APPLIED NANOPARTICLES

Monthly Anaerobic Digestion Newsletter

April 2017 compilation and overview of cutting-edge biogas industry news

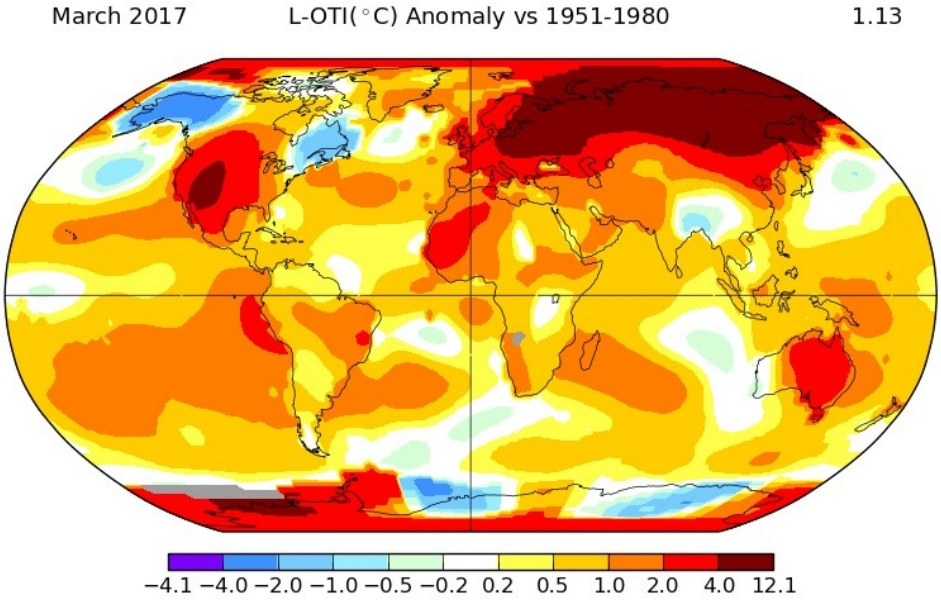
2020, The Climate Turning Point

April 25, 2017. **Cut fossil fuel use 'dramatically' to meet climate goals, says Shell-backed report** by Simon Evans, Carbon Brief. "The use of fossil fuel, particularly coal and oil, must decline "sharply" if the world is to meet the goals of the Paris accord, according to a new report backed by energy giants Shell and BHP Billiton. Global coal use must be cut by 70% within 25 years, oil use must fall 30% and gas can increase by only 2% out to 2040. **The growing global population will instead get its energy from a huge expansion of renewables, combined with more efficient energy use and other low-carbon technologies**. Those are the conclusions of the Energy Transitions Commission, a group set up in 2013 by a cross-section of major firms, NGOs and academics. Its conclusions broadly align with other pathways for 2C and below, but the commission's membership adds an interesting twist to the findings. The commission's report sets out a pathway to keeping temperatures well-below 2C above pre-industrial temperatures, in line with the less ambitious end of the Paris Agreement on climate change. It says this path is hugely challenging, but that it is "technically and economically possible", and that it would bring "important additional social benefits…and economic opportunities" (...) close to 100% renewable will be possible in many countries by 2035. This near-100% renewable system would cost $70 per megawatt hour (MWh), the report says, allowing renewables to be "fully cost-competitive with fossil fuels, allowing for all necessary flexibility and back-up costs" (...) In short, **some of the world's largest energy firms now agree that it is not only technically and economically possible, but also offers economic opportunities to move move towards a low-carbon future**."

