British Columbia Multihull Society

November 2016

In Memoriam Eileen Gunning

A brunch celebrating the life of Eileen Gunning, a longtime BCMS member, will be held at the Sylvia Hotel in Vancouver on Sunday, November 13th, at 11am. If you are coming, please RSVP to Patrick Brown at 250-629-6055 or tightrop@gmail.com .

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Photovoltaic Power for Multihulls

Alec Mackenzie

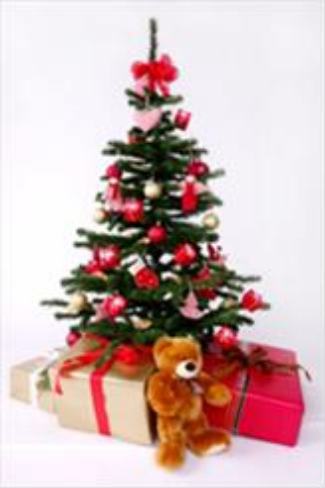
Photovoltaic battery charging systems are more efficient and much less expensive compared to even a few years ago. At the same time, energy saving advances in LED lighting and other on-board electronics continues to reduce electrical demand. For those rare times when there is insufficient solar energy available, supplemental charging can be provided by the main engine alternator or by quiet, efficient fuel cell generators. Taken together, these trends are enabling more and more boaters to dispense with the cost, noise and maintenance requirements of frequent main engine running while enjoying all the benefits of on-board electricity when away from the dock.

Photovoltaic charging systems require exposure to direct sunlight for extended periods of time. In BC we get those conditions throughout the late spring, summer and early fall. Several days of battery storage capacity provides adequate buffer to get through occasional spells of cloudy weather, particularly if there is sufficient solar charging capacity to catch up on the next sunny day.

Solar panel mounting

Multihulls are particularly well suited to solar charging systems since their large deck areas provide many panel mounting opportunities. Solar panel energy output drops to almost nothing if just one photovoltaic cell in that panel is fully shaded, so mounting locations should be chosen

'Tis almost the Christmas Season once again.



All are invited to the
BC Multi-Hull Christmas Party

Jamie & Lynn McKerrow's Place
11242 Sussex Place, Delta

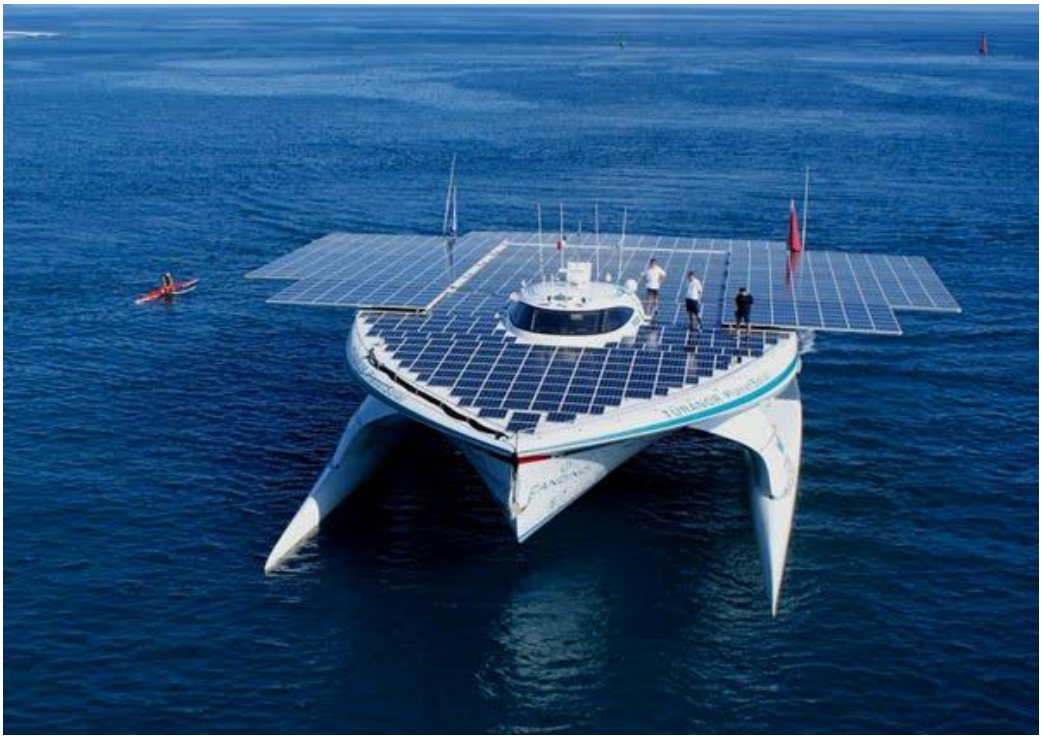
December 10th, 5pm

This is a pot luck dinner and BYOB.
We will have a secret Santa gift exchange, bring a gift valued around $20.00 to participate
Please RSVP: members@bcms.bc.ca

