



Swiss Sustainable Yachts AG

AQUON One Use Cases

Content

Reasoning	3
Assumptions	3
Energy System	4
Hibernate in the Bahamas	5
Island Hopping in Croatia	6
Weekend trip from Palma to Ibiza	7
Monaco to St. Tropez	8
Coastline touring in Sweden	9
Mediterranean Cruise	10

Reasoning



- **Starting point:** AQUON One generates its own solar energy from its photovoltaic installation on board. An electrolyser transforms solar energy and water into green hydrogen. This powers the electric engines, all on-board appliances, and it charges the tender – free of emissions. For the typical use of a yacht, AQUON One generates sufficient clean energy to be self-sufficient.
- **Challenge:** Understand the energy concept of AQUON One and its implications for using the yacht.
- **Solution:** Illustrate typical usage scenarios with defined use cases, simulating the energy usage and generation of AQUON One's energy system in each scenario.

Assumptions

All presented numbers are based on realistic calculations and assumptions derived in cooperation with scientists from the Hochschule Rapperswil in Switzerland. A conservative approach was chosen whenever making any assumptions.

In general conservative assumptions:

- 30% of usable battery, 50 kWh always as reserve available
- The electric tender has 4kW power
- Assumptions of diesel consumption and CO2 savings:
 - 7.7 l/h @ 8knots for a diesel powered ship.
 - 2.95 kg CO2 / l diesel, including provision of the fuel.
 - Source: database ecoinvent.ch, 2016.
- All the assumptions regarding the energy consumption on board of the AQUON One are based on the energy consumption of a single-family home with 4 people living in it. On average, such a household needs 15 kWh for living and 40 kWh for air-conditioning. For each use-case this figures are adapted individually.



Sunlight 

1



SOLAR ENERGY
PV Panels

Photovoltaic panels convert sunlight into electricity

2

H₂

HYDROGEN GENERATION
Electrolyser + Compressor

Excess energy on board is used to convert pure water into hydrogen (H₂ gas), which is then compressed

3



HYDROGEN ENERGY STORAGE
Carbon Tanks

The compressed hydrogen gas is filled in lightweight carbon tanks as long-term energy storage on board

4



ELECTRICITY PRODUCTION
Fuel Cells

Fuel cells convert hydrogen back to electricity, which can in turn be used to power the electric engine or appliances. The only emissions are pure water and thermal heat used to cover on-board hot water supply and heating

5



SHORT-TERM ENERGY STORAGE
Li Ion Batteries

Short-term, electricity is stored in batteries or used for propulsion and on-board energy usage

6



BOAT PROPULSION
Electric Engines

AQUON One Energy System

All components, as well as their interfaces, are specifically configured for their use on board a yacht, catering to the specific requirements of this application (size, lightweight, efficiency, safety).

The AQUON One energy system is made up of the following components:

- | | |
|-----------------------------|--------------------|
| 1 Photovoltaic Cells (PV) | 4 Fuel cells |
| 2 Electrolyser + Compressor | 5 Batteries |
| 3 Carbon tanks | 6 Electric engines |

Hibernate in the Bahamas

Three weeks in the Bahamas on board AQUON One



- From Miami to the Bahamas
- AQUON One anchors in a bay near Nassau
- Two couples relax on board and use the electric tender to go on land
- Silent engine; zero-emission
- 100% of the required energy is produced from PV, storing excess energy as green hydrogen fuel

Trip Parameters



Duration: 21 days (1d 16h of cruise time)



Passengers:
2 couples / 4 people



Distance:
2 x 162 NM, 324 NM total



Cruising Speed: 8 knots



December, approx. 7 hours of sunshine per day.
Temperature: 25 °C / 77°F

Trip Balance



Energy autonomy at anchor:
unlimited days



Energy tank usage: 68 %
Daily energy consumption: 113 kWh



Number of fuel stops required: ZERO



Avoided CO2 emissions: 1.69 t



€ 823 saved in diesel costs (for propulsion and on-board energy)*

* Diesel costs of 1.3 €/l

Island Hopping in Croatia

Two weeks summer island hopping in Croatia on board AQUON One



- Two weeks island-hopping in Croatia
- Cruise an average of 3.75 h per day
- Silent engine; zero-emission
- 100% of the required energy is produced from PV, storing excess energy as green hydrogen fuel
- This covers energy consumption of
 - Onboard living (8 people)
 - Propulsion (30 NM at 8 knots daily)
 - Electric tender (4kW used 2h per day)

Trip Parameters



Duration: 14 days (2d 4h of cruise time)