April 24, 2017. **Arctic climate warming higher and faster than expected** by Margo McDiarmid, CBC News. "**Open water in Arctic Ocean affecting weather patterns around world**. A new international report shows that Arctic temperatures are rising higher and faster than expected, and the effects are already being felt around the world. "**The Arctic's climate is shifting to a new state**," warns the report. "This transformation has profound implications for people, resources and ecosystems worldwide." The Snow, Water, Ice and Permafrost in the Arctic assessment was written by more than 90 scientists from around the world who compiled the latest northern research on how climate change is affecting the Arctic ice and ecosystems (...) Among the findings in this year's report: The Arctic Ocean could be largely free of sea ice in the summer as early as 2030 or even before that; Arctic temperatures are rising twice as fast as the temperatures in the rest of the world; Thawing permafrost that holds 50% of the world's carbon is already affecting northern infrastructure and could release significant amounts of methane into the atmosphere; Polar bears, walruses and seals that rely on ice for survival are facing increased stress and disruption; Changes in the Arctic may be affecting weather as far away as Southeast Asia (...) This report is being released ahead of the Arctic Council meeting in Fairbanks, Alaska, on May 11."

April 22, 2017. **British power generation achieves first ever coal-free day** by Georgia Brown, The Guardian. "Friday was **Britain's first ever working day without coal power since the Industrial Revolution** (...) Coal has seen significant declines in recent years, accounting for just 9% of electricity generation in 2016, down from around 23% the year before, as coal plants closed or switched to burning biomass such as wood pellets. Britain's last coal power station will be forced to close in 2025, as part of a government plan to phase out the fossil fuel to meet its climate change commitments (...) **Britain became the first country to use coal for electricity** when Thomas Edison opened the Holborn Viaduct power station in London in 1882."

April 20, 2017. **We Just Breached the 410 Parts Per Million Threshold** by Brian Kahn, Climate Central. "**The world just passed another round-numbered climate milestone**. Scientists predicted it would happen this year and lo and behold, it has. On Tuesday, the Mauna Loa Observatory recorded its first-ever carbon dioxide reading in excess of 410 parts per million (it was 410.28 ppm in case you want the full deal). **Carbon dioxide hasn't reached that height in millions of years**. It's a new atmosphere that humanity will have to contend with, one that's trapping more heat and causing the climate to change at a quickening rate (...) "Its pretty depressing that it's only a couple of years since the 400 ppm milestone was toppled," Gavin Foster, a paleoclimate researcher at the University of Southampton told Climate Central."



April 19, 2017. **Antarctic Scientists Go Chasing Waterfalls... and discover rivers and lakes they're unused** to by Robinson Meyer, The Atlantic. "The first-ever hydrological survey of Antarctica has just been completed, and **it found nearly 700 streams, ponds, and waterfalls, a sprawling and active meltwater drainage system never previously documented**. The system appears to cover the entire continent, carrying water across both grounded ice and the floating ice shelves which surround its coast. Its scale rivals anything found on the more temperate parts of the planet (...) **They may require the recalculation of some of the longest-term estimates of sea-level rise, though it is unclear whether those projections will increase or decrease**. Contemporary models of the planet's snow-and-ice system—the cryosphere—do not account for such an expansive meltwater network in Antarctica."

April 18, 2017. **Urgency and Opportunity: Why the next four years are critical to the future of our planet** by Mark Watts, Executive Director of C40. "The launch of Mission 2020 should be welcomed by everyone who understands why **tackling climate change is humanity's most urgent task**. Its focus is getting us over the first hurdle in the race to exit the Fossil Fuel Age and move into a greener, cleaner, climate-safe era for humanity. C40, which launched its own 'Deadline 2020' program a few months ago, will certainly be getting right behind Mission 2020 (...) while a climate safe future ultimately requires getting down to zero GHG emissions by mid-century, unless global emissions peak in the next four years it will become essentially impossible to get there (...) **The absolutely critical period to tackle climate change is right now**."

April 17, 2017. **March 2017 was second-warmest March on record** from NASA's Goddard Institute for Space Studies. "March 2017 was the second warmest March in 137 years of modern record-keeping, according to a monthly analysis of global temperatures by scientists at NASA's Goddard Institute for Space Studies (GISS) in New York. **Last month was 1.12 degrees Celsius**

warmer than the mean March temperature from 1951-1980. The two top March temperature anomalies have occurred during the past two years."