for minimum shading from the mast, boom or other large objects. Shrouds and other rigging lines will have a relatively small effect on power output since their shadows are not large enough

to fully obstruct individual cells, thus allowing the unshaded portions of the panel to continue producing electricity and delivering it to the battery. (Think of the cells in a panel as links in a chain). Some periods of shading are inevitable, but adding one or two low cost panels can easily compensate, even if you mount them in less than optimal locations.

If mounting space is limited, adjustable panel mounts allow you to increase power production by improving the sun exposure and sun angle, particularly in the early morning and late afternoon when the sun angle is low. Alternatively, PV panels can be deployed when at anchor to increase PV capacity and minimize shading effects (move to 'sunny' locations). These panels can be stored in a locker when underway.



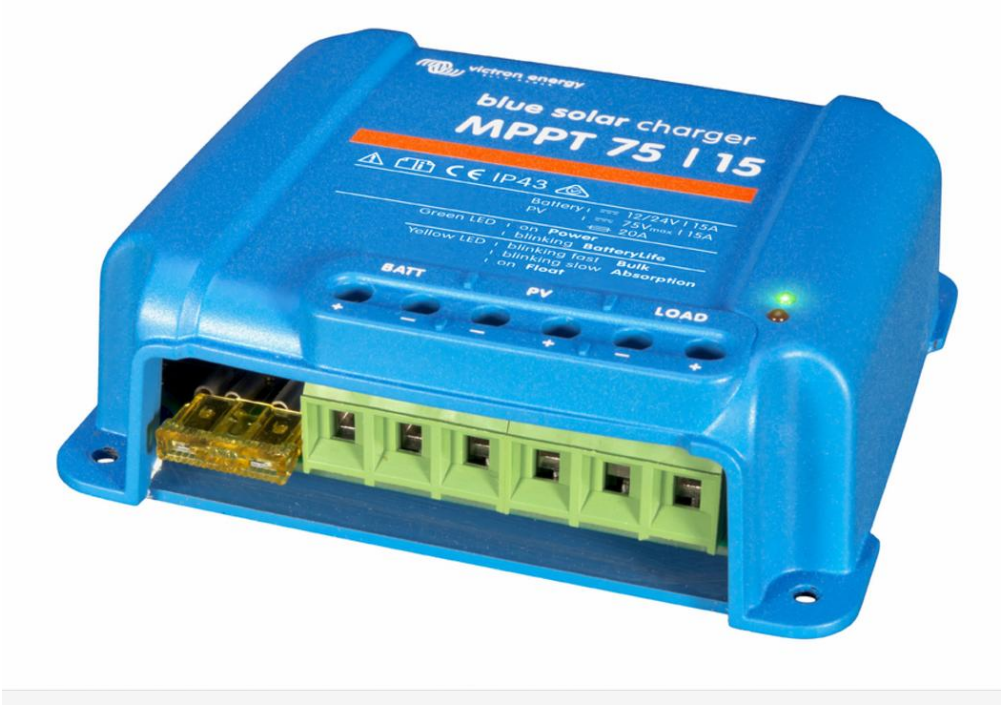
Charge Controllers

Photovoltaic Solar panels require some form of charge controller to manage the battery charging process and protect against overcharging.

Solar charge controllers come in two basic forms:

- PWM controllers provide overvoltage protection and constant voltage and float charging to match the battery's charging requirements. (PWM = Pulse width Modulation). These controllers connect the PV panel directly to the battery until the battery reaches the high voltage setting (bulk charging). The PWM controller then gradually reduces charging current to maintain that voltage until current drops to some minimum value. At this point the battery is fully charged and the PWM controller switches to a float charge voltage to maintain the battery in a fully charged condition as long as PV panel power is available.
- MPPT controllers (MPPT = Maximum Power Point Tracking)provide the same Battery charge management functions as PWM controllers with the added feature of maximizing the power produced by the solar panels during the Bulk charging phase. The MPPT controller does this by first calculating the best PV panel operating voltage to maximize power from the panel and then managing current draw to keep the panel at this optimum voltage. Good MPPT controllers are constantly re-evaluating this maximum power point since it is affected by temperature, shading and sun angle, all of which change over time.

