Passive House in Australia

Cost comparisons

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Passive House in Australia

Outline

- ❑ What are Passive House “extra over” costs?
- ❑ Are the costs worth it?
- ❑ Comparison: Energy demand
- ❑ Comparison: Capital costs
- ❑ Comparison: Operating costs
- ❑ Calculation: total annual costs

1 wonk

noun | \ˈwäŋk, ˈwȯŋk\


: a person preoccupied with arcane details or procedures in a specialized field; *broadly* **: a** nerd

Passive House in Australia

Passive House “extra over” costs

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Costs

Trade section	Affected by PH
Termite management	No
Demolition	No
Site preparation	No
Earthwork	No
Service trenching	No
Landscape-walling and edging	No
Concrete pavement	No
Paving	No
Concrete	No
Brick and block	No
Light Steel framing	No
Light timber framing	Yes
Sheet floor and decking	Yes
Roofing	No
Cladding	Yes
Windows & Doors	Yes

Trade section	Affected by PH
Glass mirrors and shower screens	No
Insulation and membranes	Yes
Lining	Yes
Joinery	No
Misc appliances and fittings	No
Waterproofing - wet areas	No
Ceramic Tiling	No
Carpets	No
Timber floors	No
Floor sanding and finishing	No
Painting	No
Mechanical	Yes
Hydraulic	No
Electrical	No
Cleaning	No

Costs

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Termite management	No
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Painting	No
Mechanical	Yes
Hydraulic	No
Electrical	No
Cleaning	No

Passive House in Australia

A fair question:

“Are the “extra over” costs worth it?”

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Compare

- Baseline building
- Passive House

- Energy demand
- Building cost
- Operating costs

- Energy demand: kWh/m2.yr
- Building cost: $
- Operating costs: $/kWh

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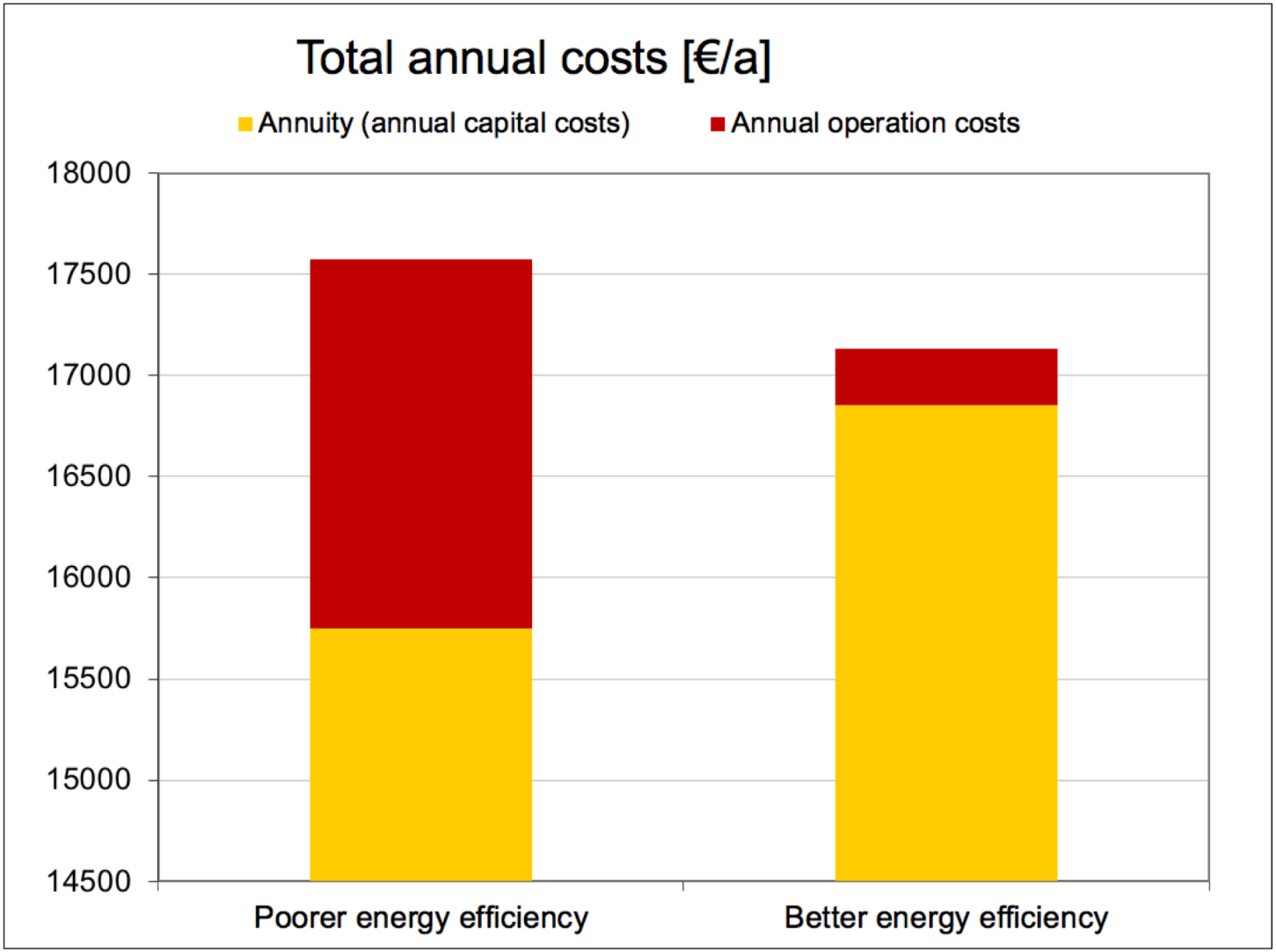
- Building cost: $
- Operating costs: $/kWh

