



ROADMAP TOWARDS NEARLY ZERO ENERGY SPORT BUILDINGS

Neuza Rosa

neuza.rosa@jesusferreira.pt



Final Dissemination Event
21 February 2017, Brussels

step by step
renovation
towards nearly
zero energy
SPORT buildings



Co-funded by the Intelligent Energy Europe
Programme of the European Union

Topics

- What is a Nearly Zero Energy Sport Building?
- Steps to achieve Nearly Zero Energy Sport Building:
 - \ Energy audit & Energy Performance Certificate
 - \ Action plan
 - \ Implementation of energy improvement measures
 - \ Available financing options
 - \ Measurement and Verification of energy savings

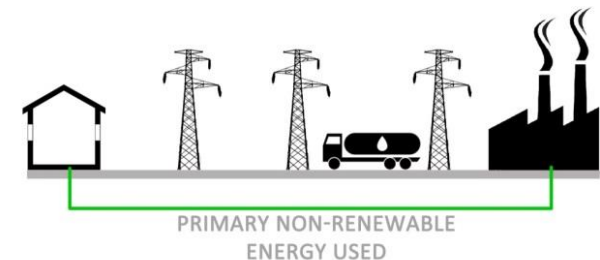
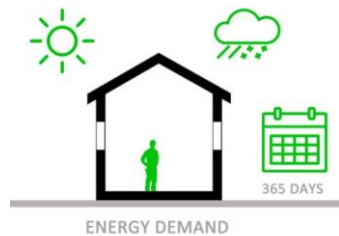
What is a Nearly Zero Energy Sport Building?

Energy Performance Building Directive (EPBD, 2010/31/EU)



Main legislative instrument at EU level referring to the concept of nZEB

“Means a **building that has a very high energy performance**. The nearly zero or very low amount of energy required should be covered to a very significant extent by **energy from renewable sources**, including energy from renewable sources produced on-site or nearby”.



What is a Nearly Zero Energy Sport Building?

All Member States are responsible to:

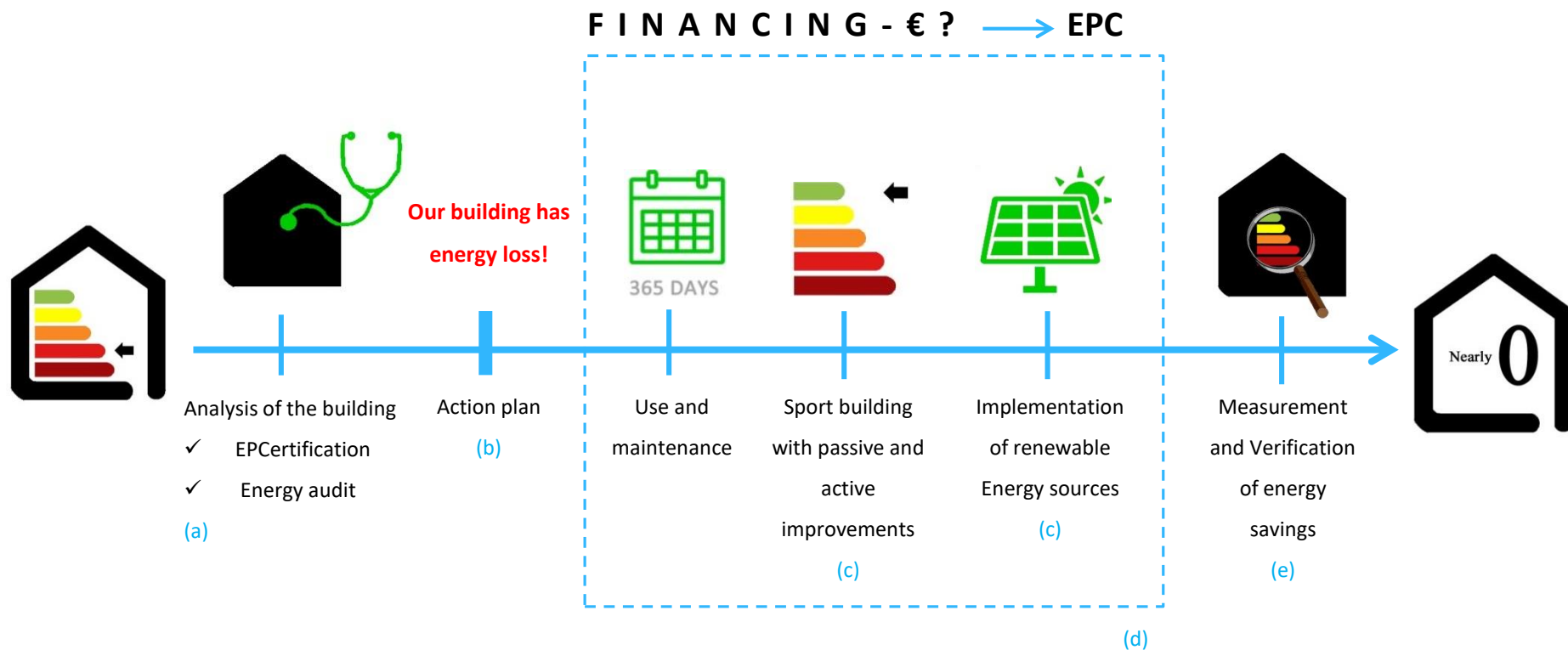
- Define a nZEB in their national plans
- Reflecting the national, regional or local conditions
- Including a numerical indicator of primary energy use expressed in kWh/m² per year
- Establish thresholds for different building typologies, including sport facilities

