

## Adopting Tomorrow's Technology Today: Dayton, Ohio invests in High Tech Trolleybuses with In-Motion Charging

After lengthy testing, the Greater Dayton Regional Transit Authority (GDRTA) is buying 26 NexGen Electric Trolleys and will put the first production model in service by 2019. The RTA Board authorized spending up to \$57.4 million for the 26 vehicles and parts, plus 15 more NexGen Trolleys that will be bought once federal funding is in place, Executive Director Mark Donaghy told reporters. It is the largest bus contract in RTA history.

The NexGen Electric Trolleybus bus costs 63 percent more than a standard diesel transit bus, but has a 20-year, 800,000 mile life compared to the diesel's 12-year, 500,000 mile life, Donaghy said. Electric trolleys are cheaper to operate, better for the environment and quieter than a diesel bus, he explained.

"Using electric instead of diesel buses is a step towards a clean air environment for Dayton," said Peggy Ann Berry, an occupational safety and health professional and Climate Reality Project leader in Dayton. "Diesel buses release dirty fossil fuel emissions into the environment. These emissions exacerbate asthma attacks as well as add to the cardiac burden of older adults."

RTA is now finalizing the cost of the NexGen after making several modifications to the prototype. The US Federal Transit Administration (FTA) is picking up 80 percent of the cost, and the rest comes from the local sales tax and rider fares. "We ran the heck out of the test fleet," Donaghy said. "I very pleased with the bus. I think at the end of the day we have the best possible design."

The NexGen Trolleys will replace the RTA's current trolleybuses which have been in service since 1998. They operate on seven routes over 124 miles of overhead wire. Those buses cost \$550,000 each back in 1998, while a new electric trolley is about double that price. Hybrid diesel buses can be bought for about \$750,000 each, but RTA Director Donaghy said the ones that RTA has bought have been a disappointment, and no more will be purchased.

The RTA is one of five transit systems in the U.S. that use electric trolleys. The NexGen Trolley is being built on a contract with Kiepe Electric of Georgia, which provides electric components, a traction motor and poles on a bus body provided by subcontractor Gillig Corp. of California. (con't on Page 2)



The NexGen Trolley reaches the end of the route 5 line on Southmoor Circle in Kettering. [Photo: Lisa Powell, Dayton Daily News, Newswire]

## Alberta uses Carbon Tax to Fund Valley Line LRT

The Province of Alberta is converting a \$176-million loan to the City of Edmonton into a grant for the construction of the 13 km southeast leg of the Valley Line LRT connecting Downtown and Millwoods. The funding was originally given to the city in 2014 as an interest-free loan by Allison Redford's Progressive Conservative government. The Province is converting the loan into a grant with money from carbon tax revenue.

The funds keep the Province's total Valley Line contribution at \$600 million, or one-third of the \$1.8-billion project cost. The announcement came on September 15<sup>th</sup>. (con't on Page 2)

## *Dayton's NexGen Electric Trolley* (con't from Page 1)

Seattle and San Francisco transit systems both bought new electric trolleys with Kiepe electric components, and their vehicles are also equipped with advanced battery technology that enables off-wire operation on a scale that would have been impossible ten years ago. Dayton's NexGen trolley can drive 15 miles off-wire fully loaded at 50 miles per hour, powered only by its battery. The battery is charged while the bus is on-wire. "I think that's the way to go," said Harvey Hylton, a retired RTA engineer who once managed the RTA trolley fleet and sat on the selection committee that picked the NexGen vehicles.

A number of non-trolley, battery-electric buses are being added in North American cities that rely on fast-charge stations located along bus routes. But those buses are more often used on downtown circulator routes, rather than getting the heavy-duty use required of electric trolley fleets. RTAs trolleybuses provide about 2.4 million rides annually.

During testing, the RTA operated four prototype NexGen trolleys on regular routes. The goal was for the NexGen bus to be able to run to the end of the line on wire and then off-wire to nearly any point RTA serves in Montgomery County and Greene County on the Wright State University route. The model chosen is powered off-wire by a 3,000-pound Lithium Titanate Oxide battery with a 12-year lifespan. One prototype model used a diesel engine and generator rather than a battery to power it off-wire, but RTA was not satisfied with how that bus performed, Mark Donaghy told reporters. As the prototypes were purchased by the RTA, they will also be added to the Dayton fleet. [Source: Dayton Daily News, October 20, 2017]

## *Edmonton LRT Expansion* (con't from Page 1)

"I'm pleased to see the province's continued support and commitment for LRT expansion in our city, which itself is a key part of our greater transit strategy for the Edmonton Metro region," Mayor Don Iveson said. Iveson, provincial Minister of Transportation and Minister of Infrastructure Brian Mason, and other officials were on hand for the announcement at the Gerry Wright Operations and Maintenance Facility construction site at 75<sup>th</sup> Street and Whitemud Drive, where the Valley Line LRT vehicles will be serviced and stored.

