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Oil Index Sheds Light on Greenest, Dirtiest Petroleum Types

Oil firms are facing lots of environmental pressure and scrutiny these days, but to a large degree, oil's actual carbon footprint varies greatly depending on the type of oil and the extraction method used. In fact, the heaviest-polluting oils impact the climate almost twice as much as the cleanest oils, the Carnegie Endowment for International Peace found in its new Oil-Climate Index tool designed for policy-makers and investors, detailed in the report Know Your Oil. Oil sector emissions range from 450-500 kilograms of carbon dioxide equivalent per barrel of crude for conventional light oil to 700-800 kg CO₂/bbl for the worst polluters, according to the index. In all, the index covers 30 oils and measures emissions from production to refining, transport and end use (see table). Carnegie hopes to expand the tool as "high-quality, consistent, open-source oil data" is made available.

Unsurprisingly, the worst on the list include heavy oils, which require considerable energy to extract and transform into high-value products such as gasoline, and "extreme" oils, which are difficult to access because they are located deep underground or in remote and environmentally sensitive areas such as the Arctic. Gassy oils — when the associated gas is flared — also score poorly in the index. More unexpectedly, older fields such as California's Midway Sunset perform equally low as they typically require the injection of large volumes of steam and yield a mix of oil and water that must be separated, involving extra steps that consume energy equal to roughly half of the extracted oil's energy content.

The financial community is a key target for the data, based on the notion that investors in high-emission sources such as heavy oil will take a business risk that the index can measure, co-author Jonathan Koomey told *EI New Energy*. Those investing in an oil field want to see "30 to 40 years" of production and "you don't want your asset to get stranded" under tightening climate policies because of its emissions footprint, he insisted (NE Jan. 15'15). While typical climate impact assessments focus solely on the emissions at combustion — typically 400-450 kg CO₂/bbl for oil — a thorough analysis must take into account the entire value chain and the full range of greenhouse gases involved, Koomey emphasized.

The most critical upstream parameter is the amount of gas trapped with the oil and how that gas is handled. China's Bozhong and Nigeria's Obagi emit well over 200 kg CO₂/bbl due to flaring, whereas Norway's Ekofisk only generates 22 kg CO₂/bbl during production as the associated gas is gathered and sold. Recovering extra-heavy oils and operating depleted fields usually requires heat and involves pumping water, which

Renewable Energy Price Parity

	Gas (\$/MMBtu)	CO ₂ (\$/ton)
Europe		
Market Price	6.81	7.13
Wind Onshore	10.89	77.20
Solar PV	9.70	60.41
US		
Market Price	2.86	0.00
Wind Onshore	8.71	100.43
Solar PV	7.37	83.05
Japan		
Market Price	15.12	0.00
Wind Onshore	17.54	41.46
Solar PV	20.89	106.05

Market prices Jan 28. Table indicates either gas or CO₂ price needed for new renewable energy to match profitability of new gas-fired power, without subsidies. High US carbon prices reflect low gas prices. Japan at parity so no carbon price needed. Source: Energy Intelligence

Climate Impact Widely Differs Across Oil Types

Name	Country	Type	Up	Mid	Down	Total
(emissions in kg CO2 eq./bbl)						
Suncor Synthetic H	Canada	Extra Heavy	155	110	560	825
Bozhong	China	High Flare	272	80	460	812
Syncrude Synthetic	Canada	Extra Heavy	200	61	505	767
Hamaca	Venezuela	Extra Heavy	176	34	532	742
Midway Sunset	US	High Steam	202	96	441	739
Suncor Synthetic A	Canada	Extra Heavy	161	29	543	733
Duri	Indonesia	High Steam	186	101	444	732
Obagi	Nigeria	High Flare	237	33	449	720
South Belridge	US	Depleted	110	113	462	685
Bonny	Nigeria	High Flare	169	33	449	651
Cold Lake Diluted Bitumen	Canada	Extra Heavy	115	78	445	638
Wilmington	US	Depleted	52	105	453	609
Frade	Brazil	Heavy	32	99	446	577
Brent	UK	Depleted	115	28	416	559
Alaska North Slope	US	High Gas	91	37	428	556
Zubair	Iraq	Conv'l	73	42	425	540
Lula	Brazil	Ultra-Deep	46	59	434	539
Chayvo	Russia	Ultra-Deep	76	29	425	529
Midale	Canada	Depleted	61	45	417	523
Girassol	Angola	Conv'l	41	41	437	519
Kuito	Angola	Heavy	39	39	436	515
Mars	US	Ultra-Deep	34	41	429	505
Forties	UK	Depleted	46	47	410	502
Ratawi	Kuwait	Conv'l	36	34	425	494
Hibernia	Canada	Conv'l	27	37	429	492
Thunder Horse	US	Ultra-Deep	31	35	420	487
Azeri Light	Azerbaijan	Light	33	25	427	485
Agbami	Nigeria	Light	51	25	395	471
Ekofisk	Norway	Light	22	25	419	466
Tengiz	Kazakhstan	Light	30	42	385	456

Greenhouse gases emissions caused by the production and usage of 30 oil types, in kg of equivalent of CO2 per barrel of crude. Up = extraction; Mid = refining and transport; Down = final use. Source: Carnegie Endowment for International Peace

are both energy- and emissions-intensive, typically adding 100-200 kg CO₂/bbl. Enhanced oil recovery using carbon capture and storage could significantly improve that picture, Adam Brandt, another co-author, told *EI New Energy* (NE Mar.5'15).