April 17, 2017. **7,000 massive methane gas bubbles under the Russian permafrost could explode anytime** by Dr. Joe Romm, Climate Progress. "Scorching March brings Arctic temperatures up to 20°F warmer than normal. Russian scientists have recently discovered some 7,000 underground methane bubbles in Siberia that could explode anytime. 'Their appearance at such high latitudes is most likely linked to thawing permafrost," explained a Russian Academy of Science spokesperson, "which is in turn linked to overall rise of temperature on the north of Eurasia during last several decades." (...) In general, the Arctic warms twice as fast as the planet as a whole (...) But in March, Siberia again saw stunning temperatures, according to NASA's latest monthly report. Globally, it was the second hottest March on record, losing out only to March 2016. **Parts of Siberia and the Arctic were as much as 12.1°C (22°F) above the 1951–1980 average** (...) "It is just a matter of time when some of those craters appear in North America as well."

Due to the warming climate, the eruptions by methane blasts are causing new craters. Credit: Olga Gertcyk, Siberia Times

April 11, 2017. **March was a record month for renewable power in Germany** by Craig Morris, Energy Transition. "Renewable energy made up just over 41% of Germany's power supply last month, the most ever at around 19.5 TWh. It's a good thing, too, because nuclear power production may have fallen to its lowest monthly level since the 1970s – even though no nuclear plant has been switched off since 2015."

April 10, 2017. **2020, The Climate Turning Point**. "A group of leading climate and business experts will today identify the year 2020 as **a game changing opportunity to turn the tide on the devastating impacts of carbon emissions** (...) Drawing on findings from a newly published report - "2020: The Climate Turning Point" - the campaign will highlight why the 2020 turning point is necessary, and importantly how it can be realistically achieved, thanks to exponentially growing

climate action. **What needs to happen by 2020?** In the next three years, businesses, investors and policy makers need to take bold, but achievable steps so that major milestones are reached by 2020. A wide range of sectors have a role to play so that by 2020: • Energy: Renewables outcompete fossil fuels as new electricity sources worldwide. • Transport: Zero emission transport is the preferred form of all new mobility in the world's major cities and transport routes • Infrastructure: Cities and states have established plans and are implementing policies and regulations with the aim to fully decarbonise infrastructure by 2050 • Land Use: Large-scale deforestation is replaced by large-scale land restoration and agriculture shifts to earth friendly practices • Industry: Heavy industry - including iron & steel, cement, chemicals, and oil & gas - commits to being Paris compliant • Finance: Investment in climate action is beyond USD $1trillion per year and all financial institutions have a disclosed transition strategy"

April 7, 2017. **The role of cities in tackling global challenges** by British Council. "Cities need far greater autonomy to drive economic growth, increase living standards and play a much larger role in global governance, says a new British Council report. Cities, Prosperity and Influence examines how the growth of urban living means established world cities such as the "Big Six" super cities: London, New York, Paris, Tokyo, Hong Kong and Singapore can be an increasingly important economic and cultural force in world affairs. The report argues that **nation-states are no longer best placed to deal with some of the 21st century's biggest global challenges**; issues such as mass migration, infectious disease, climate change and security require co-operation at different levels of governance (...) World cities now account for 80% of world GDP (...) With cities wielding such economic power they must be at the heart of globalisation."

