

Bikes on Caltrain Electrified Trains

BIKES ONboard project

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January 15, 2015

Presentation to the
Caltrain Bicycle Advisory Committee

The BIKES ONboard project started in early 2008. Shirley Johnson leads the project as a volunteer. Our objective is to work with Caltrain to improve its onboard bicycle service.

There are many volunteers who have worked on this project over the years, too many to name. Dedicated bicycle commuters have volunteered countless hours of their time for this effort, because we believe that Caltrain's onboard bicycle service is truly wonderful and we want to see it thrive.

Outline

- History of bikes onboard Caltrain
- Bicycle bumps
- Projections for Caltrain bike ridership
- Benefits of 20% bike capacity
- Ranked priorities for electrified trains
- Summary

Here is an outline of this presentation.

History of bikes onboard Caltrain

Year	Bicycle Access
1992	8 bikes allowed per train
1996	24 bikes allowed per train
2002	32 bikes allowed on gallery bike cars, but only 16 bikes on new Bombardier cars; trains have either one or two bike cars
2009	40 bikes allowed on gallery bike cars and 24 bikes allowed on Bombardier bike cars; all Bombardier trains upgraded to two bike cars
2011	All gallery trains upgraded to two bike cars
Fall, 2015	All Bombardier trains to be upgraded to three bike cars

3

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There has been a long history of incremental improvements toward better bicycle access onboard Caltrain. In 1992, eight bikes were allowed per train.

The service proved to be popular, so bike capacity was increased to 24 bikes per train in 1996.

By 2002, bike capacity was maxed out, so Caltrain increased bike space to 32 bikes per train on gallery trains. Caltrain put new Bombardier trains into service in 2002, but the Bombardier bike cars held only 16 bikes. Some trains had one bike car and some had two, so bike capacity among trains varied from 16 to 64 bikes per train. Customers never knew which train would show up, which made it uncertain whether customers with bikes would be allowed to board or not.

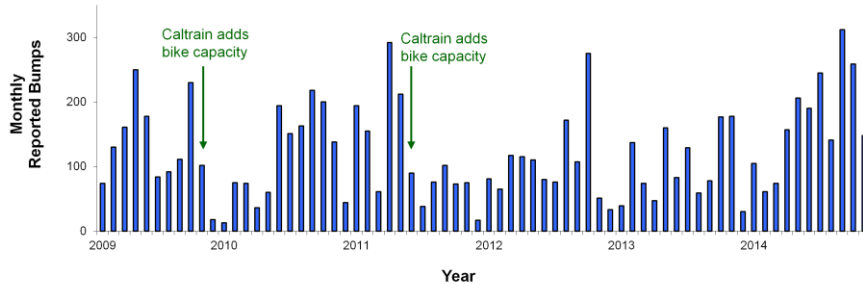
Bicycle bumps became a huge problem, and Caltrain addressed this in 2009 by increasing bike capacity to 40 bikes per gallery bike car and 24 bikes per Bombardier bike car, as well as upgrading all Bombardier trains to two bike cars. Gallery trains still had either one or two bike cars, so bike capacity varied from 40 to 80 bikes per train. Consistency was better than before, but service was still unpredictable with many bicyclists continuing to get bumped.

In 2011, Caltrain upgraded all gallery trains to two bike cars, and scheduled specific train types on specific runs. This helped bicyclists know what to expect, so they could better estimate their chances of being allowed to board. But service disruptions can result in train swaps, and sometimes a Bombardier train (with 48 bike spaces) replaces a gallery train (with 80 bike spaces), leading to many bicycle bumps. Plus Bombardier trains are typically scheduled on baby bullet runs, the most desirable trains, systematically excluding bicyclists.

At the Joint Powers Board meeting on January 8, 2015, staff announced that all Bombardier trains will be upgraded to three bike cars. This is a slight increase in bike capacity of just 8%, not enough to eliminate all bicycle bumps, but at least all trains will be more consistent with 72 to 80 bikes per train. The 16 new Bombardier cars will add over 15% more seats to the fleet, addressing the needs of all passengers.

Bicycle bumps

Caltrain leaves customers with bicycles behind



The graph shows the minimum number of bumps, because not all bumps are reported.

4

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Caltrain customers voluntarily report bumps by email to the Joint Powers Board. We compile these bump reports and graph them as shown here. We started compiling bump reports in February 2009. Not all bumps are reported, so the graph shows the minimum number of bumps that occurred each month.

