



Illustrations by Paul Blow



# BIG ENERGY, BIG POWER

Even if most do rely on fossil fuels, not all energy companies and utilities are equal when it comes to how they use resources, govern and treat employees.

CK IDENTIFIES THE LEADERS IN THE PACK.


**BY TYLER HAMILTON** The push to get universities, municipalities and religious organizations to divest from high-carbon holdings is gaining momentum, but it remains a hard sell for pension funds and asset managers. If these big investors are reluctant in the short term to step away from fossil fuels outright, what if instead they invested only in those energy companies and utilities that perform operationally at the highest levels relative to their peers when assessed against a range of environmental, social and governance metrics? In this issue, *Corporate Knights* presents the Top 10 energy companies and the Top 10 utilities in the world as measured across key sustainability performance indicators – the same indicators that we use for our annual Global 100 ranking.

**A FEW HIGHLIGHTS FROM THESE TWO INDUSTRY-SPECIFIC RANKINGS:**

- There are no U.S. companies among the Top 10 in energy and no North American companies in the Top 10 for global utilities.
- In the energy ranking, only Canada had more than one company on the Top 10 list, with Cenovus Energy, Enbridge and Suncor Energy making the cut.
- Nine out of the Top 10 on the energy ranking were on CK's most recent Global 100 ranking, so sustainability leaders in the sector appear to be maintaining their strong performance.
- Most energy and utility companies on the lists excelled at disclosure, with eight energy companies and seven utilities reporting all 12 key performance indicators.

Eni, the integrated energy giant based in Italy and operating in 90 countries, was the only company on the Top 10 energy list that didn't make our recent Global 100. The data suggests, however, that Eni may improve its positioning on next year's Global 100 list (to be released in January). The company has improved its safety score from last year and scores well when it comes to paying taxes, investing in innovation, and tying executive compensation to sustainability performance.

On the utility side, Centrica also appears to be improving its performance relative to peers. The U.K.-based company led the Top 10 list even though it was the third highest ranked utility on our Global 100. Centrica has improved its productivity when it comes to energy and water use, and lowered its greenhouse gas emissions and waste production relative to revenues.

See page 26 for more highlights from CK's Top 10 energy companies and utilities lists. 

RANK

ENERGY COMPANY

ENERGY PRODUCTIVITY	CARBON PRODUCTIVITY	WATER PRODUCTIVITY	WASTE PRODUCTIVITY	TAX SCORE	% OF WOMEN ON BOARD OF DIRECTORS	% OF WOMEN EXEC. MANAGERS	CEO-TO-AVERAGE WORKER PAY	CLEAN CAPITALISM PAY LINK	OVERALL SCORE

TOP ENERGY COMPANIES

1	STATOIL ASA	\$482	\$8,145	\$11,133	\$231,286	50%	36.4%	20%	15	50%	74.74%
2	NESTE OIL OYJ	\$910	\$6,203	\$3,090	\$267,873	7%	42.9%	11%	13	100%	68.59%
3	CENOVUS ENERGY INC	\$220	\$2,916	\$1,228	\$19,768	12%	11.1%	13%	67	100%	56.16%
4	GALP ENERGIA SGPS SA	\$541	\$6,733	\$2,049	\$720,882	63%	4.8%	8%	34	50%	55.00%
5	REPSOL SA	\$424	\$5,098	\$1,173	\$496,315	20%	13.3%	0%	110	50%	54.36%
6	BG GROUP PLC	\$179	\$2,440	\$9,606	\$167,549	27%	14.3%	0%	53	100%	53.47%
7	ROYAL DUTCH SHELL PLC	N/A	\$5,767	\$2,301	\$149,969	40%	15.4%	0%	64	100%	52.61%
8	SUNCOR ENERGY INC	\$137	\$1,850	\$269	\$15,311	14%	16.7%	10%	90	100%	52.60%
9	ENBRIDGE INC	\$428	\$4,162	N/A	N/A	6%	16.7%	25%	110	100%	52.09%
10	ENI SPA	\$391	\$3,116	\$69	\$118,685	39%	0.0%	0%	107	100%	49.14%