The points that **EPBD must define** are:

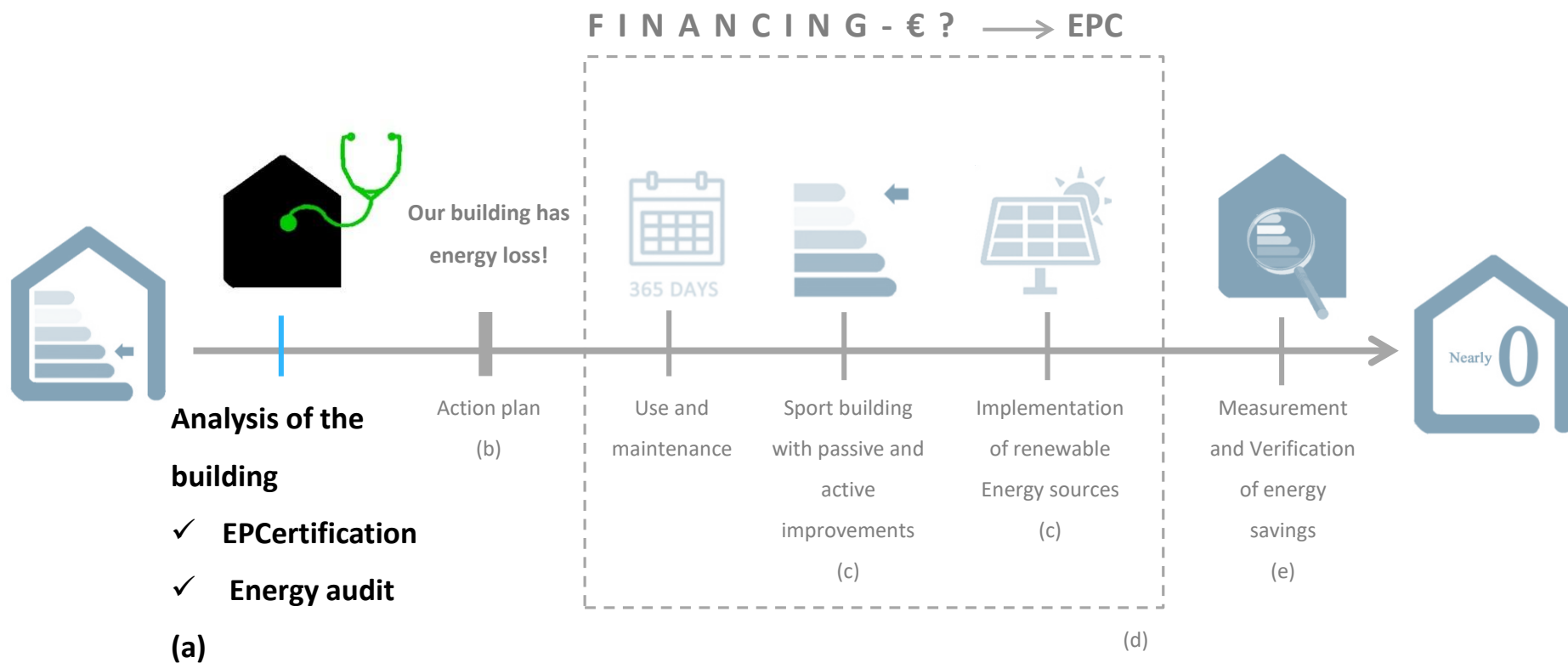
1. Energy demand
2. The % renewable energy used
3. The primary non-renewable energy used and CO₂ emissions



Steps to achieve Nearly Zero Energy Sport Building



Steps to achieve Nearly Zero Energy Sport Building



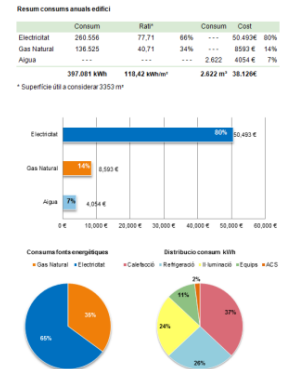
Steps to achieve Nearly Zero Energy Sport Building

Energy audit

Establish the **current energy situation**, to analyse the energy usage within the building and to identify the energy improvement opportunities

Detailed energy audit should examine:

- Data from energy bills and/or the monitoring systems
- Equipments, schedule profiles, regulation systems and building envelope
- Others



Steps to achieve Nearly Zero Energy Sport Building

Energy Performance Indicators

Annual energy
consumption per
floor area (**kWh/m²y**)

Energy consumption
per floor area and
degree days

Renewable Energy
Ratio (**RER**)

CO₂ emissions
indicators

Energy consumption
per energy use and
floor area

Energy consumption
per annual accesses
(**kWh/n^oaccesses·y**)

Energy consumption
per water pool
surface and **HDD** (for
indoor swimming
pools)

Energy consumption
per days of operation
and ice surface (for
ice rinks)

Annual energy
consumption per
conditioned volume
(**kWh/m³y**)

Energy consumption
per hours of
operation (**kWh/h·y**)

Steps to achieve Nearly Zero Energy Sport Building

Energy improvement opportunities should be identified within **energy audits**, quantifying the potential energy savings, economic savings, CO2 savings, the investment required as well as the payback period of proposed measures.