Caltrain added bike capacity in late 2009, and bumps dropped briefly, but service was still inconsistent with 40 to 80 bikes per train. Bumps were back up again later in 2010.

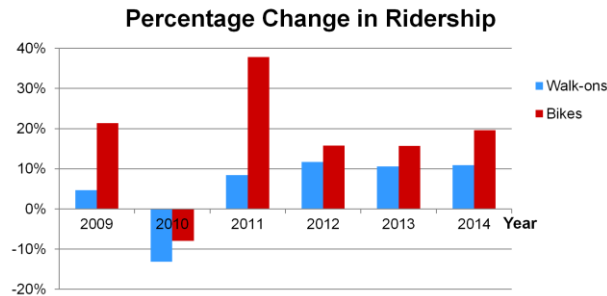
Caltrain upgraded all trains to two bike cars in 2011, and bumps dropped off in 2012, but bumps never went down to zero.

The spike in October 2012 is when Caltrain changed its schedule. Bombardier trains and gallery trains were switched on some runs, leading to more bumps when a Bombardier train with 48 bike spaces unexpectedly showed up in place of a gallery train with 80 bike spaces. Bicyclists had to adjust their schedules to accommodate the changes in equipment, and then bumps decreased the next month.

Bumps are on the rise again in 2014. In fact, September 2014 set a record high for reported bumps.

Bicycle bumps cause Caltrain service to be unreliable. For those commuters who need to get to work on time, it's not merely an inconvenience; it could cost them their jobs. We've received letters from many cyclists who said they went back to driving, because they couldn't count on Caltrain.

Caltrain ridership



Average increase in ridership since 2008:
Walk-ons = 5.5%
Bikes = 17.1%

Note: Bike ridership is capped by limited bike capacity.

5

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This graph shows annual percentage change in Caltrain ridership. The data are taken from Caltrain February annual passenger counts.

Blue shows walk-on ridership and red shows bike ridership. Increase in bike ridership has outpaced increase in walk-on ridership. Even in 2010 during the recession when overall ridership decreased, bike ridership fell less than walk-on ridership. This emphasizes the popularity of Caltrain's onboard bicycle service.

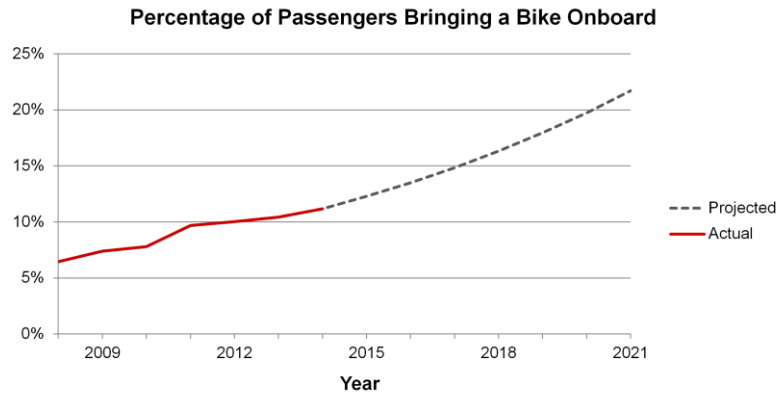
We use this data to make predictions for future ridership in the next slide. We chose data from the past six years, because Caltrain added bicycle capacity in 2009 and 2011. Therefore, growth in bicycle boardings since 2008 is more representative of actual demand than prior years, when bicycle capacity was even more restricted. Over the past six years, February annual passenger counts show:

Average annual increase in weekday walk-on boardings = 5.5%
Average annual increase in weekday bicycle boardings = 17.1%

Bike ridership is Caltrain's fastest growing customer segment, increasing 147% since 2008 while walk-on ridership increased only 35%.

It is remarkable that Caltrain bike ridership continues to increase, despite the high number of bicycle bumps. February 2014 passenger counts showed that over 11% of passengers bring a bike onboard and a Caltrain survey (published in the EIR for electrification) showed that 13% of passengers bring a bike onboard, whereas Caltrain has only 10% onboard bike capacity. This suggests that bicyclists are adjusting their commutes to take shoulder period trains, just so they can bring their bikes onboard.

Bike ridership on Caltrain



Electrification is scheduled for 2021, when more than 20% of passengers are projected to bring a bike onboard.