TOP UTILITIES

1	CENTRICA PLC	\$332	\$5,131	\$56	\$1,053,733	21%	27.3%	17%	161	50%	60.76%
2	ACCIONA SA	\$815	\$11,152	\$948	\$15,124	5%	30.7%	15%	110	50%	56.03%
3	CIA ENERGETICA DE MINAS GERAIS	N/A	\$19,349	\$11,381	\$353,999	19%	7.1%	10%	N/A	0%	55.65%
4	ENAGAS SA	\$281	\$4,199	\$17,474	\$481,868	9%	15.4%	0%	24	50%	53.60%
5	CLP HOLDINGS LTD	\$30	\$351	\$3	\$1,218,731	5%	17.6%	12.5%	61	50%	52.80%
6	SNAM SPA	\$375	\$2,148	\$1,075	\$150,520	25%	22.2%	0%	29	50%	52.05%
7	IBERDROLA SA	\$55	\$1,061	\$482	\$27,936	14%	21.4%	22%	71	50%	51.97%
8	FORTUM OYJ	\$15	\$366	\$2	\$10,128	13%	42.9%	13%	36	0%	43.98%
9	RWE AG	\$42	\$356	\$209	\$4,809	4%	15.0%	0%	65	100%	37.60%
10	GDF SUEZ	\$62	\$805	\$8	\$7,902	12%	27.8%	0%	43	0%	36.13%

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# UTILITIES UNDER THREAT

How distributed energy is changing North America's power sector.

By Stephen Lacey



**F**or a glimpse at the legacy of yesterday's electricity business, one can travel to the Southeastern U.S., where two massive nuclear reactors are being constructed at the 2,400-megawatt Vogtle power station in Georgia.

When completed, they will be the first nuclear units constructed in America since 1979. But getting them built is the problem. The expansion, which will consist of two 1,100-megawatt generating units, is 14 months over schedule and nearly \$1 billion over budget. It could be 2018 before either reactor finally starts feeding the grid.

The project has sparked widespread backlash from consumer advocates, environmentalists and even a local libertarian Tea Party group. This summer, an economist working for Georgia's Public Service Commission slammed the project, saying that if regulators knew how expensive the process would be from the beginning, the expansion never would have been approved.

"If a decision had to be made today to build a new nuclear project, it would not be justified on the basis of these results," Philip Hayet, a nuclear consultant with the commission, said in August.

Just a week before that rebuke, Duke Energy announced plans to scrap a 2,200-megawatt

nuclear power plant in Florida as the projected costs climbed to \$24 billion and the estimated time of completion was moved out to 2024. Duke had already spent \$1 billion on the cancelled project, which ratepayers will need to soak up in the coming years. In Ontario, ground zero of Canada's nuclear industry, plans to build new reactors totaling more than 2,000 megawatts were scrapped in October because of the high price tag and falling power demand in the province.

Meanwhile, 2,600 miles away in California, the future of the power sector is starting to emerge. There, in the first half of 2013, more than 7,300 solar photovoltaic (PV) systems were installed on residential rooftops without any help from state incentives. Although the 33 megawatts of systems did qualify for net metering (a payment from the utility for the retail value of the solar electricity) and a federal investment tax credit, installers were able to make the economics work outside the state's solar promotion program.

"It would be hard to overstate the significance of this," said Shayle Kann,

vice-president at GTM Research, who crunched the numbers (disclosure: the author of this article works for GTM's sister media division). "This is emblematic of a sea change in the solar industry and, even more importantly, the energy industry."

Directly comparing the baseload generation potential of a fully constructed nuclear plant with several thousand distributed solar systems would be a stretch. But the juxtaposition of these two experiences – years of delay and billions of dollars in cost overruns for building a centralized nuclear plant versus the rapid installation of distributed solar PV with fewer incentives – offers a look at where the electricity industry is headed.

The last five years have set the stage for a major transition in the U.S. power sector. With natural gas prices still hovering at historic lows, utilities are scrapping plans for nuclear and coal plants in favour of combined-cycle gas plants. And with the cost of wind and solar dropping, renewables are also dominating new power plant development. For example, U.S. utilities could

purchase wind power in 2011 and 2012 for an average negotiated price of 4 cents per kilowatt-hour, according to the U.S. Department of Energy's Lawrence Berkeley National Laboratory.

