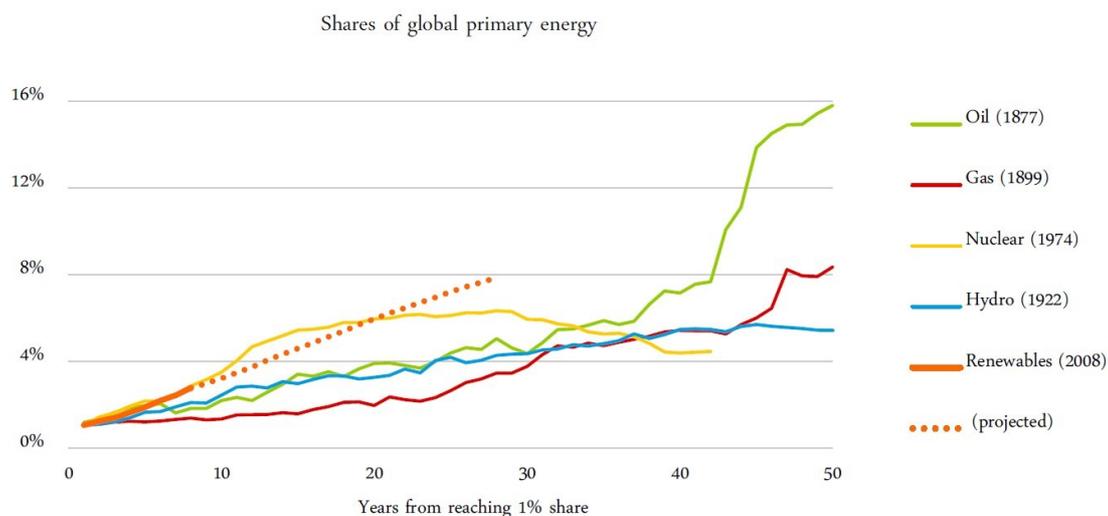




The Global Energy Transition is Underway

July 26, 2016. **Balance of power tilts from fossil fuels to renewable energy** by Ed Crooks, Financial Times. “These are strange days in the energy business. Startling headlines are emerging from the sector that would have seemed impossible just a few years ago (...) The implication of those stories is to suggest **there are momentous changes under way in the global energy system**, undermining received wisdom in the sector. It is clear that the world is shifting toward renewables and — as a proportion of total consumption — away from oil, gas and coal (...) Spencer Dale, chief economist at BP, published a fascinating chart in June showing **the rate of adoption of existing energy sources and technologies**, which makes clear that it is **often a lengthy process** (...) **That said, there are examples from history of when energy systems have changed rapidly after reaching tipping points.** Oil consumption had been growing steadily through the late 19th and early 20th centuries, but really took off during and after the first world war, as warships switched from coal to fuel oil and armies became mechanised with petrol- and diesel-engine vehicles (...) It is clear, too, that the growth of renewables and other low-carbon energy sources will not follow a straight line. Investment in “clean” energy has been faltering this year after hitting a record in 2015, according to Bloomberg New Energy Finance. For the first half of 2016, it is down 23 per cent from the equivalent period last year. Even so, **the elements are being put in place for what could be a quite sudden and far-reaching energy transition**, which could be triggered by an unexpected and sustained surge in oil prices.”

Speed of transition



Note: - For sources of data pre-1965 see “Economic development and the demand for energy” by Ruehl et al, Energy Policy, 2012.

BP Statistical Review of World Energy

The global transition to renewables has already more momentum than previous fundamental shifts in energy resources

context:

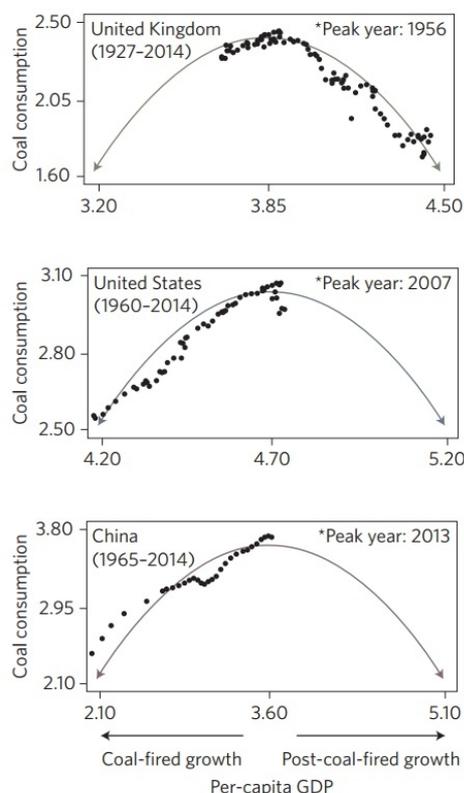
January 19, 2016. **How long will it take? Conceptualizing the temporal dynamics of energy transitions** by Benjamin K. Sovacool. “**Transitioning away from our current global energy system is of paramount importance. The speed at which a transition can take place—its timing, or temporal dynamics—is a critical element of consideration.** This study therefore investigates the issue of time in global and national energy transitions by asking: What does the mainstream academic literature suggest about the time scale of energy transitions? Additionally, what does some of the more recent empirical data related to transitions say, or challenge, about conventional views? In answering these questions, the article presents a “mainstream” view of energy transitions as long, protracted affairs, often taking decades to centuries to occur. However, the article then offers some empirical evidence that the predominant view of timing may not always be supported by the evidence. With this in mind, the final part of the article argues for more transparent conceptions and definitions of energy transitions, and it asks”.