Comparison: annual costs over 30 years



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Compare energy demand

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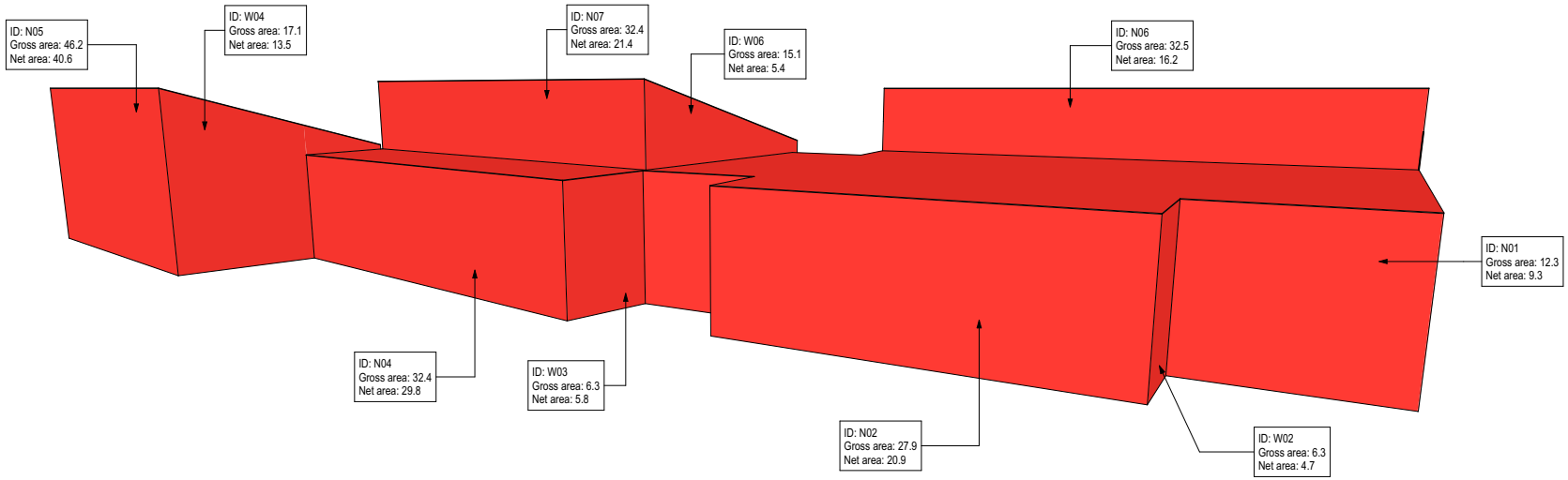
ID: N05
Gross area: 46.2
Net area: 40.6
ID: W04
Gross area: 17.1
Net area: 13.5
ID: N07
Gross area: 32.4
Net area: 21.4
ID: W06
Gross area: 15.1
Net area: 5.4
ID: N06
Gross area: 32.5
Net area: 16.2
ID: N01
Gross area: 12.3
Net area: 9.3
ID: N04
Gross area: 32.4
Net area: 29.8
ID: W03
Gross area: 6.3
Net area: 5.8
ID: N02
Gross area: 27.9
Net area: 20.9
ID: W02
Gross area: 6.3
Net area: 4.7