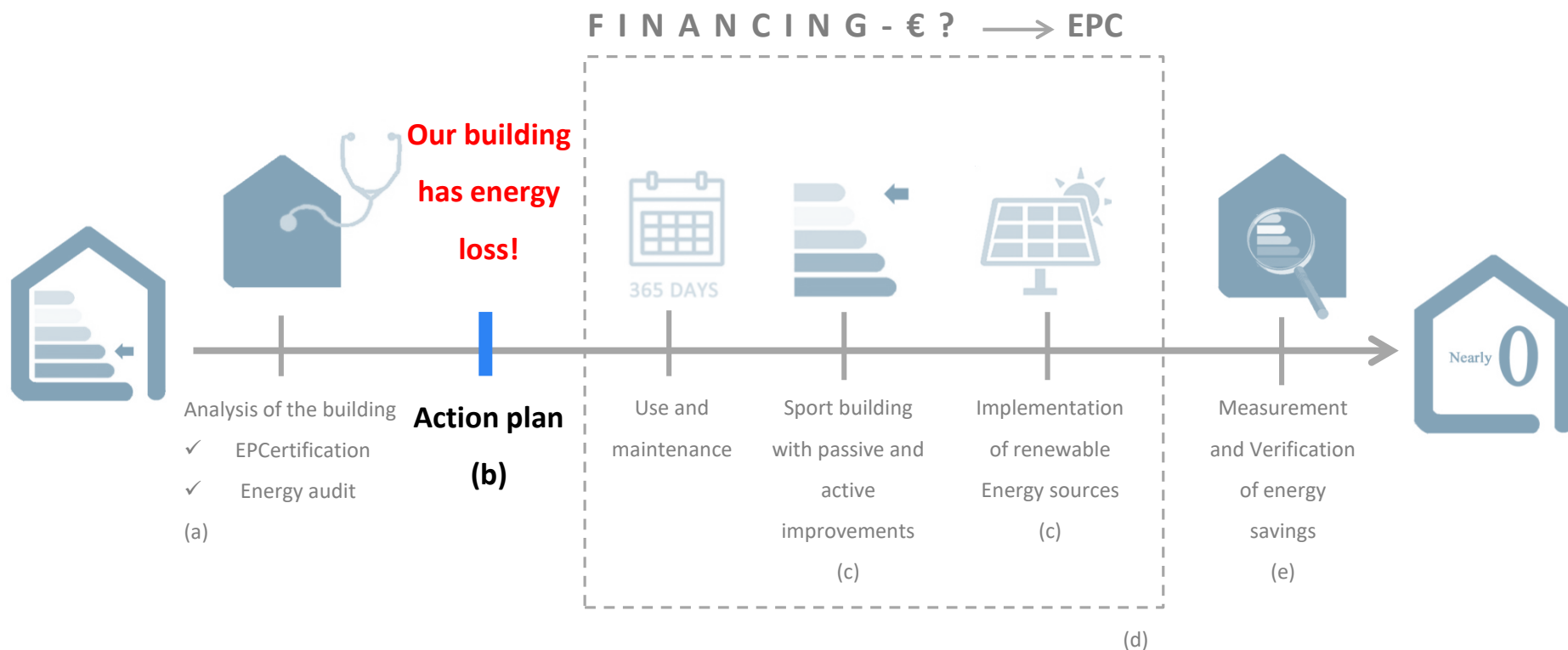
An accurate estimation  Successful action plan

EPCertificate

- Identify the actual energy rating of the building
- Identify energy measures that will improve the energy rating of the building.