*Air quality improving in Beijing:
PM2.5 averaged 64 µg/m³ in 1st half 2016, down 17.9% from last year*

July 25, 2016. **China's coal peak hailed as turning point in climate change battle** by Damian Carrington, The Guardian. “The global battle against climate change has passed a historic turning point with China’s huge coal burning finally having peaked, according to senior economists. They say the moment may well be a significant milestone in the course of the Anthropocene, the current era in which human activity dominates the world’s environment. **China is the world’s biggest polluter** and more than tripled its coal burning from 2000 to 2013, emitting billions of tonnes of climate-warming carbon dioxide. But its coal consumption peaked in 2014, much earlier than expected, and then began falling. The economists argue in a new paper that this can now be seen as permanent trend, not a blip, due to major shifts in the Chinese economy and a crackdown on pollution. “I think it is a real turning point,” said Lord Nicholas Stern, an eminent climate economist at the London School of Economics, who wrote the analysis with colleagues from

Tsinghua University in Beijing. “I think historians really will see [the coal peak of] 2014 as a very important event in the history of the climate and economy of the world.” The team’s analysis concludes that China’s coal peak “may well be an important milestone in the Anthropocene and a turning point in international efforts to [cut] the emissions of climate-altering greenhouse gases”



*Historical trajectories of economic development and coal consumption for the UK, the US and China.
Source: [China's post-coal growth](#), published by Nature Geoscience*

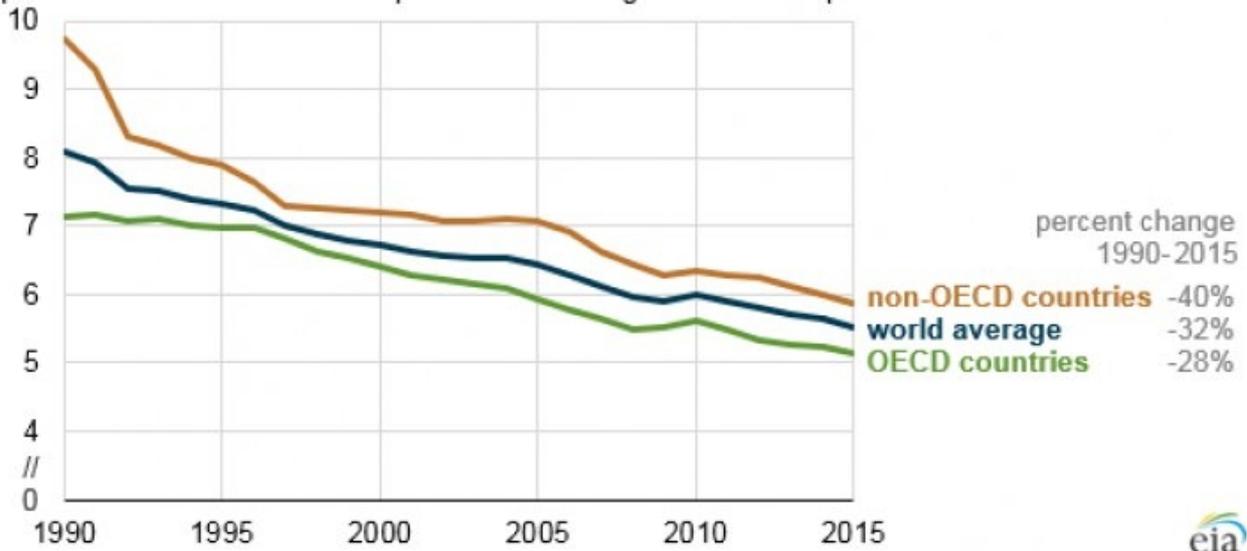
July 25, 2016. **“Nos encontramos ante el final de las energías fósiles”** Entrevista a Jeremy Rifkin por Guillermo Altares, El País. “El sociólogo y economista Jeremy Rifkin (Denver, 1945) predijo el fin del trabajo mucho antes de que todos los ‘think tanks’ del mundo (...) Ha publicado recientemente **La sociedad de coste marginal cero**, donde augura un futuro de energía gratuita que cambiará por completo el modelo de producción y, con ello, la sociedad. Pero no lo plantea como una utopía, sino como una realidad inminente (...) “En el punto en el que estamos es irrelevante lo que estos gigantes de la energía digan, porque esto ya está ocurriendo. La segunda revolución industrial ya ha tocado techo y está en pleno declive. **El elefante en la habitación es el cambio climático: nos enfrentamos a transformaciones radicales en el planeta en los próximos 50 años, no en dos siglos.** Necesitamos un nuevo planteamiento económico y debemos enfrentarnos a la pregunta fundamental sobre cómo producimos.”

