LNEG
Laboratório Nacional de Energia e Geologia, I. P.

nearly Zero Energy Buildings

Laura Aelenei

23 de Março 2012

MINISTÉRIO DA ECONOMIA E DO EMPREGO

Tópicos a abordar...

Contexto actual

NZEB/nZEB - definição, conceito

Como alcançar o estatuto NZEB/nZEB?

Edifício SOLAR XXI: um edifício nZEB

contexto actual

International Energy Policy

USA: “The building technologies program outlines the technology portofolio and activities that are necessary to **achieve our strategic goal of net zero-energy buildings** (NZEB) at low increment cost by 2025.”

[www1.eere.energy.gov/buildings/about/,01/2007]

UK: “The objective of the proposal is to set a timetable for movinf towards **zero carbon development** as a contribution to meeting the UK target to reduce carbon emission by 60% by 2050.”

[Department for Communities and Local Government, 13th of December 2006 press release]

Austria: “Vision 2050 on energy in buildings: The building stock of the year 2050 should be in total over the entire life cycle (involves the production and operation of the building**) free of any carbon emissions**.”

[www.e2050.at/pdf/energie_gebauede.pdf]

Netherlands: “In the Netherland, the government and the construction sector aim at achieving **energy neutral new construction in 2020**.”

[Chiel Boomstra, Trecodome]

Germany: “ From current point of view future capable buildings are building architectural demanding with high user comfort, minimal energy demand, optimized technological equipment, meaningful integration into large energy supply systems as well as together economical energy demand cover. **Zero emission houses** are the long-term objective.”

[“Das 5.Energgieforschungsprogramm der Bundesregierung”, BMWA, 07/2005]

LNEG

NZEB definição
conceito

NZEB - definições

zero site energy

zero source energy

zero energy emissions

zero energy costs

Net-Zero Site Energy - produção de energia a partir de fontes renováveis (fotovoltaica, eólica, etc.) em quantidade suficiente para compensar as necessidades anuais (contagem efectuada no local).

Net-Zero Source Energy - produção de energia em quantidade suficiente para compensar as necessidades anuais (contagem efectuada na fonte). "Source energy" pretende referir a energia primária requerida para produção de energia útil utilizada no local (a contabilização das necessidades deve entrar em conta com os coeficientes de conversão!)

Net-Zero Energy Emissions - produção de energia "limpa" em quantidade suficiente para compensar a energia adquirida produzida a partir de fontes convencionais (associados a produção de CO2), calculada numa base anual.

Net-Zero Energy Costs - produção (e venda) de energia em quantidade suficiente para compensar os custos associados a aquisição de energia necessária para funcionamento/utilização do edifício, calculada numa base anual

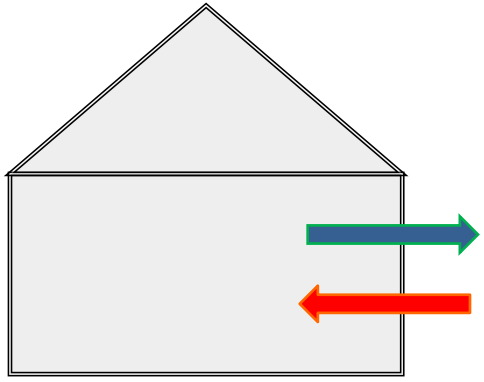
NZEB - conceito

Energy Supply

- Electricity
  (PV, wind, geothermal)
- Thermal
  (Solar, Geothermal)

y Kwh

Input = Output



Energy production

Energy consumption

Energy Demand

- Heating
- Cooling
- Lighting
- Hot Water
- Appliances

x Kwh

NZEB - definição & conceito

- Condições de fronteira e balanço
  - Fronteira fisica
  - Factores de conversão
  - Clima e conforto
- Balanço energético
  - Itens considerados
  - Período
  - Supply options
- Interacção com a rede
  - Load match
  - Grids interaction
- Monitorização e certificação

RECAST EPBD

DIRECTIVE 2010/31/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 19 May 2010
on the energy performance of buildings
(recast)

