November 29, 2021

Liane M. Randolph, Chair
California Air Resources Board
1001 I Street
Sacramento, California 95814

Subject: Proposed Amendments to the Small Off-Road Engine Regulations

Dear Chairwoman Randolph,

The RV Industry Association (RVIA) appreciates this additional opportunity to provide written comments on the California Air Resources Board (CARB) staff proposal to amend the regulations pertaining to small off-road engines (SORE).

RVIA is a national trade association representing the manufacturers and their component suppliers of America's family camping vehicles, including motorhomes, travel trailers, fifth-wheel trailers, truck campers and park models, collectively referred to as Recreation Vehicles or RVs. RVIA is a unifying force for safety and professionalism within the RV industry, works with government agencies to protect and promote the interests of RV businesses and camping consumers, serves as a clearinghouse for industry information and works with the media to educate the public about the benefits of RVing.

BACKGROUND

RVIA has followed this rulemaking since its inception. . Over the course of the past fifteen months, RVIA has interacted with CARB staff on multiple occasions, yet there was absolutely no mention of our concerns or products in the ISOR, SRIA or any other rulemaking documents made available to date by staff. On August 31, 2020, RVIA submitted nine pages of written comments to rulemaking staff discussing our many concerns about the feasibility and cost-effectiveness of Staff's zero emission equipment (ZEE) standards, if applied to fixed mount stationary RV generators. . RVIA's Aug. 31, 2020, comments addressed the following topics:

- Background on RVs and RV Generator Fitment
- RV Registration in CA 2016-2019, by type
- RV Generator Fitment by RV Type
- RV Generator Facts
- RV and RV Generator Use
- Alternatives to Traditional Generators
- CARB's Proposed SORE Regulation Upgrade

A copy of RVIA's Aug. 31, 2020, comments is included with our written comments (see Appendix. A).

RVIA supplemented its written comments with a presentation entitled, "High Energy Density Auxiliary Power Systems for Recreational Vehicles" (attached as Appendix B). This presentation was given to CARB Staff virtually on May 10, 2021. Slide 27 of the presentation asked that CARB defer subjecting fixed mount RV SORES to the zero-emission requirements until there exists sufficient evidence that zero emission technology will be capable of accommodating the unusually large and long-duration power demands of RVs in a cost-effective manner.

Most recently, RVIA met virtually with CARB staff on November 17, 2021, to discuss the RV industry's concerns with the formal proposal that was released in October of 2021. We noted in that meeting, that despite efforts to make our concerns known in advance of the proposed regulation being released for public comment, it seems that our comments and concerns had been overlooked in the drafting of the proposed amendments. As will be discussed in greater detail below, we also pointed out some new issues with the regulation relating to definitions (or rather lack thereof) for exempt stationary generators, non-exempt portable generators, and RV fixed mount stationary generators.

At our meeting with Staff on November 17, 2021, we were informed that there would be no modifications to the proposal by staff and that the only mechanism at this point in time would be to appeal to the Board to have our concerns addressed. Chair Randolph, we now appeal to you and your fellow Board members to address our concerns and direct Staff to modify the proposal as appropriate.

RVIA's POSITION WITH REGARD TO THE APPLICABILITY OF THE SORE REGULATION

RVs utilize SOREs to run onboard fixed-mount stationary generators that supply large amounts of electricity used to power life-sustaining equipment such as air conditioning, heating, refrigeration and lighting. Without SORE-powered onboard generators, many types of RVs will lose the functionality that makes them an attractive form of outdoor recreation. RVs will also lose the utility that is critical to the role they play in solving serious social problems, emergencies and disasters in the State of California. During the COVID-19 pandemic, California Governor Newsom obtained 1,309 travel trailers from the Federal Emergency Management Agency and private companies to house the homeless to protect them from COVID-19. RVs were also used to house medical personnel and to serve as laboratories to free up space in hospitals. For decades, RVs have served as police commands during emergencies. RV are often deployed following natural disasters as was the case when hundreds of units served as temporary housing following Hurricane Katrina in 2005.

Staff's proposed amendments to the SORE regulation exempt stationary generators from the regulation for good reason (mainly because they are of critically important tools to ensure life-sustaining equipment when power from the electricity grid is not available). In its proposal, however, staff has not provided a definition for "stationary generator." There is only a note in the ISOR stating that stationary generators are "not moved for equipment operation or storage." SORE-powered generators used in RV applications are bolted into the RV. They are not moved for operation, nor storage. They are permanently affixed in a storage enclosure as an integral component of the vehicle, and typically only accessed for maintenance.

Though some within CARB may wrongly consider RV generators to be portable, and thus subject to the regulation, they are not. While the proposed regulation does not provide a definition for portable generator,

CARB staff informed RVIA that portable generators are "those moved by hand and not bolted to concrete pad or other permanent build surface." Staff is clearly mistaken given that RV generators are bolted into the RV as an installed component and thus have no ability to be moved by hand. For reasons unknown, CARB staff has attempted to lump fixed-mount stationary RV generators into the same category with free-standing portable generators. As shown in the table below, fixed-mount stationary RV generators have absolutely NOTHING in common with portable generators and EVERYTHING in common with exempt stationary generators.

Generators Characteristic	**Generator Type**		
	Stationary	**RV Fixed-Mount Stationary Generator**	**Portable Generator**
Subject to ZEE SORE Requirement?		X	X
Not moved for equipment operation or storage?	X	X	
Not moveable by hand?	X	X	
Bolted to permanent surface?	X	X	
Rarely refueled?	X	X	
Routinely powering very large electrical loads (whole house; 4000 watts/hrs. or more)?	X	X	
Would the battery needed for powering the generator for just one day be twice the size of a Tesla battery and cost > $20,000?	X	X	
Is the generator routinely required to run multiple days at a time without being refueled?	X	X	
Never tilted?	X	X	
Routinely powering air conditioning to prevent heatstroke?	X	X	
Routinely powering refrigerating units to keep food from spoiling?	X	X	
Annual hours of use are extremely low?	X	X	

For the reasons discussed above, RVIA considers fixed-mount stationary RV generators to be exempt from the SORE regulation until such time that the regulation is amended to indicate otherwise.

RVIA'S VIEWS ON COMPLIANCE WITH THE PROPOSED AMENDMENTS IN THE EVENT FIXED MOUNT STATIONARY RV GENERATORS ARE DEEMED TO BE SUBJECT TO THE SORE REGULATION

In the event CARB modifies its proposal to explicitly state that fixed-mount stationary RV generators are subject to the regulation, RVIA makes the following recommendations to the Board.

The zero emission equipment (ZEE) standards should not be applied to Fixed-Mount Stationary RV Generators until 2035 or later

In our written comments submitted to Staff on Aug. 31, 2020, and also in our presentation to Staff on May 10, 2021, we provided Staff with data on RV sales, generator fitment, CA registrations by type, RV generator fitment by RV type, RV generator facts, RV and generator use information, etc. While RVIA has not sought to trivialize the environmental impact that emissions from RV generators might have on the environment, it is important to understand the emissions impact that is specific to RV generators. We note that CARB staff has not endeavored to conduct an emissions impact assessment specific to RV generators. RVIA understands that comments being filed by the Engine Manufacturers Association (EMA) will reference an emissions impact study conducted by AIR on behalf of EMA and its members[1]. Our understanding is that emissions from RV generators represent an infinitesimal fraction of SORE emissions in California. We ask the Board to take this *de minimis* impact into consideration as we discuss the challenges of complying with the proposed rule and the impacts that the rule will have on California residents and businesses.