July 22, 2016. **Global Economy Becoming Less Energy Intense** by Bobby Magill, Climate Central. “The amount of coal, oil, gas and renewable energy used by the global economy is falling quickly, a clear sign that economic growth is having less of an impact on climate change than in the past, according to new data from the U.S. Department of Energy. **The measure of the amount of energy that is used per unit of gross domestic product is known as energy intensity, and it’s an important indicator in the progress countries are making in tackling climate change. Globally,**

energy intensity has fallen 30 percent since 1990, and about 2 percent between 2014 and 2015. “This is excellent news,” Penn State University climatologist [Michael Mann](#) said. “The dramatic drop we are seeing in global energy intensity is a very direct indication that energy efficiency measures are having a very direct impact on global carbon emissions” (...) **Until recently, the global economy and greenhouse gas emissions increased and decreased together**. They have long been linked because, historically, a growing economy required burning a growing volume of fossil fuels to keep factories and vehicle engines running. That is beginning to change. The International Energy Agency [announced](#) last year that global greenhouse gas emissions produced by burning fossil fuels were the same in 2014 as they were in 2013 despite a growing global economy. The trend [continued](#) in 2015 as emissions remained flat even as the world’s economy grew 3 percent. The reason: More electricity was produced from renewables and natural gas than ever before, and energy is being used more efficiently (...) Globally, the Energy Information Administration expects both the energy and carbon intensity of the global economy to gradually decline over the next 25 years. “We are making headway,” Mann said. “But we need further incentives for policies that will accelerate the transition away from fossil fuels if we are to stabilize warming below dangerous levels.”

World energy intensity, 1990-2015

quadrillion British thermal units per trillion dollars gross domestic product



[*Global energy intensity continues to decline.*](#)

Source: EIA, International Energy Outlook 2016, International Energy Statistics, and Oxford Economics

July 21, 2016. **World Meteorological Organization (WMO): Global Warming Happening Faster Than Predicted.**

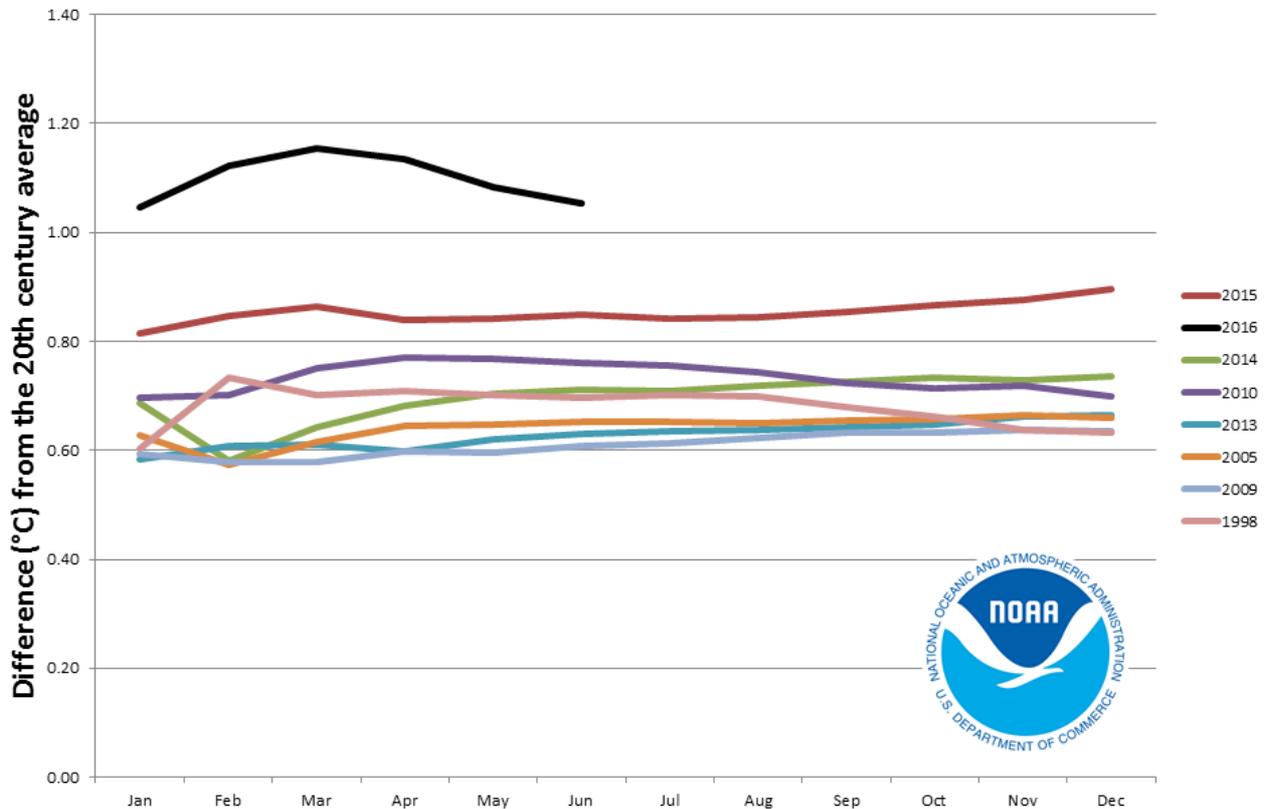
“The dramatic, sweeping changes in the state of the world climate is **alarming**. June was the 14th month in a row of record heat for land and oceans. It also marked the 378th consecutive month with temperatures above the 20th century average. David Carlson, director of the WMO’s World Climate Research Program, told VOA global warming is happening faster than predicted. “This year suggests that the planet can warm up faster than we expected on a much shorter time. We would have thought that it would take several years to see a jump like this,” he said (...) Carlson warned **the world is running out of time to cut the emissions of greenhouse gases leading to global warming**. He said **nations that have signed up to the Paris Climate Change agreement last year must take more aggressive action.**”

