The Bioeconomy Consultants

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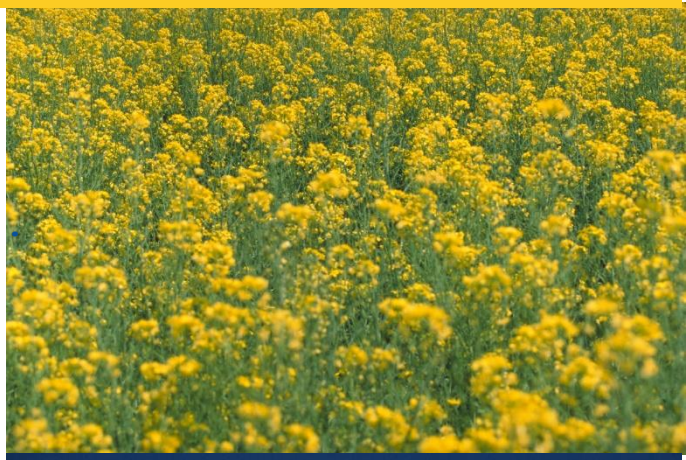
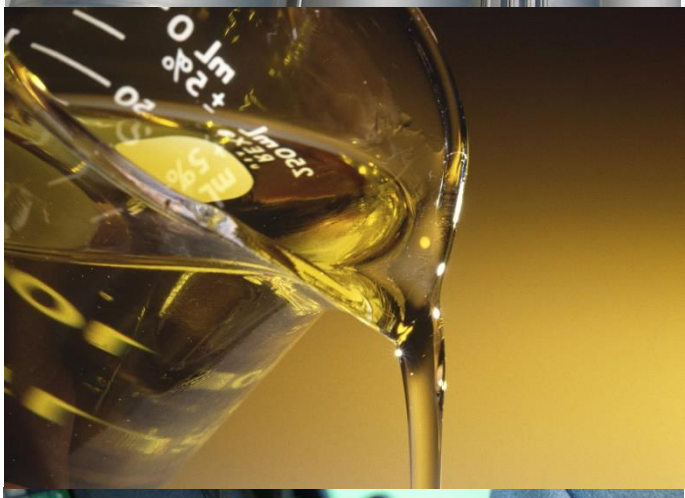


# News Review

## Issue Sixty-Three

## June 2017

**Each month we review the latest news and select key announcements and commentary from across the biofuels sector.**



# Contents

# Foreword

A warm welcome to the last of June's NNFCC news reviews.

As the debate rages on and on about RED II across Europe, the biofuels industry has found itself caught up in the centre of that maelstrom. An eternal sticking point for the crop-based biofuels industry is that it takes up agricultural land that could otherwise be used for food, or that it results in non-agricultural land being acquired to grow fuel crops. This latter point is the lynchpin of the arguments against palm oil's use in biofuel, as frequently palm oil is cultivated unsustainably, leading to reductions in rainforest. This month, Norway has already voted to ban palm-oil based biofuel outright - something the European Parliament continues to mull over.

However, it is not palm-oil that has been making unwelcome ripples in the biofuels sector, but ethanol. Under the proposed framework of the EU's second Renewable Energy Directive (RED II), crop-based ethanol would see itself phased out entirely by the end of the directive's course. Industry members have questioned why this should be the case, as crop-based ethanol in Europe is sourced sustainably in terms of land-use, and has demonstrably positive environmental impacts through the reduction of carbon emissions. A recent report by the Impact Assessment Institute found discrepancies between the European Commission's evidence for the positive impact of crop-based ethanol and the provisions provided for it in the RED II framework. Members of the biofuels industry are understandably displeased, and it will be interesting to see how this plays out over the coming months – especially with RED II expected to be enshrined in legislation by the turn of the year.

There is better news on the advanced biofuels front, with UPM becoming world pioneers in achieving RSB certification for their wood-based biofuel. This certification covers much more than just the fuel's environmental impact, but also aspects like human rights and social responsibility in the way that is produced, and BioVerno (the fuel in question) is the first wood-based biofuel to achieve this certification. Elsewhere, Norway's Statkraft are working to produce a 'drop in' biodiesel from woodchips, in a move that correlates nicely with their country's aforementioned ban on palm-oil based biofuels. The news from across the pond in the USA is also good for advanced biofuels: as corn-based primary biofuel production has reached its limit under the country's renewable fuel program, and the remaining deficit of 21 billion gallons must be filled by advanced and lignocellulosic biofuels – no doubt an opportunity many in the industry are eager to exploit.

