SEPTA Wayside Energy Storage Project

Press Coverage
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PENNSYLVANIA ENERGY DEVELOPMENT AUTHORITY GRANT (2010)

Viridity Energy and the Southeastern Pennsylvania Transportation Authority (SEPTA) Awarded $900,000 from the State of Pennsylvania for Innovative Project to Recycle Energy Produced by Electric Public Transit

Press Release: Pennsylvania Energy Development Authority (PEDA) grant will fund Viridity Energy’s innovative energy storage project to help SEPTA achieve economic value and environmental benefits through deployment of smart grid solutions

September 1, 2010

PHILADELPHIA—(BUSINESS WIRE)—Viridity Energy, a Philadelphia-area smart grid company, today announced that it had received a $900,000 grant for its innovative pilot project with the Southeastern Pennsylvania Transportation Authority (SEPTA), the nation’s sixth largest public transit organization. As part of the project, Viridity Energy will deploy its software optimization system to allow SEPTA to recycle the energy created from the regenerative braking ability of trains and trolleys at a high-use propulsion substation in Philadelphia, which will in turn improve power quality, produce energy savings and generate revenues. The State of Pennsylvania awarded the Viridity Energy “SEPTA Recycled Energy and Optimization Project” funding through the 2010 Pennsylvania Energy Development Authority (PEDA) grant program.

The project will pair the latest 21st century technologies and energy optimization practices with one of the country’s oldest transportation systems, dating back to the deployment of electric trolleys in 1892. Mass transit systems across the country are striving to maintain high quality service while facing growing fiscal challenges which are further compounded by rising energy costs. The pilot represents a large and untapped potential for transit systems to help meet these challenges and at the same time improve grid reliability in highly populated urban neighborhoods.

The project calls for Viridity Energy and SEPTA to install a large-scale battery to capture the energy from regenerative braking of trains along a portion of the Market-Frankford Line, the highest ridership line in SEPTA’s system. The Viridity Energy-SEPTA project will result in numerous economic, operational and environmental benefits including, but not limited to, the following:

- **Delivers Energy Savings** — SEPTA will capture and productively use electric power that would be otherwise wasted while reducing its electricity consumption.
- **Realizes Economic Value** — In addition to using less electricity and reducing operating costs, the project will generate significant revenues through participation in PJM’s wholesale power markets.
- **Increases Operational Efficiency** — SEPTA will increase operation and maintenance efficiencies through improved power quality and system management.
- **Achieves Sustainability and Carbon Footprint Goals** — By reducing its use of electricity generated on the grid, the project will help SEPTA decrease its carbon emissions by 1,258 tons per year.
- **Enhances Grid Reliability** — The stored energy will help balance electric generation and electric load on the PJM interconnection system while assisting PECO Energy Company in preserving the reliability of its electric distribution system.

“We are delighted to receive this grant from PEDA and are looking forward to working with SEPTA to deploy the latest energy optimization techniques with the goal of improving their operational efficiency, reducing their carbon footprint and lowering their...
costs,” said Audrey Zibelman, President and CEO of Viridity Energy. “This project is a perfect example of how smart grid innovations and advances in technology can effectively be paired with revenue opportunities from competitive energy markets to yield substantial economic, operational and environmental benefits to all the parties involved.”

As part of the pilot project, SEPTA expects to generate approximately $500,000 in economic value for the agency. A successful pilot could lead to potential deployment at all 38 SEPTA substations. It is estimated that this expansion could translate into significant savings from SEPTA’s current electricity spend.

“We are pleased to partner with Viridity Energy on this project under the PEDA grant program,” stated Joseph M. Casey, General Manager, Southeastern Pennsylvania Transportation Authority (SEPTA). “Upon implementation, the storage system will serve as a foundation for measurable gains in both energy efficiency and voltage stability in this critical corridor, providing a replicable and scalable model for broader system-wide implementation. By moving towards energy storage, SEPTA will be assuming a leadership role among transit agencies.”

“SEPTA’s partnership with Viridity Energy supports Philadelphia’s burgeoning market position as a cutting-edge center for smart grid technologies,” said Rina Cutler, Deputy Mayor for Transportation and Utilities. “This kind of energy saving technology and improvement to transit service reliability advances the Mayor’s Greenworks Philadelphia agenda.”

About Viridity Energy

Viridity Energy is making the next generation of the smart grid a reality by providing large energy consumers with powerful tools to increase energy efficiency and decrease energy costs. The company’s unique and flexible VPowe™ platform enables customers to dynamically shift and balance energy load, integrate advanced energy technologies and convert existing energy investments into lucrative new revenue streams. Viridity Energy helps organizations achieve sustainability goals and contribute to the greater good by stabilizing energy price fluctuations. Headquartered in Conshohocken, Pennsylvania, Viridity Energy was founded in 2008 by former executives of PJM Interconnection. For more information visit www.viridityenergy.com

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**SEPTA pilot program to capture, reuse subway energy**

By Andrew Maykuth, Inquirer Staff Writer

*Philadelphia Inquirer: September 2, 2010*

The Market-Frankford Line is going hybrid.

SEPTA announced a pilot project Wednesday that would capture electricity generated by braking subway trains, much like a hybrid automobile produces power when it slows down.

The electricity will be stored in a large, railside battery array and reused when the train accelerates. The system is expected to reduce electrical power purchases 10 percent to 20 percent at each location of the batteries, said Andrew Gillespie, SEPTA’s chief engineering officer for power.

But the system is designed to do more than capture power from the subway’s dynamic braking system, said Audrey Zibelman, the chief executive officer of Viridity Energy Inc., the Conshohocken smart-grid innovator that devised the project for SEPTA.

The power-storage system is potentially so large - each battery array would store one megawatt of power - that SEPTA could further reduce its electric bill by buying cheap power at night to use or resell during expensive peak hours.

And SEPTA also could collect fees from the regional grid operator, PJM Interconnection L.L.C., by providing power on short notice - one or two seconds - to stabilize regional power flows on the grid.
Zibelman said the transit agency could realize energy savings "substantially higher" than the 20 percent target Viridity typically sets for a project. SEPTA currently spends about $20 million a year to buy electricity from Peco Energy Co. to power its trains, subways, and electrified trolley and bus fleet.

The pilot project, involving a single battery array at a SEPTA electric substation in Kensington, would cost about $1.5 million.

The Pennsylvania Energy Development Authority is underwriting the project with a $900,000 grant. Viridity will underwrite the remaining capital cost, Zibelman said.

If the project proves economic - Viridity estimates one battery array will generate $500,000 a year in value - SEPTA envisions installing the technology at all 33 electric substations that serve its subway and trolley lines.

The system will take advantage of regenerative-braking capacity already installed in the Market-Frankford Line and SEPTA's electrified buses and trolleys.

When applied, the brakes now convert the train's kinetic energy into electricity, which is transmitted into the third-rail system for use by other trains.

But when there are no other trains nearby to consume the electricity, the power is lost. Excess electricity from the brakes is converted into heat that is dissipated from vents in the carriage rooftops.