Potential of biogas from digestion in EU beyond 2020

April 19, 2017. **New study focuses on potential of biogas as source of clean energy**. "A new study examines the use of biogas – gas produced from organic waste – as an energy source in Europe, and shows that it has not yet reached its full potential. As the EU works towards its ambitious energy and climate targets for 2020 and 2030, **biogas can be a flexible and sustainable alternative source of energy, which supports energy security and greenhouse gas emission reduction in electricity, heating and transport**. However, in some EU countries the absence of policies promoting biogas means that currently its full potential is not being used. **The study makes a number of recommendations for maximising the potential of biogas in Europe**. It includes a call to create a long -term policy framework for the development of the biogas sector that also encompasses related areas, such as agriculture and waste management. In addition to creating a stable investment framework, several regulatory and technical barriers also still need to be addressed, including those hampering cross-border energy trade. The study also strongly recommends making more use of residual heat from biogas installations, and informing citizens about local biogas projects, their benefits, and safety guidelines. **In 2014, 14.9 mtoe (million tonnes of oil equivalent) of biogas was produced in the EU: this represented about 7.6% of all primary renewable energy production in the EU**. It was mainly used for renewable electricity production, followed by heat production and use as a transport fuel. The study examines the potential role, costs and benefits of biogas and the role that it could play in helping the EU to meet its targets of increased use of renewable energy and reduced greenhouse gas emissions by 2020 and 2030. **It sets out four scenarios covering possible developments in the use of biogas in the EU by 2030**. These show the different possible options for the use of biogas in cogeneration units

(which convert it into heat and electricity directly) or for its upgrade to biomethane to be fed into the gas grid or to be used as a transport fuel. It also examines the barriers preventing the development of biogas markets: at the moment, only three countries (Germany, Italy and the United Kingdom) are responsible for more than 77% of the EU's biogas production. The absence of a stable and reliable investment framework and lack of effective support are identified as key obstacles."

Table 1 Overview of the four scenarios

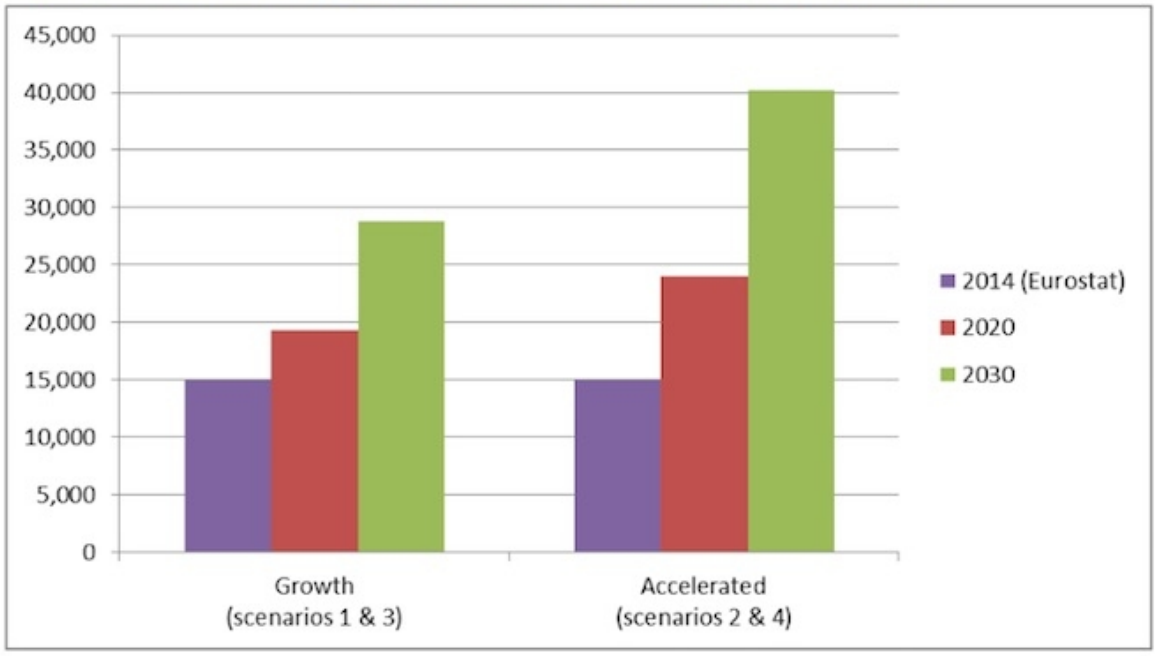
1	Local use & growth	Local use of the biogas in CHP, with electricity fed to the grid and local use of the heat Growth of feedstock deployment, regular development of investment costs and conversion efficiencies
2	Local use & accelerated growth	Local use of the biogas in CHP, with electricity fed to the grid and local use of the heat Accelerated growth of feedstock deployment, accelerated development of investment costs and conversion efficiencies
3	To gas grid & growth	Upgrading of the biogas to biomethane, fed into the gas grid. Use in built environment or in transport sector. Growth of feedstock deployment, regular development of investment costs and conversion efficiencies
4	To gas grid & accelerated growth	Upgrading of the biogas to biomethane, fed into the gas grid. Use in built environment or in transport sector. Accelerated growth of feedstock deployment, accelerated development of investment costs and conversion efficiencies

