

## Problem:

Keeping WDIQ's transmitter and associated electronics up and running during severe weather related power outages.

## Solution:

Alabama Public TV depends on VYCON's VDC flywheel system to provide reliable and cost-effective power backup to its critical broadcast equipment.

*"Since we installed the three-phase UPS along with VYCON's VDC flywheel, we have been completely protected against power outages, which we experience here about twice a month."*

Windell Wood  
Director of  
Engineering  
Alabama Public TV



## VYCON's Backup Flywheel Power System Helps Keep Alabama Public Television 'On The Air' During Hurricanes

### WDIQ Stays on the Air with VYCON's Clean Energy Storage System

Located in the Gulf Shore hurricane zone, Alabama Public Television's (APT) broadcast engineers know firsthand the constant challenges of keeping their broadcasting towers and sensitive electronics functioning during catastrophic weather conditions. And, with the devastating effects of Hurricane Katrina still fresh in the minds of local broadcasters, APT doesn't take any chances in assuring that no matter what Mother Nature produces, they can continue to broadcast 24/7.

Primarily funded by viewers and the state of Alabama, the nine-station network presents local and PBS-produced programming, community outreach activities and online services for residents and educators. The station is also responsible for broadcasting emergencies, so extra precautions are taken to assure its transmitter and associated electronic systems are up and running despite the state of incoming electricity.

#### Bring it On...

Transmission systems are notoriously difficult to protect against power anomalies because of their sensitivity to even the smallest disruption. Still, at the same time, they require high power to feed large transmitters. Now with DTV, the

requirement for clean, continuous power has never been greater. Protecting the myriad of master control switchers, transmitters, cameras, amplifiers, editing bays, servers, RAID storage systems and other critical systems has traditionally been handled by battery-based Uninterruptible Power Systems (UPSs). These systems have done well in mitigating power interruptions and conditioning "dirty" power. However, broadcast engineers are finding that adding flywheels into the power continuity design significantly enhances reliability, increases green initiatives and lowers the total cost of UPS ownership.

Any disruption to the grid supply – even in the order of milliseconds – is unacceptable. Most transmitter stations are equipped with UPSs and back-up power generators in order to ensure continuous operation. To protect against "dead air," broadcast stations will often switch to generator power even before a storm approaches, keeping enough fuel on-hand to run the system for over 24-hours solely from the generator. APT does just this with all of its nine sites. For its transmission site in Dozier, Alabama station WDIQ, APT has taken its power protection reliability to a higher level by incorporating VYCON's VDC clean energy storage system to provide an extra level of power security and backup.

## Benefits of VYCON's Clean Energy Storage Solution:

- 20x reliability vs. VRLA batteries
- High-power density, small footprint
- Parallel capability that allows for future expansion
- Fast recharge (under 150 seconds)
- Full monitoring for predictive performance
- No hazmat requirements
- Low maintenance
- 20-year useful life
- Simple installation
- N+1 redundancy options
- Quiet operation
- Wide temperature tolerance
- High efficiency



In the Dozier facility, the transmitter is a solid state Harris Platinum, 4kW VHF. The three-phase 160kVA UPS and the 215kW flywheel are carrying the entire load of the building, including monitoring, microwave and satellite equipment. There are also five, two-way repeaters and a 1kW NOAA weather transmitter. The facility also has 20 tons of air conditioning. "Keeping these systems up and running is my top priority," said Windell Wood, director of engineering for Alabama Public TV. "We wanted to make sure that we had enough power backup with the highest reliability available."

### **Batteries are the Achilles Heel of UPSs**

Batteries have a limited number of discharge cycles they can provide during their expected life. While this cycle life may be adequate in some applications, there are instances where a battery bank may be heavily discharged frequently, sometimes several times per day, caused by short-term power interruptions lasting for a few seconds or less. Every time the batteries are used (cycled), even for a split second, the more likely it is they will fail the next time they are called upon. Even testing the batteries shortens battery life, and just one cell in a battery string can render the entire battery bank useless.

According to the Electric Power Research Institute (EPRI), "Batteries are the primary field failure problem with UPS systems."

Predicting when one battery in a string of dozens will fail is next to impossible even with regular testing and frequent individual battery replacements.

