Sheffield University Management School.

ReTraCE

Realising the Transition towards the Circular Economy

Application of Circular Economy to Business Models: enabling Energy Efficiency

Dimitra Mintsidis
Federesco

1st ReTraCE Network School
Sheffield, 3-7 June 2019

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Federesco

Federesco is a National Federation representing and promoting the energy efficiency industry in Italy, it has been created in 2006 and it includes around 50 ESCos.

federesco

Federesco - EU Projects

- **EPC+ (Energy performance Contracting Plus)** Small Medium Enterprises cooperation in order to optimize and simplifiy the supply of energy efficiency interventions through **Energy Performance Contracting within the Small Medium Enterprise market.**

- **Trust EPC South (Building Trust in Energy Performance Contracting in Southern European Countries)** Raising **interest and trust of financial institutions for supporting EPC** within the tertiary sector in the Southern European Countries.

- **TransparEnSe (Increasing Transparency of Energy Service Markets)** Improving **the transparency and the reliability of the EPC market** in Europe through the implementation of a European Code of Conduct for EPC.

Federesco - EU activities

- **Board Energy H2020 e SET Plan** – Regulatory framework support and advocacy.
- **Energy Efficiency Network Europe** – Marketplace platform for international business opportunity exchange and cooperation.
- **European Utility Week** – Yearly EU event for qualified operators and best practices.
- **EU MERCI** – Esco Stakeholders' representation in the industrial sector.
- **SmartMed** - Mediterranea Flexible Energy Communities: from PEBs to PEDs.

Economy & environment

"EU circular economy policy puts the EU economy on the road to transformation to an economic system that reduces the negative impact of economic activities on the environment."

EC DG R&I, March 2019

"Accelerating the transition to the circular economy
improving access to finance for circular economy projects"

Economy

Οἶκος (house) + νόμος (regulation)

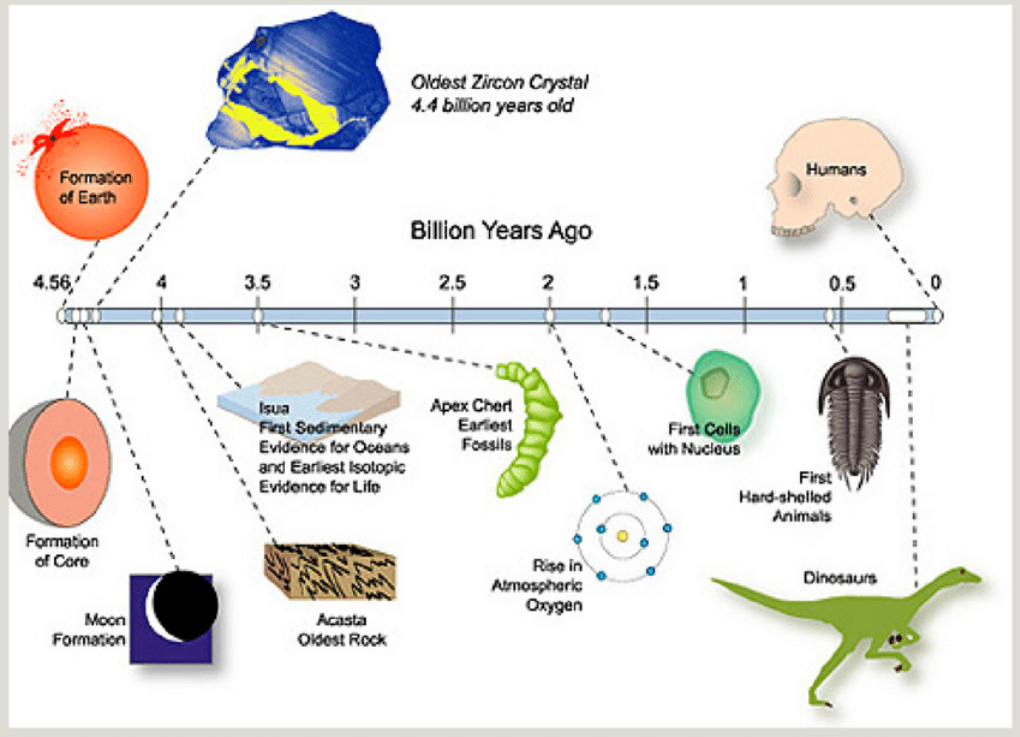
«Management of the place we live in»

The environmental issue

EC R&I 2017 paper

CIRCULAR ECONOMY RESEARCH AND INNOVATION

Connecting economic & environmental gains



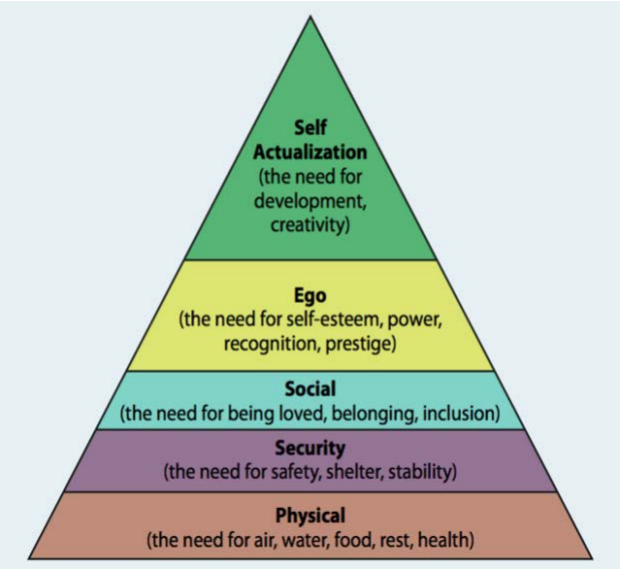
Human being on earth timeline

From ethics to marketing, humanly

A

INPUT

Resources
(stock limit
and circularity,
...no way out)



Maslow's Pyramid of needs and desired comfort levels

B

OUTPUT

Needs' satisfaction
(products, services,
experiences,
waste and the 4Rs)

C

...The C factor.

The C factor: creativity

A radical change: innovation

"...We can not solve our problems with the same level of thinking that created them..."

