already 20 percent cheaper than they were last year, as traders factor in the impending availability of cheaper power from the EU and Scandinavia.

Natural gas options are also opening up. Last year Lithuania began operating the Baltic states' first liquefied natural gas terminal, which is receiving Norwegian gas.

The Baltics are also taking steps to synchronize with Europe's grid. Currently, the three countries' grids form the western flank of a massive interconnection that spans eight time zones and is dominated by Russia's power system. But earlier this year the Baltic transmission system operators hammered out a joint plan outlining how to desynchronize their AC grid from the Moscow-directed interconnection and synchronize it with Europe's. The specified power line reinforcements and upgraded grid controls could take a decade to complete and could cost the Baltics €1 billion (approximately US $1.08 billion), according to Virbickas.

That may be more than the Baltics can earn back from a more fluid power market. But the cost and effort is justified, says Virbickas, because it will boost supply security. He expects Lithuania to be an equal partner in the cooperative management of continental Europe's grid by the European Network of Transmission System Operators for Electricity, the Brussels-based consortium of European grid operators. In contrast, he says, the Baltic grid operators have little role in determining how the Russian grid is run.

One delicate question remains unanswered, however: the electrical fate of Kaliningrad, a Russian exclave that's sandwiched between Poland and Lithuania. Discussions on whether Kaliningrad will become an electrical island or join the European grid ended with the breakdown in Russia-EU relations last year. "It is a difficult project geopolitically because we have Kaliningrad in between," predicts Romas Švedas, formerly a Lithuanian diplomat and vice minister of energy. "It will be a lengthy process." —PETER FAIRLEY

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FBI WANTS BETTER AUTOMATED IMAGE ANALYSIS FOR TATTOOS

It's a tougher problem than facial recognition

Nothing makes a statement quite like a tattoo. And law enforcement in the United States increasingly uses them to help identify criminals and, sometimes, the victims of crime or natural disasters.

Today police take photographs of tattoos when suspects are booked, categorizing them using keywords defined in a biometric standard called ANSI-NIST-ITL 1-2011. The standard has eight main categories, such as "animal" and "plant," as well as 70 subcategories, such as "cat," "bird," "flower," and "leaf." The FBI maintains a database of tattoos as part of its Next Generation Identification Program, but searching by keyword is problematic because the categories aren't granular enough and different people often tag the same tattoo differently.

"It's very subjective as to what each person sees within a tattoo," says Eric Phillips, management and program analyst at the FBI's Biometric Center of Excellence, in Clarksburg, W.Va.

The stylized letter *D* insignia of the Detroit Tigers baseball team, for example, is easily misinterpreted, says Mei Ngan, a computer scientist at the National Institute of Standards and Technology (NIST). One person might recognize it as the team's emblem, but another might see it as just a letter, and yet another might consider it an abstract design.

That's why the FBI would prefer to use image-based tattoo recognition technology. Rather than rely on keywords, it would use an algorithm to compare and match features extracted from the image itself. The FBI turned to NIST, which issued a challenge last fall to assess the state of the art of such technology. Six organizations participated, running their algorithms against a set of data provided by the FBI. The organizations were

image-analysis and algorithm-development firm Compass Technical Consulting; the Fraunhofer Institute of Optronics, System Technologies and Image Exploitation; the French Alternative Energies and Atomic Energy Commission; nonprofit research contractor MITRE; security and identity tech firm MorphoTrak; and Purdue University.

In June, the six groups reported on how well their algorithms performed in five different types of searches. The algorithms did well in three of these searches, achieving success rates of 90 percent and above in detecting whether a given image contained a tattoo; identifying the same tattoo on the same person, over a span of time; and identifying a small segment of a larger tattoo.

The algorithms performed poorly—with hit rates as low as 15 percent—at two tasks: identifying visually similar tattoos on different people, and searching for similar tattoos across a variety of media, including sketches, scanned prints, and computer graphics.

The tattoo image algorithms are similar to those used in facial and other image-recognition technologies, says Anil K. Jain, a professor of computer science and engineering at Michigan State University, which licensed an algorithm developed by its researchers to MorphoTrak three years ago. The algorithms are all based on extracting key points in an image. However, where fingerprints have ridges and valleys, and faces have eyes and noses, tattoos have no standard features to identify and compare, he says.

(Jain recently proved that a person's fingerprints remain basically unchanged over time. Surprisingly, this assumption had gone unproved despite the heavy reliance on fingerprints in criminal justice.)

Beyond highlighting the weakness in algorithms, the challenge demonstrated the need for improvement in two areas, says NIST's Ngan. First, she says, law enforcement needs to develop best practices in how to collect tattoo images: Take separate photos of each tattoo on each forearm rather than one photo of both forearms, for example, and make sure clothing or jewelry does not partially obscure the image. Second, the biometrics industry must better define what in a tattoo image it wants the technology to compare. "We need to give the algorithms a better definition of what we consider to be similar," Ngan says.

—TAM HARBERT

> Fingerprints have ridges and valleys, and faces have eyes and noses, but tattoos have no standard features to identify and compare

A WEARABLE TURNS BASEBALL PITCHING INTO A SCIENCE

Teams are keen, but some pitchers see a downside to the data

A wearable sensor that tracks strain on a pitcher's elbow is making waves in major league baseball (MLB). This season, 27 MLB teams and their minor league affiliates are trying out the device, called the mThrow, in the hope that it will help monitor pitchers' workloads, improve pitching mechanics, and prevent injuries. The device's maker, Motus Global, in Massapequa, N.Y., plans to officially launch a consumer version this month. Teams seem to like it, but some players might have reservations about sharing their data.

Injuries to professional pitchers in the United States have become epidemic. The reconstructive procedures known as Tommy John surgeries, which repair the elbow's ulnar collateral ligament (UCL), have increased among major league players from 14 performed in 2002 to 31 in 2014, according to the blog Baseball Heat Maps. Attempting to curb such injuries by arbitrarily limiting the number of throws or innings pitched hasn't been effective, says Thomas Karakolis, an expert on the subject at the University of Waterloo in Ontario, Canada. "Baseball managers should be figuring out the forces on muscles, tendons, and ligaments for each individual player and guiding them based on that," Karakolis says.

The mThrow could be the key to that. But first, Motus must derive meaning from the data it is amassing. "I don't think we quite have a grasp of all the information [the mThrow] is giving us, but I think it's the beginning of something very big," says Jamie Reed, senior director of medical operations for the Texas Rangers, whose major and minor league teams are using the device.

The mThrow consists of a compression sleeve with a small removable sensor worn in a pocket over the elbow. The sensor's accelerometers and gyroscopes

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