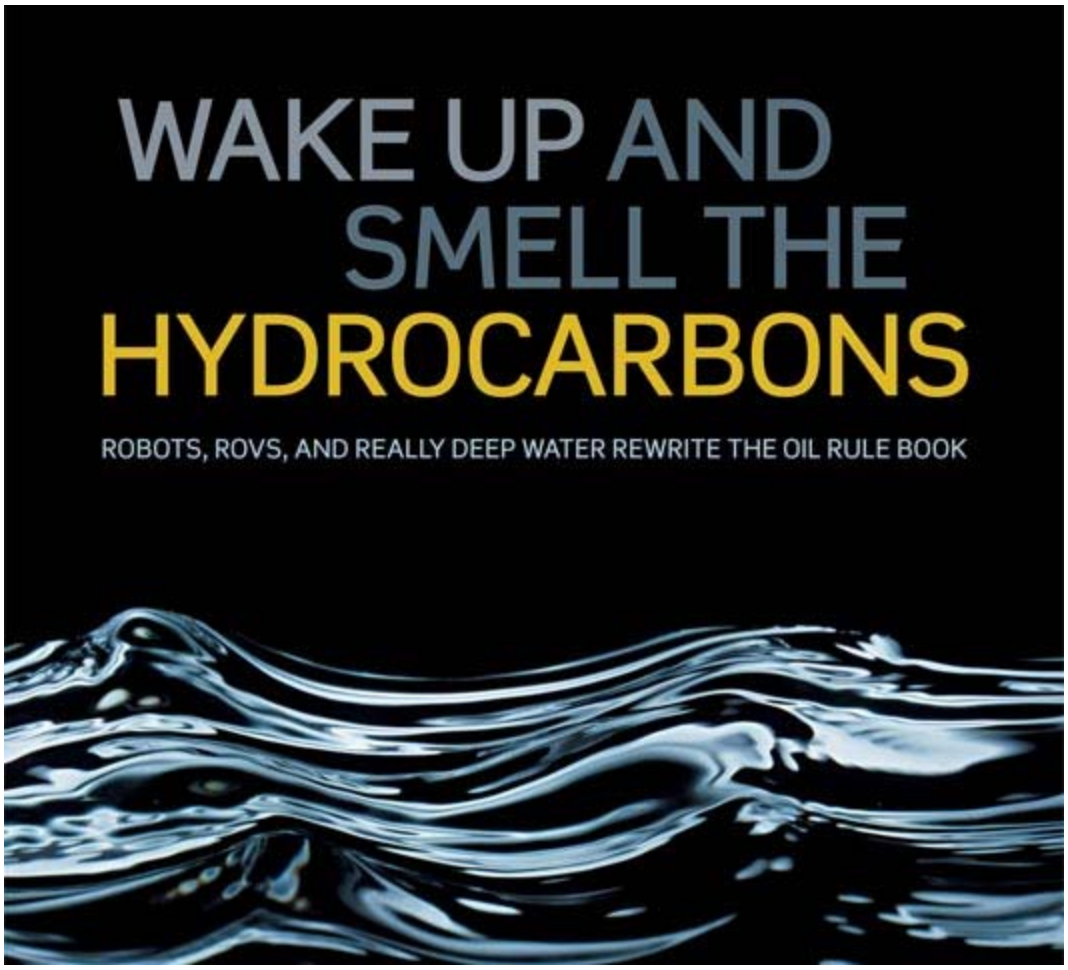

Picture this: On the floor of the Gulf of Mexico, nearly 10,000 feet below the surface — that's around two miles down — robots are laying pipe while an ROV (remote-operated vehicle) continually surveys the scene, providing a steady stream of real-time data. Meanwhile, somewhere back in Houston — or maybe farther away, in London, perhaps, or Hong Kong — a team of petroleum engineers is studying computer monitors and live video feeds from the Gulf to stay in sync with what is happening there, working to produce ever more oil and natural gas from places where nobody could have imagined drilling even a generation ago.

There are no humans at the drilling site — not a one.

This may well be the future that lets us heat our homes and power our cars; and that future may be here by the year 2020. "That's the obvious next step, letting robots do the work on site," says futurist Dan Burrus, author of *Technotrends*. The time frame: probably in the next 10 years, and the experts say it cannot come a moment too soon. That's because oil and gas companies have produced the easy hydrocarbons. What remains is the energy that is dramatically harder to get to. This is oil that lies maybe miles below the sea surface or is hidden below frozen tundra.

It’s in places that are plain nasty to work in. At this month’s Offshore Technology Conference, more than 70,000 oil and gas exploration professionals from all over the world will converge on Houston to discuss how to make that future happen. One thing they all hear is the clock ticking, because nowadays, change is coming fast to the petroleum business.

Actually, we are already hip deep in the transformation of hydrocarbon production. Go back just a single generation and you’d find hundreds of workers jamming big offshore platforms. One thousand feet of water was big-time deep for drilling then, and the strong preference was for tranquil seas near the shoreline. Now big oil is pushing into previously unimaginable depths in the Gulf of Mexico (as far as 10 miles below the surface). Explorers also are plunging into the frozen seas off Alaska and probing off western Africa. “Frontier exploration is the order of the day,” says James Spear, vice president and chief geologist for Hyperdynamics/SCS Corporation, a Houston-based oil and gas exploration company that is actively exploring tracts off the coast of the Republic of Guinea in western Africa.