Steps to achieve Nearly Zero Energy Sport Building



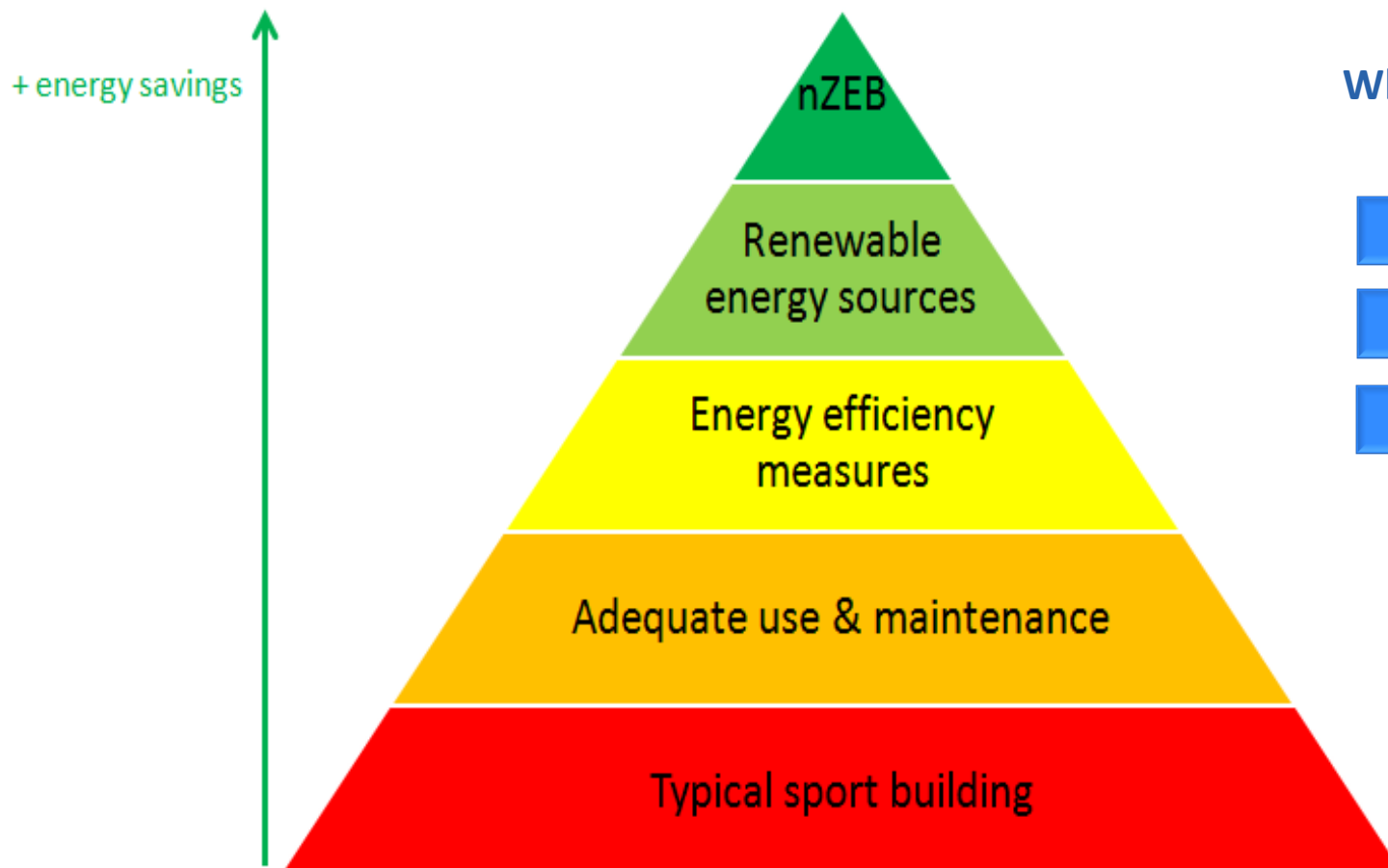
Steps to achieve Nearly Zero Energy Sport Building

A **nZEB action plan** should be defined to:

- Prioritise the **actions to be implemented** in short, medium and long term
- Prioritise the **energy conservation measures** to be implemented in the next years
- Ensure achievement of ambitious nZEB levels, by combining **different types** of energy measures aimed to reduce energy demand and increase the share of renewable sources

Each sport building responsible should select the packages of energy improvement measures to be implemented, including energy efficiency measures and renewable energies, in order to maximize the savings potential of the sport buildings.

Steps to achieve Nearly Zero Energy Sport Building



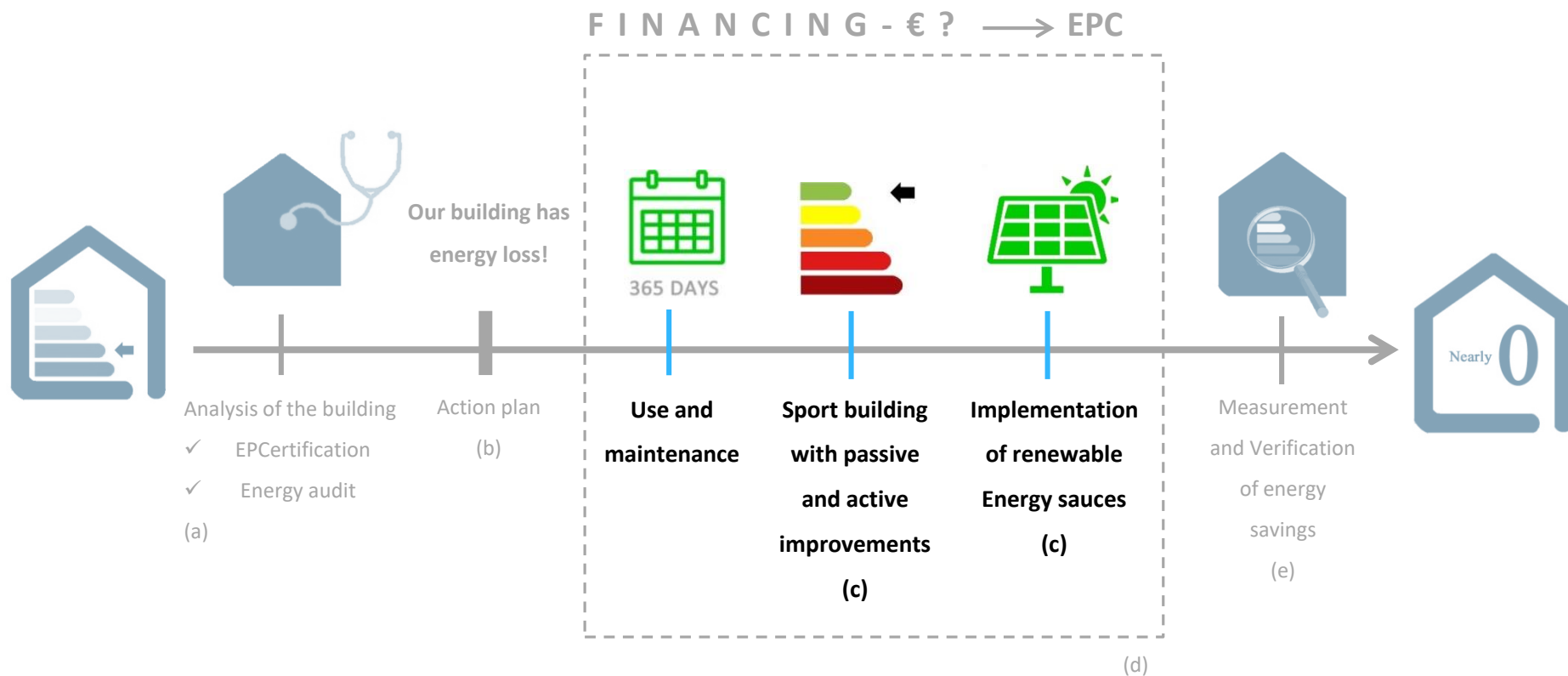
What is the criteria to prioritize?