Albert Einstein

Different things

Different ways

Circular economy and use of resources: energy

Energy saving: the first energy source

"Energy efficiency is the most universally available source of energy. **Putting energy efficiency first** reflects the fact that the **cheapest and cleanest source of energy is the energy that does not need to be produced or used**. This means making sure that energy efficiency is taken into account throughout the energy system, i.e. actively managing demand so as to optimise energy consumption, reduce costs for consumers and import dependency, while treating investment in energy efficiency infrastructure as a cost-effective pathway towards a low-carbon and circular economy. This will enable retiring generation over-capacity from the market, especially fossil fuel generation."

A binding 30% EU-wide target for energy efficiency by 2030 aiming to reduce our dependency on energy imports, boost economy and create jobs, cut more emissions (cut CO2 emissions by at least 40% by 2030)

Efficient buildings, clarified ecodesign framework and measures, smarter finance.

Extension beyond 2020 of the energy savings requirement to 2030 (specified in Article 7).

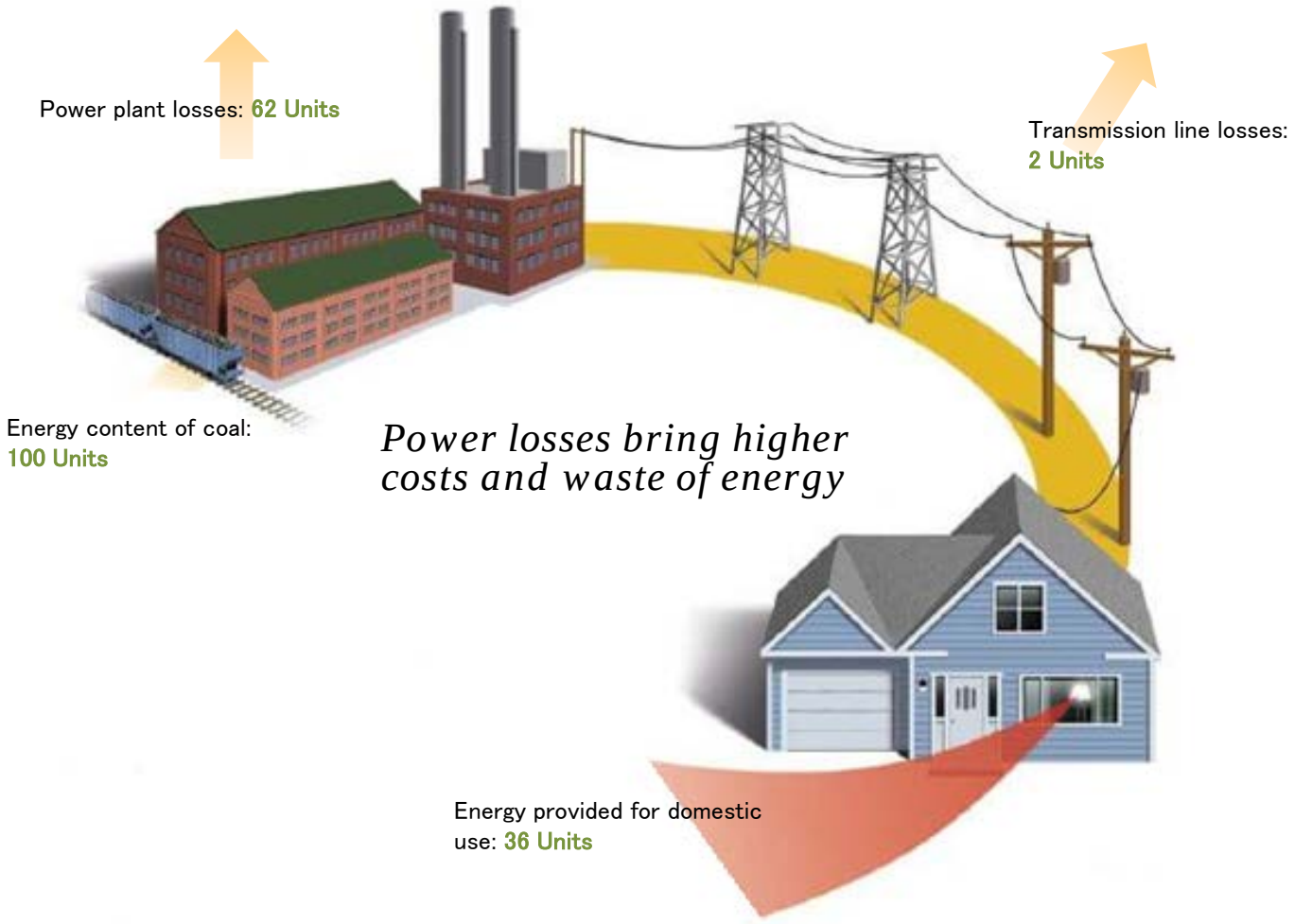
European Commission, Clean Energy For All Europeans, Doc **COM(2016)860** final, 2016

The international trend

G20 Meeting of Energy Ministers 15 June 2018, Bariloche, Argentina declar

- role of energy in promoting **fair and sustainable development**
- need to transform our energy systems, in line with the spirit of the 2030 Agenda for Sustainable Development,
- need for persistent actions to address the global challenges, including **climate change and energy security**
- key topics such as Energy Transitions, Energy Efficiency, Renewable Energy, Data Transparency, and Energy Access and Affordability
- Energy Transitions towards **Cleaner, more Flexible and Transparent Systems**
- **Energy efficiency prioritised** and one of the pillars of the 2030 Agenda for Sustainable Development
- contribution to energy security, **industrial competitiveness**, emissions reduction, economic growth, job creation and others **social benefits** when introduced in a cost-effective manner
- **Behaviour Change** bridge between innovation, technological progress, energy efficiency
- **innovation and market uptake** key driver of the energy transitions processes

