EEVC NEWSLETTER

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Affiliated with EAA

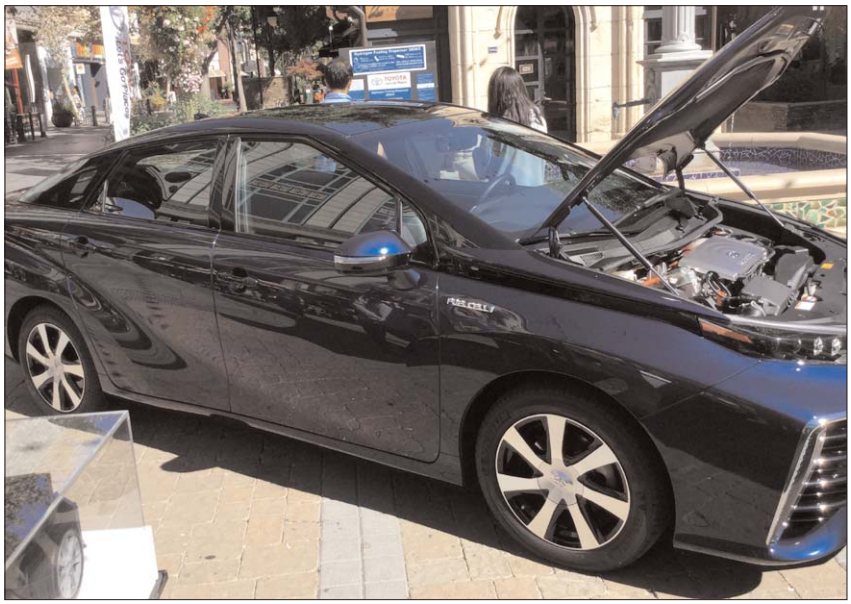
A DEMONSTRATION DRIVE IN THE MIRAI

Peter Cleaveland

On September 18 my son and I went down to San Jose for an appointment to see and drive the new Toyota Mirai hydrogen fuel cell car.

A few initial observations:

First off, it's very luxurious — it should be, as it's built on a Lexus platform. Its also pretty peppy; I didn't floor it, but it seemed to have decent acceleration. The car has several driving modes, ranging from Eco to Power, which vary the curve of motor output to accelerator position. The regenerative braking (at least in the car I drove) was slightly intrusive; as an ICE driver paying California gas prices I've learned to hypermile as much as possible, which involves a lot of coasting; when I took my foot off the pedal in the Mirai it slowed down fairly rapidly. I suspect that may be adjustable, or one would have to get used to feathering the accelerator.



The 2017 Toyota Mirai hydrogen fuel call car claims a range of 312 miles.

Claimed acceleration is 0-60 in 9 seconds. Drag coefficient is a fairly conventional 0.29. Power steering is, as expected, electric.

The solid polymer fuel cell stack, with 370 cells, weighs 123.5 lb. and generates a maximum 114 kW (153 hp), at a power density of 3.1 kW/liter, 2.0 kW/kg.

The two carbon fiber/glass fiber/polymer fuel tanks together weigh 193 lb. and hold 5 kg of hydrogen at 70 MPa (700 bar, 691 atmospheres, 10,152 psi). The ac synchronous motor/generator puts out 113 kW (151 hp)

The car claims 312 mile range. Refueling takes 5 minutes. Rated fuel consumption is 67 mpge city/hwy/combined (EPA).

The drive battery is a nickel metal hydride

A look under the hood

type.

The car was introduced first in Southern California, and is now being brought to Northern California.

Maximum speed is listed as 111 mph (I didn't get a chance to check that out, since the demo was on local roads and a Toyota rep sat beside me).