Read on for the latest news.

# Policy

## Corn ethanol reaches limit in US, advanced biofuels must fill gap

*Public Domain Pictures*

Corn ethanol has reached its official limit under the Environmental Protection Agency's renewable fuel program, which means other less-developed, low-carbon fuels will have to step up to fill a 21 billion-gallon gap by 2022.

Under the Renewable Fuel Standard, which was passed by Congress in 2007, refiners must blend 36 billion gallons of biofuels in the nation's gasoline and diesel fuel supply by 2022. Corn ethanol, the biggest component of the program, and other conventional biofuels are capped at 15 billion gallons beginning in 2017.

That means the remaining 21 billion gallons must be met by advanced biofuels derived from everything from municipal waste to switch grass cellulose and even algae. But those fuels are falling short of the amount required to be blended as of this year, raising serious questions about the future of the program after 2022.

Gasoline and diesel refiners say the gap will create a situation in which differing biofuel factions spar against one another over their share of the market.

Click here for more information.

## RED II biofuels proposals scrutinised

The Impact Assessment Institute has published its study scrutinising the Impact Assessment accompanying the European Commission legislative proposal "Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources", including the impact assessment on "Sustainability of Bioenergy", and on the coherence between the Impact Assessments and the legislative proposal published on 30th November 2016.

The study, authored by Erik Akse, Fiona Dubernet, Simon Godwin and Julie lenoir identifies a number of significant shortcomings in the transparency of evidence, the underlying assumptions and the technical analysis. It also finds that the legislative proposal includes provisions not fully supported by evidence and in some cases in inconsistent with the Impact Assessments without full explanation of the reasoning.

As part of the Institute's standard peer review process, scientific and factual comments on the content of the study are invited from any stakeholder at any time to inform a potential revision.

Click here for more information.

## European Commission's plans to modernise European trasport

The European Commission has unveiled a package of proposals designed to modernise European mobility and transport. The aim is to help the sector to remain competitive in a socially fair transition towards clean energy and digitalisation. Initiatives include objectives to reduce CO2 emissions, air pollution.

A number of the proposals have direct or indirect implications for the energy sector, and complement existing initiatives that, for example,

promote increased use of low carbon, including renewables-based, fuels and improve energy efficiency. Most obviously, this package seeks to encourage cleaner transport, thereby contributing to the EU's efforts to meet its Paris Agreement commitments. In more specific terms, there are incentives for cleaner fuels, with further initiatives to follow relating to emissions standards for cars and vans, as well as for heavy goods vehicles. An additional strong emphasis is put on e-mobility and the deployment of electric vehicles, complementing the Commission's earlier initiative in the 'Clean Energy for All Europeans' package.

Click here for more information.

## Norway commits to palm-oil biofuel ban

*Pixabay*

A majority in the Norwegian parliament has voted to ban the public procurement and use of biofuel based on palm oil. "This is a ground-breaking victory in the fight for the climate and rainforests", says Rainforest Foundation Norway.

The Norwegian parliament considered a number of proposals for Norway's biofuels policy, several of them designed to limit the use of palm oil in biodiesel. The resolution adopted in early June instructs the government to introduce a regulation on public procurement that "imposes requirements that biofuel based on palm oil or by-products of palm oil shall not be used."

During the debate over the proposal, the majority requested that this be done in a way that does not violate international trade agreements. In addition, the parliament instructs the government to advocate for the rejection by the fuel industry of the use of palm oil biofuel.

The decision to ban palm oil-based biofuel comes a year – almost to the day – after Norway's unparalleled and internationally lauded pledge that the government's public procurement policy be deforestation-free to ensure the state does "not contribute to deforestation of the rainforest".

Click here for more information.

## European Parliament still considering Palm Oil ban

Members of the European Parliament will consider provisions in revised renewables legislation that could restrict imports of biofuels that drive deforestation, including palm oil.

