# PRESS KIT

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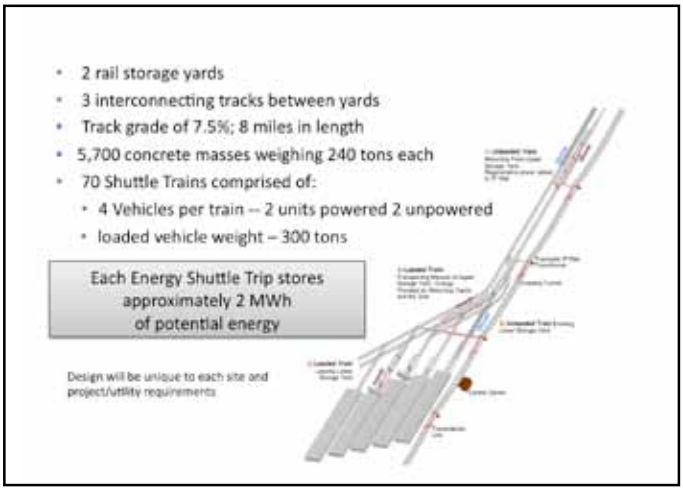
ARES' mission is to deploy its energy storage technology to enable the global electric grid to integrate unprecedented amounts of clean, environmentally responsible, renewable energy while maintaining reliable electric service necessary to power growth and economic prosperity.

## What Is ARES?

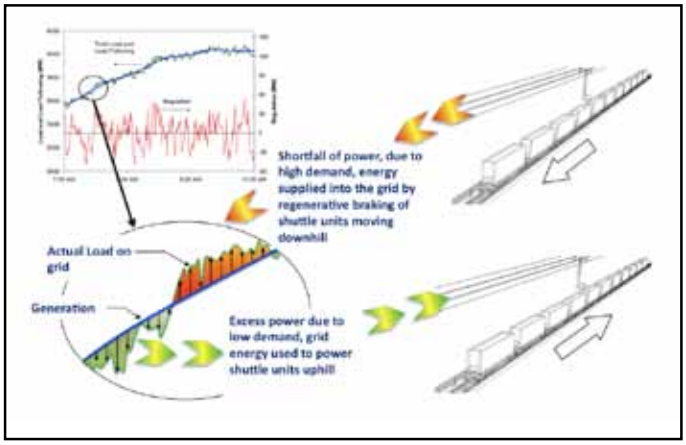
ARES has developed a breakthrough gravity-based energy storage technology that will permit the global electric grid to more effectively, reliably and cleanly assimilate renewable energy and will provide significant stability to the grid. ARES stores energy by raising the elevation of mass against the force of gravity, and recovers the stored energy as the mass is returned to its original location. ARES has combined proven electric railroad technology with modern electronics in an internationally-patented system that has very low technology risk, growing markets, limited competition and expected high returns to investors.

ARES will use surplus wind/solar energy or other low-cost energy from the grid to move millions of pounds of mass uphill on railroad shuttles, effectively storing thousands of megawatt-hours (MWh) of potential energy, enough to power a medium-sized city for several hours.

### How ARES Performs Storage
(333MW with 8 hours storage)




### How ARES Performs Frequency Regulation



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## What Are Ancillary Services And How Can ARES Help?

Because of its flexibility, ARES can provide a wide range of what are referred to as “ancillary services,” which enable the grid to adjust to momentary changes in demand, stabilize voltage and provide emergency capability to restart generators following catastrophic failures.

There is an active market and need for ancillary services in the US. ARES systems can provide grid-scale ancillary services, including Regulation Up, Regulation Down, Spin, Non-Spin and Replacement Reserves, VAR Support, Blackstart and Grid Inertia.

The ARES fast response technology bridges the power gap between large scale battery and flywheel installations and far larger pumped-storage hydro – at a lower life-cycle cost than batteries, a higher energy-to-power ratio than flywheels and a greater efficiency and far faster ramp-rate than pumped-storage. In the U.S, ancillary services are sold into both real-time and day-ahead markets. These services are generally operated by Independent System Operators (ISO) or Regional Transmission Organizations (RTO) under federal jurisdiction.

### ARES Energy Storage Performance

| | |
|---|---|
| Scalability | 100 – 3,000 MW |
| Storage Duration | 2 – 24 hours |
| Response Time (0 to 100% rated power) | 5 Seconds to Full Charging<br>25 Seconds to Full Discharging |
| Round-Trip Efficiency | 78.3% |
| Time from Full Charge to Full Discharge | 34 seconds |
| Standby Storage Losses | None |
| VAR Support Capacity (Reactive Power) | 25 – 125% of rated power |
| System Life | 40 years + |

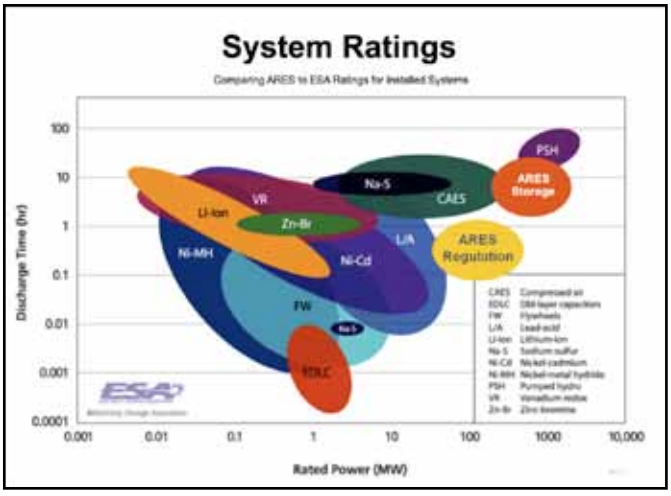
### ARES Fast Response Regulation Performance

| | |
|---|---|
| Scalability | 10 – 200 MW |
| Storage Duration | 15 – 60 minutes |
| Response Time 0 to 100% Reg-Up Power | < 10 seconds |
| Response Time 0 to 100% Reg-Dn Power | < 4 seconds |
| One-way Efficiency | > 91.6% (Combined M&E) |
| Time from Full Charge to Full Discharge | <13 seconds |
| VAR Support Capacity (Reactive Power) | 25 – 125% of rated power |
| Standby Storage Losses | None |
| System Life | 40 years + |