context:

July 19, 2016. **La ONU convoca a líderes mundiales para avanzar en ratificación acuerdo clima.** La ONU anunció que ha invitado a los líderes de todo el mundo el próximo 21 de septiembre en Nueva York para hacer avanzar el proceso de ratificación del acuerdo de París contra el cambio climático (...) La cita, que tendrá lugar en el marco de la Asamblea General de Naciones Unidas, servirá para que algunos países depositen los instrumentos de ratificación del acuerdo y para que otros se comprometan a hacerlo antes de fin de año. **El acuerdo de París entrará en vigor 30 días después de que al menos 55 países, que representen juntos más del 55 por ciento de la emisiones globales, presenten ante la ONU su ratificación.**

July 19, 2016. **The Sustainable Development Goals Report 2016** by United Nations. “On 1 January 2016, the world officially began implementation of the 2030 Agenda for Sustainable Development—the transformative plan of action based on 17 Sustainable Development Goals—to address urgent global challenges over the next 15 years. This agenda is a road map for people and the planet that will build on the success of the Millennium Development Goals and ensure sustainable social and economic progress worldwide.”

Year-to-Date Global Temperature for 2016 and the other seven warmest years on record



July 19, 2016. **Saudi Arabia gets ready for a post-oil world.** The Kingdom’s Vision 2030 is all about transforming what fuels its economy by Sara Stefanini, Politico. “**We need to think of ourselves as an energy producer, not an oil producer.** We want to encourage clean energy and we want to encourage renewable energy. There’s no reason why we can’t be a leader in those fields.” That’s a **significant shift** for the world’s biggest oil exporter and second-largest producer (after the U.S.). Oil and gas generate around 50 percent of Saudi Arabia’s GDP and 85 percent of its export earnings. But the Kingdom realizes that the energy sector is gradually moving away from fossil fuels. While the global shift is at least partly driven by pressure to tackle climate change, Saudi Arabia’s efforts are more pragmatic.”

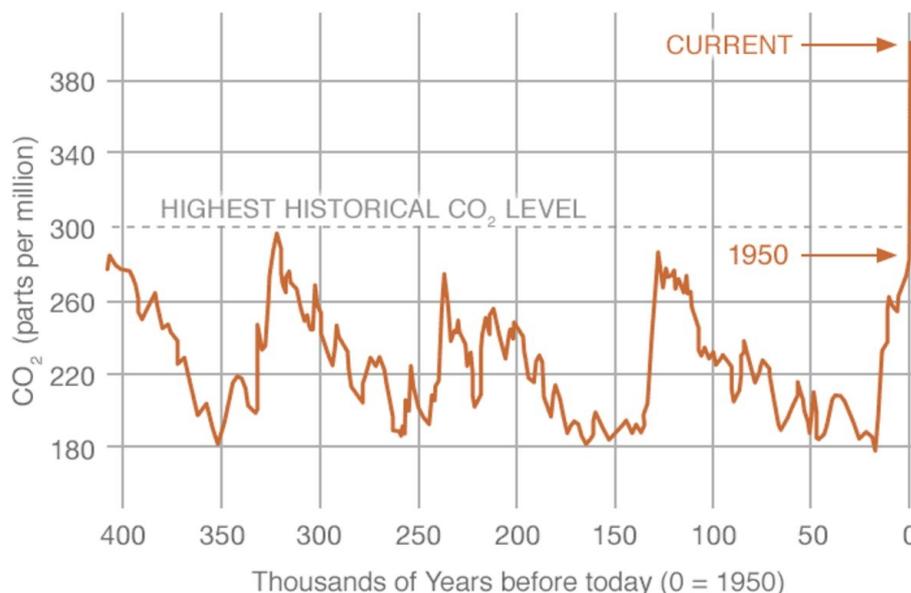
July 18, 2016. **Future of biogas unclear in the EU** by Oliver Ristau, Deutsche Welle. “Biogas can play an important role in the switch to renewable energy, as well as reduce the agriculture sector’s carbon footprint. However, the environmental payoffs are limited without sufficient funding (...) **The EU hasn’t provided any biogas targets for after 2020**, however this type of energy plays an important role in that it isn’t weather dependent like wind and solar energy. The buffer afforded by biogas provides the EU an additional option for successful comprehensive energy reform. This is especially so in conjunction with biomethane, which can be an alternative to natural gas and used for the transport sector.”