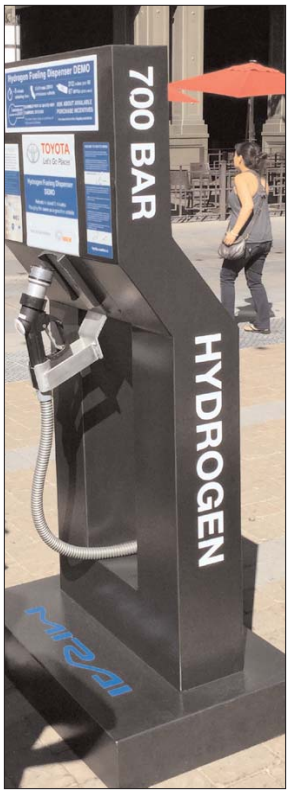
It has lots of gadgets, and every bell and whistle you can imagine.

The "gearshift" is very much like the little knob in the Prius; not too strange once you get used to it.

The demonstration was in the Santana Row shopping district, a collection of stores for high-end customers. The Tesla store is there, for example, in between Brooks Brothers and Gucci.

MSRP is $57,500; how much of that is manufacturer's subsidy is not stated, but it has to be a bunch. It does qualify for a $5000 California rebate and an $8000 federal tax credit. It also comes with three years of complimentary fuel, up to a limit of $15,000 (which may give you some idea of the price of hydrogen at the pump).

The demonstrator presented a map showing hydrogen filling stations in California, with more being added. Pointed out that there are new stations strategically placed along I-5, so it's possible to drive from San Francisco



to Los Angeles without range anxiety.

The DoE currently lists 29 hydrogen filling stations in the U.S., excluding private stations, and 54 if private stations are included. In California they're clustered in the Bay Area (plus a couple in the state capitol of Sacramento) and in the Los Angeles/Long Beach area, with a few in the wealthy enclaves of Santa Barbara and Palm Desert. And, of course, one at Coalinga, on I-5, listed as 202 miles from L.A.

But does it make sense?

As the Electric Auto Association points out, "It takes about four times more energy to separate the hydrogen from a source and then use it to power a vehicle compared to the energy used to power a BEV." The Vancouver Electric Vehicle Association has a set of charts that use Argonne National Laboratory data to compare the energetics, ghg emissions and cost of various systems at www.veva.bc.ca/wtw/index.htm. The Toyota tech rep agreed that the ultimate answer for fueling stations would be on-site solar, as transporting the hydrogen by pipeline or truck is really impractical. When that might begin to happen is anybody's guess. One wonders if the hydrogen station at the Harris Ranch in Coalinga, with enormous stock yards next door, plans to capture methane from all that poo and generate hydrogen. That may be the ultimate in local sourcing.

On the other hand, if you can afford $57,500 for the car, you can afford the fuel. But I wonder how long it would take most people to go through $15,000 worth of hydrogen.

CHEVY BOLT GETS ATTENTION

Information has begin to come out on the Chevrolet Bolt, and most of the commentary is favorable. The New York Times and David Baker of the *San Francisco Chronicle* seem entranced, calling it a Tesla Killer, pointing out that it has a range of 238 miles compared to 215 for the Tesla Model 3, will sell for $38.495 before rebates compared to $35,000 before incentives for the Model 3, and will be in production later this year compared to who knows when (supposedly late 2017) for the Model 3.

The EEVC Chatline Carried a number of comments from members. Tullio Falini was unimpressed with the Bolt, suggesting that GM's ability to crank out large numbers of vehicles of not-necessarily top quality gave it a strong position in the industry, but that other, higher-quality manufacturers would beat it. "The Bolt is priced every bit as much as the Leaf or the Tesla 3," he said, "both of which are presumed better quality. Why would anyone buy a Chevy when they can buy a Tesla or a Nissan for the same price."

Jim Natale responded: "The LEAF sells for $27,862-$33005 on truecar.com today. That gets you a car with 100 mile range and a Chademo port. When the Bolt hits the lot it will have 238 mile range and a J1772 port for $37500 MSRP. It's not available now so we don't know what it will sell for. We also don't know the pricing for its options nor do we know what will be included in the Model 3 for $35000 or what its options will cost. All we KNOW about the Model 3 is that Supercharger access is not included and it won't be free. We can infer that at least some colors will cost extra. Other manufacturers are reducing color choices and are charging extra for more colors."