## ARES Pilot Project

ARES has successfully built and operated a rail-based energy storage project in Tehachapi, California, which demonstrates its fast response energy storage technology. The system stores and releases electrical energy by rapidly shuttling a six ton rail vehicle along a steep-grade electrified railroad constructed in the midst of one of the most active wind farm areas in the world. The testing has successfully demonstrated ARES’ ability to rapidly input or withdraw power from the electrical grid in response to fluctuating electrical loads while operating under various environmental conditions. The ARES Tehachapi facility will remain an active test bed and research facility as ARES continues to develop green energy storage.

### ARES vs Other Energy Storage Technology



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## Energy storage

# Packing some power

**Energy technology: Better ways of storing energy are needed if electricity systems are to become cleaner and more efficient**

read the complete article HERE

Mar 3rd 2012


SUMMER in Texas last year was the hottest on record. Demand for power spiked as air conditioners hummed across the state. The Electric Reliability Council of Texas (ERCOT), the state grid operator, only narrowly avoided having to impose rolling blackouts. To do so, it had to buy all the electricity it could find on the spot market, in some cases paying an eye-watering 30 times the normal price.

On paper at least, ERCOT ought to have had plenty of power. In 2010 it reported 84,400 megawatts (MW) of total generation capacity, well over last summer's peak demand of 68,294MW. In theory, this is enough to produce some 740 billion kilowatt hours (kWh) of electricity a year—more than double the 319 billion kWh that ERCOT's customers actually demanded during 2010. In electricity generation, however, aggregates and averages carry little weight. One problem is that wind energy accounted for 9,500MW of ERCOT's total capacity, and the wind does not blow all the time. It tends to be strongest at night, when demand is low. Moreover, power firms are required by regulators to maintain a safety margin over total estimated demand—of 13.75%, in ERCOT's case—in order to ensure reliable supply.

If only it were easier for ERCOT and other utilities to store excess energy, such as that produced by wind turbines at night, for later use at peak times. Such "time shifting" would compensate for the intermittent nature of wind and solar power, making them more attractive and easier to integrate into the grid. Energy storage also allows "peak shaving". By tapping stored energy rather than firing up standby generators, utilities can save money by avoiding expensive spot-market purchases.

Surely the answer is to use giant batteries? Although batteries can deliver power for short periods, and can smooth out the bumps as different sources of power are switched on and off, they cannot provide "grid scale" performance, storing and discharging energy at high rates (hundreds of megawatts) and in really large quantities (thousands of megawatt hours). So other technologies are needed—and growing demand, driven chiefly by wider use of intermittent renewable-energy sources, is sparking plenty of new ideas.

### It's got potential

The most widely used form of bulk-energy storage is currently pumped-storage hydropower (PSH), which uses the simple combination of water and gravity to capture off-peak power and release it at times of high demand. Pumped-hydro facilities typically take advantage of natural topography, and are built around two reservoirs at different heights. Off-peak electricity is used to pump water from the lower to the higher reservoir, turning electrical energy into gravitational potential energy. When power is needed, water is released back down to the lower reservoir, spinning a turbine and generating electricity along the way. PSH accounts for more than 99% of bulk storage capacity worldwide: around 127,000MW, according to the Electric Power Research Institute (EPRI), the research arm of America's power utilities.

Yet despite its dominance, traditional PSH has limited capacity for expansion. The kind of sites needed for such systems are few and far between. As a result, several firms are devising new forms of PSH.

One ambitious idea (pictured above) is the Green Power Island concept devised by Gottlieb Paludan, a Danish architecture firm, together with researchers at the Technical University of Denmark. This involves building artificial islands with wind turbines and a deep central reservoir. When the wind blows, the energy is used to pump water out of the reservoir into the sea. When power is needed, seawater is allowed to flow back into the reservoir, driving turbines to produce electricity.

Gravity Power, a start-up based in California, has devised a system that relies on two water-filled shafts, one wider than the other, which are connected at both ends. Water is pumped down through the smaller shaft to raise a piston in the larger shaft. When demand peaks, the piston is allowed to sink back down the main shaft, forcing water through a generator to create electricity. The system's relatively compact nature means it can be installed close to areas of high demand, and extra modules can be added when more capacity is needed, says Tom Mason, the firm's boss.

Another company looking to harness the potential of gravity is Advanced Rail Energy Storage (ARES), based in Santa Monica, California. Its system uses modified railway cars on a specially built track. Off-peak electricity is used to pull the cars to the top of a hill. When energy is needed, the cars are released, and as they run back down the track their motion drives a generator. Like PSH, the ARES system requires specific topography. But William Peitzke, the firm's boss, says ARES delivers more power for the same height differential. He also says it is more efficient, with a round-trip efficiency—the ratio of energy out to energy in—of more than 85%, compared with 70-75% for PSH. A demonstration system is being built in California, and should become operational in 2013.