Mason said the southeast line is a priority for the provincial government. "Funding for this project will help to make life better for Albertans by supporting an affordable, accessible and environmentally sustainable transportation option in Alberta's capital city," Mason said.

Completion of the southeast portion of the Valley Line is expected by 2020. [Source: Global News online, September 15, 2017]

## **Leading by Example: Seattle Rides into the Future with Electric Transit**

King County Metro of Seattle is the most rapidly growing transit agency in the U.S, and leading in clean electric transit is nothing new to them. Metro has operated the second largest fleet of electric trolleybuses in the U.S. since 1940, and that system was just recently renewed with an entirely new state-of-the-art fleet of electric trolleys. Metro has also pushed the industry to innovate and became the first transit agency in the U.S. to aggressively adopt diesel-electric hybrid buses in large numbers. Seattle currently operates a fleet of about 1,400 buses, mostly hybrids, and electric trolleys.

But Metro isn't stopping there. It has now released a plan to transition to an entirely zero-emission bus fleet — powered by renewable electricity — no later than 2034. And King County Executive Dow Constantine also secured an agreement to help Puget Sound Energy generate more wind electricity, enough to meet nearly all current county needs in the service area with green energy by 2019.

Earlier this year, Metro ordered 120 battery buses — the largest such purchase in North America to date. Work also began this year on the First Avenue Electric Streetcar, a \$135 million project to expand electric streetcar service by linking the South Lake Union and First Hill streetcar routes and connecting Capitol Hill, Pioneer Square, Westlake Avenue North and Republican Street.

A lot needs to happen to make a successful jump to transit that is 100% powered by clean electricity. On the battery bus front, for instance, Metro challenged battery bus manufacturers to develop larger, articulated buses and longer-range buses, and to standardize charging stations.

"We now have battery buses operating on Routes 226 and 241, serving some of the region's densest job centers including Microsoft and downtown Bellevue. With a range of 25 miles, these buses are quiet, clean and need only a 10 minute charge before returning to service," said Rob Gannon, Manager of Metro Transit. "And we are continuing to test new models. By the middle of next year, riders in South King County will ride on six battery buses from three different manufacturers, all with an extended range of 140 miles. In addition, we will roll out four 60-foot articulated

buses from two manufacturers. We've chosen South King County as a focus area for the first big wave of battery bus deployment because we know these communities face disproportionate air pollution and health impacts, and so we want to bring the benefits of zero emissions buses there first."

While battery technology continues to evolve, the standardization of charging systems remains elusive. Metro officials say they won't be saddled with multiple different charging systems and are insisting on a universal system that works with all battery bus types. "We are also working with our local utilities to plan charging infrastructure and make sure we have reliable backup for Metro and Sound Transit bases in case of a power outage," adds Gannon. "We need confidence that we'll be able to provide essential transportation services, no matter what." [Source: Seattle Times, October 2, 2017]

## *In Memoriam – Robert R. Clark*

It is with great sadness that the Edmonton Trolley Coalition reports the passing of Robert (Bob) Clark on September 21<sup>st</sup>. Bob was a founding member of the ETC back in 1999 and steadfastly supported the mission and goals of our organization through 18 years. He served as Acting Chair and as Vice Chair for several years, and was the founder and editor of this newsletter, *Transit Talk* (originally known as the ETC Bulletin). Bob was an inspiration to the membership of this organization as he worked tirelessly to promote and support not only electric transit, but transit improvements on a wide scale. His vast knowledge and experience from years of involvement in the transit industry proved an invaluable asset in ensuring the effectiveness of our organization and its undertakings. The membership owes him a great debt of gratitude.

Bob worked for the Edmonton Transit System in a number of management roles for a period of ten years in the 1970's and 80's. During that time, he was involved in transit planning which included the renewal of the electric trolleybus system and the construction of the initial leg of Edmonton's LRT. He has been called one of the Fathers of Light Rail in Edmonton. From Edmonton, Bob and his family moved to Vancouver, BC, where he worked on the planning and construction of SkyTrain and became its first Director of Operations. Bob and his family then relocated to Nelson, BC, where he had a managing role in the design and construction of the Nelson streetcar line.

Public transit was in Bob's heart and in his blood, and so he pursued transit related activities even outside of the workplace. Not only was he involved in the Edmonton Trolley Coalition, but he also founded the Edmonton Radial Railway Society. Bob was instrumental in the resurrection of the High Level Bridge streetcar, and in the restoration of Edmonton's streetcar No.1 when it made its initial return to the High Level Bridge in 1979. Bob also helped to found transit historical societies in Glasgow, Scotland, and in Nelson, BC.

Bob's presence will indeed be missed by many. Our thoughts and prayers are with him and his family.