The controller then reduces its output voltage to match the battery voltage while proportionally increasing the charging current to conserve almost all the power (watts) produced by the PV panel. Good MPPT controllers may also offer other smart charging features that extend battery service life or slightly increase the battery's effective charge capacity.



Photovoltaic charging system explanation:

PV panels often put out their maximum power (Watts) at 15 to 19 volts depending primarily on panel design and operating temperature. Batteries typically charge at between 12V and 14.8 Volts, depending on battery type and state of charge. Obviously these two voltage ranges do not match. If you simply connect a solar panel to the battery, the battery will pull the solar panel voltage down to the battery charging voltage. This works fine, but the solar panel power output drops. In simple terms, Watts = Volts X Amps and while the photovoltaic panel voltage may drop by 3 - 5 volts, the panel current will increase only slightly – not enough to compensate for the reduced voltage, resulting in a reduction in total power produced. As mentioned above, this is how PWM charge controllers work.

In practical terms a 50% discharged lead acid battery (Charging Voltage ~ 13V) under cool conditions (MPP Panel Voltage ~ 18V) might see a 30% increase in Battery charging current when an MPPT charger is used. The benefit is much less on hot sunny days and disappears completely when in the constant voltage portion of the charge cycle, but this is the time you need the least charging capacity.

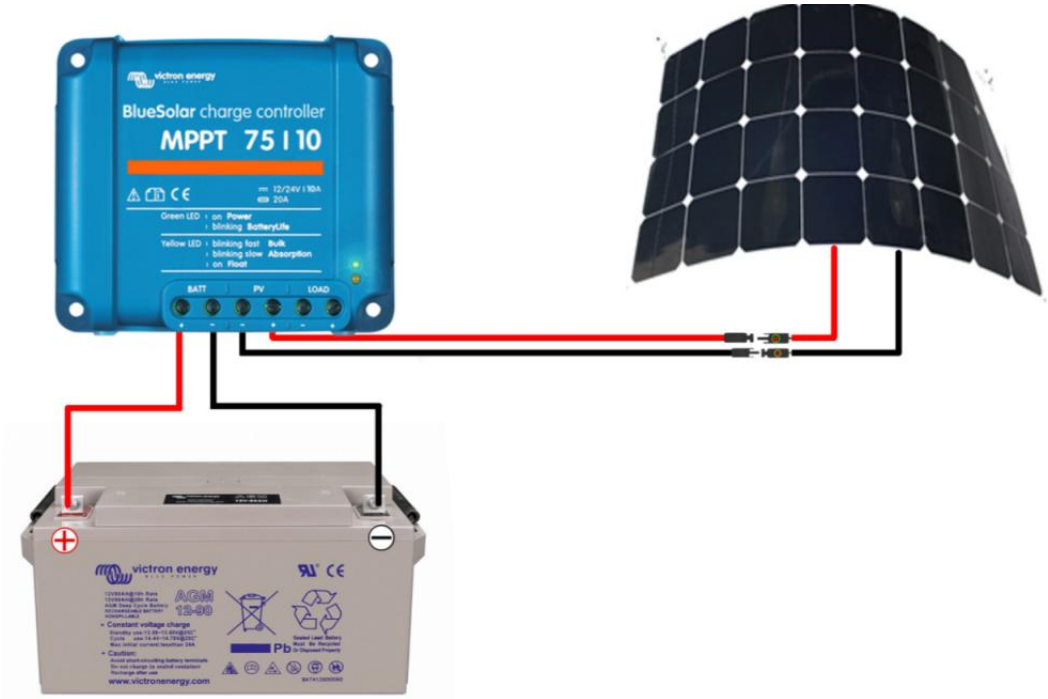
Unfortunately, everything comes at a cost:

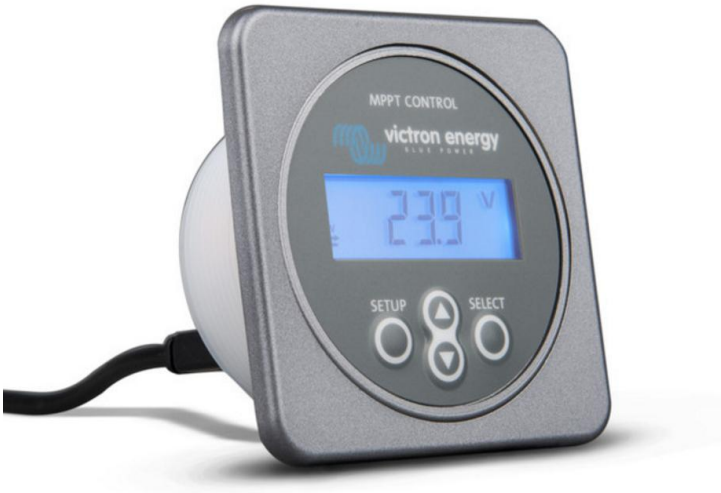
- PWM controllers are very cheap and there are literally hundreds of Chinese knock offs on the market along with units from a few higher quality manufacturers. You may get lucky, but cheap = crap most of the time and the manufacturer saves a few dollars at the expense of safety, reliability and performance. Your battery bank costs a lot and you don't want to risk damaging it through incorrect charging practices. Select a good reliable brand and you will get a good, safe charging control system at a reasonable cost.

- MPPT controllers are much more expensive, but their increased power production easily offsets this extra cost because you get more power from your solar panels. This is an important point on boats where you may not have room to mount sufficient Photovoltaic panels to meet your full charging requirements. Again, watch out for cheap MPPT controllers. Many Chinese manufacturers make cheap knock-offs and some of them are MPPT controllers in name only. Some Chinese manufacturers make good products but it can be difficult to separate the good from the bad.

My choices

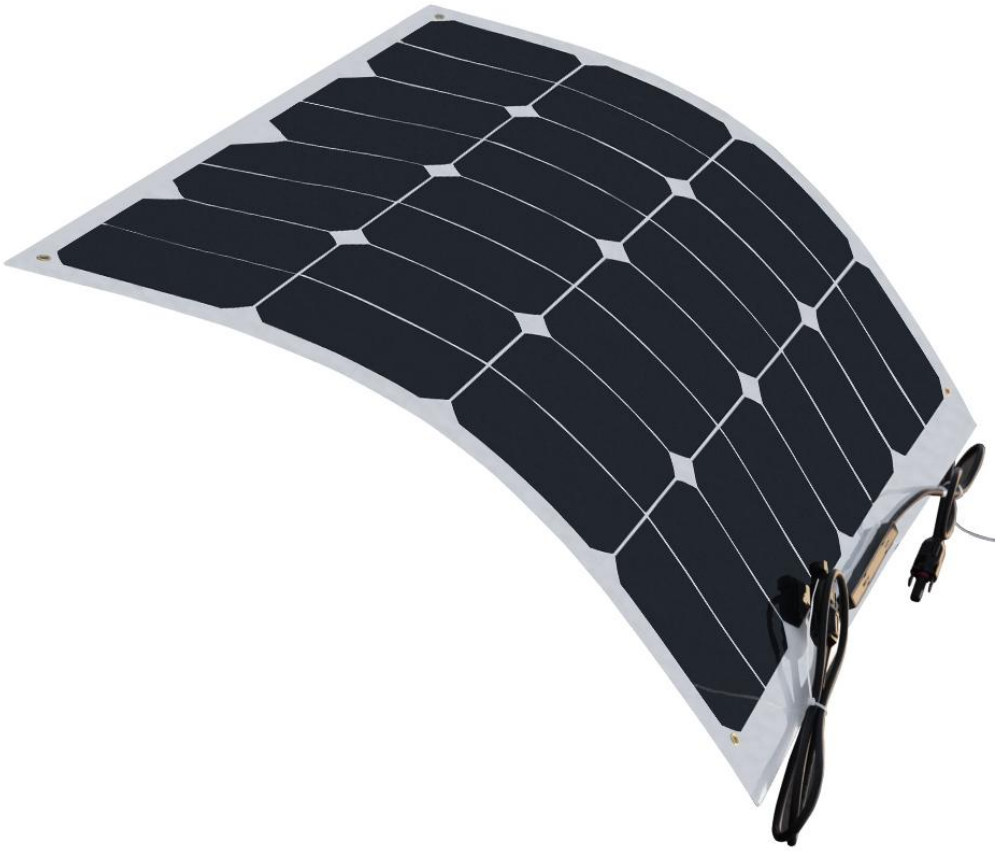
I spent a lot of time looking into this subject last winter and I finally ended up purchasing Victron Energy BlueSolar MPPT charge controllers (available through Trotac in Victoria and Monkey's Fist in Seattle). Victron has a very good product line covering a full range of charging and power products. I selected two 15 amp 12V MPPT chargers, each controlling two 12V 100 Watt panels wired in parallel for my 12V system. My panels are installed in pairs at different mounting angles, so the use of two separate controllers allows each pair of solar panels to operate at their own optimal voltages which are dependent in part on incident sun angle.