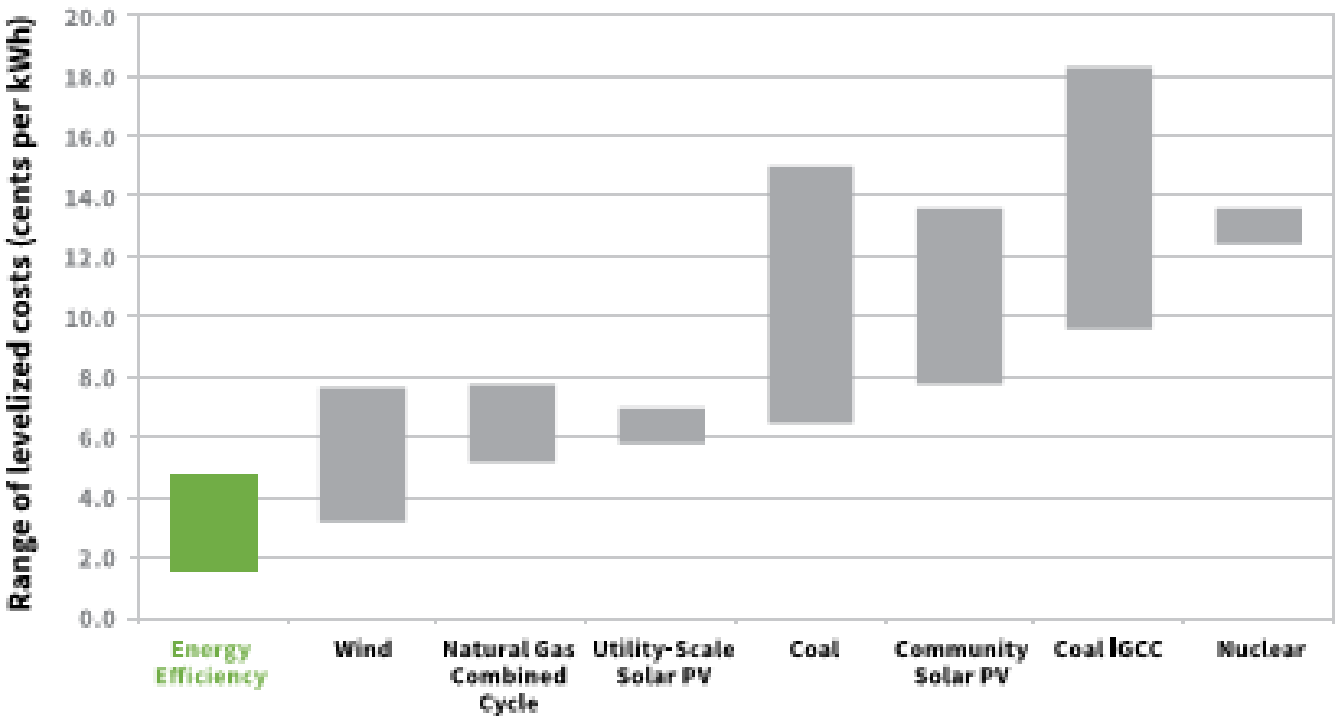
Energy Transfer Losses



Esco Italia elaboration from: National Academies Press "What you need to know about Energy", Washington, D.C., 2008.

Cost-effectiveness

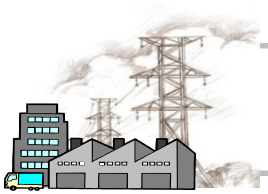
L.C.O.E. - Levelized costs of electricity by source (USD)



Source: ACEEE, *The Greatest Energy Story You Havent' Heard*, 2016

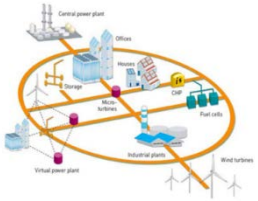
EE Benefits

Energy Efficiency is firstly and employment factor



Large Power Plants

CAPITAL INTENSIVE



Energy Efficiency & Distributed Energy

LABOUR INTENSIVE

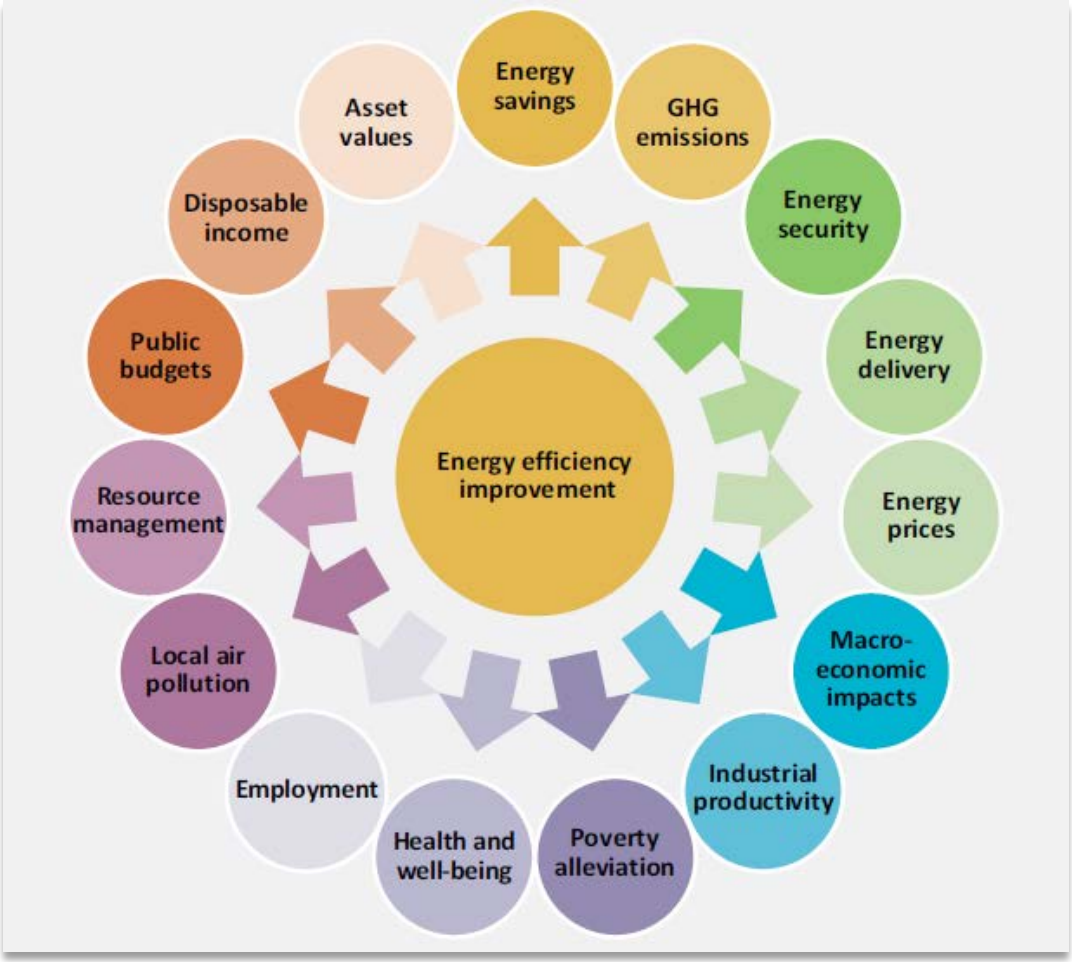
Producing energy from RES don't stop us from looking for a better use of it.

