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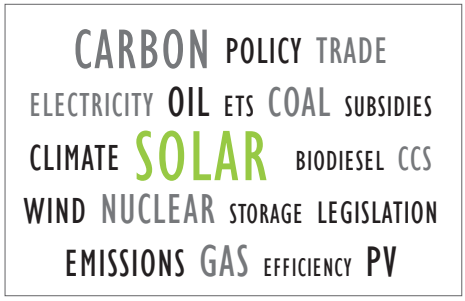

Renewable Energy Break-Even Prices

Developing Asia	Coal	Gas
Market Price	2.75	11.83
Wind Onshore	4.31	3.96
Solar PV	7.70	6.01
Solar CSP	15.95	21.71
Mideast	**Oil**	**Gas**
Market Price	64.75	7.59
Wind Onshore	22.41	4.48
Solar PV	30.81	6.20
Solar CSP	90.74	22.92

Market prices May 12. Coal and Gas in $/MMBtu, Oil in $/bbl. Table indicates fuel price above which renewable energy is more profitable than new coal-, gas- or oil-fired power, without subsidies. *Source: Energy Intelligence*

Election Surprise Shakes Up Alberta's Energy Policy

With the ballot machines still hot after last week's elections in Alberta, which saw the left-of-center New Democratic Party (NDP) end the 44-year reign of the hydrocarbon-friendly Progressive Conservatives, speculation is rife about the province's energy future (NE May7'15). Premier-elect Rachel Notley will almost certainly seek to phase out coal-fired electricity generation while boosting support for wind- and solar-based alternatives. She has also pledged to review the royalty rates paid by oil and gas companies, increase the corporate tax rate from 10% to 12%, and stop spending taxpayer dollars to promote crude oil export pipelines. On a national level, Notley has promised to work with other provinces and the federal government to address climate change — although specific details remain scarce for the moment.

One thing that is clear, however, is that while the Conservatives are gone, they are not forgotten. The structures they created to regulate and shape the province's energy industry since first forming a government back in 1971 remain in place — as do the thousands of civil servants whose jobs remain so closely entwined with the former regime. At the same time, the Alberta NDP is extremely inexperienced and possesses little institutional knowledge. "The idea that an NDP victory — however conclusive — means the prairies will be painted green overnight is laughable," said an Ottawa-based lobbyist with close industry ties. "Alberta is still dominated by oil and gas and the NDP badly needs to create jobs and strengthen the economy if they want to remain in power."

The momentous election — in which the Conservatives went from 70 seats in the legislature to just 10 — has clearly spooked Alberta's oil patch, with oil barons lining up to warn the new premier that any measures to extract more revenues from the industry would mean capital flight and job losses. The hydrocarbons industry prospered mightily under the light regulatory touch of the Conservatives, with oil and gas companies having a strong hand in determining energy policies (NE Aug.14'14). Before Premier Jim Prentice lost power to the NDP's Notley, the two previous Conservative premiers, Ed Stelmach and Alison Redford, managed to run afoul of the energy industry — a cardinal sin in a province where crude is king and royalties and taxes from hydrocarbons can account for as much as one-third of all government revenues. Stelmach introduced higher royalties on oil and gas production in 2007, then reversed course three years later after being heavily criticized for making Alberta less competitive during a global economic downturn. He also introduced rules requiring oil sands producers to reduce their

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carbon intensity by 12% and pay C$15 (US$12.50) for every ton of carbon emitted above the new target. Stelmach, however, soon lost his seat, as did his successor Redford, who had publicly toyed with the idea of raising the carbon levy from $15 to $40 — and who had toyed with ordering big emitters to reduce their carbon intensity by 40%, to boot.

Support for carbon capture and storage (CCS) in Alberta is shaky. Redford found herself the victim of an internal party revolt last year, and her departure paved the way for ex-federal cabinet minister Prentice, who said he would freeze funding for any new CCS projects in his province — one of the biggest oil-producing, and carbon-emitting, jurisdictions on the planet. He described CCS as a failed "science experiment" (NE Oct.23'14). Notley and Prentice see eye to eye on CCS, with Notley saying during the campaign that her government would put an end to "costly and ineffective" CCS initiatives.

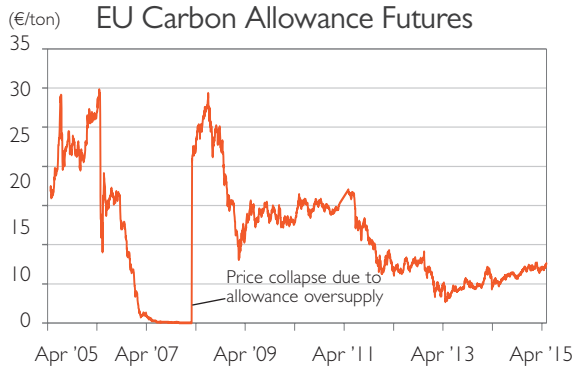
While it is unclear what Notley and her novice government-in-waiting will do with funds provided by a potentially higher carbon levy, it is obvious that she has her own constituencies to keep happy — her party's green wing and especially Alberta's powerful trade unions. Alberta's unions now occupy a seat once held by the hydrocarbons industry when the Conservatives ruled the roost. This means that pressure is building for the new government to add value to Alberta's hydrocarbon bounty, especially by refining more of the province's heavy oil at home rather than shipping raw bitumen to distant refineries.

