



RENEWABLE HEATING & HOT WATER WITH WOOD PELLETS

Webinar 1 Attributes of wood pellet fuel

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WOOD PELLET FUEL

What are wood pellets?

- Biomass fuel that is 100% renewable
- Made in NZ from waste wood, sawdust & post harvest forest residue
- Diverts wood waste from landfill and forest residues from aerobic decomposition
- **Biomass has lowest carbon emissions of any fuel in NZ at 0.003 kgCO₂e / kWh**
- Direct replacement of fossil fuels for space heating, DHW & process heat



Wood pellets

WOOD PELLET FUEL

Huge potential for diversion of unused wood waste to biomass

Annually wood waste sent to landfill in NZ :

- 250,000 tonnes to municipal landfills (council controlled)
- 1.2 MILLION tonnes to non-municipal landfills (commercial / private)

PLUS post harvest residue from forestry



COMPARISON WOOD CHIP + PELLETS



WOOD PELLET FUEL

Technical attributes of wood pellets as fuel

- Certified manufacturing = guaranteed quality control & production to ISO standards
 - Nature's Flame – DIN*plus*
 - Azwood – EN*plus*
- Approximately 10% less energy dense than coal

Attribute	Per tonne
Energy density	5.1 MWh per tonne 18 GJ per tonne
Physical density	650 kg per m ³
Moisture content	< 8%
Ash content	< 1%