Growth scenarios for biogas deployment until 2030.
The key parameters that were varied in these scenarios were
end-use of the biogas and rate of biogas production increase and innovation

Optimal use of biogas from waste streams: An assessment of the potential of biogas from digestion in EU beyond 2020. "As the European Commission is working on the further development and concretisation of the post-2020 climate and energy policies, **this study was commissioned to zoom in on the potential role, cost and benefits of biogas, and to assess the key barriers and drivers of biogas deployment in the EU**. An important question to address was what policies at both EU and Member State level can best contribute to the effective and efficient growth of biogas deployment in the EU (...) Cost of biogas production varies significantly, and depends on parameters such as the substrate used and the possibilities to distribute the resulting digestate in he surrounding agricultural area. **For most of the biogas produced**, however, **cost is higher than the price of the energy sources they replace** (natural gas, diesel, etc.). Compared to other renewable energy sources, namely wind and solar PV, **biogas has the advantage that it can be used to provide flexible power production, including in times of low wind and solar intensity**. When analysing the main drivers for biogas developments across the EU, the existence, stability and reliability of the policy framework and support schemes appears as the number one driver in all countries, independent of whether they already have a mature biogas market in place or not. National targets and goals are also identified as an important driver for the sector, as is the availability of suitable feedstocks (and waste collection processes) for biogas production. The number one barrier to biogas developments in all three sectors is the opposite of the main driver: the lack of existence, stability and reliability of the framework and support schemes. This is the result of the current revision of the existing support schemes in some Member States and lack of support schemes, especially in heat and transport sectors, in others. In addition, many other barriers were identified throughout the EU, including lack of access to finance, lack of supporting taxing regimes (e.g. in transport), uncertainties related to sustainability criteria and low public awareness

or lack of expertise. Almost all EU Member States have gas infrastructure and storage in place, a natural gas infrastructure for transport and gas quality regulations, all important prerequisites for biomethane deployment and growth. Nevertheless, there are only a limited number of Member States where upgrading of the biogas into biomethane and injection into the grid is supported. In Sweden, the biomethane sector is well developed despite limited gas infrastructure: biomethane is typically distributed by trucks rather than by the grid. Cross-border biomethane trade is ongoing between some countries but is still very limited and hampered by issues such as country specific quality requirements and lack of harmonised traceability requirements. A wide range of EU policies are relevant to biogas and biomethane developments, including directives and communications on climate change, renewable energy, transport, agriculture, waste, state aid and natural gas. Many of these are currently being revised or further developed, creating an uncertainty in the market. Because of the importance of effective and table policy support for biogas deployment and investments, **the regulations and communications for the period after 2020 are expected to be crucial to the longer term developments of biogas in the EU**. Looking at the policies on national level, a large variety of support policies for biogas and biomethane is currently in place and there is still a lack of effective support schemes in many Member States. The survey conducted as part of this study indicated a clear correlation between the financial incentives in place and the way biogas is deployed in the Member States. Biogas is mainly supported in the electricity sector, while support for biomethane has its focus on the transport sector. An overview of the biogas status and policies in each Member State is provided in an Annex of the report (...) The costs per GJ biogas depend on the feedstocks, the digester technology used and the scale of production. On average, the calculated EU-wide biogas production costs are 14€/GJ in the 'growth' scenarios and 12 €/GJ in the 'accelerated growth' scenarios. If the biogas is upgraded to biomethane at natural gas quality or all production is converted to electricity in a cogeneration unit, the resulting cost levels are 1.3 to 2.0 times the current EU prices in the EU for natural gas and electricity."