6

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This graph shows the percentage of passengers who bring a bike onboard Caltrain. The red line shows actual percentage of bike ridership from Caltrain's February annual passenger counts, and the dashed grey line shows projected bike ridership.

We created this graph by extrapolating the average increases in ridership from the previous slide. Over 20% of Caltrain passengers are expected to bring a bike onboard electrified trains, assuming there is sufficient onboard bike capacity. The projection of 20% bike ridership in 2021 is low, however, because:

- (1) Currently onboard bicycle space is limited, forcing many bicyclists back into their cars due to the high frequency of bumping. The annual increase in bicycle boardings would have been even higher than 17.1%, if Caltrain had had sufficient onboard bike space.
- (2) February passenger counts severely understate bicycle boardings in warmer months, when bicycle boardings increase over 42% whereas walk-on boardings increase only 11% according to a comparison of Caltrain February 2004 with October 2004 passenger counts (2004 is the only year Caltrain conducted its passenger count twice).

These two points emphasize that bike capacity for 20% of passengers to bring a bike onboard electrified trains is considered a minimum.

These projections are based on an extrapolation, and extending the extrapolation would eventually predict that 100% of passengers would bring a bike onboard, which is not realistic. Bike ridership will eventually flatten out. We believe the extrapolation to 2021 is reasonable, however, because it is well below the theoretical maximum of 40% (see calculations for theoretical maximum at <https://www.sfbike.org/wp-content/uploads/2014/11/2008-Caltrain-BOBreport.pdf>).

We'll adjust the projection as new data become available. At the current time, however, 20% is the best estimate we have.

Benefits of 20% bike capacity

- Promotes mode shift from driving to biking
 - Reduces need for new parking facilities
 - Reduces traffic congestion
 - Lowers fossil fuel consumption
 - Reduces carbon emissions and pollution
 - Improves public health
- Costs less than other station access modes
- Increases ridership and revenue



7

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Higher ridership is expected on electrified trains, and station access is a big consideration. Twenty percent bike capacity would promote mode shift from driving to biking. Many Caltrain parking lots are located on valuable downtown real estate, and some are already full today. Local residents suffer from Caltrain riders taking limited parking spaces on surface streets, especially acute at 22nd Street due to no Caltrain parking lot. The only way to increase parking at most stations would be to build multi-level parking structures at a cost of over \$30,000 per parking space, and an unsightly parking garage would not be welcomed by most local residents. Twenty percent bike capacity would reduce the need for expensive parking facilities and help Caltrain's image with people living near stations, because less parking would be required and traffic congestion would be reduced.

Twenty percent bike capacity would also reduce traffic congestion on freeways, because many bikes-on-board customers choose to drive alone if they are not able to bring their bikes onboard Caltrain. Another benefit is lower fossil fuel consumption to reduce our dependence on oil.

Bicycling reduces carbon emissions compared with motorized transportation, and California has mandates to reduce emissions, a leading cause of climate change. Less pollution and more exercise means healthier people, saving health care costs.

Bicycling to Caltrain costs less than other station access modes including buses, shuttles, and driving. All public transportation is subsidized, but a bike space onboard the train is subsidized less than seats on buses or shuttles (see <https://www.sfbike.org/wp-content/uploads/2014/11/2008-Caltrain-BOBreport.pdf>). Twenty percent bike space on the train would reduce the need for additional feeder buses and shuttles. We encourage Caltrain to do a thorough analysis of the full cost of first- and last-mile connections to help guide future capacity planning.

Bicycle bumps have forced cyclists back into their cars. With 20% bike capacity, bicyclists could count on getting on the train, so those who have abandoned Caltrain would return and new customers with bicycles would embrace Caltrain as a reliable commute method, increasing ridership and ticket revenue.

Priorities for bikes onboard electrified trains

Rank	Item
1	Bikes are unboxed, carry-on luggage
2	Onboard bicycle capacity for 20% of passengers
3	No charge for bikes
4	Seats reserved for cyclists within sight of bikes (one seat for each bike space)
5	Consistent bicycle capacity in every car
6	Level boarding (good for wheelchairs, strollers, luggage, and bikes)
7	Two doors on both sides of each car
8	Random-access onboard bicycle storage (no bike stacking)
9	Both bike wheels on the floor (no vertical storage)
10	Easily expandable onboard bicycle capacity to meet demand, up to 35% of passengers
11	Real-time reporting of bicycle spaces available in each car
12	Convertible space for oversize trailer/stroller/cart/bike
13	Luggage racks with a suitable design to hold folding bikes

8

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With electrification, we have an opportunity to design bikes into the system instead of doing expensive retrofits later. This prioritized list is our “wish list” for bikes onboard, ranked from highest priority to lowest priority.

