worse

The UK energy system would be less secure and less green if Britain left the EU, according to industry professionals polled before the EU exit referendum vote. An ‘overwhelming majority’ of respondents to the Energy Institute annual Barometer foresaw ‘negative effects on the UK energy system’ in the event of Brexit. *In terms of securing energy supplies, renewable energy development, climate change and sustainability, and air quality, about four times as many respondents anticipate negative effects. The single exception to this pattern was oil & gas production, where positive and negative views were broadly balanced.’

Well now we are to leave. It will take time for the impacts to hit, but the omens aren’t good (see Box), with some green targets also likely to be relaxed: www.telegraph.co.uk/news/2016/06/13/what-would-brexit-mean-for-britains-green-targets/

**Brexit mess** Brexit could lead Scotland to break away, so the residual UK would then lose its huge renewables resource, already supplying 50% of Scottish power. And EU grid link plans may be hit: www.euractiv.com/section/energy/news/uk-energy-links-to-europe-at-risk-from-brexit-analysts-warn/

So may energy efficiency: http://www.2degreesnetwork.com/groups/2degrees-community/resources/better-deuvel-you-know-europe/ else: http://blogs.sussex.ac.uk/sussexenergygroup/2016/04/13/what-would-brexit-mean-for-uk-energy-efficiency-policy/ And finally, arguably the most muddled article on energy & Brexit: www.telegraph.co.uk/business/2016/06/20/why-europe-is-to-blame-for-the-uk-s-acute-energy-policy-failures/ So will all now be wonderful? Or will the EU continue to be blamed as things continue to go wrong?
**After Hinkley** The aim is to go for many more nuclear plants

That’s what DECC wants: [www.gov.uk/government/speeches/realising-the-vision-for-a-new-fleet-of-nuclear-power-stations](http://www.gov.uk/government/speeches/realising-the-vision-for-a-new-fleet-of-nuclear-power-stations) and Helm too: [http://www.dieterhelm.co.uk/node/1420](http://www.dieterhelm.co.uk/node/1420) But it all depends on Hinkley….

‘The strength of the Hinkley deal is that there is no payment unless the power station goes ahead and is built efficiently by EDF’. So said David Cameron (16/3/16). While true, what he didn’t say was that the Hinkley contract includes a *let out* clause, insulating EDF and its backers from action that might be taken in the event of a policy change. DECC said ‘in certain, highly unlikely scenarios where there is a political shutdown of [Hinkley] by a UK, EU or international competent authority, payments could be up to around £22 billion excluding non-decommissioning operational costs that may be incurred after any shutdown’. [www.theguardian.com/uk-news/2016/mar/18/hinkley-point-c-nuclear-deal-22bn-poison-pill-taxpayer](http://www.theguardian.com/uk-news/2016/mar/18/hinkley-point-c-nuclear-deal-22bn-poison-pill-taxpayer)

It’s not *that* unlikely that a new UK government would decide to abandon nuclear - e.g. after another major accident somewhere. Maybe not the present team though. Cameron said ‘if we want low-cost, low-carbon energy, we need strong nuclear energy at the heart of the system’. And if the Hinkley deal collapses, then other nuclear options, like **Small Modular Reactors** (SMRs), may be pushed more. In the Autumn Statement 2015, the government announced a competition to identify the best value SMRs in the UK ‘to pave the way to build one of the world’s first SMRs’. The 2016 Budget announced the first stage of this competition, which will generate a list of SMR developers that could deliver on the government’s aims, and ‘at least £30m for an SMR-enabling advanced manufacturing R&D programme to develop nuclear skills capacity’. [www.gov.uk/government/uploads/system/uploads/attachment_data/file/508193/HMT_Budget_2016_Web_Accessible.pdf](http://www.gov.uk/government/uploads/system/uploads/attachment_data/file/508193/HMT_Budget_2016_Web_Accessible.pdf)

There are other projects. In evidence to the Energy and Climate Change Select Committee, NuGen and Horizon Nuclear Power, said they were learning from EDF Energy’s experience with Hinkley. NuGen CEO Ton Samson said ‘we believe it’s necessary to replace the existing aging fleet of nuclear assets, and to overcome the impacts of the shutdown of the coal assets by 2025. And we think it is essential for security of supply to have a domestic source of baseload power here in the UK that we can depend upon for the following 60 years.’ They are offering the Westinghouse AP1000 for Moorside, Sellafield - a Final Investment Decision is set for 2018. Horizon is offering Hitachi’s Advanced Boiling water Reactor at Wylfa, Anglesey, and Oldbury-on-Severn: it hopes its GDA review will be completed next year. NuGen are still awaiting completion of theirs: [www.world-nuclear-news.org/NN-UK-nuclear-leaders-look-beyond-Hinkley-24031601.html](http://www.world-nuclear-news.org/NN-UK-nuclear-leaders-look-beyond-Hinkley-24031601.html)

**Hinkley Small Print**

In the event that either reactor is not commissioned by the end of its target commissioning window [2025+4], the CfD payment term for that reactor is shortened commensurately for each day of delay through to the long stop date. If neither reactor has been commissioned by 4 years after the last day of the target commissioning window for reactor 2 i.e. Nov 2033 (the longstop date), the Low Carbon Contracts Company can terminate the contract.