About half the power produced by the regenerative brakes is now lost, Gillespie said.

SEPTA says the batteries, in addition to capturing the regenerated power that is now lost, will help increase the system's electrical efficiency and stabilize the voltage - it operates on 600-volt direct-current power.

Zibelman envisions other transit agencies' adopting Viridity's technology.

"This is an opportunity," she said, "for us to develop a market."

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**Philly subway to capture energy from braking trains**

**By Martin La Monica**

*CNET: September 1, 2010*

Here's an unusual way to upgrade a subway system: add a giant battery.

Viridity Energy said on Monday it has been awarded a $900,000 grant by the Pennsylvania Energy Development Authority to build a system which will capture the energy from Philadelphia subway *cuts* as they brake to enter a station.

The regenerative braking system will collected energy in a large battery installed along the busy Market-Frankford Line. The stored energy will be used to power trains when they leave the station and to earn money selling energy back to the grid.

"Essentially we're creating a microgrid that is integrated with the transmission grid and operated so that its optimized for efficiency and economics," said Audrey Zibelman, President and CEO of Viridity Energy.

The project, which Viridity hopes to be operating by next spring, will have a battery between one and one and a half megawatts of capacity which will replace the current system which cannot capture all the energy from incoming trains.

With the battery in place, it can power trains when they leave, cutting down on the operating costs of Southeastern Pennsylvania Transportation Authority (SEPTA).
The battery will be able to make money, too, by providing services to the grid. Using its stored energy, it can make money from grid operator PJM by supplying quick bursts of energy to maintain a steady frequency. SEPTA can also draw energy from the grid at off-peak times and supply it at peak times when the utility is looking to lower usage because energy prices are high.

Viridity Energy's hosted software is like a "network operating service" that optimizes how the energy is pulled into and dispatched from the battery, said Zibelman. The company, which makes money by getting a percentage of customers' revenue, is now evaluating what types of batteries it will use, she added.

"Electric vehicles are on everyone's mind right now as where we need to go, but we have an electric vehicle system already sitting here. Let's use those first," Zibelman said. "It's something could be done in almost any transit system.

SEPTA estimates it can save $500,000 a year on its electricity spending. If the project is successful, SEPTA hopes to replicate the model system-wide, Joseph Casey, SEPTA general manager said in a statement.

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**SEPTA to capture braking system energy for electricity**

*By Peter Key, Staff Writer – Philadelphia Business Journal*

*September 1, 2010*

Viridity Energy Inc. said Wednesday that it and SEPTA have received a $900,000 grant from the state of Pennsylvania to fund a project to capture electricity produced by the braking systems of the trains on SEPTA’s Market-Frankford Line.

Viridity, which develops smart-grid software, and SEPTA will install a battery in a substation to store electricity produced by the trains on a portion of the line. The stored electricity will be fed back into the line’s electrical system, allowing SEPTA to reduce the amount of electricity it has to buy.

SEPTA and Conshohocken, Pa.-based Viridity said that if the project is successful, SEPTA could deploy batteries at all 38 of its substations and use them and Viridity’s software to reduce its power bill significantly.

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**Viridity Energy and SEPTA Awarded $900,000 from State for Innovative Project**

*Mass Transit Magazine*

*September 1st, 2010*

Viridity Energy announced that it had received a $900,000 grant for its innovative pilot project with the Southeastern Pennsylvania Transportation Authority (SEPTA), the nation’s sixth largest public transit organization. As part of the project, Viridity Energy will deploy its software optimization system to allow SEPTA to recycle the energy created from the regenerative braking ability of trains and trolleys at a high-use propulsion substation in Philadelphia, which will in turn improve power quality, produce energy savings and generate revenues. The state of Pennsylvania awarded the Viridity Energy “SEPTA Recycled Energy and Optimization Project” funding through the 2010 Pennsylvania Energy Development Authority (PEDA) grant program.

The project will pair the latest 21st century technologies and energy optimization practices with one of the country’s oldest transportation systems, dating back to the deployment of electric trolleys in 1892. Mass transit systems across the country are striving to maintain high-quality service while facing growing fiscal challenges which are further compounded by rising energy costs. The pilot represents a large and untapped potential for transit systems to help meet these challenges and at the same time, improve grid reliability in highly populated urban neighborhoods.
The project calls for Viridity Energy and SEPTA to install a large-scale battery to capture the energy from regenerative braking of trains along a portion of the Market-Frankford Line, the highest ridership line in SEPTA’s system. The Viridity Energy-SEPTA project will result in numerous economic, operational and environmental benefits including, but not limited to, the following:

Delivers Energy Savings – SEPTA will capture and productively use electric power that would be otherwise wasted while reducing its electricity consumption.

Realizes Economic Value – In addition to using less electricity and reducing operating costs, the project will generate significant revenues through participation in PJM’s wholesale power markets.

Increases Operational Efficiency – SEPTA will increase operation and maintenance efficiencies through improved power quality and system management.

Achieves Sustainability and Carbon Footprint Goals – By reducing its use of electricity generated on the grid, the project will help SEPTA decrease its carbon emissions by 1,258 tons per year.

Enhances Grid Reliability – The stored energy will help balance electric generation and electric load on the PJM interconnection system while assisting PECO Energy Company in preserving the reliability of its electric distribution system.

“We are delighted to receive this grant from PEDA and are looking forward to working with SEPTA to deploy the latest energy optimization techniques with the goal of improving their operational efficiency, reducing their carbon footprint and lowering their costs,” said Audrey Zibelman, president and CEO of Viridity Energy. “This project is a perfect example of how smart grid innovations and advances in technology can effectively be paired with revenue opportunities from competitive energy markets to yield substantial economic, operational and environmental benefits to all the parties involved.”

As part of the pilot project, SEPTA expects to generate approximately $500,000 in economic value for the agency. A successful pilot could lead to potential deployment at all 38 SEPTA substations. It is estimated that this expansion could translate into significant savings from SEPTA’s current electricity spend.

“We are pleased to partner with Viridity Energy on this project under the PEDA grant program,” stated Joseph M. Casey, general manager, Southeastern Pennsylvania Transportation Authority (SEPTA). “Upon implementation, the storage system will serve as a foundation for measurable gains in both energy efficiency and voltage stability in this critical corridor, providing a replicable and scalable model for broader system-wide implementation. By moving towards energy storage, SEPTA will be assuming a leadership role among transit agencies.”

“SEPTA’s partnership with Viridity Energy supports Philadelphia’s burgeoning market position as a cutting-edge center for smart grid technologies,” said Rina Cutler, deputy mayor for Transportation and Utilities. “This kind of energy saving technology and improvement to transit service reliability advances the Mayor's Greenworks Philadelphia agenda.”

