TIMBERWORX
CUSTOM HOMES

BluewaterEnergy
Renewable Energy Solutions

Net-Zero Design For Luxury Homes

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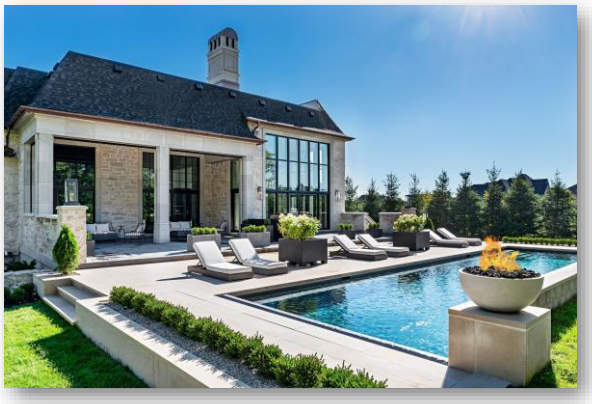
Timberworx Net-Zero Luxury Home

The Aim

We wanted to build a Net Zero Luxury Home that didn't sacrifice on the features that go into our Custom Homes. The homes we typically build have lots of glass, tall ceilings, and expansive open areas, which had to be incorporated into this project.



The aim was to build a Certified Luxury Net-Zero Home without compromising on our standard of quality, features, and finished look.

We did not want to tell a client that they could not have what they wanted

We only wanted to do things that we would be prepared to pay for ourselves if we were going to ask our clients to pay for it.

Challenges

- Our design team did not want it to look like an "Energy Efficient" Home, and they do not like the look of solar panels, so they had to be invisible.
- Being told it could not be done
- Incorporating large curtain walls of glass
- Dealing with high ceilings, and varying heights throughout the home – 12', 16', and 20'
- Walkout portion and pony walls on the bump out portions – problematic to seal tightly along with the varying ceiling heights
- Inclusion of wood burning fireplace
- Ensuring solar modules were not visible from front or side elevations
- Supporting the weight of the solar PV array on roof with open concept interior with a 60' clear span

Planning/Construction

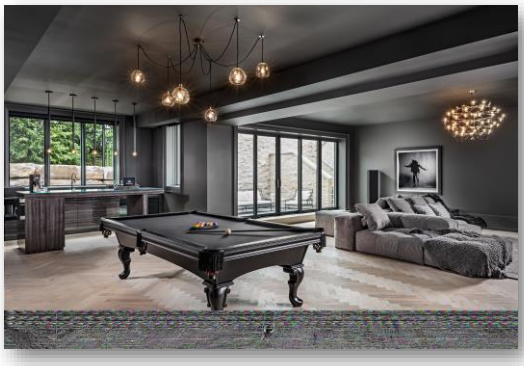
- Sat our team around the table and discussed the challenges until everyone agreed that we could find solutions and that this project could be done.

- Curtain walls of glass – 19' tall one piece windows, structural engineering requirements. Glass is engineered double pane with coating
- Went from 12' to 16' to 20' ceilings throughout house. Pre Areoseal – really hard to keep vapour barrier continuous due to ceiling height changes. Now not an issue due to AeroSeal
- Wood Burning Fireplace – needed insulation behind, added engineered studs, encased fireplace in block to get fire protection, spent 3 months with engineers.

- For solar array we designed a simple commercial style 1/12 pitch roof c/w parapet walls down the side to hide the panels from the side views. Modeled site lines PV array couldn't be seen from the front elevation. Design allowed us to orient all the panels south even though the home faces North.

Lessons Learned

- The 60' clear span commercial grade trusses required a full 5.5" bearing which wasn't possible on our standard 10" poured concrete wall with a 5" stone veneer shelf and 2" of foam. It was a lot of extra work in additional blocking and framing for adequate support.
- We thought we would be going to a 12" poured wall moving forward, but as it turns out, our latest NZ Modelling allows us to use 1" ext foam on the exterior walls which allows us to stay with our standard 10" poured wall.
- Sealing the home was labour intensive and took more than one late evening site visit by Mehmet complete with a smoke gun to seal it up. While our second NZ home was considerably easier in regards to the learning curve, it was on our 3rd NZ build that we employed Areosealing the home.