Wood pellets

PELLET FUEL PRODUCTION PROCESS

Fibre inputs trucked to site and stored



Product stored awaiting processing



Input fibre added to feedstock reception



Product screened for metal & oversize before drying



Fibre conveyed to dryer



Product dried to required moisture content



Dried product/dry input fibre conveyed to Hammermill



Product refined to required size



Fibre conveyed to dry storage



Product moisture allowed to homogenise



Fibre conveyed to pellet presses



Product pressed into pellets and cooled



Pellets conveyed to bulk storage



Product stored ready for bagging or bulk delivery



Pellets readied for customer, bagging if required



AVAILABILITY OF PELLET FUEL

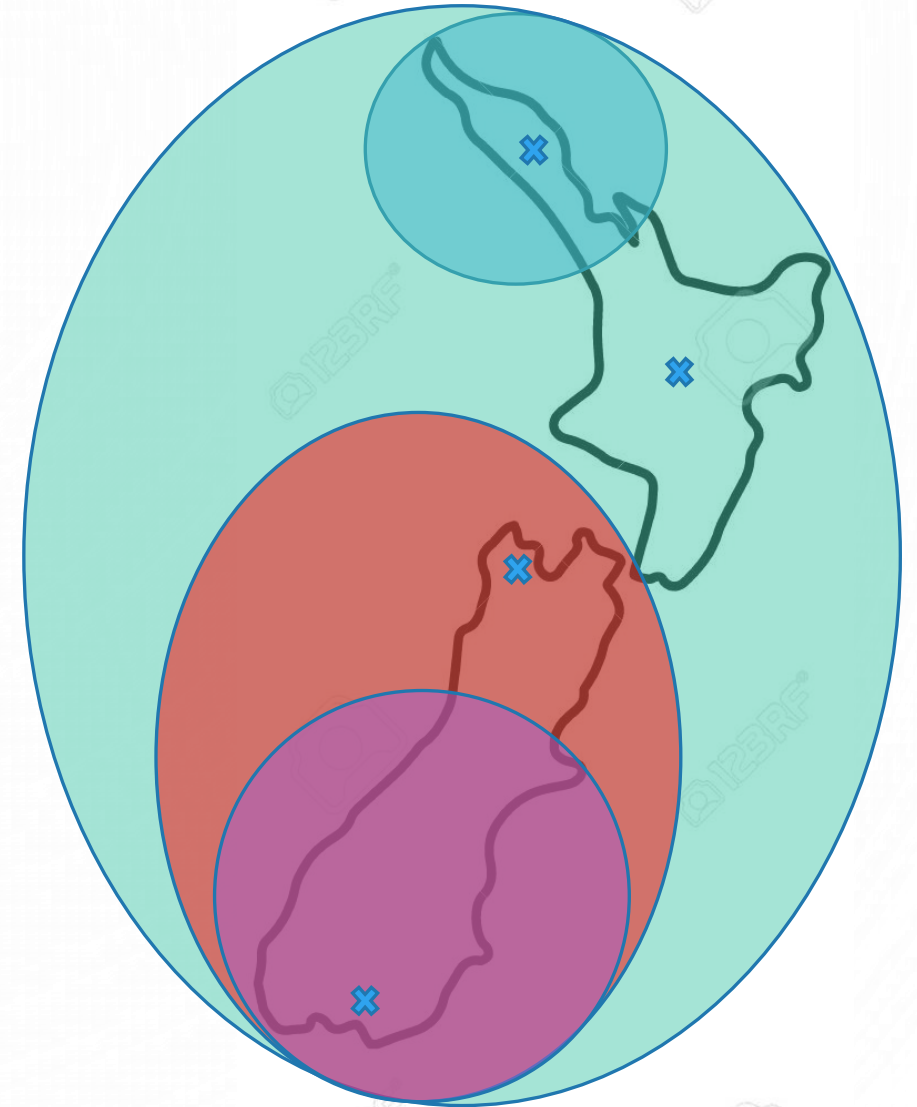
NZ manufacturers

- Azwood – Nelson
- Niagara – Invercargill
- Nature's Flame – Taupo
- Waipapa Pine – Whangarei

Up to 15 year guaranteed supply contracts offered

All manufacturers are increasing production of pellets as demand rises

Bulk delivery by truck with no manual handling required through-out country



PRICE OF PELLET FUEL

Price varies depends on number of factors

Price range for commercial, bulk deliveries across NZ

5.8c to 8.3c per kWh

\$15.69 to \$22.51 per GJ

\$296 to \$425 per tonne

Up to 15 year price contracts being offered

Contrast with commercial prices now being quoted for natural gas at <11c/kWh and electricity at <20c/kWh

Three year contracts generally absolute maximum for commercial fossil fuels & electricity



COMPARISON OF DIFFERENT HEAT SOURCES

Heating technology	Fuel	Reduction in CO2 emissions if replaced with pellets	Real world example for building with DHW use of 10,000L per day (204MWh/yr)	
			Annual CO2 emissions	Calculated annual running cost
Pellet boiler	Wood pellets	Base case	599	\$16,320
Heat pump	Electricity (COP 3)	-91%	39,726	\$22,440
Gas boiler	Natural gas	-98%	45,149	\$26,720
	LPG	-99%	47,290	\$27,770
Diesel boiler	Diesel	-99%	47,290	\$27,770

What will the cost of fossil fuels & electricity be in 2025 and beyond?
 Are all fossil fuel installations already stranded assets?

Costs / kWh - pellets \$0.08, electricity \$0.17, NG \$0.11, LPG \$0.18, diesel \$0.10

EXAMPLE OF COST COMPARISON – GAS TO PELLETS



	Gas		Wood pellets	
	Current	Forecast	12T deliveries	28T deliveries
Heat energy required (approx.)	0.8 MWh per year			
Fuel consumption at plant efficiency	1.2 MWh at 70% efficiency		0.9 MWh at 85% efficiency	
Cost per kWh	\$0.05	\$0.11	\$0.07	\$0.06
Annual cost	\$60,300	\$129,200	\$63,300	\$56,700



EXAMPLE OF COST COMPARISON WITH GAS BOILER



	Gas		Wood pellets	
	Current	Forecast	12T deliveries	28T deliveries
Cost vs current gas			\$2,989	- \$3,608
Cost vs forecast gas	\$68,837		-\$65,848	-\$72,445
Annual carbon emissions kg		229,004		3,031
CO2 emissions		100%		-99%
Payback for pellet boiler system at forecast gas price				4 to 4.3 years



FACTORS THAT IMPACT PRICE OF PELLET FUEL

1. Manufacturer

- Nature's Flame
- Azwood
- Niagara
- Waipapa Pine



2. Annual tonnage

- Price breaks depend on annual tonnage, generally
 - <50 tonnes (255 MWh)
 - <100 tonnes (510 MWh)
 - <500 tonnes (2,550 MWh)
- Can be usually be split between different sites if same fuel manufacturer