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What about Hinkley? The evidence on it to the Select Committee, from a range of perspectives, seemed to agree it’s wasn’t a sensible option, but some felt other nuclear options might be, if (unlike Hinkley) they were subject to tendering: [http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/energy-and-climate-change-committee/uk-new-nuclear-status-update/oral/31029.pdf](http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/energy-and-climate-change-committee/uk-new-nuclear-status-update/oral/31029.pdf) This study says that long-term Hinkley will cost £40bn more than the equivalent output from wind & solar. Maybe an overestimate, but their costs are falling fast: [www.newweather.org/wp-content/uploads/2016/04/Toxic-Time-Capsule.pdf](http://www.newweather.org/wp-content/uploads/2016/04/Toxic-Time-Capsule.pdf) And while some say that the UK government won’t challenge China on steel dumping, since it wants to keep them sweet on the Hinkley deal, here’s an interesting Chinese nuclear insight: [http://asian-power.com/power-utility/news/cgn-powers-dropped-nuke-deal-in-uk-sensible-move-analyst](http://asian-power.com/power-utility/news/cgn-powers-dropped-nuke-deal-in-uk-sensible-move-analyst)

Adding yet another dimension, trade unions in EDF say they may strike if Hinkley goes ahead - they fear that the investment could destroy EDFs finances and undermine their jobs.

[www.reuters.com/article/edf-britain-nuclear-idUSL5N1794NP](http://www.reuters.com/article/edf-britain-nuclear-idUSL5N1794NP) Oddly the UK unions are all for it! But if France does offer EDF €3bn, that raises state aid issues: [http://uk.reuters.com/article/uk-edf-hinkleypoint-idUKKCN0X1JCR](http://uk.reuters.com/article/uk-edf-hinkleypoint-idUKKCN0X1JCR) Energy minister Ségolène Royal wobbled: ‘This project must offer further proof that it is well-founded and offer a guarantee that the investment in this project will not dry up investments that must be made in renewable energies.’ Times 8/4/16. It looks doomed.
2. Global news & developments

While oil companies like Exxon, Mobil, BP and Shell cut back, clean energy booms recovering from the recession…

…though BP’s Energy Outlook 2016 sees oil still booming, although it does see coal falling and renewables expanding: ‘Renewables are expected to account for more than a third of EU power generation by 2035’. But Carbon Brief says, ‘this sits awkwardly against the fact that renewables already supplied a third of EU power in 2014 and continue to expand rapidly’: www.carbonbrief.org/analysis-how-the-bp-energy-outlook-has-changed-after-paris


Next: a £1.3 trillion boost to global GDP

Doubling up renewables in the global energy mix by 2030, to achieve a 36% share by 2030, would increase global GDP by $1.3 trillion, and boost social welfare and employment worldwide, say the International Renewable Energy Agency. Japan would see the largest positive GDP impact (2.3%) but Australia, Brazil, Germany, Mexico, South Africa and South Korea would also see growth of more than 1% each. Employment in the renewable energy sector would also increase from 9.2 million global jobs today, to more than 24 million by 2030. Renewable Energy Benefits: Measuring the Economics: www.irena.org/menu/index.aspx?mnu=Subcat&PriMenuID=36&CatID=141&SubcatID=690

..and the IEA sees renewables as dominating by 2040


*A global assessment of environmental performance, ranks the US at 26th but Germany as 30th: http://epi.yale.edu/reports/2016-report The top 5 are Scandinavian!
The European Union - and the UK

The UK vote to leave the EU will impact on energy policy & renewables in the EU and the UK. Under the pressure of the EU Renewables Directive, the UK has been forced to push renewables quite hard, and despite government resistance, it’s done quite well on wind – coming 6th global, with offshore wind helping out: see the chart below. But now, the UK will be able to ignore EU Energy & Climate Directives, which may set a precedent for an abandoning some of its own policies. Though the residual EU might do better, freed of the drag of the UK, which is still way behind most other EU countries in renewables overall.

http://www.sonnenseite.com/upload/Medien/Pressebilder_2016/WWEA_WindEnergyWorldwide.jpg

Wind Energy Worldwide

Top 15 countries by total wind installations

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<tr>
<td>1</td>
<td>China</td>
<td>148'000</td>
<td>32'970</td>
<td>29.0</td>
<td>114'763</td>
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<td>2</td>
<td>United States</td>
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<td>8'598</td>
<td>13.1</td>
<td>65'754</td>
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<td>3</td>
<td>Germany</td>
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<td>4'519</td>
<td>11.7</td>
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<td>India *</td>
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<td>2'294</td>
<td>10.2</td>
<td>22'465</td>
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<tr>
<td>5</td>
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<td>22'987</td>
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<td>6</td>
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<td>1'174</td>
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<td>12'440</td>
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<td>7</td>
<td>Canada</td>
<td>11'205</td>
<td>1'511</td>
<td>15.6</td>
<td>9'694</td>
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<tr>
<td>8</td>
<td>France</td>
<td>10'293</td>
<td>997</td>
<td>10.7</td>
<td>9'296</td>
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<tr>
<td>9</td>
<td>Italy</td>
<td>8'958</td>
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<tr>
<td>10</td>
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<tr>
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<td>Sweden</td>
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<td>615</td>
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<tr>
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<td>1'266</td>
<td>33.0</td>
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<td>126</td>
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<td>4'953</td>
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<tr>
<td>14</td>
<td>Denmark</td>
<td>5'064</td>
<td>217</td>
<td>3.7</td>
<td>4'883</td>
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<tr>
<td>15</td>
<td>Turkey</td>
<td>4'718</td>
<td>955</td>
<td>25.4</td>
<td>3'763</td>
</tr>
<tr>
<td>Rest of the World</td>
<td></td>
<td>40'800</td>
<td>5'000</td>
<td>14.0</td>
<td>35'799</td>
</tr>
</tbody>
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Total          | 434'856            | 53'690                        | 17.2                        | 371'374             |

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* by november 2015
** Includes all installed wind capacity, connected and not-connected to the grid.
*** Includes the net capacity added during the year 2015.