- This a much more sensible approach to cutting labour and therefore costs and will be standard for us moving forward. The Areoseal eliminates the stress of knowing you will hit the required NZ air tightness numbers vs hoping you do.

Technology & Trends

Technology we are excited about…

1. Tesla Solar Shingles!
2. VRV/Heatpump with significantly reduced duct sizes
3. Smart Panels to monitor and control every circuit
4. The complete home energy solution – generation, storage, control, use

Trends we are excited about…

1. Solar financing program which we think would be very well received if they can come to market with competitive rates.
2. NZ sites being appraised at an additional $15/#' by a very reputable firm which is very encouraging.

Energy Model

HOW YOUR RATING IS CALCULATED:

I.	Rated annual energy consumption	90 GJ/year
II.	Minus renewable energy contribution	- 90 GJ/year
	Equals your **EnerGuide rating**	**= 0 GJ/year**

I. Your rated annual energy consumption is the total amount of energy your house would use in a year based on the EnerGuide Rating System standard operating conditions. For your house, this includes 109.61 GJ of passive solar gain.

Energy Sources	Rated Consumption (GJ/year)	Equivalent Units (per year)	Greenhouse Gas Emissions (tonnes/year)
Electricity	65	18185.5 kWh	0.0
Natural gas	25	668.3 m^3	1.3
Total	90		1.3

II. On-site renewable power generation systems can offset some or even all of your home's energy consumption. Renewable energy contributions are factored differently for your rating and your greenhouse gas emissions calculations.

On-Site Renewable Energy	Estimated Contribution (GJ/year)	Equivalent Units (per year)	Offset Greenhouse Gas Emissions (tonnes/year)
Electricity	91	25368 kWh	2.4
Solar water heating	0	0	0.0
Total	91		1.3

YOUR RATED GREENHOUSE GAS EMISSIONS CALCULATION:

Total greenhouse gas emissions	1.3 tonnes/year
Minus emissions offset by on-site renewables	- 1.3 tonnes/year
Equals your **rated greenhouse gas emissions**	**= 1.3 tonnes/year**

Planned Energy Consumption 90GJ

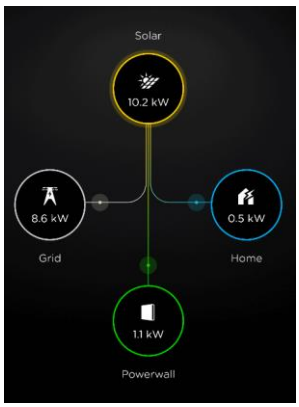
Planned Energy Generation 91GJ = 25,368kWh

- 70 x 330W Solar Modules = 23.1kW
- 10kW set-up as microFIT
- 10kW set-up as self-consumption/net-meter
- Annual Generation: 28,430kWh = 102GJ
- Ballasted, non-penetrating racking
- Heavier, requiring additional support -
- Wired as two separate systems

Solar PV Array Design

- Battery Storage included to feature exciting new technology
- 3 x Tesla Powerwall = 40.5kWh of storage
- Charged by solar during day, used to power home through the night
- Primary source of back-up power
- Instantaneous transfer
- No Servicing required
- Works when you need it – no service calls in -30C when it does not start

Battery Storage



Energy Monitoring

The Outcome

What's Next

1. More individual Net-Zero Luxury homes
2. Net-Zero Communities:
    a. Fox Run 2
    b. Heritage Lakes Phase 2
3. Continue to find ways to lower costs to drive uptake of full Net-Zero

Why Net-Zero?

1. Contribute to making progress toward preserving our planet for ourselves and future generations
2. A Direct Cost Savings benefit for homeowners, as well as protection against steadily rising energy costs
3. Add Energy Resilience and Protect against increasingly chaotic weather events
4. Meet demand for Smart Homes with the latest technology – this is it!
5. Integrating Solar Generation into the home during construction is less costly for the home buyer
6. Shows Leadership in the community, and sets a positive example for others' to follow
7. First step toward complete Energy Independence
8. Easy to add Energy Storage and EV Charger for a complete Home Energy System