July 18, 2016. **BRICS bank sells yuan bonds to fund green projects**. “The New Development Bank (NDB) launched by the BRICS countries has issued its first bonds worldwide to raise funds for clean energy projects in member states (...) Earlier this year, Russian Finance Minister Anton Siluanov said the NDB “will soon become a strong and well-respected international financial institution, playing a leading role in **the changing international financial architecture**” (...) BRICS members, China, India and Russia are also the three largest shareholders in the China-led Asian Infrastructure Investment Bank (AIIB). Both the BRICS Bank and the AIIB will extend China’s financial reach and compete not only with the World Bank, but also with the Asian Development Bank, which is heavily dominated by Japan.”

context:

July 23, 2015. **The Eurasian Big Bang: How China and Russia Are Running Rings Around Washington** by Pepe Escobar.

July 11, 2016. **Fossil Fuel Industry Risks Losing \$33 Trillion to Climate Change** by Joe Ryan, Bloomberg. “The fossil fuel industry risks losing \$33 trillion in revenue **over the next 25 years as global warming may drive companies to leave oil, natural gas and coal in the ground**, according to a Barclays Plc energy analyst. Government regulations and other efforts to cut carbon emissions will inevitably slash demand for fossil fuels, jeopardizing traditional energy producers, Mark Lewis, Barclays’s head of European utilities equity research, said during a panel discussion in New York on financial risks from climate change. His comments are part of a growing chorus calling for more transparency from oil and gas companies about how their balance sheets may be affected by the global shift away from fossil fuels. As governments adopt stricter environmental policies, there’s **increasing risk that companies’ untapped deposits of oil, gas and coal may go unused, turning valuable reserves into stranded assets of questionable value.**”



July 10, 2016. **Legal shake-up threatens Germany's energy 'revolution'** by Guy Chazan, Financial Times. **“Legislation means citizen-owned energy co-operatives may come to an end.** In Germany, people's power has wrought a revolution (...) Germany's Energiewende, or energy transition, is one of the most radical pivots attempted by a modern industrialised economy. The country is shunting aside polluting fossil fuels and nuclear power in favour of wind, solar and biomass, which by 2050 are to provide 80 per cent of its electricity, if targets are met. The change was underpinned by the Renewable Energy Law, known in Germany as the EEG, which set guaranteed prices or “feed-in tariffs” for electricity generated from carbon-free sources. In the years that followed, dozens of energy co-operatives and “citizen's initiatives” sprung up to take advantage of what quickly became an attractive investment opportunity. **Roughly half of Germany's total renewable energy capacity was installed by such entities**, which now number close to 1,000 (...) Rising bills and pressure from the EU — which wants to see a more market-based method of supporting carbon-free power — have prompted the government to pass a big reform of the EEG, which was voted through by the Bundestag on Friday. From next year, feed-in tariffs will be replaced with a system of competitive auctions: anyone can bid, but the developer offering the cheapest electricity wins.”

