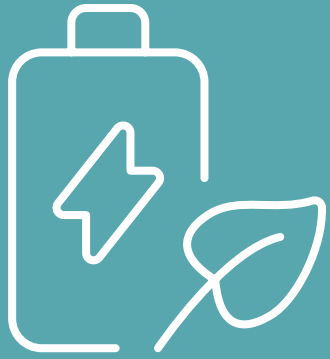




EBOOK

# Prepare for the Zero-Emission Future with Intelligent Yard Management

[www.vontas.com](http://www.vontas.com)



## Across North America, agencies are converting their fleets to zero-emission, battery-electric buses (ZEB).

Thousands of battery electric buses will be deployed over the next 5-10 years. While a crucial change for the environment, ZEBs present unique challenges at agencies for maintenance, operations, and, most especially, yard management.

A battery-electric bus can't be recharged in a few minutes like a diesel, natural gas, or hydrogen fuel cell bus can be refueled. Depending on the remaining charge, age of the battery, weather, and even the topography of the route, it can take hours to charge a bus and have it ready for service again.

When you have a small handful of ZEBs in your fleet, managing charging and availability is easy, but when most, or all, of your buses are electric, you have a whole new level of complexity and planning to manage.

**Intelligent and automated Yard Management is the solution to managing our zero-emission future. In this eBook we'll outline the background, challenges, real-world scenarios, and practical solutions managing ZEBs at your agency with Vontas OnSite.**



## Managing electric vehicles is different

**Electric vehicles might not need gas, diesel, or even oil changes, but they still need maintenance and most importantly they need to be charged. A fossil fuel, Compressed Natural Gas (CNG), or hydrogen fuel cell bus can be refilled and ready for the road in minutes, but a ZEB is more complicated.**

The bus could have enough charge for a short run, but not a long one. A bus could come in on reserve capacity and needs a full charge. You could have several buses that need recharging, and you need to prioritize which buses charge for how long at a limited number of charging stations.

If you have a handful of ZEBs your ratio to charging stations to buses is relatively high and if you need to swap a diesel bus into service while a ZEB charges, you can. But as the ratio of ZEB to diesel and charging stations to ZEBs changes, the math gets more complex. Most agencies will only have charging capacity for a portion of ZEBs at any given time and as you have fewer and fewer diesels to swap, your fallback capacity drops.

**“Our current EV management is a manual process requiring team members to check the status of the vehicles. We have a 1 to 1 dispenser stall to vehicle ratio. As our fleet continues to grow, we will not be able to effectively manage our fleet without automated tools for vehicle location and charge management.”**

Adam Tamayoshi, Vice President of Maintenance,  
Oahu Transit Services

ZEBs need routine maintenance just like any other vehicle in your revenue fleet. ZEB maintenance is different than diesel, and beyond the need to train mechanics to be electricians, some things will take longer and others shorter.



ZEBs are complex pieces of rolling technology with the batteries, restorative braking systems, and computer control systems to manage the power and motors. These systems will take longer to maintain, troubleshoot, and repair. This could mean needing to have more vehicles in reserve to go into service. Which also means those vehicles need to be kept at a certain charge level to be ready for the road.

All of this adds up to the transition to ZEB won't be easy without tools and technologies to manage and coordinate everything. Solutions from the yard to the garage, from inside the vehicle to inside the office all need to understand ZEB and manage them as smoothly as they do for other fuels today.

## Automated Yard Management manages the details

Managing a bus yard is complicated. Keeping track of where buses are, which ones are ready to go out into service and which ones need some kind of maintenance is a real challenge. Automated Yard Management (YM) handles the details of the what, where, when, and who for all buses coming and going in the yard.

Managing what needs to be done with fossil fuel buses is challenging enough, and could be managed with manual systems, ZEBs are too complicated to figure out on the back of an envelope. You can wash and fuel a diesel bus quickly, but an electric bus has more to consider, and more time needed to do it.

## The Yard Today

### BUS ARRIVES AT THE GARAGE



## When a ZEB comes into the yard you need to know:

- What's its charge level?
- Could it go back out onto a route? Which route?
- Does it need charging before going out?
- How long will it take to charge to be ready for service?
- Does it need to be washed?
- Does it need maintenance?
- Where should it park?
- Who will be driving it next? Do they know?

Automated YM handles all of this for you and gives you at-a-glance views of the entire yard and your entire fleet. You can see which buses are ready for service and which aren't. You can direct operators to their bus knowing the bus is parked exactly where it's supposed to be.