Payback €/year

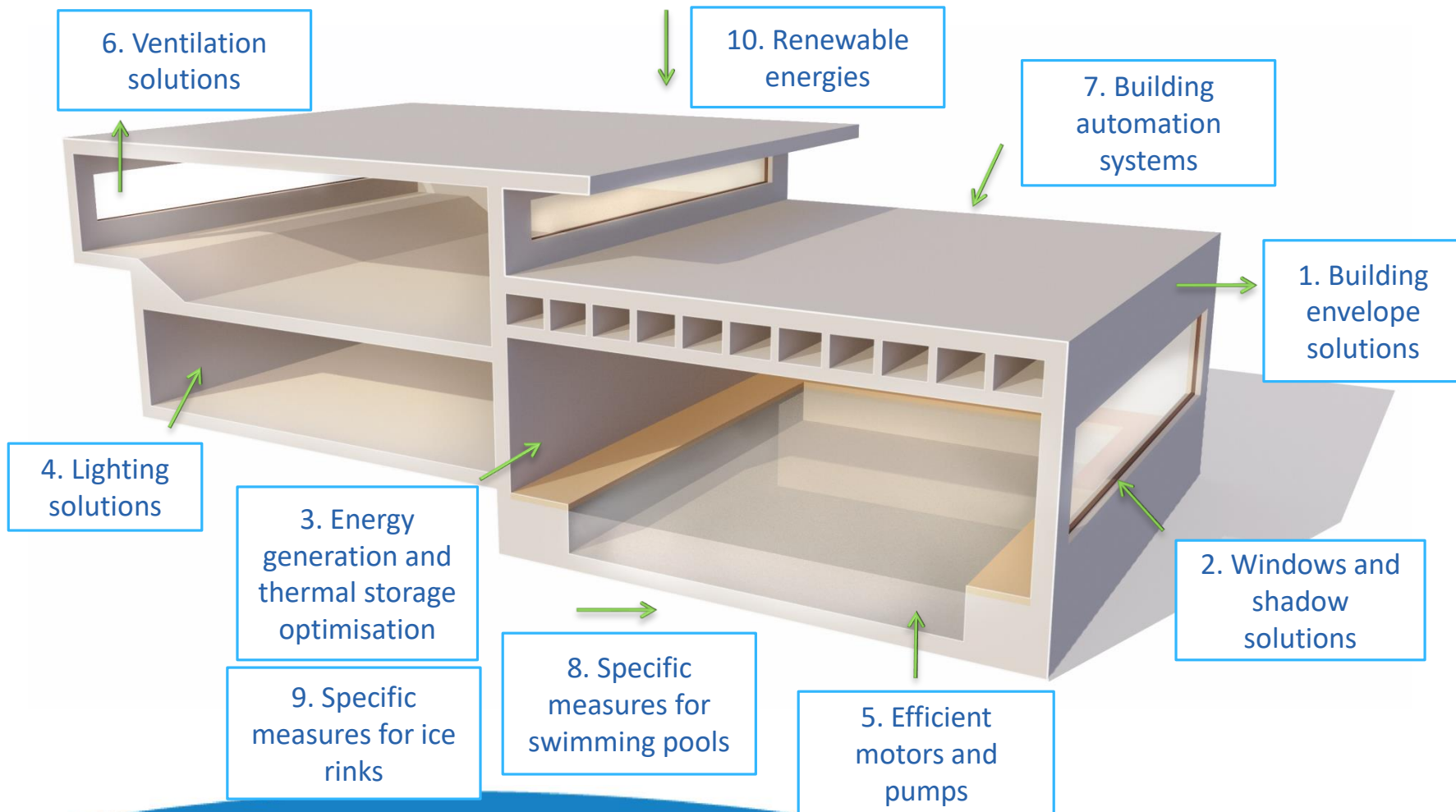
Energy Savings

Cost/investment

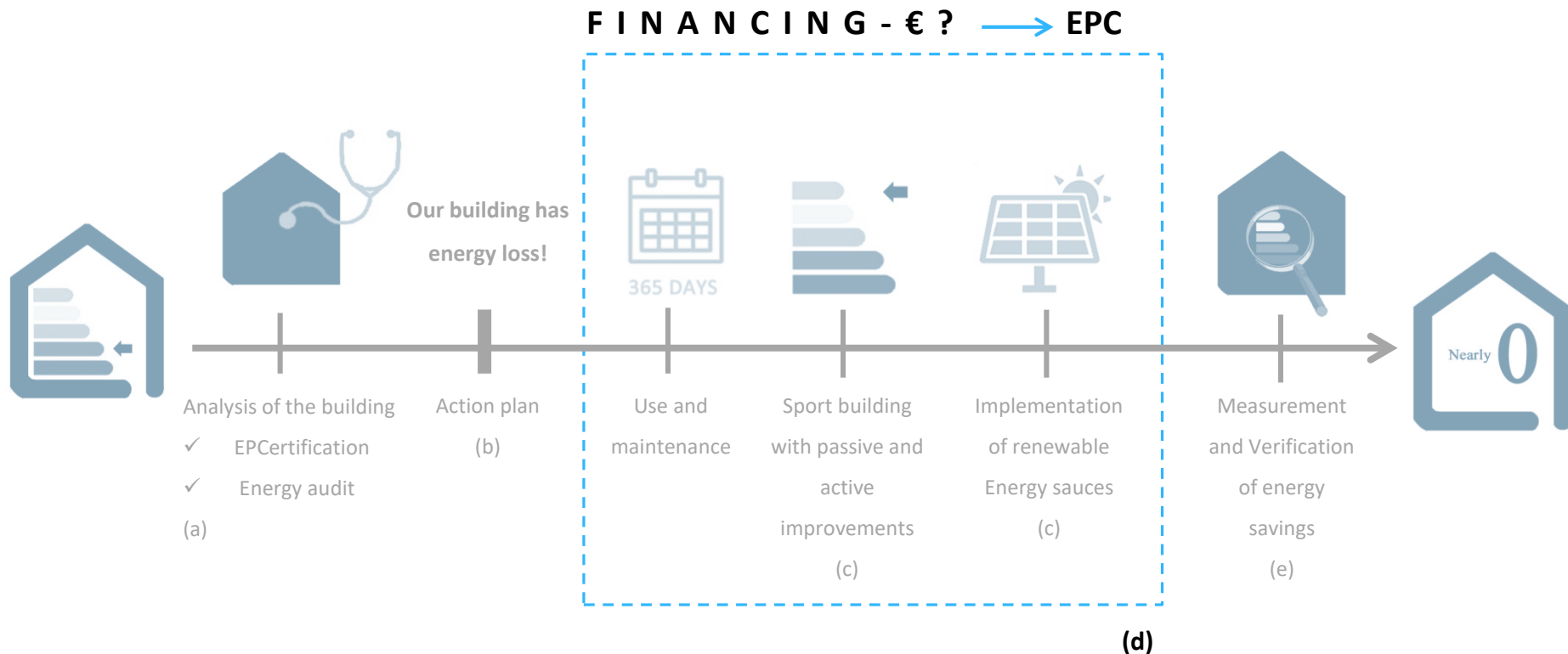
Steps to achieve Nearly Zero Energy Sport Building



Steps to achieve Nearly Zero Energy Sport Building



Steps to achieve Nearly Zero Energy Sport Building



Steps to achieve Nearly Zero Energy Sport Building

Once the **energy improvement opportunities are identified**, the next step consists on determine **how they could be financed**

Available financing options

- **Energy Performance Contracting (EPC)**
- **European Energy Efficiency Investment Fund**
- **National and Regional Governmental Funds**
- **Private Energy Efficiency Funds**
- **Own resources**
- **Loans**
- **Combination**
- **Others**

Steps to achieve Nearly Zero Energy Sport Building

Energy Performance Contracting

A contractual arrangement between the beneficiary and the provider (normally an ESCO) of an energy efficiency improvement measure, where investments in that measure are paid for in relation to a contractually agreed level of energy efficiency improvement.

Guaranteed savings model
Shared savings model

What is an ESCO?

A natural or legal person that delivers energy services and/or other energy efficiency improvement measures in a user's facility or premises, and accept some degree of financial risk in so doing. The payment for the services delivered is based (either wholly or in part) on the achievement of energy efficiency improvement, and on meeting of the other agreed performance criteria.