Article 9
Nearly zero-energy buildings

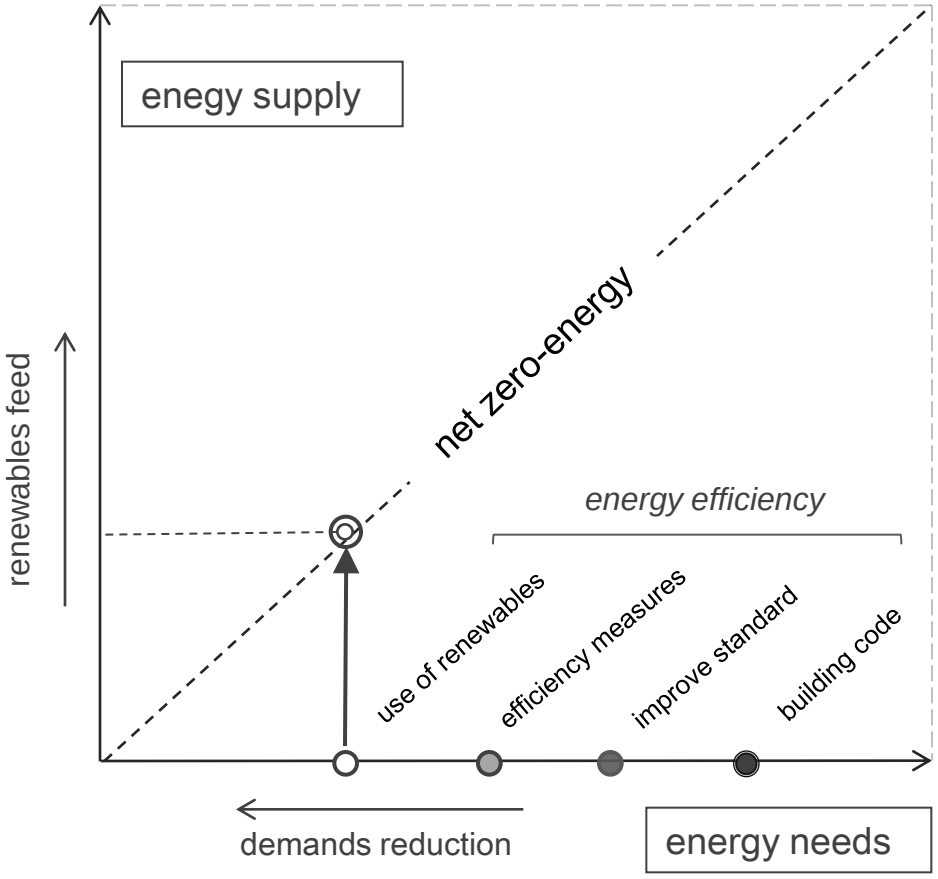
1. Member States shall ensure that:

(a) by 31 December 2020, all new buildings are nearly zero- energy buildings; and
(b) after 31 December 2018, new buildings occupied and owned by public authorities are nearly zero-energy buildings.

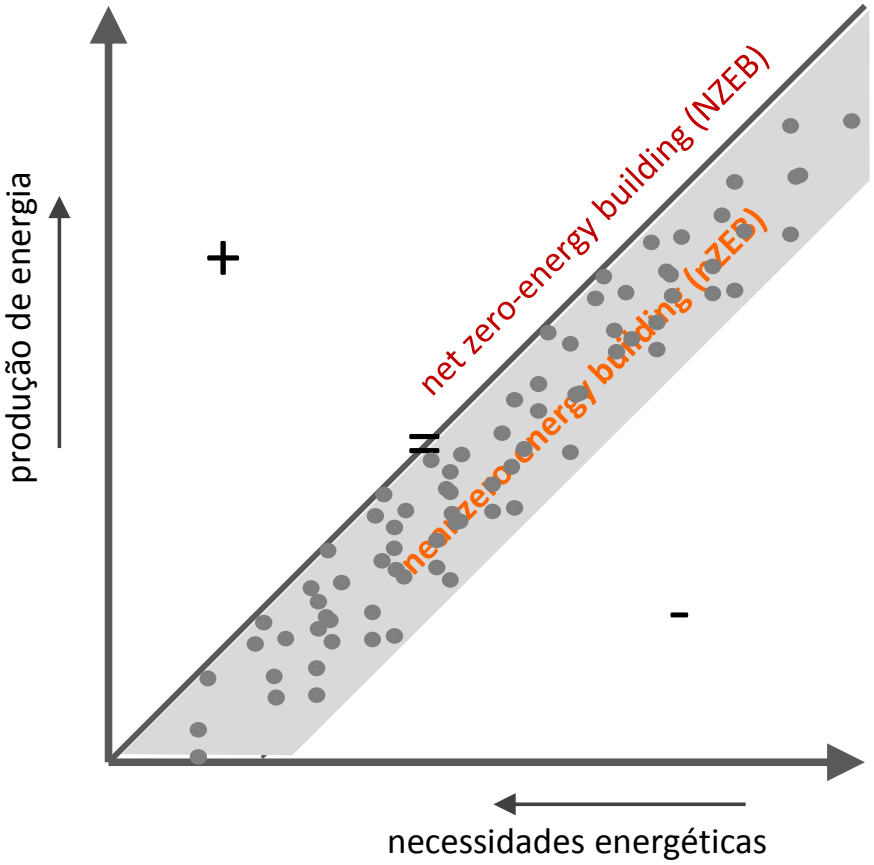
Member States shall draw up national plans for increasing the number of nearly zero-energy buildings. These national plans may include targets differentiated according to the category of building.