The second-biggest form of bulk-energy storage, though it is dwarfed by PSH, is compressed-air energy storage (CAES). This involves compressing air and storing it in large repositories, such as underground salt caverns. During peak hours the air is released to drive a turbine. There are only two commercial CAES plants in operation: one in Huntorf, Germany, and the other in McIntosh, Alabama. The big drawback of CAES is its inefficiency. According to RWE, a German utility, the Huntorf plant is only 42% efficient, and the one in Alabama is only slightly better. The problem is that air heats up when pressurised and cools down when expanded. In existing CAES systems energy is lost as heat during compression, and the air must then be reheated before expansion. The energy to do this usually comes from natural gas, reducing efficiency and increasing greenhouse-gas emissions.

As with hydro storage, efforts are under way to adapt the basic concept of CAES to make it more efficient and easier to install. RWE is working with GE, an industrial conglomerate, and others to commercialise a compressed-air system that captures the heat produced during compression, stores it, and then reapplies it during the expansion process, eliminating the need for additional sources of heat. Having proven the theoretical feasibility of this concept, the partners must now overcome the technical hurdles, which include developing pumps to compress air to 70 times atmospheric pressure, and ceramic materials to store heat at up to 600°C. The aim is to start building a 90MW demonstration plant in Strasfurt, Germany, in 2013, says Peter Moser, the head of RWE's research arm.

Several smaller outfits are also developing more efficient forms of CAES. SustainX, a company spun out of Dartmouth University's engineering school and supported by America's Department of Energy (DOE) and GE, among others, has developed what it calls "isothermal CAES", which removes heat from the compressed air by injecting water vapour. The water absorbs the heat and is then stored and reapplied to the air during the expansion process. And rather than relying on salt caverns, SustainX uses standard steel pipes to store the compressed air, allowing its systems to be installed wherever they are needed. The firm has built a 40 kilowatt demonstration plant and is partnering with AES, a utility, to build a 1-2MW system. General Compression, a Massachusetts-based company also backed by the DOE, has developed an isothermal CAES system focused on providing support to wind farms. With the backing of ConocoPhillips, an energy giant, it is building a 2MW demonstration plant in Texas.

Another way to store energy is in the form of heat. That is the approach taken by Isentropic, a company based in Cambridge, England, with a system it calls pumped heat electricity storage (PHES), which uses argon gas to transfer heat between two vast

tanks filled with gravel. Incoming energy drives a heat pump, compressing and heating the argon and creating a temperature differential between the two tanks, with one at 500°C and the other at -160°C. During periods of high demand, the heat pump runs in reverse as a heat engine, expanding and cooling the argon and generating electricity. Isentropic says its system has an efficiency of 72-80%, depending on size.

BrightSource Energy, an energy company based in Oakland, California, has signed a deal with Southern California Edison, a utility, to implement a system that stores energy in molten salt. BrightSource generates electricity using an approach called concentrated solar power, in which computer-controlled mirrors, known as heliostats, focus the sun's heat to boil water and turn a steam turbine. But this approach works only while the sun is shining. The storage system, called SolarPLUS, uses a heat exchanger to transfer some of the heat captured by the heliostats to the molten salt. It is then run back through the heat exchanger to drive the steam turbine when needed. This allows BrightSource's plants to deliver energy even after dark, and gives utilities and grid operators more flexibility than solar power usually provides. BrightSource is planning to equip three of its plants with SolarPLUS.

Changing the rules

Time-shifting would compensate for the intermittent nature of wind and solar power. The potential market is huge: according to Pike Research, a market-research firm, $122 billion will be invested in energy-storage projects between 2011 and 2021. It predicts that the bulk of this spending will go towards new forms of CAES. Green-minded governments and regulators are taking a closer interest in the technology. California has passed a law requiring utilities to consider storage in their plans. Germany's environment ministry last year proposed a project to assess technology developments and funding needs for energy storage. And the British government's "low-carbon networks" fund is being used to build some demonstration projects.

Yet large-scale deployment of bulk storage systems will require regulatory as well as technical progress. Storage systems do not fit neatly into regulatory frameworks that distinguish between power providers and grid operators, since they can be used by both. Their ability to take power off the grid, store it, and then release it later creates "potential problems for current tariff, billing and metering approaches," notes the EPRI in a recent report. Nor is it clear whether power companies will be allowed to pass on the cost of storage facilities to their customers. But given the technology's potential to make power grids cleaner and more reliable, it seems likely that changes to the rules are in store.

# ARES system to put energy storage on the right track

By Darren Quick

read the complete article HERE

July 22, 2013

We've recently looked at ocean-based energy storage system concepts from MIT and Subhydro AS that are designed to overcome the intermittency problems of renewable energy sources like wind and solar by pumping water out of large tanks and using gravity to let it back in and generate electricity when needed. Santa Barbara, California-based company Advanced Rail Energy Storage (ARES) has come up with a land-based alternative that would provide grid scale energy storage using electric locomotives.

ARES' technology uses heavy rail cars that are pushed to the top of a grade using excess power from renewable energy plants or when electricity demand is low. Then, when the wind drops, the sun stops shining, or electricity demand rises, the rail cars are released back down the hill, generating electricity through regenerative braking.

Because the system doesn't rely on the use of water like the aforementioned ocean-based systems, the company says the technology is suitable for a wider variety of areas with minimal environmental impact. The company says the system can also respond to increases or decreases in demand in a matter of seconds, boasts a charge/discharge efficiency of 86 percent, and can deliver constant power for periods of up to eight hours.

ARES' Director of Technology Development, William Peitzke told us to think of the system as basically a "grid-scale flywheel or battery, but one which is able to lock into direct synchronization with the grid providing heavy inertia for added grid stability."

The company says its system is scalable and can be configured to provide grid-frequency regulation systems from 10 to 200 MW power and grid scale energy storage systems from 200 MW power with 1 GWh of energy storage, up to regional energy storage hubs of 2 GW power and 32 GWh of energy storage. ARES adds that its system also boasts a higher energy-to-power ratio than flywheels, a lower life-cycle cost than batteries and a faster ramp-up rate than pumped-storage.