Figure 2 Growth of biogas production in EU28 in the scenarios in ktoe[2]



Biogas production in the EU could increase from the current level of 14.9 Mtoe towards 28.8 to 40.2 Mtoe in 2030.

How digitalization is changing energy markets

April 25, 2017. **Introduction of digital meters to biogas plants**. "From 2019, the classical electricity meters in Flanders will be replaced by modern digital meters. The installation of digital meters, which can be expanded into smart meters, is a **next step in the implementation of a smart energy network**. In the future, decentralized production of energy will only increase, making it necessary to better match the different production units. This evolution has already been implemented with, among other things, virtual power plants that offer decentralized energy produced flexibly in the electricity market and seek extra revenue (...) a number of possibilities arising from the introduction of the digital meter. **This meter allows flexibility to be reimbursed, even on small installations**."

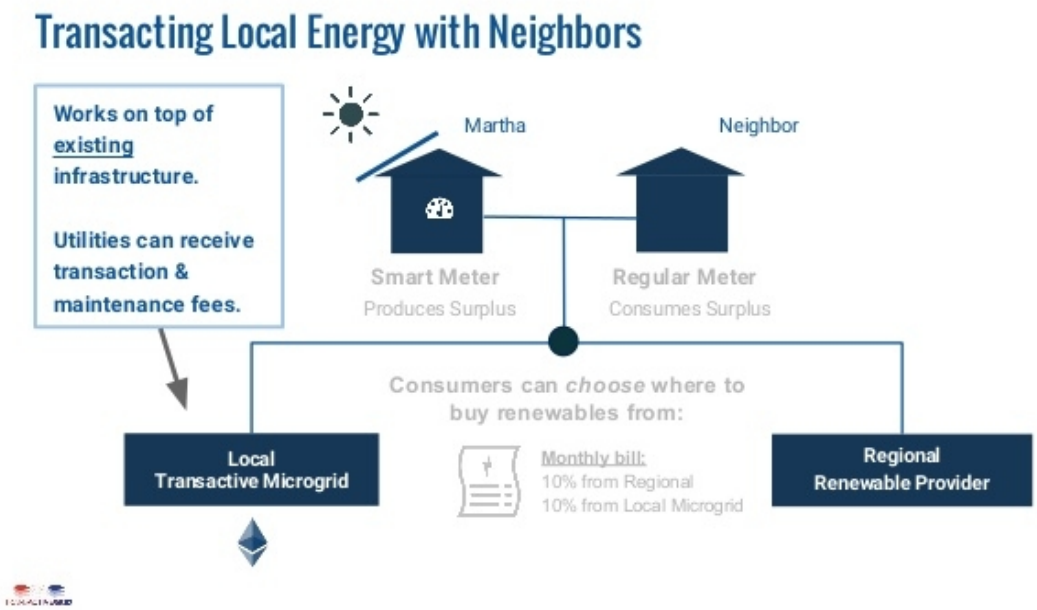
context:

March 2016 BioGAS+ Newsletter. **Biogas and the digital disruption into energy**

April 19, 2017. **Blockchain Is Helping to Build a New Kind of Energy Grid** by Elizabeth Woyke, MIT Technology Review. "**Using the technology behind Bitcoin, participants in the Brooklyn Microgrid are buying and selling locally generated renewable energy over a peer-to-peer network**. If you have solar panels that produce more energy than you need, you can sell the excess to a utility company. But what if you could sell it to your neighbor instead? A company called LO3 Energy has developed a system that lets people buy and sell locally generated solar energy within their communities. The system uses blockchain—the electronic ledger technology that underpins the digital currency Bitcoin—to facilitate and record the transactions. Distributing energy this way is more efficient than transmitting energy over distances, said LO3's founder, Lawrence Orsini, and would make neighborhoods more resilient to power outages, as well as helping meet demand when energy needs exceed expectations. **It's also in line with growing public support for renewable energy, distributed and decentralized energy systems, and "buy local" programs in general** (...) Blockchain makes the Brooklyn Microgrid possible. Participants install smart meters equipped with the technology, which track the energy they generate and consume. Records of the automatic "smart contracts" that enable neighbor-to-neighbor transactions are also tracked using blockchain."