In 2012, wind was the single biggest source of new generation capacity in America, beating even natural gas. And two-thirds of all distributed solar PV has been installed in the U.S. in just the last two years. The industry is expected to double solar installations in the next two years – deploying between now and 2015 what it previously took four decades to install.

Companies in the power sector are taking notice of these trends, which will bring big changes to the way electricity providers build, own and operate assets on the grid.

"The change is going to be about empowering the end-use consumer to make energy choices for themselves rather than having the government and the public service commissioners tell them how they're going to get the power," declared David Crane, CEO of the independent power company NRG Energy, in a recent television interview.

The Edison Electric Institute (EEI), a trade group representing the nation's utilities, agreed with that assessment. Over the summer, the institute released a landmark report on disruptive energy technologies, declaring a coming transformation in the sector. But its prediction for the future wasn't nearly as rosy as the one from NRG's Crane.

"The financial risks created by disruptive challenges include declining utility revenues, increasing costs, and lower profitability potential, particularly over the long-term," wrote Peter Kind, author of the EEI report.

There's a much catchier phrase for those challenges that is becoming common in energy circles: "utility death spiral."

Since the dawn of the electric grid, utilities have been tasked with building ever bigger facilities to meet ever-growing demand for power. In most cases, regulated utilities' rate of return is tied to selling more electricity, so they have very little incentive to invest in energy efficiency or encourage their customers to invest in technologies like solar. This is the model that allowed large projects like the Vogtle nuclear plant to get financed with the help of ratepayers – even when costs skyrocket.

However, a few things have shaken up that traditional model. The first was deregulation in the 1990s, which broke up utility monopolies in some markets and gave consumers more choice. The second is the falling demand for power in America over the last few years. The third – one that is just now starting to emerge – is the improving economics of efficiency and distributed renewables. Growth is now coming quickly enough that utilities are worrying about what happens when customers don't need to rely on the grid as much.

"WE KNOW THAT DISTRIBUTED ENERGY RESOURCES ARE TAKING OFF SO FAST — IT'S UNSTOPPABLE."

— SONIA AGGARWAL

While that could be a good thing for people who are able to invest in a technology like solar, it could also lead to a smaller number of customers paying for the upkeep of the electrical grid. And if the cost of paying for grid-based electricity rises, investing in distributed energy looks even more attractive to those remaining customers. This is the iterative cycle known as the utility death spiral.

"We're not seeing electric utilities pulling down their poles and their wires. We're a long way from there. But we need to start planning now for when that does happen," said Richard Caperton, managing director of energy at the Center for American Progress. "The ongoing technological improvements that make these new energy resources cheaper and cheaper will lead us down the path to the utility death spiral."


Along with this summer's report from EEI, a number of analysts have written detailed reports in recent months on how utilities can turn this potential death spiral into an opportunity. The latest, America's Power Plan, was reviewed and authored by over 150 experts in the industry. It lays out a broad range of actions that regulators and power providers can take today to prepare for the future.

One of the most important changes would be to scrap traditional rate-of-return regulation for some kind of performance-based model. Rather than simply reward utilities for selling more units of energy, regulators could reward them for the quality of service they provide. This could enable utilities to use their expertise to manage third-party service providers and not feel threatened when customers consume fewer kilowatt-hours.

"We know that distributed energy resources are taking off so fast – it's unstoppable," said Sonia Aggarwal, one of the authors of America's Power Plan. "We need to look at the way policies and market design can catch up with the technology."

In theory, many of these policies are quite easy to implement, both in the United States and neighbouring jurisdictions in Canada. But in reality, there is often resistance from vertically integrated utilities, skepticism from regulators and ratepayer advocates, and concerns from policymakers in states with heavy dependence on fossil fuels. However, the conversation is starting to shift.

"The mere fact that we are seeing the beginning of customer disruption and that there is a large universe of companies pursuing this opportunity highlight the importance of proactive and timely planning to address these challenges early on," concluded EEI's Kind in his report.

For years, people talked about distributed energy in abstractions. But now that these technologies are growing faster every year, thought leaders in the power business are starting to address the new reality. The question is: will they address it quickly enough? 



## PIGGYBACKING PIPELINES

Can right-of-ways for oil and gas pipelines be used strategically to access Canada's stranded renewable riches?