The parliament is currently considering amendments and is expected to vote on specific provisions in draft renewables legislation in October. The final legal text will need to be agreed with EU member states.

The vice-chair of the parliament's environment committee noted that specific provisions excluding palm oil in the EU's revised renewables legislation come after parliament voted on 4 April for a resolution for the phase out of biofuels associated with deforestation.

The proposed provision avoids any specific mention of palm oil but targets biofuels that have negative effects in terms of indirect land use conversion. The provision, if adopted, would reduce the share of biofuels with calculated emissions greater than 160g of CO2 equivalent. That means that palm oil is excluded.

Specific measures to reduce EU imports of palm oil over sustainability concerns could raise the prospect of unfair discrimination, according to a World Trade Organisation (WTO) counsellor.

The commission's original proposal does not take account of the links between the biodiesel and agricultural sectors. It is thought that the 3.8pc cap by 2030, coupled with the lack of incorporation obligations for biofuels, would de facto result in their phase-out shortly after 2020.

Click here for more information.

# Markets

## Limited market share slowing down german biofuels

Biodiesel and bioethanol use is declining in the German oil industry, according to official mineral oil data published by the Federal Office of Economics and Export Control for the first quarter of 2017.

Even though German diesel consumption rose by 7.4% to 9.3 million tonnes by March, the share of biodiesel fell by 7% to around 500,000 tonnes. The bioethanol share also fell by 4.4% compared with the previous year while petrol sales rose by 2% to 4.3 million tonnes.

The German Biofuels Industry Association (VDB) believes that Germany's Federal Ministry of the Environment is slowing down the energy demand in transport by limiting the market share of biofuels to around 5%. VDB claims in a statement that the Ministry is planning a further restriction on renewable energies in the transport sector by allowing the oil industry to report emissions reductions in upstream oil production towards the targets for renewable energy in the transport sector.

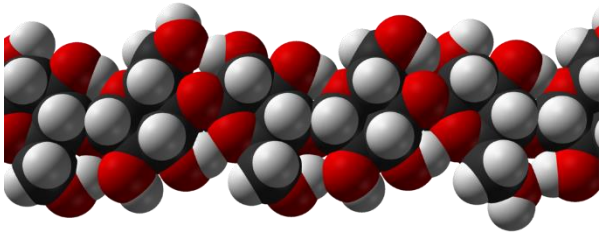
From 2020 the German petroleum industry will be obliged to lower greenhouse gas (GHG) emissions of its fuels by 6% compared to 2010. The current draft of the Upstream Emissions Reduction legislation means oil companies can meet 1.75% of this target through UER measures, with the remaining 4.25% coming through low-emission fuels and propulsion such as e-mobility, biofuels, hydrogen and natural gas.

The VDR claims that a lack of increase for renewables in the GHG quota is causing a decline in the market share for renewable energy.

Click here for more information.

# Research & Development

## Cellulose structure discovery could improve biofuel production



*Wikimedia Commons*

A major bottleneck hindering cost-effective production of biofuels and many valuable chemicals is the difficulty of breaking down cellulose—an important structural component of plant cell walls. A recent study addressed this problem by characterizing molecular features that make cellulose resistant to degradation.

The findings reveal, for the first time, structural differences between surface layers and the crystalline core of the two types of cellulose found in plant cell walls. These insights could help researchers develop efficient, cost-effective strategies for breaking down cellulose for renewable energy production and other industrial applications.

A molecular-level understanding of the resistance of cellulose to degradation is a key step toward overcoming the fundamental barrier to making biofuels cost-competitive. However, significant

questions remain with respect to cellulose's structure, particularly its surface layers and crystalline core.

To address this knowledge gap, researchers from Washington State University; EMSL, the Environmental Molecular Sciences Laboratory; and Pacific Northwest National Laboratory developed a novel high-resolution technique called Total Internal Reflection Sum Frequency Generation Vibrational Spectroscopy (TIR-SFG-VS) and combined it with conventional non-TIR SFG-VS to characterize molecular structures of cellulose's surface layers and crystalline bulk, respectively. The researchers used Sum Frequency Generation for Surface Vibrational Spectroscopy at EMSL, a DOE Office of Science user facility.

The findings revealed for the first time the structural differences between the surface layers and the crystalline core of cellulose.