Tullio notes that GM has announced plans to build 30,000 Bolts, suggesting that the incentive isn't to put out a new car but to comply with regulations: "It appears they are making this car to help their average fleet MPG and emission levels to meet Gov't. standards. Or maybe they are just banking on a spike in gas prices coming up. We'll see."

Considering the changes that seem inevitable for the auto industry, perhaps culminating in providing cars — maybe self-driving or Uber-style, as a service, rather than as a product — and it will be interesting to see what happens over the next decade.

REPORT ON NATIONAL DRIVE ELECTRIC WEEK IN VINCENTOWN, NJ

Ken Barbour

The unofficial official count of vehicles at the National Drive Electric Week event in Vincentown, NJ on September 17 is 19 electric cars, trucks, and SUVs, two hybrids (Prii) and four electric motorcycles (all Zeros), as follows:

1 Coda
1 Kia Soul EV
1 Mercedes B Class electric
1 Tesla Roadster
1 Tesla Model S
1 US Electricar S-10
2 Chevy Volt
3 Mitsubishi iMiEV
4 BMW i3
4 Nissan Leaf
1 2016 Zero SR red
1 2015 Zero SR red
1 2016 Zero DS orange
1 2016 Zero DSR black
1 Prius
1 Prius C

Aimee (my wife) registered all the cars and gave them reusable bags provided by Mt Holly Motorsports with stuff inside provided by Nissan and Zero. She also gave everyone a sign to display on their car touting how many oil free miles they have driven. Sadly, I don't have a photo of Aimee as she was the one taking the pictures. We also had everyone sign a petition that we will send to the state of NJ. All Electric cars are sales tax exempt in NJ, but electric motorcycles are not. So that's what we would like to change. There is a list of zero emission vehicles that NJ gets from CA to see

if something qualifies, but strangely Zero Motorcycles (built in Santa Cruz) are not on there. No electric motorcycles are and I'm trying to change that.

The rider on the left is on Ken's red SR. On the right on an orange DS (dealership's demo bike) is EEVC member Theo Padavano from Blairstown, NJ.

Dan Monroe is posing in front of his Leaf with the j1772 cable plugged in for show.

Ollie and Dottie Perry next to their blue Leaf

This beautiful white S-10 pickup belongs to Al Arrison.

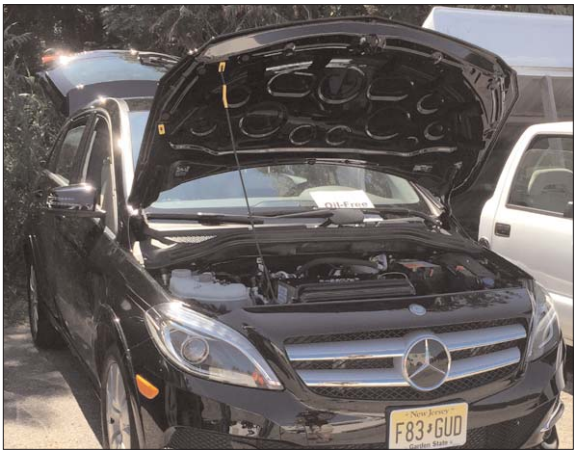
The Tesla Model S belongs to Omar Martin from AC.

The Tesla Roadster belongs to Michael Thwaite (behind car wearing hat) and Pamela Thwaite (behind car with umbrella) the president and vice president of NJEAA.

BMW i3, owner not known

The black IMiev (NOT GAS) is driven by Ken's parents, Trudie and Ken Barbour Sr.

This all white iMiEV belongs to Gerald (Gerry) Lisewski and wife.



This Mercedes Benz B Class electric may be from the NJEAA club.