Hydraulically fractured oils, such as in the Bakken or Eagle Ford in the US, also involve pumping water and can generate significant methane emissions during “flowback,” when the hydrocarbons are pumped back up to the ground after the well is fractured, the report emphasizes. However, the lack of publicly available data on these sources prevented the team from assessing fracked crudes. “We have more information about Opec oil than we do about some of the newer US oils,” Koomey stressed.

Midstream emissions are usually small, ranging from 15-25 kg CO₂/bbl for simple hydroskimming refineries processing light sweet crudes to 25-50 kg CO₂/bbl for medium conversion plants, and up to around 100 kg CO₂/bbl for deep conversion of heavy crudes. Those numbers could be reduced in future configurations by adding carbon capture to key refining technologies such as fluid catalytic cracking and steam methane reformer units.

While some products like asphalt or petrochemical feedstocks do not generate emissions because they are not burnt, most hydrocarbons are combusted to power vehicles or generate heat or electricity (NE Jun.20'13). The heaviest oils generate the most combustion emissions,” with Canada’s Suncor Synthetic H, which is extracted from oil sands, the highest in the index at 565 kg CO₂/bbl. By contrast, Kazakhstan’s Tengiz, an ultra-light crude, yields a product slate emitting just 390 kg CO₂/bbl.

Similar lifecycle assessments of greenhouse gas emissions have been made by institutions such as the US’ National Renewable Energy Laboratory. And those show that renewable and nuclear energy are not totally carbon-free, with wind for example causing some 10 kg CO₂ per megawatt hour and solar photovoltaic 40 kg CO₂/MWh, mostly from manufacturing the equipment — compared with some 1,000 kg CO₂/MWh for coal and 450 kg CO₂/MWh for gas.

Philippe Roos, Strasbourg

US Biofuel Mandate Debate Continues as Industry Splinters

The biofuel industry was once united in opposing an overhaul of the US Renewable Fuel Standard (RFS), but a fissure has erupted that could kick-start legislative efforts to place advanced biofuels at the center of the policy. In a departure from the party line, Advanced Biofuels Association (ABA) President Michael McAdams has criticized the RFS’ lack of effective support for cellulosic ethanol and other advanced biofuels. In turn, his statements have riled corn growers and corn ethanol producers, whose first-generation biofuel has seen the bulk of the benefits from the RFS.

This marks another challenge against corn ethanol, which has lost considerable support among both parties in Washington in recent years — as illustrated by a bipartisan Senate proposal to scrap the RFS’ corn ethanol targets while keeping the advanced biofuel components intact (NE Nov.7'13). The RFS — passed under a bipartisan Congress and signed into law by President George W. Bush in 2007 — requires oil refiners to blend steadily rising volumes of biofuels into gasoline and diesel or ensure that such blending occurs further downstream. Ethanol derived from corn has accounted for most of the blended volumes since then, but the RFS also includes requirements for advanced biofuels to be blended in growing volumes. Since 2007, critics of the policy have increased in number, with green groups and politicians pointing to the detrimental environmental and economic impacts from corn ethanol. Meanwhile, the advanced biofuel industry — which is considered “greener” and relies on inedible feedstocks — has struggled to take off (NE Dec.18'14).

Advanced biofuels were arguably the original intent of the RFS, with corn ethanol simply a stepping stone (NE Feb.26'15). ABA points out that the policy authors called for an additional 21 billion gallons of advanced biofuel by 2022, compared with 15 billion gallons of corn ethanol. “The RFS may be working for some, but it is only minimally helpful to advance the promise and potential of next-generation renewable fuels,” McAdams told an industry conference. In particular, McAdams urged Congress to amend the RFS to assign a minimum price to the compliance credits for cellulosic biofuels. He also said that the value of these credits should be indexed to the price of oil, so that the price premium for cellulosic producers would increase as oil prices fall and decrease as oil prices rise (NE Mar.5'15). McAdams also called for an extension of the RFS beyond its current expiration in 2022, and the elimination of a waiver credit system that acts as a loophole by allowing refiners to avoid mandatory blending of advanced biofuels.