James Irwin, Toronto

Breakthrough Revives Europe's Carbon Market

Ten years old this year, Europe's Emissions Trading System (ETS) now has something more to celebrate. A preliminary agreement reached last week by the EU's Council and Parliament promises to end the oversupply of allowances that has dogged the market for much of its existence — potentially putting the ETS back on course to be a serious driver of carbon abatement (NE May7'15). The deal on the Market Stability Reserve (MSR) — which has now been ratified by the Council, with pending endorsement by Parliament seen as a formality — was more ambitious than perhaps expected. Due to start now on Jan. 1 2019, two years earlier than previously proposed, the MSR is also slated to draw in an estimated 600 million allowances expected to remain unsold at the end of the current trading phase in 2020, in addition to another 900 million excess allowances already being temporarily removed from the market — in a process known as backloading (NE May15'14). "None of that was guaranteed just a few weeks ago," Stig Schjolset, head of carbon analysis at Thomson Reuters Point Carbon, told *EI New Energy*. "It's really as good as you could have hoped for," he added (NE Apr.2'15).

The key significance of the MSR is its ability to introduce flexibility on the supply side of the market, which has been a "missing piece," Schjolset noted. This, he said, will help to re-balance the ETS, which has seen the build-up of an oversupply of some 2.1 billion allowances — each equivalent to one metric ton of carbon dioxide — partly due to the impact on emissions from the economic downturn. An earlier oversupply problem drove prices to near-zero at the end of the first ETS phase in 2007 (see table). But with the MSR in place from 2019, Point Carbon see prices for the ETS allowances, known as EUAs, reaching €19 ($21.35) by 2020 and €32 by 2030 — versus current prices of around €7.60. Conversely, a 2021 start would have seen prices rise to only €9 by 2020, or fall to €4 without any MSR. Higher prices over a longer time should, Schjolset said, help to drive more carbon abatement before 2030, a key policy aim of the EU.



Prompt month futures for allowances on the EU's Emissions Trading System. *Source: ICE.*

This breakthrough is all the more noteworthy given that the commission came forward with a proposal "that was really unambitious" and then the council and the parliament "improved it a lot" — in contrast with the typical pattern of commission policy proposals getting weakened, noted Femke de Jong, policy officer at NGO Carbon Market Watch. "In a way it's the world upside down," she said. Part of this is attributed to the new balance of power in the European Parliament since elections last year. With an influx of members from fringe parties and no political group commanding a majority, there has been more effort by parties in the center to negotiate and reach agreements, an EU observer suggested (NE May22'14). Divisions are also less pronounced in the EU Council, with Lithuania and the Czech Republic having stepped out of a blocking minority of countries, led by Poland, which had opposed a strong MSR. This

was helped by a sweetener in the MSR deal, which will see more revenue from EUA auctions flowing to poorer member states. Advocates of strong climate policies hope that cooperation will continue and build progress for separate measures — for example on policies addressing carbon leakage, and in putting flesh on the bones of the EU's 2030 climate package (NE Oct.30'14).

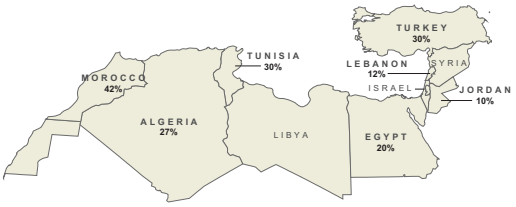
Looming climate talks in Paris at the end of the year may be helping to focus policymakers' minds on such issues. "I think it would have been problematic if there had been no agreement on the MSR by the time European negotiators came to Paris," said Sarah Deblock, European policy director at the International Emissions Trading Association. Now the EU has "hopefully more of a credible image," said de Jong, whereas before "a lot of people looked at the EU and thought, well, you are the climate leaders but your main instrument for carbon markets doesn't deliver a price, or do anything." Setting the ETS on a better course could "help the case for markets" at the Paris climate talks as it "has been the biggest and it has been easy to portray it as a failed market," Schjolset noted (NE Nov.13'14).

Ronan Kavanagh, London

Renewables Gain Appeal in Mideast, North Africa

Renewable energy has grown more attractive in the Middle East and North Africa (Mena) region because it is increasingly affordable without subsidies, competitive against oil and able to meet the region's growing electricity demand. In order to make way for renewables, however, power grids around the Mediterranean need more interconnections — but not for the reason experts emphasized just a few years ago, participants said at a recent conference organized by industry group Eurelectric in Brussels on the energy transition in Mena. As renewables now seem set to intensively develop on both sides of the Mediterranean, stronger interconnections would make the life of system operators much easier by helping them address foreseeable imbalances in Mena and Europe, speakers said in Brussels (see map).

Renewable Energy Targets in Southern Mediterranean Countries



Renewable energy targets in % of total electricity capacity (Morocco, 2020), electricity mix (Algeria, 2030; Tunisia, 2030; Egypt, 2020; Turkey, 2023), total energy supply (Lebanon, 2020) or primary energy (Jordan, 2020). *Source: Res4Med*

While Mena enjoys exceptional natural conditions, including sunshine across the region and many windy areas, especially on Morocco's Atlantic coast and the Red Sea, exports to Europe were once seen as indispensable to make renewable energy projects bankable because generating costs were too high for local customers. This is no longer true, said Roberto Vigotti of nonprofit Res4Med, as new world records were recently set at auctions in Mena — at just $41 per megawatt hour for wind in Egypt and $60/MWh for solar photovoltaic (PV) in Dubai, without subsidies (NE Dec.4'14). At such low prices, which match recent 2030 forecasts, the price of oil, even at current lows, doesn't matter anymore, Eurelectric's Hans ten Berge insisted (NE Dec.11'14).