Comments on specific items:

3. No charge for bikes. Some people suggest that passengers should pay extra to bring their bikes onboard. Bicycling to and from stations should be encouraged due to economic, environmental, and social benefits, so charging to dissuade people from bringing their bikes onboard is counterproductive. Trumping that, however, is that state law prohibits charging extra for luggage or bikes.

4. Seats reserved for cyclists within sight of bikes is important for cyclists to guard their bikes against theft or damage.

5. Consistent bike capacity in every car has three main advantages: (1) distributes bicycle boardings at all doors, which can reduce dwell time when there are many cyclists boarding at a given station, (2) ensures all trains will have bike space irrespective of train length – particularly important in the event Caltrain runs shorter trains midday by decoupling some cars; EMUs make that easier to do as they are independently powered, and (3) simplifies operations, because there is no need to place specific cars at specific locations in the consist when all cars have essentially the same configuration.

10. Easily expandable onboard bike capacity to meet demand, up to 35% of passengers. Electrified trains will be around for many years, and 20% of passengers are expected to bring a bike onboard in 2021. We must be prepared for even more passengers wanting to bring a bike onboard in subsequent years. Current trains have easily expandable onboard bike capacity – seats can be replaced with bike racks. It may be as simple as that.

Summary

- Caltrain's bikes onboard service has many benefits
- Bicycle bumps are an ongoing problem
- Projections show over 20% of passengers may bring a bike onboard electrified trains
- Let's design bikes into the system now!



9

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Caltrain's bikes onboard service has economic, environmental, and social benefits. Caltrain is doing the right thing by continuing to expand the service.

Bicycling is increasingly popular, and as better bike infrastructure is put in place, even more people will ride. In Holland, for example, 40% of trips are taken by bike in some cities. San Francisco has a ways to go, with only 4% of trips taken by bike. We need to plan for the future of increasing bike ridership.

Caltrain's onboard bicycle service is a godsend for those who don't want to spend their time stuck in traffic on 101. Bringing a bike onboard Caltrain is exceptionally popular, and Caltrain hasn't been able to keep up with demand. Bicycle bumps are at an all-time high.

Projections based on Caltrain ridership data show that 20% of passengers are expected to bring a bike onboard electrified trains. It's important that electrified car design takes this into consideration, because retrofits are expensive.

We encourage Caltrain to continue wayside improvements, so that people who don't need their bikes at both ends of their commutes have a practical and safe alternative.

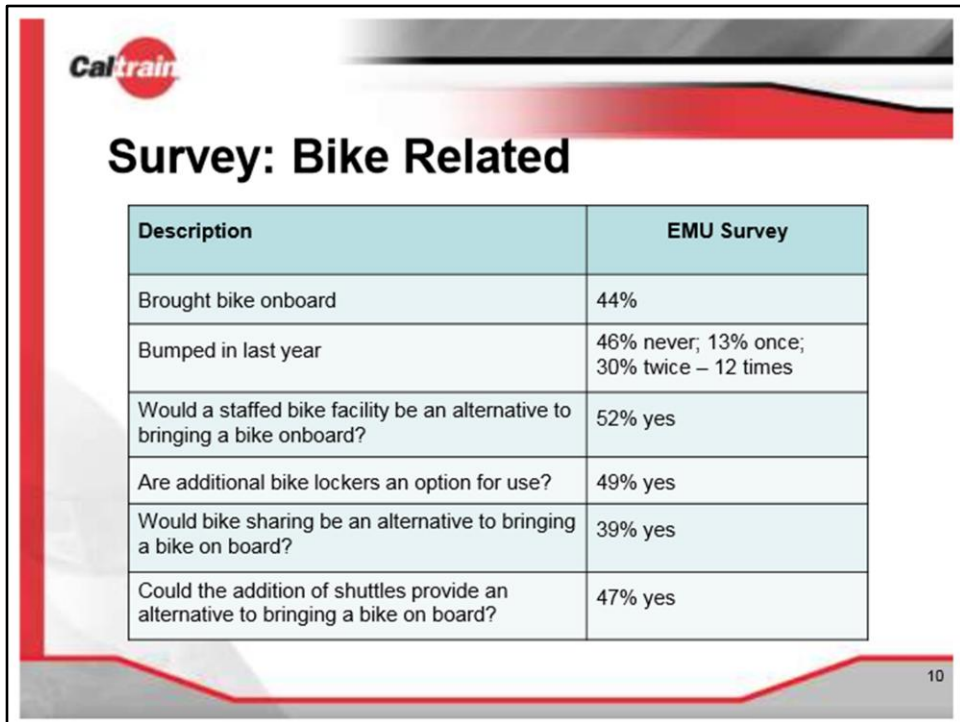
We have an opportunity to design bikes into the system now for electrified trains. Let's not pass up that opportunity to make many happy customers!