The EU’s European Energy Union initiative seeks to complete the single energy market programme and integrate EU energy systems more effectively. This opens up many issues: for example, is building a big competitive market really the best way forward? Won’t it squeeze out smaller players? Or will it tame the big players, by exposing them to wider competition? Is there any alternative to integration given the need to link of renewables across the EU with supergrid networks? Some of the institutional issues are explored in a timely book by Prof. Rafael Leal-Arcas from Queen Mary College London. It suggests that the creation of a European Energy Union might be an effective and viable solution to the energy security problems that the EU is facing, by making it easier to trade energy inside the EU. It notes that ‘the EU currently has to rely on energy-rich countries for its energy needs, many of whom are politically and economically unstable. This places the EU in a vulnerable position.’ The book explores the institutional and legal framework, looking at the key issues, which it sees as the need to support security, solidarity and trust, via the completion of the single competitive internal market which would support moderation of demand and decarbonisation of the EU energy mix i.e., greater use of renewable energy. However, much of that is now academic given the UK’s exit. It may be able to join in some of its trading, but it cannot not shape the market design and rules: http://www.claeys-casteels.com/eu_energy_studies_8.php

The European Energy Union  UK will miss out

The EU's European Energy Union initiative seeks to complete the single energy market programme and integrate EU energy systems more effectively. This opens up many issues: for example, is building a big competitive market really the best way forward? Won’t it squeeze out smaller players? Or will it tame the big players, by exposing them to wider competition? Is there any alternative to integration given the need to link of renewables across the EU with supergrid networks? Some of the institutional issues are explored in a timely book by Prof. Rafael Leal-Arcas from Queen Mary College London. It suggests that the creation of a European Energy Union might be an effective and viable solution to the energy security problems that the EU is facing, by making it easier to trade energy inside the EU. It notes that ‘the EU currently has to rely on energy-rich countries for its energy needs, many of whom are politically and economically unstable. This places the EU in a vulnerable position.’ The book explores the institutional and legal framework, looking at the key issues, which it sees as the need to support security, solidarity and trust, via the completion of the single competitive internal market which would support moderation of demand and decarbonisation of the EU energy mix i.e., greater use of renewable energy. However, much of that is now academic given the UK’s exit. It may be able to join in some of its trading, but it cannot not shape the market design and rules: http://www.claeys-casteels.com/eu_energy_studies_8.php
**EU News**

EU e-Highway2050 project has now looked to 2050: it deals with the transition paths for the whole power system, with a focus on the transmission network, to support the EU in reaching a low carbon economy by 2050. Five scenarios are explored including three with nuclear (19-25%) one with 100% renewables, in which wind supplies around 52% of EU power and solar 24% by 2050 (7% of the solar coming from North Africa), and a ‘small and local’ scenario in which energy efficiency cuts demand by 50%, biomass supplies 19%, nuclear still 10%.

The detailed simulations show that the 2030 transmission network would not be sufficient to support the 2050 energy scenarios. Indeed, during significant periods, grid congestions would prevent some available generation reaching the load. Huge volumes of renewables would be curtailed and compensated by expensive thermal generation, emitting CO2. To limit that, different proposed architectures of the transmission grid have been developed and compared to assess their techno-economic efficiency. They included the development of major North-South transmission corridors, though, it’s claimed that, with some enhancement, the proposed architectures could be integrated in the present or 2030 grid, without introducing a separated ‘layer’ of new transmission grids. The cost of grid expansion/upgrade depends on the scenario but are put at €100-400 bn, although that would be offset by the improved use of energy sources, avoiding up to 500 TWh p.a. of renewable curtailment. The report says that additional studies could be performed to assess the techno-economic efficiency of the solutions its proposes and also other options like for instance Power to Gas, and notes that ‘a combination of all the solutions might even lead to more promising answers to the system challenges’. But it says transmission grids offer many advantages including enhanced trade and balancing opportunities. [http://www.e-highway2050.eu/results/](http://www.e-highway2050.eu/results/)

