

Teknologiasta liiketoimintaa



Passive and zero energy buildings in Finland

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Very low energy and passive buildings: Myths and misconceptions

- User perspective
 - Houses do not need heating systems
 - Houses can not have good architecture
 - Houses can have no or just minimum amount of windows
 - Technology is too complicated for the users
 - Houses are too hot in the summer
 - Mechanical ventilation system makes a lot of noise
- Construction
 - Houses are expensive
 - Building envelope cannot breathe through the building envelope because it is too airtight and consequently the indoor climate is bad.
 - Houses have risks of having moisture problems



Energy Performance of Buildings Directive Nearly zero energy buildings



- Building integrated renewable energy production increases
 - Production and consumption mismatch
- Grid connection and tariff policies
- Energy storages
- Impacts on the building's internal grid in refurbishment
- Control systems: low temperature differences



Overview on the Finnish energy requirements

	1976	1978	1985	2003	2007	2010	2012	
Building envelope								
Wall U [W/m²K]	0,4	0,29	0,28	0,25	0,24	0,17	0,17	
Roof U [W/m ² K]	0,35	0,23	0,22	0,16	0,15	0,09	0,09	
Floor U [W/m ² K]	0,4	0,4	0,36	0,25	0,24	0,16	0,16	
Window U [W/m ² K]	2,1	2,1	2,1	1,4	1,4	1	1	
Door U [W/m ² K]	-	-	-	1,4	1,4	1	1	
Ventilation and airtightness								
Airtightness n ₅₀ [1/h]	6	6	6	4	4	2		
Airtightness q ₅₀ [m ³ /m ² h]							2	
Yearly heat recovery efficiency [%]	0	0	0	30	30	45	45	
Verification								
Requirements on building components								
Specific heat loss, heat demand, SFP								
Delivered energy								
Use of natural resources (primary energy)								



Marketing - Finland





Marketing - Latvia





How well different concepts are known - Finland





How well different concepts are known - Latvia



Source: IEE-NorthPass

√vπ

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Investment - Finland





Investment - Latvia



Source: IEE-NorthPass

Very low energy and passive houses: Examples of extra costs



Paroc Passive House, Vantaa: extra costs 85 €/m² or 5%



TA Passive house, Oulu: extra costs 3,3% compared to reference with the same size and architecture



MERA buildings, Heinola and Helsinki: extra costs <3%

Zero energy buildings Kuopio and Järvenpää



Students' hostel

Energy demand	
Space heating	12 k ^v
Water heating	13 k
Electricity, facility	6 k
Total	31 k\

12 kWh/m² 13 kWh/m² 6 kWh/m² 31 kWh/m²



www.nollaenergia.fi



Home for the elderly

- Financing by long-term loan with interest subsidy
- Total cost 2900 €/m²
- Typical 2500 3000 €/m²

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Zero energy, case Järvenpää





Are zero energy buildings profitable? Impact of building concept on management expenditure and rent



Source: Mestariasunnot Oy



IEA5-Solar House

- Energy-efficiency
 - Ground source heat pump
 - Solar thermal, PV
 - High insulation level, super windows
 - Quality + professional use
- Monitoring and follow-up since 1994: <u>No moisture problems, good indoor air quality</u>

	Pietarsaari 1993	Typical 2011		
Component	U-value [W/m ² K]			
Wall	0,12	0,17		
Roof	0,09	0,09		
Floor	0,1	0,16		
Door	0,4	1,0		
Window	0,7	1,0		







Nearly zero energy house IEA5





- Pietarsaari 1993: Delivered energy < 50 kWh/m²
- Development: Delivered energy < 40 kWh/m²
- PV:
 - Present system 2 kW_p
 - Renewal ~8 kW_p



Elderly home, Lahti



- Nearly zero energy building
- Energy demand 60 kWh/m² primary energy, 50% renewables
- 16500 m²
- Priority in user needs
- Ground heat/cool
- District heating
- PV
- Atrium



Elderly home, Lahti: Bidding process & procurement



- A series of meetings with all the stakeholders including candidate contractors
 - Understanding the requirements
 - Process briefing
- Competitive bidding for invited contractors
- Offers compared according to a given protocol:
 - Price (maximum assessment points 60 p)
 - Project plan (2 p)
 - Organization and experience of the team (12 p)
 - Development and innovation (8 p)
 - Technical and energy solutions (15 p)
 - Replacement apartments for the elderly living in apartment buildings to be demolished (3 p).





From passive house to net zero energy house

- Passive house:
 - Well designed detail solutions
 - Prefabricated building elements easy installation
 - Airtightness: n₅₀ = 0,09 1/h
- Zero energy building:
 - Delivered energy 45 kWh/m²
 - Passive house as a basic solution
 - Heat pump heating
 - LED lighting
- Produced energy ~ 45 kWh/m²
 - Solar electricity 8 kW
 - Solar thermal 5 m²

Source: http://www.suutarinen.fi/



Investment in building envelope or building services systems or both?



- Apartment house, Lahti
- Net floor area 2587 m²
- Energy class A, heat demand 94 kWh / m²
- Construction cost 2674 € / m²
- Typical reference (Class A) 2100 2500 € / m²
- Ground source heat pump heating:
 - Delivered heating energy 38 kWh / m²
 - Solar thermal
- Heating costs -50% compared to typical



Conclusions

- Passive and very low energy buildings are cost-efficient basic solutions for nearly zero and net zero energy buildings
 - Not the only possible solutions
- Zero energy buildings (passive buildings, very low energy buildings) can have many different architectural expressions and provide many architectural possibilities! (Quote: Anne Grete Hestnes on zero emission buildings)
- Moisture damages can be avoided by good design, construction and maintenance
- Even passive houses can have windows
- More information still required: Too much myths and misconceptions



Thank You!