LNEG

NZEB



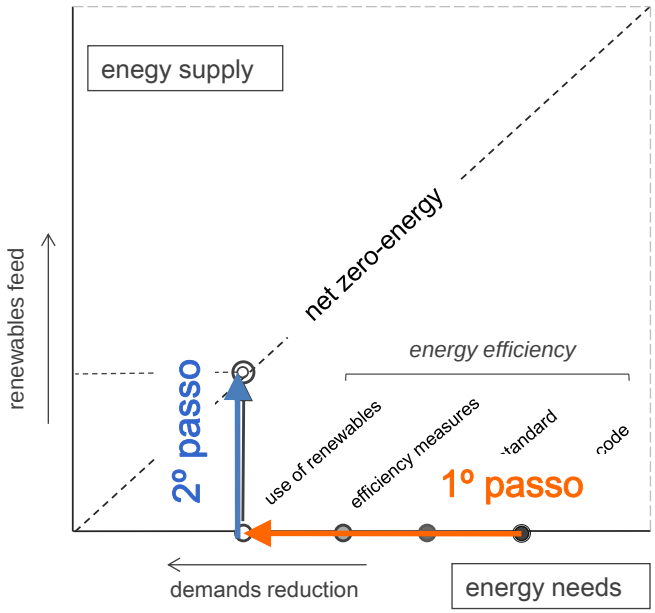
nZEB



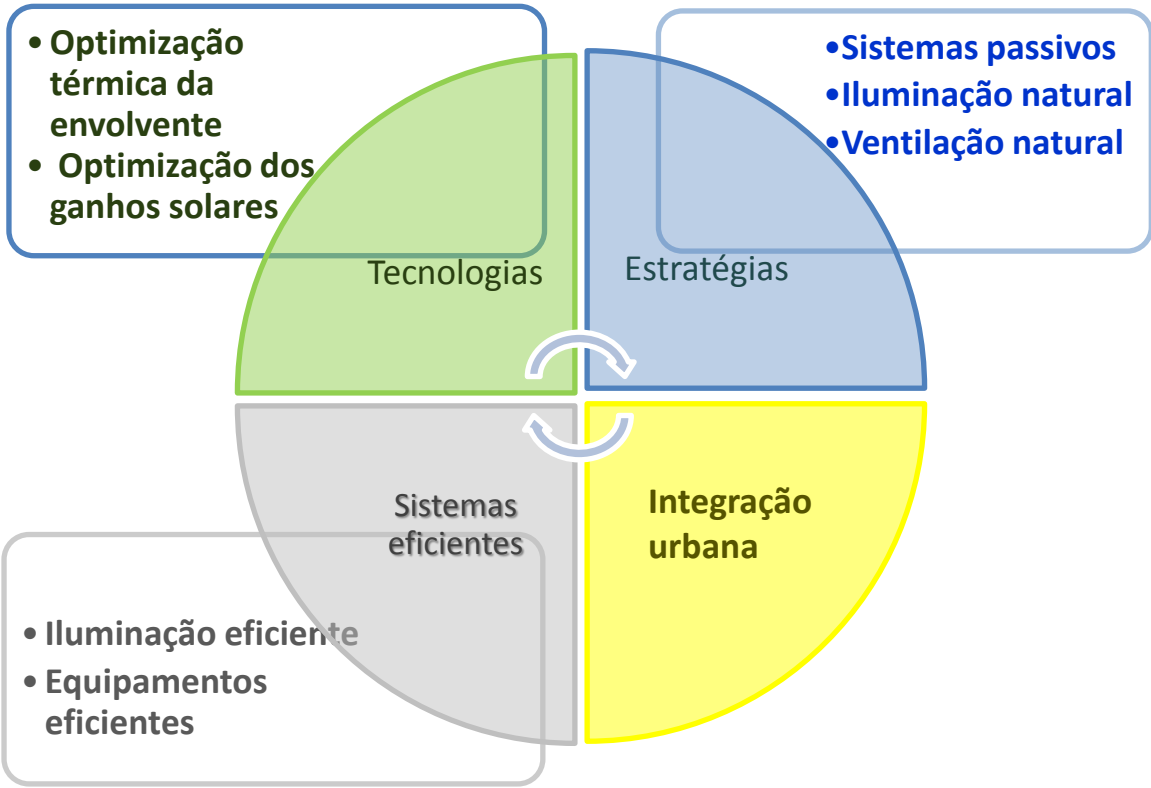
Laura Aelenei

Como alcançar o estatuto NZEB?

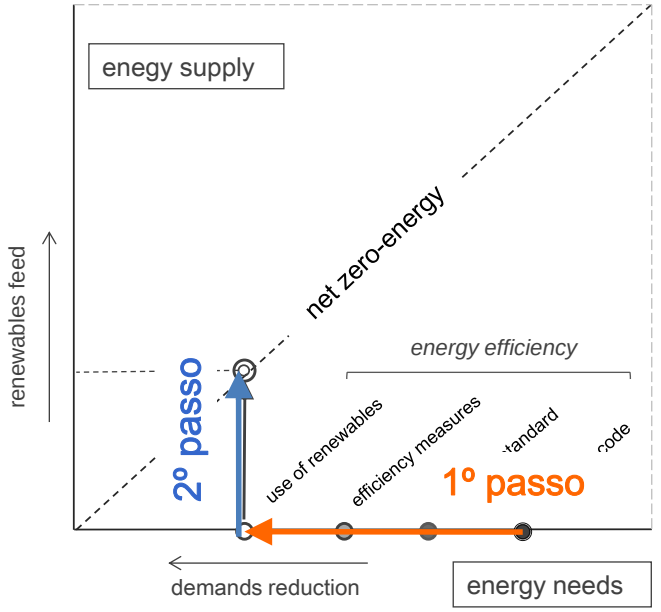
Como alcançar NZEB



1º passo: reduzir as necessidades energéticas do edifício



2º passo: produção de energia



NET ZEB
TASK 40 /ANNEX 52

SHC
SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

International Energy Agency
Energy Conservation in Buildings and Community Systems Programme

SHC TASK 40 - ECBCS ANNEX 52

Towards Net Zero Energy solar Buildings

(October 2008 – September 2013)

PORTUGAL

Definições/Definitions
Ferramentas de design/Design Process Tools
NZEB Design; Casos de estudo/ Advanced Building Design; Case studies