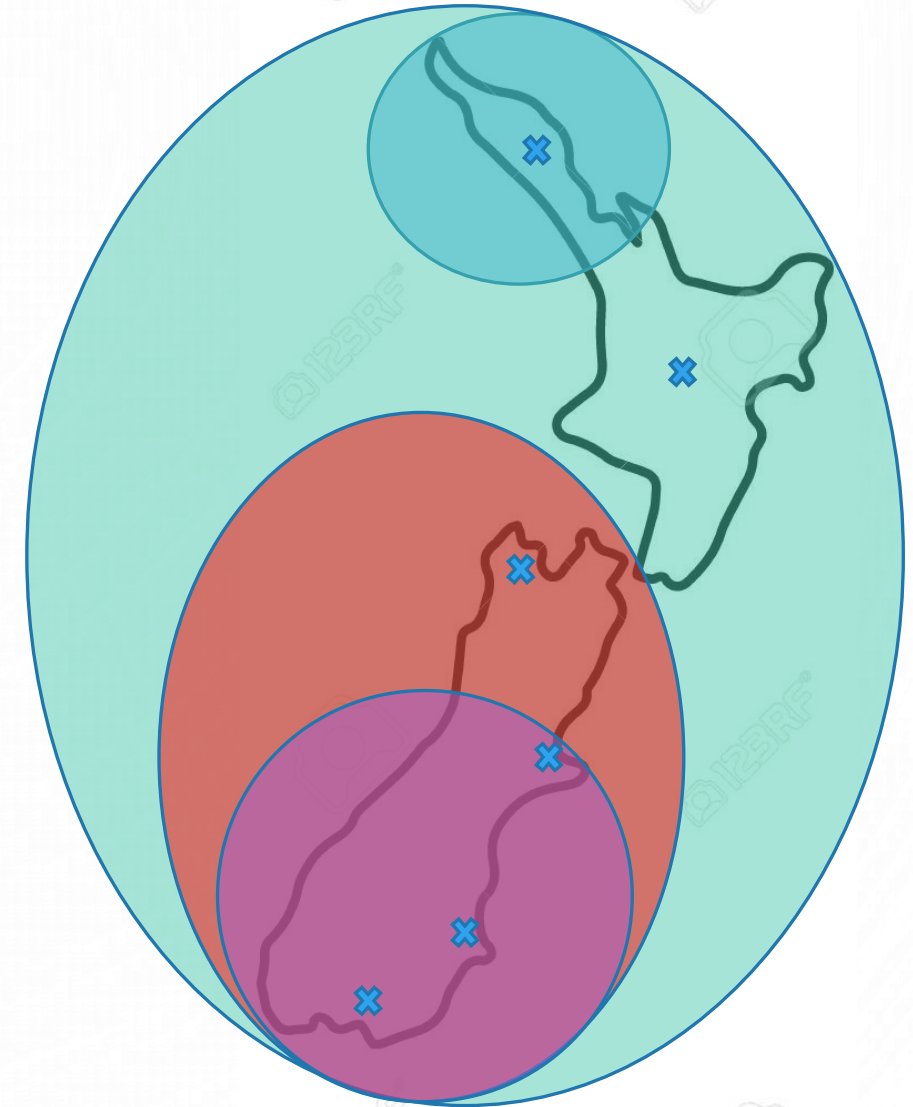


FACTORS THAT IMPACT PRICE OF PELLET FUEL

3. Freight cost determined by distance from fuel bulk depot to site.

Fuel store depots:

- Azwood – Nelson, Dunedin & Christchurch – South Island deliveries only
- Nature's Flame – Taupo & Christchurch – both North & South Island
- Niagara – Invercargill – lower half of South Island
- Waipapa Pine – Whangarei – not currently distributing to commercial customers, plans to expand



FACTORS THAT IMPACT PRICE OF PELLET FUEL

4. Maximum tonnage in each delivery

- Larger store optimises cost of fuel by reducing proportional cost of freight per tonne
- Varies depending on storage capacity at site
- Blower trucks available nationally – some variation in capacity depending on location
- Generally maximum with blower = 12 tonnes (truck) or 28 tonnes (truck & trailer)