The ZEE mandate in 2028 is neither feasible nor cost-effective for RV generators. In our May 10, 2021, presentation to Staff (see attached Appendix B), we attempted to explain how, depending on size and accessories, RVs typically have either a 50-amp service @ 120 volts AC (6,000 watts) or a 30-amp service @ 120 volts AC (3600 watts). RVs are, for all intents and purposes, already electrified. When they are operated (on average about 22 days/year), they are more often than not plugged into the electrical grid at an RV campground or park. When they are occasionally operated off the grid, important life-sustaining equipment such as air conditioning, heating, refrigeration and lighting are powered by the generator. Large motorhomes will have two to three rooftop air conditioners to keep the unit cool which can be especially challenging in parts of California. Typically, a 7000-watt LP generator will be used to power these 15,000 BTU AC units. Multiple AC units, lights, refrigerator, microwaves, television, motors to power slideouts, etc., all place a tremendous demand on the generator. Batteries can theoretically provide the power needed to power these appliances, but not for long. In the case of a medium size RV that consumes just 4000 watts per hour, we estimate that you would need a 100-kwh battery to support operations for just 24 hours. This is twice the size of a battery found on a Tesla. The battery alone, at $200/kwh, would cost about $20,000. Consider separately a long weekend trip or week-long trip to a location in California where there is no grid power (e.g., Cherry Lake, Willow Lake, Anza Borrego State Park, Laguna Mountain, Oceano Dunes State Vehicular Recreational Area, Death Valley National Park, Joshua Tree National Park, etc.). For such trips, much larger batteries would be necessary to support life in the unit for days at a time. Motorhomes, as they exist today with current technology, have no place for the batteries needed for such operations. Such batteries would add upwards of a ton in weight to the vehicle which in and of itself would have countless negative impacts (road safety, vehicle fuel economy, cost). If forced to be powered by batteries, the motorhomes would need to be designed to recharge the batteries using the diesel engine of the vehicle that is responsible for propelling the vehicle down the road. The cost of such batteries would approach $100,000 per unit. Emissions from this large diesel

[1] EMA's members include Cummins which sells the Onan brand RV generators.

engine will far offset any emissions reductions realized from not having the LP or gas SORE-powered generator onboard. Until such time that motorhomes are capable of reasonably being equipped with motors and batteries to replace the prime mover source, there is no feasible or cost-effective way to modify an ICE powered motorhome to be fitted with zero emission SORE solution.

Based on conversations RVIA has had with the supplier community, it is our understanding that the motorhome segment is more likely to be electrified via a fuel cell solution than a battery solution. This, however, will not happen in the foreseeable future. RVIA also understands that the Advanced Clean Truck (ACT) rule does not require motorhomes to be electrified. Rather, the rule gives chassis manufacturers the flexibility to electrify some vehicle types, but not all. In 2035, only 55% of Class 2b-3 vehicles[2] and only 75% of Class 4-8 vehicles[3] are required to be zero emissions (see table from the ACT rule below).

Table A-1. ZEV Sales Percentage Schedule

Model Year	Class 2b-3 Group*	Class 4-8 Group	Class 7-8 Tractors Group
2024	~~3%~~ 5%	~~7%~~ 9%	~~3%~~ 5%
2025	~~5%~~ 7%	~~9%~~ 11%	~~5%~~ 7%
2026	~~7%~~ 10%	~~11%~~ 13%	~~7%~~ 10%
2027	~~9%~~ 15%	~~13%~~ 20%	~~9%~~ 15%
2028	~~11%~~ 20%	~~24%~~ 30%	~~11%~~ 20%
2029	~~13%~~ 25%	~~37%~~ 40%	~~13%~~ 25%
2030 ~~and beyond~~	~~15%~~ 30%	50%	~~15%~~ 30%
2031	35%	55%	35%
2032	40%	60%	40%
2033	45%	65%	40%
2034	50%	70%	40%
2035 and beyond	55%	75%	40%

Generally, RV chassis manufacturers make many other types of vehicle chassis (e.g., dump trucks, school buses, delivery trucks and vans, etc.) We anticipate that RV chassis manufacturers will not be electrifying RV chassis and will instead opt to electrify medium and heavy-duty vehicles likes school buses and delivery trucks (i.e., vehicles that each night return to a central location for recharging). Motorhomes have no opportunity for recharging when they are boondocking in Death Valley for days at a time. Again, please keep in mind that, more often than not, RVs today are operating already as electric vehicles (because most of the time they are parked at RV campgrounds where they are plugged into grid power). The SORE generator is only there for the limited use cases when the RV is operated off-grid. We have informed CARB that, on average, an RV generator is typically only run about 50 hours per year. Please reference the AIR emissions impact study conducted for EMA to better understand the de minimis impact our generators have on SORE emissions in California.

Governor Newsom's Executive Order No. N-79-20 sets a goal to "transition to 100 percent zero-emission off-road vehicles and equipment by 2035 where feasible." While there is no evidence that motorhomes will

[2] A Sprinter van type motorhome is exemplary of a Class 2b-3 vehicle.
[3] Large Class A and Class C motorhomes are exemplary of Class 4-8 vehicles.

be electrified by 2035 (certainly the ACT does not require this), our industry is prepared to do what it can to help California meet the goal that was set out by the Governor. We believe that 2035 may be a point in time that zero emission RV generators might be feasible, should they be deemed to be subject to the SORE regulation.

Implications for CA Residents and California RV Dealers should RV generators be subject to the 2028 SORE regulation

In the event RV generators are subject to the 2028 SORE generator ban, California residents will either forego purchasing an RV altogether, thus depriving the state of significant sales tax revenues and harming a vibrant all-American industry and many California RV dealers in particular, or they will travel across the state line where they can legally purchase a SORE-equipped RV that suits their needs. There is nothing in California law that would prevent them from doing so. When a new vehicle dealer submits a vehicle registration request to the California Department of Motor Vehicles, they must attest only to the fact that the vehicle has an appropriate California Emissions Label affixed to the vehicle or engine pursuant to Title 13, California Code of Regulations, Chapter 1, Article 2, Section 1965 or Title 13, California Code of Regulations, Chapter 9, Article 3, Section 2413, and that it is in compliance with California Vehicle Code Section 24007(b)(1)[4]. Ensuring compliance with the SORE regulations is not part of the vehicle or trailer registration process. Thus, the law would not prohibit California residents from buying RVs with generators in ~~Nevada~~ neighboring states and registering them for use in California (or outside California). We note that, already today, one of the leading sellers of RV to California residents is already located out of California[5]. If RVs are subject to the zero emissions standards in 2028, residents of California who decide not to opt for another form of recreating, will go to ~~Nevada~~ one of those neighboring states for their RV purchase. As a consequence, California's RV dealers will see a massive loss in sales to out-of-state dealers and a commensurate loss of income - many will inevitably go out of business. Given that California residents will have the opportunity to buy what they need across the state line, these damages will be suffered without realizing any benefit in air quality. We direct you to the comments submitted by the California RV Dealers Association for more details about the implications that are likely to be experienced by the business community in California.

Regarding the more stringent engine emissions standards that are proposed for the years leading up to the proposed zero emissions generator ban in 2028, we note that, when asked by RVIA, engine suppliers have no idea how they will comply or what will be the cost impact born by RV manufacturers and ultimately by consumers. They "think" they might be able to comply, but simply have yet to engineer or cost out compliant solutions. CARB itself has conducted no research specific to RV generators and has no cost numbers specific to our products. Because fixed-mount stationary RV generators have nothing in common with portable generators, CARB cannot and should not attempt to use costs for portable generators when evaluating the economic impact of the rule on the RV community. This is yet another reason for concluding that RV fixed-

[4] See REG 397 (REV. 1/2019).
[5] Through October 2021, National RV Indoor RV Centers with its location in Las Vegas had sold 86 motorhomes to residents of California (placing it at #14 on the list of top motorhome dealers per the California RV Dealers Association).

mount generators should be deemed stationary and thus exempt from the regulation as we believe to be the case.