Corn ethanol supporters have been predictably unhappy with the ABA's policy shift. “This is a short-sighted proposal that would set the entire renewable fuels industry on the path to a rollback of the RFS,” said Tom Buis, chief executive of trade group Growth Energy. Many in the conventional biofuel industry fear that opening the RFS for reform would leave all parts of the policy vulnerable — with many legislators eyeing full repeal of the RFS, panelists noted (NE Jan.22'15). But there's a “clear political signal” that Republicans are not interested in messing with the RFS, said Brooke Coleman of the Advanced Ethanol Council. Also, politicians from both sides of the aisle worry that addressing one part of the RFS could open the door to a number of other pet areas for reform, ultimately resulting in one “big mud fight,” Coleman said. Change must happen through adjustments by the Environmental Protection Agency in its implementation of the RFS, “not on the Hill,” said Jon Jobe of the National Biodiesel Board.

Rosa Lin and Emily Meredith, Washington

Brazil's Drought Means Risky Business for Energy

Drought is becoming the new norm in Brazil where a third straight year of low rainfall continues to jeopardize energy production and drain the country's main hydropower resources. Brazil's cash crop sugarcane ethanol industry, however, will likely be spared the worst effects — and the industry may even fill some of the void left by hydro while benefiting from the drought's likely impacts on sugar pricing. For hydro, efforts have been made over the years to keep their systems going, at great financial cost to the government. But the situation has gone from bad to worse to potentially catastrophic due to critically low water levels in the country's biggest city, Sao Paulo. Concerns are high that water and energy rationing might finally be enforced, which would deal a crippling blow to large energy-dependent industries and set back already-stagnant economic growth.

Hydro provides nearly 70% of Brazil's electricity and country's four main reservoir systems have barely topped 50% capacity over the past 24 months (NE Feb.20'14). This week the principal South and Southeast hydro systems that power Brazil's industrial heartland are operating at just 47% and 24% capacity, respectively. But the predicament has worsened in recent months as ongoing drought in the southeast is now threatening water supplies for Sao Paulo and its surrounding municipalities. The Cantareira reservoir system that serves the 20 million habitants of the area is operating at just 13% capacity according to state-owned water management company Sabesp. The other major system, Alto Tiete, is at 20% capacity. With the end of the “rainy” summer season approaching, a possible drop in capacity to 10% would require water-rationing measures, says Brazil's Energy Minister Eduardo Braga. By some accounts that is already under way, with Sao Paulo residents experiencing diminished water pressure.

Brazil is known for housing the world's largest supply of freshwater, and the origins of its recent troubles are myriad, with many unknown factors at play. Distribution problems are often cited. The Amazon River Basin holds 50% of the country's freshwater, but 80% of Brazil's population lives in the southeast. Researchers also say that Amazon deforestation means fewer trees to lift moisture into the atmosphere that circulates south and southeast, eventually falling as rain. Plans to increase water supply are limited. A large scale irrigation project to import water from south of Sao Paulo is under way but will not be ready until 2017. For now the most viable alternative is an arrangement to supply Sao Paulo with water from the Paraiba do Sul river. The river proposal has led to sensitive negotiations between three state governments, brokered by the federal government's National Water Agency. So far a test program is in place until Jun. 30 to divert about 80 cubic meters per second of the river's flow towards Sao Paulo.

Meanwhile, barring any last-minute historical rainfall as the dry season approaches, the specter of power rationing is growing. Researchers predict that rationing would shave off between 0.5%-1% of GDP this year, a year already slated for low growth. Worst off would be Brazil's large energy-consuming industries such as steel, petrochemicals, metals and mining, which would likely need to reduce or reschedule production. Other industries that generate their own energy would see little impact, notably Brazil's sugar and sugarcane ethanol sectors. Large ethanol producers even produce excess energy in their cogeneration process, which they sell back to the grid at high market prices. Raizen, Brazil's third-largest ethanol producer, operates two dozen self-sufficient plants, 13 of which have long-term contracts to sell energy to the national grid.

Naki B. Mendoza, Washington

Offshore Wind Industry Pursues Further Cost Savings

Reducing costs and getting governments to put in place far-sighted renewable goals beyond 2020, dominated discussion last week at the European Wind Energy Association (Ewea) annual offshore wind industry conference in Copenhagen, Denmark. And, in the pursuit of a cost-reduction goal, three industry heavyweights took what they described as an "unprecedented step" there in promising to work closely together, swapping information to help bring offshore wind costs down below €100 per megawatt hour (\$106/MWh) for projects taking a final investment decision (FID) in 2020. Critics however argue that the *United Industry* declaration, signed by Denmark's Dong Energy and turbine makers MHI-Vestas and Siemens, could potentially water down competition and may prove stronger on rhetoric than concrete action.

