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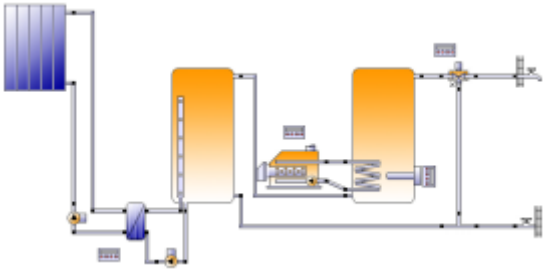
# Summary report

| | |
|---|---|
| solarHOt | **This report has been created by:**<br>Dan Gretsch<br>SolarHot Ltd.<br>233-O E. Johnson Street, 27513 Cary, US |
| Variant (Hot water) | Project Restaurant |
| | NC Raleigh — Site: Clear — Country: USA<br>Longitude: -78.78° — Latitude: 35.87° — Elevation: 350 ft<br>Average outdoor temperature 59.8 °F<br>Radiation collector fields: 55047 kBtu/Year<br>Collector field (facing south) — Orientation: 0° — Tilt angle: 37° |
|  | **Solar system (predefined Vela Solaris template)**<br>8d: Hot water (solar thermal, 2 tanks)<br>**System**<br>Collector area: 95.971016 ft²<br>Total absorber area: 89.06059 ft²<br>Volume of tanks: Volume: 211.3 gal (2 Tank)<br>Auxiliary heating power: Power: 249.1 kBtu/hr (2 Auxiliary heating )<br>Total piping length: Length: 134.514 ft (15 Piping) |
| Consumption demand | Energy demand covered |
| Total end energy supplied to the reference system (consumed fuel and electricity from the grid) | - |
| Total end energy supplied to the system (consumed fuel and electricity from the grid) | 16285.3 kBtu/Year |
| Fraction of solar energy to system (net) | 74.4 % |
| Solar fraction hot water (SFnHw) | - |
| Solar fraction building (SFnBd) | - |
| Annual fuel savings | 41888 ft³: [Natural gas] Gas boiler, large / - |
| Annual energy savings | 42496.1 kBtu: Gas boiler, large / 0 kBtu: Electric resistance heater element 3 |
| Annual reduction in CO2 emissions | 6358.8 pound: [Natural gas] Gas boiler, large / 0 pound : [Electricity] Electric resistance heater element 3 |
| Collector field yield of collector fields | 25963 kBtu/Year |
| Collector field yield relating to gross area | 271 kBtu/ft²/Year |
| Collector field yield relating to aperture area | 292 kBtu/ft²/Year |
| Consumption demand | Energy demand covered |
| User defined components/materials | None. Only Vela Solaris-controlled elements are simulated. |
| Explanations | http://www.polysun.ch/ |

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# System overview

## Meteorological data

| Properties | Value, unit | Properties | Value, unit |
|---|---|---|---|
| Outdoor temperature | 59.8 °F | Global irradiance | 508.9 kBtu/ft² |
| Diffuse irradiance | 216.8 kBtu/ft² | Long wavelength irradiance | 918.7 kBtu/ft² |
| Wind speed | 0.84 ft/s | Air humidity | 70 % |
| Outdoor temperature 24-h-mean | 59.8 °F | Standard outdoor temperature | 12.2 °F |
| Normal direct irradiance | 523.9 kBtu/ft² | | |

## Definition of the consumers

| Consumer | Cat. n. | Name | Description | Temperature setting | Energy consumption |
|---|---|---|---|---|---|
| Presence | 1 | always present | Presence days: 365 | - | - |
| Hot water | | | 100.2 gal/d | 145 °F | 26373.2 kBtu/Year |

## Definition of the solar system

| Element | Cat. n. | Name | Properties, Value, unit |
|---|---|---|---|
| Collector North America | 9171 | 3x Solarhot S-SC-126P32 | Data Source: SRCC |
| Boiler | 3 | Gas boiler, large | Power: 238.91 kBtu/hr, Efficiency value: 90% |
| Pipe 16 | 32 | Copper pipe 22x1 | - |
| External heat exchanger | 2 | Plate heat exchanger, medium size | Transfer capacity: 10000 W/K, Number of heat exchanger plates: 30 |
| Storage tank 2 | 567 | 500l potable water master tank | Volume: 132.1 gal, Thickness of insulation: 3.15 in |
| Storage tank 3 | 564 | 300l potable water tank | Volume: 79.3 gal, Thickness of insulation: 3.15 in |
| Mixing valve controller | | | Definition temperature setting: Variable value, Temperature shift: 3.6 R |
| Pump controller solar loop | | | Maximum tank temperature: 190 °F, Cut-in temperature difference: 10.8 R, Cut-off temperature difference: 3.6 R, Definition flow rate setting: Specific flow rate |
| Auxiliary heating controller 2 | | | Reference for temperature sensors 1: Variable value, Minimum operation time: 10 min, Minimum downtime: 0 min |
| Auxiliary heating controller 3 | | | Reference for temperature sensors 1: Fixed value, Minimum operation time: 0 min, Minimum downtime: 0 min |