Since Mena is hungry for power — demand will more than double by 2040 while it is only expected to grow by 15% in the EU, according to the International Energy Agency — renewables are the ideal solution for the region, Vigotti insisted. They are not only clean and cheap, they can also be planned and built in a short period of time in response to growing energy shortages — and constructing wind and solar plants is labor intensive, a welcome feature given high unemployment rates in the region. Intermittency is no longer an obstacle, Vigotti added, as the combination of storage, demand side management, interconnections, accurate production forecasting and flexible conventional generation provide enough flexibility to keep power systems reliable (NE Apr.30'15).

Renewables also allow energy importers to save on oil and gas bills and countries with limited reserves, such as Egypt and Tunisia, to safeguard independence — paradoxically leaving coal as the only credible competitor as long as carbon emissions are not factored in, said RWE's Paul van Son. He cited the Safi plant, a 1,400 MW coal-fired unit under development in Morocco, and phase one of the Hassyan clean coal power project, a 1,200 MW plant currently being evaluated in Dubai. And while exporters such as Saudi Arabia feel less pressured than importers, renewables will take off there too, Vigotti said — using oil to generate electricity "makes no sense," he emphasized (NE Jan.29'15).

By contrast, Europe doesn't need green power from abroad, with demand stagnating and plenty of renewable capacity being added. Spain is actually exporting power to Morocco through the existing Gibraltar interconnector, which makes Moroccan national utility ONEE one of the biggest operators in the Spanish wholesale market. Similarly, Europe could send power to Tunisia, where capacity margins are thin, if the long-awaited line out of Sicily — a 200 kilometer, 600 MW project — was built, said

Italian transmission system operator Terna's Carlo Crea (NE Jul.18'13). That interconnection would be especially valuable, Enel's Giuseppe Montesano said, as it would close the Western Mediterranean loop and make continental Europe and Maghreb countries, including Morocco, Algeria and Tunisia, one single power system able to optimize reserves and take advantage of diverse demand and weather patterns — a key feature for intermittency management. Morocco could, for example, export excess generation a few hours every day from its growing solar capacity while still importing cheap baseload power from Spain during off-peak hours, said ONEE's Salah Eddin el-Fijel (NE Nov.27'14).

Further east, while most countries from Libya to Iraq and Turkey are physically interconnected, actual power flows are very limited due to current political circumstances, Jordan utility Nepco's Abdelfattah Aldaradkah said (NE Mar.13'14). The planned interconnection between Egypt and Saudi Arabia would allow Gulf Cooperation Council countries to export power in winter and import in summer, when peak demand is about twice as high as during cooler months.

Philippe Roos, Brussels

Who Wins in Solar Trade War?

In the face of hostile trade actions from the US and Europe, China's solar photovoltaic (PV) manufacturing industry has apparently adapted — partly by opening up new markets in Asia, and partly by shifting some production to third-party countries. In the US and Europe, however, the benefits of curbing China's market share remain controversial. Erecting barriers to Chinese products has failed to lift the price of US-sourced PV modules, but resulted in the unintended consequence of hurting US exports to China of polysilicon, a raw material used in making solar wafers, said John Smirnow, vice president of trade and competitiveness at the US Solar Energy Industries Association (SEIA), in his speech at the Shanghai New Energy Conference held late last month. In Europe, a minimum price requirement on Chinese solar products has also "ended the continued cost reductions of solar electricity, which contributed to the slowing of solar power installation since 2013," said Oliver Schaefer, president of the European PV Industry Association (EPIA), in Shanghai.

In the US, despite the attempt to keep out Chinese products through antidumping and countervailing duties in 2012, PV module prices "continue to fall," resulting in only "modest" investments of $10 million in the country's manufacturing capacity, said Smirnow. Chinese exports of PV modules to the US, on the other hand, were initially resilient, edging down by only a meager 0.9% in 2013 and actually rebounding 29% in 2014 to $2.17 billion. But as the US closed a tariff loophole in late 2014, intake of Chinese PV cells plunged 49% to $294 million in the first quarter of 2015, according to figures from the Chinese Chamber of Commerce for Import and Export of Machinery and Electronic products (CCCME). China retaliated in 2013 by slapping antidumping duties on US polysilicon makers, which saw their sales to China retreat by nearly 6% in 2014 and fall by a steeper 16% in the first quarter of this year to 4,711 tons, according to Chinese customs figures.

In Europe, the minimum price requirement reduced the inflow of Chinese PV cells in 2014 by 24% to $2.82 billion, CCCME figures showed. But this also means an estimated 30% of the solar market in Europe did not materialize due to "artificially inflated prices," said EPIA's Schaefer. The primary beneficiaries of the solar trade war, observed SEIA's Smirnow, are Chinese polysilicon manufacturers, Taiwanese solar cell producers and other countries like South Korea, Malaysia, Singapore and Thailand as some Chinese exporters sought to avoid duties through third-country processing or manufacturing. Chinese PV manufacturers Talesun and Trina have both announced plans for setting up plants in Thailand targeting markets in US, Europe and southeast Asia. Other Chinese manufacturers also indicated readiness to build overseas bases in response to President Xi Jinping's "One Belt and One Road" policy call for extending Chinese trade ties with countries in the traditional silk road belt and in the 21st century maritime silk road.