STORAGE OF WOOD PELLETS

Convert existing coal store bunker



Previously dump truck
now blower delivery



Delivery grate with pellets instead of coal

STORAGE OF WOOD PELLETS

Create a new fuel storage room with sloping floor

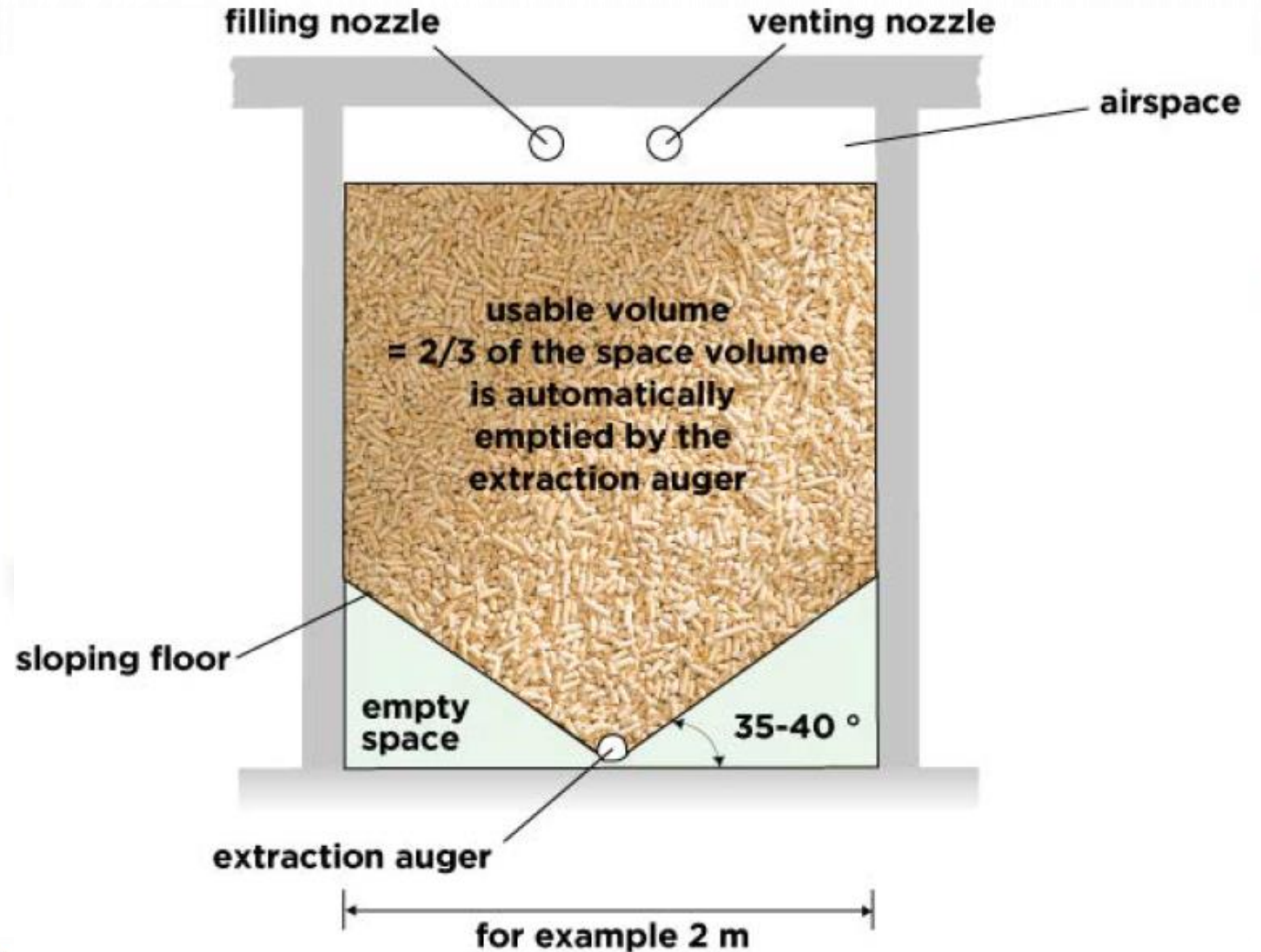
1m³ = 650kg pellets

Construction work required

Some space lost with sloping floor to each auger

Longer & taller is better than shorter & wider

Multiple augers can feed multiple boilers, reducing space loss



STORAGE OF WOOD PELLETS