With multiple vehicles position on the same track, the vehicles move independently and can be positioned mid-elevation in a queue. As one vehicle comes out of the queue at the end, another enters the queue to maintain a constant power into or out of the grid.

Power is transferred to and from the vehicles by way of a conductor rail, while vehicle speed and location information gathered from small leading wheels on the vehicles is transmitted to a control station that coordinates the vehicles based on current energy requirements and prevents the vehicles from crashing into each other. In the event of a power disruption, air brakes on the vehicles activate automatically.
ARES recently held an open day at its R & D facility located in Tehachapi, California. Built as a proof of concept for its patented Regulation Energy Management (REM) system, the pilot plant is designed to even out intermittent power supply from a neighboring wind farm. This facility features a pilot vehicle that weighs 12,500 lb (5,670 kg) and runs on a 15-inch (381 mm) gauge track that is 880 ft (268 m) in length, making it 3.75:1 scale when measured against a standard 4 ft 8.5 inch (1,435 mm) gauge track.

The company is currently in the middle of the permit process to construct a full-scale commercial 50 MW REM system in Pahrump, Nevada for the Valley Electric Association and the California Independent System Operator (CA-ISO). This system will extend the length of the track to 5 miles (8 km) and up the weight of the individual vehicles to 300 tons (272 tonnes). The single track will be on an eight percent grade and have 32 vehicles operating on it, each able to absorb or provide around 1.5 MW of power.

ARES CEO Jim Kelly adds that the system can "be deployed at around half the cost of other available storage technologies. Just as important, ARES produces no emissions, burns no fuel, requires no water, does not use environmentally troublesome materials and sits very lightly on the land."

# Go West, Clean Megawatts

Mar 25, 2014

read the complete article HERE

by Judith Lewis Mernit

On one of the blazing screens of Valley Electric Association's control room in Pahrump, Nev., an image pops up of what looks like a glowing rail yard on Mars: Gunmetal train cars lined up on silver tracks, the whole scene set neatly on a shimmering brown slope. Valley Electric's CEO, Tom Husted, erupts with enthusiasm at the sight. "There it is!" he exclaims. "ARES. Heard of it?"

Pronounced like the name of the Greek god of war, ARES stands for Advanced Rail Energy Storage. The concept is simple: When excess power comes off an energy source that's not always available – solar, say, or wind – that power, rather than going to waste, is used to move the rail cars up a hill to a storage yard. Then, after the wind stops or the sun goes down, the cars descend, generating electricity via regenerative braking.

ARESis the new, new thing in energy storage. It has never been put to work on a full-size electrical grid. The world's firstgrid-scale system will be built about three miles northeast of Pahrump on a long alluvial fan coming down from the nearby Spring Mountains.

An unincorporated town of 36,000 in northern Nye County just east of Death Valley, Pahrump is not a place you'd expect to findan energy utopia; the very name evokes the sorrowful report of a circus tuba. In Paiute, however, the word means "water in the rock," a place with a plentiful desert aquifer, where the snow on distant Mount Charleston reflectsthe Mojave Desert's banded sunset. Valley Electric's territory, which stretches for nearly 7,000 square miles along Nevada's western edge, boasts some of the best clean-energy resources in the world: Sunshine beaming down on a mid-elevation desert; steady, perennial winds; sulfurous steam that wafts up from fumaroles in the chalky earth, sure clues to the geothermal bounty that lies beneath.

"We believe those natural resources in Nevada that are developed properly and responsibly can mean to Nevada what other natural resources are to other states," Husted says. In other words, Nevada could indeed become, to paraphrase U.S. Sen. Harry Reid, the Saudi Arabia of renewable energy.

A couple of years ago, Husted counted up his applications for interconnection into the 350 miles of transmission Valley Electric owns, and realized that 3,000 megawatts of renewable electricity was under development in the utility's territory. "Three thousand megawatts," he says. "That's two times the output of Hoover Dam." Obviously it wasn't all for Nevada's 2 million residents. "It was to get to the markets," Husted says, "and those markets are in California." So in early 2013, Valley Electric left the Nevada in-state electrical market and made its system data and circuits available to
California's grid operators; the few hundred megawatts currently generated within its territory travel south to connection points near Las Vegas, where they blend into the system managed by the California Independent System Operator.

ARES could be the perfect complement to those wind and solar megawatts. Steven Greenlee, a spokesman for the California grid authority, describes the electricity market as a continuously circulating "infinitypool" that needs to be maintained at a certain level; that effort gets trickier as more intermittent resources come online. A storage scheme like ARES would be like having a large tank next to that pool, ready in case the level dips too low. California's utilities have been ordered to add storage to their infrastructure by 2016, the better to balance a grid buffeted by wind and doldrums, sun and clouds. ARES CEO James Kelly says he hopes to have the Nevada project online just in time.

The idea seems so simple. “I’m shocked no one has thought of this before,” I tell Valley Electric’s system operator, Clay Calhoun, a friendly, blue-eyed man in his 30s, brimming with enthusiasm for the slick technology around him. “That’s how it works,” he replies. “Sometimes people win Nobel prizes for incredibly simple inventions.” The possibility was always there; someone just had to put the pieces together when the world was ready.

You might say the same of Nevada’s clean energy resources. It’s all been here for eons. Someone just had to have a reason to harness it.

Right now, that reason is California. Husted is betting that as California utilities jettison out-of-state coal plants to meet their state’s 33 percent by 2020 renewable mandate, they’ll snap up contracts for carbon-free power. Southern California Edison, one of California’s three for-profit utilities, has already signed on to buy power from two southern Nevada solar plants to supply about 70,000 customers for 20 years. The Los Angeles Department of Water and Power will buy a similar amount of electricity from a solar plant on the reservation of the Moapa Band of Paiutes, about an hour’s drive east of Las Vegas.