Closing

RVIA appreciates the opportunity to comment on Staff's proposal to amend the SORE regulations. On November 16, 2021, RVIA requested through the Board Liaison an opportunity to meet with you and other members and we look forward to discussing our concerns with the proposal in advance of the Board hearing scheduled for December 9-10, 2021. In the meantime, should you have questions about any of the information discussed in this letter and/or the attachments to this letter, please call me (571) 665-5860 or email me at mochs@riva.org.

Sincerely,

Michael Ochs

Michael Ochs
Director, Government Affairs

cc:

Board Member Sandra Berg
Board Member John Eisenhut
Board Member Daniel Sperling, Ph.D
Board Member John R. Balmes, MD
Board Member Diane Takvorian
Board Member Dean Florez
Board Member Hector De La Torre
Board Member Davina Hurt
Board Member Barbara Riordan
Board Member Phil Serna
Board Member Nathan Fletcher
Board Member Tania Pacheco-Werner, Ph.D.
Board Member Gideon Kracov
Ex-Officio Board Member Senator Connie Leyva
Ex-Officio Board Member Assemblymember Eduardo Garcia

Appendix A

RV Industry Association Input on CARB's Draft SORE Regulations,

Letter to Ms. Dorothy Fibiger, Ph.D,

Aug. 31, 2020

Aug. 31, 2020

Ms. Dorothy Fibiger, Ph.D.
Air Resources Engineer, SORE Lead
Monitoring and Laboratory Division
California Air Resources Board

RE: RV Industry Association Input on CARB's Draft SORE Regulations

Dear Ms. Fibiger,

Introduction
The RV Industry Association (RVIA) appreciates the opportunity to provide comments on the California Air Resources Board (CARB) plans to amend its regulations pertaining to small off-road engines (SORE), specifically spark-ignition engines rated at or below 19 kilowatts.
RVIA is a national trade association that represents the manufacturers and suppliers of America's family camping vehicles, including motorhomes, travel trailers, fifth-wheel trailers, truck campers and park models, collectively referred to as Recreation Vehicles or RVs. Our comments, which focus on RVs equipped with SI engine powered generators, are organized as follows:

- Background on RVs and RV Generator Fitment
- RV Registration in CA 2016-2019, by type
- RV Generator Fitment by RV Type
- RV Generator Facts
- RV and RV Generator Use
- Alternatives to Traditional Generators
- CARB's Proposed SORE Regulation Upgrade

Background on RVs and RV Generator Fitment
Recreation vehicles or RVs fall into one of two main categories (motorized or non-motorized). A general overview of both types follows.

Motorized RVs (motorhomes)
Within the motorhome category, there are three sub-categories:

Class A motorhomes,
Class B motorhomes, and
Class C motorhomes.

Class A Motorhome

A Class A motorhome is built on a heavy-duty gasoline or diesel chassis with the engine located either in the rear or the front, specifically designed for motorhome use. Class A motorhomes have home-like amenities such as kitchens, bathrooms, living areas with entertainment centers and centrally controlled heating and air conditioning. Virtually all Class A motorhomes come equipped with a generator. Important Note: Motorhome generators typically receive fuel from the fuel tank that supplies the motorhome engine and are thus exempt from SORE evaporative emission regulations. Reference 13 CCR 2766. Exemptions (c), pg.45. They range in size from 21-45 ft in length and have costs that range from $60,000 to $500,000+.

Class B Motorhome

A Class B motorhome is built using a cargo van as the base. In the State of California, in order to qualify as Class B RV, a vehicle must have four of the following six built-in items:

1. a water system, typically a sink or shower
2. a refrigerator
3. a cooking system
4. a fuel or 110 V electrical system
5. an AC unit or heater
6. a toilet

Most are built with a modified roof that is high enough to allow occupants to stand up inside. On average, only about 75% of Class B motorhomes are equipped with generators. Class B motorhomes vary in size from 16-22 ft. in length and cost between $60,000 and $130,000.

Class C Motorhome

Class C motorhomes usually use an extended van or pickup truck chassis with an attached cab. Nearly all Class C motorhomes are equipped with generators (see footnote 1). The Class C motorhome is known by many people as a "cab-over" motorhome, as most have an area that hangs over the cabin with a mattress for sleeping. They range in size from 21-35 ft. in length and cost between $43,000 and $200,000+.

Non-motorized RVs (travel trailers, fifth-wheel trailers, truck campers, sport utility RVs (toy haulers), and park models)

Sport Utility RV (Toy Haulers)

Sport utility RVs or toy haulers are for the family who wants to take motorcycles, dirt bikes, ATVS or other motorized toys on the road. The rear end of the unit drops down, forming a ramp for access into a "garage" area where motorized toys can be safely stored; the living quarters are separated by a wall. The units vary in size from 19-39 ft length and cost from $10,300 to $170,000. Most toy haulers are equipped with a generator.

Travel trailers

The travel trailer is a towable RV that connects to a ball hitch mounted on the tow vehicle, and is designed as living quarters for recreational travel. They are equipped with all the conveniences of home, including sleeping, showering, dining, cooking, entertainment and storage. A very small fraction of travel trailers are equipped with generators. They vary in size from 12-40 ft in length and cost from $8,000 to $95,000.

Fifth-wheel travel trailers

The Fifth-Wheel Travel Trailer can have the same amenities as the conventional Travel Trailer, but is constructed with a raised forward section that allows for bi-level floor plan. These models are designed to be towed by a pickup truck equipped with a device known as a fifth-wheel hitch. They vary in size from 21-42 ft in length and cost from $18,000 to $160,000. Like conventional travel trailers, very few fifth-wheel trailers are equipped with generators.

Truck campers

A truck camper is a living space unit that is temporarily mounted into the bed of a pickup truck. The smallest of truck campers provide a sleeping area with perhaps an ice box and storage cabinetry, while top-of-the-line campers feature a refrigerator/freezer, propane range/oven, microwave oven, air conditioner, furnace, water heater, and lavatory with shower. Very few truck campers are equipped with generators.

Park Models

Park Model RVs are unique units that provide temporary accommodations for recreation, camping or seasonal use. Park Model RVs are designed to look like a home, but they need to be hooked up to site electricity, sewer and water like any RV. Park Model RVs are generally not equipped with generators. They are hooked up to the site electrical service.

RV Registrations in CA 2016-2019, by type

RV type	Annual CA Registrations			
	2016	**2017**	**2018**	**2019**
Class A Motorhome	3,089	2,913	2,779	2,338
Class B Motorhome	598	772	962	1,072
Class C Motorhome	3,920	4,353	4,435	4,027
Sport Utility RV (toy hauler)	4,061	4,485	5,060	4,624
Travel Trailer	17,638	20,503	21,863	20,141
Fifth Wheel Travel Trailer	3,930	4,501	4,782	4,347
Park Model	159	209	194	183
Truck Camper	7	4	7	41

RV Generator Fitment by RV Type

RV Type	Approximate percentage of units shipped w/generators	2019 New retail registrations in CA	Estimated annual number of products in CA equipped w/generators (based on 2019 new registrations)
Class A Motorhomes	100%	2317	2317
Class B Motorhomes	75%	1072	804
Class C Motorhomes	100%	4005	4005
Sport Utility RV (SUTs)	42%	4489	1885
Travel Trailers	2%	19670	393
5th Wheel Travel Trailers	3%	4347	130
		total	9534

RV Generators Facts

Nearly all generators produced for the RV industry are supplied by a single manufacturer, Cummins Onan. Specifications for Cummins Onan RV generators can be found online at https://www.cummins.com/product-finder?f[0]=product_type:generator&f[1]=markets:2071.