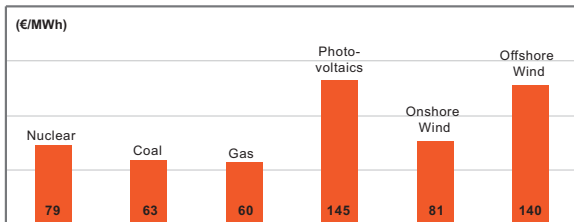
But even without such grand gestures, offshore wind costs on a levelized cost of energy (LCOE) basis are coming down. Last month, the UK government said that over the period 2010-14, LCOE dropped by 11% to £121/MWh (\$185/MWh) for offshore wind projects with a FID made from 2012-14, while in January Irish wind developer Mainstream Renewable Power (MRP) won a UK competitive contract-for-difference (CFD) auction for a 448 megawatt offshore wind farm at £114.39/MWh (\$169/MWh) for electricity generated over a 15-year period (NE Mar.12'15). Consultancy Ernst & Young said last week that offshore wind could hit an LCOE of €90/MWh

(\$95/MWh) by 2030 as long as a "continual stream of projects enters the pipeline." That pipeline would take offshore capacity from some 8 gigawatts worldwide, mostly in European waters, now to approximately 23.5 GW by 2020. E&Y suggests offshore wind could be "cost competitive with other sources of energy" by 2023, given the right conditions.

Siemens, however, argues that governments, subsidy-paying consumers and the electricity industry at large should go beyond the traditional LCOE cost comparisons for renewables, fossil fuel and nuclear power stations; instead looking at what the firm labels "society's cost of electricity" or Scoe. This, Siemens says, also takes account of environmental and social factors — such as subsidies paid to fossil fuel and nuclear, transmission costs, variability or balancing costs, geopolitical risk when buying coal and gas from unstable countries, and environmental impacts including carbon costs — that should be considered in calculations to get the "true cost" of offshore wind versus other generation technologies. Taking these variables into account, Siemens claims that by 2025, offshore wind in the UK will be cheaper than nuclear, coal, gas and solar photovoltaics, and at roughly the same level as onshore wind — which is set to be the cheapest form of renewable generation by the middle of the next decade.

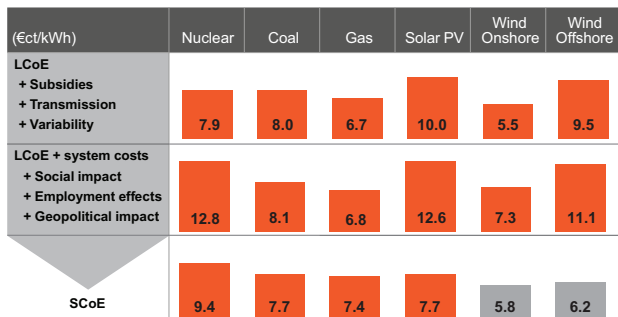
Beyond cost comparisons, utilities and turbine makers are utilizing the "size matters" truism and betting on larger-capacity turbines to also help reduce costs. Siemens unveiled a new updated 7 MW turbine this month — based on its proven 6 MW 154 model — which will be available commercially in 2017, according to Michael Hannibal, offshore chief executive of Siemens' wind and renewables division (NE Mar.27'14). Siemens signed a major deal last week with the Egyptian government to

Gas Wins on Levelized Costs of Electricity Basis



Source: Siemens

Offshore Wind Competitive Under True 'Society' Cost



Source: Siemens

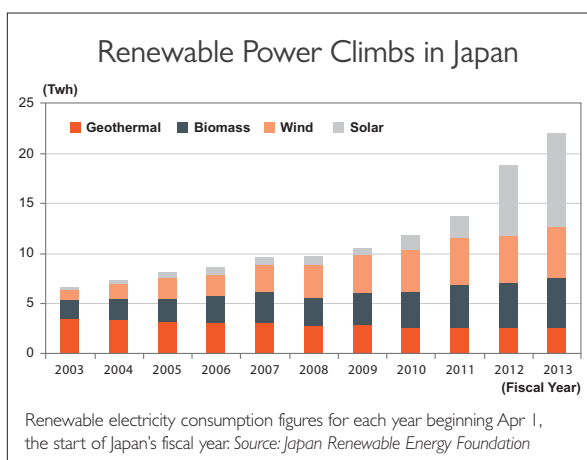
build a massive 4.4 GW gas-fired CCGT complex at the Beni Suef power site in Southern Egypt and 2 GW of wind capacity — along with a rotor blade manufacturing plant in the country. Siemens was also named as the preferred supplier for the second phase of Dong Energy’s 660 MW Walney Extension project in the Irish Sea Last month. Dong picked competitor MHI-Vestas’ 8 MW turbines for the first phase of the Walney Extension. The industry will closely watch how the triumvirate of companies that inked the *United Industry* agreement last week will share information and work together to bring down costs as they undertake the Walney Extension projects.