Steps to achieve Nearly Zero Energy Sport Building

European Energy Efficiency Investment Fund

Public-private partnership capitalized by the European Commission, European Investment Bank, Cassa Depositi e Prestiti and Deutsche Bank. Investments in energy **efficiency and renewable energy projects** in the range of € 5 M to € 25 M can apply for this fund. The final beneficiaries must be **municipal, local, regional authorities or public and private entities** acting on their behalf, such as utilities and energy service companies. The Fund also **provides technical assistance funds** to municipalities

Steps to achieve Nearly Zero Energy Sport Building

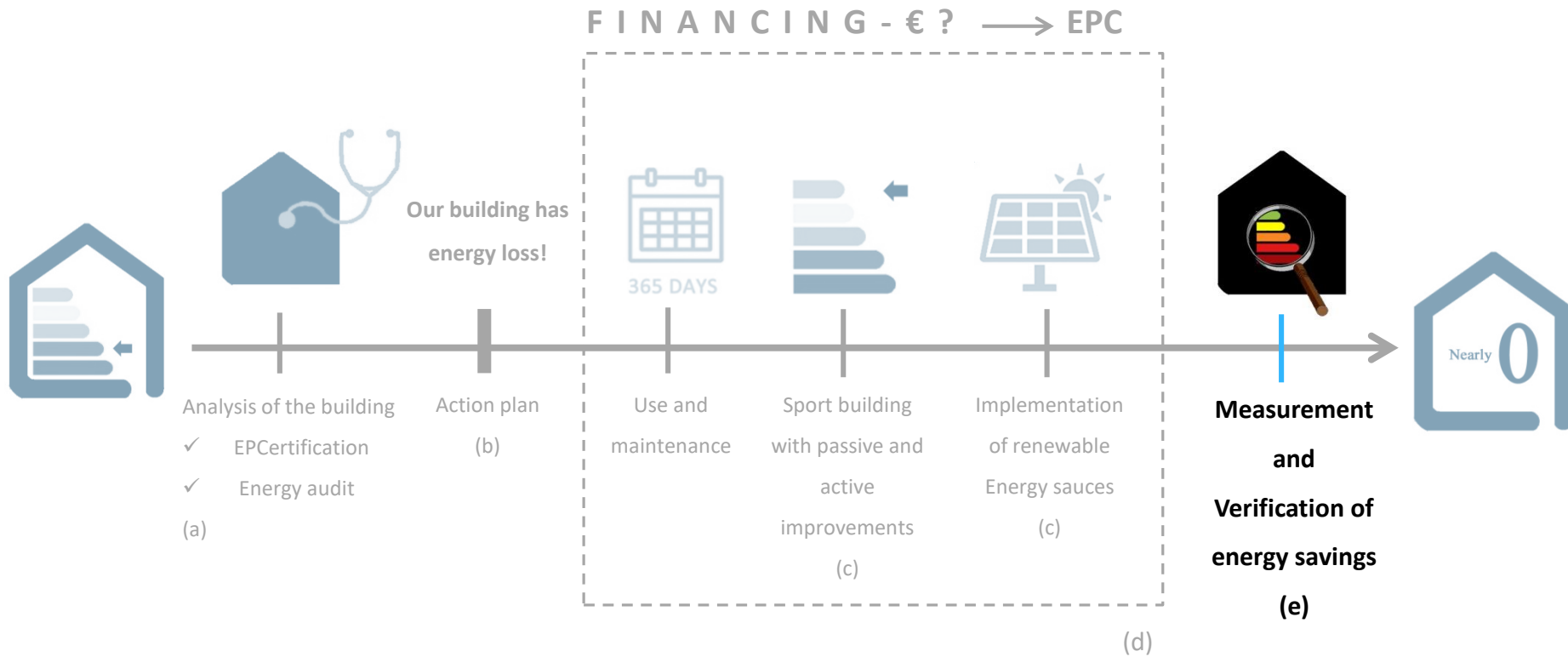
National and Regional Governmental Funds

Some EU countries have dedicated funds to finance energy efficiency projects. All the documents must accomplish with the tender procedure

Private Energy Efficiency Funds

Almost all the available private funds follow the energy performance contracting model