The two riders standing next to the Zeros are Austin from Connecticut on the left and Rahul on the right. Rahul is from nearby East Windsor, NJ., and drives a Chevy Volt.

This pic of the 2015 Leaf S pulling the trailer with the 2016 Zero SR on it was taken before anyone arrived. That's how I got my Leaf, my wife Aimee, my Zero and all my promotional materials to the event in one trip. The Leaf towed the bike to the event and back home (60 miles total) with no problems and still had 25% battery left.

REMINDER: GASOLINE PRICES REALLY HAVE AFFECTED ELECTRIC CAR SALES
Oliver Perry

The *Wall Street Journal* Business News Wednesday September 14, 2016 page B2 Headline…. "Cheap Gas Clips Toyota Prius Sales"

Toyota Motor Corp.'s latest Prius hybrid has a problem: gasoline prices.

Prius sales in the U.S. have fallen by 11% compared with last year. Americans are more likely to trade in a hybrid or electric car for an SUV then they are for another hybrid or electric vehicle, according to a survey conducted by automotive research firm Edmonds.com.

U.S. people want larger cars because they drive more. (My comment… I am not sure what the writer means.. by because they drove more than the Japanese. I think Sean McLain needs to express himself a little clearer on this point.)

Sales of Nissan's Leaf are off 36% this year through August. Overall sales for the (I am assuming both hybrid and electric) vehicles are down 14.4 % for the year says Hybridcars.com and market researcher Baum and Associates.

COMMENT ON THE ABOVE
Jim Natale

There is never a "the reason" for anything. Other factors to consider:

Exchange rates

This is the first year of the Gen4, an entirely different car. There's a stigma attached to the first model year.

Beauty and utility are in the eye of the beholder. The car doesn't come with a spare tire and the deck isn't flush. What's the point of a hatch if you have to lift cargo?

Where are we in the credit cycle? Except for captive finance (the manufacturer subsidizes the loan) interest rates are rising, loan defaults are increasing, and credit is tightening.

The industry has had a few good-to-record years but GM and Ford have lowered guidance. That means a load of other stuff isn't selling either. Nobody lowers guidance because their hybrids and EVs aren't moving. (Well, there is someone who lowered their guidance because their EVs aren't selling and I'll get to that point.)

The market has changed. After Honda killed the Insight the Prius held the top spot of most fuel efficient vehicle. Other hybrids are close. Plug in hybrids handily beat the Prius. In the chat room, owners of older Prius have moved on to Plug in Prius, HyCam, Volt, and LEAF.

With Tesla promising a 200 mile range EV for $35000 "someday" and Chevy looking like they will deliver one late this year or early next, who is going to want to drop serious cash on a 100 mile LEAF? Nissan may have to offer the old LEAF as part of a twofer just to get them off the lots.

"The weak market for electric cars, EXCEPT FOR TESLA MOTORS INC..."

Did Rip Van Winkle just wake up? Last year Tesla lowered their guidance and just beat their revised low end of 50000 cars. Here's the excerpt from Tesla's letter to shareholders as reported by cleantechnica.com:

"We expect to generate positive net cash flow and achieve non-GAAP profitability for the full-year 2016. Thus our cash balance at the end of 2016 should increase from the year end 2015 level. We plan to fund about $1.5 billion in capital expenditures without accessing any outside capital other than our existing sources that support our leasing and finished goods inventory. We plan to invest in equipment to support cell production at the Gigafactory, begin installation of Model 3 vehicle production machinery, open about 80 retail locations and service centers, and energize about 300 new Supercharger locations.

"To achieve these goals we plan to deliver 80,000 to 90,000 new Model S and Model X vehicles in 2016, representing accelerating growth over 2015 at the midpoint of the range. We expect our average vehicle transaction price to increase slightly during 2016, as Model X grows to become a larger share of our deliveries throughout the year. In Q1, we plan to grow deliveries 60% year on year to approximately 16,000 vehicles, and we plan to directly lease about the same percentage of cars as we did in Q4.