Jay Eden, London

Japan Struggles on Energy Policy Direction

The Japanese government is expected to reach a decision soon on the best mix of nuclear, renewables and fossil fuels for the resource-scarce country over the long-term, to fill a void in its energy equations four years after the Fukushima disaster left the country shaken and divided over the use of nuclear energy. The Ministry of Economy, Trade and Industry (Meti) is now holding discussions to determine the exact ratios to be assigned to each energy category, but the outcome is unlikely to please all parties. The renewables sector, for example, is “not optimistic” about the policy outlook, Mika Ohbayashi, director of the Japan Renewable Energy Foundation (JREF), tells *EI New Energy* (NE Dec. 11’14). An end to the impasse would allow the power industry to move forward with capacity investment plans. While Japan’s solar photovoltaic (PV) capacity is estimated to have risen by over 9 gigawatts in 2014, second only to China’s 10 GW growth, the future outlook for Japanese PV investors is marred by recent regulation changes which have strengthened the hands of “traditional,” nuclear- and fossil fuel-oriented utilities in curbing solar output.

Meti has denied recent local media reports suggesting that it has settled on a 20% ratio for renewables in the country’s electricity output by 2030. The reports were a misinterpretation of Meti’s stated commitment to ensure that renewables get a share of “at least 20%,” a ministry official tells *EI New Energy*. The JREF has recommended that the target be set to a far higher 45% by 2030. The Ministry of Energy is treading a middle path, calling for a 30% renewables ratio.



Meanwhile, traditional utilities — which own nuclear plants and control the grid systems in territorial monopolies — have warned that they could potentially reject up to 30%-50% of renewables output offered to them, says Ohbayashi. Previously obligated to prioritize renewable energy deployment, Japanese grid operators recently appealed successfully for a relaxation of the regulation and now have greater leeway in rejecting renewable supply without compensation and in withholding grid access once their capacity to handle intermittent renewable output is breached (NE Oct. 9’14). The Japanese solar PV industry is reeling from the 30%-50% output curtailment projections, which would severely undermine the certainty of capacity utilization and pose an almost insurmountable obstacle to raising finance, she adds. The utilities have based their calculations on maximum nuclear deployment from the country’s 48 operable but idled reactors once they get the go-ahead to restart, according to Ohbayashi. Japan’s Institute for Energy Economics has predicted the restart of at least four reactors this year under the pro-nuclear government led by Prime Minister Shinzo Abe.

Before the March 2011 Fukushima nuclear disaster, output from over 50 reactors had provided around 30% of the country’s electricity needs. The anti-nuclear camp has advocated for zero nuclear dependence, pointing to the country’s apparent ability to cope without reactors for the first time in 50 years during calendar year 2014. Japan’s coal consumption in power generation rose only 3.3% in 2014, while LNG usage grew marginally by 0.8%. In 2013, nuclear supplied 1.6% of electricity, according to data from Japan’s Federation of Electricity Power Companies. In 2014, the use of crude oil and fuel oil in power generation fell by 25% and 17%, respectively, despite the absence of nuclear, as they were substituted by coal and LNG. The country’s falling power consumption — due partly to energy conservation efforts and a sluggish economy — has also prevented sharp upticks in coal and LNG usage. Electricity demand fell 2% in 2014 from the previous year and has dropped by some 9% compared with the 2010 pre-Fukushima level.

Meti's decision on an optimal 2030 energy mix could come in mid-April, followed by a one-month public consultation period, with the outcome finalized in late May or June. The ministry is also expected to confirm Japan's new feed-in-tariffs for renewable energy ahead of the new fiscal year starting Apr. 1. While the new rates will be based on ensuring a return of at least 8% to solar investors, the uncertainty from output curtailment by grid operators means profitability would be lower, says Ohbayahi.

Kimfeng Wong, Singapore

France's Energy Overhaul Hits Political Road Blocks

France's much-debated energy transition law is now in limbo after a joint committee failed to reconcile the legislative language on nuclear approved by the National Assembly in October and the more recent version cleared by the Senate on Mar. 3. The law aims to firm up Socialist President Francois Hollande's ambitious energy targets by reducing total energy demand by 50% by 2050, cutting greenhouse gas emissions by 75% from 1990 levels by 2050, and increasing the share of renewable energy (including hydro) in the electricity mix from the current level just slightly under 15% to 32% in 2030. But Hollande hopes to decrease nuclear's contribution to the power mix from the current 75%-80% to 50% by 2025, and this has become a sticking point. The National Assembly approved Hollande's nuclear target as proposed, but the conservative Senate opted for a less forceful version that included some loopholes for nuclear.