To this end, it is imperative to invest in:

RES, energy efficiency and distributed energy

A *public-private, common policy* promoting "**electric revenue**", from conventional fuels to RES

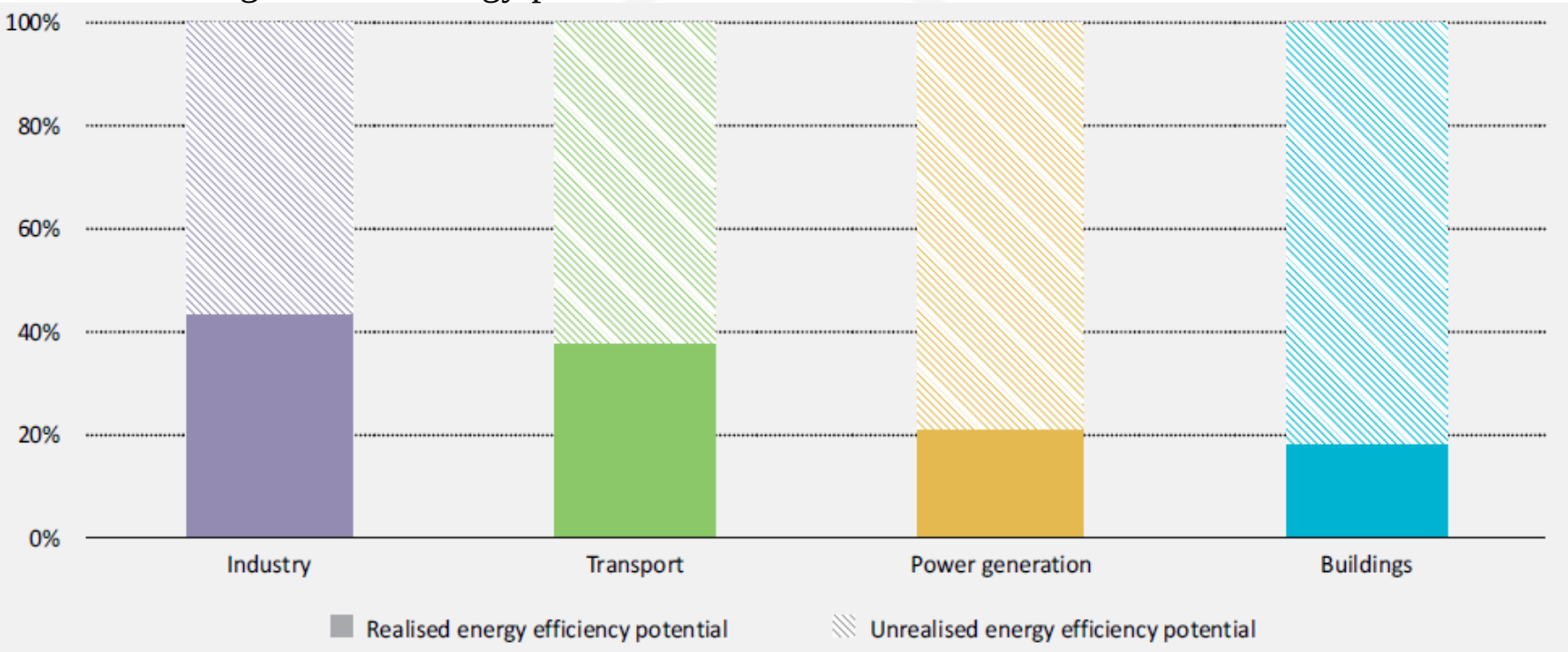
Multiple benefits



*Source: IEA, Capturing the Multiple Benefits of Energy Efficiency, 2015

A paradigm shift for emissions reduction

Energy efficiency may contribute to a 40% of 2050 CO_2 reduction targets, with the hugher rates in terms of costs and benefits*.
IEA 2035 scenario estimates a significant impact of energy efficiency measures without reconsidering current energy policies:



*Source: IEA, Capturing the Multiple Benefits of Energy Efficiency, 2015

Multisectoral impacts

Personal

- Health and well-being
- Reducing poverty
- Increasing personal revenue

Sectorial

- Higher productivity and competitivenes s
- Better infrastuctures for energy supply
- Renovation for a higher quality

National

- Boosting employment
- Reducing consumption and public budget
- Energy security
- Macroeconomic impacts

International

- Reducing GHG
- Lower energy costs
- Better use of natural ressources
- Towards higher development

*Source: IEA, Capturing the Multiple Benefits of Energy Efficiency, 2015

EE Benefits for industries

Expecially in the industrial sector, energy efficiency brings:

Lower energy consumption

GHG Reduction

Lower energy costs

High environmental, socio-political impact

Financial benefits through White Certificates (EEO scheme)

Crucial role in marketing, energy services and institutional activity

Better business profile

New role in the energy and environmenal sectors

What is an ESCo?

ESCOs

Legislative Decree 115/2008 Directive 2006/32/EC

"a natural or legal person that delivers energy services and/or other energy efficiency improvement measures in a user's facility or premises, and accepts 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 improvements and on the meeting of the other agreed performance criteria".