By Tyler Hamilton

**B**illions of barrels of oil and trillions of cubic feet of natural gas lay undeveloped in Canada's Mackenzie Valley, a fact that Bob McLeod never hesitates to raise when on the hunt for foreign investors.

But the premier of the Northwest Territories, speaking last year on a trade mission to Beijing, spoke just as enthusiastically about the vast potential to develop renewable energy resources along the same Mackenzie River system.

"The Mackenzie has some of the best undeveloped hydroelectric resources in North America ... clean energy that would supply a hungry market to the south of us," McLeod told Chinese investors. "It would be a long-term investment with significant upfront capital costs," he added, but "50 to 100 or more years of low operating and maintenance costs will provide an excellent return on investment."

That McLeod chose to highlight the opportunity to develop and export vast amounts of both renewable *and* non-renewable resources is no surprise. More puzzling is that in the larger Canadian context, development of renewables such as hydro and wind power has been largely left out of the energy-export dialogue, along with the associated job creation and energy security benefits it would bring.

The federal government talks broadly about Canada being a clean energy superpower, but when it gets down to specifics it is fixated with building pipelines. The job of those

pipelines is, for the most part, to move diluted bitumen from Alberta's oil sands to energy-hungry markets near and far.

"Our current obsession with pipelines is distracting us," says Danny Harvey, a climate scientist and geography professor at the University of Toronto. "Canada and Alberta need to begin now to prepare for the post-carbon world – a world that will be largely powered by some combination of hydro, wind, solar and biomass energy, all of which are or could be produced in abundance in Canada."

But can pipeline assets, both existing and planned, be leveraged to accelerate the transition to a low-carbon economy? We know that some pipeline owners, such as TransCanada, also have substantial ownership of transmission assets. Internally, do the two sides talk to each other? In an effort to access stranded renewable sources, it may be easier and less costly to build high-capacity, high-voltage transmission lines if they could piggyback, where appropriate, the same right-of-ways already used by pipelines.

It's a question and scenario *Corporate Knights* posed to several experts from the pipeline and power sectors during and after an Enbridge-sponsored roundtable discussion held in Calgary, Alberta, on September 18. Beyond answers like "maybe" and "it depends," we were mostly left with new questions.

Is there a strong enough environmental and economic argument for such an approach? Would the public support it? Who would finance it? Is it the only approach that should be considered? Should the discussion be about exporting green energy generally rather than green electrons specifically?

Some things are clear. There has been little serious research investigating the medium- and long-term economic potential of exporting Canada's renewable energy resources. If such research exists, it is not recent nor in the public domain.

We also know that more than 800,000 kilometres of major pipeline right-of-ways crisscross the continent, often reaching into areas where no major electricity transmission infrastructure exists. More projects are in the planning stages, such as TransCanada's contentious 2,000-kilometre Keystone XL pipeline, which would pass through or near five U.S. states with grid emissions that exceed the U.S. state average. Two of them, Wyoming and North Dakota, have the dirtiest electricity in the country.

Finally, if we are serious about preventing the worst impacts of climate change, the day will come when we'll need to dramatically reduce the amount of fossil fuels mined, pumped and burned. The International Energy Agency estimates that two-thirds of current proven fossil fuel reserves must stay buried to keep the global climate from warming more than 2 degrees C. And it's not just about greenhouse gases. In October, the World Health Organization officially declared air pollution a "leading environmental cause of cancer deaths."

Ultimately, less petroleum is going to have to flow through fewer pipelines, though it's a reality the industry at this point appears unwilling to acknowledge. "The current strategies laid out in (corporate) annual reports talk of growth that is incompatible with emissions limits," according to a recent report from the Association of Chartered Certified Accountants.

With existing and planned pipeline infrastructure investments at risk, the challenge is to find ways to future-proof their value.

### Power Pipe Dream

For the past several years power industry consultant Paul Grant has had his eye on the Mackenzie Gas Project, a proposed 1,200-kilometre pipeline that would connect gas fields in the northern parts of the Northwest Territories to markets in Alberta and the United States. The ambitious project, anticipated to cost at least \$16 billion, was shelved in early 2012 because of the collapse in natural gas prices,

though proponents, such as Premier McLeod, still hope that a change in market conditions will revive interest.