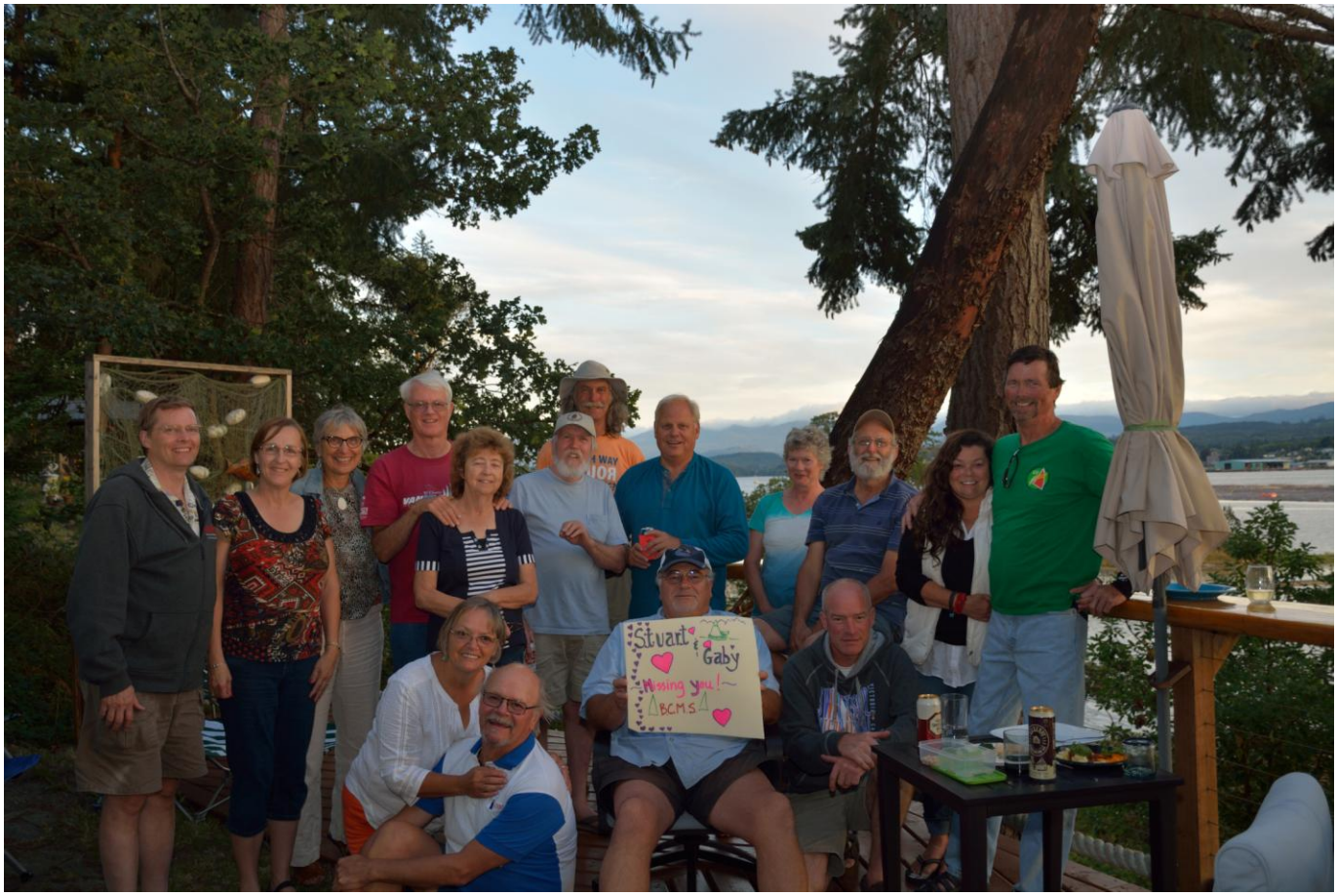
The controllers were small and reasonably priced (approximately $150 CAD each) and this configuration leaves me with 50% of my charging capacity if I suffer a failure. I could have purchased a single larger controller, but it would have cost me about the same in the end. My four hundred Rated watts of PV panel routinely produced more than 20 Amps of charging current during the summer months – a significant improvement over my previous experience with the same panels before I installed the MPPT controllers. I am very happy with this result.