**EDF does the numbers: 60% renewable by 2030**

‘EDF needs to change its strategy and invest in renewables rather than something as complicated as Hinkley’, French Minister Jean-Vincent Place: [http://uk.reuters.com/article/uk-edf-hinkleypoint-idUKKCN0XI0NG?rpc=401](http://uk.reuters.com/article/uk-edf-hinkleypoint-idUKKCN0XI0NG?rpc=401) In that context EDFs R&D Paper ‘Technical & Economic Analysis of the European Electricity System with 60% RES’, by Alain Burtin and Vera Silva, is quite surprising. It looks at an EU future dominated by renewables, with nuclear only playing a moderate role (90 GW total), with, in its High Renewables scenario, taken from the EU Energy Roadmap 2011, 60% of electricity coming from renewables by 2030. 20% would be hydro and biomass, 40% would come from variable renewables - 700 GW in all, 220 GW of solar, 280 GW of onshore wind and 205 GW of offshore wind. EDF calculates that wind and PV would displace 160 GW of baseload capacity, but would require 60 GW of backup, so the net reduction is only 100 GW, with all that being due to wind, since PV only displaces 20 GW and needs 20 GW backup, its capacity credit being zero, while that for wind is 20%. Coal capacity is reduced by 170 GW from 250 GW, CCGT is increased from 70 GW to 85 GW. OCGT is increased by from 35 GW to 100 GW. The study assumes that in 2030 total demand is 3600 TWh p.a. with a peak demand of 600 GW, met with 1440 TWh/p.a. from variable renewables, 720 TWh p.a. from hydro, biomass and geothermal and 1440 TWh p.a. from fossil and nuclear. But demand will vary, as will renewable supply, so balancing will be needed, with surpluses at times being available for storage to meet shortfalls at other times, some of this being shifted via inter-connectors, and hydro providing backup, gas plants a bit too. Large supply swings would have to be dealt with - with 700 GW of wind and PV they could amount to the equivalent of 50% of total demand within a 24 hour period. It says that storage and flexible demand can help a bit with balancing, but there will still be a need for back-up plants. Full EdF report: [www.energypost.eu/wp-content/uploads/2015/06/EDF-study-for-download-on-EP.pdf](http://www.energypost.eu/wp-content/uploads/2015/06/EDF-study-for-download-on-EP.pdf) Review: [http://euanmearns.com/technical-and-economic-analysis-of-the-european-electricity-system-with-60-res-a-review/](http://euanmearns.com/technical-and-economic-analysis-of-the-european-electricity-system-with-60-res-a-review/)
Germany at 32%  Over 32% of Germany’s electricity is now from renewables: http://energytransition.de/2016/01/germany-is-20-years-away-from-100-percent-renewable-power-not/  However there can be problems with success. The more renewable energy there is in the market, and the lower its price, the lower is its market value - it sees off expensive fossil fuel, cuts overall prices, but also thus cuts its potential income. See this slightly garbled analysis: http://energyandcarbon.com/the-declining-value-of-wind-and-solar-to-the-german-power-system  As the chart below shows, the value of still mostly fossil-derived power has certainly fallen in Germany.

As Bloomberg reported: ‘utilities in Europe’s biggest power market are suffering from the lowest prices since 2002 as the unprecedented shift to renewable energy squeezes margins at coal, gas and nuclear plants. That saw Vattenfall write down its German lignite assets by $1.8 billion in 2015’. www.bloomberg.com/news/articles/2016-02-12/billionaire-neighbors-embrace-dirty-fuel-shunned-by-germany  And so CO₂ cuts continue: https://cleantechnica.com/2016/02/04/germany-greenhouse-gas-emissions-fell-4-6-in-2014-new-data-shows/  For very useful graphic data on German energy generation see: https://energy-charts.de/  This is useful too, not least in explaining how Germany’s occasional no-sun, low-wind ‘dunkelflaute’ (‘dark doldrums’) problem may be reduced- in part by offshore wind turbines with higher load factors: http://energytransition.de/2016/01/2015-germanys-record-wind-year/  Last year it added ~2.3 GW offshore. However, there are ominous signs that wind growth will be cut back soon: http://dailycaller.com/2016/04/08/germany-to-abandon-1-1-trillion-wind-power-program-by-2019/  

Denmark  Wind now supplies 43% of its annual electricity, and at times there’s too much.  And so, like Germany, it has been looking to Power to Gas conversion/storage options. In one variant, excess wind-derived electricity is used to electrolyse water to make hydrogen gas, which is then reacted with carbon dioxide (CO₂) obtained by processing biogas. Biogas consist of methane (CH₄) plus 35% CO₂, which needs to be removed anyway to make pure CH₄ to be added to the gas grid. The new process ends up with around 50% more pure CH₄ than would otherwise be produced, all of which can be fed to the gas grid, which also act as an energy store: http://www.4coffshore.com/windfarms/surplus-wind-stored-as-gas-nid3196.html  

Spain  A new era of forced ‘zero subsidy’ for Spain’s wind power looks to have started.  In a recent auction of 500 MW of wind capacity, the winning bids were at market rates - no extra support being required. But it remains to be seen if projects can go ahead on this basis. www.icis.com/resources/news/2016/01/15/9961000/spain-ushers-in-new-era-of-subsidy-free-wind-power/  

EU on Biomass  Some greens want some biomass blocked in the EU’s new review: http://www.theecologist.org/blogs_and_comments/commentators/2987102/largescale_bioenergy_must_be_excluded_from_the_eus_renewable_energy_definition.html  The use of forestry waste & biofuel is not seen as sustainable.
US grid modernization plan