Create a new fuel storage room with supplier fuel storage system

No construction work for sloping floor or bulk head wall/s required

Requires blower truck delivery

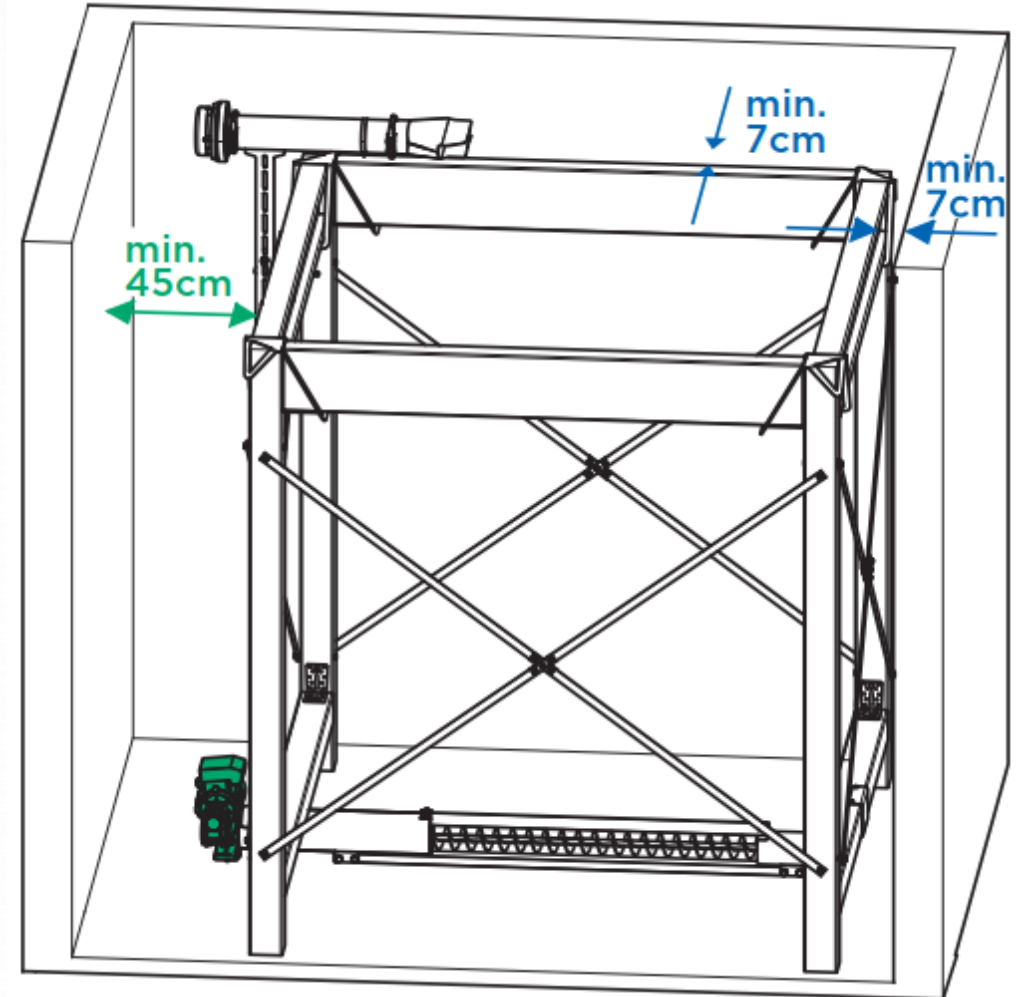
Can handle humid environments

Maximises available space if design includes adjustable sides



PELLET STORAGE IN FLEXILO

Dimensions	Footprint	Capacity
1.84 x 1.44	2.65m ²	3 tonnes
2.30 x 1.84	4.23m ²	5 tonnes
2.58 x 2.04	3.74m ²	6 tonnes
2.58 x 2.58	6.66m ²	8 tonnes



More sizes and capacities available to suit different spaces and arrangements.