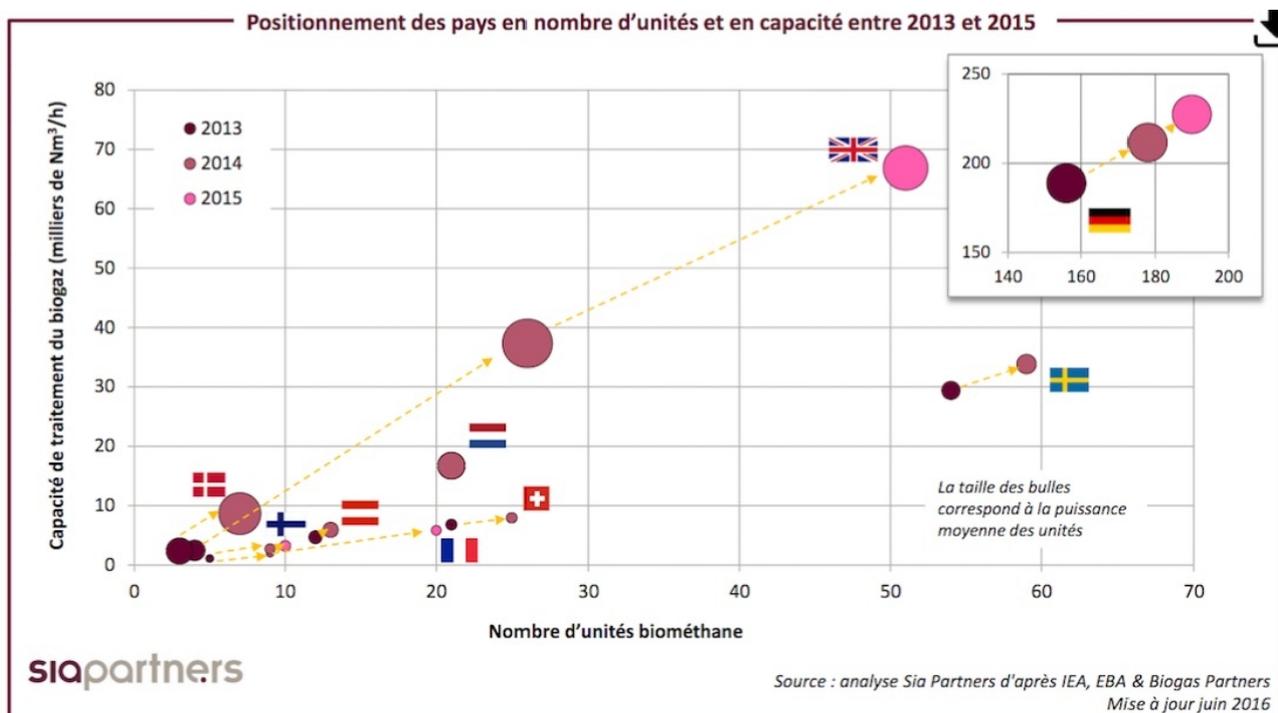
July 8, 2016. **Bundestag a définitivement adopté la loi EEG2016.**

July 8, 2016. **ADBA exclusive: UK's anaerobic digestion industry will focus on boosting performance.** “The UK's anaerobic digestion (AD) industry will concentrate on improving its environmental, operational and safety performance in an effort to move the sector forward, Anaerobic Digestion and Bioresources Association's (ADBA) CEO Charlotte Morton told Bioenergy Insight. Morton's comments came as she officially launched **ADBA's Best Practice Scheme for the AD sector** at the UK AD & Biogas 2016 conference in Birmingham, which took place from 6-7 July. The scheme is an industry-led certification scheme, involving stakeholders from across the sector. The project aims to help the industry improve its environmental, safety and operational performance. Speaking to Bioenergy Insight, Morton said: **“The more we can do to improve performance the less reliant we are on government incentives.** So, that's what we have to continue to do. The launch of the best practice scheme is something that should contribute to that. **Improving performance through whatever means, whether that is through improving best practice, research and innovation or investment, is probably the one single thing that we can do on our own.** “There is so much that can be achieved. If you look at my lifetime in AD we have tripled the potential of the industry through looking at things like what research and development can offer, for example. This includes analyses of feedstock and improved performance, for example.” Almost a third more biogas energy is being produced in the UK compared to this time last year, ADBA revealed at the UK AD & Biogas 2016 conference. The AD Market Report, published at the event, shows that the UK now has 617MWe of biogas capacity, enough to power the equivalent of 800,000 homes.

July 5, 2016. **Where is the future of China's biogas? Review, forecast, and policy implications** by Lei Gu, Yi-Xin Zhang, Jian-Zhou Wang, Gina Chen, Hugh Batty. “This paper discusses the history and present status of different categories of biogas production in China, most of which are classified into rural household production, agriculture-based engineering production, and industry-based engineering production. To evaluate the future biogas production of China, five models including the Hubbert model, the Weibull model, the generalized Weng model, the H-C-Z model, and the Grey model are applied to analyze and forecast the biogas production of each province and the entire country. It is proved that those models which originated from oil research can also be applied to other energy sources. The simulation results reveal that **China's total biogas production is unlikely to keep on a fast-growing trend in the next few years**, mainly due to a recent decrease in rural household production, and this greatly differs from the previous goal set by the official department. In addition, China's biogas production will present a more uneven pattern among

regions in the future. This paper will give preliminary explanation for the regional difference of the three biogas sectors and propose some recommendations for instituting corresponding policies and strategies to promote the development of the biogas industry in China.”