"Throughout the rest of 2016, Automotive gross margin should continue to increase,

helped by cost reductions for Model S and improving margin on Model X as our manufacturing efficiency improves for that vehicle. By year-end, Model S gross margin should begin to approach 30% and Model X gross margin should be about 25%, with continued improvement for Model X in 2017."

Who believes Tesla is going to have positive cash flow for 2016? They had a capital raise in May. (Which was supposed to be used for the Model 3 but paid for the callable bonds.) They need another to fund the Solar City acquisition, pay for the Gigafactory, pay for Model 3 tooling, and to cover their operating loss for 2016.

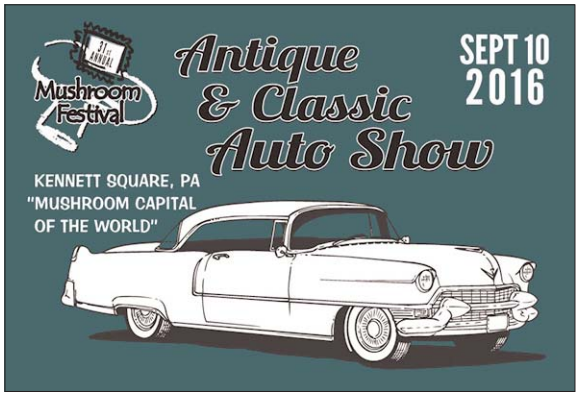
If demand is so high why are estimated delivery dates so near and inventory is rising?

I will agree with the Edmonds quote from the *WSJ*. Many wanted a larger vehicle but settled for a Prius. Now they are trading the Prius for what they want.

For the record, I'm starting to believe that what we experienced was an oil bubble. We may very well have $40-$50 oil for a very long time. The wild card is government regulation. Will various governments require capping wells and prohibit new ones? Will those experiencing earthquakes in Europe and the USA trade jobs and income for stable ground?

The weak market for hybrids and electric cars, EXCEPT FOR TESLA MOTORS INC., do not bode well for GM's forth quarter launch of its Chevrolet Bolt electric car. Sales of the Prius C are down 45 %.

MUSHROOM FESTIVAL IN KENNETT SQUARE A GOOD VENUE FOR EVS



By all accounts the Mushroom Festival in Kennett Square was a success, reports Jurgen Balitsky, and that 25 electric cars and motorcycles were there. Jurgen sends along the pictures below (unfortunately without captions)

Additional pictures are available at http://www.meetup.com/MDVolt/photos/27065991/

NEWS UPDATE

EV scandal in China

The history of alternate energy projects in the United States is littered with stories of companies that sprang up not to develop technology or create products, but to harvest federal dollars. It seems China is no different in that regard. A September 13 AP story reports that five Chinese companies have been "caught collecting millions of dollars in subsidies for buses they never made."

Searching for next generation batteries

The Society of Automotive Engineers is quietly working on standards for the of batteries that, it is hoped, will replace today's lithium-ion units. A September 17 article by Kami Buchholz in *Automotive Engineering* reported on a "leaders Debate" session at the 2016 Battery Show North America. One topic was not about new technologies, but what to do with existing batteries as they are taken from service. While they may not meet their original specifications, they still have some capacity; and in any case should be kept out of landfills.

Also discussed, according to the article, was new technology that would replace current liquid-electrolyte batteries with solid ion conductors; there was significant talk about Li-S technology as the possible way forward to lighter and less expensive batteries.

A September 19 story entitled "SAE Battery Standards committees prepare for next-gen chemistries," discussed evolving standards for EV batteries, with 22 separate efforts going on. most of them having to do with lithium ion materials, labeling and safety.

Tesla Motors Wins 'Landmark' Project Contract for Southern California Powerpack System

Tesla Motors has been awarded a contract by Southern California Edison to provide a 20 megawatt Powerpack electricity system after the Aliso Canyon methane gas leak last year led to the closure of the facility.