Net Zero Energy Buildings - worldwide

19	SUNDAY'S - Offices and Rowhouses in Gleisdorf, Austria	solar low energy houses (primary energy)	space heating, ventilation, domestic hot water appliances, office equipment, lighting	main facade oriented south			0,23		0,01	
20	Sunny woods in Zürich, Switzerland	zero heating energy building (electricity)	space heating, DHW, ventilation	south-nord	heated part is established in timber-frame construction. The rest are made out of concrete	0,49	45,67	0,03	1,33	0,16	7,31
21	Forum Chriesbach, Dübendorf, Switzerland	zero heating energy building, 2000-Watt Society, Minergie-P (primary energy)	space heating, DHW, cooling, ventilation, lighting, services, equipment like appliances, and office equipment	south-east to north-west	massive constructions elements, use of concrete and brick-earthwall s, inside wood and steel		50,77	0,004	0,20	0,04	2,03
22	Support Office Marchi International in Kemptthal, Switzerland	net zero energy office building, Minergie-P Eco (electricity)	space heating, DHW, ventilation, lighting, service equipment, office equipment	south oriented main facade	prefabricated timber frame construction combined with concrete staircases	0,34	25,34			0,30	9,63

Project Name: **SOLAR XXI**

Contact Person	Helder Gonçalves/Laura Aelenei
email	helder.goncalves@lneg.pt / laura.aelenei@lneg.pt

Building Information:

- **Building Status** Construction completed August 2006
- **Location** Paço do Lumiar, 22 Lisbon 0 Portugal
- **Latitude** North 38°46'20.27" N
- **Longitude** West 9°10'39.83" W
- **Climate Challenge** Heating & Cooling Dominated
- **Building Type** Non-residential_Office
- **Site Context** Village, Urban Edge - 2-5 storey buildings with at most narrow lanes between adjacent bu
- **Engineer Civil** Obrecol SA
  - Address 0
  - email 0
  - Web Addres 0
- **Engineer MEP** Lomarisco Ldaf Aquadomos Lda
  - Address 0
  - email 0
  - Web Address 0
- **Engineer Structural** 0
  - Address 0

Solar XXXI - PT | ENERPOS - FR RE | CIRCE-Zaragoza - ES | LIMA - ES | Primary School Lajon - IT

http://www.enob.info/de/nullenergie-plusenergie-klimaneutrale-gebaeude-im-stromnetz-20/nullenergiegebaeude-karte-internationaler-projekte/

NET ZEB
TASK 40 /ANNEX 52

LNEG

Edifício SOLAR XXI: um edifício nZEB

SOLAR XXI

LNEG, Lisbon
Latitude 38°46'20.27" north
Longitude 9°10'39.83" west

Project Co-ordinator
Helder Gonçalves

Architect
Pedro Cabrita
Isabel Diniz

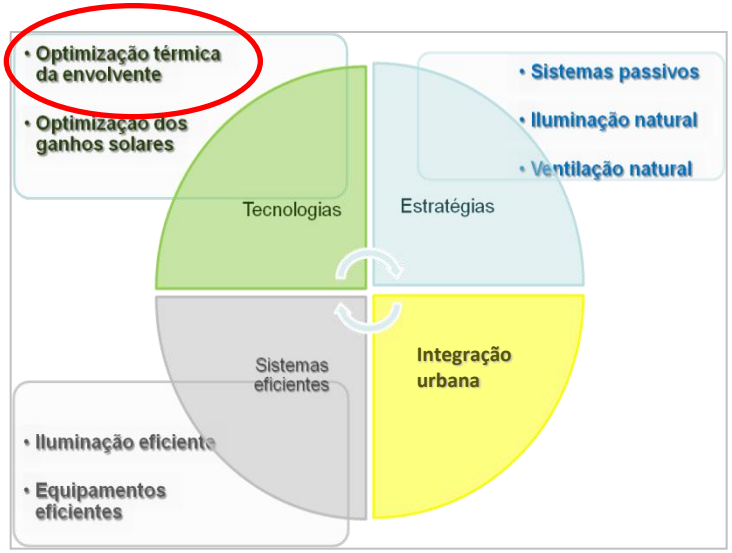
SOLAR XXI

LNEG, Lisbon
Latitude 38°46'20.27" north
Longitude 9°10'39.83" west

Project Co-ordinator
Helder Gonçalves

Architect
Pedro Cabrita
Isabel Diniz

Reduzir as necessidades energéticas
Optimização térmica da envolvente

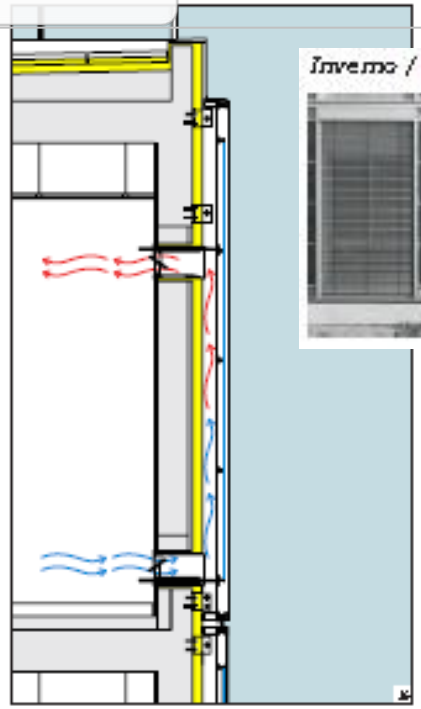


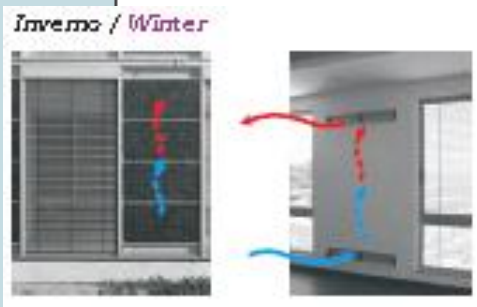
Building elements	Material	U value (W/m²K)
External walls	Brick wall + ETICS (6 cm)	0.45
Roof	Concrete with external insulation (10 cm)	0.26
Thermal bridges	Concrete with external insulation (6 cm)	0.55
Windows	Transparent double glazing	3.50
Envelope (average)		0.88