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**SEPTA, Viridity Energy land state funding for energy recycling project**

**ProgressiveRailroading.com**

*September 7, 2010*

Last week, Viridity Energy announced it received a $900,000 Pennsylvania grant for an energy pilot project with the Southeastern Pennsylvania Transportation Authority (SEPTA). The state awarded funding through the 2010 Pennsylvania Energy Development Authority grant program.
As part of the project, Viridity Energy will deploy its software optimization system, which would enable SEPTA to recycle energy created from regenerative braking of trains and trolleys at a propulsion substation in Philadelphia. The project calls for Viridity Energy and SEPTA to install a large-scale battery to capture the braking energy along a portion of the Market-Frankford Line.

The project will help SEPTA cut energy costs, increase operational efficiency and decrease carbon emissions, Viridity Energy officials said in a prepared statement. SEPTA expects the pilot to generate savings of about $500,000. If the pilot project is successful, the agency might deploy the software system at all of its 38 substations.

"By moving towards energy storage, SEPTA will be assuming a leadership role among transit agencies," said SEPTA General Manager Joseph Casey.

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*Project aims to turn commuter trains' wasted energy into cash*

By Michael Burnham, E&E reporter, Greenwire

*September 13, 2010*

PHILADELPHIA -- Sparks fly and steel beams shake as electrified trains stop and go at Huntingdon Station on Market-Frankford, the city's busiest subway line.

The Southeastern Pennsylvania Transportation Authority's (SEPTA) nearby Letterly substation is able to capture about half of braking trains' kinetic energy to power outbound ones. The timing has to be just right, such as when a train is approaching the powder-blue, elevated platform from the other direction.

If only we could catch and release it all, at will, engineers have mused often. They are about to get their wish.

The Philadelphia-area startup Viridity Energy Inc. will use a $900,000 state grant to augment SEPTA's regenerative braking system with a device capable of storing up to 1.5 megawatts. Engineers are mulling everything from lithium-ion batteries to flywheels -- discs that maintain kinetic energy by spinning -- to store electricity in the bowels of the more than 80-year-old Letterly substation.

SEPTA will propel the Huntingdon Station's outbound trains with the power as well as sell it to PJM Interconnection LLC, the regional grid operator. Viridity will use its smart-grid software to show when the price is just right, such as on hot summer afternoons when Philadelphians crank up their window air conditioners and box fans.

"Clearly, SEPTA has a lot of electricity it’s not leveraging," said Laurie Actman, Viridity's director of business development and government relations. "The battery will take the uncertainty away and enable [SEPTA] to reuse all of the power."

When approaching trains hit the brakes today, SEPTA converts the kinetic energy into electricity and sends it to a third rail at the Huntingdon station. If there are no nearby trains in need of propulsion, the energy is dissipated as heat through the rooftops of train carriages.

The pilot project, which will include a three-month demonstration in early 2012, will cost about $1.5 million. Viridity hopes to demonstrate that SEPTA could recoup the capital investment within three years through energy savings, Actman estimated.

SEPTA, the nation's fifth-largest transit agency by ridership, spends about $20 million annually to buy electricity from Peco Energy Co. to power a fleet that includes 38 electrified buses and a sprawling network of subway trains and trolleys.

The Letterly pilot project will reduce energy consumption by about 15 percent, which translates to about $500,000 annually, estimated Erik Johanson, a SEPTA strategy and sustainability planner. The project will also further the agency's bid to slash its greenhouse gas emissions 5 percent annually, he said.
"Any way we can reduce our electricity consumption and prepare for a carbon-priced world is clearly in our best interest," Johanson added.

'Increasingly valuable proposition'

Viridity has yet to prove the Letterly pilot project's wherewithal, but SEPTA officials are already mulling whether to install energy-storage devices in most of the agency's 34 active DC-current substations.

Building a new substation, not including land, would cost SEPTA between $5 million and $9 million, agency officials estimate. The cost of installing an energy-storage device in an existing substation would cost in the range of $1 million to $1.5 million.

"If we did this systemwide, we could save about $2 million a year on energy," Johanson estimated. "This [technology] is going to be an increasingly valuable proposition for us."

The prospect of cutting power bills and greenhouse gas emissions has spurred several other electrified transit operators to test energy-storage devices.

TriMet, the public transit operator for the Portland, Ore., metropolitan area, tested a Siemens-built unit of supercapacitors in 2004. The wayside unit was able to temporarily store energy captured from trains braking at a station on its MAX light-rail line.

The pilot project's basic technology "worked just fine," but the concept of a fixed energy-storage device was not ideal for a slower-moving line where trains pass by every 10-15 minutes, said Thomas Heilig, the agency's director of systems engineering.

"We came to the conclusion that it would be better for us to put units on the [train] cars than on the wayside," Heilig explained.

TriMet is seeking a $10 million grant from the Department of Transportation to install energy-storage units atop 20 of its train cars.

"This is a technology that could really save us some money," Heilig added.

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**SEPTA hopes a giant battery will capture energy now lost**

*Philadelphia Business Journal - by Athena D. Merritt Staff Writer*

*September 17, 2010*

Every time a subway train brakes on SEPTA’s Market-Frankford Line electricity is generated. By next summer, a large-scale battery could be in place to capture and recycle that energy under a pilot project Viridity Energy Inc. started this week.

The energy conserving move on the transportation authority’s highest ridership line is just one of several actions that SEPTA is planning or has made as part of a broader environmental sustainability strategy. All stand to benefit the transit agency when state-imposed energy rate caps on Peco Energy Co. expire Dec. 31.

SEPTA spends an estimated $20 million annually to power its subway, trolley and regional rail lines. The Market-Frankford Line project will turn what was once an expense on the books into revenue by enabling SEPTA to capture energy that can be used later or sold back to the power grid, Viridity Energy President and CEO Audrey Zibelman said.

If the installation of the truck-size, one megawatt battery proves successful, others are already lined up and waiting.

“Several [transit] agencies have reached out to us as a matter of interest,” Zibelman said of the project, which if successful could lead to deployment at all 38 SEPTA substations. “We are in ongoing conversations with transit agencies in New York and Amtrak.”

SEPTA has applied for a $2.7 million federal grant to install wayside storage super-capacitors at the Allison and Pine substations, which feed the Southwest Philadelphia trolley and Broad Street subway, respectively. With Mondre Energy Inc.’s guidance, SEPTA
also struck an agreement last month to begin procuring about 40 megawatts of electric to power subway, trolley and railroad lines from Exelon and Sempra Energy. The contracts, which began January 1, are expected to save more than $8 million through the end of 2012.

“Basically they were able to give us a better rate than Peco,” SEPTA spokesman Andrew Busch said.

SEPTA and MEI are also shopping for deals for electricity for offices, maintenance yards and other facilities, Busch said. Toward the end of the year SEPTA will put out requests for proposals for a project to install solar panels on roofs, SEPTA Director of Strategic Planning Byron Comati said. Like Viridity’s project, the solar panels would give SEPTA another source from which energy can be drawn and sold back to the grid, Comati said.

“We have so much interest from the private sector on solar panels and their installation, which is very viable because we have so much square footage on our roofs,” Comati said of SEPTA’s maintenance shops for bus and rail.