Los Angeles is still in need of a system to ensure power reliability during the winter months after the October 2015 "catastrophic rupture in the Aliso Canyon natural gas reservoir caused a methane gas spill that displaced more than 8,000 Californians," Tesla said in a blog post on Sept 15. The spill released "1.6 million pounds of methane into the atmosphere," considered the worst in US history.

After the leak, Southern California Edison and other utilities were told by the state's utilities commission to find a "utility-scale storage solution" that could be running by Dec. 31, Tesla said.

When the Powerpack system is finished in three months, it will be the largest lithium ion battery storage project in the world and have the energy to power more than 2500 households for a day or charge 1000 Tesla vehicles. No price for the contract award was given.

"In order to achieve a future with high penetration of solar and electric vehicles, the world needs a two-way, flexible electric grid," Tesla said. "Working in close collaboration with Southern California Edison, the Tesla Powerpack system will be a landmark project that truly heralds the new age of storage on the electric grid."

Paris Auto Show disses diesel

The Volkswagen diesel emissions scandal seems to have taken the shine off diesel in Europe, at least for the moment. As reported in an article by Jerry Garrett in the *New York Times* for September 22, the Paris Auto Show, opening October 1, is expected to pay much more attention to EVs than to diesels. EVs to be shown include the first of four EVs Mercedes-Benz plans to produce by 2020. Mit-

subishi will have multiple models on display, according to the article, and Toyota will show "new Prius models with enhanced electric operation." And VW itself will be showing new EV technologies.

The effect of EVs on utility stocks

The Electric Power Research Institute (EPRI) has published a report on the effect of increasing use of EVs on utility investments. EPRI's Electric Transportation Program is a collaboration of utilities, vendors, regulatory agencies, researchers, and laboratories. The goal is to better understand the costs and benefits of electric transportation and to transfer the technology to other locations and industries. EPRI used a Transportation Electrification model at three different utilities to examine the effects of investments in public plug-in electric vehicle (PEV) charging infrastructure on electric vehicle (EV) drivers and utility customers, using the Total Resource Cost (TRC) and Ratepayer Impact Measure (RIM) tests. This analysis simulated EV adoption and charging station use, determining in a simple way the cost for upgrades to the distribution, transmission, and generation infrastructure. This report will benefit any utility interested in the value of transportation electrification and the development of associated programs and infrastructure.

The 136-page report, entitled *The Value of Transportation Electrification: Three Preliminary Case Studies of Impacts on Utility Stakeholders*, is available for free download at www.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=000000003002007751

COMING EVENTS

Paris Motor Show
Oct 1-16, Paris. Go to http://www.nextgreencar.com/event/6929/paris-motor-show/

SAE 2016 Range Extenders for Electric Vehicles Symposium
Nov 2-3, Knoxville, TN. Go to www.sae.org/events/rex/

IEEE – ESARS ITEC 2016
Nov 2-4, Touluse, France. Go to stx wtx, www.esars-itec.org/

SAE 2016 Vehicle Electrification and Connected Vehicle Technology Forum
Nov 30-Dec 1, Shanghai. Go to www.sae.org/events/vept/

SAE 2017 Hybrid and Electric Vehicle Technologies Symposium
Feb 7-9, 2017, San Diego-Mission Valley, CA.

CALIFORNIA BATTLES CLIMATE CHANGE
By California Pete

The cumulative effect of California's efforts to increase the use of non-fossil energy are making a difference, according to an article by David Baker in the *San Francisco Chronicle* for Sept 24. "More than 27 percent of California's demand for electricity at this moment is being met by renewable sources — primarily the sun, the wind and the Earth's own heat," says Baker. "Just a few short years ago, that would have been considered astonishing. Now it happens on a regular basis. Next summer, the percentage will be even higher. State law requires that California get 33 percent of its electricity from renewables by 2020 and 50 percent 10 years later."