By revealing cellulose's conformation and non-uniformity, the results challenge the traditional understanding of cellulose materials and showcase the strong value of powerful spectroscopic tools in advancing knowledge about the structure of cellulose.

Click here for more information.

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### Biofuel algae genome sequenced

The growing human population generates increasing demand for food and energy. Microalgae are a promising source of sustainable bioproducts whose production may not exacerbate worsening environmental problems. The green alga Chromochloris zofingiensis has potential as a biofuel feedstock and source of high-value nutraceutical molecules, including the carotenoid astaxanthin. This paper presents a high-quality, chromosome-level assembly of the genome by using a hybrid sequencing approach with independent validation by optical mapping. Our analyses of the genome and transcriptome, in addition to experiments characterizing astaxanthin production, advance understanding of the green lineage and carotenoid production, and enhance prospects for improving commercial production of C. zofingiensis.

Click here for more information.

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# Bioethanol

### Americans appreciate ethanol option for small engines

*Max Pixel*

Growth Energy released a new survey showing that U.S. small engine owners are pleased with the performance of their fuel and find it easy to pick the best option, including regular unleaded blends of 10 percent ethanol (E10). Conducted by Quadrant Strategies, the random poll of 500 owners of lawnmowers, snow blowers, leaf blowers, weed whackers, and other small engines also found that nine in 10 respondents considered it important to have options at the pump that include ethanol blends.

According to the survey, 95 percent of owners found it easy to pick the right fuel, 98 percent reported satisfaction with their fuel's performance, and 90 percent considered it important to have options at the pump, including ethanol blends. The numbers were the same or even higher among only those respondents who reported using standard unleaded gasoline, which contains 10 percent ethanol.

The survey also questioned small engine owners about how ethanol's benefits impact their views of the homegrown fuel. 78 percent appreciated that ethanol replaces dangerous chemicals in gasoline like MTBE, 85 percent were pleased to learn that all major small engine manufacturers warranty their engines for 10 percent blends, and 88 percent valued that ethanol reduces America's dependence on foreign oil. The same share, 88 percent, reacted positively to ethanol's air quality benefits and the fact that it cuts carbon emissions by 43 percent.

Click here for more information.

# Biodiesel

## UPM's BioVerno becomes world's first RSB certified wood-based biofuel

UPM Biofuels has again received a new acknowledgement of the sustainability of its value chain by receiving an RSB (The Roundtable on Sustainable Biomaterials) certificate for both UPM BioVerno renewable diesel and naphtha, as well as production sidestreams turpentine and pitch. RSB verifies the sustainability and reliability of feedstock sourcing and production.

In RSB certification, the sustainability of biofuels is evaluated against 12 principles which have been approved by many stakeholders, including NGOs and UN agencies. In addition to the greenhouse gas savings compared to fossil fuels, the RSB principles cover biodiversity, human rights and environmental and social responsibility throughout the value chain.

RSB is one of the European Commission's approved voluntary schemes, which can be used to show compliance with the EU Renewable Energy Directive's sustainability criteria. RSB certification can also be used to verify the sustainability of biomaterials for non-energy applications. UPM Biofuels uses crude tall oil, a residue from pulp production, to produce both biofuels and biomaterials in its Biorefinery in Lappeenranta, Finland.

UPM Biofuels has previously received sustainability certificates under the Finnish National Sustainability Scheme, ISCC EU and ISCC PLUS (International Sustainability and Carbon Certification) schemes.

Click here for more information.

## Statkraft to make secondary biofuels from woodchips

*Wikimedia Commons*

Norwegian utility Statkraft has found a way to produce biofuel from wood chippings and other solid organic waste, which it says replicates in minutes a process that made crude oil underground over millions of years.

Using high temperatures and pressure, Statkraft's "hydro thermal liquefaction" process turns wood and organic waste into diesel, producing what it says is a second-generation biofuel that is carbon neutral.

Statkraft CEO Christian Rynning-Toennesen said up to 7 percent of the new fuel, whose energy density is similar to fossil-derived diesel, could be mixed into diesel fuel and used for any vehicle without modification. With small adjustments, a diesel engine could run solely on the fuel, he said.