A typical LP generator for a medium-sized RV (e.g., Cummins Onan RV 5500 watt LP generator uses a 10.7 HP 653 cc 4-cycle OHV V-twin engine to produce 5500 watts of electricity. It can run

two 13,500 BTU AC units w/1100 additional watts available. A larger motorhome might use a 7000 watt LP generator to power 2 15,000 BTU AC units with 2000 additional watts available. This generator uses a 14 HP 653 cc gas 4 cycle OHV v-twin engine. Very large diesel motorhomes might use one of Onan's diesel RV generators providing 12,500 watts for powering three 15,000 BTU AC units and 5000 watts worth of other devices. By comparison, the generator found on a typical Class B motorhome might be the Cummins Onan 3200-watt gas generator for powering a 13,500 BTU AC unit (which uses about 1800 watts leaving 1400 watts for other purposes).

Generators used in RVs are fueled by either gasoline, LP gas (propane), or diesel fuel. Choice of fuel depends on various factors. RV manufacturers and consumers desire to have a single fuel system on the unit when possible. A single fuel reduces cost, complexity, weight, etc. Diesel generators are the most expensive of the group and tend to be found on only the larger, more expensive Class A and C diesel motorhomes. Because the LP gas typically used to fuel gas stoves, refrigerators, and furnaces can also be used to fuel an LP generator, LP gas is a popular choice for RV generators. LP generators, however, tend to be more expensive than gasoline generators. LP gas is also more difficult to acquire in the field. LP has only about 80% of the energy content of gasoline and thus results in larger engines and longer runtimes. Gasoline generators have the advantage of using the same fuel source that fuels the engine on a gas motorhome and have the lowest acquisition cost. Gasoline is also the easiest fuel to purchase, thus making it a convenient/popular solution for the RV owner.

RVIA estimates the fuel split for RV generators as follows:

LP gas: 3.5%
Gasoline: 74.4%
Diesel: 22.1%

Based on our estimate that 9534 RVs equipped with generators were registered in 2019 in California, we further estimate (based on the above LP/Gas/Diesel split) that 2019 registrations of new RVs equipped with generators powered by SI engines numbered about 7,426 units. About three-quarters of these generators are fueled by the motorhome fuel tank and thus are exempt from the evaporative emissions requirements in the SORE regulation.

RV and RV Generator Use

In 2015, RVIA commissioned Statistical Surveys, Inc. to collect vehicle miles travelled (VMT) data for motorhomes. In carrying out this analysis, Statistical Surveys, Inc. used data from IHS Inc., a well-known source of information on the automotive industry, to review odometer readings of three year old motorhomes sold in calendar years, 2012-2014. Using readings from 987 motorhomes, Statistical Surveys found that the average VMT for motorhomes was 4,290 and that the median VMT was 3,042. We provide this data primarily to make the point that motorhomes are not operated like commercial weighing 10,000 lbs. or more. Generally speaking, their use is limited to recreation purposes. Average motorhome use is 27.5 days per year[1]. Larger units are likely to be used less often and park in campgrounds with site electricity. Smaller units, particularly toy haulers, tend to see more frequent use and are more likely to be used in locations where site electricity does

[1] RV consumer demographic profile by Richard Curtain, 2011 version, page 19.

not exist. With motorhomes, when the vehicle is in motion or when the vehicle engine is in operation, the RV obtains electricity via the vehicles propulsion system (i.e., generator operation is not necessary). When the motorhome is parked at its destination (most often a campground equipped with electricity), the RV gets electricity from the grid. Because some RV types such as toy haulers are used more often where power from the grid is not available, generator use for this type of product will be higher than for conventional travel trailers and motorhomes. We know that generator use rates vary greatly from user to user. It depends on the type of RV, where they are going, how often they are using the unit, etc. On average, it is probably a few hours per year per unit. We know, anecdotally, that most RV generators are brought in for repair not because of wear and tear, but rather due to lack of use.

Alternatives to Traditional Generators

A small number of RV manufacturers have begun to offer Class B motorhomes with lithium-ion based systems. For example, certain Winnebago Class B motorhomes can be equipped with their 3600 watt Pure3 Energy Management System lithium-ion energy pack and inverter which includes a second under-hood alternator powered by the chassis engine and energy pack heating system. Such vehicles are otherwise fitted with a similarly-sized gas generator. The lithium-ion system (equipped with rooftop solar) is capable of running the air conditioning system on the vehicle for about twelve hours. After that, the diesel or gas vehicle engine must start up to in order to continue delivering electricity to the unit. The lithium-based system available on the Winnebago Class B motorhome is about a $19,000 upgrade[2].

While battery-based systems are scalable, larger systems increase in price. In the case of a medium size RV that consumes 4000 watts per hour, you would need a 100 kwh battery to support operations for 24 hours. This is twice the size of a battery found on a Tesla. The battery alone, at $200/kwh, would cost about $20,000.

CARB's Proposed SORE Regulation Upgrade

Based on materials released by CARB in June, it is RVIA's understanding that the changes staff is proposing to make to the SORE regulations include, among other things, the following:

- 2023-2024
  - For HC + NOx, a 3 g/kWh standard for engines ≥ 225 cc - < 825 cc (compared to 8 g/kWh today)
  - 50% reduction in evaporative emissions
  - More stringent durability requirement (engines would need to be certified to meet 5000-hour test standard instead of current standards which are 1000 hours and less)

- 2025-2027
  - Zero emissions standard with credits

- 2028
  - Zero emissions standard without credits

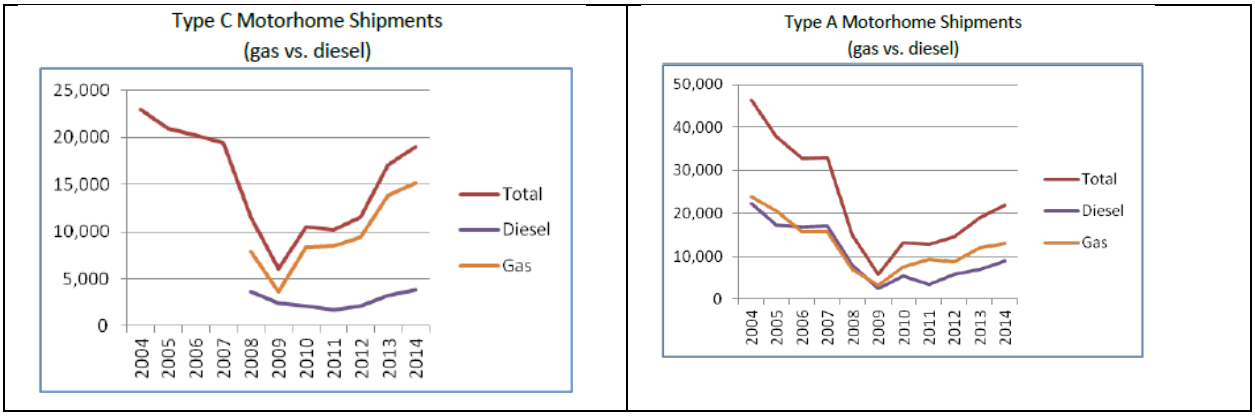
[2] https://www.lichtsinn.com/blog/the-travato-59kl-and-59gl-pure3-energy-management-system-pros-and-cons/?gclid=Cj0KCQjw4f35BRDBARIsAPePBHx180_i8o3JWWz65g2izHz76HH5Ya6hnHQlamB2lMaFstH0Sphtg7MaArNrEALw_wcB

The rule applies to spark ignition (SI) engines rated at or below 19 kw (i.e., diesel engines are not in scope).

