

# From the ocean floor to batteries—partners in energy

## Heading into deep water

### Perth researchers help Chevron keep oil and gas flowing smoothly

Out in the Gulf of Mexico Chevron are operating a \$7.5 billion platform that's recovering oil and gas from two-kilometre-deep ocean. It's the largest and deepest operation in the Gulf, with over 146km of pipeline bringing oil and gas to refineries. But pipelines operating at extreme depths in cold water and crushing pressure are prone to blockage. University of Western Australia researchers are helping Chevron keep oil and gas flowing through deep-water pipes.

Ice-like solids known as gas hydrates can form in pipelines when water and natural gas are exposed to high pressures and the low temperatures of the ocean floor. "Deep ocean blockages are difficult and expensive to fix. You can't send divers down," says Eric May, the Chevron Chair in Gas Process Engineering at the University of Western Australia.

"We've shown that new pipeline heating technologies are safe for both preventing and removing hydrate blockages. Working with Chevron Energy Technology Company in Houston, Texas, we've made software available to industry to help assess the risk of blockage. We've shown that in many circumstances pipeline heating systems can safely remove a blockage."

#### Avoiding shutdowns

When the gas reaches land, the challenges continue. Chevron has invested over \$50 billion to produce natural gas and convert it to LNG on Barrow Island off the West Australian coast. "LNG plants are at risk of unplanned shutdowns caused by contaminants like benzene freezing in the cryogenic heat exchangers that liquify the natural gas. A single unplanned shutdown can cost at least \$20 million," says Eric. He and his colleagues have already developed new computer models to help plant operators reduce the risk of a shutdown. Now they've established the Australian Centre for LNG Futures with the support of GE Oil and Gas, Clough Engineering, and the Australian Government. Together they're planning to build a micro-scale LNG plant to test ideas for improving reliability and efficiency.

"A one per cent improvement is a big deal when you're producing \$100 billion of gas each year."

East Penn Manufacturing are developing CSIRO battery technology for grid storage and hybrid cars.



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### From car batteries to grid storage

New battery technologies are in the news. But there's still life in lead. East Penn Manufacturing operates the largest single-site, lead-acid battery manufacturing facility in the world in Berks County, Pennsylvania. They argue that their new lead batteries are 99 per cent recyclable and ideal for large-scale storage. To prove it, they're developing a 3MW power storage system using the UltraBattery technology invented by Australia's CSIRO.

By combining lead-acid technology with a supercapacitor, the UltraBattery not only charges and discharges rapidly, but lasts four to five times longer than an ordinary battery.

The UltraBattery also costs about 70 per cent less to produce than the nickel-metal hydride batteries normally used in electric vehicles. In 2014 Kia Motors displayed a concept car using an UltraBattery made by East Penn.

### Also...

CSIRO is collaborating with the US Army Research Laboratories, the Department of Energy and others on advanced electrolytes for batteries, lithium-sulfur and lithium-air batteries, and ways to better integrate renewable energy generation and battery storage across national electricity grid systems.

The Australian Solar Thermal Research Initiative is working with the US Department of Energy and Arizona University to bring down the cost of solar thermal energy.

The US Navy has signed an agreement with the Queensland Government to develop biofuels for Navy ships.

The Rockefeller Centre in New York is using Opticool, an energy management system developed by CSIRO to keep its occupants comfortable.

Read about these, and other Australia-US partnerships in mining, cyber security, advanced manufacturing, food and more at [www.usa.embassy.gov.au](http://www.usa.embassy.gov.au)



Australian Government



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Liquid natural gas production plant on Barrow Island, Western Australia  
Photo courtesy Chevron Australia