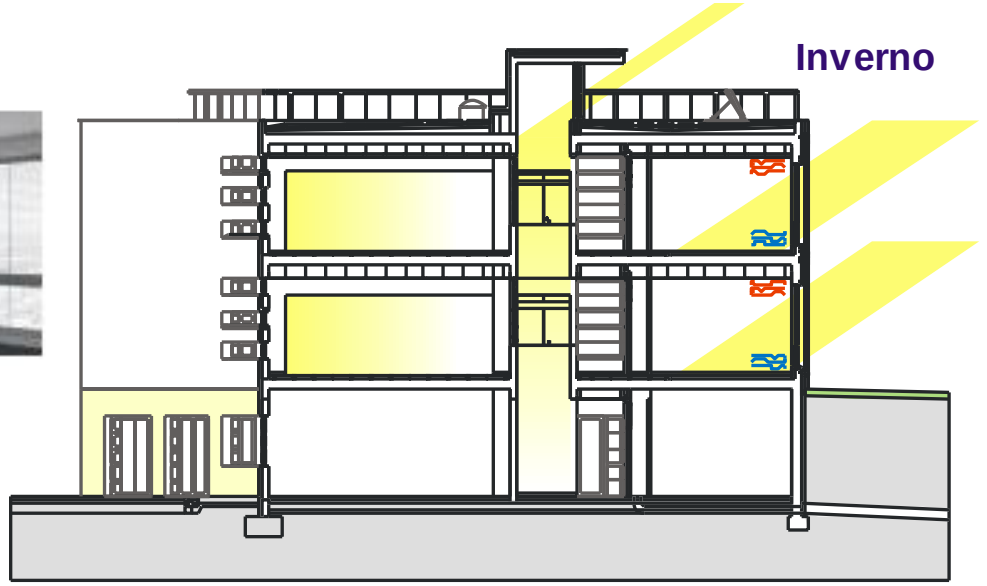
Reduzir as necessidades de aquecimento

Ganhos Directos nos vãos

Sistema de reuperação de calor dos painéis fotovoltaicos





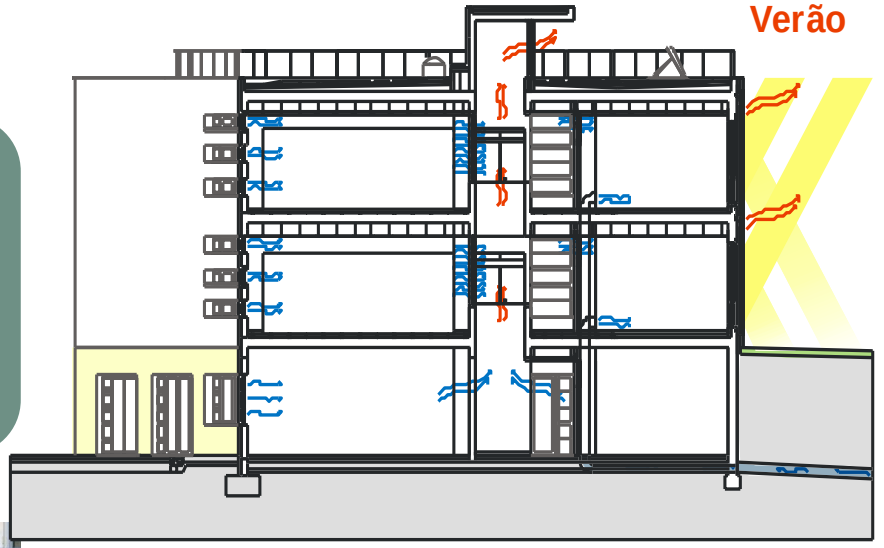


Reduzir as necessidades da arrefecimento

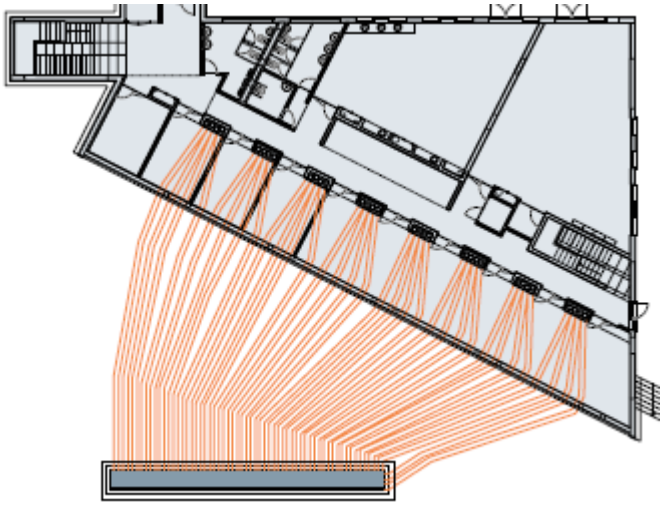
Controle solar

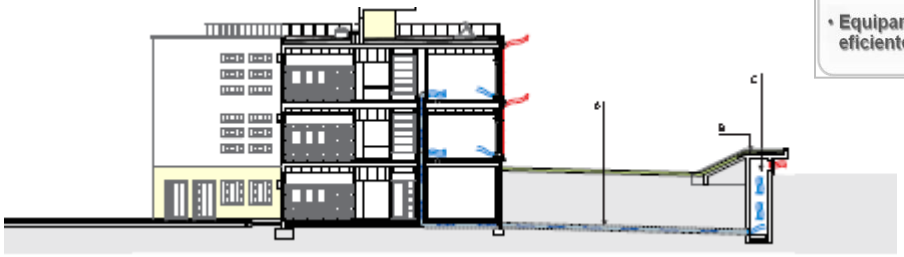