*Brian Tucker, Chair*

## **San Francisco Commits to Modern Electric Transit with Order for 185 Trolleybuses**

The San Francisco Municipal Transportation Agency (SFMTA, popularly known as MUNI) has placed an order for 185 new trolleybuses to renew its fleet of 12 metre ETI vehicles that date from 2001. The manufacturer, New Flyer of America, will supply its 12 metre long Xcelsior model.

The order is an option on a contract originally placed by King County Metro Transit of Seattle in 2013 that allowed options to be exercised by SFMTA. The order concludes the largest zero-emission bus procurement in North America to date.

The vehicles will sport the latest in 21<sup>st</sup> century advancements for electric vehicles, namely Kiepe's "In Motion Charging" system that will allow them to run off-wire where necessary. Batteries will recharge when the vehicle is back under overhead lines. Kiepe Electric is a well-established international supplier of electric bus propulsion.

Over the past year SFMTA also ordered a total of 93 new 18 metre articulated trolleybuses.

The new trolleybuses represent a milestone in modernization for the SFMTA and received unwavering support from Mayor Ed Lee, the SFMTA Board of Directors, and the Board of Supervisors to improve and renew the rubber tired fleet. "The people of San Francisco deserve modern, reliable transportation services that support the quality of life and economic vitality of the city," said SFMTA Director of Transportation Ed Reiskin. "By investing in new, high-performing, quiet and green electric trolley vehicles, we are able to provide better options for moving around the city." [Sources: Metro Report, Aug 2, 2017; Metro magazine, June 15, 2017; Kiepe Electric, August 4, 2017]

## Brno, Czechoslovakia gets Trolleybuses with In-Motion Charging

In 2018, Skoda will be delivering 10 26tr air-conditioned trolleybuses to Brno with off-wire capability similar to that of the new trolleybuses in Dayton. Part of the development work on the demonstrator unit was done at the Brno operator's workshops. The SOR TNB12 demonstrator is called "Acumario", and it has been referred to as a "partial trolleybus", indicating its off-wire capability. The demonstrator unit operated until the end of July.

The electrics are by Rail Electronics CZ, with batteries mounted on the roof and in the rear. The vehicles will be air-conditioned and recharge dynamically through regeneration and using the poles when travelling on wired sections of route. The off-wire range is significantly less than that of the Dayton NexGen trolleys, at only 15 km.

The Czechoslovakian city of Prague has also been testing In-Motion charging with "partial trolleybuses" as a solution to range problems encountered with its fleet of battery electric buses. [Source: International Trolleybus News (R.C. DeArmond), October 10 and 12, 2017]

## Linz, Austria to get In-Motion Charging

Linz transport operator Linz Linien has ordered 20 high capacity ExquiCity trolleybuses from Van Hool to replace its current fleet. The vehicles are due to enter service by the end of 2019.

Being built at Van Hool's factory in Belgium, the 24 metre buses have a capacity of 180 passengers. Batteries allow off-wire operation and are recharged through the overhead wires using an In-Motion Charging system by Kiepe Electric. Other features include air-conditioning and an anti-icing system that sprays the overhead lines with antifreeze to reduce ice formation on cold nights. [Source: International Trolleybus News (R.C. DeArmond), October 11, 2017]

## Esslingen's Trolleybuses with In-Motion Charging generate Huge Interest

Esslingen Municipal Transportation Authority (SVE) presented its new Solaris trolleybuses with Kiepe's In-Motion-Charging (IMC) system to visiting transit professionals earlier this year. The four trolleybuses have been in regular service since 2016. The IMC articulated buses are equipped with lithium titanate (LTO) traction batteries which, with 37 kWh of usable energy and an output of 240 kW, enable normal operation on sections of the route with no overhead lines. Even in unfavorable conditions, they have an operating range of ten kilometers in battery mode. "On Route 113, the trolleybuses cover two-thirds of the distance on battery power. This enabled us to bring the Berkheim district into our zero-emission network with no additional infrastructure costs. Ever since they entered service, these vehicles have been as reliable as diesel buses," said Harald Boog, head of operations at SVE.

The trolleybuses have a top speed of 65 km/h in both on- and off-wire operating modes. Their dual axle drive with 160 kW available at each powered axle gives the buses outstanding performance on gradients and in difficult weather conditions. The slight difference between battery power and power-from-the-wire is generally not noticeable.

"The key to our success was the development of a new, powerful battery charging concept. This cleared the way to topping up the battery fast on the short stretches with overhead lines," explained Kiepe project manager Joachim Berndt. If necessary the buses can draw on up to 600 kW while hooked up to the overhead lines. "The IMC concept means that it takes only short sections with overhead lines to reliably eliminate the risk of a recharging bottleneck." [Source: Kiepe Electric, Feb. 17, 2017]

## MUNI Dances on the Trolley, encouraging people to Take Transit

Dance and transit united on October 24<sup>th</sup> to lure hundreds of people to a free performances along San Francisco streets, parks and alleyways as the annual San Francisco Trolley Dances took place. The roving audience saw dancers perform on bleachers at Golden Gate Park as trapeze artists swung in the background. They witnessed a hip-hop dance troupe take over a South of Market alley, and Japanese drummers and dancers frolic outside Kezar Stadium. At Golden Gate Park, they were greeted by a stilt-walker, singer and dancer. They watched dancers on the bleachers at the Circus Center, a training venue near the park, and saw a juggler using the Diabolo, or Chinese yo-yo. There were even taiko drummers and dancers in a corner of the park.