July 5, 2016. **Observatoire du biométhane: Benchmark des filières européennes.** Le think tank France Biométhane, né en avril dernier, publie le 1er « benchmark européen pour le biométhane », réalisé en collaboration avec le cabinet Sia Partners. Cet observatoire indépendant permet de suivre le marché et les perspectives du biométhane en France et en Europe.



L'Allemagne représente de loin le premier marché de la filière en Europe avec plus de 180 unités en opération en 2015. Derrière, le Royaume-Uni a connu la plus forte dynamique avec 51 unités mises en opération en moins de 4 ans, rattrapant la Suède, pays historique de la filière.

July 2, 2016. **UK Anaerobic Digestion Industry is Still Bubbling the Gas!** by Sam Bright, Anaerobic Digestion News. “Despite numerous profits of doom six months ago, the UK anaerobic digestion industry seems to be surviving (...) There have been announcements within the last month (June 2016) of not only existing UK biogas plants being commissioned, but also of new projects starting. Although the UK industry may soon be damaged by the investment uncertainties which surround the UK's EU "Brexit", the withdrawal of UK government subsidy funding in a variety of forms over the last year or so, may be something that the industry can work through. If it can do this without losing the growing biogas skills-base so gradually developed over the last 10 years, it will be a major achievement. That would then, provide a much needed basis for exporting UK biogas skills worldwide **to make the UK a more global exporter instead of relying on UK and European markets.**”

July, 2016. **Biogas: Boom or Bust?** By Dr Caitlin Burns and Lucy Hopwood of NNFCC look at the **current position of the UK anaerobic digestion industry. Is a decade of “boom” set to become a period of “bust”?** The anaerobic digestion (AD) industry has boomed over the past 10 years, from a nascent energy sector into an established industry. But this rapid growth is set to slow due to recent and planned changes in policy and without better access to waste (...) The AD sector faces a challenging future: operating in an unfavourable policy landscape with increasingly stringent compliance criteria, feedstock restrictions and reducing levels of support. **There is hope for the**

coming year but beyond 2017 the development landscape remains questionable with the risk that new regulations will be too limiting and under the new cost-control mechanisms the industry could be a victim of its own success.”

June 29, 2016. **EU Biofuels Annual 2016** by USDA Foreign Agriculture Service’s Global Agricultural Information Network. **“The European biogas sector is very diverse.** Depending on national priorities, i.e. whether biogas production is primarily seen as a means of waste management, as a means of generating renewable energy, or a combination of the two, countries have structured their financial incentives (or the lack thereof) to favor different feedstocks. According to the latest available data, in 2014, Germany and the United Kingdom, the two largest biogas producers in the EU represented the two ends of the scale. Germany generates 93 percent of its biogas from the fermentation of agricultural crops and crop residues while the United Kingdom, along with Greece, Estonia, Ireland, and Portugal, relies almost entirely on landfill and sewage sludge gas. All other countries use a variety of feedstock combinations. Germany is the leader in biogas production accounting for 65 percent of total EU production in 2014. Italy, the Czech Republic, the United Kingdom and Austria followed with a production share of 14, 5, 3, and 3 percent, respectively.

Calendar Year	2010	2011	2012	2013	2014	2015^e	2016^f	2017^f
Landfill	2,657	2,739	2,744	2,816	2,751	2,750	2,750	2,750
Sewage Sludge	1,017	1,169	1,195	1,368	1,358	1,360	1,360	1,360
Field Crops/ Manure/ Agro-food industry waste	4,856	6,509	8,247	9,708	10,758	11,700	12,500	13,000
Total	8,530	10,416	12,185	13,892	14,866	15,810	16,610	17,110

Sources: 2008-2014 Eurostat table nrg_109, downloaded on May 9, 2016; 2015-2017: e, f = Estimate/Forecast EU FAS Posts