Protecção dos vãos envidraçados (estores exteriores)

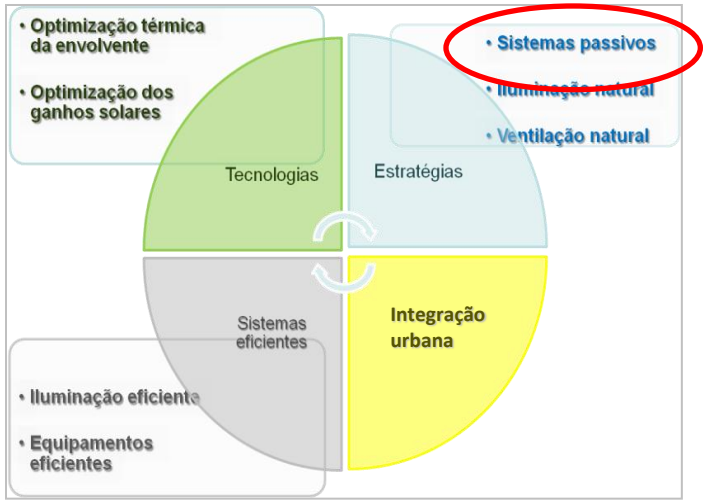
Isolamento Exterior (redução das ganhos solares na envolvente)



Sistema de arrefecimento pelo solo, permutador de 32 tubos a ar.

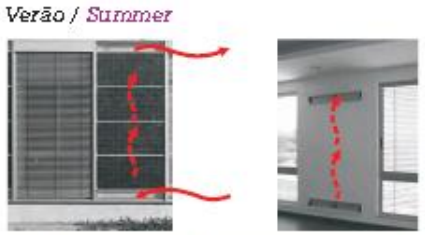


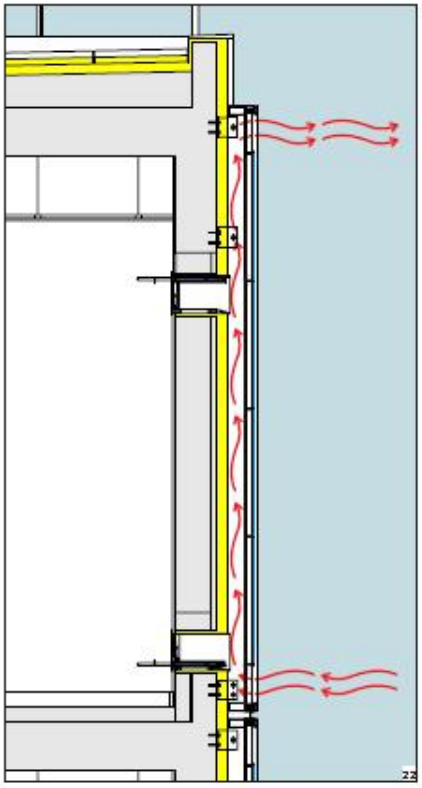




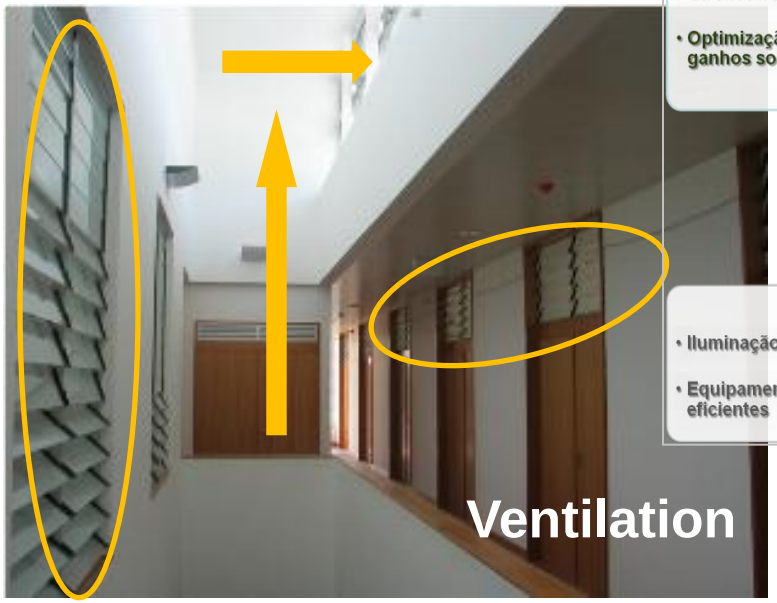
Reduzir as necessidades de arrefecimento