The San Francisco Trolley Dances have been going on for 14 years. The event employs regularly scheduled Muni streetcars and trolleybuses to connect a series of performance sites spread around the city. "It's about using Muni, using the SFMTA, to piece San Francisco together," said Zackary Forcum, Managing Director of the event. MUNI takes them on the tour; it's all about getting people to use transit. [Source: SF Chronicle, October 24, 2017]

## SF Cable Cars Shut Down for Overhaul

San Francisco's famous cable cars click and clack up hills every day, punctuated by the occasional "ding!" However, beginning on September 22<sup>nd</sup>, the California Street Cable Car line fell silent. It was out of service for at least a week while the gearbox running four miles of steel cable under city streets was replaced.

This was the first in a series of replacements to gearboxes running each of the city's four cable car lines — the California, Hyde, Powell and Mason lines — each of which will be out of service in turn. Those shutdowns will happen in 2019.

This will be the first time the gearboxes have been swapped since 1984. That's when then-Mayor Dianne Feinstein initiated a major overhaul of the City's cable car barn at Washington and Mason streets.

And soon the cable cars themselves will all be rebuilt. Though the rolling historical landmarks are continually undergoing maintenance, the SFMTA's 20-year capital plan shows a \$42 million need to begin an "accelerated" overhaul and reconstruction of the fleet. After an overhaul, they last 20 years, but right now the SFMTA is having trouble keeping up on the everyday maintenance. Other upgrades will soon follow to the cable car's trackway and turnarounds.

"The gearbox is the first step," said Ed Cobean, Senior Operations Manager of the San Francisco Municipal Transportation Agency's Cable Car Division. Each gearbox is the size of a small sedan and weighs 20 tons. They are the drivers of the cable cars, and spin massive "shivs," which are the 30-foot-tall wheels that pull the some 12 miles of steel cables. The steel cables are then gripped by the cable cars to move. The steel cables themselves are replaced on the California Cable Car line every six months, and about every four months on the three other cable car lines, said Cobean.

The knowledge needed to repair the outdated, but highly valued, world-famous technology is unique, said Robert Bergesen, a senior mechanic for the cable car system. "There's a lot of pride in the cable car system," he said. [Source: SF Examiner Sept 22, 2017]

## A Push for Diesel Leaves Londoners Gasping Amid Record Pollution

Every winter the coughing begins. London, England is left choking from record levels of pollution, much of it caused by diesel buses and trucks, as well as by wood-burning fires in private homes, a growing trend. It has been bad enough to evoke comparisons to the Great Smog of 1952, when fumes from factories and chimneys killed 12,000 Londoners.

London's air pollution today is different than seven decades ago, and more insidious. It is no longer thick as "pea soup," but the city's air is now laced with nitrogen dioxide — a toxic gas produced by vehicles with diesel engines. The pollution is linked to 23,500 deaths in Britain each year, according to the Department for Environment, Food and Rural Affairs. Britain has the highest number of deaths from nitrogen dioxide in the European Union after Italy. Consequently, the European Union has ordered five members, including Britain, to reduce car pollution levels or risk being sent to the European Court of Justice where they could face huge financial penalties. The current problem is partly an unintended consequence of previous efforts to aid the environment. Previously, the British government provided financial incentives to encourage a shift to diesel engines because laboratory tests suggested they would cut harmful emissions and combat climate change. Yet, it turned out that diesel vehicles emit on average five times the emissions in real-world driving as in the tests, according to a British Transport Department study.

"No one at the time thought of the consequences of increased nitrogen dioxide emissions from diesel," said Anna Heslop, a lawyer at ClientEarth, an environmental law firm that last year forced the British government to produce a better plan to improve air quality. Recently, London has been put on "very high" pollution alerts when cold air and stationary weather patterns failed to clear the toxic air caused by diesel traffic and open fires. "The time will come when we'll start wearing masks," Ray Hussain, 73, said as he waited for his diesel bus on Brixton Road one morning. At nearly any point during the rush, 16 double-decker buses lined the road. Traffic was snarled, and whiffs of acrid air stung the eyes.