One option, reportedly being considered by project partner Imperial Oil, which is majority owned by ExxonMobil, is to make the pipeline part of a liquefied natural gas (LNG) project that

"IT'S HAPPENING ALL OVER THE WORLD, EXCEPT FOR NORTH AMERICA."

—STEVE ECKROAD

could open up exports to Asia. Grant, a former researcher for IBM and later a scientist at the Electric Power Research Institute (EPRI), envisions that pipeline being built alongside a high-voltage direct-current (HVDC) transmission line that would carry clean electricity south.

"Both the political and economic leverage would be, 'Hey, we're going to build this pipeline anyway, we have all the right-of-ways negotiated with indigenous peoples, and all of the government hurdles are out of the way,'" explains Grant. "I've been trying to convince them to do a paper study on that concept."

The Mackenzie River alone has more than 10,000 megawatts of undeveloped potential. Less than half of 1 per cent of that has been developed. The southwest corner of the Northwest Territories also has geothermal resources capable of producing thousands of megawatts of electricity. Wind resources are also substantial, though best used to help remote communities reduce their dependence on diesel generators.

Grant has a bolder idea. Why not build the most efficient natural gas power plants available right where the gas is produced, then use a portion of that gas to generate low-carbon electricity that can be exported to Alberta and on to U.S. markets? With all that power generation in one location, it would be easier to capture the carbon, and store (or recycle) the carbon emissions, he adds.

It's the very definition of blue-sky thinking, and while Grant admits he has struggled to find an audience for the idea, he says the technology is available – though not commercially proven – to make it economical. The key, he says, is to use an emerging class of superconducting cable that, when kept properly refrigerated, transmits direct current super efficiently at high voltages. It's an approach be-

ing tested in China, Japan and Germany.

"It's happening all over the world, except for North America," says Steve Eckroad, who as a program manager at the utility-funded EPRI has spent years studying superconductivity in power delivery applications.

One of the only companies making superconducting cables is Devens, Massachusetts-based American Superconductor. Managing director Jack McCall, who is in charge of business development at the company, says the cables are capable of carrying up to 150 times more electricity than conventional transmission wires made out of copper and aluminum. And because they're made out of superconducting material, there is no "line loss" of electricity caused by resistance to power flow. That's a big problem with today's transmission technology, which over long distances can see up to a third of electricity lost as heat as it moves from point A to B.

The large carrying capacity and extreme efficiency of superconducting cabling means its relatively higher cost per kilometre becomes more competitive as distance grows. Research by EPRI and American Superconductor has shown that for underground lines of 1,000 kilometres or longer the economics begin to make sense, at least when compared to doing the same with traditional alternating current (AC) overhead transmission lines.

McCall says one major benefit of superconducting transmission lines is that the right-of-way required for them is only 25 feet wide, versus at least 250 feet for overhead transmission. That means it could easily piggyback narrower pipeline right-of-ways, which brings added savings when one considers that most delays and early project costs are related to obtaining easements.

"If you've already gone through that trouble of getting a right-of-way or have an existing one, you avoid that cost," says McCall, adding that the cables emit no heat or electromagnetic fields so could be co-located close to active pipelines. Technically, the superconducting cables could even run through inactive or abandoned pipelines.

### Greener Gas

It's all easier said than done, of course. The technology has yet to be proven beyond the distance of a kilo-

## TRANSMISSION OPERATORS AND OWNERS AN "INSANELY CONSERVATIVE" BUNCH.

— JACK McCALL

metre, and superconducting cable isn't being manufactured in that kind of volume — yet. And just because it may be less expensive over long distances than conventional overhead power lines, that doesn't mean it makes economic sense.

This is why the Institute for Advanced Sustainability Studies in Potsdam, Germany, decided two years ago to explore the approach in more detail. "We're first researching it to see if it's possible, if it's competitive," says Adela

Marian, who is leading the effort. "There needs to be a lot of convincing done at all levels, including industry and government, but we think it has very good potential."

In North America, Enbridge is one major pipeline company increasingly interested in new transmission opportunities. In 2011 it purchased its first power transmission asset — a 345-kilometre export line connecting Alberta with Montana that is expected to enable the development and sale of wind power.