“PHPP”

Passive House Planning Package

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Passive House Verification

Photo or Drawing

Building:	New dwelling
Street:	1/475 Browns Road
Postcode/City:	Scarsdale
Province/Country:	Victoria / AU-Australia
Building type:	
Climate data set:	ud---01-AU0018a-Ballarat
Climate zone:	4: Warm-temperate — Altitude of location: 380 m
Home owner / Client:	
Street:	
Postcode/City:	
Province/Country:	

Architecture:	Green Point Design
Street:	320 Neill Street
Postcode/City:	3350 Ballarat
Province/Country:	Victoria
Energy consultancy:	Green Point Design
Street:	320 Neill Street
Postcode/City:	3350 Ballarat
Province/Country:	Victoria

Mechanical engineer:	
Street:	
Postcode/City:	
Province/Country:	
Certification:	
Street:	
Postcode/City:	
Province/Country:	

Year of construction:	2019	Interior temperature winter [°C]:	20.0
No. of dwelling units:	1	Internal heat gains (IHG) heating case [W/m²]:	2.3
No. of occupants:	3.1	Specific capacity [Wh/K per m² TFA]:	60

Interior temp. summer [°C]:	25.0	
IHG cooling case [W/m²]:	5.6	
Mechanical cooling:	x	

Specific building characteristics with reference to the treated floor area

					Criteria	Alternative criteria	Fullfilled?[2]
	Treated floor area	m²	245.0				
Space heating	Heating demand	kWh/(m²a)	15	≤	15	-	yes
	Heating load	W/m²	10	≤	-	10	
Space cooling	Cooling & dehum. demand	kWh/(m²a)	13	≤	15	15	yes
	Cooling load	W/m²	25	≤	-	10	
	Frequency of overheating (> 25 °C)	%	-	≤	-		-
	Frequency of excessively high humidity (> 12 g/kg)	%	0	≤	10		yes
Airtightness	Pressurization test result n_{50}	1/h	0.6	≤	0.6		yes
Non-renewable Primary Energy (PE)	PE demand	kWh/(m²a)	70	≤	-		-
Primary Energy Renewable (PER)	PER demand	kWh/(m²a)	33	≤	60	60	yes
	Generation of renewable energy (in relation to pro-jected building footprint area)	kWh/(m²a)	2	≥	-	-	

[2] Empty field: Data missing; '-': No requirement

I confirm that the values given herein have been determined following the PHPP methodology and based on the characteristic values of the building. The PHPP calculations are attached to this verification.

Passive House Classic? yes

Task: | First name: | Surname: | Signature:

Issued on: | City:

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Energy demand: variants worksheet

Variant calculation

Passive House with PHPP Version 9.6a

New dwelling / Climate: AU0018a-Ballarat / TFA: 245 m² / Heating: 14.9 kWh/(m²a) / Cooling: 13.3 kWh/(m²a) / PER: 33.5 kWh/(m²a)