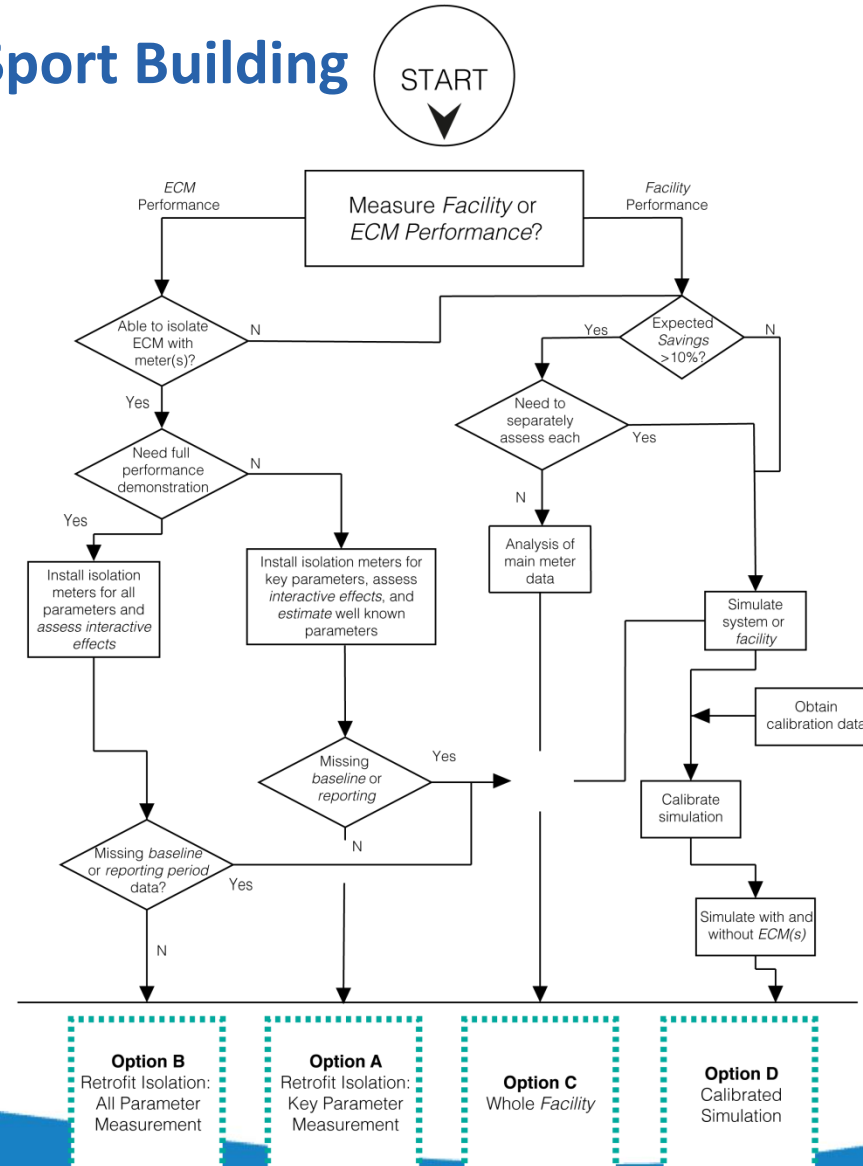
Steps to achieve Nearly Zero Energy Sport Building



Steps to achieve Nearly Zero Energy Sport Building

M&V is the process of **determining savings** from an energy retrofit project which can be verified with a **certain degree of confidence**. Four options are defined within **IPMVP** for measurement and verification of energy savings:

- Option A** - Retrofitting isolation systems with measurements of all key parameters
- Option B** - Retrofitting isolation systems with measurements of all parameters
- Option C** - Whole facility
- Option D** - Calibrated simulation



Steps to achieve Nearly Zero Energy Sport Building

Option A - Retrofitting isolation systems with measurements of all key parameters

IPMVP OPTION	SAVINGS CALCULATION	TYPICAL APPLICATIONS
<p>Savings are determined by field measurement of the key performance parameter(s), which define the energy use of the ECM's affected system(s) or the success of the project.</p> <p>Parameters not selected for field measurements are estimated.</p>	<p>Engineering calculation of baseline and reporting period energy from:</p> <ul style="list-style-type: none">• Short-term or continuous measurements of key operating parameter(s) and• Estimated values• Adjustments as required	<p>A lighting retrofit where:</p> <ol style="list-style-type: none">1) Power draw is the key performance parameter that is measured periodically and2) Lighting operating hours are estimated based on facility schedules and occupant behaviour

Steps to achieve Nearly Zero Energy Sport Building

Option B - Retrofitting isolation systems with measurements of all parameters

IPMVP OPTION	SAVINGS CALCULATION	TYPICAL APPLICATIONS
<p>Savings are determined by field measurement of the energy use of the ECM affected system.</p> <p>Option B requires that all parameters are measured.</p>	<ul style="list-style-type: none">• Short term or continuous measurements of baseline and reporting period energy, or engineering computations using measurements of proxies of energy uses• Adjustments as required	<p>Application of a variable speed drive and controls to a motor to adjust pump flow.</p> <p>Measure electric power with a kW meter installed on the electrical supply to the motor, which reads the power every minute. In the baseline period this meter is in place for a week to verify constant loading</p>

Steps to achieve Nearly Zero Energy Sport Building

Option C - Whole facility

IPMVP OPTION

Savings are determined by measuring energy use at the whole facility or sub-facility level.

Continuous measurements of the entire facility's energy use are taken throughout the reporting period.

SAVINGS CALCULATION

- Analysis of whole facility baseline and reporting period (utility) meter data. Energy data are often derived from utility meters, either through direct reading of the meter, or from utility invoices

- Adjustments as required, using techniques such as simple comparison or regression analysis

TYPICAL APPLICATIONS

Multifaceted energy management program affecting many systems in a facility.

Measure energy use with the gas and electric utility meters for at least twelve month baseline period and throughout the reporting period.

Steps to achieve Nearly Zero Energy Sport Building

Option D - Calibrated simulation

IPMVP OPTION

Savings are determined through simulation of the energy use of the whole facility, or of a sub-facility.

This option usually requires considerable skill in calibrated simulation.

SAVINGS CALCULATION

Energy use simulation, calibrated with hourly or monthly utility billing data.

(Energy end use metering may be used to help refine input data).

TYPICAL APPLICATIONS

Option D is used when there is no baseline data available (e.g. a facility without a meter before implementing ECMs)

Baseline energy use, determined using the calibrated simulation, is compared to a simulation of reporting period energy use

Steps to achieve Nearly Zero Energy Sport Building



Thank you for your attention

Neuza Rosa

neuza.rosa@jesusferreira.pt



JESUS FERREIRA
CONSULTORES
energyconsulting