UNI CEI11352:2014 *for general requirements*

- To provide energy services as defined by UNI CEI EN 15900 Standard;
- To be able to perform such tasks with proper organizational, diagnostic, project management, financial capabilities;
- To offer energy performance guarantees accepting financial and technical risks;
- To get the payment of such services based on the improvements acheived and on saved energy.
- To constantly report to the client on measured data and improvements.

Main activities of ESCos

The ESCo are the reference operator for all energy issues and finalize their activities to achieve maximum energy savings, through a **strategic** and **operational** approach on the entire chain.

Energy Efficiency

Renewable Energy

Distributed Generation

- Energy Audit
- Design, implementation and maintenance activities
- Energy and environmental monitoring
- Management System for Energy - ISO 50001
- Management of economic incentives: Conto Termico, White Certificates (TEE), Emission Trading Certificates (CIC), CO_2 emission quotas
- Financial resources procurement
- Training, Communication, Information

What is an ESCo: value-added services

Remuneration based on guaranteed saving

Providing project financing: Third Part Financing (TPF)

Starting with small initial investments

Qualified Project Managers and professionals

Reducing energy consumption and operational costs

Certifying improvement measures with tradable “White Certificates”

Energy Management (ISO 50001) Quality Management (ISO 9001)

Project Planning: First steps

- **Energy Audit**
- First step towards energy efficiency improvement for a building or facility, involving:
  1. **Data collection** and bill auditing on energy consumption and current expenses
  2. **Data Analysis** identifying main concerns about energy use and waste to reduce energy costs
  3. A tailored **Action plan** including EE **cost-effective solutions** and project implelmentation.

- **Energy Management System**
- Systemic approach on continuous improvement aming to manange and optimize energy use and consumption.

EE Project Process

Initial stage
Critical Analysis
Primary data detection

Data collection on effective consuption, useful for the energy audit to better correspond to real conditions

ENERGY MONITORING

EED 2012/27/EU

PROJECT VALIDATION

APPLICATION FOR WHITE CERTIFICATES

TPF CONTRACTS

COMPLIANCE CHECK

ENERGY MONITORING

WHITE CERTFICATES MANAGEMENT

ENERGY MONITORING

COMPLIANCE CHECK

DATA DETECTION

ANALYSIS

- EME
- Energy Audit
- Energy Management System(50001)
- Feasibility study
- Initial energy certification

DESINING

- Project definition
- Indentifying suppliers
- Economic-Financial Plan
- Analysis on environmental, economic, financial impacts
- Coordination
- EME

IMPLEMENTATION

- Identifying and tracking financial support
- Project management
- Energy Efficiency and Distributed Energy measures
- Project evaluation and check-up of implementation results.

MANAGEMENT

- Testing, start up
- Final energy certification
- Ecological footprint and environmental balance sheet
- Post-delivery managment and maintenance - EME
- Old plants removal

PERFORMANCE CHECK

Final stage
Performance Analysis

Monitoring achieved performances and actual consumption once EE measures have been implemented

FE | federesco

Benefits of implementing EE projects

- Cost effectiveness
- Emission reduction
- Financial incentives
- Reputation enhancement

Energy Management System

Evaluations and checks of energy management can be helpful for companies for the identification of the changes to implement in order to reduce energy costs and consumption.

Esco model and EPC

According to the Energy Efficiency Directive 2012/27/EU (EED), Energy Performance Contracting *"means a contractual arrangement between the beneficiary and the provider of an energy efficiency improvement measure, verified and monitored during the whole term of the contract, where investments (work, supply or service) in that measure are paid for in relation to a contractually agreed level of energy efficiency improvement or other agreed energy performance criterion, such as financial savings."* EPC projects may also include additional services related to efficient energy supply.

Third-Party Financing (TPF)

For the purpose of the Council Directive 93/76/EEC 'third-party financing' *"means the overall provision of auditing, installation, operation, maintenance and financing services for an energy efficiency investment, with recovery of the cost of these services being contingent, either wholly or in part, on the level of energy savings."*

A public or private subject willing to reduce energy consumption has thus to choose between the follwing two options:

WITHOUT TPF

Identifies suppliers and allocates its own financial resources to carry out the intervention