		Active						
Select the active variant here >>>>>>>		6-Passive House	Baseline building		Variable window		PH - Low energy	Passive House
Results	**Units**	6	1	2	3	4	5	6
Heating demand	kWh/(m²a)	**14.9**	98.9		120.3		25.3	14.9
Heating load	W/m²	**10.2**	36.5		41.7		13.9	10.2
Cooling & dehum. demand	kWh/(m²a)	**13.3**	5.8		7.2		12.1	13.3
Cooling load	W/m²	**24.5**	28.4		30.7		25.4	24.5
Frequency of overheating (> 25 °C)	%							
PER demand	kWh/(m²a)	**33.5**	135.5		166.4		42.6	33.5
Passive House Classic?	yes / no	**yes**	no		no		no	yes
Final energy		-	-	-	-	-	-	-
User determined results		-	-	-	-	-	-	-

Input variables	**Units**	**Value**	1	2	3	4	5	6
Building assembly layers	U-Value							
Radiation balance	Areas							
Thermal bridges	Areas							
Windows and shading	Windows	Shading						
Ventilation	Ventilation							
Summer ventilation	SummVent							
Heat generator	PER							
Compressor cooling units	Cooling units							
User determined parameters								

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Energy demand

		Active		
	Select the active variant here >>>>>>>	6-Passive House	Baseline building	
	Units	6	1	
Heating demand	kWh/(m²a)	14.9	98.9	
Heating load	W/m²	10.2	36.5	
Cooling & dehum. demand	kWh/(m²a)	13.3	5.8	
Cooling load	W/m²	24.5	28.4	
uency of overheating (> 25 °C)	%			
PER demand	kWh/(m²a)	33.5	135.5	
Passive House Classic?	yes / no	yes	no	
		-	-	

Energy demand

Variant calculation

Passive House with PHPP Version 9.6a

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	Heating demand	kWh/(m²a)	**14.9**	98.9		120.3		25.3	14.9	
	Heating load	W/m²	**10.2**	36.5		41.7		13.9	10.2	
	Cooling & dehum. demand	kWh/(m²a)	**13.3**	5.8		7.2		12.1	13.3	
	Cooling load	W/m²	**24.5**	28.4		30.7		25.4	24.5	
	Frequency of overheating (> 25 °C)	%								
	PER demand	kWh/(m²a)	**33.5**	135.5		166.4		42.6	33.5	
	Passive House Classic?	yes / no	**yes**	no		no		no	yes	
▼	**Final energy**		-	-	-	-	-	-	-	
▼	**User determined results**		-	-	-	-	-	-	-	

Input variables		**Units**	**Value**	1	2	3	4	5	6
▼	**Building assembly layers**		U-value						
a	**External regid insulation**	W/(mK)	0.021	0		0		0.021	0.021
		mm	50	0		0		50	50
b	**Timber frames wall**	W/(mK)	0.04	0.04		0.04		0.04	0.04
		mm	90	140		140		90	90
c	**Plasterboard**	W/(mK)	0.18	0.18		0.18		0.18	0.18
		mm	10	10		10		10	10
d		W/(mK)	0						
		mm	0						
e	**Floor insulation**	W/(mK)	0.021	0.00		0.00		0.02	0.02
		mm	50	0		0		50	50
f	**Concrete slab**	W/(mK)	2.3	2.30		2.30		2.30	2.30
		mm	100	100		100		100	100
▼	**Radiation balance**	Areas							
▼	**Thermal bridges**	Areas							
▼	**Windows and shading**	Windows	Shading						
▼	**Ventilation**	Ventilation							
▼	**Summer ventilation**	SummVent							
▼	**Heat generator**	PER							
▼	**Compressor cooling units**	Cooling units							
▼	**User determined parameters**								

Energy demand

	Units	Passive House Value	Baseline building 1
	U-Value		
External rigid insulation	W/(mK)	0.021	0
	mm	50	0
Timber frames wall	W/(mK)	0.04	0.04
	mm	90	140
Plasterboard	W/(mK)	0.18	0.18
	mm	10	10
	W/(mK)	0	
	mm	0	
Floor insulation	W/(mK)	0.021	0.00
	mm	50	0
Concrete slab	W/(mK)	2.3	2.30
	mm	100	100

Energy demand: variants worksheet

		Active		
	Select the active variant here >>>>>>>	6-Passive House	Baseline building	
	Units	6	1	
Heating demand	kWh/(m²a)	14.9	98.9	
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PER demand	kWh/(m²a)	33.5	135.5	
Passive House Classic?	yes / no	yes	no	
		-	-	

Passive House in Australia

Compare costs

- Capital costs
- Operating costs

Capital costs

Engage a builder or quantity surveyor to advise on building costs.