Some schools are considering handing out gas masks to pupils, saying children's lungs are in danger of being stunted. More than 440 schools are in areas exceeding legal air quality levels, according to Mayor Sadiq Khan of London. Khan has proposed a clean air zone in central London, and a toxicity charge of \$12 per day for polluting vehicles that enter the zone. Earlier this month, London's Metropolitan Police announced a plan to introduce about 300 environmentally friendly police vehicles, including hydrogen fuel cell vehicles and hybrid electric cars, as part of a fleet overhaul. What is remarkable is that any real plan to clean up the large numbers of diesel buses roaming the city has yet to materialize. [Source: February 17, 2017, NY Times]

## Major Cities Pledge to ban Diesel Buses

Four major world cities have pledged to ban diesel vehicles from their streets by 2020, as world leaders attempt to tackle the crisis of dangerous air pollution. Paris, Madrid, Athens and Mexico City will implement the bans. Diesel engines are thought to be behind the toxic air pollution that causes at least half a million premature deaths in Europe each year, with particulate matter and nitrogen oxides being the main health concerns.

At a climate meeting in Mexico, the cities' mayors also pledged to incentivise electric, hybrid and hydrogen vehicles, and walking and cycling. Two of the four cities already operate extensive electric trolleybus systems as well as other electric transit modes.

The move comes amid increasing concerns about the impact of diesel engines on the health of people living in cities. A 2016 report found that air pollution causes nearly half a million premature deaths each year in Europe alone. [Source: Road.cc, December 3, 2016]

## Toronto Go Transit Passengers at Risk from Diesel Exhaust, says study

GO Transit commuters with health concerns might want to start sitting at the back of the train, says a new study. Research from the University of Toronto has found that passengers on commuter trains are at risk for exposure to "markedly high levels" of carcinogenic exhaust. Passengers in the car directly behind the locomotive are at particular risk.

The study recommends that "immediate steps be taken to evaluate and mitigate exposure in all diesel powered passengers trains", and that "passengers with existing cardiac or respiratory conditions may wish to travel near the rear" of trains being pulled by a locomotive. While diesel exhaust can cause cancer, both of the components the scientists measured are toxic in their own right. Ultrafine particles have been known to cause lung and other health problems, while black carbon (essentially soot) has been linked to damage to

respiratory, cardiovascular and nervous systems. The researchers found that concentrations of the two pollutants were not high when trains were in “push mode,” which is when the locomotive is at the back of the moving train. Roughly half of GO trains are pushed. But when the trains were in “pull mode,” with the locomotive at the front, the researchers found that inside the coaches concentrations of ultrafine particles and black carbon were five and four times higher, respectively, than in air sampled on the streets of downtown Toronto.

GO trains are operated by the provincial agency Metrolinx. Its chief operating officer, Gary Percy, maintained that it is safe to travel by GO train. “We want to assure everyone who relies on GO Transit every day that we place the highest priority on their health and safety, and we will continue to monitor and report on air quality to ensure we see improvements.”

The research was conducted by the Southern Ontario Centre for Atmospheric Aerosol Research at U of T and is one of the first studies to measure pollutant exposure inside commuter trains.

Cheri Di Novo, the NDP MPP for Parkdale-High Park, has been advocating for years for the diesel trains that run through her riding to be replaced by electric ones. She said the study is proof that the effects of diesel trains are “worse than we ever imagined.” Di Novo said Metrolinx should have been more aggressive in electrifying its lines, particularly the UP Express, which opened in 2015. She and other critics have argued that it should have operated with electric trains from the start. “It’s alarming, and it’s more alarming than we thought,” Di Novo said. “Electrification has got to be a priority.” [Source: [www.thestar.com](http://www.thestar.com) Feb. 7, 2017]

## Electric Streetcar News

### Streetcars to Return to Detroit After 61 Years

One a sunny Friday in May, something new rolled down Woodward Avenue in Detroit: a streetcar. The event marked a return to electric streetcars in the Automotive Capital of America after a 61 year absence.

Known as the Q-Line, six streetcars ply a 6.6 mile loop — 3.3 miles each way — connecting downtown Detroit with the New Center neighborhood, which was once home to General Motors. Along the way, passengers can stop at Comerica Park and Ford Field, Wayne State University, the Detroit Institute of Arts, the Museum of Contemporary Art Detroit, Fox Theatre and the Detroit Opera House. And in the fall, the Little Caesars Arena will open along the line.



The Q-Line has brought revitalization and development to a core area of Detroit – totaling some \$7 billion in the years since the line was first conceived. It is an important step at bringing mass transit to an area that, for years, could not agree on a plan. [Source: *The Two-Way*: Breaking News from NPR, May 12, 2017; photo courtesy The Two-Way]

### Oklahoma City Breaks Ground on OKC Streetcar

The future was on Oklahoma City Mayor Mick Cornett’s mind on February 7th as city leaders, merchants and others broke ground to mark the beginning of downtown streetcar line construction. Cornett called the MAPS 3 streetcar a big advance for “a generation which raised its hand and said, ‘We want to move Oklahoma City forward, faster than it’s ever moved before.’”