Initial costs are totally on the CLIENT

WITH TPF

Identifies an ESCo detecting both suppliers and financial resources

Initial costs are totally on the ESCo *

* depending on the availability banking

federesco

TPF Possible scenarios

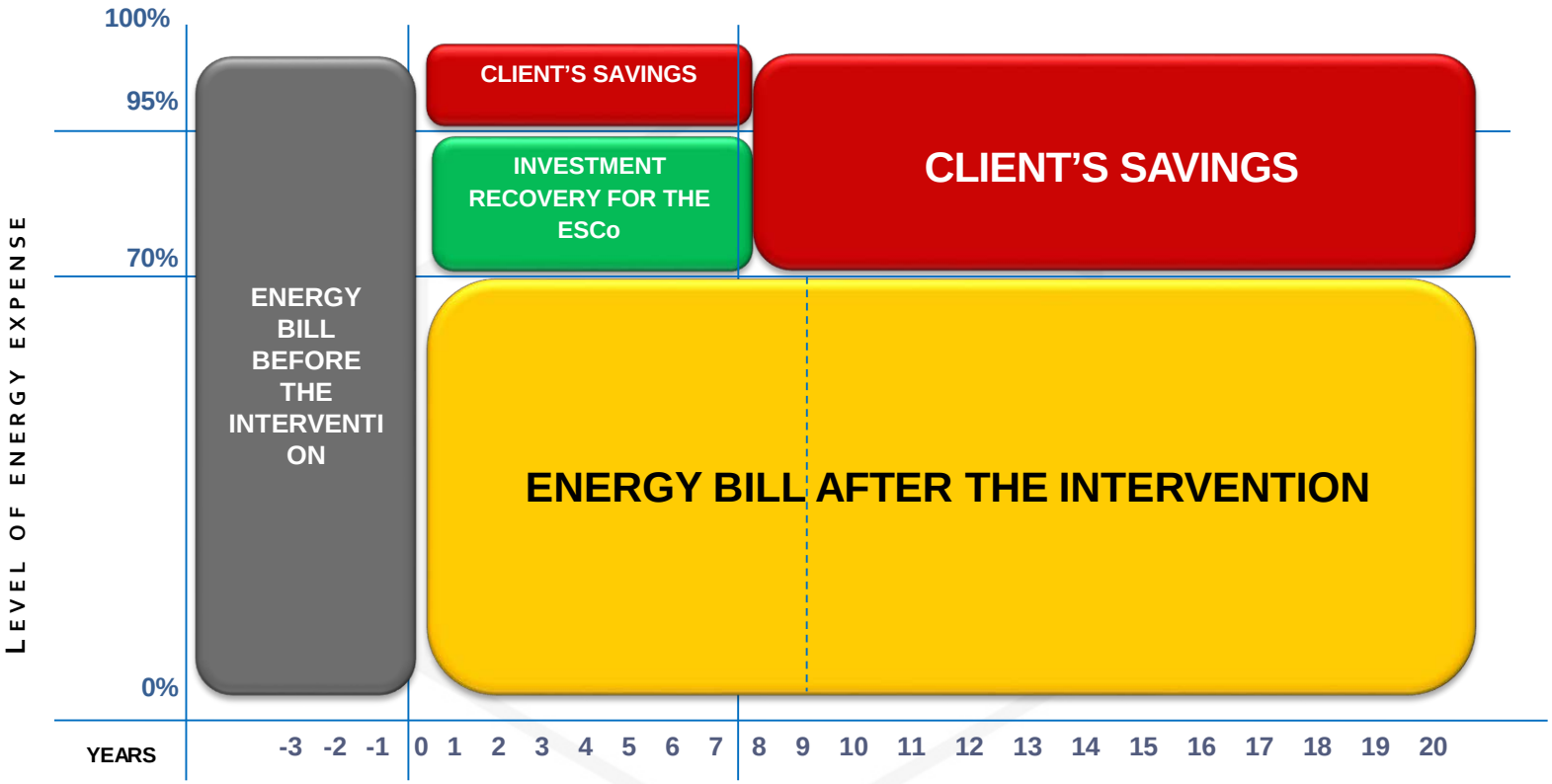
Energy Bill	Total investment	Expected savings
100 €	120 €	30%/year

Pay-back time

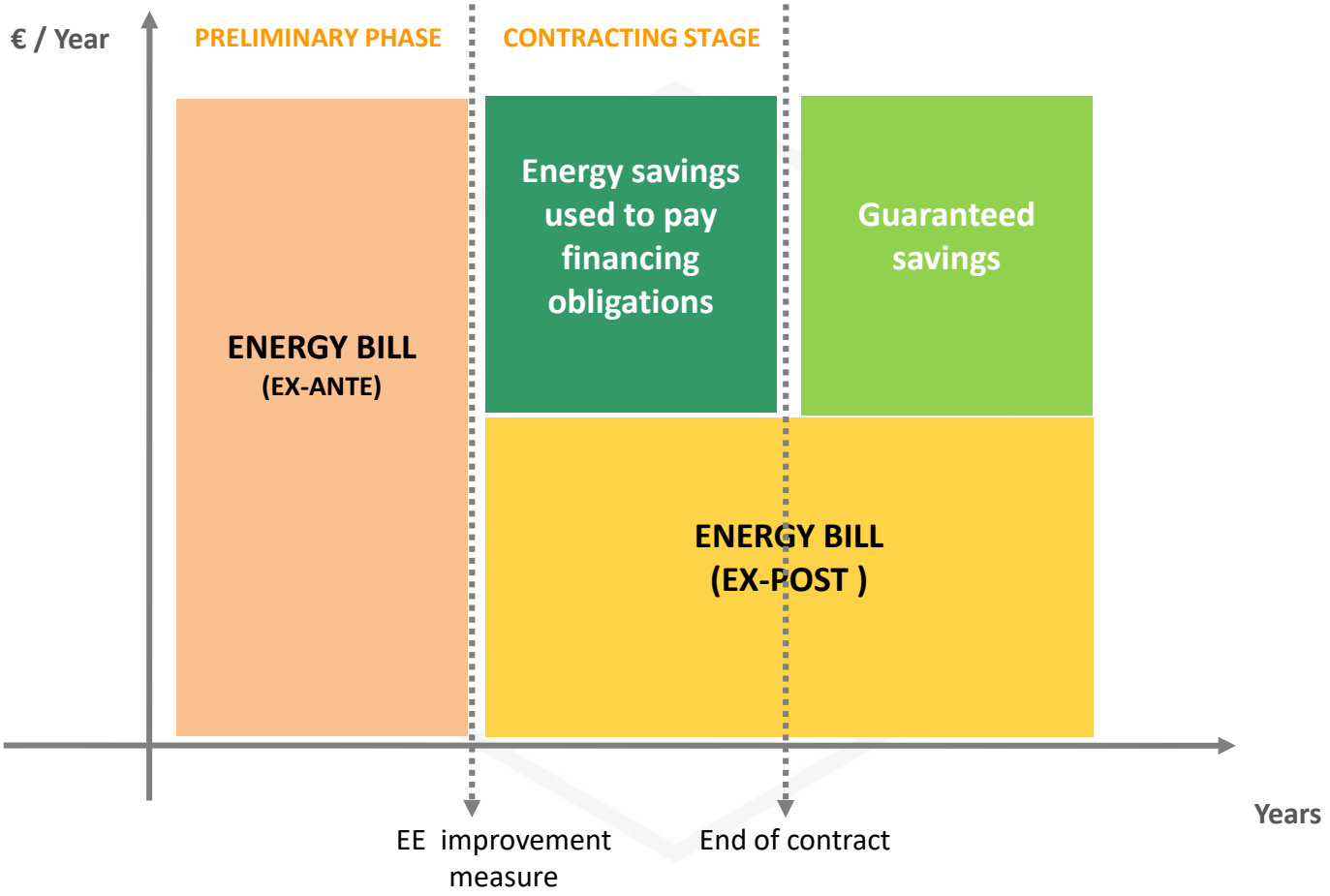
1° Scenario	2° Scenario	
In **5 years**	In **15 years**	
100% of total savings to the **ESCo**	50% Of total savings to the **client**	50% of total savings to the **ESCo**