Paring back nuclear's prominence in the French electricity mix has been a key promise of Hollande after signing a coalition agreement with the Green Party, which is further left than the Socialists, on the eve of France's 2012 presidential elections. Still, it took the new Socialist government over two years to introduce the energy transition law, the draft text of which was first announced by Energy Minister Segolene Royal this summer (NE Jul.31'14). Not only did the text proposed by Royal — and quickly signed off by the cabinet — include the downsizing to 50% for nuclear, it also set a fleet-wide nuclear capacity ceiling going forward of 63.2 gigawatts, the country's current total installed capacity. That would mean that once the 1.6 GW third-generation reactor under construction at Flamanville is connected to the grid, an equivalent amount of nuclear capacity — likely EDF's two 920 megawatt units at Fessenheim — must be shuttered.

Hollande, Royal and Prime Minister Manuel Valls had relatively little difficulty pushing the proposed legislation through the National Assembly in early October, even though elements of the Socialist party, including the pro-nuclear trade unions, were not entirely behind it (NE Oct.16'14). By that time the conservative Union for a Popular Movement (UMP) had wrested control of the Parliament's upper house during senatorial elections Sep. 28 — the first time in three years that the Socialists had lost control of the upper chamber.

This UMP-led Senate now presents an obstacle for Hollande's energy agenda. The party quickly pushed through a new Senate version of the bill that would make Hollande's 50% nuclear target conditional on "maintaining French energy independence" and "competitive electricity prices." The UMP also revised the 63.2 GW target to 64.8 GW — which would allow the Fessenheim units to remain on line when Flamanville-3 is connected to the grid. In some ways, these revisions could strengthen the government's attempts to slash electricity demand, as they will remove an incentive from pro-nuclear planners to encourage an expansion of demand to avoid absolute cuts in nuclear output.

From here, the energy transition law will be discussed again in both chambers. Since final say belongs to the National Assembly, there is a high likelihood that the initial nuclear target will be reinstated. Indeed, the nuclear targets are a key government policy, with Valls saying in a Feb. 12 speech that the 2025 objective is a goal "we must achieve," and urging a stop to what he calls "a fruitless debate on nuclear." The Hollande administration's continued support for the National Assembly's version of the text is the most critical factor to watch. Royal has signaled a willingness to compromise with the Senate, while Valls and Hollande have made clear that they will not abandon the 2025 target, particularly as they defend their left front in the run-up to regional elections at the end of the month.

Phil Chaffee, London

IN BRIEF

Egypt Announces Renewable Deals

Renewable energy deals announced at the recent Egypt Economic Development Conference at Sharm el-Sheikh should account for impressive volumes, although most of the agreements were nonbinding. Abu Dhabi's Masdar and Saudi Arabia's Acwa Power are considering 1,500 megawatts of solar and 500 MW of wind capacity, starting with a 200 MW solar photovoltaic plant. Similar agreements were announced with Canada's SkyPower for 3 GW of solar capacity, and with German-owned but Bahrain-based Terra Sola and Switzerland's Terra Nex for 2 GW. Germany's Siemens also announced plans to construct a wind turbine blade manufacturing plant in northern Egypt along with 2 GW of wind generating capacity. Egypt has 31 GW of installed electricity capacity dominated by natural gas and oil, with 2,100 MW of hydro, 550 MW of wind and 20 MW of solar. Renewables are projected to account for 20% of Egypt's electricity mix by 2020 (NE Feb.5'15).

RGGI Prices Keep Rising

Carbon prices on the US Northeast's Regional Greenhouse Gas Initiative (RGGI) cleared at \$5.41 per short ton of carbon dioxide in the latest quarterly auction this month — the scheme's highest price yet. RGGI allowance prices had fallen below \$2/ton from 2010-12 due to an oversupply of allowances, but prices have been gradually climbing after the initiative debated and implemented hefty reforms in 2013-14 (NE Feb.14'13). RGGI's nine member states opted to tighten the cap on power sector carbon emissions to 91 million short tons in 2014, from 165 million short tons previously, and the cap is slated to decline by 2.5% each year from 2015-20. RGGI became the first US cap-and-trade scheme in 2008.

US Wind Could Grow Faster

Wind power could meet as much as 35% of US electricity demand by the year 2050 if policies aimed at lowering costs are enacted aggressively, according to a report from the US Department of Energy (DOE) last week. While aggressive policies could put wind on par with other electricity sources in terms of cost by 2030, doing so would require that controversial US wind production tax credits be made permanent, according to Dan Utech, a top White House energy adviser (NE Dec.11'14). Supporters of the credit have not yet been able to persuade Congress to renew the credits in increments longer than one year, which the industry says creates an unsteady investment climate. The DOE study found that such policies would increase electricity costs by 1% through 2030, although the report projects a 2% cost savings by 2050. A report from the Energy Information Administration, an independent branch of the DOE, shows that spending on wind subsidies increased to \$5.9 billion in 2013 from \$5.5 billion in 2010 as wind firms took greater advantage of the credit.