The US Department of Energy has launched a comprehensive new Grid Modernization Multi-Year Program Plan (GMMYPP), aiming to improving the resiliency, reliability and security of the electricity delivery system. Up to $220 million will be invested over three years, subject to congressional appropriations, for 88 innovative and cross cutting R&D grid-technology projects led by 14 of DOE’s national labs in co-ordination with public - and private-sector partners. The projects cover advanced storage systems, clean energy integration, standards and test procedures, EVs, solar systems and other key grid modernization areas. That includes $18 million in funding for six new solar/storage projects across the US as part of the SunShot Initiative, using internet-capable inverters in conjunction with smart buildings, smart appliances and utility communication and control systems. The 5-year extension of the Federal Investment Tax Credit and Production Tax Credit system should also help wind projects continue to develop - it’s now at 70 GW. Meanwhile, the role of the big power utilities is in the spotlight in the US as elsewhere. A report from Lawrence Berkeley Labs says that, as the use of DER’s (distributed energy resources) spreads, there are two strategies utilities may have adopt to survive: they either ‘successfully evolve to play the major role in using DERs to provide services to customers’, or ‘these functions are increasingly performed by competitive firms, and the utility “sticks to its knitting” in terms of providing and maintaining infrastructure’.


Meanwhile there are battles over the specifics of the new and revised market systems that are emerging, for example over Net Metering, as well as over power system reserve operating rules and regulation: it can get quite complicated! But it’s all about utility power and money: www.renewableenergyworld.com/articles/2016/01/solar-industry-rejoices-as-california-regulators-approve-net-metering-successor-program.html and www.powermarketstoday.com/public/California-PUC-net-metering-arguments-made-public.cfm www.renewableenergyworld.com/articles/2016/01/a-s-supreme-court-decision-demand-response-forces-awaken.html But see this www.powermarketstoday.com/public/Arguments-over-ERCOT-ORDC-find-no-consensus.cfm Also this https://energyathas.wordpress.com/2016/02/08/is-community-choice-electric-sunny-a-solution-or-a-problem/

As that argues, it may not be as easy as you might think/hope to escape the power of the utilities. And more generally, the US Supreme Courts interim blocking of Obama’s Clean Power Plan is very worrying, illustrating the power of reaction, though some States may ignore it, and it may be reversed.

78% GHG cut by 2030 with supergrids

A new study from the US National Oceanic and Atmospheric Administration (NOAA) says the US could cut GHG emissions from electricity production by 78% on 1990 levels by 2030, and keep up with growing energy demand, using existing solar and wind technology, at little extra cost to consumers. But it would need HVDC supergrid ‘electron superhighways’ to transmit electricity across the country and provide overall grid balancing: www.sciencealert.com/us-could-slash-energy-production-emissions-to-78-below-1990-levels-in-just-15-years-report-shows

China hits 145 GW of wind - but hydro still leads

With wind prices falling, China’s National Energy Administration has cut its onshore wind Feed-In Tariff rates to regulate development - it’s been roaring ahead, with over 145 GW in place so far. It added 30 GW last year, says the Chinese Wind Energy Association. However, China’s big hydro project has been eclipsed by Itaipu, a 14,000 MW hydro project on the Parana River between Brazil and Paraguay, which produced 89.2 TWh in 2015, 2.6% more than the 22,500 MW Three Gorges on the Yangtze River in China. Big hydro is not popular with environmentalists, who worry about local impacts, but hydro is huge in China (282 GW), though that includes many thousands of smaller, less invasive, projects. But wind might overtake hydro soon - it’s already overtaken nuclear. PV is also getting going.

http://energyindemand.com/2016/02/13/china-overtakes-europe-for-installed-wind-power-capacity/
Russia could win - with renewables

Renewable energy could supply Russia & Central Asian countries with all the electricity they need by 2030 - and cut costs significantly. A new study from Lappeenranta University of Technology (LUT) in Finland says that renewable energy is the cheapest option for region and could make Russia a very energy competitive region in the future. A 100% renewable energy system for Russia and Central Asia would be roughly 50% lower in cost than a system based on latest European nuclear technology or carbon capture and storage. The modeled energy system is based on wind, hydro, solar, biomass and some geothermal energy. Wind amounts to about 60% of the production whilst solar, biomass and hydro are distributed evenly. The total installed capacity of renewable energy is about 550 GW. It is all supported with pumped hydro storage, batteries, and power-to-gas, converting renewable electricity into gases such as hydrogen and synthetic natural gas. The new system would also be integrated with HVDC supergrid links, with the whole integrated system lowering the cost of electricity by 20% for Russia and Central Asia - including countries such as Kazakhstan which, like Russia, has a vast wind resource. It would be a big change from the present, with the total capacity in the area being 388GW, of which wind & solar only account for 1.5 GW. Prof. Christian Breyer, study co-author, said ‘it demonstrates that the region can become one of the most energy-competitive regions in the world.’

Azerbaijan A 2013 policy aims to get 20% of electricity from renewable by 2020. Also 9.7% of total energy use. The total renewable resource is put at 8GW, the wind resource being 800 MW, plus more offshore in the Caspian sea: [www.kas.de/wf/doc/kas_40177-1522-35-30.pdf?150123132359](http://www.kas.de/wf/doc/kas_40177-1522-35-30.pdf?150123132359)

Greening the Gulf area - cutting oil & water use

Scaling up renewables in the Gulf Co-operation Council (GCC) countries would reap multiple benefits, according to the International Renewable Energy Agency (IRENA).