Ventilação natural



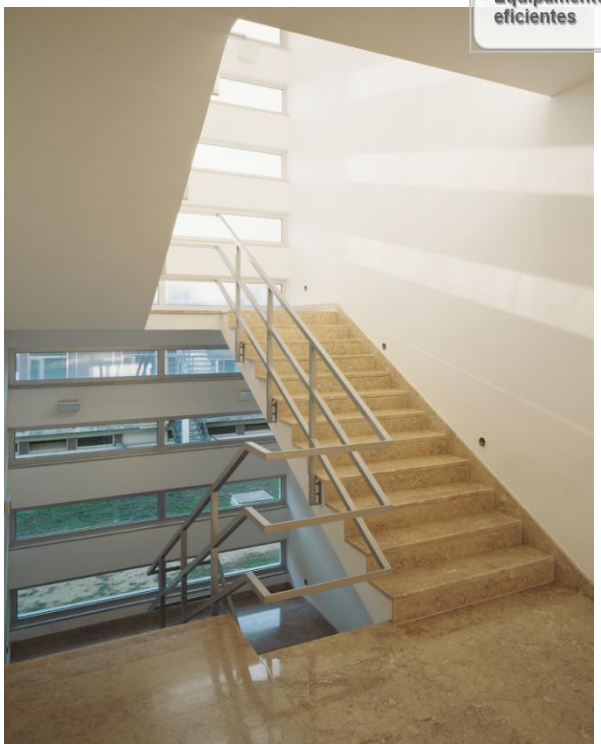


Sistema ventilação natural transversal e por efeito de chaminé pelo hall central.



Reduzir as necessidades energéticas
Iluminação natural

Vãos distribuidos, claraboia central comum aos 3 pisos com ligação às salas a norte e a sul, propiciam iluminação natural, todo o ano.