Installation was really easy. Two wires connect to the solar panels and two wires (with fusing) to the battery. These MPPT controllers work right out of the box and have a flashing LED that shows basic operational states. As an option you can purchase remote display options that show you voltage, current and other operational information. The display I selected plugs into the charge controllers with a single cable. I purchased one unit that I can quickly move between controllers.



Victron also offers more complex (and expensive) monitoring systems for larger or more complex boat electrical systems. See their website for more details. https://www.victronenergy.com/

I also purchased several 100 watt semi-flexible Photovoltaic panels from Polar battery in Vancouver. The current market price for these panels is approximately $300 Canadian. Rigid aluminum and glass panels are less expensive, but weigh quite a bit more. Choose the panel type that best suits your particular mounting requirements.



Pizza Night at Pepperdines, NewCastle Sail-in, July 2016

Pub Nights @ River House Pub

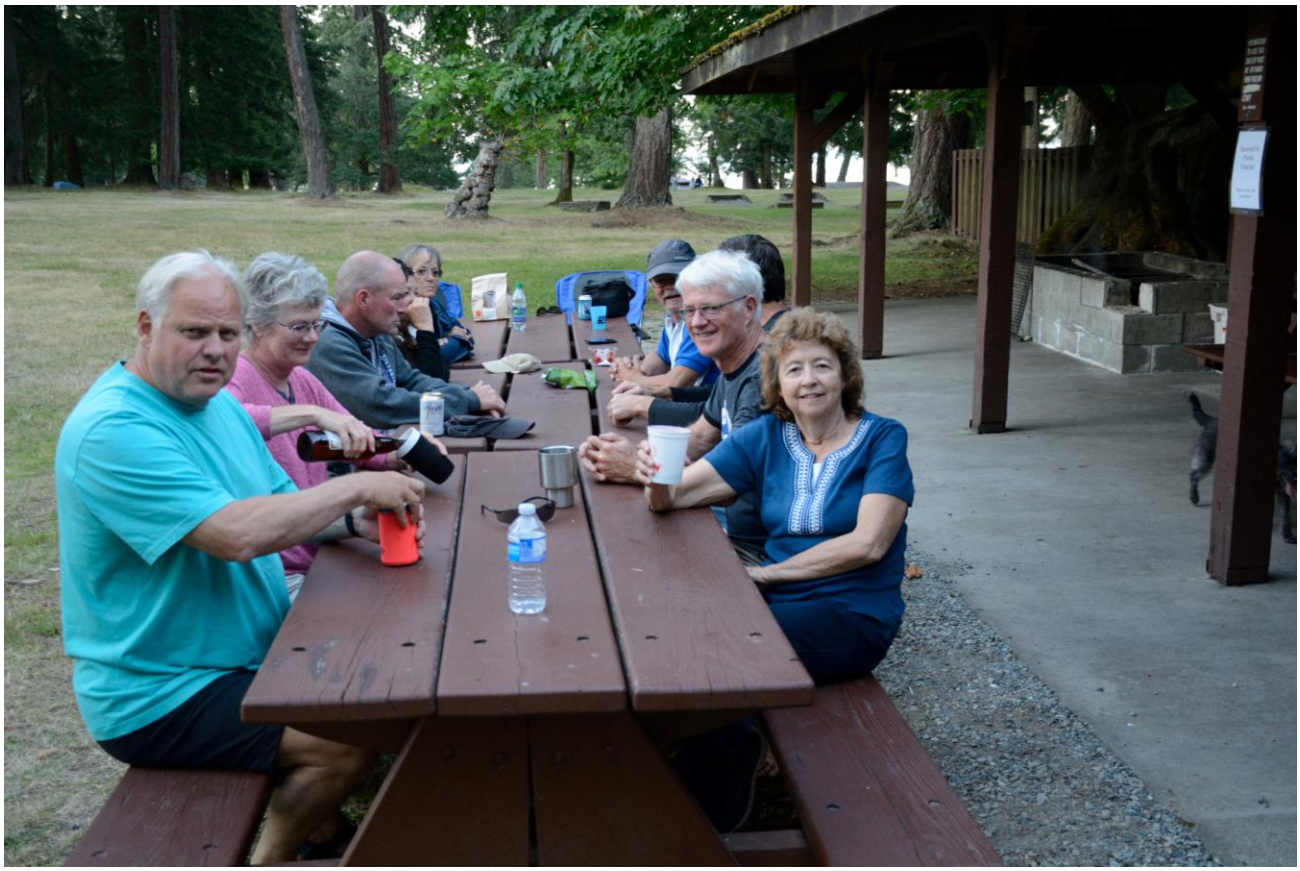
Please note the new location,

5825 60th Avenue, Delta

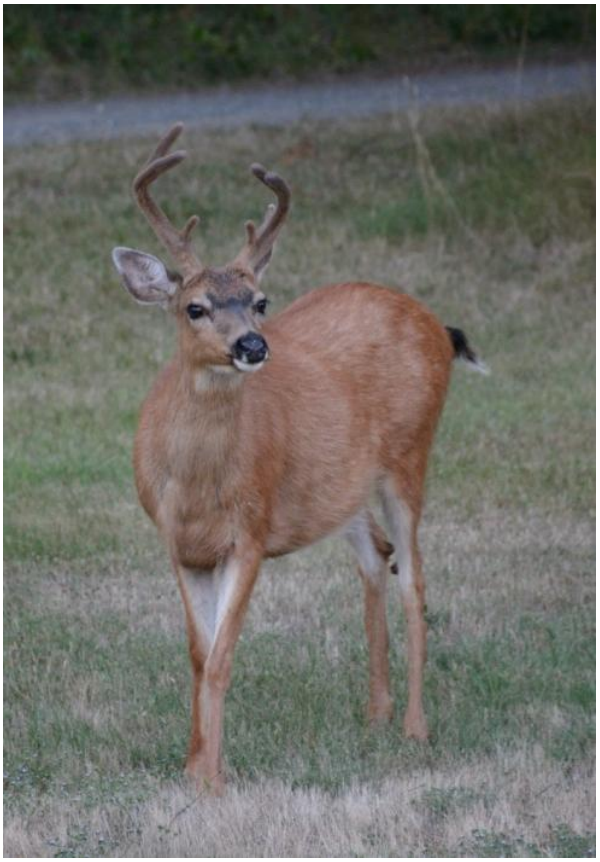