Still, Enbridge believes pipelines, in the end, may be the better way to move green energy over long distances. Instead of building power lines to transmit green electricity, why not use those clean electrons on site to produce hydrogen gas? That hydrogen can then be injected into an existing natural gas pipeline. The more hydrogen injected in that pipeline over time, the lower the carbon content of the gas inside. The concept is called "power to gas," and Enbridge's investment in hydrogen production company Hydrogenics in 2012 is part of its effort to introduce the approach to Canada.

Chuck Szmurlo, vice-president of alternative and emerging technologies at the Calgary-based pipeline company, says pipelines not only can act as a carrier of green energy, they provide a way to store renewable electricity when it's not needed — all while reducing the carbon footprint of natural

gas. "The natural gas system is so big, even a couple of per cent of hydrogen in the mix would represent all electricity from renewables," he says.

Enbridge's willingness to experiment shows how different pipeline companies are from utilities. McCall calls transmission operators and owners an "insanely conservative" bunch that never wants to be the first to install a technology. "They want to be the 10th," Grant says utilities by nature don't like to stray from the norm. "It's the hassle factor," he says. "It presents a new skills set they have to deal with."

It may be that pipeline companies — which, compared to power utilities, invest much more in research and development — will have to take the lead when it comes to embracing an uncertain future. Whether it's piggybacking pipelines with next-generation transmission or using gas pipelines to carry and store green energy, it's clear there are options out there.

Faced down the road with the possibility of having to write off billions of dollars of infrastructure as a casualty of our carbon crackdown, it may be wise to start studying these options now. 



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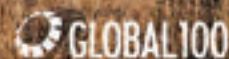


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# TESTING THE WATERS

With hydraulic fracturing exempt from U.S. government oversight, states search for novel ways to regulate fracking fluids.

By Jeremy Runnalls

**I**RON MOUNTAIN, Michigan — Wherever Jim Peters goes, a contingent from the Committee to Ban Fracking in Michigan follows. The operations manager at NorthStar Energy LLC and representative for the Michigan Oil and Gas Producers Education Foundation admires their perseverance, but says they're not there to have a discussion. "They just poison the atmosphere for everyone else," he complains to a group of journalists gathered on the shores of Lake Antoine. The fracking wars have touched down in "the Wolverine State."

Hydraulic fracturing, or fracking, is a process wherein rock is fractured by a pressurized liquid. Popularized by the discovery of horizontal drilling in the late 1990s, it has led to the natural gas and tight oil boom currently powering the ongoing energy revolution in North America. Thirty-one states now contain potentially viable shale gas plays, including Michigan.

Few issues cause as much political heartburn as the expansion of fracking in the United States. The International Energy Agency estimates that U.S. gas output will continue to increase for the next five years, on top of the sixfold increase that has occurred since 2007. Proponents such as John Griffin, a spokesman for the American Petroleum Institute in Michigan, believe that the continued expansion of natural gas is a necessity. "It's strengthening America's energy security, and creating jobs at home," says Griffin, "all while reducing overall emissions."

Opponents of fracking are convinced that industry is glossing over the environmental consequences. From fears about fresh water depletion, methane emissions and earthquakes, community opposition to new wells has been fierce.



Scientists have been considering the idea of putting tracers in the fracking fluid.

Illustration by Paul Blow

But the greatest concern remains groundwater contamination. To dislodge oil and gas from within rock formations, a mixture of sand and chemicals is added to water during the fracking process. Local residents are apprehensive about these chemicals infiltrating local water supplies. Further complications arise during the treatment process, as wastewater needs to be stored before being treated or reused.

There has been some evidence of groundwater being affected around drill sites, including a recently published study by researchers at the University of Texas that found higher levels of heavy metals, including arsenic, in groundwater around fracking sites in the Barnett Shale deposit. Another study released this year found elevated radium levels in wastewater discharged from a Pennsylvania treatment plant. Other research, however, has found no

fluid that is sourced entirely from the food industry," he told committee members. "Without proprietary protection, it would not have invested in its development." Lawsuits are underway in several states challenging the use of trade secret exemptions, including one suit currently pending before the Wyoming Supreme Court.