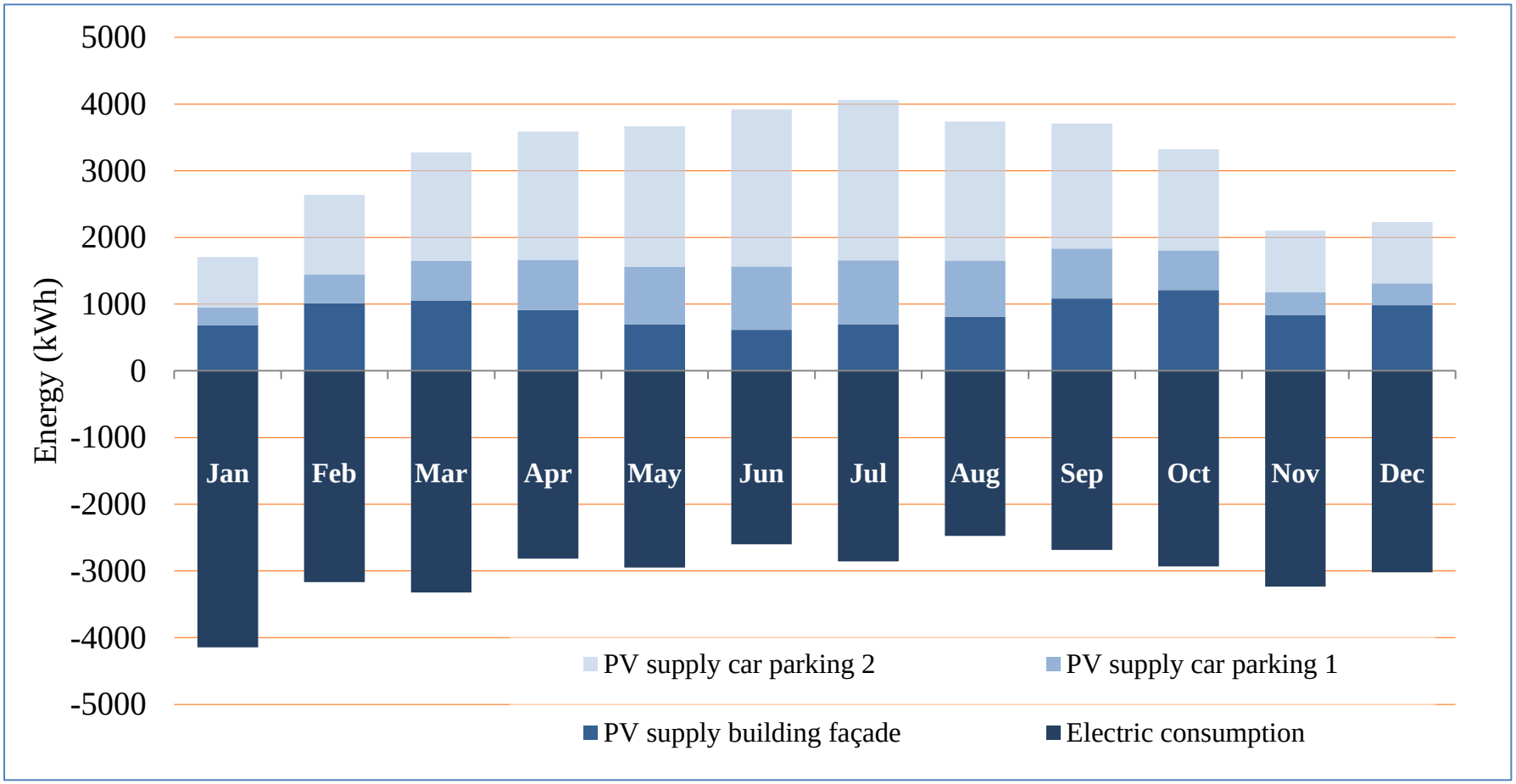
INTEGRAÇÃO DE ENERGIAS RENOVÁVEIS

Produção de energia

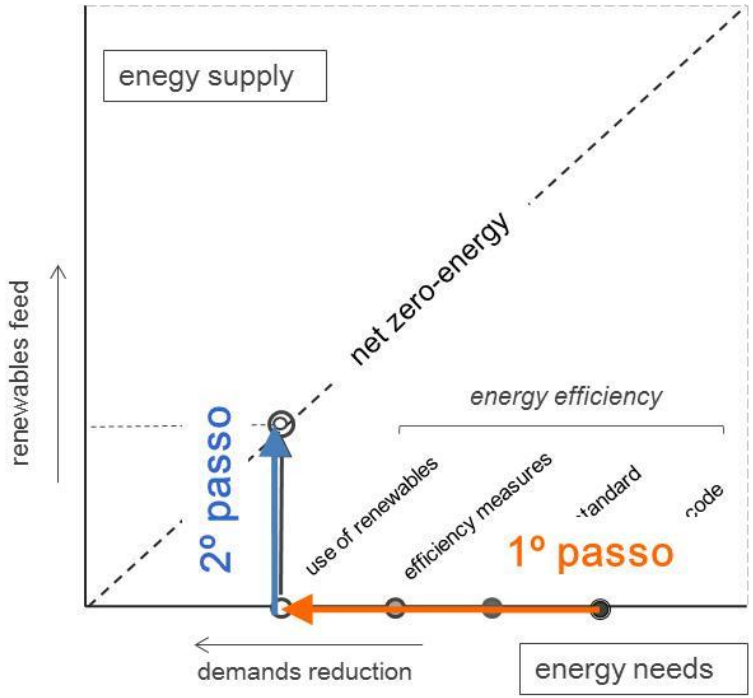
Renewable Energy Systems	Integration	Area (m^2)	Installed Peak power (kW)	Productivity (kWh/kW)
76 PV multicristalline silicon modules	Building façade	96	12	1004
100 PV amorphous silicon	Car parking 1	95	6	1401
150 PV CIS thin-film modules	Car parking 2	110	12	1401
CPC Thermal Solar Collectors	Building roof	16	11 MWh productivity	

INTEGRAÇÃO DE ENERGIAS RENOVÁVEIS

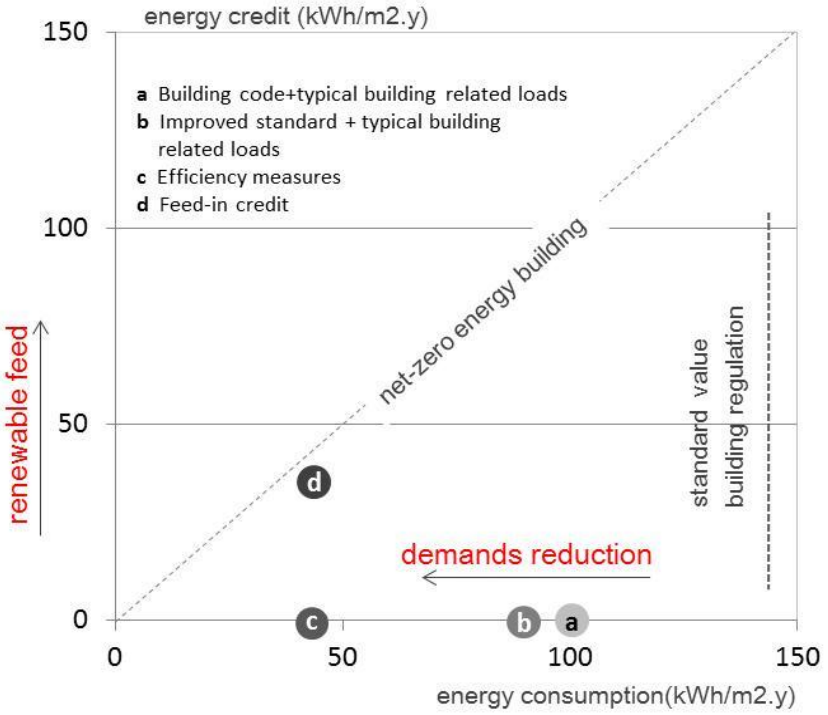
Produção de energia electrica / Consumo energia electrica



SOLAR XXI NZEB Performance



NZEB



SOLAR XXI

Energy performance for office/service buildings
IEE (Energy Eficiency Indicator)

IEE
SOLAR XXI
(real)

2.8

kgep/(m2.year)

IEE
SOLAR XXI
(typical user related loads)

16

kgep/(m2.year)

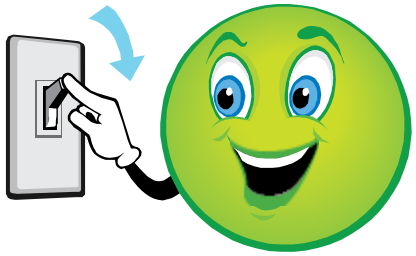
IEE

Standard value office building

30

kgep/(m2.year)

obrigada



LNEG
Laboratório Nacional de Energia e Geologia, I. P.

www.lneg.pt

laura.aelenei@lneg.pt

MINISTÉRIO DA ECONOMIA E DO EMPREGO