A significant effort is also under way by SEPTA to convert to more energy-efficient lighting systems and boilers wherever possible. Last month, SEPTA received energy star certification for its headquarters at 1234 Market St., Comati said.

“When you have a large footprint in the region as SEPTA does, the opportunities for being very sustainability conscious are there,” Comati said.

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**SEPTA subways go hybrid with lossless battery storage system**

By John Steele

*September 21, 2010*

Philadelphians know SEPTA’s Market-Frankford El as the Blue Line. But a new pilot program, which stores leftover power from the subway’s regenerative braking system in a massive battery, would make the Blue Line a little greener, and provide SEPTA some much-needed capital.

Earlier this month, SEPTA and Conshohocken smart-grid firm Viridity Energy announced receipt of $900,000 from the Pennsylvania Energy Development Authority to install a massive storage battery—about the size of a cement truck—at SEPTA’s Kensington electrical substation. The current regenerative braking system transmits electricity, collected as trains enter stations, to other electric vehicles. But if no other vehicles are in range, the electricity is lost. The battery, capable of storing up to a megawatt of electricity, would siphon energy to be resold to the power grid. Viridity estimates that this one battery will generate $500,000 a year in clean, green profit. SEPTA has already applied for new funding to install these battery systems at all 33 substations across their service area.

"With this technology, SEPTA can be very strategic with their power; when they are using it, when they are storing it and when they are selling it back into the grid," says Viridity Director of Business Development Laurie Actman. "At peak periods, the grid is willing to pay premium prices for sources of reliable load.

Since 2008, SEPTA has struggled to execute capital improvements to its transit infrastructure. Most recently, a proposed switch to SmartCards has drawn scrutiny from city media and transit bloggers. When Governor Ed Rendell made a play to turn state thoroughfare I-80 into a federal toll road, he promised a chunk of the resulting revenue to SEPTA. Since Rendell's proposal was defeated, SEPTA has been looking for other ways to fund improvements, from fare hikes to advertising on the sides of trains. The battery system technology could be the answer they have been looking for that will finally bring the Philadelphia subway into the 21st century.
"As we all know, SEPTA has always had a constrained budget and not enough money to invest in its infrastructure," says Actman. "For so long, SEPTA’s infrastructure, that was built nearly a century ago, has been a liability. We are turning that into an opportunity."

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**PROJECT DEVELOPMENT & FTA TIGGER GRANT (2011)**

*Saving Electricity on a Philadelphia Subway Line*

By Matthew Wald – New York Times

*June 13, 2011*

Subway trains need a lot of electricity to get going, turning electricity into kinetic energy, the energy of movement. When they pull into a station, many of them can do the opposite: generate electricity from their momentum. They turn their motors into generators to slow the train, producing current.

But in many systems, some of that energy goes to waste because of a bottleneck: the third rail, which carries current to the train, cannot handle as much energy as the train is generating during deceleration. Too much current pushes up the voltage, and when the voltage gets too high, the electricity is dissipated by running it through a piece of metal that converts it into heat.

But in Philadelphia, on the Market-Frankford line of the Southeast Pennsylvania Transit Authority, a new company called Viridity Energy will install batteries to capture a lot of that electricity and hold it while the train is in the station. Then it can deliver the power when the train starts up again or store it for a time of day when it is needed more.

“Economically, it will identify what’s the best thing for Septa to do, based on hours and prices in the market,” said Audrey Zibelman, the founder, president and chief executive of the company, which is based in Conshohocken, just west of Philadelphia.

Yet the batteries are fairly small. The whole installation stores only about 400 kilowatt-hours, which a house with central air conditioning could consume in a week or maybe less. But it can accept or discharge energy fast, at a rate of about 800 kilowatts — enough to run about 800 window air conditioners going full blast.

For short periods the battery pack can handle 1.5 megawatts. That’s about half of the theoretical maximum that a train could put out while it was braking, according to Kevin Morelock, director of the project. (The other half would go on the third rail system.) The amount of electricity the batteries will capture during each deceleration is small, 2 to 4 kilowatt-hours.

The trick is that Septa has thousands of train stops a year, so the system will empty and refill quite frequently. They will hold less than a dollar’s worth of electricity in each cycle but should save $135,000 a year for the transit authority, Ms. Zibelman said. The energy savings should reach 1,500 to 1,600 megawatt-hours a year, she said, enough to run 1,000 suburban houses for a year.

The batteries, to be built by Saft, a major manufacturer, will sit by the side of the tracks in a box that looks like a shipping container. Beyond capturing electricity, they will perform a second function: help keep the alternating current of the regional electric grid working at exactly the right rate.

The system is nominally 60 cycles, meaning that the electrons reverse course 60 times per second, but in practice that varies from 59.999 to 60.001. When it strays from that range, someone has to add or subtract energy, a service that the grid operators will pay cash for.

For technical reasons, frequency control is becoming more of a challenge; because natural gas-fired plants and wind turbines generally do not regulate the frequency of the grid as well as old-fashioned coal plants do, some experts say, the job is getting harder. In New York, one company recently opened a plant that does this regulation work with flywheels.
Viridity, which plans to go into operation by the end of this year, will be hooked up by computer to the operator of the regional power grid, PJM. (The letters used to stand for Pennsylvania-Jersey-Maryland, but the system now sprawls from Delaware to Ohio and beyond, covering parts of 14 states.) Every few seconds, it can add energy or subtract it from the subway system's third rail network. That will change Septa's demand on the regional grid in a way that helps keep the grid at the proper frequency.

A third company, Envitech of Pointe-Claire, Quebec, will supply the electronic control system. The project will cost $1.6 million, part of which will come from the Pennsylvania Energy Development Authority. Viridity says it will demonstrate that such projects can pay for themselves in savings.

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SEPTA to install giant energy-saving battery

By Carolyn Beeler – Newsworks

June 19, 2011

SEPTA has chosen the French company Saft to manufacture a giant battery it hopes will help lower energy costs on the Market-Frankford line in Philadelphia.

The battery, which will be housed in a custom-built shipping container in a substation near the Tioga stop in Kensington, will capture and store the energy released by trains when they decelerate.

"Currently, the majority of that energy is being wasted because there's nothing to use that power," said SEPTA's Andrew Gillespie. "It becomes heat off the top of the car, so we want to capture that wasted energy."

The battery will sit underground about a block away from the train tracks. Gillespie projects it will supply about 10 percent of the power needed out of that substation, and will save SEPTA around $100,000 a year in electricity costs.

Right now, a small percentage of energy released by decelerating trains is transferred through the third rail, to give nearby trains leaving the station a boost. The battery system however, would capture more energy and store it for a longer time.

The new battery will also bring in additional revenue by helping regulate the grid, making power available at times of peak electricity usage, said Audrey Zibelman, head of Conshohocken-based Viridity Energy, which is partnering with SEPTA on the effort.

Zibelman says batteries have been installed in New York train stations in a similar pilot project, but this is the first effort she knows about that will also be able to perform regulatory functions.