China's Top Solar Cell Export Destinations January-March 2015

	Export Value (US$ million)	Ratio (%)	Year-on Year Chg. (%)
1 Japan	$1356	36.1%	0.6%
2 UK	298	7.9	35.5
3 US	294	7.8	-49.2
4 India	261	7	63.6
5 Netherlands	$221	5.9%	0.8%

Source: Chinese Chamber of Commerce.

Both the SEIA and EPIA are calling for an end to the solar trade war. The SEIA has proposed replacing all anti-dumping and countervailing duties with a minimum price undertaking by US polysilicon exporters and a "modest" import fee of "a few cents per watt" on Chinese solar modules (NE Jul.31'14). The EPIA wants a "normalization" of trade relations at the end of this year, when the floor price and volume cap imposed on Chinese solar panel imports are due to expire (NE May15'14).

Meanwhile, China has diverted much of its solar sales away from Western markets. Sales to Asia and the Middle East jumped 124% in 2013 and continued to grow by a

robust 43% in 2014 to $7.86 billion, CCCME figures showed. Asia and the Middle East are now taking 60% of China's solar cells exports while the US and European ratios are down to around 8% and 20%, respectively, compared with the 2013 mix of 45%-14%-30%. China has also enlarged its domestic demand tremendously: There is now a "relatively healthier" balance between exports and self consumption with 40% of China-made PV modules being absorbed within the country, up from just 5% in 2010, said Sun Guangbin, CCCME's deputy secretary general.

Kimfeng Wong, Shanghai

India's Massive Solar Push Attracts Global Investors

Several of the world's top solar photovoltaic (PV) module makers are expressing interest in setting up a manufacturing base in India, attracted by the South Asian nation's goal of adding 100 gigawatts of solar power generation capacity over the next seven years — nearly a thirtyfold jump from the country's existing solar base, if achieved (NE Nov.27'14). Notably, an initial pact was signed in January to invest up to $4 billion to build a vertically integrated solar PV manufacturing facility in western Gujarat state by SunEdison, a US-based developer, and India's Adani Enterprises, controlled by billionaire Gautam Adani (NE Jan.15'15). Similarly, China's top solar panel producers, Trina Solar and JA Solar, are eyeing investments, and so are Canadian Solar and the US' First Solar. Solar Consultancy Bridge to India estimates that 2,000 MW per year of capacity is in planning stages.

Helped by India's policy push, solar generation capacity has already catapulted to 3,744 MW as of end-March — up from just 2 MW in 2009. Still, it is just 1% of the country's total installed power generation capacity, which is dominated by coal. Prime Minister Narendra Modi's government, which came to power around a year ago, raised the country's solar capacity addition target fivefold to 100 GW by 2022 as New Delhi faces international pressure to commit to binding emissions reduction targets (NE Dec.11'14). India has been meeting 80% of its demand for solar gear via cheaper imports from the US and China, even as only a fifth of its local solar cell manufacturing capacity of 1,200 MW and about a fourth of module making capacity of 2,500 MW was being used until mid-2014, according to government officials. Those shut capacities are coming back on stream with the government's massive solar target, and because it has stipulated that projects being set up by state-run entities should use locally made solar gear. New Delhi-based IndoSolar, for example, had not been able to utilize its solar cell-making capacity for a significant part of the last two years. However, with fresh orders under its belt, the country's largest solar cell-maker utilized its full capacity in the last two quarters of the financial year ended Mar. 31, it said May 4.

One of the aspects of Modi's "Make in India" campaign — which seeks to generate jobs for millions of youth and drive economic growth — is guiding government policy to attract investment in renewable manufacturing capacities. Modi's predecessor, Prime Minister Manmohan Singh, had set a target to achieve local solar gear manufacturing capacity of 5,000 MW by 2020. Bridge To India's senior manager of market intelligence, Jasmeet Khurana, told *EI New Energy* that the target looks very conservative now. Tarun Kapoor, joint secretary at the Ministry of New and Renewable Energy, told *EI New Energy* that "we are seeing a lot of interest from global companies like First Solar in setting up manufacturing base in India," adding, "they are exploring various models like whether to go alone or partner with an Indian company. But no one has committed investment so far." A First Solar spokeswoman told *EI New Energy* that demand for PV in India has been cyclical, which has deterred investment decisions. But the 100 GW policy push should soon result in into significant annual demand that would be predictable and lead to tangible investment decisions, she said.

However, the implementation of the policy is fraught with challenges. Amit Bhandari, a fellow at Mumbai-based think tank Gateway House, said that every megawatt of solar power needs up to five acres of land, making land acquisition a big challenge. Tepid interest among state power distributors to buy costly solar power is also a roadblock.

Bridge to India's Khurana says that the challenge will be to make the manufacturing bases globally competitive, even though the capacities being discussed are about 300-400 MW, compared with China's massive bases that run in gigawatts. Also, the US has filed a World Trade Organization petition against the provisions of India's domestic content requirements, alleging that it renders less favorable treatment to imported products and violates trade rules. India has maintained that the provisions are necessary to overcome short supply of local PV cells and modules and argues that its domestic content rules are not a trade violation since they involve projects set up by the government.