As noted above, virtually all generators supplied to the RV industry come from Cummins Onan. It is RVIA's understanding that while compliance with the proposed 3 g/kWh HC + NOx standard for 2023 engines ≥ 225 cc - < 825 cc may be technologically feasible, it is unlikely to be complied with by Cummins Onan given the cost of developing a compliant engines cannot be supported by the very small RV generator business in California. To avoid a situation where RV manufacturers are unable to purchase compliant SI engine-based generators starting in 2023, we urge CARB to establish a standard that does not jeopardize the ability of RV manufacturers to source generators for the 2023 and later timeframe. It is important CARB understand that the SI engine product produced to support the RV industry is unique to the RV industry. The cost of developing compliant products for our small industry cannot be spread across other industries. If the cost of compliance cannot be supported by sales to our industry, the manufacturer will simply drop the product from its portfolio and focus its efforts elsewhere. Were this to happen, it would seriously impact our industry and consumers.

Similarly, and with regard to staff's proposed 2025 and later zero emissions standards, we recommend the proposal be significantly modified to prevent extreme adverse impacts on our industry and consumers. It is clear that, within the RV industry, there is a growing demand for RVs incorporating alternative clean energy solutions. This is evidenced by limited demand in the Class B motorhome segment for lithium-based systems. RVIA and its member companies fully support and embrace the long-term goal of net-zero emissions. That said, it is important that we acknowledge the current state of technology, its limitations, and its costs. We see that today, it is possible to power an RV with a lithium-based storage system, but we know that such systems have a very-limited ability to satisfy the electrical needs of the product for more than a very short period of time. We also know that the cost penalty is large and palatable only to those willing to pay a large premium to go green. We also know that RV consumers are diverse in their wants and needs, and importantly in their ability to afford RVs with all the bells and whistles. We know that the success of the RV industry is tied to the economic well-being of the country. We know this from past history. During the recession of 2007-2009, as depicted below, RV sales declined 76%. This contrasts to 39% reduction in commercial truck sales for the same period. It is evidence that the RV buyer is a spender of discretionary funds. Motorhomes are purchased by middle class families with a median income of $91,000 and a median age of 48 years. Generally speaking, the RV consumer is extremely cost conscious. Cuts in discretionary funds or product price increases have a large influence on RV sales and the well-being of our industry. Unlike landscapers and other commercial business owners who earn money from their gas-powered products, RV consumers earn no revenue from their product and thus cannot write off increased product costs as the cost of doing business. Rather, when costs increase, the RV buyer looks for a less experience alternative to meet their recreation needs. This could be abandoning the RV lifestyle altogether. Such an outcome would be extremely bad for our industry which consists of hundreds of manufacturing sites in the U.S employing nearly 94,000 full-time employees, including dozens in California which employ more than 4900 workers. Our industry is dominated by small volume manufacturers located in rural areas

that depend on the jobs tied to RV manufacturing. Roughly half of all motorhome manufacturers produce fewer than one hundred motorhomes per year[3].



We are confident in saying that the average Class C motorhome buyer or travel trailer buyer that is spending between $50,000 and $100,000 on an RV unit will not be able or willing to spend 20 to 40 percent more for a unit equipped with a zero emission solution that provides reduced utility at a cost that is currently 6x the cost of conventional technology. We also know that from a practicality standpoint, battery-based systems scaled up to satisfy the electrical demand of large Class A motorhomes and/or large travel trailers would require massively large batteries that would have extreme weight implications for the vehicle and the roads they travel. It should also be understood that, at least for motorhomes, a product lacking a reliable backup power source will end up relying on the motorhome's large gas or diesel engine. Thus, imposing a zero emission standard on the RV sector would likely have result in increased emissions compared to today, not the reductions intended.

For these reasons, we believe that staff's zero emission standards proposal should be modified to exclude SI engines used in RV generators. We believe that, rather than mandating a zero emission solution for the RV sector, you could incentivize the development and adoption of zero emission solutions in our sector by finding a way to give credits to suppliers of zero emission systems which they could in turn sell to suppliers of conventional systems that are subject to the zero emission standard. In other words, don't force the RV consumer to spend many times more on a system that fails to fully meet their needs. Instead, craft a regulation that, for our sector, gives suppliers an incentive to innovate and develop solutions that make no sense economically for end users. If through credits, suppliers can recoup cost of developing and producing new zero emission systems, they will be more likely to grow and find ways to make systems more financially attractive in the future for sectors like ours.

Closing

RVIA appreciates the opportunity to provide our input to the development of the SORE regulation. We urge you to revise your draft to address our concerns with the proposed near-term 2023-2024

[3] Statistical Survey, Inc.

exhaust and evaporative emissions standards as well as the zero emissions standards that have been proposed for 2025 and later.

We welcome the opportunity to provide additional information that you may need to support the revisions we are requesting. I can be reached via email at mochs@riva.org and by telephone at (571) 665-5860. Additionally, you can contact Dale Kardos at Dale.Kardos@motorvehicleregs.com or (202) 306-4997.

Sincerely,

Michael Ochs

Michael Ochs
Director, Government Affairs

Appendix B

RV Industry Association Presentation

High Energy Density Auxiliary Power Systems for Recreational Vehicles

May 10, 2021

Appendix B

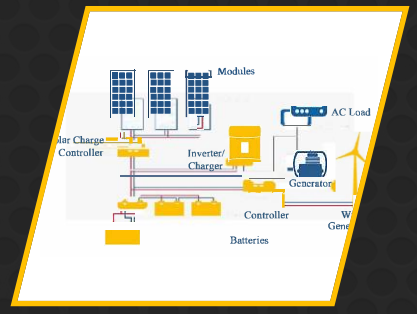
High Energy Density Auxiliary Power Systems for Recreational Vehicles