Renewable Energy Market Analysis: The GCC Region, finds that GCC countries could save 11 trillion liters of water withdrawal (a 16% decrease), save 400 million barrels of oil in the power sector (a 25% decrease), create more than 200,000 direct jobs and reduce the per capita carbon footprint by 8% in 2030, if GCC plans and targets are achieved. The report finds that increasing renewables to meet national plans and targets would cut fuel use in the power and water sectors by 50% in the United Arab Emirates, 23% in Saudi Arabia and 21% in Kuwait. Desalination now accounts for a major share of total energy consumption in most GCC countries. Solar desalination could offer a reliable, cost-effective and sustainable alternative: [www.irena.org/menu/index.aspx?mnu=Subcat&PriMenuID=36&CatID=141&SubcatID=691](http://www.irena.org/menu/index.aspx?mnu=Subcat&PriMenuID=36&CatID=141&SubcatID=691)

India is looking for rapid adoption of clean energy, along with micro grids and storage. An extra 30-50 GW of new wind (on top of the 25GW now) and 20-30 GW of solar capacity in expected by 2020, up from ~6GW now. There are also energy access initiatives e.g. the government provides up to 90% of the capital funding for building micro-grids in rural areas with no access to electricity. Interest in storage is also growing. The India Energy Storage Alliance puts the potential at 15-20 GW by 2020: [www.indiaesa.info](http://www.indiaesa.info)

In praise of CCS - vital for the future says IEA

‘Carbon capture and storage (CCS) is the only technology able to deliver significant emissions reductions from the use of fossil fuels’. So said the International Energy Agency in a report last year. It went on ‘CCS can reduce emissions not only from power generation, but also from industrial sectors such as iron and steel, refining, petrochemical, and cement manufacturing’. According to its modeling (see graph), ‘CCS could deliver 13% of the cumulative emissions reductions needed by 2050 to limit the global increase in temperature to 2°C (IEA 2DS). This represents the capture and storage of around 6 billion tonnes (Bt) of CO2 emissions per year in 2050, nearly triple India’s energy sector emissions today.’ It adds ‘Half of this captured CO2 in the 2DS would come from industrial sectors, where there are currently limited or no alternatives for achieving deep emission reductions. While there are alternatives to CCS in power generation, delaying or abandoning CCS in the sector would increase the investment required by 40% or more in the 2DS, and may place untenable and unrealistic demands on other low emission technology options.’

While some see CCS as just a way to allow fossil fuels to still be used, the IEA says ‘a 2°C pathway represents a significant departure from “business-as usual” for fossil fuels. Coal use in power generation falls to around one-third of current levels.’ However, it is still used, but emissions are reduced since 95% of coal-fired generators are equipped with CCS. It adds ‘40% of gas-fired power generation will also need to be equipped with CCS in 2050’. It says ‘this has implications for decisions to invest in fossil fuel-based power generation and industrial facilities today, as most of these large capital investments are based on assumed lifetimes of several decades - 30 to 40 years for a power plant. Retrofitting of CCS would prolong the economic life of these assets and provide a form of insurance against asset stranding. China alone has an installed capacity of around 860 gigawatts (GW) of coal-fired power, and IEA analysis suggests that more than one-third of this fleet could be candidates for CCS retrofit.’ Is that really what we want - to make fossil fuel use viable long term? Is it actually possible technically? The IEA say yes and report on some existing CCS projects.

In addition to various Enhanced Oil Recovery CO2 injection project it says ‘the global portfolio of CCS projects now includes the Boundary Dam Project in Saskatchewan, Canada, which in October 2014 became the first operating coal-fired power plant to apply CCS. Two additional projects in the power sector, the Kemper County project in Mississippi and the Petra Nova Carbon Capture Project in Texas, are due to come into operation in 2016. The Shell Quest CCS project, launched in November 2015, is the world’s first CCS project to reduce emissions from oil sands upgrading.’ And more are planned. It concludes ‘Boosting the number of large-scale projects under development is a priority. These projects are critically important in providing commercial experience, enabling key technologies to be refined and cost reductions to be achieved.’ Convinced? Well the UK government wasn’t: it scrapped the UK’s £1bn CCS competition. For once they may have been right…
French Phase out

The energy transition law in France requires the share of nuclear to be cut to 50% by 2025, from over 75% of electricity now. That could force state-controlled utility EDF to close up to a third of its 58 nuclear reactors by 2025, the state audit office, the Cour des Comptes, says. It estimates that the planned reduction could lead to the closure of 17 to 20 reactors if power consumption and exports remain at current levels. EDF says demand will rise longer term, so closures can be avoided while still staying at 50%, but it is preparing to shut Fessenheim, the oldest plant, near the German border, in 2018, to make room for the much delayed new EPR at Flamanville on the Normandy coast - assuming it’s ready by then. Although they would be able to earn income desperately needed by cash strapped EDF, keeping the other older plants open would be costly. The auditor said the cost of upgrading them would be €100 bn over the 2014-30 period, well above EDF’s €55 bn estimate for the 2014-25 period, due to the fact that it also includes EDF’s operating expenses over that period. http://uk.reuters.com/article/us-edf-nuclear-idUKKCN0VJ0ML (Fessenheim’s closure has now been brought forward)

*Areva* reported a €2 bn 2015 net loss, with half due to additional provisions for its Finnish EPR.