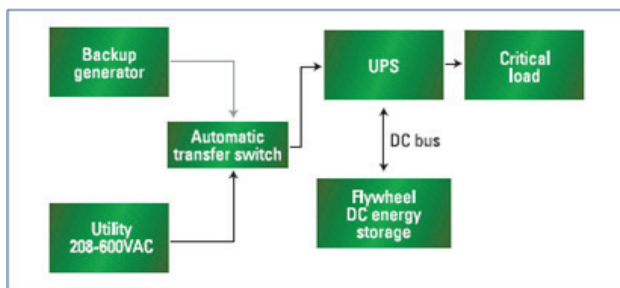
In designing the optimum power backup scheme for the transmission facility, Wood consulted other broadcast engineers to discuss various solutions.

He quickly discovered that using UPSs with batteries is problematic as their reliability is always a concern. "You never know if you have enough battery capacity and the charge state of the batteries is always in question," said Wood. Because UPS batteries are chemically based, frequent battery maintenance, testing, cooling requirements, weight, toxic and hazardous chemicals and disposal issues are top concerns. Reliability always resides at the top of the list.

### **Flywheels Up the Reliability Game**

Today's flywheel systems replace lead-acid batteries and work like a dynamic battery that stores energy kinetically by spinning a mass around an axis. Electrical input spins the flywheel rotor up to speed, and a standby charge keeps it spinning 24/7 until called upon to release the stored energy. The amount of energy available and its duration is proportional to its mass and the square of its revolution speed. For flywheels, doubling mass doubles energy capacity, but doubling rotational speed quadruples energy capacity.

During a power event – usually attributed to local storms – VYCON’s VDC flywheel provides backup power seamlessly and instantaneously to APT’s transmission equipment. Wood, opting to eliminate UPS batteries altogether, chose the VDC to provide instant power to the connected load. However, if the power event is longer than a couple of minutes, the flywheel will automatically and gracefully hand off to the facility’s backup engine-generator. It’s important to note that according to the EPRI, 80 percent of all utility power anomalies/disturbances last less than two seconds and 98 percent last less than 10 seconds. In the real world, the flywheel energy storage system has plenty of time – up to a couple of minutes – to gracefully hand-off to the broadcast facility’s generator.



*When used with a UPS system, the VDC flywheel system provides uninterrupted DC ride-through power and voltage stabilization during brief utility power disruptions and brownouts.*

“Since we installed the three-phase UPS along with VYCON’s VDC flywheel, we have been completely protected against power outages, which we experience here about twice a month,” said Wood. “The flywheel system has operated flawlessly, and we’re saving considerable money and resources by using a flywheel that requires no bearing replacement and has a 20-year life.” When choosing the flywheel, Wood needed a system that could accommodate a 208 volt output. “Other flywheel systems have a 480 output which wouldn’t fit our needs. The VYCON VDC has a 480/208 voltage configuration which was perfect for us.”



*The slim footprint of the VDC flywheel is easy to pair with three-phase UPS systems.*

The latest flywheel designs sold by world-leaders in three-phase UPS systems take advantage of higher speeds and full magnetic levitation packing more green energy storage into a much smaller footprint and removing any kind of bearing maintenance requirements. Over a 20-year design lifespan, cost savings from a hazmat-free flywheel versus a five-minute valve regulated lead-acid (VRLA) battery bank are in the range of \$100,000 to \$200,000 per flywheel deployed.

“This technology will not only give us the uptime we require, but will save Alabama Public TV money by providing clean, reliable power for 15 to 20 years compared to the typical battery-driven technology life cycle of three to four years,” says Wood. “We’re ready for the next power outage – it’s not a matter of if – just when.”

## About VYCON:

VYCON is an innovator in the design and manufacture of technologically advanced flywheel energy storage systems that enable a highly reliable, cost-effective and “green” energy storage solution for a variety of applications. The company’s REGEN flywheel systems, used in regenerative power applications such as container cargo handling crane applications and light electric rail, reduce power and energy costs to port and rail operators as well as provide a reduction in green house gasses. In addition, VYCON’s line of VDC and VDC-XE systems are deployed in mission-critical operations around the world protecting critical computing assets against costly power outages.

For more information on our innovative clean energy storage systems for your application, contact us at 714-386-3800 or visit our web site at: [www.vyconenergy.com](http://www.vyconenergy.com).



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