Appendix

Added May 15, 2015

Relevant New Information

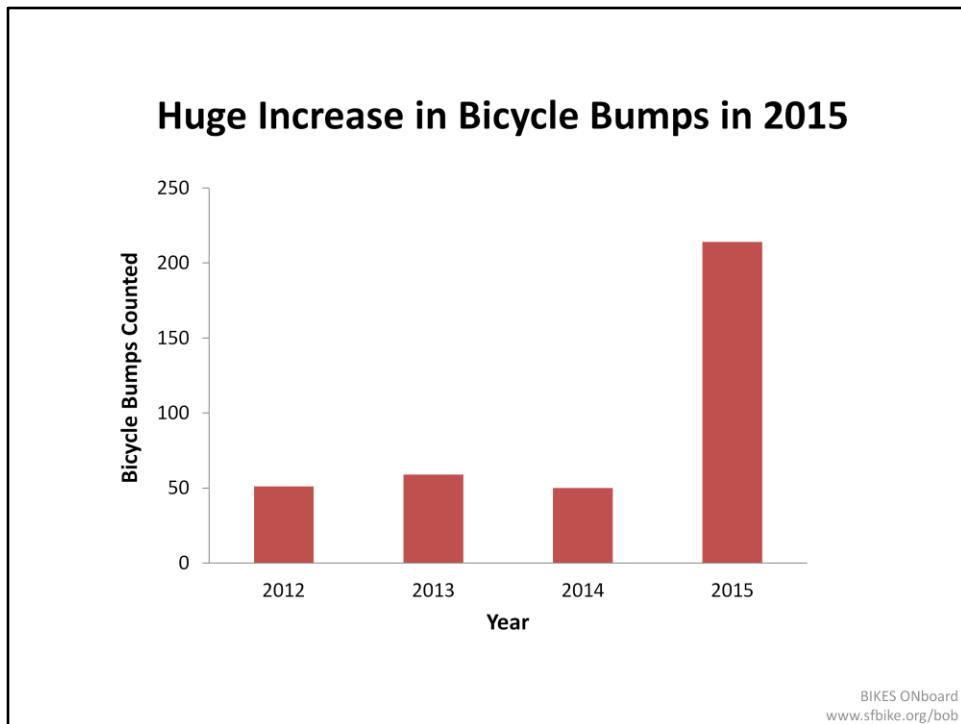
- 1. Electrification Survey Results**
- 2. 2015 February Annual Passenger Counts**