Clean Cars Touted for Economics

In a new report, Cambridge Econometrics suggests efforts to clean up vehicle emissions could deliver some big cost savings for the UK. Low-carbon vehicle technologies — including the gradual introduction of electric propulsion — could reduce carbon dioxide emissions from cars and vans by 47% by 2030 and also save the country up to £7 billion per year on vehicle fueling and replacement costs. Any extra up-front expenses incurred by consumers to purchase green cars would be outweighed by energy savings within a few years, the study said. Projected decreases in air pollution are also expected to offer health benefits worth £1 billion-£1.2 billion for the UK economy.

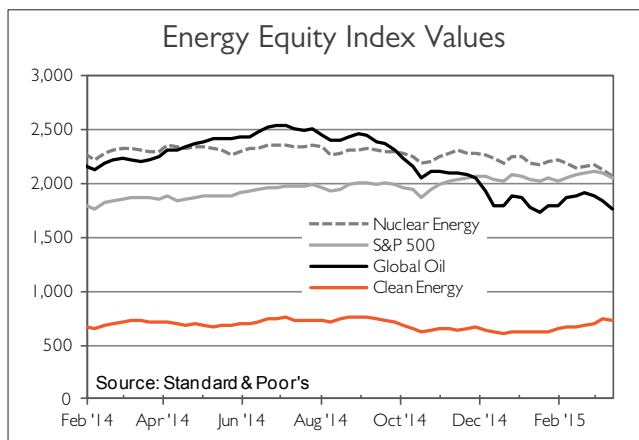
US Officials Temper Climate Hopes

US officials may be optimistic about their chances of reaching a climate pact in Paris later this year, but they are already tempering expectations about how far it will go (NE Mar.5'15). "We all know the agreement we are trying to reach in Paris will not completely and totally be able to eliminate the threat. It's not going to," US Secretary of State John Kerry told an audience in Washington last week. "But it is an absolutely vital first step and it would be a breakthrough demonstration that countries across the globe now recognize the problem and the need for each and every one of us to contribute to a solution." Remarks made by both Kerry and Environmental Protection Agency Administrator Gina McCarthy indicate that the US is not pushing for a binding treaty in Paris. That insulates it from congressional rejection but rules out the strictest international repercussions in the event that countries don't make good on their promises. But Kerry said that Washington is seeking to insert climate and environmental standards in other treaties, such as trade agreements. "Just like labor standards in other agreements, these environmental [standards] have to be enforceable."

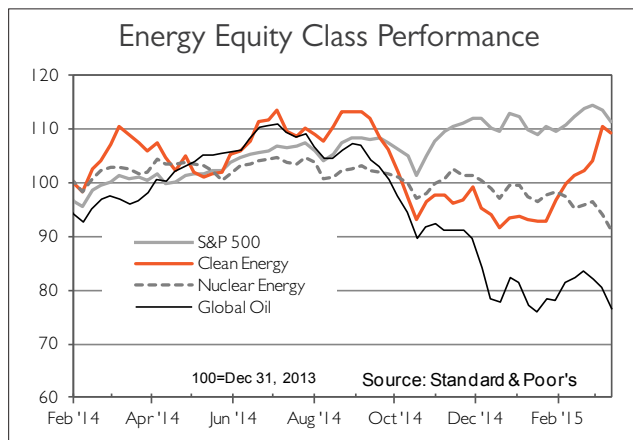
UK Cities Eyed for Green Transport

Twelve UK cities have been short-listed to become likely global leaders in ultra-low-emission vehicle technologies with the help of government funding. The cities range from London to Dundee alongside regions such as West Yorkshire and Northern Ireland, the UK government said in an announcement. A total of £35 million (\$53 million) in funds will be shared among two to four of those cities starting this autumn. A further £30 million will be allocated to local authorities and bus operators to replace old vehicles with greener alternatives to help clean up air quality.

CLEAN ENERGY EQUITY MARKETS



Source: Standard & Poor's



Source: Standard & Poor's

EI NEW ENERGY DATA

Energy Futures: Reference Prices

Carbon (€/ton)	Mar 17	Mar 10	Chg.
ECX EUA	6.73	6.82	-0.09
ECX CER	0.02	0.02	0.00
Crude oil (\$/bbl)			
Nymex light, sweet	43.46	48.29	-4.83
ICE Brent	53.51	56.39	-2.88
Natural gas (\$/MMBtu)			
Nymex Henry Hub	2.86	2.73	+0.12
ICE UK NBP	6.81	6.97	-0.16
Coal (\$/ton)			
Nymex Capp*	53.03	52.33	+0.70
ICE Rotterdam	61.35	61.90	-0.55

All prices are front month. EUA = EU Allowances; CER = Certified Emission Reductions under UN CDM. ICE UK gas converted from p/therm. *Short tons. Source: Exchanges