Not all has gone smoothly, the article adds: "Some emission-cutting technologies touted with great promise 10 years ago — biofuels from yeast or algae, cars powered by hydrogen fuel cells — have never quite borne fruit or are just now entering the marketplace."

"And yet," the article goes on, "1.7 percent of new cars registered in California last year ran solely on electricity, not gas. In the territory of Pacific Gas and Electric Co., the state's largest utility, another family installs a rooftop solar array every seven minutes. Solar power plants capable of generating enough electricity for entire towns have spread across the state, from the Central Valley through the Mojave Desert."

Overall emissions have decreased by 9.5 percent from the peak in 2004, and models predict that they will drop precipitously in the next few years.

For the full text of Baker's article, go to www.sfchronicle.com/bayarea/article/Climate-change-law-has-reshaped-California-in-10-9277756.php

But will that be enough?

While California is making great strides in decarbonization, the rest of the world is behind. An August 20 *New York Times* article by Heidi Cullen, chief scientist for the environmental research group Climate Central, points out that temperatures just keep increasing. "July wasn't just hot — it was the hottest month ever recorded, according to NASA. And this year is likely to be the hottest year on record," she writes. "Fourteen of the 15 hottest years have occurred since 2000, as heat waves have become more frequent, more intense and longer lasting. A study in the journal *Nature Climate Change* last year found that three of every four daily heat extremes can be tied to global warming.

The article includes maps that predict what will happen if present trends continue: an increasing number of places in the United States will experience months at a time of temperatures greater than 95 ºF, which will make outdoor activity "unbearable, and sometimes deadly." Not mentioned in the *Times* article is what will happen to agriculture, both in the U.S. and around the world, and the strong possibility that large areas of the planet will become uninhabitable.

Cullen's article can be found at www.nytimes.com/interactive/2016/08/20/sunday-review/climate-change-hot-future.html?_r=0

Politics are different here

While much of the country suffers the din of saturation political advertising for the presidency, California is strangely quiet on that front: With the Golden State solidly on the Democratic side, neither major candidate sees a need to campaign here. Not only do we not see the candidates, we don't see many of their ads on TV.

That's not to say that the candidates don't come here; California is an ATM: they swoop in to attend fund raisers — some of which cost as much as $200,000 to meet the candidate and perhaps share a meal — before jetting back to wherever the action is.

What we do see are advertisements for ballot measures. There are 17 state wide, and in San Francisco an additional 25. Some contradict each other, so it's quite a task to figure out which to vote for and against, and no telling what the results will be.

The use of ballot measures puts California in a class by itself. All it takes is enough signatures (gathered by professional canvassers) to get a measure on the ballot. That's why this year's Voters Guide is 222 pages long. The ballot itself promises to be nearly as long.

And you should see the political ads about them: if there were a prize for misleading advertising, they would take it in a walk. One of my favorite tactics is used against measures that would levy a tax or fee on something, and divide the proceeds among several recipients — say schools and the homeless, for example, with some also going to the general fund. Opponents run ads saying that one or another of these groups — or even some unnamed group — is getting shortchanged because much of the money is going to "special interests."

And don't get me started about the proposition to levy a 1 cent per ounce tax on sugary soda. The Beverage Association and its backers are running ads that call it a tax on groceries. "No, it's not," says the other side. And back and forth we go.

NOTICE ON DUES

Annual dues are $20 with electronic delivery of the Newsletter, or $25 for a printed copy. Make checks payable to EEVC and mail to James Natale, 3307 Concord Dr, Cinnaminson NJ, 08077, or pay via PayPal to www.paypal.me/EEVC.

MEETING SCHEDULE

Meetings are held in Room 49, Plymouth-Whitemarsh High School, 201 East Germantown Pike in Plymouth Meeting, PA, and begin at 7:00 p.m.

October 12

November 9

December 14

January 11

February 8