Twelve states have made the submission of chemicals to the website clearinghouse FracFocus a disclosure requirement. The online registry for chemicals, with 45,000 records from more than 400 companies, is managed jointly by the Groundwater Protection Council and the Interstate Oil and Gas Compact Commission. Amy Mall, a

## SOME RESIDENTS JUST DON'T TRUST COMPANIES TO BE OBJECTIVE.

such link. An ongoing U.S. Department of Energy study in Pennsylvania tagged tracers with unique markers. Described as the first independent look at the movement of toxic chemicals during drilling operations, a year in it has showed no evidence of chemical contamination of drinking water.

Little federal regulation currently exists on fracking, largely due to the original passage of the Energy Policy Act of 2005. Language within the bill, known as the "Halliburton loophole," exempted drilling companies from complying with the Clean Water Act. Subsequent bills in Congress aimed at defining hydraulic fracturing as a federally regulated activity under the Safe Drinking Water Act have gone nowhere, which has forced individual states to establish their own guidelines.

Wyoming was the first state to require disclosure of fracking fluids to the public in September 2010, followed by Arkansas, Pennsylvania and Michigan. Fifteen states now have laws on the books, with legislation pending in an additional seven states. Some regulatory structures only require confidential disclosure of fluids to regulators, none of which are released to the public. Even in states that require public disclosure, according to Jennifer McKay, a policy specialist for the Michigan-based Tip of the Mitt Watershed Council, a "trade secret" exemption allows companies to omit information to protect intellectual property.

At a recent State Senate hearing in Texas, Marc Edwards, Halliburton's senior vice-president of completion and production, defended the necessity of trade secrets. "Halliburton has the only frack

senior policy analyst at the Natural Resources Defense Council, testified at the same hearing as Halliburton about the problems with the system. "The problem with FracFocus is that it's not a government website with specific requirements and a legitimate process to determine what actually is a trade secret," she explained. A Harvard Law School study in April showed some companies claiming a chemical as proprietary in one state while disclosing it in another.

Some companies, like Canadian natural gas giant Encana, have developed their own internal rules for screening chemicals with the potential to impact human health. The Calgary, Alberta-based company, which has extensive shale gas plays across the U.S., launched the Responsible Products Program in conjunction with a third-party toxicologist. "To give you a scope of the program," says Spencer Forgo, a communications advisor for the company, "over the course of 2012 we assessed in excess of 350 fluid system products across our operations." Fluids containing arsenic, cadmium, chromium and other metals have been banned by Encana already, and the company is pushing to adopt the practice across the industry in North America.

Fracking remains in its infancy

in Michigan, with only 19 new wells having been drilled since 2010. That pales in comparison to the 13,540 wells drilled in Texas alone last year. It's for this reason that proactive regulations should be put in place to ensure the growth of a well-regulated industry, says McKay. "Our top priorities remain the full disclosure of chemicals, paired with baseline testing," she said. Companies are not required to release information on fracking cocktails until 60 days after fracking occurs, making testing for specific fracking fluids all the more difficult. Some companies, such as Encana, offer free tests to homeowners who live near wells, but homeowners are often wary to accept these offers. "Some residents just don't trust companies to remain objective," says Emily Whittaker, a policy specialist at Freshwater Future. In August, the environmental NGO began offering its own testing program for any Michigan citizen with concerns.

With many fracking cocktails proprietary and likely to remain so in the future, those conducting tests often don't know what they're looking for. Scientists have been looking for alternative ways around this, including the idea of putting tracers in the fracking fluid. Using a similar method as the Department of Energy study, competing companies that began at Rice University and Duke University are racing to bring trace fracking fluids to market. A field test is currently underway at a well site in Texas. The appeal of this technology is that it would allow companies to continue to guard trade secrets, while adding definitive traceability into the process.

Lawmakers have already put forth bills in the Texas legislature to mandate the use of tracers, but industry remains non-committal on the subject. "If companies want to adopt this on a voluntary basis they should go right ahead, but in my opinion adding another layer of regulation for companies is not necessary," says Barclay Nicholson, an energy and commercial litigation attorney at Norton Rose Fulbright's Houston office.

For some, hydraulic fracturing will never be safe enough to accept. Activists are currently circulating a petition to place a Michigan fracking ban on the 2014 state-wide ballot. LuAnne Kozma, the spokesperson for Ban Michigan Fracking, explained her reasoning when announcing the creation of the group. "We know enough now to demand a ban," she declared in a press release. ❧