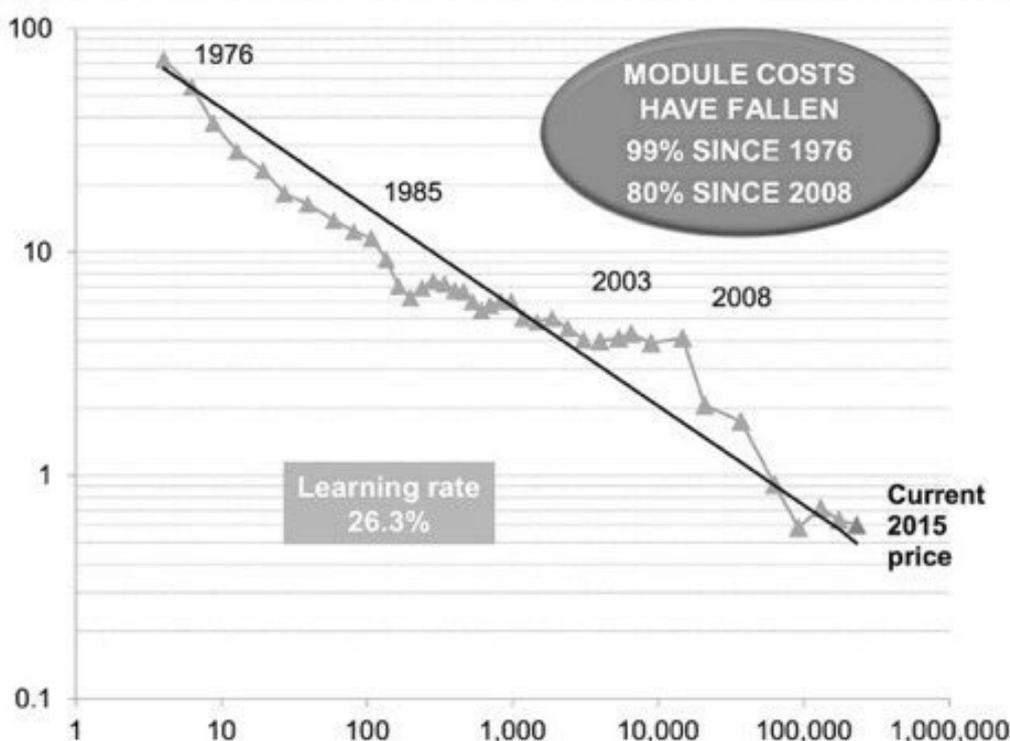
The incentive for farmers in Germany to invest in biogas digesters was a guaranteed feed-in price for the generated electricity which is considerably higher than that of electricity generated from fossil fuels, natural gas coal, or nuclear sources. This feed-in price was guaranteed for 20 years from the erection of the plants. However, changes to the German renewable energy law (EEG) in 2012 and 2014, reduced the attractiveness of investing in new plants. As a result, further increase in biogas plants will be minimal. Instead, investments will likely focus on rejuvenating existing plants. Biogas production is increasing in the Czech Republic (driven by feed-in tariffs to compensate for the cost of production) and Denmark (driven by the goal to use 50 percent of livestock manure for biogas production by 2020). In France, the government seeks to increase the number of biogas facilities by means of investment support and electricity purchase prices, however, the administrative burden and a lack of profitability for investors is limiting expansion. According to its National Renewable Energy Action Plan (NAP), Hungary wants to increase its biogas production capacity from 45 MW to 55 MW by 2020. However, the increase is stifled by problems with the green energy feed-in system and the low electricity purchase prices, which make further investments into biogas facilities economically unattractive. In the Netherlands, low electricity prices have even led to a decline in biogas production. The majority of the biogas is used to generate electricity and/or heat. The trend is toward the so-called cogeneration plants which produce electricity and capture the process heat at the same time (Germany, the Netherlands, Austria, Czech Republic, and Poland). The heat can be supplied to nearby buildings or sold to district heating systems. A growing number of large scale operations are purifying the biogas, which contains 50-75 percent methane, to bio-methane (99 percent methane) and subsequently entering it into the natural gas grid (Germany, Austria). The use of purified biogas as transportation fuel is still marginal in most EU countries with the exception of Sweden and Germany. In 2014, the EU consumed 134 MT of oil equivalent (TOE) of biogas for transportation uses: 84 TOE in Sweden and 50 TOE in Germany.”

June 29, 2016. **The reform of the Renewable Energy Act: Germany's energy transition revamp stirs controversy over speed, participation** by Sören Amelang, dossier Clean Energy Wire. “The German Renewable Energy Act (EEG) is the mechanism that has made possible the energy transition so far. It guaranteed renewable energy producers high returns on investment, which in turn helped to bring down the costs of installing renewable power capacity. Lawmakers now say the sector is mature enough to take the training wheels off and be exposed to market forces. Major reform of the EEG aims to do just that, reducing costs for consumers. At the same time, the new legislation will limit how much new renewable capacity can be built each year. But the plans are hugely controversial. Big energy companies and industry see it as a step in the right direction. The renewable lobby and citizens’ energy groups say it will result in Germany missing its climate targets and betray the collective spirit of the Energiewende in an effort to appease big business.”

June 25, 2016. **China has become a green energy superpower. These 5 charts show how** by Emma Luxton, World Economic Forum. “Investment in green energy is on the rise, and a world powered entirely by renewables is no longer a distant dream, with a handful of countries hitting 100% renewable electricity production. But while Portugal ran on renewable energy alone for four days and clean energy accounted for 33% of Germany’s power use in 2015, **it is developing countries, and China in particular, driving this green revolution.** And these charts, from the REN21 Renewables 2016 Global Status report and the United Nations Global Trends in Renewable Energy Investment 2016 report, show **how China is paving the way to a clean energy future.**”

The Beautiful Math of Solar Power

Every time the world's solar power doubles, the cost of panels falls 26%



Les unités de méthanisation peuvent, grâce à une gestion flexible, participer à la stabilisation du réseau électrique en fournissant de l'énergie de réglage positive ou négative.