But whether California utilities can buy enough electricity from Nevada to nourish a thriving new industry is no sure thing. It might be tough just to get that power to market. The lines down south are close to full; other lines don’t stretch to the remote sources of energy. North of Pahrump, Husted says, geothermal wells have been drilled and capped for want of transmission.

Transmission “is sort of a chicken-and-egg thing,” says Paul Thomsen, director of the Governor’s Officeof Energy in Nevada. “A utility wants to put generation where transmission is, but transmission doesn’t go where there isn’t generation.” Sometimes a utility invests in transmission based on the future value of a new plant, but even that doesn’t always go as planned. In 2007, NV Energy planned to construct a sprawling coal-burning facility near Ely, Nev. The utility would have leveraged the plant’s future profitsto build a 235-mile-long, $500 million transmission line to transport the plant’s power south to Las Vegas and beyond. When NV Energy canceled the plant in 2009, the transmission went with it.

In 2009, however, Sen. Reid resurrected that line with an item in the American Recovery and Reinvestment Act guaranteeing $2 billion in loan backing for transmission devoted to renewables. The One Nevada, or “ON,” Line, went into service this year. The firstindependent producer to wheel power over its wires, Ormat Technologies of Reno, sends electricity from its new Don A. Campbell geothermal plant to Southern California.

Both Husted and Thomsen cite the ON Line and Ormat’s new plant as encouraging developments. Husted, however, has an even better idea: A proposed 300-mile line called the Nevada West Connect, which he speaks of as if it already exists. “We believe it’s good not just for Nevada, not just for Valley Electric, but for California.” Like coal and natural gas, geothermal produces always-on power, not subject to the vagaries of weather. As California dumps coal and turns to renewables, geothermal demand could soar and investors might rally around to build transmission.

Or not. Drilling a geothermal well is expensive, and its power-producing capacity isn’t certain until drilling is complete. A Canadian company called Nevada Geothermal (now Alternative Earth Resources) nearly defaulted on an Energy Department loan in 2011 when a project came in fivemegawatts weaker than promised. Another geothermal company, Terra-Gen, explored, drilled and secured transmission rights at a site in Churchill County, Nev., near a plant that’s been sending electricity to Southern California Edison for a quarter of a century. Three years in, the utility that had agreed to purchase the power, PacificGas & Electric, pulled out. After all, why go to Nevada for clean power when there’s plenty available at home?

In 2011, California Gov. Jerry Brown’s renewable energy director, Michael Picker, wrote a letter to the Western Electricity Coordinating
Council detailing all the new renewable energy that California had planned within its borders. Spurred by stimulus funds and fast-tracking from the Interior Department, California had signed off on 11 new solar plants; he projected that by the end of 2011, 10,000 megawatts of new generation would have cleared federal and state approval.

In light of that, Picker had some concerns as to whether electricity imports would degrade California’s own energy market.

In Picker's estimation, California, with all its new utility-scale and rooftop solar, should be exporting electricity to its Western neighbors, not the other way around.

So far, that hasn't happened. While solar on California rooftops doubled last year, it still satisfiesa tiny fraction of the state's total demand. And many large-scale solar plants in California were canceled due to costs, environmental impacts or both.

One example is the Calico Solar Project, which was in development in the Cady Mountains, 37 miles east of Barstow, Calif. Developers at K Road Solar burned through three different technologies before mounting concerns over bighorn sheep and tortoises delayed the project so long that they gave up. They did, however, manage to salvage one commodity – a power purchase contract with the Los Angeles Department of Water and Power. With that in hand, K Road went to Nevada. The plant once known as Calico has since been bought by First Solar of Tempe, Ariz., and will soon occupy 800 acres on lands managed by the Moapa Band of Paiutes. No matter how many pictures you see of the Reid Gardner Generating Station in Moapa, Nev., or stories you read about children with asthma

and adults with lung cancer, nothing prepares you for how close the coal-burning plant towers over the schoolyards and playgrounds on the Moapa Reservation. "We're about 600 yards away right here," says Darren Daboda, the tribe's former chairman and current environmental analyst, sitting in his officein a flatstucco building on the main road through town. The plant is technically outside the reservation's boundaries, "but there are no boundaries when it comes to air," Daboda says.

Daboda, 44, is a large, soft-spoken man with a broad face and a persistent smile; he wears a Tilley hat indoors and out. When he was chairman, he was instrumental in wooing solar developers; now, he's in charge of ensuring that the three solar facilities planned for the 71,000-acre reservation are done in an environmentally responsible manner. He has also led protests against the coal plant, which has sickened Moapa's residents for 49 years. The opposition got a big boost in 2012, when the plant's biggest customer, the California Department of Water Resources, declined to renew its contract. Now, after many broken promises, Daboda and his allies have almost won: Three units of Reid Gardner will be shut down this year; the fourth will go in 2017.

Unlike the Navajos, who get millions of dollars in revenue from coal plants on their land, the Moapa get nothing from Reid Gardner. NV Energy (then Sierra Pacific)reneged on early pledges to hire from the reservation. The plant's demise is nothing but a win for the tribe – especially since it leaves behind transmission to Southern California, with room on the lines for solar power.

And the reservation is an ideal site for solar, protected from wind and rain on two sides by low mountain ranges. "It fitsin with our desire to be good stewards of the land," Daboda says. It's an economic opportunity for the Moapa in a way the coal plant never was, generating lease income along with construction and maintenance jobs in a place with astronomically high unemployment.