“Oil and gas just have to be found in more remote places,” adds Chris Nuttall, a petroleum expert with PA Consulting Group in New York.

More than 40 percent of the United States’ total energy needs today are supplied by oil. Estimates by the Energy Information Administration predict that even as far out as 2030, oil and gas will provide roughly 61 percent of North American energy needs. “We are going to be reliant on petroleum for a significant period,” says futurist Herb London, president of the New York–based think tank the Hudson Institute.

Shell’s Perdido development, off the coast of Freeport, Texas

Global demand will only intensify the pressures on the world’s shrinking hydrocarbon reserves. Deloitte Services LP energy consultant Branko Terzic says that, broadly speaking, 2 billion people on the planet right now have adequate energy, 2 billion have inadequate energy (sometimes it is there, sometimes not), and 2 billion have no electricity at all. And the have-nots want to join the haves. “Energy demand is growing very strongly across the globe,” says Terzic, who adds that the appetite for power will not diminish soon in China, India, Brazil, and the globe’s other emerging economies.

The big question: 10 years from now will we all be running on empty?

Ask the experts and they are actually upbeat — assuming oil stays over $70 per barrel (as this is written it is hovering near $110). According to Exploration and Service Manager Alan Murray with the research firm Wood Mackenzie in Edinburgh, Scotland, at that price point, taking the risks necessary to find the new oil fields makes real economic sense. “The industry will have to operate in ever more demanding environments,” adds Steve Casteel, a senior vice president with the Montreal-based global security firm Garda.

Think about ice, lots of it. Right now, Shell, for instance, is exploring two areas off the coast of Alaska in the Beaufort and Chukchi seas. Up there, says Travis Purvis, a well delivery manager for Shell Alaska, “you can go from open water to slush to ice coverage, literally within a matter of hours.” Picture an iceberg barreling toward the drilling rig. If it hits the rig straight on, an environmental catastrophe could result. But Shell scientists say that is highly unlikely. Satellite images, sonar, and onsite monitoring of the oil field alert the team when an iceberg shows up, Purvis says, and decisions get made, pronto. “We decide if we can manage it with our ice breakers. Or, if we have to, we can secure the well, pull up our anchors, and move off location with the drill ship because it couldn’t withstand the impact. We have options.”

Move south now, to Shell’s Perdido development, a huge petroleum find that sits in 8,000 feet of water, about 200 miles south of Freeport, Texas, in the Gulf of Mexico. According to Dale Snyder, Perdido project manager for Shell, the company is building a platform with two helicopter landing pads and also has contracted its own long-range helicopters.

Given the need to search for oil in ever more remote places, it’s no surprise that, along with robotics, the other big trend that will reshape how oil and gas are produced is “a push for sub-sea production,” according to Charlie Williams, a chief scientist at Shell. That’s the big idea that is tantalizing oil futurists — remove humans from the offshore platforms, give their jobs to robots, and design technology that will work on the sea floor.

“Sub-sea production has emerged as a strong trend,” agrees Eric Smith, associate director of the Energy Institute at Tulane University, who adds that trials in the North Sea have shown promise. Moreover, he says, the industry is increasingly determined to bring this technology to fruition.

Halliburton executive vice president Tim Probert neatly wraps up the oil industry’s ambitions with a bright bow: “We talk about the next trillion barrels. In the industry we believe we’ve pumped around 1 trillion barrels since Colonel Drake’s well in the 1850s [the Pennsylvania find that ushered in commercial oil production]. We expect to produce the next trillion barrels in the next 30 years or so.”

But don’t get the idea that all this technology means a *Matrix*-style world where humans are dispensable. Hardly. Purvis of Shell Alaska says that an upshot of the new technology is that he can sit on his sofa using a laptop and monitor production at distant wells via the Internet — and he is not exaggerating. That’s because, as robotics replace human eyes on site, oil companies are rushing to find ways to let remote eyes, many pairs of them, stay fully tuned to distant production.

Purvis explains: “We are setting up real-time operations centers. These are places where we can bring in data from around the world to a center of experts who are watching this data in real time all the time. That is true in the Gulf of Mexico and in Alaska. We have technology and sensors at the end of our drills, so when we’re drilling ahead we can see these data. These data will be streaming via satellite to the real-time operations center in Houston. We’ll also have a hub here in Anchorage, so we’ll have that same data

streaming into the Anchorage office, and frankly, if I want to be at my house on a Saturday morning and log in and take a look at what's going on at the drill ship, I can do that as well."

A lot more innovation is likely just around the bend, as petroleum companies grapple with the need to produce more energy, faster. The good news: advances are feeding on each other. "We are at a tipping point," says Andrew Steinhubl, an energy expert with consulting firm Booz Allen Hamilton. Where before, companies were gingerly taking small steps to embrace paradigm-shattering technologies, now they are in full gallop, Steinhubl claims, and the simple reasons are that we need the energy, and the new technology works.

"It's taken a while to get real uptake," Steinhubl says. "But we definitely are there now."

— *Robert McGarvey*