Rakesh Sharma, New Delhi

Germany Eyes Solution to Balance Natural Gas, Renewables

Germany is facing an energy policy paradox, with the country's renewable energy incentives blamed for leaving utilities with major financial losses and not enough of an incentive to maintain a reliable supply of back-up power stations. Should capacity mechanisms, which would provide payments for capacity, help keep the wolf from the utilities' doors? The largest economy in Europe embarked down a renewables pathway, the so-called Energiewende, in the early nineties, with the aim of getting 40%-45% of electricity from renewables by 2025. In 2011, post Fukushima, politicians hastily adopted a nuclear phase out policy to close all units by 2022. Replacing nuclear, gas was supposed to provide back-up capacity when needed, with coal and lignite taking a back seat on pollution grounds. Problems surfaced before the dawn of the new decade as overly attractive feed-in tariffs for renewables, principally small-scale, rooftop solar photovoltaic (PV) units, led to years of aggressive capacity growth. Gas, unable to compete on price against coal and lignite, slid down the merit order, hitting a low of 9.5% of the electricity mix last year, while lignite provided 25.4% and coal some 17.8%. For 2010, Germany was supposed to hit a target of getting 12.5% of electricity from renewables. That year, renewables provided roughly 17%. Last year, renewables accounted for 26.2% of electricity. At the end of March, Germany boasted solar PV capacity of 38.6 gigawatts and 36 GW of wind — with peak capacity last year recorded at 83 GW and overall dispatchable installed capacity of some 113 GW.

The country's four main utilities — E.On, RWE, Vattenfall Europe and EnBW — plus smaller generators and regional municipal utilities or Stadwerke, now claim the Energiewende is "broken," leaving them saddled with multi-billion Euro losses, a graveyard of mothballed or permanently shuttered power stations, many of which are ultra-modern, highly efficient gas-fired units and virtually nonexistent market signals to build new baseload capacity (NE Apr.23'15). Struggling generators of all sizes, including Stadwerke, have called on the government to consider providing some form of capacity payment to keep the wolf from the door, despite the country suffering from massive overcapacity of fossil fuel power stations, including coal, lignite and gas-fired units. At a Platts energy conference in London in late April, Michael Lewis, chief operating officer assets at E.On Next Generation, said "the fundamental problem is we added an enormous volume of new capacity ... without any thought of what that means for existing capacity in the system." Germany's largest utility by market cap, E.On, threw in the traditional generation towel last December, shocking the power sector with an announcement it would split and concentrate on renewables and customer services (NE Dec.4'14). Peer RWE said in April the company was in "crisis" and that it would consider an E.On-style split if the situation deteriorated much further (WGI Apr.29'15). "It's not just the big four utilities which are suffering. There are a lot of municipalities, including the city of Essen which is home to the headquarters of RWE, that have had to cut back on public services because they have had to pay for losses at municipal Stadwerke," says Lewis.

With more than one-third of the EU's 28 member states operating or considering some form of capacity mechanism, the European Commission launched a state aid sector inquiry last month to investigate if countries' plans will cause market abuse or distortion. Eleven member states are being studied: Belgium, Croatia, Denmark, France, Germany, Ireland, Italy, Poland, Portugal, Spain and Sweden. These countries have a broad range of mechanisms for the Commission to study. The Commission expects to publish a draft report on its findings concerning capacity mechanisms around the end of the year. The document will be open to consultation, with a final report due in the summer of 2016.

E.On's Lewis agrees that Germany is unlikely to adopt capacity mechanisms while the problem of overcapacity exists, as German politicians have repeatedly stated, but he says sooner rather than later the inexorable rise in renewable capacity coupled with the closure of gigawatts of gas- and coal-fired units will eventually squeeze supply margins. "Flexible capacity will close [the overcapacity gap]. More plants will close. Prices will spike very rapidly. Politicians won't like this and they will seek to create a capacity market," says Lewis.

Capacity markets are being implemented for various different reasons in EU member states. In the UK and Belgium, there is a fear that more programmable capacity will be retired than will be built over the coming years and that safety margins could become tight. In countries such as Italy and Spain, the issue is trying to make an economic case for units which remain idle for much of the year or to compensate for low interconnector capacity with neighboring markets (WGI Mar.4'15). In Germany, where there is a major problem with overcapacity, there is a need for regional units to remain operational to stabilize the surrounding grid.

Jay Eden, London

IN BRIEF

Statoil Sets Up 'New Energy' Unit

Norway's Statoil underlined its ambitions in renewable energy and low-carbon production this week, announcing the creation of a dedicated "new energy" business unit as part of a major shake-up of the group's senior management team (NE May7'15). Statoil said the creation of the unit reflected its aspiration to "gradually complement the oil and gas portfolio with profitable renewable energy and other low-carbon energy assets." In particular, it is aiming to potentially expand into other sources of renewable energy beyond Statoil's existing wind power assets, the company said: "The business area will seek new opportunities to deliver attractive returns through technology and business innovation, as well as venture activities." The unit will be led by Irene Rummelhoff, formerly head of exploration in Norway.