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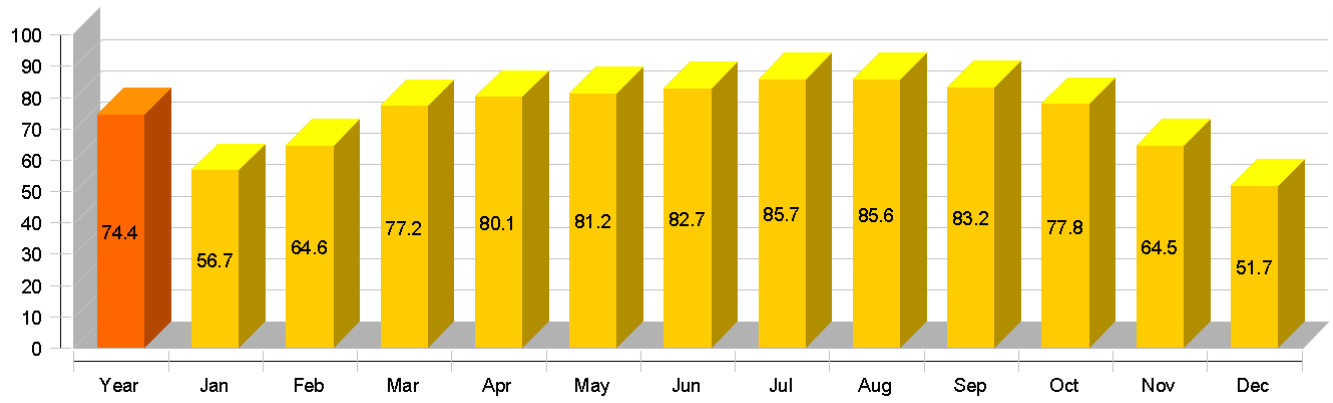
# Results overview

## Fraction of solar energy to system (net)

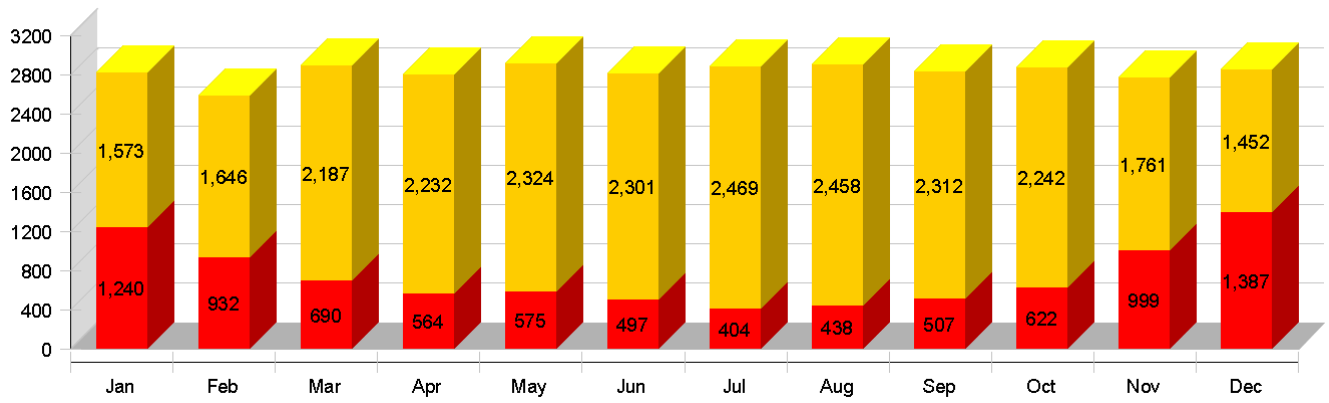
| Symbol | Unit | Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SFn | % | 74.4 | 56.7 | 64.6 | 77.2 | 80.1 | 81.2 | 82.7 | 85.7 | 85.6 | 83.2 | 77.8 | 64.5 | 51.7 |
| Qsol | kBtu | 25963 | 1636 | 1716 | 2277 | 2329 | 2423 | 2396 | 2562 | 2554 | 2406 | 2329 | 1828 | 1507 |
| Saux | kBtu | 8855 | 1240 | 932 | 690 | 564 | 575 | 497 | 404 | 438 | 507 | 622 | 999 | 1387 |
| Qdem | kBtu | 26373 | 2415 | 2295 | 2584 | 2459 | 2415 | 2169 | 2069 | 1942 | 1839 | 1942 | 2002 | 2242 |
| Qdef | kBtu | 577 | 48 | 43 | 50 | 51 | 49 | 52 | 51 | 47 | 47 | 49 | 45 | 46 |

SFn: Fraction of solar energy to system (net), Qsol: Solar energy to the system, Saux: Auxiliary energy in tank, Qdem: Energy demand, Qdef: Energy deficit

## Fraction of solar energy to system (net) [%]




## Solar yield and auxiliary energy [kBtu]



## Daily maximum collector temperature [ °F]