Overview

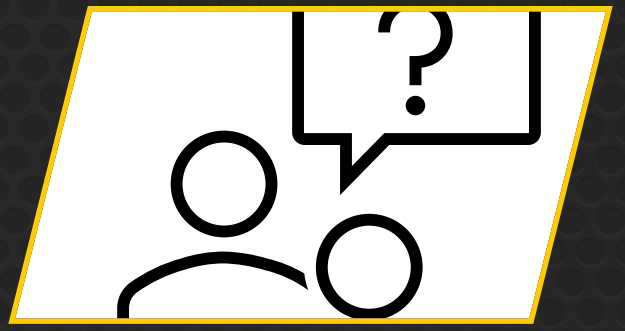
Background:
Introduction to RV's

Power Requirements and Sources

Current RV Electrical Systems

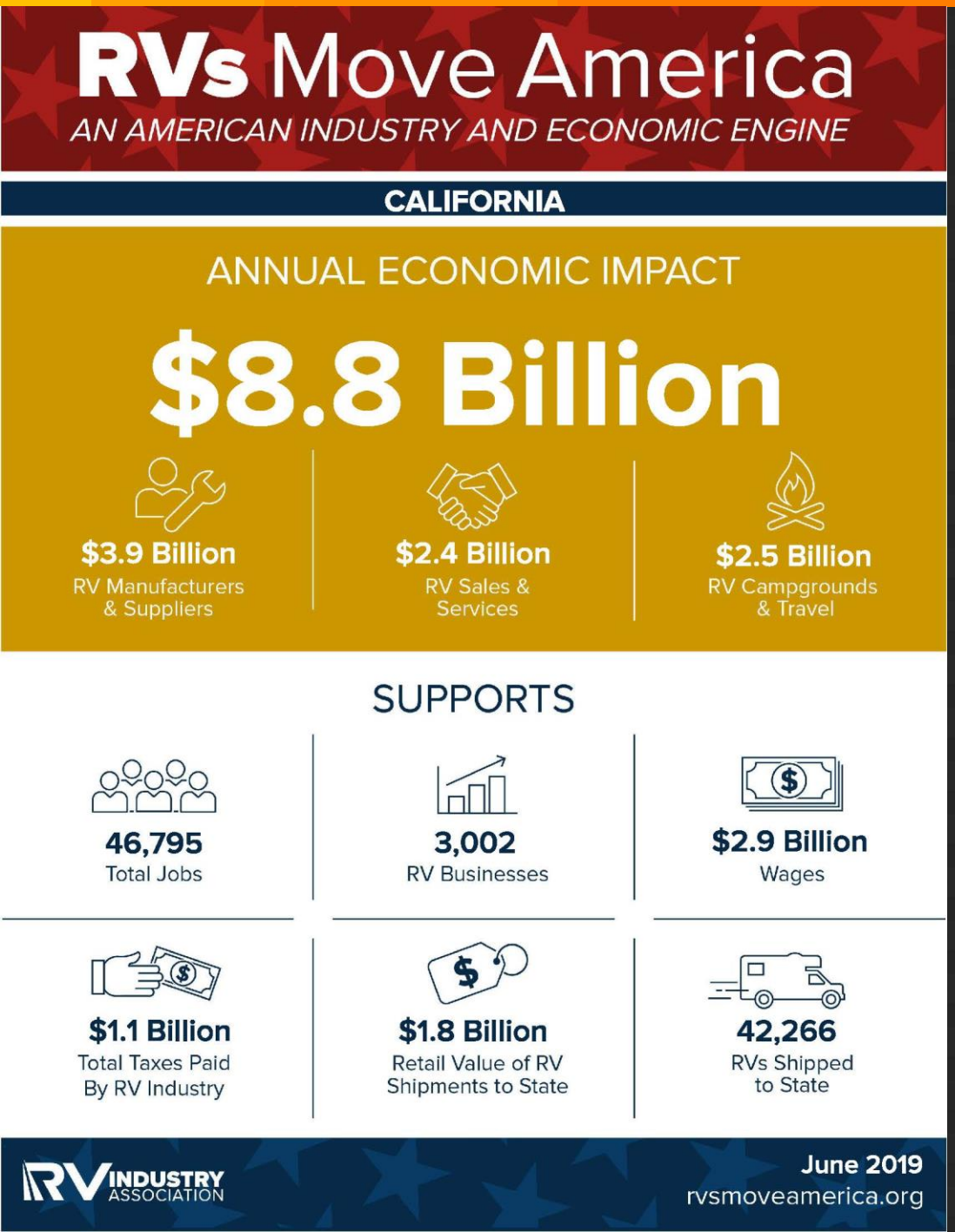


Paths Forward



RV Industry Recommendation

Introduction to RVs



Recreational Vehicles are an important part of California's and the Nation's Economy

- Nationally, the RV industry has an annual economic impact of $114 Billion
- In California, the industry has an $8.8 Billion annual impact
- California is a primary destination for many "out-of-state" RVers

Types of Recreational Vehicles

Class A

Class B

Class C

Sport Utility Trailer

Mobile Living

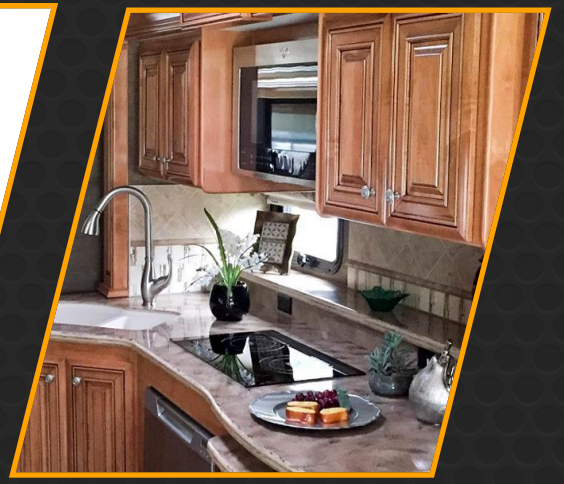
Your House on Wheels

Electric fireplace and HDTV

Washer/Dryer

Air Conditioner

Hot Water Heater



Kitchen with induction cooktop and microwave

Typical Usage

Recreational Vehicles need to be functional in a variety of locations and environments.
Here are some examples:

Urban

In Transit

4 Season

Remote

Power / Energy Requirements

Virtual RV Tour

- Full kitchen
- Bathroom
- Living areas
- Entertainment centers
- Centrally controlled heating and air conditioning.
- Washer / Dryer

Typical Power Requirement

Depending on size and accessories, RVs typically have one of the following electrical systems:

- 50 A @ 120 Vac = 6000 W
- 30 A @ 120 Vac = 3600W

Typical Power Sources

RVs rely on a variety of sources for power.

Genset uses vehicle fuel system and evaporative emissions system

Evolution of Auxiliary Power for RV's

- Since the inception of Motorized RVs in the early 1960's "fixed mount" generators have been utilized to provide the same comforts as home.
- With the introduction of the Sport Utility Trailer RV segment (invented in California in the early 2000s), "fixed mount" generators utilized for the same reason.
- Over the years, features and amenities have been added which increase the power requirements.

Power Requirements

- Power requirements are a function of the **amount** and **duration** of the power required by the RV.
- Power requirements of 2500 to 6000 W for periods of 60 to 80 hours are common.
- Mobile onboard SORE powered generators along with sufficient fuel are essential, especially in remote areas and emergency situations.

Comparison of RV Generators to Portables

While recreational vehicles and portable generators both utilize SOREs there are several important differences in the impact that each has on California's emissions inventory:

≠

Generators on RVs are:

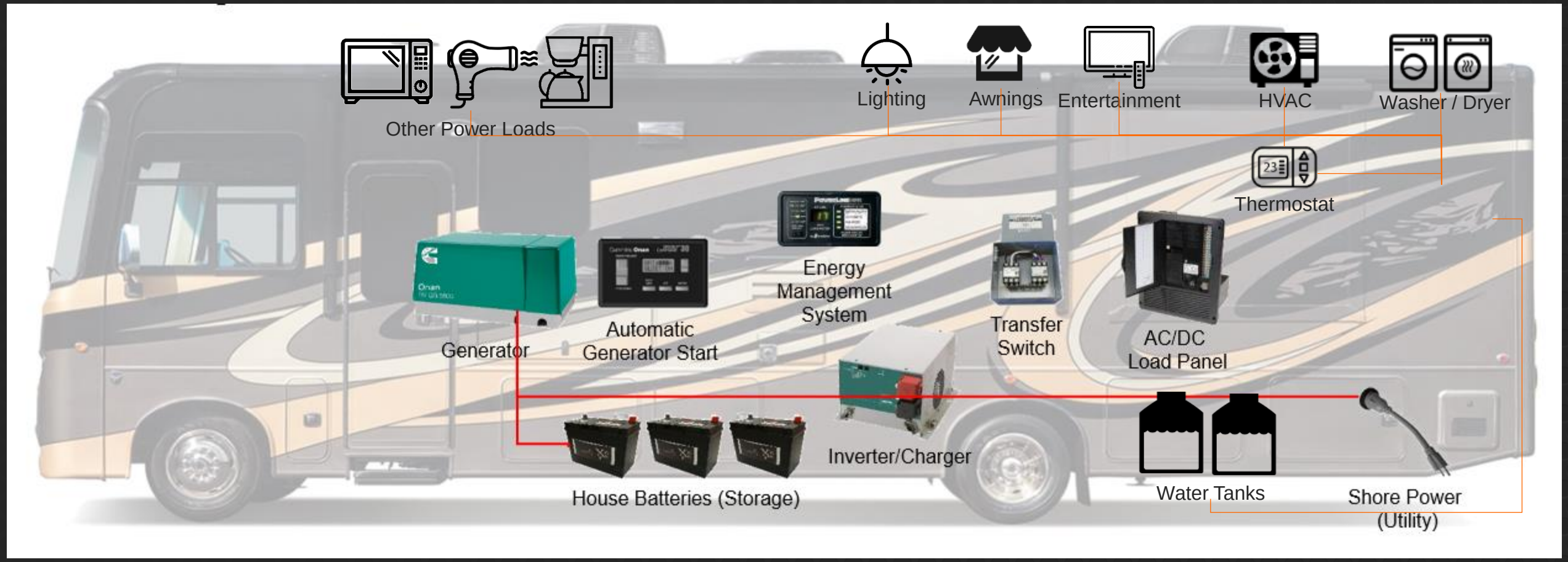
- Permanently attached to vehicle.
- Fueled by 30 - 40 gallon permanently installed fuel tanks.
- Refueled at a gas station with EVR systems.
- Refueled infrequently (60 to 80 hours of run time).
- On average used less than 100 hours per year.

