

3.1 Naenae Aquatic Centre



The Naenae Aquatic and Fitness Centre will be New Zealand’s first Greenstar 5 rated aquatic centre. This case study and associated modelling compares the benefits of Greenstar and Passive House rating systems with typical aquatic facility building fabric and design (the Passive House option was not selected in the eventual building). Passive House highlights a Whole of Life approach, where slight uplift in construction cost results in significant cost savings and reduced environmental impact over the life of the project.

Client/Location:

Hutt City Council
Naenae, Lower Hutt

The key differences between the Greenstar 5 Base Case and the Passive House case are given in the table below:

Case Study Stage:

Concept Design Study

Project Value:

Approx. \$68M (Greenstar 5)

Features:

- 50-metre 10-lane pool
- Learners’ pool
- Leisure pool
- Fitness centre

Key Metrics:

Climate Zone: 3
Floor Area: 4,680 m²
Water surface area: 1,680 m²
Occupants: 660

	Greenstar 5 Base Case	Passive House
Mechanical Plant	Externally located within service yard - 8 no. air handling units required	Mechanical plant located within the building envelope - 5 no. air handling units required
Hydroslide	Fully external to the building	Slide tubes 50% internal, 50% external
Services Undercroft	Partially insulated	Fully insulated High performance windows, doors and skylights
Insulation R values (m2K/W):		
Windows	1.1	1.25
Walls	5.00	7.15
Roofs	5.00	10.00
Air tightness	not required for Greenstar	0.4 m ³ h/m ² @ 50 Pa
Design EUI	900-1000 kWh/m ² yr	600-700 kWh/m ² yr
Leisure Pool Temperatures	Pool water: 32°C Pool hall air: 27°C	Pool water: 32°C Pool hall air: 29°C

Key Information

Key information when compared with a typical aquatic facility of the same size:

	Greenstar 5 Base Case	Passive House
Capital Cost Increase over typical	3.75%	7.26%
% Energy cost savings per annum over typical	24%	60%

The comparative Energy Use Intensity (EUI) is given on the adjacent graph. The increased efficiency of the Passive House model means that it is cheaper to own and operate over a whole 50-year building life span. Financial analysis shows implementing the Passive House approach provides cumulative cash saving of \$23,900,000 (or \$6,900,000 NPV) compared to the Greenstar 5 model over 50 years.

Compared to the Greenstar model, up to the year 2050 the Passive House scheme saves 20,000 tonnes of CO₂e emissions from purchased electricity. This equates to needing to plant a 1000 hectare forest to offset the additional carbon of the Greenstar base case over the next 30 years. (Passive House forest shown in green outline, base case shown in red outline).

Existing Passive House aquatic centres typically operate with the air temperature two degrees warmer than the water temperature. The reason is twofold:

- It minimises the amount of pool water evaporation and therefore heat loss within the space (and also reduces water use). Reduced evaporation also leads to reduced ventilation air change rates, therefore reduced air handling requirements and energy use.
- It maximises user (children and supervising parents in the water) comfort by eliminating the evaporative cooling effect that is commonplace in New Zealand leisure pools.

New Zealand aquatic centres typically have a greater number of casual spectators than European facilities. The operation of a facility with an air temperature at 2 degrees higher than the water temperature will therefore be a paradigm shift for pool operators as it would be likely to adversely affect lifeguard and clothed spectator comfort levels. The modelling undertaken assumes the pool and air temperatures given on the previous page.

Energy loss associated with hydrosides is significant due to their large surface area.

Considerable energy savings can be made by accommodating the slides within the insulated building fabric, or insulating the slides where these are outdoors.

The following graph below provides a quick summary of the energy savings for a new aquatic centre project. Annual energy use is reduced by achieving a Green Star 5-star rating, - a very high level of sustainability certification available in New Zealand. By investing further than required by Green Star in terms of building insulation and air-tightness (among other factors) to achieve Passive House certification, energy use is even further reduced. Refer to Section 2.2 for more information about these sustainability rating systems.

Comparative energy use for a proposed aquatic centre