Track for the \$131.8 million streetcar system will be laid through the central business district, connecting MidTown and Bricktown. Construction is beginning in Bricktown and includes overhead wires, boarding platforms and electrical substations. A main line 4.6 miles in length will run through downtown, while a 2.3-mile Bricktown loop offers an option for frequent service between the entertainment district and a new convention center complex. There will be 22 stops.

In remarks at the groundbreaking, Cornett said he’d been reflecting on the demise of Oklahoma City’s previous streetcar system in the 1940s. It was a day when America was moving in a new direction, he said. “We were hitting the accelerator, moving toward a car-centric economy,” Cornett said. “Change produced success for the nation, but also suburban sprawl and development that we enjoy today and we curse today. In general, the auto-centric lifestyle that we and other cities created for ourselves was a very unhealthy environment,” he said.

Now the streetcar is coming back because voters said that it “is a much more enjoyable way to investigate and explore downtown Oklahoma City. And the streetcar contributes to the city’s growing commitment to pedestrian-friendly development, a central tenet of Cornett’s push for healthier living,” Cornett emphasized.

The streetcar will be integrated with the bus network and regional rail transit. [Source: *The Oklahoman*, Feb. 8, 2017]

### Tempe, Arizona Streetcar in the Works

Earlier this year, the Valley Metro Rail Board of Directors approved a contract with Stacy and Witbeck Inc. and Stantec Engineering to build a streetcar line for Tempe. Stacy and Witbeck successfully completed the Kansas City streetcar line in 2016 and bring a vast amount of experience to the Tempe project. Construction of the three-mile streetcar route has now begun, with the line anticipated to open in 2020. [Source: *Valley Metro*, Jan 23, 2017 and subsequent dates]

## Sparks Effect: Kansas City Electric Streetcar Proven to boost Business

Kansas City's streetcar started running on May 6<sup>th</sup>, 2016 from the River Market to Union Station . Not even a year later, Downtown stores and other small retail establishments are saying the streetcar has been great for business.

According to a survey of stores and businesses in Downtown Kansas City, a whopping 97 percent said the streetcar has had a positive impact on their business, and 80 percent said they had seen an uptick in revenue and foot traffic. "A lot of the merchants are seeing new customers," said John Pajor, business advocate for Kansas City Municipal Government.

The survey also allowed businesses to elaborate on what future improvements they would like to see. Respondents favored streetcar expansion as well as park-and-ride facilities for transit users. [Source: Kansas City Star, Jan. 26, 2017]

## Streetcars Return to Memphis after Three Year Absence

After a three year absence, the first Memphis streetcar finally lumbered out of the garage in mid-September of this year to test safe and smooth operation. Refurbished from the ground up, it was painted in dark blue and white. "All indications are that the test went well," said Memphis Area Transit Authority boss Gary Rosenfeld.

All of the Memphis streetcars are undergoing refurbishment and are expected to be back in operation by 2020, after having been withdrawn from service three years ago due to safety issues. "I think our community is behind spending money on things that are of value," says Memphis Chief Operations Officer Doug McGowen. "[The streetcars] create value in our community, and this is important."

Many businesses along Main Street reported a big drop in sales after the streetcars were taken off and are anxious for their return. [Source: Local Memphis, September 21, 2017]

## Galveston City Council gives approval to resume Streetcar Service

Electric streetcars are making their return to the streets of Galveston this year after having been out of service since Hurricane Ike back in 2008. Galveston City Council had approved a contract for the repair of the trolleys with the Idaho-based Gomaco Trolley Company.

"It is great to be 'on track'," City Manager Brian Maxwell commented. "I think it's going to have major impact both for tourism and ... towards our goal of getting people out of their cars." [Source: Click 2 Houston, Jan 27, 2017]

## *Battery Bus News*

### ABB and Novabus to Partner on "Opportunity Charger" for Battery Buses in Montreal

ABB, a worldwide supplier of technical and digital solutions to industry, and Nova Bus have announced a business collaboration to deliver the first ABB battery bus "opportunity charger" in North America in hopes of getting more electric transit solutions to cities across the U.S. and Canada. "Transportation can be one of the biggest contributors to climate change. Supporting Nova Bus with ABB's innovative charging solution will help to reduce greenhouse gas emissions," explained Derek Monk, General Manager at ABB Canada. "This initiative represents a major step in the advancement of battery buses in public transit in North America and it will be the first ABB battery bus opportunity charging station in the Americas." [Photo: ABB]



The order from Nova Bus comprises one complete 300 kW modular common interface charging system with inverted pantograph technology and commissioning from the new ABB Campus in Montréal. The ABB DC fast charger is based on a common interface, which allows charging stations and electrified buses from different manufacturers to be used together and only takes three to four minutes to charge the batteries at the charging station. Battery bus systems based on the OppCharge interface are being implemented in more than 12 countries.

A demo e-bus and charging infrastructure from Nova Bus is scheduled to travel across the USA in the Fall of 2017 and encourage transit authorities to jump on board. [Source: ABB News Release, Feb 10, 2017].