Portable generators:

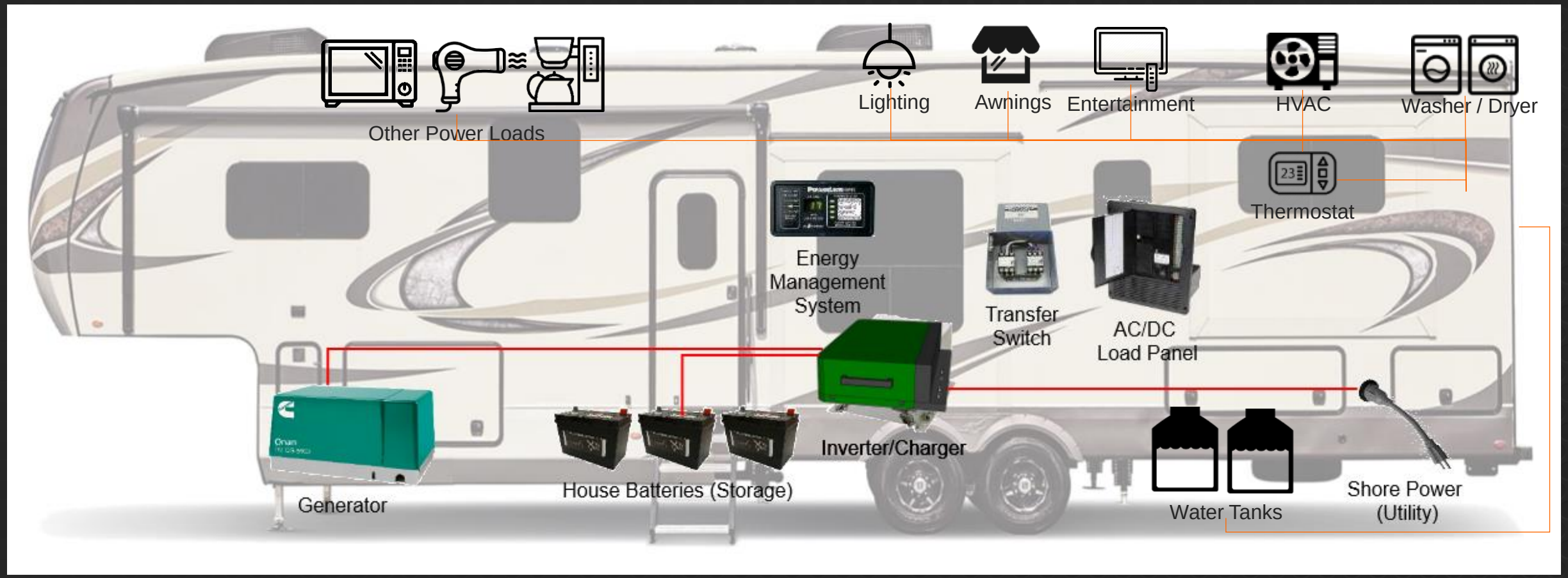
- Portable.
- Most often refueled by hand (gas can).
- Refueled on average every 10-15 hours of run time.
- Requires two refueling events per refueling (i.e., first the gas can and then the generator).

Current RV Electrical Systems

Motorized auxiliary power system and related electrical components

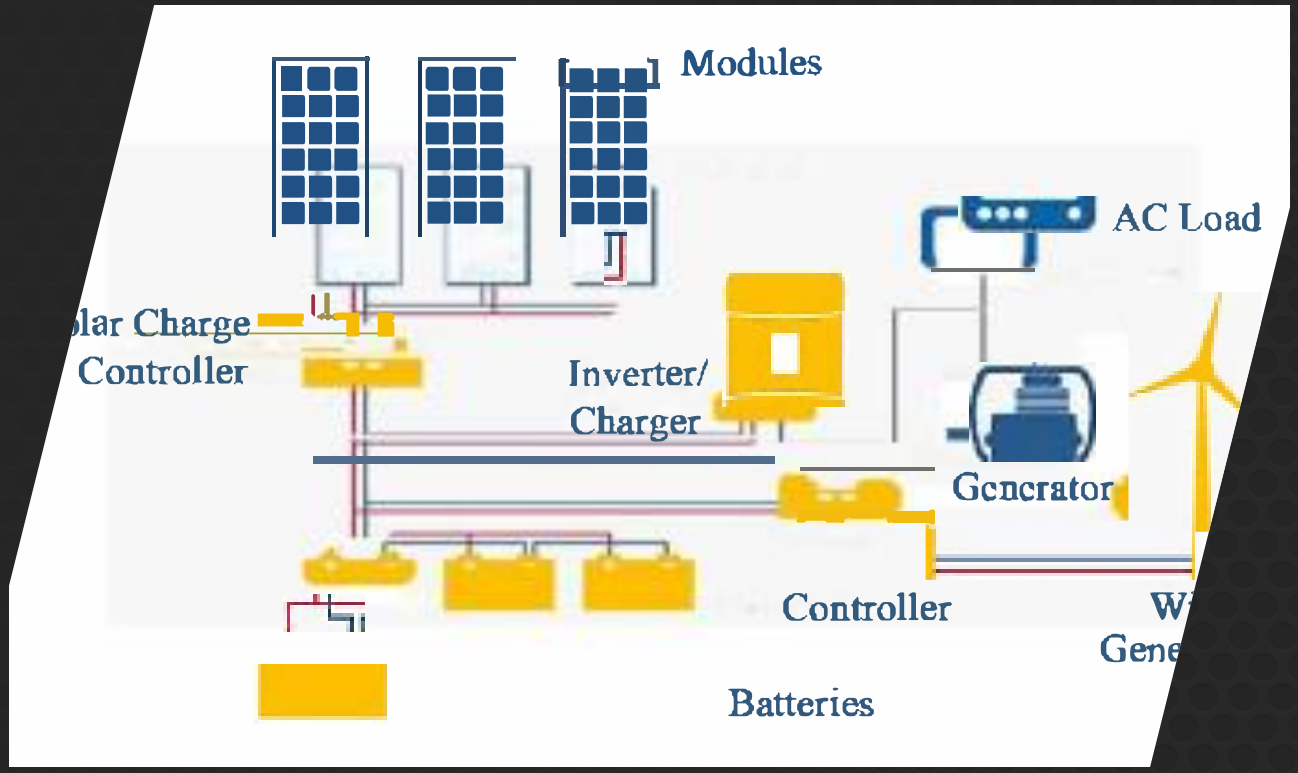


Towable Sport Utility Trailer (SUT) auxiliary power system and related electrical components



Sport Utility Trailers are one of the most energy demanding RVs because of the remote locations (desert, forest) and the extreme weather conditions in which they are typically used.

Paths Forward



Auxiliary Power Challenges for RVs

- We have RVIA member companies that are currently in the “New Energy” power segment and working on electric and fuel cell solutions, but the technology is extremely expensive and limited in its ability to address RV power requirements today.

New Technology Development Criteria

- Sustainability
  - Criteria emissions GHG's, safety, noise, vibration, service ergonomics, heat, codes and standards, etc.
- Affordability
  - Initial cost, cost to maintain, resale cost, etc.
- Availability
  - Unplanned downtime like reliability, downtime due to maintenance, battery capacity and recharge frequency
- Efficiency
  - Cost per Kilowatt hour
- Productivity
  - Power density, ability to cover all loads, transient response, weight, etc.