A SEPTA representative said the battery should be installed by January; if the project is successful, it may expand.

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SEPTA makes public transportation more sustainable

By Andy Sharpe – Delaware Valley Association of Rail Passengers

July 18, 2011

Next time you ride on SEPTA’s Market-Frankford train, you might be helping to make Philadelphia a more sustainable city in more ways than you think. Soon, not only will you be using electric public transportation, but you’ll be helping to conserve electricity through an innovative partnership between SEPTA, Viridity Energy, and the industrial-strength battery manufacturer Saft. This is all thanks to a $900,000 grant from the Pennsylvania Energy Development Authority (PEDA).
SEPTA, Viridity, and Saft hope that Market-Frankford Line trains will eventually be able to run on their own recycled power in a process known as regenerative braking. Saft will provide one megawatt battery along the railway that will enable trains to pick up their electricity from the braking of other trains. If all goes as planned, SEPTA will even be able to generate revenue by selling excess electricity back into the general power grid.

What is even more exciting about this is that Philadelphia will be the first city in the country to have a track-side battery to enable this degree of regenerative braking. This latest innovation for Philadelphia is expected to become a reality later this year. If all works as planned, SEPTA could introduce similar electricity regeneration at 32 substations all over the rail system.

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**SEPTA Gets Fed Grant for Energy Saving Purchases**

By Lynne Adkins – CBS Philadelphia

*November 15, 2011*

PHILADELPHIA (CBS) – SEPTA is receiving two federal grants that will help the transit agency save energy dollars while adding to the bus fleet.

The $6½-million grant will let Septa buy 100 new hybrid buses to replace older, less energy-efficient models currently on the streets. Hybrid buses use diesel-electric technology and reduce emissions by almost 30 percent.

SEPTA spokesman Andrew Busch says the federal grant will also pay for a money-saving energy project on the Market-Frankford line that will harness the normal action of the subway trains.

“When they brake, it creates energy that these batteries are able to capture,” he explained, “and that energy can also be sold back to the grid. It’s a savings in terms of the energy that we have to expend to run the trains on the Market-Frankford line, and we can also resell some of the leftover energy that we don’t use.”

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**Train to Tomorrow-land**

By David Ferris – Sierra Club Magazine

*Jan/Feb 2012*

Andrew Gillespie's love for electric trains is a complicated thing. As the chief power engineer for the Southeastern Pennsylvania Transportation Authority, the sixth-largest U.S. transit system by ridership, he yearns for those gleaming bullet trains found in Japan and Germany. But he's in Philadelphia, where the electric rail lines are a century old and the system is perpetually short of money.

So when local smart-grid company Viridity Energy approached him with a plan to link his vast network of subway cars--and the electricity from their regenerative brakes--to the power grid, he saw the light. His agency could transform its creaky old infrastructure into an ultramodern asset and make cash by selling power to the local utility.

Though the pilot project involves just five subway stops, its potential is impressive. A six-car train can generate three megawatts (enough to power 125 homes) during the 15 seconds it takes to stop. Gillespie thinks the project can pay for itself in four years and then fund its own expansion to the rest of the system. Transit managers in other cities are closely watching Philadelphia’s experiment.

Gillespie grew up in the 1970s playing with his dad's model trains, and he developed an early interest in electrified transit. "Electric
trains are quiet, they're sleek, they can get to their top speeds much quicker. Diesels are dirty, they're loud, and they blow cinders," he says.

By trimming energy usage, the project will also help put the brakes on greenhouse-gas emissions from Pennsylvania's old coal-fired power plants. And perhaps help residents understand the role transit plays in making cities cleaner and more livable. "What I like about Philly is that there's a lot of opportunity to live car-free," Gillespie says. "Trains are an opportunity to make the area better."
**E-Trains & Energy Storage**

By Anissa Dehamna – CleanTechies

*March 1, 2012*

One of the most promising aspects of energy storage is that it’s used to make an existing system more efficient. If you think of the grid as the system, then energy storage can help make generation, transmission, distribution, and even customer energy use more efficient.

How many different systems are there? The grid is the most obvious example. Microgrids are another type of system. A more relevant system to the average consumer is a transportation system. And there are several examples of companies in the energy storage space targeting transportation systems.

How does it work? An energy storage system (specifically, a battery) is paired with an electricity-powered train system; the battery captures the energy from regenerative braking, just as the battery in a hybrid-electric vehicle does (which is part of the reason why these vehicles have high gas mileage). In the case of transportation systems, the battery is situated not on the train itself, but at a station the train travels through.

Hitachi is supplying two 1 megawatt lithium ion battery systems to the Seoul Metro in Korea, after successfully trialing what the company calls the B-CHOP system in a train station in Kobe, Japan. In this case, the batteries will collect energy from passing (and braking) trains and use that energy to run other electric trains on the system. The goal is to reduce the overall energy consumption of the electric trains passing through the station.

NGK Insulators has also installed several sodium sulfur battery systems at rail stations in Japan, although it is not clear whether these systems are being used to capture energy from the braking trains themselves, or to manage how much the stations and trains are taxing the grid. A subtle difference in applications, but an important one.

SEPTA (Philadelphia) is testing a battery from SAFT at a busy rail station and is using it to store and release energy. The transport agency is also partnering with Viridity Energy (also based in Philadelphia) to participate in demand response programs and the and frequency regulation market. Thankfully for SEPTA, PJM Interconnection — the independent system operator for the region — is one of the most progressive system operators in the country and allows even relatively small assets (like a modestly sized battery) to participate in the frequency regulation market. Programs like these could make railways and urban transit systems even more efficient ways of transporting large numbers of people.

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**Viridity Captures Train Braking Power, Sells It to the Grid**

Jeff St. John – GreenTech Grid

*April 26, 2012*

Electric-powered trains have been capturing the energy from regenerative braking for years now. But besides reducing power bills, they haven’t done much with the energy they’ve saved.

Philadelphia-based startup Viridity Energy is seeking to put a grid value on that energy with a new battery-backed, grid-connected system installed with the Southeastern Pennsylvania Transit Authority (SEPTA) train system. After a year and a half of work, Viridity
is now turning on the 800-kilowatt battery backed system, and will soon start bidding its energy reductions into demand response and frequency regulation markets.

It’s the latest move by Viridity into the world of so-called microgrids, virtual power plants, or other systems that allow buildings (or trains, in this case) to share their power with the grid. SEPTA’s project taps regenerative braking power at five downtown train stations along the Market-Frankford line, the city’s most-used, using power equipment from Envitech and Viridity’s “VPower” optimization software, and feeds it to an 800-kilowatt, 400-kilowatt-hour battery from Saft at the substation serving the five stations.

That’s a pretty small battery, compared to the multi-megawatt wind power backup systems being installed around the world. But Kevin Morelock, Viridity’s managing director of technical sales and partnerships, said in a Wednesday interview that Viridity’s ability to manage and optimize the interplay of battery, train power system and grid interconnections should yield returns that make it worth the effort.