http://www.riverhousegroup.com/

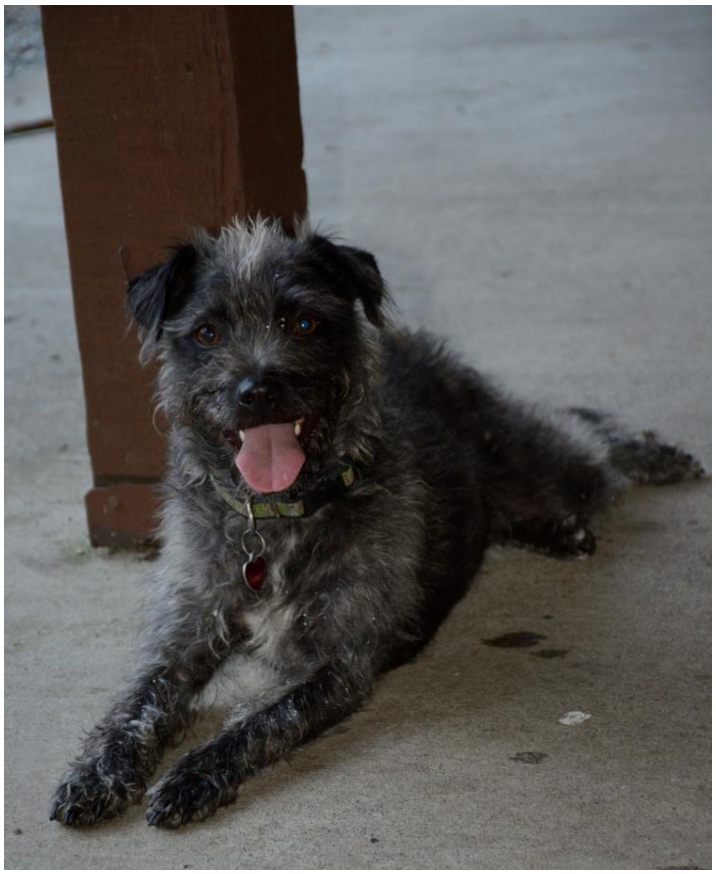
7:30 pm

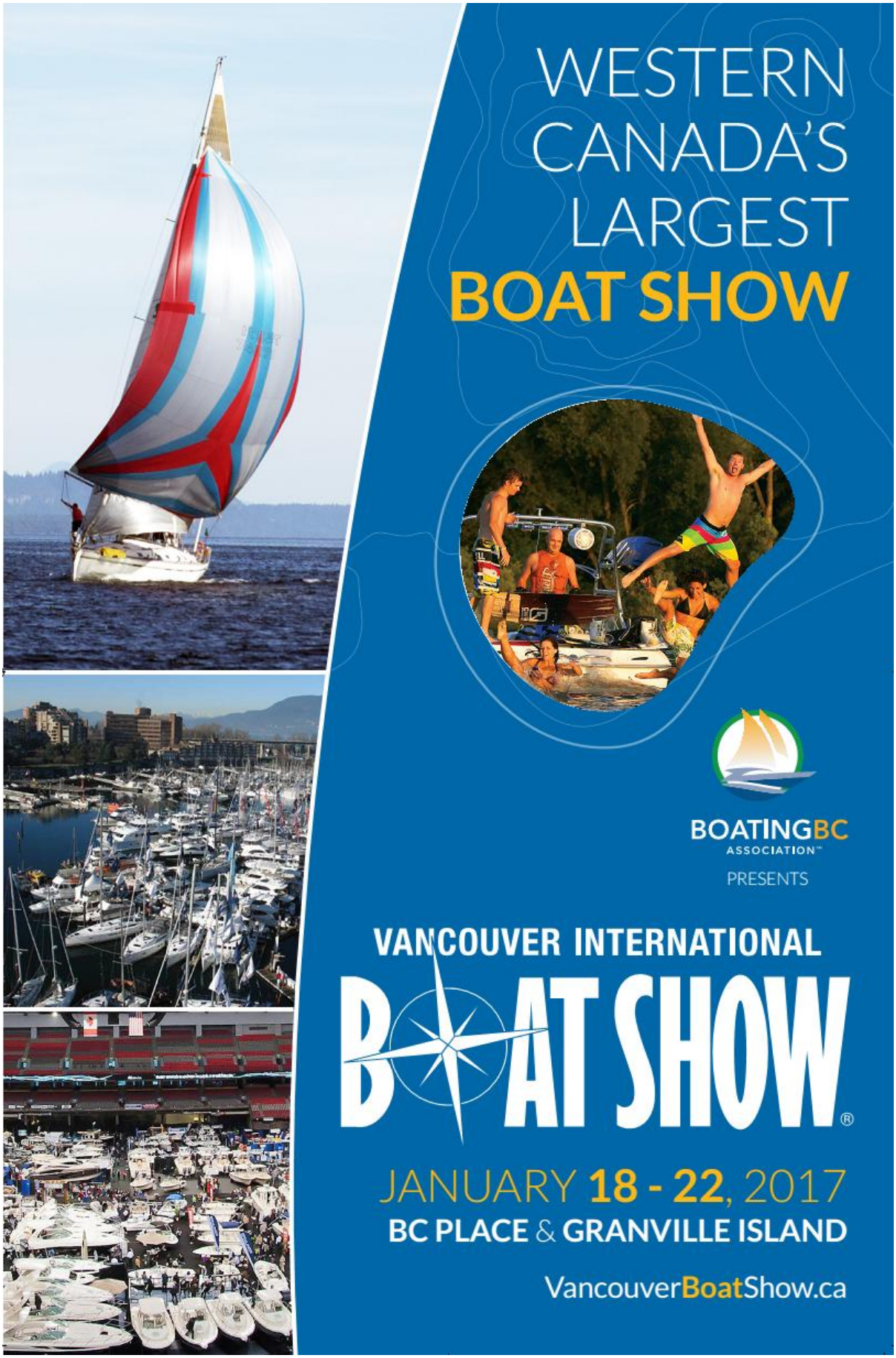
November 15, 2016
January 17, 2017
February 21, 2017
March 21, 2017



New Castle Sail-in, Barbeque, animals welcome too.



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Speaking of Solar Panels…For sale

4 - 70 watt shell solar panels in used but in excellent condition.

Dimensions: 1200 mm * 527mm * 34 mm (47.2” * 20.7” * 1.3”)

Total of 280 Watts STC power rating

$140 (50 cents per watt)

Contact Alec at alec8@shaw.ca

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