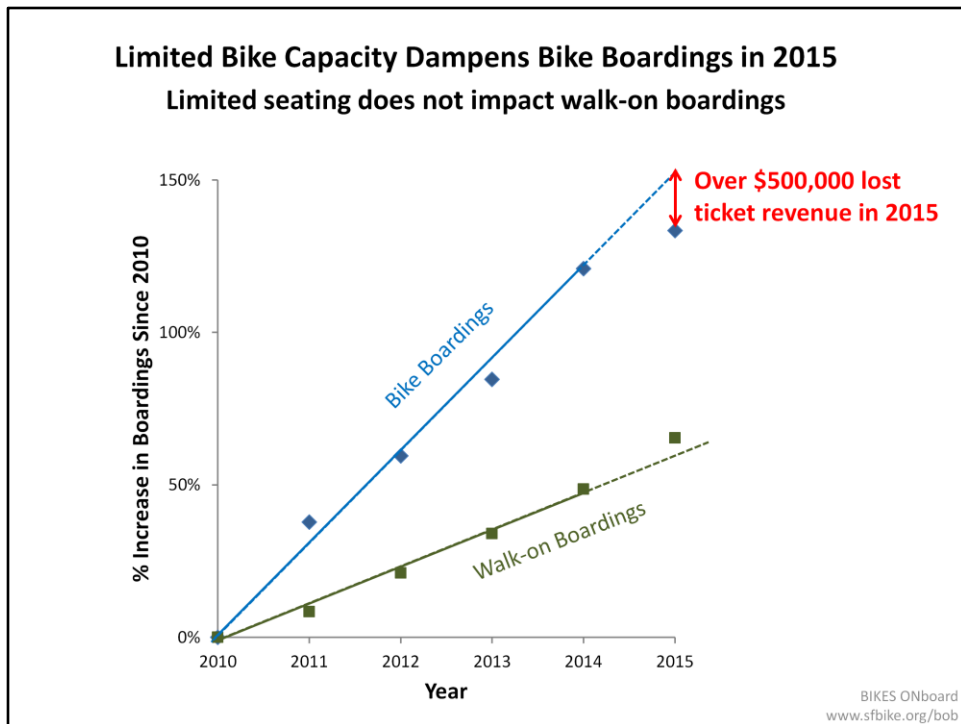
After we made our projection that 20% of passengers will bring their bikes onboard electrified Caltrain in 2021, some new information has become available. This slide shows results of a survey that Caltrain conducted in 2014 (for more survey results, see http://www.caltrain.com/Assets/_Agendas+and+Minutes/JPB/Board+of+Directors/Presentations/2015/2015-02-05+JPB+BOD+PCEP+Qtrly+Update.pdf) The survey is statistically invalid, so the numbers should be taken with a grain of salt. For example, forty-four percent of survey respondents brought their bikes onboard Caltrain, more than actually bring their bikes onboard. The good news from this survey is that some people said they would consider alternatives to bringing their bikes onboard. This survey suggests that about 50% of people might use an alternative.

Caltrain did another survey in 2007 that asked “Why do/did you bring your bike onboard?” Only 20% said they brought their bikes onboard due to unsatisfactory bike parking options (18%) or unaware of bike parking options (2%). So let’s say 20 to 50% of bikes-on-board passengers would be willing to use an alternative. That’s great, because that could potentially handle the over 40% increase in bike boardings in warmer months compared with February bike boardings, on which our projection for 2021 is based.

Caltrain has recently been awarded a grant to develop a bicycle parking management plan. As part of that grant, Caltrain plans to “understand the factors that influence [customers] to take their bikes on board.” We are also encouraging Caltrain to determine subsidies for all station access modes to assess the economic benefit of bikes onboard. Once this information becomes available, we may adjust our recommendation for onboard bike capacity, but as of today, our 20% estimate is the best we have.



Caltrain released results of its 2015 February annual passenger counts last month. Caltrain counts bicycle bumps on a subset of trains, and this graph shows bicycle bumps counted as a function of year. There was a huge increase in bicycle bumps in 2015 due to bike capacity being completely maxed out. Bicycle bumps force bicyclists back into their cars costing Caltrain ridership and ticket revenue. This is illustrated by the next graph.



This graph shows the percentage increase in Caltrain boardings relative to 2010. Both bike boardings and walk-on boardings were increasing approximately linearly until 2015, when bike boardings fell off.

In contrast, walk-on boardings continued their same upward trajectory. Some trains have standing room only during commute periods, but limited seating capacity did not dampen walk-on boardings. This shows that customers are willing to stand on Caltrain.

However, customers are not willing to be bumped and left behind on the platform. They'll abandon Caltrain and find an alternative commute method; most will just drive instead. Caltrain will lose over half a million dollars in ticket revenue in 2015 due to insufficient onboard bike capacity.

We're thrilled that Caltrain plans to add a third bike car to Bombardier trains to reduce bicycle bumps and bring bicycling customers back. Bike boardings should come back up after the third bike car is added in late 2015.

As you can imagine, by 2021 and probably before, we'll be in a similar situation we are today with insufficient bike capacity forcing bicyclists back into their cars. That's why it's so important that electrified trains have space to allow 20% of passengers to bring their bikes onboard to meet latent demand and to provide space for continued growth.

Appendix Summary

The new information supports
20% of passengers bringing their bikes onboard
electrified Caltrain.