How does it work? Well, when trains use their electric motors to slow down (usually approaching a station), that sends voltage down the “third rail” or overhead power line that supplies the trains their power. If there’s a train ahead, it can capture that voltage itself - but if there isn’t a train, that over-voltage is generally dissipated as heat, Morelock said.

Viridity’s system, on the other hand, taps the third rail and captures that voltage to charge the battery, he said. From there, the battery can be used either to power trains when power prices are high, to cushion substation loads to manage peak power moments, or to bid back into grid power markets, he said.

Those markets include so-called “economic” demand response -- turning down power use when the grid is at peak demand, usually at day-ahead or hour-ahead increments -- as well as frequency regulation markets, which require assets (usually gas-fired power plants) that can react in minutes, if not seconds, to balance fluctuations of grid frequency.

Viridity is already bidding battery-backed power into frequency regulation markets with partner and battery supplier Axion Power, which has installed Viridity’s system at its New Castle, Pa. manufacturing plant.

Saft and Envitech are financing the SEPTA project, helped along with a $900,000 Pennsylvania state grant that Viridity landed last year, Morelock said. With that grant, Viridity is expecting a return on investment of about 2 to 3 years on the project, he said.

Building a similar system without a grant would likely double that payback period to four to six years, he noted. SEPTA is working on a second, similar project, backed by $1.2 million in federal grants, that will use a different set of batteries from an as-yet unnamed supplier, he said. Other companies looking to capture train braking power and apply it to grid needs include flywheel maker Vycon Power and ultracapacitor maker Maxwell Technologies.

Viridity raised $14 million in January 2011 and is balancing and storing power at several university campus microgrids, a wind power storage management project in Pennsylvania, and other locations. While batteries play a part in some of its projects, others are concentrating on building energy management systems that pre-cool libraries, turn down lights in unused corridors, or adjust thermostats during peak power times to shave energy that can be bid back into power markets.

In February of this year, Viridity launched a partnership with big energy services company ConEd Solutions that could see its technology deployed in offices and other buildings. It’s also working with the developers of the Tres Amigas project, a multi-billion dollar effort to link the United States’ three main power grids via a high-voltage direct current transmission hub in New Mexico.
Philly’s SEPTA Trains are Rolling Power Generators

Tina Casey – Clean Technica

May 1, 2012

Commuter trains run by SEPTA, the Southeastern Pennsylvania Transportation Authority, are becoming “virtual power generators” thanks to new technology that captures the energy from braking and feeds it back to the grid. CleanTechnica first reported on the regenerative braking system when it was in development a couple of years ago and we’re happy to pass along news that the system has hit an important milestone on the path to completion.

Trains that capture kinetic energy

Regenerative braking systems are ideal for just about any kind of mechanism that involves frequent braking. That includes elevators, school buses, trucks, shipping cranes and yes, commuter trains. SEPTA partnered with the company Viridity Energy to develop a system that not only captures the kinetic energy from braking, but also stores it for later use.

The pilot program for the new system is situated on Philadelphia’s heavily used Market-Frankford line, and with the help of a large-scale lithium-ion battery from the company Saft it is now capturing and storing energy.

Another company, transit energy specialist Envitech Energy, is on board to provide power conversion, control and integration. When fully operational, the new system will enable SEPTA to sell energy to the grid, just like any other power generator.

A regional transmission organization, PJM, has dibs on the electricity, which enables it to add another element of alternative energy to its portfolio while providing SEPTA with the kind of revenue stream that other commuter rail systems can only dream about.

Sustainable energy in a built environment

The new system is another great example of the potential for alternative energy to piggyback on environments that are already developed for other purposes, rather than impinging on virgin lands. Rooftop solar panels and building-integrated solar technologies are of course two other obvious examples.

New developments in piezoelectric technology (the same trick behind that push-button starter on your barbecue grill) may some day make it possible to harvest energy from any surface under stress, such as floors and even highways.

Along similar lines, the U.S. EPA is aggressively promoting the use of brownfields and other abandoned industrial sites for wind and solar power installations, the Department of Agriculture is looking into the potential for growing biofuel crops on the grounds of airports, wastewater treatment plants are emerging as multi-purpose alternative energy generators and sports venues from baseball to football, hockey and even NASCAR are getting into the act.

And when those possibilities are exhausted, there’s always you: wearable solar gear and human-powered kinetic energy are just around the corner.
Electric Wizards: SEPTA generates revenue through cutting-edge technology

By Samantha Wittchen – Grid Magazine

May 30, 2012

Innovation” might not be the first word Philadelphians associate with SEPTA—two tokens sold in a plastic bag that says “Go Green” seems, um, not innovative—but that reputation deserves to change. SEPTA is piloting a cutting-edge regenerative braking project that saves energy and money, and positions Philadelphia as a global leader in public transportation sustainability.

This change couldn’t come at a better time. In August, Philadelphia will host the 2012 American Public Transportation Association’s “Sustainability and Public Transportation Workshop.” As hundreds of the industry’s leading sustainability and environmental policy professionals descend on the city, SEPTA will showcase its progress on the WAYSIDE Energy Storage System, a regenerative braking and energy storage system implemented at one of SEPTA’s electrical substations on the Market-Frankford Line.

The project began in 2010 when SEPTA announced a partnership with local power technology firm Viridity Energy. Backed by funding from the Pennsylvania Energy Development Authority and the federal government, the pilot is set to reduce electrical usage at the substation by 10 percent. The project will conclude by the end of 2012.

Regenerative braking itself isn’t new. New York, Seattle, Portland and Los Angeles all currently employ this technology, and SEPTA uses it to power the lights and air conditioning on trains. What makes SEPTA’s pilot system innovative is its use of a large battery to store the electricity generated by braking trains. Viridity will monitor the battery using their software to determine whether it’s more cost-effective for SEPTA to use the energy for powering trains or to sell the energy back to the grid.

Here’s how regenerative braking works on SEPTA trains: Instead of using brake pads to create friction to slow the train, the braking mechanism puts the electric motor in reverse, turning it into an electric generator. The generator can then provide electricity to a variety of applications, like lights, air conditioning, other trains and storage devices (batteries). Any excess electricity that can’t be stored is sent to a resistor bank on top of the train car and converted to heat. In the SEPTA pilot project, electricity stored in the battery can then flow to the grid.

The technology’s scalability is what makes it so important and potentially transformative. There are more than two dozen substations where this technology could be replicated, explains Andy Gillespie, SEPTA’s chief engineer for power, which would fundamentally change the way SEPTA manages power for its subways and trolleys.

The project may also save SEPTA a good chunk of change. Between reducing electricity costs and revenue generated by selling electricity, they’re expecting a net annual benefit of $300,000. The savings will provide the capital to fund future projects at other substations, creating a positive loop of savings. The demonstration phase began on March 1, and the transit industry is closely watching this project to see if it can be a model for other transit systems throughout the country. The workshop in August will be a great opportunity to further the project (by attracting more federal transit dollars) and demonstrate Philadelphia’s growth as an innovative sustainability leader.