The biofuels industry has seen a string of failures due to technological issues, changes to subsidies and problems with obtaining sufficient feedstock, particularly in the European Union, which puts limits on how much farmland can be switched from food production to making biofuels, such as ethanol.

However, Statkraft's procedure would use wood chippings and offcuts that have no other use, alongside other waste.

After converting waste into an energy-rich liquid, the process separates out the water, then adds hydrogen to produce diesel in a process similar to oil refining.

Click here for more information.

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# Aviation Fuel

## DLR in pursuit of "designer" aviation biofuels

German Aerospace Center

*DLR*

Biofuels have the potential to make air transport more climate-friendly and reduce dependency on fossil raw materials, since they are produced using renewable raw materials, such as oil plants, grain, algae and wood. Researchers at the German Aerospace Centre (DLR), together with Lufthansa Technik and the Bundeswehr Research Institute for Materials, Fuels and Lubricants, investigated the chemical and physical properties of particularly promising biofuels. The European Union-funded 'High Biofuel Blends in Aviation' (HBBA) study focused on blends, i.e. mixtures of conventional kerosene with biofuels. The study analysed particularly promising biofuels, according to source, production process and approval status.

An airliner turbine can cost up to several million euro. Should it be operated using non-certified fuel for research purposes, for example, it may not be reinstalled in an aircraft. This means that bridging the gap between tests on a laboratory scale to actual implementation in an aircraft represents a huge challenge for researchers. For the first time, scientists at the DLR Institute of Combustion Technology now have the opportunity to investigate biofuels on a special test rig at Lufthansa Technik in Hamburg, where a dismounted aero-engine is available especially for research purposes. Using this engine, the scientists examined and compared three different fuels: pure biofuel, a blend consisting of 50 percent biofuel and 50 percent conventional fuel, as well as conventional kerosene as a reference.

The certification of a completely new fuel is an extremely elaborate and lengthy process. Blends of biofuels and conventional kerosene represent an important intermediate stage – some of their properties correspond to those of normal kerosene, which means that not all parameters required for the combustion process have to be completely re-examined. They are also an important step toward so-called designer fuels. Such fuels are composed in such a way that their properties are as optimal as possible in terms of environmental friendliness and technical characteristics. Research in this field is a major focus for the DLR Institute of Combustion Technology.

The fewer individual components a fuel has, the better and faster the chemical and physical processes that occur during its combustion can be defined. Several hundred substances are present in the Jet-A type kerosene used predominantly in the field of civil aviation. The combustion analyses are correspondingly complicated. The aim with designer fuels is therefore to work within a precise range of substances with as few components as possible. In this way, combustion properties can be optimised and polluting emissions reduced. In this context, so-called aromatic compounds are of particular interest. When the proportion of these

is reduced or completely eliminated, considerably fewer soot particles arise during combustion. At higher layers of the atmosphere, these soot particles largely enhance the formation of ice crystals, which are visible as contrails, and can persist over several hours and contribute to climate change.

Click here for more information.

# Other Fuels

## Study conducted into vehicle biomethane uptake

The French gas distribution company GRDF commissioned a study to gain insight into the supporting measures in force in other European countries to support biomethane use in the transport sector. The study focused on national policy measures in seven European countries: Austria, Germany, Italy, the Netherlands, Sweden, Switzerland and the United Kingdom. The most promising policies were identified and their transferability to the French context was assessed.

The focus of the study was on the tail end of the supply chain, i.e. vehicle uptake, fuel uptake and filling infrastructure developments. Biogas production and upgrading of biogas to biomethane were also taken on board, however, these being essential first steps in the supply chain. The final report of the study is accompanied by an extensive factsheet containing all the details on the selected countries. The study was carried out by CE Delft and eclareon.

Trends in natural gas (NG) and bioNG use in the transport sector in Sweden and Italy should be closely monitored, as the policies and underlying strategy of these two countries seem to fit the French context best. It should be borne in mind, though, that these policies are part of a broader long-term strategy geared to specific national circumstances: bioNG in transport in Sweden and NG in transport in Italy.

Biomethane should be further integrated into the French strategy to decarbonise the transport sector and a level playing field created between biofuels and biomethane. One way to achieved the latter aim would be to include biomethane in the blending obligation when the current French system is reformed.

Click here for more information.