Operating costs

Comparison between two variants

Passive House with PHPP Version 9.6a

New dwelling / Climate: AU0018a-Ballarat / TFA: 245 m² / Heating: 14.9 kWh/(m²a) / Cooling: 13.3 kWh/(m²a) / PER: 33.5 kWh/(m²a)

▼ Surface temperature ▼ Annual rate ▼ Energy, CO_2, Costs ▼ Boundary conditions

Selection of comparison configuration

Description	1-Baseline - PH entire bldg
Component type	5-Entire building
Building component	

Calculation of the selected configuration

	Poorer energy efficiency	Better energy efficiency	Difference / Savings / Profit	
Design according to variant	1-Baseline building	6-Passive House		
Annual heating demand	98.880	14.867		kWh(m²a)
Minimum inside surface temperature	-	-		°C

	Investment costs						
	Per m² TFA	Complete building	Per m² TFA	Complete building	Per m² TFA	Complete building	
Treated floor area (TFA)	1	245	1	245	1	245	m²
Investment costs minus financial support	2041	500000	2245	550000	204	50000	€
Annuity (annual capital costs)	64.3	15749	70.71	17324	**6.43**	**1575**	€/a

	Operation (heating + cooling + mechanical ventilation)						
	Per m² of TFA	Entire building	Per m² of TFA	Entire building	Per m² TFA	Complete building	
Area	1	245	1	245	1	245	m²
Heating demand	98.9	24225	14.9	3642	84.0	20583	kWh/a
Cooling + dehumidification demand	5.79	1418	13.32	3262	-7.53	-1844	kWh/a
CO_2 emissions	42.40	10387	8.98	2201	33.41	8186	kg/a
Primary energy renewable (PER)	7.13	29649	0.00	0	121.02	29649	kWh/a
Annual operation costs	19.92	4881	4.22	1034	**15.70**	**3847**	€/a

	Cost-effectiveness						
Maximal economically viable additional investment costs					498.52	122137	€
Average cost for saved kWh of final energy					10.23		Cent/kWh
Total annual costs	84.20	20630	74.93	18358	**9.27**	**2272.15**	€/a

Information: The cost efficiency comparison has not been implemented on the basis of single building elements

Boundary conditions					
Interest rate + inflation		**Price of final energy [€/kWh]**		**Utilisation period [a]**	
Nominal interest rate	4.5%	Electricity	0.25	Assembly layers	50
Inflation	2.5%	Gas / Oil	0.09	Vent. system	30
Period under consideration [a]	30	Wood	0.07	Thermal bridges	50
		District heating	0.10	Entire building	50
		Other	0.09	Windows	40

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Operating costs

Boundary conditions					
Interest rate + inflation		**Price of final energy [€/kWh]**		**Utilisation period [a]**	
Nominal interest rate	4.5%	Electricity	0.25	Assembly layers	50
Inflation	2.5%	Gas / Oil	0.09	Vent. system	30
Period under consideration [a]	30	Wood	0.07	Thermal bridges	50
		District heating	0.10	Entire building	50
		Other	0.09	Windows	40

Energy prices assume to increase with inflation only.

Operating costs

Boundary conditions					
Interest rate + inflation		**Price of final energy [€/kWh]**		**Utilisation period [a]**	
Nominal interest rate	4.5%	Electricity	0.25	Assembly layers	50
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Period under consideration [a]	30	Wood	0.07	Thermal bridges	50
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Operating costs

Boundary conditions					
Interest rate + inflation		**Price of final energy [€/kWh]**		**Utilisation period [a]**	
Nominal interest rate	4.5%	Electricity	0.25	Assembly layers	50
Inflation	2.5%	Gas / Oil	0.09	Vent. system	30
Period under consideration [a]	30	Wood	0.07	Thermal bridges	50
		District heating	0.10	Entire building	50
		Other	0.09	Windows	40