Now, if we could just talk to them about those tokens.
**DEMONSTRATION STAGE (2012)**

*SEPTA is putting the brakes — the El's brakes — on wasted energy*

By Andrew Maykuth – Philadelphia Inquirer

*June 27, 2012*

A lot of energy is wasted each time a train stops at one of the 28 stations on SEPTA's Market-Frankford Line.

In a six-car train, the brakes produce about 3 million watts of power during the 15 seconds it takes to halt the 400 tons of hurtling metal, plastic and humanity. Some of the electricity is reused by other trains on the line. Much of the power is lost — dissipated as hot air through the subway car’s rooftop vents.

But what if the electricity produced by the train’s regenerative brakes could be captured and reused, as it is with a hybrid vehicle? And what if the power could be resold at a profit?

That's what SEPTA and Viridity Energy, a Philadelphia smart-grid company, hope to accomplish. On Wednesday, the partners will formally launch a sophisticated battery-storage system to capture energy from the Market-Frankford El.

The Wayside Energy Storage Project, situated in Kensington, is generating a lot of excitement in energy-efficiency circles because it combines two concepts — reducing SEPTA’s electric bill from Peco Energy Co., and selling stored energy back into regional power markets. It's all about the economics.

"By combining the two together, the return on investment goes up, and the payoff is much quicker." said Kevin Morelock, managing director of Viridity Energy.

SEPTA received a $900,000 grant from the Pennsylvania Energy Development Authority to prove the concept, which it hopes to replicate throughout the Market-Frankford Line. Viridity hopes the system, if it proves effective, can be reproduced in transit systems around the world.

Viridity estimates that the one-battery system alone will return more than $250,000 in total economic benefits a year.

SEPTA recently received a $1.5 million federal grant to build a second system. Andrew Gillespie, its chief power engineer, said the transit agency hopes the savings from the two units will fund the installation of up to 10 systems on the El, its busiest service.

"When the battery gets full, it discharges into the rails," said Gillespie. "When we do that, we are not buying power from Peco."

SEPTA aims to cut energy use 10 percent by 2015 and reduce greenhouse-gas emissions 5 percent a year. It currently spends about $20 million a year on electricity for its subways, trains and trolleys.

The project demonstrates the complexities of the "smart grid" system, where regional grid operators such as PJM Interconnection Inc. need to coordinate an increasingly scattered network of energy sources — solar panels, wind turbines, and small power generators — to maintain a delicate balance between supply and demand.

"It sounds like a simple concept, but it’s actually very complicated to do, to control the system so we can participate in the wholesale market, at the same time we can capture the ‘re-gen’ power," Gillespie said. "The two things have to work simultaneously. That's been the hardest thing to prove."

Just as a hybrid car recovers energy when it slows down, many electrified trains convert kinetic energy into electricity with regenerative brakes. On SEPTA’s Market-Frankford Line, the power is put back into the third-rail system, for use by other trains.
The Wayside battery-storage project takes the concept one step further. By storing SEPTA’s excess regenerated power in large battery systems, Viridity can control discharges to take advantage of PJM’s fluctuating electricity markets.

SEPTA installed its battery system in a spare room at the Letterly Power Substation, a century-old brick building near the Huntingdon Station in Kensington.

The beauty of the system is hidden from view. Lithium-ion batteries, produced by Saft North America, are stacked in racks in a 20-foot white, refrigerated shipping container that has the visual appeal of a meat locker. The brains of the system, the switching and control equipment built by ABB EnviTech, is housed in a beige metal cabinet. The two humming, unattended metal boxes are controlled remotely by Viridity personnel at 18th and Market Streets.

"On an average 65-degree day, electricity is probably selling for 10 cents a kilowatt," Gillespie said during a tour last week, when the temperatures had surpassed 90 degrees by 9 a.m. "You get a day like today, it could be selling at 25 cents a kilowatt. If you discharge your battery the right time, you could make 25 cents a kilowatt where you’re only buying it for 10."

SEPTA also plans to participate in PJM's "frequency regulation market," which requires producers to add power to or subtract it from the grid on a moment’s notice to ensure the system operates at a stable frequency. SEPTA’s batteries, which can store up to 800 kilowatts, are well-suited to an instantaneous response.

Gillespie said SEPTA expects the one unit to reduce its power purchases by $90,000 to $150,000 a year, and to earn $75,000 to $250,000 a year by selling into PJM’s energy markets. Viridity gets to keep 30 percent of the revenue from PJM, he said.

Viridity, which has worked with Drexel University and Thomas Jefferson University and its Center City hospital on energy-storage projects, is banking on the high visibility of the SEPTA project.

"There's a new generator in town," the company says in its promotional literature. "And it's pulling into a subway station near you."

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**Cutting the Electric Bill with a Giant Battery**

**By Matthew Wald – New York Times**

**June 27, 2012**

A giant battery bank installed by the side of the Southeast Pennsylvania Transit Authority’s subway tracks a little over a month ago is saving about nine megawatt-hours of power a week, its manufacturer says, which is more electricity than the typical apartment-dweller uses in a year.

The battery system, which I wrote about last year, is allowing the trains to run a bit like Prius hybrids. When they slow down at a station, their motors turn into generators, converting torque into current. Before the battery bank was installed, some of that current was returned to the third rail; but if the voltage got too high, it was shunted instead into a giant electric heater under the train, which simply dissipated the energy as heat.

Now the battery captures excess current, about 3.5 to 4 kilowatt-hours per train that stops, and puts it back on the line when a train is accelerating. Sometimes it does this for several trains at once.

The battery bank is also receiving signals every four seconds from the regional grid operator and either absorbing energy or giving it back to the grid to help balance supply and demand.

With the house current known as AC, for alternating current, electrons change direction at 60 cycles per second; if there is more supply than demand, they run a bit faster, and if there is more load than supply, they run a little more slowly. Essentially the battery owners get paid for helping keep the system as close to 60 cycles as possible.
Jim McDowall, the business development manager at Saft, which built the battery, said the combination of energy storage plus grid balancing would make the project profitable. The nine megawatt-hours cost about $90 each, he said, which would put the weekly savings in the range of $800.

As a storage device, the battery is more like a peanut butter jar than a wine jug; electrically speaking, it has a wide mouth and can empty and fill quickly, although its volume is small. It can accept or send out power equal to 1.5 megawatts, which is enough to light up a good-size shopping center, but it holds only 420 kilowatt-hours. That’s plenty for this application, however.

Officials held a ribbon-cutting ceremony for the battery bank on Tuesday. Saft and the developer of the system, Viridity Energy, are hunting for other applications.

Cutting the Electric Bill with a Giant Battery

By Heather Redfern – Metro Magazine

June 27, 2012

Public transit has always been the green transportation alternative. How do you make it even more environmentally-friendly and efficient for the 21st Century? The Southeastern Pennsylvania Transportation Authority (SEPTA), in partnership with Viridity Energy Inc. — a Philadelphia smart grid company — is bringing the regenerative braking energy technology long used by hybrid-electric vehicles to its Market-Frankford Line elevated trains.