US Jet Biofuel Plant Advances

US biofuels firm Fulcrum BioEnergy Inc. has awarded Spain's Abengoa a $200 million contract to build its first biorefinery in the US. The Sierra Biofuels Plant near Reno, Nevada will process syncrude made from municipal solid waste (MSW), converting 200,000 tons of MSW into more than 10 million gallons of jet fuel per year. Fulcrum Vice President Rick Barraza said, "Everything is in place to get the Sierra project under construction: Our feedstock is under contract, the offtake for fuel is under contract, we have secured the technology, we've demonstrated and proven our process, we're nearing financial close and we'll be ready to start construction during the second half of this year." Fulcrum has a 10-year fuel offtake agreement with Cathay Pacific Airways in place (JFI Aug.11'14).

UK Election Mixed for Green Energy

Conservative MP Amber Rudd has been given the top job at the UK Department of Energy and Climate Change, following a government reshuffle after last week's general election. The appointment of Rudd, viewed by many in the low-carbon industry as someone who "gets" climate change and renewables, is seen as a positive move by a Conservative government that wooed voters with a manifesto pledge to virtually wipe out support for onshore wind but embrace shale gas fracking and nuclear new-build projects such (NE Apr.16'15). Rudd steps up from the role of energy minister under the previous coalition government. Green groups have welcomed the appointment.

US, Japan Team Up in Clean Energy

The US Department of Energy and Japan's Ministry of Economy, Trade and Industry (Meti) have reached an agreement to cooperate in clean energy technologies as part of a broader economic and security deal. The two nations will join hands on energy conservation, renewable energy, smart grids, storage batteries, green transport and carbon capture and storage technologies, said Meti. A White House statement said the two sides will also continue collaboration on methane hydrate research, as well as working together to achieve a "successful" global climate change agreement at the Paris talks in late 2015. Japan has affirmed that it "intends to submit an ambitious target" to help reduce greenhouse gas emissions, according to the White House statement (NE Apr.30'15).

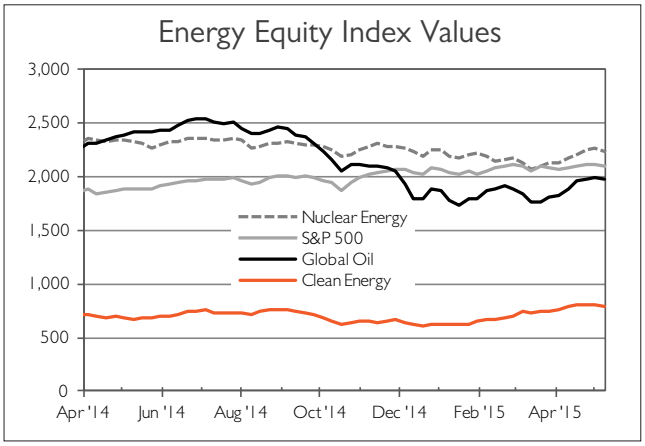
Indonesia Finalizes Biodiesel Incentive

Indonesia's President Joko Widodo has signed a regulation aimed at raising revenue to subsidize biodiesel consumption in the country. The new rule, which is to take effect at the end of May, requires exporters to pay levies of $50/ton on crude palm oil and $30/ton for processed palm oil products, Reuters reported, citing government officials. Chief Economic Minister Sofyan Djalil told reporters the levies would generate $750 million/yr. Part of the proceeds would be used to fund a 4,000 rupiah/liter (US 30¢) subsidy for biodiesel. Indonesia is among the largest diesel importers in Asia but has been taking steps to boost consumption of locally produced biodiesel as a substitute, so it can cut back on its US dollar-denominated oil import bill.

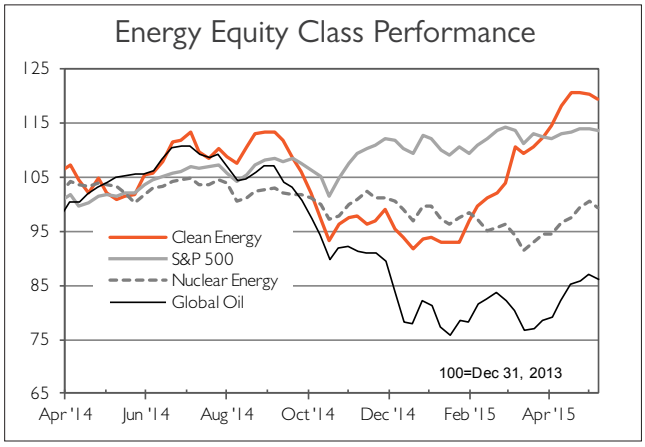
World Bank Urges Decarbonization

Full decarbonization of the global economy by 2100 to stabilize global warming under 2°C is possible if countries act early enough and use appropriate policies involving carbon pricing together with instruments such as targeted investment subsidies and performance standards — while making sure everyone is kept happy "by not only protecting vulnerable people" but also, sometimes, "compensating powerful lobbies" (NE Feb.19'15). Those are the World Bank's key messages from a new report titled *Decarbonizing Development*. Early action is the most cost-effective, the report insists, as it allows countries to "green their capital" instead of letting dirty assets be developed and end up stranded and having to be retired early at considerable cost. "Getting prices right" — which, besides pricing carbon, involves ending fossil fuel subsidies — is important too, but sometimes not effective enough, for example to support radical "green innovation," the World Bank emphasizes.