Unfortunately, First Solar's success doesn't guarantee Moapa's solar energy future. Two other projects in development on the tribe's lands have yet to secure buyers. Even though Nevada lawmakers last June outlawed new coal generation, Nevada's largest utility, NV Energy, probably won't want solar from Moapa: The utility has already met the state's modest, and loophole-ridden, renewable energy standard. California won't buy more either, at least not now – utilities are on track to meet the 2020 goal.

In fact, it's possible that renewable energy projects in Nevada will go the way of coal-firedpower in Nevada, which was poised for a boom in the early aughts. Natural gas prices had spiked, and California's utilities were crawling from the wreckage of the Enron-induced energy crisis. Dozens of new coal plants had been scheduled around the West, four in Nevada; some were meant to export power to ailing California. That almost none of them went forward might serve as a cautionary tale: There is obvious peril in planning for the fickleCalifornia market. California is changing in ways that energy developers eyeing Nevada may not yet understand.

Michael Picker, now at the California Public Utilities Commission, still believes California might someday export electricity, but not in the same way that other states now serve as energy colonies to California. Instead, he expects that as utilities build or procure more wind and solar, they'll have excess electricity at certain times to trade among states. They can do that most efficientlyif Western grid managers have the flexibilityto move watts back and forth wherever and whenever they're needed – a regional "energy imbalance market."

As it happens, there's one in the works: In February of last year, the Utah-based utility PacificCorp,which serves parts of six Western states, began collaborating with the California Independent System Operator on a shared system that would update generator and consumption data every fiveminutes, so power can shift around where demand rises. California has already been doing this for years within the state; now that coordination may expand throughout the West.

An energy imbalance market that included Nevada might not kill Valley Electric's, or Nevada's, energy hub ambitions. Paul Thomsen of the Nevada state Energy Officethinks it actually behooves the state to get involved. "If we can develop a scenario in the Western United States that isn't push/pull – that can allow power to flowto California when they need it, or to Utah when they need it – then we get into a cooperative discussion," says Thomsen. "Maybe when (California) has excess solar, we can get that at a very attractive price. Other times when California has a huge demand, instead of firingup a (natural gas-fired)'peaker' plant, we can send you geothermal."

Or power from a storage system like ARES.
Back in the swanky Pahrump control room, Tom Husted and Rick Eckert, Valley Electric's chief operating officer,say they like the energy imbalance market concept just fine."It's a step in the right direction," Eckert says. It just doesn't go far enough. They want transmission that sends power from Valley Electric's territory straight through to California.

That's what will draw renewable energy development here, where it's welcome and hence cheap and fast to develop. That's what will lower electricity rates for the nonprofitcooperative utility's 45,000 members. And that's what will drive economic development to, as Husted puts it, "a county with the highest unemployment rate in a state with the highest unemployment rate in the country.

"We believe we have a huge economic opportunity to develop this vast resource in the West," he adds. "And that's a very strong belief."

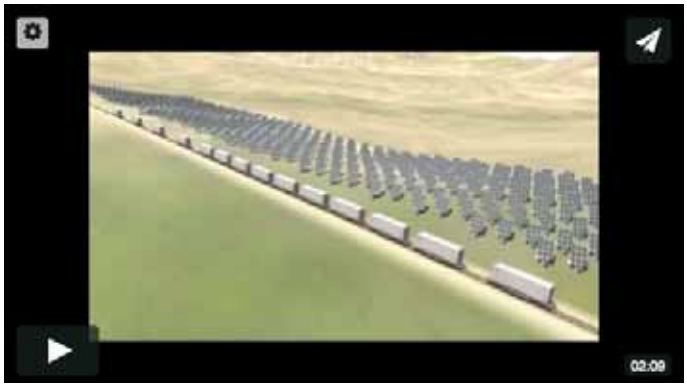
# Videos

*The ARES Vision*

**View: http://vimeo.com/48546631**


*ARES Technology: The Bakersfield Californian*

**View: http://vimeo.com/48344799**



*Ancillary Services Facility*

**View: http://vimeo.com/39364772**


*Storing wind and solar power using a rail car*

**View: http://vimeo.com/75895781**

*ARES - Addressing Grid Scale Storage*

**View: http://vimeo.com/46460725**

*ARES Technology*

**View: http://vimeo.com/48344799**

# ARES Successfully demonstrates its technology

*It's the story of the little train that could.... one day provide a jolt to California's renewable energy industry….*

In order to prove that rail technology can be effectively used for energy storage, Advanced Rail Energy Storage (ARES) successfully built a ¼ scale demonstration project in Tehachapi CA. On just over 800 feet of track, a remotely controlled rail car, carrying a four-ton concrete pad, travels quietly uphill. The electric motors inside the vehicle turn the wheels, powered by a diesel generator. It's using electricity to go uphill, but when it comes back down, the motors become generators themselves and the vehicle produces electricity.

ARES technology addresses one of the major drawbacks to wind and solar energy – they are not available on a 24-7 basis. You're at the mercy of the wind and the sun. But, ARES uses the power of gravity to store wind and solar power so that it can be used when it is needed.

Developed over the last three years by Bill Peitzke and engineer Matt Brown, ARES was designed to fulfill a crucial role in the renewable energy industry: energy storage, enabling green energy to be grid ready, even when the wind isn't blowing or the sun isn't shining.

"Renewable energy sources are all very intermittent and need a component of storage to allow the grid to operate more reliably," Peitzke said. For centuries, the best way to store energy and then produce it has been hydroelectric power plants, using the power of falling water and gravity. But, for environmental and other reasons the west's appetite for new hydropower projects has declined.

Peitzke and Brown have integrated locomotive and other technologies to create rail energy storage. This pilot project in Tehachapi has been peer reviewed and recently patented by the U.S. government. ARES is positioning its technology to unlock the full potential of green power.