context:

March 2016 BioGAS+ Newsletter. **Energiewende 2.0: Blockchain in the energy transition**



April 13, 2017. **IEA examines critical interplay between digital and energy systems**. "The growing use of information and communications technology – digitalization – is increasingly permeating modern life, from the way people work and travel to the way they live and entertain. Digitalization is increasingly having an impact on energy systems, bringing both the potential for substantial efficiency and system improvements and raising new policy issues. The opportunities and challenges raised by the intersection of digitalization and energy were the focus of a two-day workshop held by the International Energy Agency in Paris this month that brought together more than 120 global experts. This workshop was part of an extensive effort by the IEA to examine the relationship between digitalization and energy that will result in a comprehensive report published in October. The IEA has deep experience analysing the impact of technology, business and policy changes on energy systems. Through its work on smart grids, system integration of renewables, electric vehicles and smart charging, and the use of technology in the oil and gas sector, the IEA has been analysing the impact of digitalization for many years. One of its most-downloaded reports, "More Data, Less Energy," examined the implications of connected devices on energy demand. "Every unit of the IEA – from efficiency to investment, from electricity to transportation, from renewables to modelling, from sustainability to statistics – is examining the implications of digitalization on the energy sector," says Dr Fatih Birol, the IEA's executive director. "The interest in this topic is strong, but **the world's current understanding of the scale and scope of its potential remains limited**, particularly when it comes to analytically-rigorous assessments." The IEA's workshop, which was held under Chatham House Rule, examined **critical questions that will help inform future analysis and policy recommendations**. Speakers and participants represented IEA member and partner governments worldwide, well-established energy companies and new start-ups, major ICT companies, financial actors, environmental organizations, and researchers. Workshop participants addressed questions such as: **How big an impact will digitalization have on energy systems? Which companies and business models are best positioned to take advantage of opportunities presented by digitalization? How can governments and regulators make sure that businesses and consumers benefits from digitalization? And what are the most significant challenges and obstacles?** The various speakers explained how digitalization has already led to higher efficiency in operations throughout the energy supply chain, thanks to better analytics, the use of virtual facilities, the introduction of automation and artificial intelligence, and the use of quantum computing technologies. Thanks to sensors, remote analysis and drones, for instance, operators can use predictive maintenance to extend the life of power generation, transmission and distribution assets. Big data in seismic mapping has significantly increased recoverable resources in oil and gas. The workshop also explored how **digital technologies are starting to enable new linkages and interactions between energy supply and demand**. Remote control of energy assets such as distributed generation and storage resources within smart grids can enable better electricity load management. The workshop examined **the significant challenges from digital disruption to existing energy business models, and how various market actors are positioning themselves to take advantage of opportunities**. Participants explored key policy challenges, including data privacy, ownership, and standardization to strengthening digital resilience, as well as providing a sound regulatory environment for dealing with quickly-evolving technology and workforce challenges. The IEA's forthcoming study aims to provide new insight and perspective, accurate data and information, and highlight key case studies. The report will include an assessment of the potential value that digitalization could generate and to help advise policy-makers on how to enable and protect those gains. **"We're all entering this brave new world together – whether as business competitors or potential partners, government regulators, or other key actors and stakeholders,"** Dr Birol noted in his opening remarks to the workshop, "Our hope is that the IEA can provide analytically-rigorous insight and perspective in order to help all actors of the energy sector navigate the digitalization and energy landscape in the most sensible, cost-effective manner possible."

context:

January 2017 BioGAS+ Newsletter. **"Enernet: Energy is the new new internet"**