Adoption of New Technology

- RV Manufacturers are trying Lithium-ion batteries on a very limited basis to replace or downsize the generator.

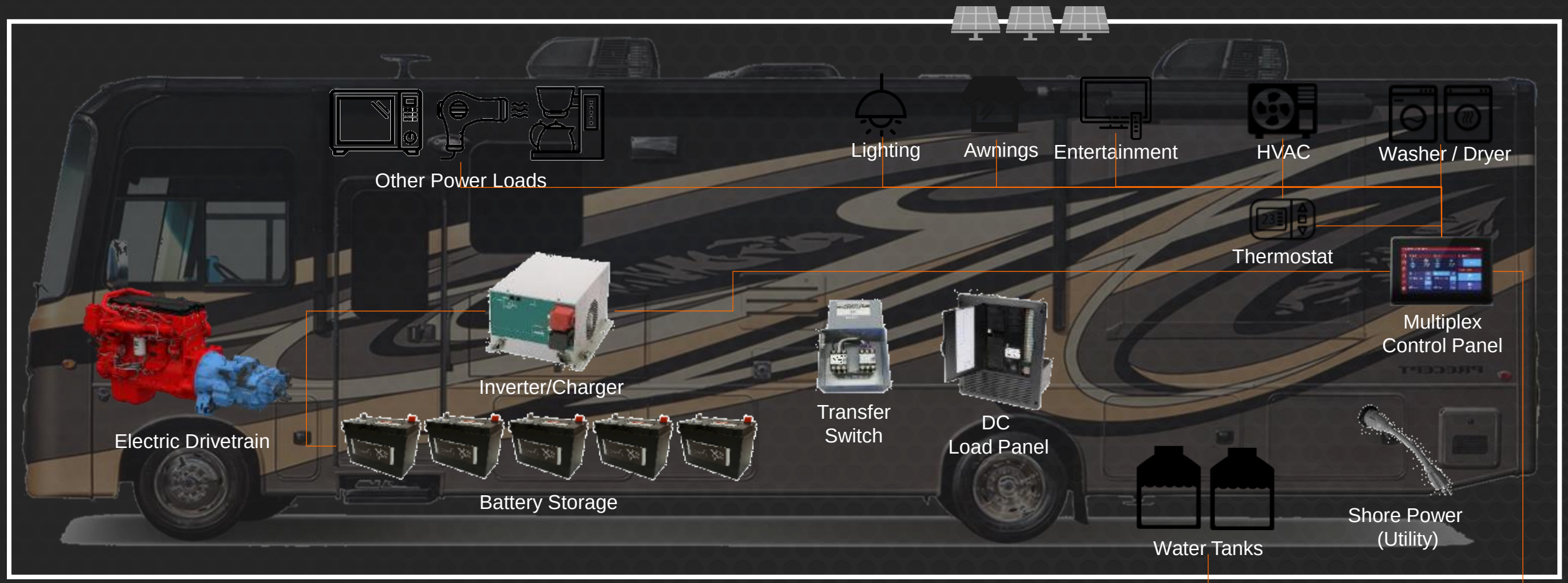
- Lithium-ion battery system is a $20k upcharge over the generator
- While running the AC and limited other accessories the unit can run on battery for 4 hours before recharging
- To recharge the vehicle engine needs to run at idle for 45-60 minutes

- Prevost chassis product with a new cost of $2.7 million
- The generator was downsized from a 20kW to a 12.5kW Lithium-ion battery system and 4 inverters is a $75-100k additional cost

Auxiliary Power Challenges for RVs

- Regardless of the battery solution, there will be a need to recharge the batteries on a regular basis. Moving the RV to recharge the batteries is not an option.
- An engine of some type must be run to recharge the batteries
  - Optimized “fixed mount” generator
  - Vehicle engine at idle for 45-60 minutes every 4 hours

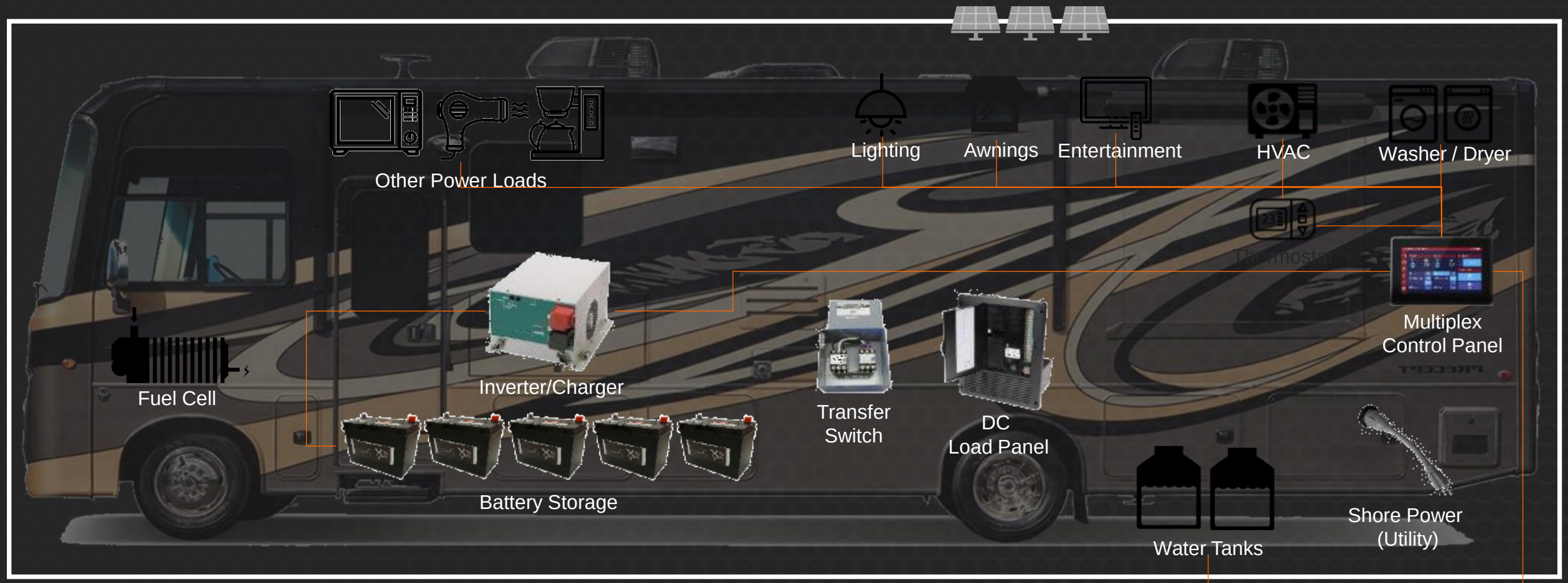
RV Potential Future State – Semi Electric



Future RV Motorized Power Trains

- Semi electric product will continue to have a drive engine and will be similar to a hybrid car.
- The batteries would be charged while the unit is underway.
- While the unit is “dry camping” the drive engine will still need to run to recharge the batteries

RV Potential Future State – Fuel Cell



Future RV Motorized Power Trains

- The RV industry is studying the applicability of fuel cells in the context of the 5 attributes, e.g. where to get hydrogen, how/where to store it, capacity, safety, temperature, etc., and of course, cost.
- There will still be storage batteries to both store energy and balance the loads.
- While the unit is “dry camping” either the primary fuel cell or a secondary fuel cell will run continuously.

RV Industry Recommendation

RVIA requests that CARB defer subjecting fixed mount RV SOREs to the zero-emission requirements until there exists sufficient evidence that zero emission technology will be capable of accommodating the unusually large and long-duration power demands of RVs in a cost-effective manner.


RV INDUSTRY ASSOCIATION
SENECA
Thank You