With zero emissions and a relatively small environmental footprint, energy storage facilities like ARES could help to further wean the world from fossil fuels. "Being able to deploy efficient, cost effective grid-scale storage technology that doesn't rely on water and has multiple siting opportunities, a less complicated permitting and regulatory review process is really the holy grail because it allows for everything that comes after it," Peitzke said.

**So, what are industry insiders saying about ARES?**
Wind power pioneer, Jim Dehlsen who founded Zond Corporation in 1980 and built some of the first wind turbines in Kern County says the rail-based energy storage concept is right on track in making renewable energy more reliable and less intermittent, stabilizing the power grid and reducing the chances for cascading events that lead to blackouts.

"I think ARES has done an excellent job. The engineering is very good. They've got a patent and that's what investors like to see. There's really no "black box" involved. It's more thinking about things that are out there now and putting it together in an intelligent way and being able to deploy fairly quickly. That's the genius in this deal," said Dehlsen.

ARES technology has now been thoroughly reviewed by experts in the field of heavy-haul rail engineering, locomotive design, electrical engineering, power transmission & distribution, environmental and regulatory affairs as well as experts in the field of energy storage economics. It has been recognized and endorsed by utilities, independent system operators, and NGO's, as the deployable solution to the looming need for grid scale storage.


*Storing wind and solar power using a rail car*

**View: http://vimeo.com/75895781**

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# Advanced Rail Energy Storage (ARES) Ancillary Services Project

## Green Energy Storage for Green Energy

ARES' mission is to enable the electric grid to integrate unprecedented amounts of clean, environmentally responsible, renewable energy while maintaining reliable electric service necessary to power growth and economic prosperity.

James Kelly, CEO ARES

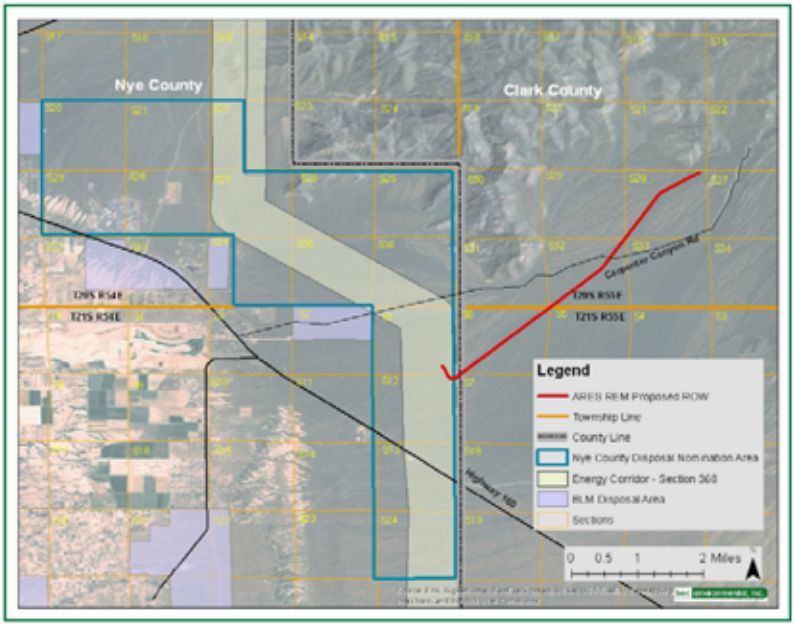
*"ARES gives us a tool that system planners and engineers can put in their tool kit to enable...high levels of renewables while maintaining the reliability and safety of the grid."*
*~ Jim Kelly, ARES CEO*

## Leadership

Jim Kelly, ARES Chief Executive Officer, has over 38 years of electrical utility experience. The former Senior Vice President of Transmission and Distribution for Southern California Edison, Jim was one of the early pioneers of the Smart Grid and led advancements in grid sensing, monitoring, and control.

## Ancillary Services*

As more and more renewable energy resources come online, the transmission grid must adapt to increasing fluctuations in generation. Ancillary services enable transmission system operators to adjust the flow of electricity and "smooth" or regulate voltage on the grid. ARES' fast response technology bridges the power gap between smaller battery and flywheel installations and far larger pumped-storage hydro – at a lower life-cycle cost than batteries, a higher energy-to-power ratio than flywheels and a greater efficiency and far faster ramp-rate than pumped-storage. ARES' technology uses electricity when it is abundant to power locomotives uphill. When electricity is scarce, the locomotives descend and their motors act as generators to return electricity to the grid.




First-of-its kind, utility-scale ancillary services in Clark and Nye Counties, Nevada.

ARES proposes to locate a first-of-its-kind 50 megawatt (MW) grid-scale ancillary services facility in the Carpenter Canyon area east of Pahrump, in Nye and Clark Counties, Nevada. The ARES' REM project will provide 12.5 megawatt-hours (MWh) of fast response energy to assist in the balancing of intermittent renewable energy (solar and wind) connected to the regional transmission grid, increasing renewable energy penetration while maintaining grid reliability.

*"Because we're located in the Sun Belt, [ARES] fits nicely into our grid and has the potential to further the renewable opportunities we have here."*
*~ Tom Husted, CEO VEA*

In partnership with Valley Electric Association (VEA), the project would access the regional electrical grid through VEA owned and operated transmission facilities and receive and respond to commands from the regional transmission grid operator, California Independent System Operator (CAISO).

## Facility Components

*Rail Corridor [Clark County]:* The corridor would include the rail line, an access road, a parallel power distribution line with track electrification rail or overhead catenary, a short spur rail to be used as a mid-elevation turnout, and drainage management features.