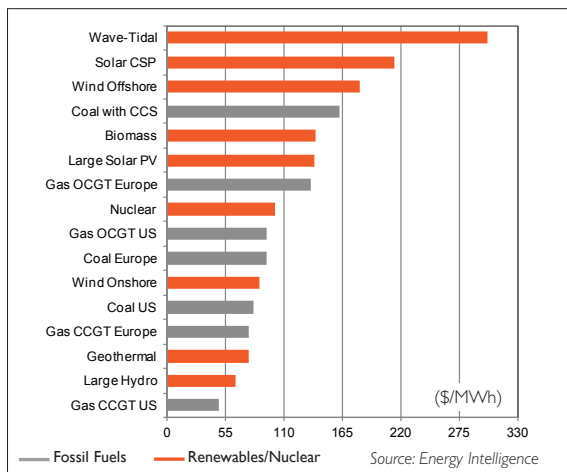
DATA: The complete set of EI New Energy data is available to web subscribers, including full levelized cost of energy (LCOE) calculations, fuel switching thresholds, electricity production by sector; ethanol and biodiesel fundamentals, carbon prices, methodologies and reader's guides. Historical data is available as a premium Data Source product.

Global Carbon Prices

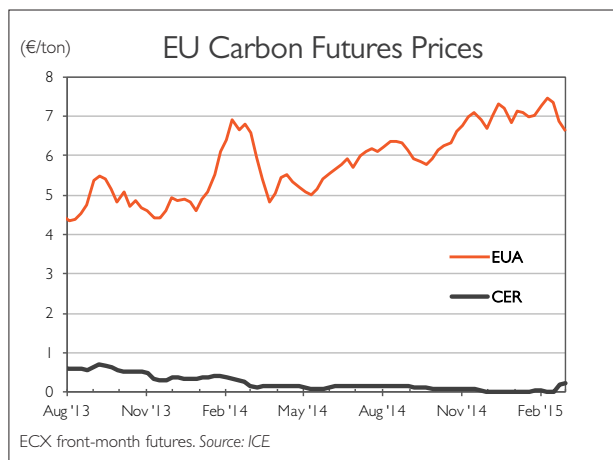
Europe (€/ton)	Mar 17	Mar 10	Chg.
EUA Dec '15	6.78	6.87	-0.09
CER Dec '15	0.42	0.40	+0.02
US (\$/ton)			
CCA (Calif.) Dec '15	12.65	12.66	-0.01
RGGI (Northeast) Dec '15*	5.49	5.49	0.00
New Zealand (NZ\$/ton)			
NZU (spot)	6.40	6.30	+0.10

Benchmark months. *Short tons; all others metric tons. Source: ICE, OMF

Newbuild Power Generation Costs



Source: Energy Intelligence



ECX front-month futures. Source: ICE

Global Electricity Prices

Europe (\$/MWh)	Mar 17	Mar 10	Chg.
Germany (EEX)	33.84	37.28	-3.44
France (Powernext)	48.59	49.59	-0.99
Scandinavia (Nordpool)	28.26	27.88	+0.38
UK (APX)	61.92	59.06	+2.87
Italy (GME)	55.65	55.62	+0.02
Spain (Omel)	49.48	51.88	-2.40
North America			
New England	88.50	36.13	+52.38
Texas (Ercot)	20.03	26.37	-6.33
US Mid-Atlantic (PJM West)	28.17	28.81	-0.64
US Southwest (Palo Verde)	25.63	24.75	+0.88
Canada (Ontario)	14.39	23.32	-8.94
Other			
Australia (NSW)	32.74	46.94	-14.19
Brazil (SE-CW)	119.93	125.25	-5.32
India (IEX)	40.85	45.97	-5.12
Japan (JPEX)	101.48	113.20	-11.72
Russia (ATS)	18.95	18.55	+0.40
Singapore (USEP)	56.89	58.28	-1.38

Wholesale prices. Source: Exchanges

Key Biofuel Prices

US (\$/gallon)	Mar 17	Mar 10	Chg.
Futures			
CBOT Ethanol	1.4230	1.4670	-0.0440
RBOB Gasoline	1.7301	1.8183	-0.0882
Spot market			
Ethanol Midcont.	1.43	1.43	0.00
Ethanol NY Harbor	1.49	1.52	-0.03
Ethanol US Gulf	1.48	1.52	-0.04
Europe (\$/ton)			
Futures			
ICE Gasoil	509.00	561.25	-52.25
Spot market			
Gasoline	600.00	592.00	+8.00
Diesel	509.75	552.50	-42.75
Biodiesel			
Fame 0	809.00	821.25	-12.25
RME	811.50	836.25	-24.75
SME	791.50	821.25	-29.75
PME	776.50	786.25	-9.75

Source: Thomson Reuters, ICAP, Exchanges

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