## Frederick County Maryland to add Battery Buses to its Fleet

TransIT Services of Frederick County hopes to add several battery buses to its fleet in the coming months as part of the process of moving the county's fleet towards an electric future. The transit service has received funding for one such bus so far in fiscal 2018, and could get another if it is awarded another grant, said TransIT Director Nancy Norris. The agency also hopes to add four more in fiscal 2019, which begins July 1, 2018, she said.

The additions are part of Norris' hopes to shift the county's aging fleet to electric in the next few years. Along with the environmental benefits that electric buses provide, they also offer savings on fuel and maintenance costs, Norris said. It costs the county \$4,200 per year to power an electric vehicle, compared with \$23,000 in fuel for a diesel bus, she said. An electric bus averages \$1,500 in maintenance costs in the first year of ownership, while a diesel bus has \$8,600 in costs.

That's consistent with experience in the transit industry, said Paul Lewis, Vice President of policy for the Eno Center for Transportation, a nonprofit think tank dealing with transportation issues. Electric vehicles tend to be more expensive to buy, but cheaper to maintain, causing transit agencies to balance higher upfront costs with lower costs over a vehicle's life, Lewis said. [Source: The Frederick News-Post, October 31, 2017]

## Indianapolis Airport to get Battery Buses

Complete Coach Works (CCW) will provide the Indianapolis International Airport (IAA) with six Zero-Emission Propulsion System 35 foot remanufactured buses equipped with battery-electric propulsion. This will be the largest fleet of battery-electric buses at any airport in the United States. IAA is utilizing a Zero Emissions Vehicle (ZEV) grant for the acquisition from the Federal Aviation Administration (FAA.) The grant is designed to reduce emissions from airport-owned vehicles and facilitate use of zero-emissions technologies at airports. "By spring of 2017, with the implementation of these new vehicles, over half our fleet will be electric, significantly lessening our dependence on diesel," said Mario Rodriguez, Executive Director of the Indianapolis Airport Authority. [Source: Complete Coach Works News Release, February 8, 2017]

## Belgium Orders 90 Fast Charge Battery Hybrid Buses

Volvo Buses has secured its largest ever order for battery buses earlier this year from the Belgian cities of Charleroi and Namur, who together have ordered 90 Volvo 7900 battery hybrid buses as well as 12 charging stations. The charging stations will be delivered by ABB. Delivery commenced in the Fall.

The Volvo 7900 battery hybrid operates quietly and exhaust emission-free on electricity for about 70 per cent of its route. Battery recharging takes 3 to 4 minutes with so called opportunity charging. A small diesel engine can also provide power if needed. Energy consumption is about 60 per cent lower than for a corresponding diesel bus. Volvo's battery hybrids have already entered service in cities such as Gothenburg, Stockholm, Hamburg, Luxemburg, Namur and Curitiba.



Volvo Battery Hybrid Bus docked at an ABB OppCharge charger. [Photo AB Volvo]

The order sets a new milestone in the drive for electromobility. Volvo Buses President Håkan Agnevall told reporters: "We can see that more and more of the world's cities are choosing electrified city bus traffic in order to deal with poor air quality and noise. The common interface for fast charging of buses and trucks, OppCharge, is gaining ground. The use by many suppliers of a common interface will facilitate the transition to electromobility" [Source: AB Volvo, Feb 15, 2017]



## Microvast to Produce Battery Buses in America

Microvast has been a vertically integrated developer and manufacturer of safe, long-life, fast-charging lithium-ion battery systems for more than 10 years. Its electric and hybrid bus business was launched in 2010, mainly focusing on Europe and China. As of the end of 2016, more than 15,000 Microvast battery-powered buses were operating in public transport networks in China, as well as in five countries in Europe. Collectively, Microvast powered buses have traveled over a billion kilometers.

The company has now announced plans to expand operations in the U.S., where it expects to put its first battery electric buses on the road in 2017. While its primary emphasis is on the “e-bus” sector, the company will also be pursuing opportunities in truck electrification, mining processes, grid-scale energy storage, and other markets.

Microvast has established its U.S. headquarters near Houston, and will open a battery manufacturing facility in Sugar Land. [Source: Microvast Inc. Press Release, Feb 2, 2017]

## Park City Utah to replace Diesels with Battery Buses

Most times of year, driving in the high altitudes of Summit County includes blue skies and much less smog than the Salt Lake Valley. To that end, Park City is making a transportation investment that civic leaders hope will pay big environmental dividends for years to come.

Park City Transit has announced the acquisition of six new zero-emission battery buses this year. The new energy-efficient vehicles make up the nation’s first electric bus-rapid transit route in a resort community — along state Route 224, explained Park City Councilwoman Becca Gerber.

“We spent \$3.9 million on these six buses,” Gerber said. Park City has a goal of becoming completely carbon-neutral by 2032 and is working to develop a renewable energy source to generate power for the fleet by 2022, Gerber said. “We will really be walking the talk toward having a better environment, reducing climate change, reducing carbon in our atmosphere, preserving our way of life and our air quality,” she said.