*Rail Vehicles:* Shuttle trains, each comprised of electric locomotives and multiple cars carrying concrete masses, will ascend and descend the rail line at slow speeds to either take electricity off the grid (ascend), or supply electricity to the grid (descend).

*(Continued on page 2)*

*Note: In the California market place, ancillary services are referred to as Regulation Energy Management (REM).

# ARES Ancillary Services Project

*(Continued from page 1)*

*Operations, Control and Maintenance Facility (Nye County):* Rail operations would be supported with a project operations facility, control facility, maintenance facility, substation, parking area, and spur rail. The control facilities will respond to grid requirements by controlling the speed and number of shuttles in motion. A remote monitoring system would be installed at the facility to enable around the clock monitoring of the rail line as well as the support facilities by an on-site security officer.

Tehachapi demonstration (1/4 scale)

*Transmission Interconnection (Nye County):* To connect the ARES project to the local grid, VEA's preliminary plan includes:

- A new substation located adjacent to the ARES Operations, Control and Maintenance Facility.
- A new 0.6 mile 230 kV (kilovolt) transmission line installed and operated by VEA to connect the substation to an existing 230 kV transmission line.
- An upgrade of the existing 230 kV transmission line.

ARES anticipates the facility would be staffed around the clock for the duration of the BLM lease. Weekday day shifts would be staffed by five personnel including a control/operator, a security officer, a general manager, maintenance workers and an administrative worker. Other shifts may be staffed by three personnel including a control/operator and a security officer. ARES is committed to utilizing local suppliers and workers as much as possible for construction and operation of the project.

ARES' rail based energy storage systems are covered by one or more of the following US patents: 8593012, 8674541 with foreign patents pending and issued.

**Economic Benefits:**

- Estimated project cost: $40 Million
- Construction: 100 full time equivalent (FTE) personnel for 12-18 months
- Operations: 16 FTE for 30 to 40 years
- Estimated aggregated economic benefit to the area: $100 Million

"The genesis of ARES was in response to the global environmental challenges facing our planet and our need for sustainable energy sources."
~Francesca Cava, VP Operations ARES

**Environmental Stewardship and Sustainability:**

- No emissions
- No fossil fuels used
- Water not required
- No hazardous waste creation
- No harmful extraction of materials
- Clean decommissioning process with no lasting impacts to the natural environment

**For more information on ARES, please visit the website www.aresnorthamerica.com.**

For questions on this project please contact:

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# Meet the ARES management team

**James Kelly, Chief Executive Officer** – James Kelly worked at Edison International for 38 years. Prior to his retirement he was the Senior Vice President of Transmission & Distribution for Southern California Edison (SCE), and was responsible for the operation and maintenance of an electrical grid comprised of about 12,000 miles of transmission and 100,000 miles of distribution lines spread across a 50,000-square-mile service area.

Mr. Kelly was also President of Edison ESI, a subsidiary company that operates one of the largest electrical and mechanical repair facilities in the U.S. Prior to that position, Mr. Kelly was the Vice President of Engineering & Technical Services, responsible for planning, engineering, and designing SCE's electrical grid, as well as research and development, safety and training.

**Steve Sullivan, Chief Operations Officer** – Steve Sullivan worked at Edison International for 35 years. Prior to his retirement he led the two largest Southern California Edison organizations dedicated to serving government customers; first as Director of Local Public Affairs, and then as Director of Government & Institutions of the Business Customer Division.

Sullivan was responsible for ensuring SCE's compliance with approximately 200 local city and county franchises necessary for SCE to conduct its business, including development of legislation, franchise negotiations, land use policies, siting and permitting of major generation, transmission and distribution facilities, and divestiture of company assets.

**Francesca Cava, VP of Operations and Board member for ARES** – Prior to this position, she served as the Arctic Policy Project Manager for the Aspen Institute Dialogue and Commission on Arctic Climate Change. She also served as the ocean literacy project manager at the National Geographic Society and was a submersible pilot and project manager for the 5-year exploration of the ocean during the Sustainable Seas Expeditions.

She was appointed as a Coastal Commissioner on the California Coastal Commission for 4 years. Additionally, she completed a 21-year career in the National Oceanic and Atmospheric Administration [NOAA], where she served as the Director of the U.S. National Marine Sanctuary and National Estuarine Research Reserve Programs, overseeing over 200 employees.

# Meet the ARES management team

**William Peitzke, Founder and Director of Technology Development and Board member for ARES –** Bill has 29 years of experience in the energy business. He founded Williams Resources Corporation, a California company providing a wide range of energy, strategic alliance and project conceptualization services in the deregulated California utility marketplace.

In the mid-1980's he pioneered private brokering of long-term natural gas contracts to large co-generation facilities in California as well as providing the enabling economic studies for many significant pipeline expansions and generation facility acquisitions. Before deregulation of the California gas and electricity marketplace, his investment banking practice successfully consummated the sale of numerous large oil and gas reserve packages including major utility natural gas reserve portfolios.

**Matt Brown, Director, Engineering** – As President of Matt Brown Performance Design, Mr. Brown provided advanced concept design and managed prototype construction, testing and analysis for clients including Clipper Windpower, Gyroton and Aquantis.

Mr. Brown provided engineering, construction supervision and testing of an experimental, wave-piercing boat for Transonic Hull Company; and both designed and engineered racing yachts for Reichel-Pugh Yacht Design. As Vice President of Engineering for CBTF Co., co-invented, designed, engineered, tested and brought to market the patented Canting Ballast Twin Foil (CBTF) for sailboats; and designed and tested the M-Ship. As Associate Designer for Advanced Aeromechanisms Corp., provided engineering design, construction supervision and testing for both the 1992 and 1995 America's Cup Race entry Stars and Stripes.

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