## 30 biogas buses for Nottingham

A fleet of 30 biogas double-decker buses will take to the road in Nottingham from this summer, following a £17 million investment.

The buses, which are powered using gas produced by anaerobic digestion of food waste and sewage, with a reported reduction in NOx emissions of around 36,000 kg across the city's bus fleet according to Nottingham City Transport (NCT).

NCT, working in partnership with Nottingham city council successfully secured £4.4 million in grant funding for the new vehicles from the Government's Office for Low Emission Vehicles (OLEV).

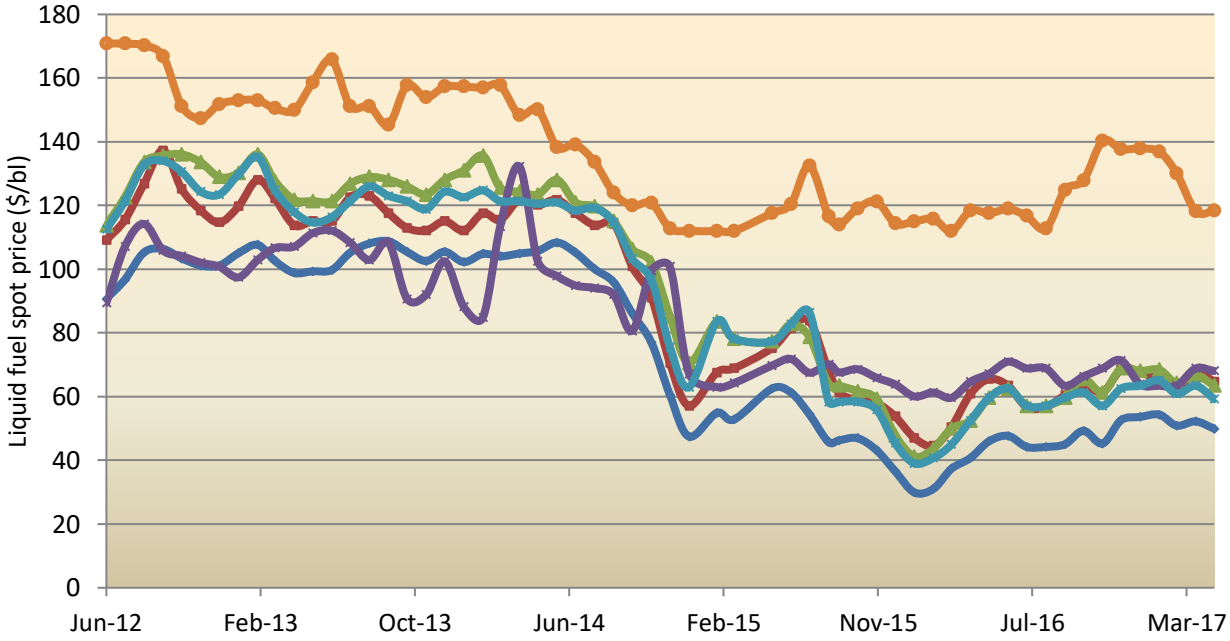
A further £12.4 million has been invested in the vehicles and the gas fuelling infrastructure needed to fill the fleet at the city's Parliament Street Garage. Roadgas and ZF Transmissions have worked alongside NCT to establish the fuelling infrastructure.

The engines and chassis the Enviro400CBG City vehicles have been developed by Swedish firm Scania and are bodied in Britain by Alexander Dennis Limited (ADL).

Click here for more information.

# Price Information

**Historical spot prices of liquid fossil fuels and liquid biofuels. Five years' prices up to May 2017 are given in $ per barrel.**




- Crude Oil (petroleum), simple average of three spot price
- Gulf Coast Gasoline
- Diesel - New York Harbor Ultra-Low Sulfur No 2 Diesel Spot Price
- Ethanol Average Rack Prices F.O.B. Omaha, Nebraska
- Jet Fuel Spot Price FOB - U.S. Gulf Coast Kerosene
- FAME 0° FOB ARA

*Prices of Crude oil, diesel, gasoline, and jet fuel are recorded from www.indexmundi.com; Price of ethanol from www.neo.ne.gov, Biodiesel spot prices from https://www.neste.com/*

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