Third-party Financing (TPF)

TPF EXAMPLE



TPF & EPC


€ / Year
PRELIMINARY PHASE
CONTRACTING STAGE
ENERGY BILL
(EX-ANTE)
Energy savings used to pay financing obligations
Guaranteed savings
ENERGY BILL
(EX-POST)
Years
EE improvement measure
End of contract

Risk management

- Due diligence of financing institution
- Standardised methodologies and results

→ **Verification and validation**

- Technical commitment and guarantees from the ESCo

→ **Performance bond**

- Lack of financial resources by the ESCo side
- Clients are not willing to finance by equity
- Lack of financial guarantees both by ESCos and by client

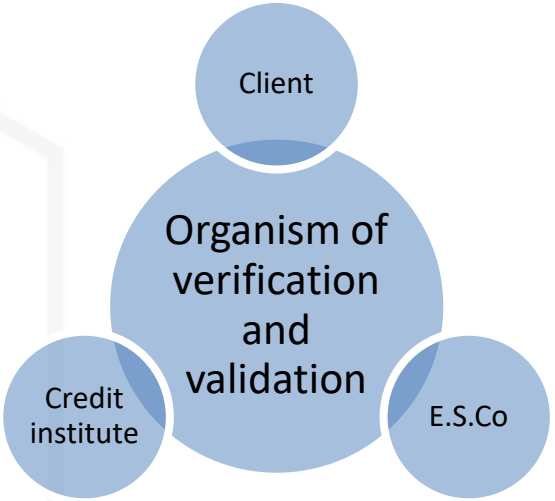
→ **TPF fund**

→ **Agreements with banks**

Verification and validation of EE projects

Minimizing risks of failure of an intervention for a EE project intervention:

- Incorrect goals
- Design lacking
- Incorrect assessment of incentives
- Inadequate contractual schemes
- Risk management not provided
- Incorrect evaluation of possible future scenarios



In order to support the stakeholders of an energy efficiency intervention, it is necessary to have a third party having the following features:

- ✓ Independency and impartiality
- ✓ ISO/IEC 17020 certification
- ✓ Standard check list for each stage of the project

Approaching solutions

More effective use of funds and tools

Assistance and aggregation

De-risking

Smart finance for smart buildings

315 bn EUR
(21 % for energy)

18 bn EUR for energy efficiency
2014-2020

Federesco Partners

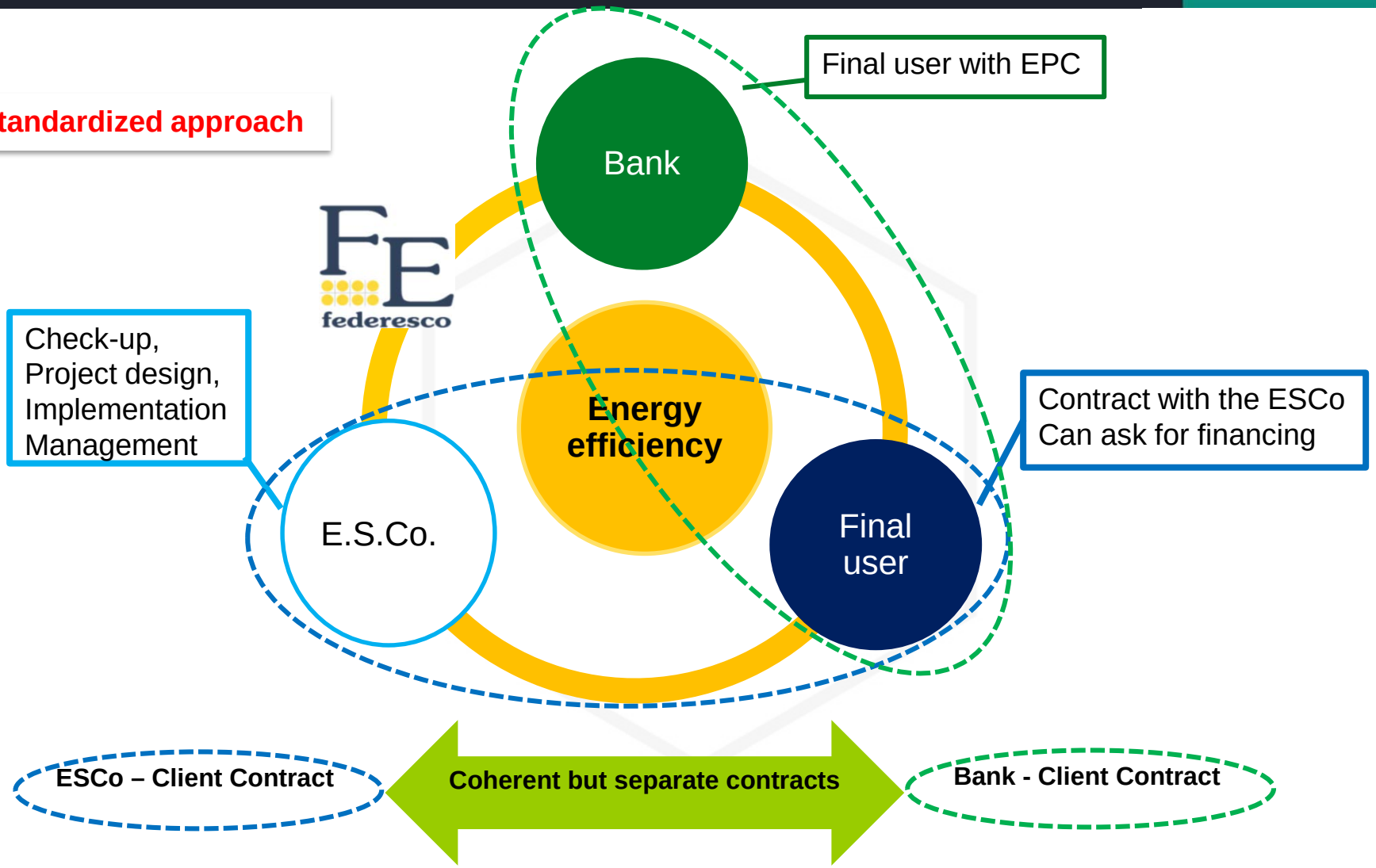
Federesco has a wide range of partnerships with institutional bodies, banks and R&D institutes.