Boiler flue termination at roof

Eight storey building including two basement levels

20 metres

Pellet fuel deliveries by blower truck connects to fitting in service bay wall
Fills bulk pellet fuel bags in sub basement

20 metres

Ground floor

128kW pellet boiler with automatic vacuum fuel delivery from bulk fuel bags
Must retain some residual pellets before delivery otherwise

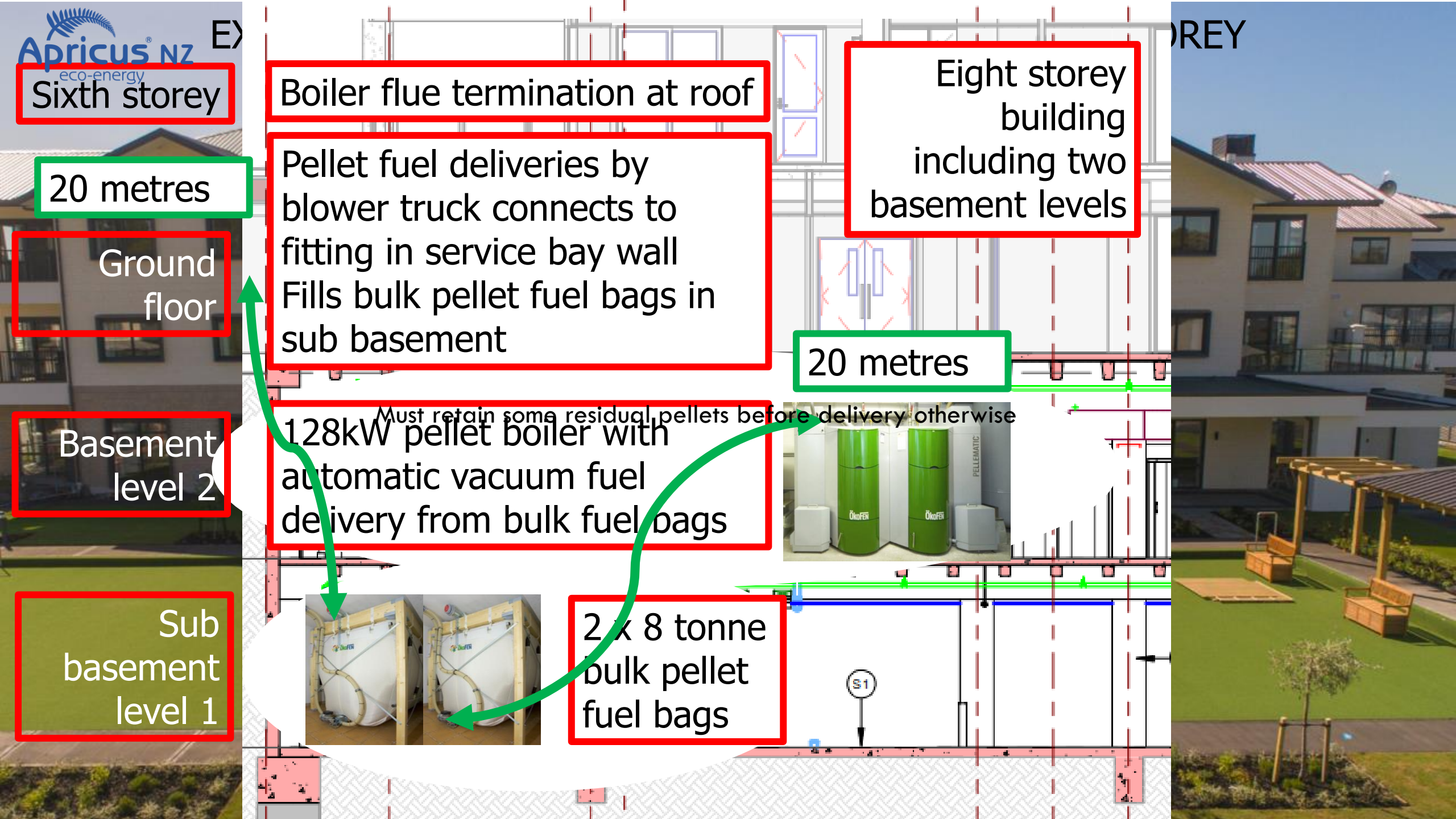


Basement level 2

Sub basement level 1



2 x 8 tonne bulk pellet fuel bags



MSDS HAZARDS + FIRE SAFETY

- ✓ Not classified as Hazardous Substance
- ✓ Not classified as Dangerous Good
- ✓ No Hazchem Code allocated
- ✓ No Emergency Procedure Guid
- ✓ Spillage requires “sweeping or vacuuming”

- ✓ Auto-ignition temperature of 200°C
- ✓ Fire can be fought with N₂, CO₂, foam, sand, water spray or fog
- ✓ Thermal decomposition products include CO & CO₂



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Designers and distributors of renewable heating & hot water systems

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