CLEAN ENERGY EQUITY MARKETS



Source: Standard & Poor's



Source: Standard & Poor's

SPECIAL ANALYSIS

Is Losing Nuclear a Show-Stopper for Carbon Goals?

EI New Energy *kicks off a four-part series on the impact of reactor closures in Germany, Japan and California, with a broad look at what's happened to the generation mix and CO_2 levels in these markets. The subsequent features in this joint series with sister publication* Nuclear Intelligence Weekly *will delve more deeply into these issues in each of the three locations.*

Whether by choice or by circumstance the loss of nuclear power in three advanced and highly populated regions of the world — Germany, Japan and the US state of California — is playing a key role in turning traditional assumptions about energy planning on their head. The stunning rise of renewables is grabbing headlines, but so too are concerns about carbon emissions levels as gas and coal replace some of the lost nuclear capacity. Grid operators, meanwhile, are being forced to adjust their delivery systems to accommodate new sources of generation.

It could be argued that the transition taking place—albeit at decidedly different speeds depending on location—would have happened anyway, but there's no doubt that the Fukushima catastrophe accelerated the pace. Since March 2011, eight of Germany's 17 reactors were forced into early retirement because of a government policy change, while Japan gradually lost output from the 48 reactors that remained operational after Fukushima as they were shut down for routine maintenance and refueling and then unable to restart because of regulatory issues and local political resistance (NIW May31'11). In California, Southern California Edison was forced to permanently retire its two San Onofre 1,100-MW reactors in 2013 because of costly steam generator problems, leaving the two-unit Diablo Canyon plant, with two gigawatts of capacity, the state's sole nuclear generator.

Of the three markets, Japan's was most heavily dependent on nuclear power, with up to 30% of its generation before Fukushima coming from reactors; Germany obtained about a quarter of its electricity from nuclear energy compared to about 16% today; California was never that dependent on nuclear — it accounts for less than 3% of output currently compared to about 8% back in 2001, according to the California Energy Commission. Even so, in all three cases fossil fuels were brought in to replace relatively carbon-free nuclear generation. But so too were renewables, along with energy efficiency measures that contributed to shifts in demand growth. As a result, CO_2 levels didn't always rise as fast as the doomsayers predicted.

Germany's CO_2 emissions are 16% below 1990 levels despite coal and gas capacity brought in to replace the shutdown reactors and aging coal plants. Some new gas plants have even been forced into retirement, creating a problem because they are necessary to make up for renewable energy intermittency. And Germany is extremely and increasingly energy-efficient. Between 2010 and 2014 nuclear and gas generation have declined sharply, by 31% and 35%, respectively. Coal is up but by only 1%, having started to decline again for the first time since 2010 (by 6%) in 2013. Renewables are 53% higher and contribute 28% of the nation's electricity supply. In 2014, despite healthy GDP growth, CO_2 emissions in Germany actually declined.

In Japan, by contrast, the growth of renewables has been far slower than in Germany, and the loss of nuclear capacity is wreaking havoc with the government's greenhouse gas reduction plans. Latest figures show emissions rising to the second highest level on record at 1.408 billion tons in FY-2013. That is only lower than the FY-2007 peak of 1.412 billion tons. The FY-2013 level is 10.8% higher than the FY-1990 level, making it almost impossible for Tokyo to realize its pre-Fukushima ambitions of a 30% cut from 1990 levels by 2030. With no reactors currently operating, fossil fuels account for nearly 90% of power output, up from 66% in 2007. Renewables (hydro, wind, solar), by contrast, contributed only 11% in FY-2013, up from 9% in 2007. Tokyo's most recent energy plan proposes capping fossil fuels at a 56% share of power output by 2030, or more than double the ratio under the pre-Fukushima plan. Nuclear is to contribute 20%-22%, less than half the ratio proposed before Fukushima, and given the uncertainty surrounding reactor restarts many question whether that percentage is even achievable (NIW Apr.24'15). Renewables have been allotted 22%-24% in the new plan, hardly a leap from the 20% envisaged before Fukushima, and in sharp contrast to Germany's renewables rollout.

Natural Gas, Renewables Fill US Gaps

In the US, carbon emissions have typically risen modestly when baseload nuclear became unavailable. Natural gas largely filled the void left by the closure of the two San Onofre units just north of San Diego, California in 2012 and the shutdown of the Vermont Yankee reactor in the Northeast at the end of 2014. In both cases, however, part of the lost nuclear generation was replaced by renewables. The San Onofre shutdown in January 2012 (made permanent in mid-2013) forced a change in grid operations, too. A new transmission line brought in renewables output from western California to the San Diego region, and the region's grid operator, California ISO, repositioned its fleet so that it could fill the gap with power generated by gas, solar and wind. The state's governor, Jerry Brown, launched an ambitious cap-and-trade program on schedule in January 2013; last month Brown announced a target for the state to slash greenhouse gas emissions by 40% below 1990 levels by 2030.

With an increasing number of reactors worldwide slated for closure over the next few decades, the experiences in Japan, Germany and California offer utilities and energy planners interesting lessons. Mainly they point to the importance of planning well in advance of the actual closures so that emissions and grid stability can be manageable; otherwise the impacts will be worse. The San Onofre plant closure led to a higher level of emissions than in Vermont, where the reactor was powered down many months after the utility announced its closure decision. "What you get by shutting down nuclear on relatively short notice is, inevitably, higher climate impacts than what you get through a phased and planned shutdown," said Peter Bradford, an adjunct professor at Vermont Law School.