But where hybrid-electric buses and cars have onboard batteries to capture and store energy created when the vehicle brakes, trains don’t have a storage capability and the energy created during the regenerative braking process can only be used by a nearby
accelerating train. And if there’s no train? That energy is lost, vanishing into the air.

Until now.

SEPTA and Viridity have devised a way to capture, store and reuse braking “El” trains’ energy, building upon the idea of an on-board battery.

In a first-of-its kind “wayside energy storage” project, SEPTA and Viridity have devised a way to capture, store and reuse braking “El” trains’ energy, building upon the idea of an on-board battery. Instead of just one battery like that on a car or bus, SEPTA’s system is several large batteries (produced by Saft Batteries Inc.) and a controller (produced by ABB Envitech, Inc.) located offsite (“wayside”) at SEPTA’s Letterly Substation. The stored energy can later be used by SEPTA to meet a variety of energy needs on the portion of the Market-Frankford Line served by that substation, including powering additional trains.

Wayside energy storage is green for reasons other than being socially responsible by reducing the amount of energy SEPTA needs from the power grid. The project will be a money saver and revenue generator for SEPTA — an important outcome at a time when transportation organizations are being looked upon to develop innovative means of creating income.

Much like SEPTA’s hybrid buses reduce fuel consumption, the battery is projected to decrease the electric bills at Letterly Substation by up to $190,000 per year. Additionally, the excess energy captured and stored by the battery can provide support to the electric grid via the frequency regulation market. Through its partnership with Viridity, SEPTA will deploy its energy surplus as virtual power into PJM Interconnection’s wholesale power frequency regulation and energy markets. SEPTA anticipates that frequency regulation and other demand response programs could generate up to $250,000 annually in new revenue.

“Through this pilot project, SEPTA will become even more energy efficient, which will help control operating costs — benefiting both customers and taxpayers. We’ve made our system cleaner, greener and more efficient in recent years: things like replacing traditional diesel buses with diesel-electric hybrids and installing energy-efficient lighting at stations, facilities and offices,” said SEPTA GM Joseph Casey. “These measures are helping us control costs in tough economic conditions and making us a better neighbor in the communities we serve.”

The Letterly Substation project, funded by a $900,000 grant from the Pennsylvania Energy Development Authority, is just the first in SEPTA’s wayside energy storage initiative. The agency received a $1.44 million FTA grant to install another device at a substation in Northeast Philadelphia. That grant will also be used to test alternative battery technology and determine the best fit for SEPTA’s propulsion system. The results will be shared within the transportation industry, allowing other rail transit agencies to determine how they might be able to use the wayside storage technology in their systems.
SEPTA Launches Cutting-Edge Regenerative Braking Initiative: Wayside Energy Storage

By Andrew Busch - Southeastern Pennsylvania Transportation Authority

July 27, 2012

Since the early 1900s, the Letterly Substation in Philadelphia’s Kensington neighborhood has been providing the power needed to run one of the city’s busiest train lines.

Now this facility is on the cutting-edge of 21st-century technology that is making public transit more sustainable and efficient, thanks to an innovative program to reduce power consumption and costs by harnessing the energy generated by trains.

The Southeastern Pennsylvania Transportation Authority (SEPTA) and Viridity Energy, a Philadelphia-based smart-grid firm, have launched a pilot project to bring regenerative braking energy—similar to that used by hybrid vehicles—to subway/elevated trains on the Market-Frankford Line. This line is SEPTA’s busiest route, serving nearly 190,000 riders daily.

In a first-of-its-kind “wayside energy storage” project, SEPTA and Viridity have devised a way to capture, store, and reuse braking “El” trains’ energy—the energy released when trains apply the brakes, usually dissipated as heat—building on the idea of an onboard battery. Instead of a single battery as in a car or bus, however, SEPTA’s system comprises several large batteries (produced by Saft Batteries Inc.) and a controller (produced by ABB Envitech Inc.) located offsite—or wayside—at SEPTA’s Letterly Substation.

Together with Viridity, SEPTA, a gold-level signatory to APTA’s Sustainability Commitment, will connect to the frequency regulation market—used to keep the electricity grid in a state of equilibrium—and other demand-response programs to sell the excess electricity captured by the wayside energy storage device on the electric market. Later, SEPTA can use the stored energy to meet a variety of energy needs on the portion of the Market-Frankford Line served by that substation, including powering additional trains.

This process will help the agency conserve energy and cut down on electric costs. It also creates an opportunity to generate new revenue, as the captured energy can be sold on the power market.

SEPTA has more than 30 substations, many of which could eventually take advantage of this technology.

Other public transit agencies will be able to share results from this pilot to assist their efforts to similarly reduce energy use and greenhouse gas emissions. SEPTA and others hope that soon economies of scale will allow the expansion of this promising partnership to generate economic gains without external support.

“Through this pilot project, SEPTA will become even more energy efficient, which will help control operating costs—benefiting both customers and taxpayers,” said SEPTA General Manager Joseph Casey. “We’ve made our system cleaner, greener, and more efficient in recent years through such efforts as replacing traditional diesel buses with diesel-electric hybrids and installing energy-efficient lighting at stations, facilities, and offices. These measures are helping us control costs in tough economic conditions and making us a better neighbor in the communities we serve.”

SEPTA anticipates that the energy optimization program could provide approximately 10 percent of the energy needed at Letterly Substation, which could reduce power bills by up to $190,000 a year. In addition, the agency could generate up to $250,000 in new revenues by selling captured power.

The pilot project, funded by a $900,000 grant awarded to Viridity by the Pennsylvania Energy Development Authority, is just the beginning of SEPTA’s wayside energy storage initiative.

SEPTA is exploring additional grant and funding opportunities that could allow for similar energy optimization projects at other power substations. The transit authority recently received a $1.44 million FTA grant to install another device at a substation in Northeast Philadelphia. That grant will also be used to test alternative battery technology and determine the best fit for SEPTA’s propulsion system.
These projects build on efforts undertaken as part of SEPTA’s Sustainability Program, a major goal of which is making the public transit agency greener and more efficient, and providing for improvements to an aging system that are vital to keeping it moving for current and future customers.

Kyle Bell, APTA program manager, environment and infrastructure, contributed to this story.

**Focus on Sustainability**
SEPTA’s role as an industry leader on these types of energy-saving initiatives will be in the national spotlight Aug. 5-8, when the agency hosts the 2012 APTA Sustainability and Public Transportation Workshop in Philadelphia.

The workshop will explore how emerging partnerships are paving the way to implement cutting-edge sustainable practices. Hear from speakers with a wealth of knowledge in these areas, including APTA Sustainability Commitment signatories. Learn how APTA members are improving efficiency, saving money, mitigating environmental impacts, and promoting strategies that encourage public transit use.