The new vehicles have a substantial range according to Alan Westenskow, Director of Business Development for manufacturer Proterra. They get the equivalent of about 21 miles per gallon, compared with around 4 miles per gallon for a standard diesel bus. The battery bus also requires far less maintenance because of its electric motor and the absence of oil and other fluids needed to run a traditional internal combustion engine, Westenskow said.

Park City is purchasing the new buses at a discounted price closer to the \$500,000 cost of a diesel vehicle, and leasing the batteries at an additional cost. This makes the buses more affordable in the short term, he added. [Source: Deseret News Utah, Jan. 17, 2017]

## Foothill Transit Launches Long Range Proterra Bus

On November 3, 2017, Foothill Transit rolled out bus No. 2600 into revenue service, marking the launch of Proterra’s new long-range battery bus. The bus launched on Foothill Transit’s Line 280, which runs between Azusa and Puente Hills Mall, a 22-mile round trip.

The bus, a Proterra Catalyst E2, will charge en-route at a special docking station at the Azusa Intermodal Transit Center, allowing for continuous service all day long. At a full charge, the Catalyst E2 can travel a nominal distance of 254 miles. That extended range is vital for Foothill Transit to achieve its all-electric commitment by 2030. The agency serves a geographic area more than 300 square miles with 39 fixed-route bus lines, some of which have a round trip distance of more than 70 miles. “Going all-electric means we need vehicles that can literally go the distance,” said Doran Barnes, executive director of Foothill Transit. “We’re still leading the charge, and we can because of the constant evolution of battery technology, and because of the dedication of incredible engineers who believe that providing zero-emissions vehicles ultimately improves our environment.”

Foothill Transit was the first in the nation to launch the fast-charge battery bus back in 2010. The agency intends to convert its 330-bus fleet over to electric vehicles. [Source: Foothill Transit, November 1, 2017]

# Features of Dayton's NexGen Trolleybus

## The NexGen electric trolley bus

The Greater Dayton Regional Transit Authority plans to buy 26 NexGen dual mode electric trolley buses after spending three years testing four prototypes. The new buses would replace problem-plagued trolleys in use since 1998. RTA runs seven trolley routes on 124 miles of overhead wire in Montgomery County.

### The cost of RTA fleet:

**NexGen electric trolley prototype:** \$1.4 million

**NexGen electric trolley production version:** Estimated \$1.2 million

**ETI electric trolley (current fleet):** \$550,000 in 1994

**Hybrid electric/diesel bus:** \$750,000

**Regular diesel:** \$450,000

### Roof-mounted auxiliary container

Controls auxiliary systems such as heating and air conditioning.

### Roof-mounted traction container

Controls the traction motor, allowing the bus to move.

### Trolley poles

Two poles – one positive and one negative – contact the overhead trolley wires, completing the electrical circuit, energizing the 600-volt system and powering the bus. They deploy and rack themselves with the push of a button inside the bus.

### The NexGen bus

34,000 pounds

12 feet tall with poles down

40 feet long with 38 seats

AC Drive propulsion technology



### Wheelchair ramp

The bus "kneels" down, leaning closer to the ground, and the ramp folds out, allowing the wheelchair to be rolled inside.

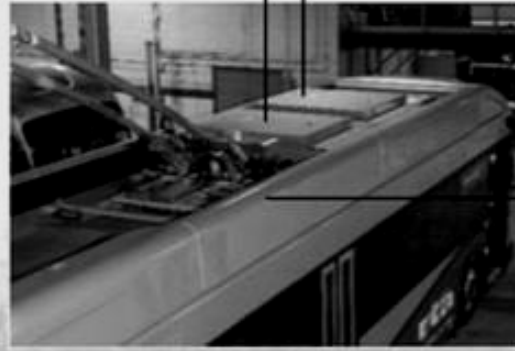
### Trolley passenger trips:

2.4 million

### Bus life expectancy

**NexGen electric trolley:** 18-20 years, 800,000 miles

**Diesel & hybrid electric/diesel bus:** 12 years, 500,000 miles



### Battery enclosure

Sealed air-conditioned enclosure contains a 3,000-pound Lithium Titanate Oxide battery with 12-year lifespan. The battery charges on the wire and is designed to power the bus for up to 15 miles off wire at full speed.

### NexGen manufacturing partnership:

**Kiepe Electric of Atlanta:** electrification, traction motor and pole set.

**Gillig Corp. of California:** bus body and chassis



### Digital dashboard

Shows speed, the position of the trolley poles, air pressure and how much of a charge is left in the battery.



### Seats

Vinyl-covered high-density foam cushion seats are designed to be easily cleaned.



### Traction motor

Propels bus wheels. It is about one-third of the size of a diesel engine and is located on the underside of the bus.