**Waste costs** There was also disagreement between EDF/Areva and radioactive waste management agency Andra on the cost of building and operating Cigéo, the proposed national underground repository for high- and intermediate-level waste, 150 miles east of Paris. Andra put its cost at around €36 bn, EDF/Areva say €20 bn. But French energy minister Ségolène Royal then intervened and signed a decree setting the ‘reference cost’ of the repository at €25 bn. However, it’s many decades away, with, even if all goes well, full-scale use not starting until the 2070s. By then, who knows what it will have cost? Or if EDF will still exist.

**Japan restarts** Local residents near Kansai Electric Power Co’s Takahama nuclear plant have been opposing the restart of units 3 and 4. But Fukui District Court reversed an injunction against the restarts. Unit 3 started up in Jan., Unit 4 in Feb. but it shut again with a fault. But then, in March, an injunction forced both offline. All of Japans nuclear plants (it had 54 before Fukushima), barring the two at Sendai re-started in 2013, are still offline. All Fukushima units have been abandoned for ever, most of the rest will likely stay shut, though 20 have applied for restarts. But with leaks continuing at Fukushima, so may opposition: www.truth-out.org/news/item/34565-radioactive-water-from-fukushima-is-leaking-into-the-pacific

**China goes offshore** A demonstration floating nuclear power plant based on China National Nuclear Corporation’s ACP100S small reactor will be built by 2019. It also expects to have a 105 MW Pebble Bed high temperature reactor working by the end of 2017 and aims to export it: www.rt.com/news/332254-china-meltdown-free-reactor/. But there have been delays with its version of the EPR, and there are fears about its overall programme: ‘China is developing its nuclear capability too fast; they just don’t have enough trained staff or adequate independent safety infrastructure,’ said civil engineer Albert Lai Kwong-tak, convenor of Hong Kong’s Professional Commons think tank and a long-standing opponent of nuclear.

**India** may buy into EPR technology, with a deal between France and India for construction of six EPRs at Jaitapur in India’s Maharashtra state set to be finalised by the end of this year. But that must surely depend of the fate of the EPRs in France, Finland, China and the UK.

**Old US plants** are less safe: e.g. leaks at Indian Point on the Hudson River near New York: http://fortune.com/2016/02/28/indian-point-nuclear/ And for the wider US picture: www.npr.org/2016/04/07/473379564/unable-to-compete-on-price-nuclear-power-on-the-decline-in-the-u-s

**Germany** Salt mine nuclear waste-dump issues persist - worries about leaks continue: www.newsscientist.com/article/2075615-radioactive-waste-dogs-germany-despite-abandoning-nuclear-power/

**Belgium** Call to shut the flawed reactors: www.greens-efa.eu/belgian-nuclear-reactors-15051.html


**Little help on climate** GHG emissions from the nuclear fuel cycle are not small: http://thebulletin.org/commentary/climate-protection-through-nuclear-power-plants-hardly9170

But **nuclear costs** may not always rise: www.sciencedirect.com/science/article/pii/S0301421516300106
3. Forum: Odds and ends for you to chew on


Stored Solar: Energy Resource for Integrated Communities in Oxford ERIE, a community project for Oxford City Council, has installed Maslow heat stores and associated control systems to run with domestic PV solar systems in initially 30 homes in the Rose Hill area, to explore the value of solar Self-Consumption and collective sharing of storage. This work is part funded by the UK government (Innovate UK) to see how using innovative energy storage technology could help a group of homes in a community to save energy. If all goes well it may be extended to all the 100 PV houses in the area: www.meetmaslow.com/wp-content/uploads/2015/05/MASLOW-60Kwh-Community-Case-Study-OXFORDy.pdf

Home solar limits: https://energyathaas.wordpress.com/2016/01/19/real-electricity-still-comes-from-the-grid/

Renewable coal?: Co-firing it with biomass cuts emissions. But does not using it! Nature Energy published a paper arguing that coal-biomass co-firing was worth supporting. While some environmentalists are keen on BECCS, Biomass Energy with Carbon Capture, since it could be carbon negative, co-firing with coal is maybe a step too far - and some don’t like biomass combustion, especially if forest derived! http://www.nature.com/articles/nenergy20152

Renewable oil: Peak oil? It keeps on coming back! The price of oil seems to bear no relation to reserves, just to production levels, which are mostly set in response to geopolitical concerns, loosely shaped by defense of market shares. Shale oil may have fired off the current round of price falls, but so has geopolitics. What it will all mean for the global economy is anyone’s guess, though it’s unlikely to be good long term - and tragic in the short term for some countries. And its impact on the environment will be tragic for everyone. Renewables may also suffer - cheap energy makes them less economically attractive. Although it does also make them cheaper to build!

Grid Defection?