## SCENARIO EXAMPLE:

Three buses come in: 2 ZEB and a diesel. YM can see that one ZEB is at 50% charge, the other is down to 25%. The diesel has a maintenance flag on it and needs to go to a service lane. The diesel has a ticket ready in EAM and the garage got an alert the bus is in the service lane ready to be brought into a maintenance bay.

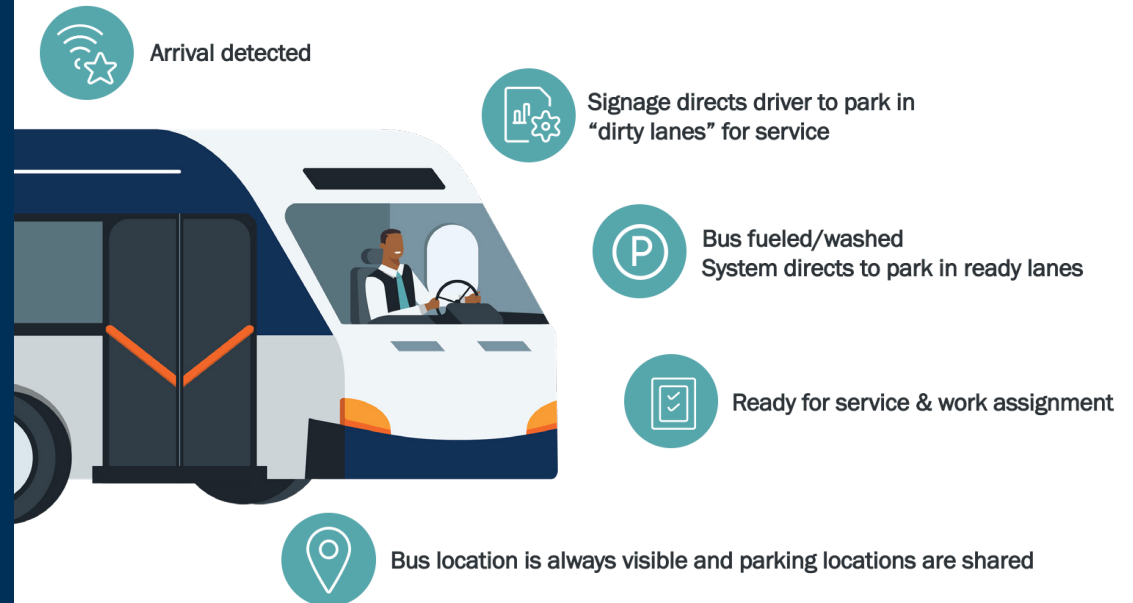
The ZEB bus with 50% charge goes into a charging lane. Connecting with onboard systems, EAM, and manufacturer systems, you know it will take 45 minutes to get to 75% and be ready for service. It is queued behind buses that will be done charging and in service before it will be needed. You know that run has fast top-up charging spots at key stops where the bus will sit for a few minutes for hand offs. At 75% charge, it has more than enough capacity to make it through the run with a comfortable margin of error.

The ZEB at 25% is done for the service day. It heads to the longer charge lane and will get a trickle charge overnight when rates are lower to be ready for the morning run.



No need to guess if a bus has enough charge to go out into service, YM, ITS, and EAM systems make sure buses that are “ready for service” are actually ready for service.