Stephanie Cooke and Lauren Craft, Washington;
Philippe Roos, Strasbourg; Kimfeng Wong, Singapore

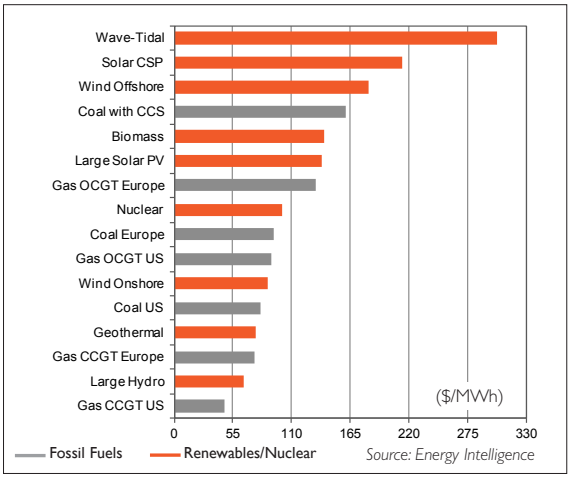
EI NEW ENERGY DATA

Energy Futures: Reference Prices

Carbon (€/ton)	May 12	May 5	Chg.
ECX EUA	7.59	7.55	+0.04
ECX CER	0.47	0.43	+0.04
Crude oil ($/bbl)			
Nymex light, sweet	60.75	60.40	+0.35
ICE Brent	66.86	67.52	-0.66
Natural gas ($/MMBtu)			
Nymex Henry Hub	2.90	2.78	+0.12
ICE UK NBP	6.73	6.44	+0.29
Coal ($/ton)			
Nymex Capp*	46.88	47.13	-0.25
ICE Rotterdam	59.35	60.15	-0.80

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*

Newbuild Power Generation Costs



Global Electricity Prices

Europe ($/MWh)	May 12	May 5	Chg.
Germany (EEX)	32.92	29.08	+3.84
France (Powernext)	30.59	33.77	-3.18
Scandinavia (Nordpool)	23.19	27.26	-4.07
UK (APX)	59.99	59.81	+0.18
Italy (GME)	60.90	60.69	+0.21
Spain (Omel)	54.92	66.86	-11.94
North America			
New England	27.13	26.58	+0.55
Texas (Ercot)	21.40	22.51	-1.12
US Mid-Atlantic (PJM West)	39.58	36.26	+3.32
US Southwest (Palo Verde)	24.00	24.25	-0.25
Canada (Ontario)	22.88	75.50	-52.62
Other			
Australia (NSW)	39.94	36.27	+3.67
Brazil (SE-CW)	128.67	127.27	+1.40
India (IEX)	43.28	42.10	+1.18
Japan (JPEX)	95.69	88.38	+7.32
Russia (ATS)	21.73	22.04	-0.31
Singapore (USEP)	72.86	69.06	+3.80

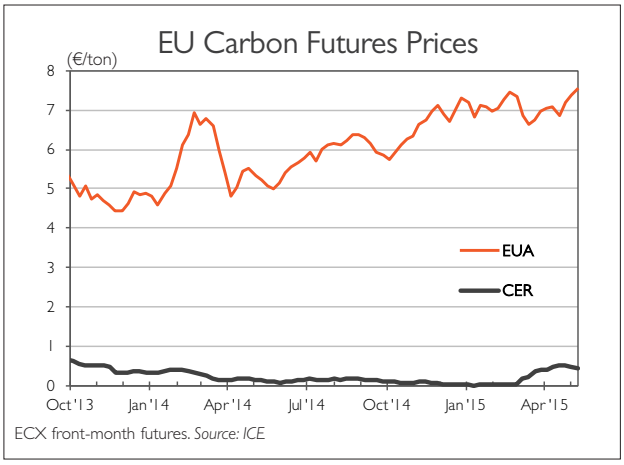
Wholesale prices. *Source: Exchanges*

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)	May 12	May 5	Chg.
EUA Dec '15	7.63	7.59	+0.04
CER Dec '15	0.47	0.43	+0.04
US ($/ton)			
CCA (Calif.) Dec '15	12.71	12.71	0.00
RGGI (Northeast) Dec '15*	5.59	5.57	+0.02
New Zealand (NZ$/ton)			
NZU (spot)	5.50	5.85	-0.35

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



ECX front-month futures. *Source: ICE*

Key Biofuel Prices

US ($/gallon)	May 12	May 5	Chg.
Futures			
CBOT Ethanol	1.6350	1.6290	+0.0060
RBOB Gasoline	2.0393	2.0634	-0.0241
Spot market			
Ethanol Midcont.	1.63	1.59	+0.04
Ethanol NY Harbor	1.70	1.68	+0.02
Ethanol US Gulf	1.69	1.68	+0.01
Europe ($/ton)			
Futures			
ICE Gasoil	607.25	618.50	-11.25
Spot market			
Gasoline	675.00	688.00	-13.00
Diesel	605.50	614.75	-9.25
Biodiesel			
Fame 0	847.25	846.00	+1.25
RME	852.25	846.00	+6.25
SME	837.25	846.00	-8.75
PME	847.25	851.00	-3.75

Source: Thomson Reuters, ICAP, Exchanges

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