Passive House in Australia

Calculation: total annual costs

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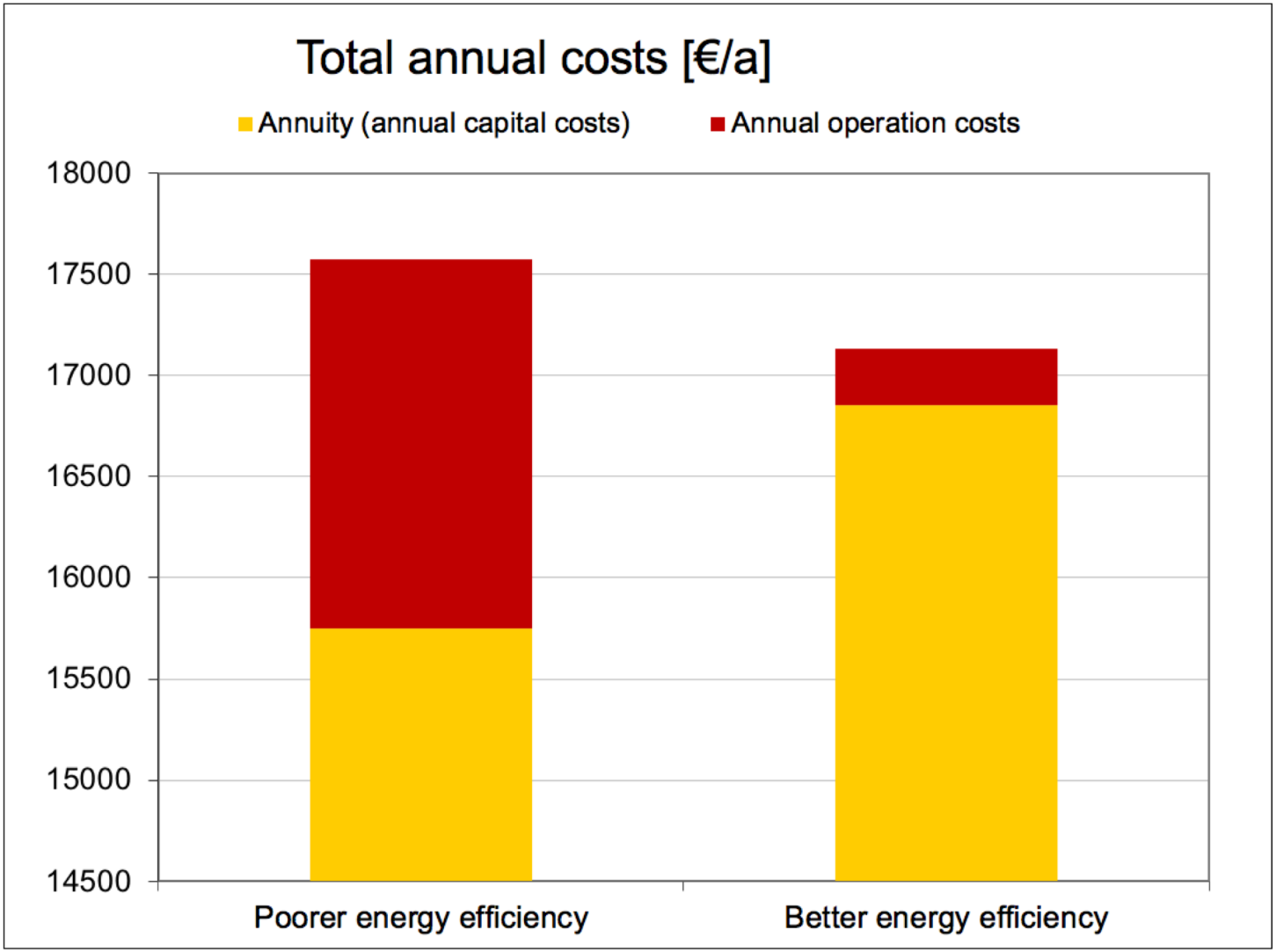
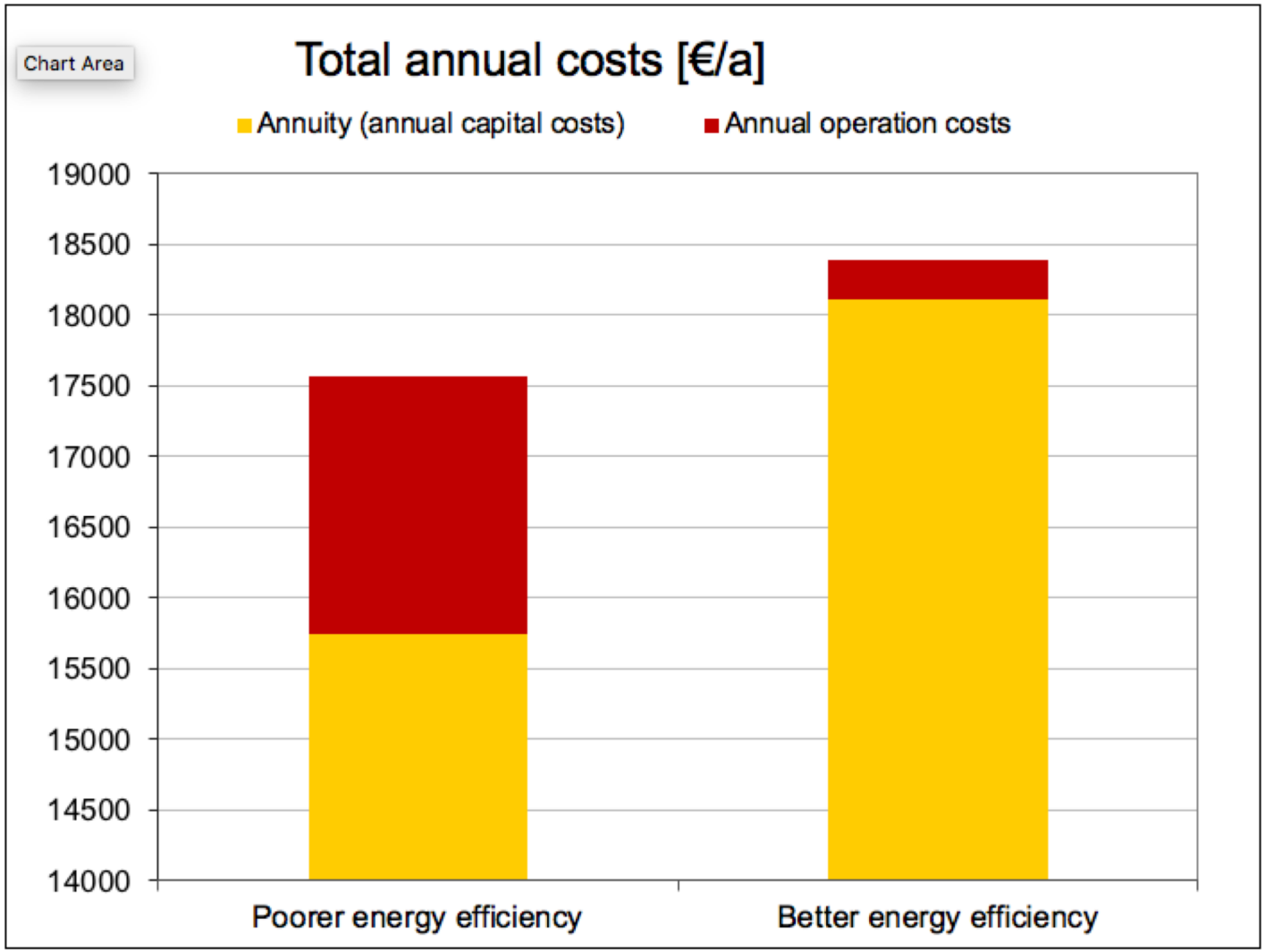
Two budget scenarios:

Baseline building +7.5%
Baseline building + 20%

Assume 7.5% additional capital costs



Assume 20% additional capital costs



Thank you!

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