Passengers:
2 family / 8 people



Distance:
14 x 30 NM daily, 420 NM total



Cruising Speed: 8 knots



Approx. 9.5 hours of sunshine per day.
Temperature: 25 °C

Trip Balance



Energy autonomy at anchor:
unlimited days



Energy tank usage: 90 %
Daily energy consumption: 205 kWh



Number of fuel stops required: ZERO



Avoided CO2 emissions: 2.04 t



€ 995 saved in diesel costs (for
propulsion and on-board energy)*

* Diesel costs of 1.3 €/l

Weekend trip from Palma to Ibiza

Round-trip from Palma to Ibiza



- AQUON One takes a roundtrip from Palma to Ibiza on Friday, and back on Sunday: 2 x 75 NM
- AQUON One anchors at in a nice bay place for the weekend
- The two families use the electric tender to go out for dinner on land and all Everyone takes at least two showers per day
- Silent engine; zero emissions
- 100% of the required energy is produced from PV, storing excess energy as green hydrogen fuel

Trip Parameters



Duration: 3 days
(18h 45m / 17h 52m of cruise time)



Passengers:
2 couples with their 4 children / 8 people



Distance:
2 x 75 NM daily, 150 NM total



Cruising Speed: 8 knots / 16 knots*
* 26 min of high speed cruising each trip



10 hours of sunshine per day in August.
Temperature: 27 °C

Trip Balance



This trip is possible 3.7 / 2.8 times
without refilling the Hydrogen Tank



Energy tank usage: 27 / 36 %
Daily energy consumption:
299 / 352 kWh



Number of fuel stops required: ZERO



Avoided CO2 emissions: 0.61 / 0.72 t



€ 299 / 352 saved in diesel costs (for
propulsion and on-board energy)*

* Diesel costs of 1.3 €/l

Monaco to St. Tropez

Day trip from Monaco to St. Tropez



- 8 friends take a day-trip from Monaco to St. Tropez
- They enjoy the flybridge and the grill, whilst cruising at a speed of 8 knots for 5 hours 30 mins per way
- Second scenario assumes only 4 hours 19 mins per way, including 70 minutes of high-speed cruising of 16 knots
- Anchoring near St. Tropez, use of tender to go to St. Tropez, in the evening back to Monaco
- Silent engine; zero-emission
- 100% of the required energy is produced from PV, storing excess energy as green hydrogen fuel

Trip Parameters



Duration: 1 day
(5h 30m / 4h 19m of cruise time)



Passengers:
8 people



Distance:
88 NM total



Cruising Speed: 8 knots / 16 knots*
* 70 min of high speed cruising



Approx. 8 hours of sunshine per day.
Temperature: 25 °C

Trip Balance



Energy autonomy at anchor:
7.5 / 2.8 trips possible without refill



Energy tank usage: 13 / 35 %
Daily energy consumption:
432 / 828 kWh



Number of fuel stops required: ZERO



Avoided CO2 emissions: 0.31 / 0.59 t



€ 149 / 286 saved in diesel costs (for propulsion and on-board energy)*

* Diesel costs of 1.3 €/l

Coastline touring in Sweden

Three weeks summer island hopping in Sweden on board AQUON One



- A family of five (parents with 3 kids) tour the coastline and islands in Sweden for three weeks during summer vacation
- They use the electric tender to move around and to go for excursions on land, they prepare dinner on board, do sports and enjoy the outdoors, taking at least two showers per day and person.
- Silent engine; zero-emission

Trip Parameters



Duration: 21 days (1d 22h of cruise time)



Passengers:
5 person family



Distance:
10 x ~37 NM daily, 372 NM total



Cruising Speed: 8 knots



Approx. 10 hours of sunshine daily.
Temperature: 20 °C, so AC is barely need

Trip Balance



Energy autonomy at anchor:
unlimited days



Energy tank usage: 39 %
Daily energy consumption: 121 kWh



Number of fuel stops required: ZERO



Avoided CO2 emissions: 1.8 t



€ 880 saved in diesel costs (for
propulsion and on-board energy)*

* Diesel costs of 1.3 €/l

Mediterranean Cruise

Three weeks tour of the Western Mediterranean



- Tour in the Western Mediterranean during the summer with AQUON One
- Two parents with two kids and one crew member living on board during this time
- Use of tender for two hours per day when in port or at bay (the tender will not be used during trips where AQUON One is constantly in motion like St. Tropez to Barcelona)
- Silent engine; zero-emission

Trip Parameters



Duration: 21 days (6d 3h of cruise time)



Passengers:
5 people living on board



Distance:
8 x ~147 NM daily, 1178 NM total



Cruising Speed: 8 knots



Approx. 11 hours of sunshine per day.
Temperature: 25 °C

Trip Balance



Energy autonomy at anchor:
unlimited days



Energy tank usage: 219 %
Daily energy consumption: 320 kWh



Number of fuel stops required:
8 stops for land power or 2 stops for hydrogen refill needed



Avoided CO2 emissions: 4.76 t



€ 2 323 saved in diesel costs (for propulsion and on-board energy)*

* Diesel costs of 1.3 €/l



Contact information

Swiss Sustainable Yachts AG
Brandschenkestrasse 24
8001 Zurich
Switzerland
www.aquon.ch

Christine Funck
christine.funck@aquon.ch
Tel: +49 172 2 777 100