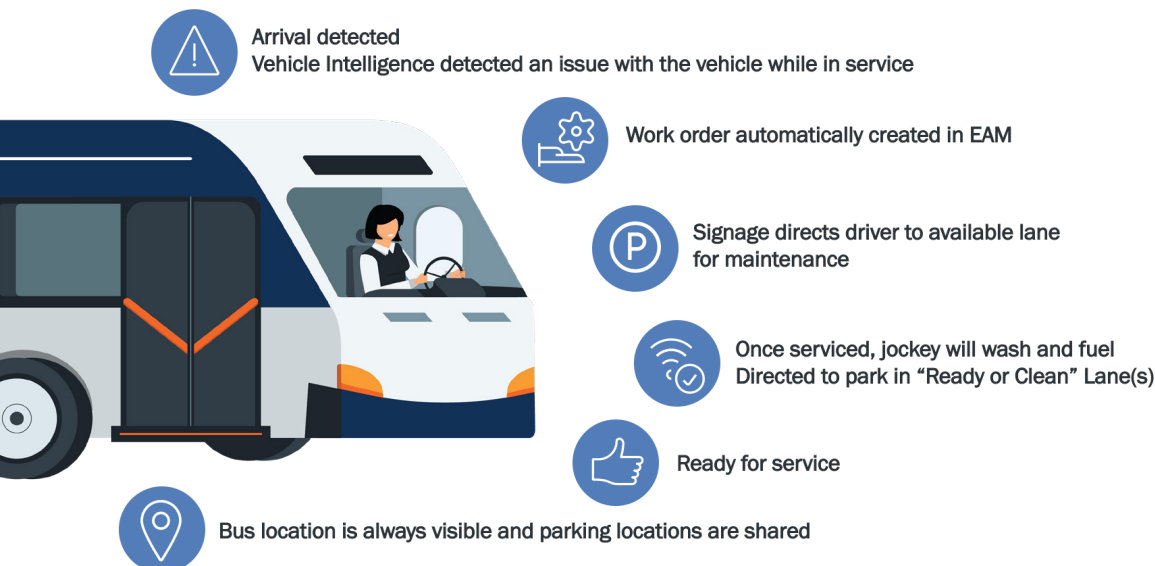
## The Yard Tomorrow - Normal Scenario



## The Yard Tomorrow - Preventative Maintenance



## The Yard Tomorrow - Vehicle Alert



### With automated Yard Management:

- Drivers know which lane to pull into when they come in
- Buses go into the right lane the first time so you have to move buses less around the yard
- Dispatch knows exactly where each bus is and its status
- Drivers know where their bus is when they begin their shift and are directed to the correct lane and spot
- Buses that aren't ready for service aren't blocking other buses at pull out
- ZEB, hybrid, and diesel buses are organized and directed based on the need for fueling, charging, maintenance, etc.
- Buses that need service go right to the service lane
- Drivers can flag they need service while on a run, alerting ITS and EAM that a service request and work order to be created so that YM routes the vehicle to the service lane

**Automated Yard Management lets people focus on their jobs, ensuring on time performance, on time pull outs, and better service for passengers.**

## Integrated solutions tie together operations from people to parts to pull-out

The bus yard is just a part of the picture. Automated Yard Management on its own is great, but when its connected with your other agency systems, the add-on benefits take center stage.

Whether Enterprise Asset Management (EAM), Intelligent Transit Systems (ITS), or Workforce Management (WM), each system integration adds additional value, and this is especially true for ZEBs.

### EAM and maintenance

When tickets are generated in EAM, YM can direct the bus to the service lane as it pulls into the yard. Tickets can be created:



Automatically from EAM for routine maintenance

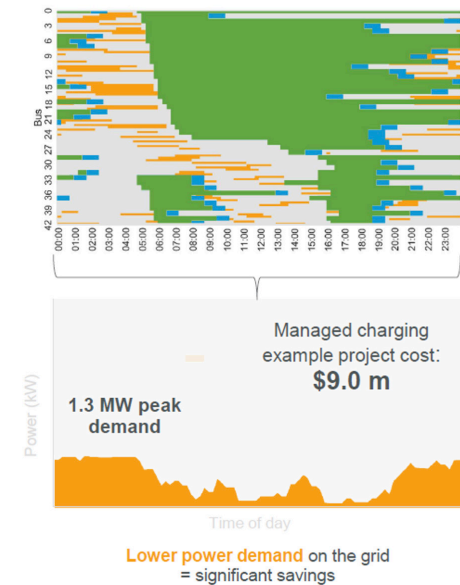
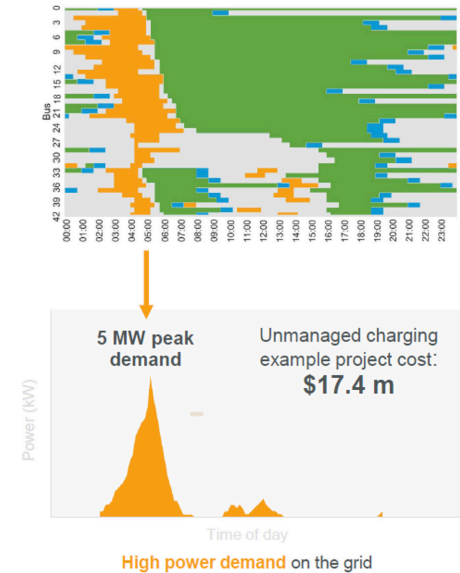


Manually when a fault is detected



By drivers if something happens on their run

Automated Yard Management that is fully aware of the unique needs of ZEBs ensures they get the correct maintenance from the right people. Service availability syncs by to YM and ITS so dispatchers know which vehicles are ready and which aren't. YM and EAM sync with ZEB onboard and charging systems to know how long charging will take and together can have buses charging for the optimal time.



Power demands and costs before and after managed charging.