Wired claimed it could soon happen, with domestic self-generation, smart meters and local storage ‘the national grid itself may become less important, we could be living in a world where consumers have super-efficient homes and are mainly generating on site’. But aren’t grids vital to link in big units and balance local variations? www.wired.co.uk/news/archive/2016-01-25/smart-grids-empower-users

Climate: A solar story from our favourite contrarians. The weather is driven by the sun, may be climate change is too: http://euanmearns.com/unprecedented-weather-is-climate-change-happening-now/ And this dams the whole climate effort - emissions from the developing world will wipe out all gains from the rest: http://euanmearns.com/the-record-of-recent-man-made-co2-emissions-1965-2014/
Urban energy There are some interesting green energy projects in cities. Energy Cities is a long running initiative involving cities who have signed a Covenant of Mayors committing them to cut carbon emissions. A survey of the programmes run by 13 of them (Zagreb, Helsinki, Freiburg, München, Salerno, Kaunas, Águeda, Barreiro, Moura, Vila Nova de Gaia, Bistria, Málaga and Växjö) found that, between 2000 and 2013, they managed to reduce their CO2 emissions by 43%, and their energy use by over 36% and more than tripled their local renewable energy production from 1.36 TWh to over 4.38 TWh. Local renewable energy production includes electricity (e.g. PV, wind), heat (CHP, geothermal, solar thermal and biomass). In addition they also expanded local non-renewable energy supply, in fact on a much large scale, boosting the total local supply significantly - see chart. As a result, while in 2000, the 13 cities could cover 24% of their energy needs with locally-produced energy (renewable and non-renewable), in 2013, more than 44% of the energy used was provided for by local energy production. http://www.energy-cities.eu/Energy-Cities-Members-delivering

It would be good to get the renewable proportion higher, but there are spatial limits to how much renewable generation can be done in cities. PV solar and biomass/wastes can only do so much. Most of the green electricity will have to be imported from often large renewable energy projects in rural areas/offshore. Even so there’s progress, including campaigns for municipally controlled projects: http://switchedonlondon.org.uk/


Solar Farms

They are spreading across the UK and have helped it to get over 8 GW of PV capacity in place. But not everyone likes the look of them, especially if they are in attractive landscape areas. They can certainly make a mess when they are being built - see the picture above of one being installed near us in N. Bucks earlier this year. The final thing will look neater, but wouldn’t it be nice if, instead of grey rectangular boxes on metal struts, more attractive designs could be developed. See left for a pretty if rather fanciful concept from Landart: http://landartgenerator.org/ HelioField solar energy concept, by Michael Chaveriat, Yikyu Choe, Myung Kweon- submission to the 2012 Land Art Generator Initiative design competition for Freshkills Park, NYC. Roof top solar is clearly best, but marginal land and old industrial sites could be revitalized with solar... Also see https://theconversation.com/power-plants-neednt-be-ugly-lets-make-them-green-and-beautiful-55415
Don’t be fooled by toes

You will regularly see charts like this, left, from BP, suggesting that fossil fuel can and will continue to expand and that renewables expansion will be limited. They make use of ‘tonnes of oil equivalent’ (toes) primary energy. That can be unhelpful. It disguises the fact that only some of this primary fossil energy ends up as finally used energy - much of the rest ends up as waste heat. As Prof. Tom Burke has noted, whereas ‘almost all of the renewable primary energy ends up providing consumers with useful energy services…only about 40% of the primary energy from fossil fuels ends up delivering useful energy services to consumers’. It’s the same for nuclear - the heat energy released by fission is used to raise steam and drive turbines just as in fossil fired plants, with the same thermodynamic losses. So non-renewables can supply much less than what is shown - maybe 5.6 bntoe by 2035. Add in more energy saving (40%?) and the renewables could meet maybe near half actual energy needs by 2035, even on this relatively conservative view of their capacity. By comparison, nuclear could do very little: www.clubofrome.net/news/sup2016/dl-02-leeuwen.pdf

A winters tale

This wind turbine in Sweden is having its rotor blades de-iced with (it’s claimed) hot water, spayed from a helicopter. This image has done the rounds on the web, along with the assertion that the aviation fuel used and the oil burned to heat the water, ‘could produce more electricity (at the right time to meet demand) than the unfrozen wind turbine could ever produce (before it freezes up again)’. https://wattsupwiththat.com/2016/01/23/saturday-silliness-wind-turbine-photo-of-the-year/ A moment’s thought would reveal that this is nonsense. A 1-2 MW turbine like this would generate the amount of energy used for deicing, maybe at most 1 MWh, in an hour or so. Also ethylene glycol can be used for de-icing as with aircraft, integral blade warmers too.

AT/RT 40 years on

This year brings several AT ‘Alternative Technology’ anniversaries, some of which are being marked by ‘40 year on’ conferences. On Sept 2-3rd some of the early pioneers will be gathering in Bristol to mark 40 years since the publication of the seminal Undercurrents book ‘Radical Technology’. And on 26th Nov the Breaking the Frame group and others will be gathering in Birmingham to look back at the equally celebrated Lucas workers alternative plan. In both cases the emphasis will be on what the ideas that emerged then mean for us all now - so its not just nostalgia! We should also add that Renew grew out of NATTA, which was set up in 1976 with the first issue of what was to become Renew emerging in Nov 1979. In various formats, its been bimonthly ever since - 222 issues so far! (This on-line version started at issue 100). http://lucasplan.org.uk www.radicaltechnology.org

Sustainable Design

Another long-timer, OU Prof. Robin Roy, has produced a book for Routledge on Consumer Product Innovation and Sustainable Design, with case studies on bicycles, washing machines, vacuum cleaners, electric lamps, television equipment and mobile phones. The case studies track the technological innovation and design evolution from their initial inventions to the present day, and examine when, why and how environmental criteria, such as improved energy and materials efficiency, became part of the design specification of these products. It looks at the influence of social, economic and cultural factors on their innovation and design and at the impacts of these products on society and the environment. It offers general conclusions about patterns of technological and design evolution, practical guidelines and design lessons. http://www.routledge.com/products/9780415869980