*Courtesy of Proterra*





## ITS and bus operators

Direct operators to their bus from a display board. ITS knows which buses are available and can help by alerting staff that ZEBs need to be moved around to optimize charging, performance, and on-time pull outs. YM makes sure all buses are where they are supposed to be and drivers don't have any surprises when they get behind the wheel.



## Workforce management and effective teams

From driving to maintenance, ZEBs need new skill sets. Drivers need to learn how electric motors work and perform. They need to know what to watch for to make sure the bus continues to operate safely on the road. Technicians and mechanics need new training to work on electric motors, batteries, and charging stations. Workforce Management is key to making sure the right people are in the right places to get the jobs done.

## Add-on benefits of Automated Yard Management

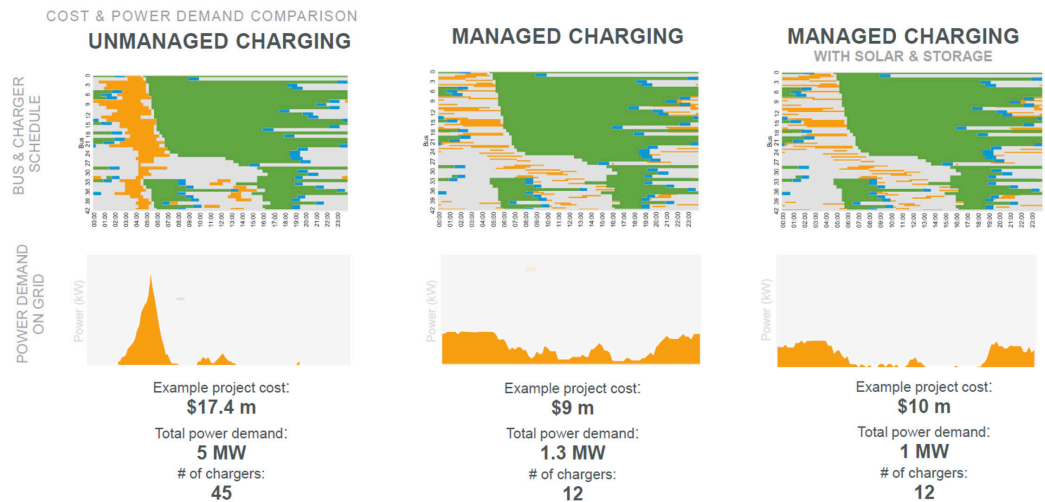
Automated Yard Management isn't just about running your bus yard more efficiently, a fully integrated YM system has benefits across your agency.



### Cost savings

Electric buses need charging and that power comes from the electrical power grid. Unlike diesel, the cost of "fuel" for a ZEB varies over the course of a day. Electric utilities have peak and nonpeak rates for customers. YM can make sure you're charging buses in the most cost-efficient way, with fast charging during peak times and longer charging during off-peak times. Only automated YM can juggle knowing which buses should be charged for how long and when to switch buses around.

**Syncing with onboard and OEM systems, automated YM ensures you use your ZEB as efficiently as possible.**



Comparing unmanaged, managed on grid only, and managed with solar and battery storage for power consumption and costs.

*Courtesy of Proterra*



## Safety

When buses aren't in the right lane and need to be shuffled around, especially during hectic pull-out times, accidents can happen. If buses are put into the right lane to begin with, the fewer buses you have to shuffle around. The less you have to move buses around and the fewer people you need out in the yard at any given time, you will have fewer accidents and incidents.

## Employee deployment

Operators can glance at a dispatch board and know exactly where to find their bus and know it's ready for pull out. No matter how diligent you are, a manual yard map will be out of date from almost the moment you post it. YM constantly updates your dispatch board with the exact location of each vehicle within 1-2 meters. Operators will know their bus is in lane 5, spot 3—and it will actually be there.



## Vontas OnSite is ready for the ZEB future

The changeover to all-electric, non-fossil fuel fleets is happening now. With significant investments from all levels of government, agencies are taking this once-in-a-generation opportunity to update their entire fleets. But to do that, and reap all the benefits of a zero emission agency, the software that manages everything from the yard to the garage to the office must be ready too.

Across Vontas, we're working with customers to support and deploy ZEBs.

As you deploy zero emissions fleets at your agency, Vontas will be there with you to help with the transition. We're on this new journey together developing software and solutions for ZEBs and all zero emissions technologies. Our support for zero emissions doesn't end with Yard Management, all Vontas solutions are becoming fully zero-emissions aware as part of our commitment to a greener transit future.

Products like EAM and WM from our sister company Trapeze, will continue to integrate with Vontas solutions so your agency has fully-integrated technology solutions to run and improve your operations today and tomorrow.

Connect with our Experts

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