Among the most renowned :

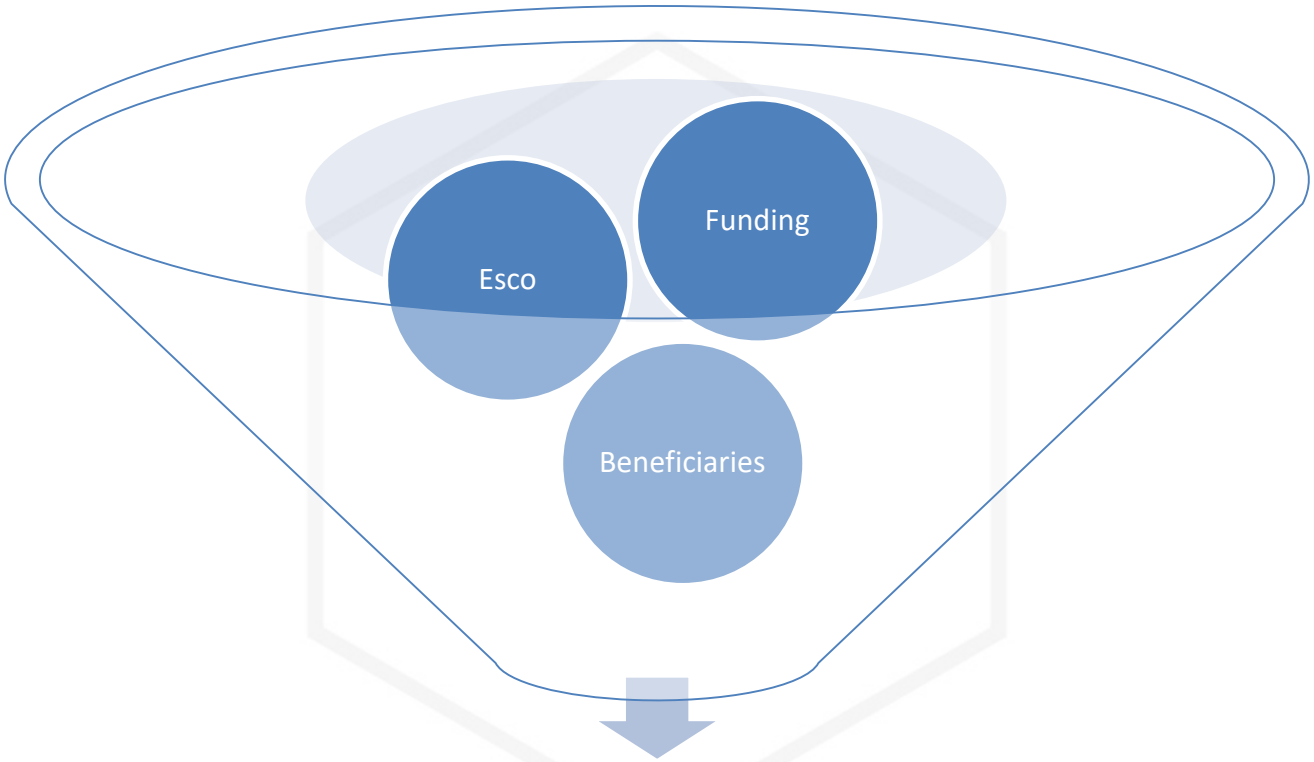
- The National Agency for New Technologies (ENEA)
- GSE), state-owned company for RES promotion and support
- **Intesa Sanpaolo**
- **Banca Prossima**
- WWF Italia Onlus

Banking Scheme Agreement

Standardized approach



From theory to practice: new business models

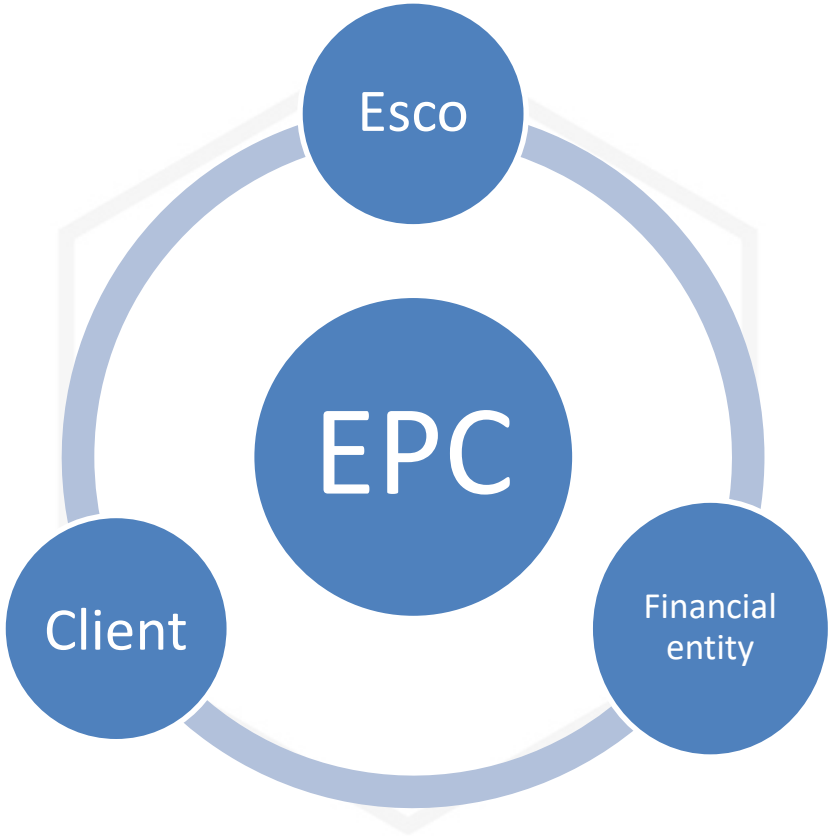


…Why is the EPC market still limited?

Clear EPC for successful projects

Different subjects and areas of competence

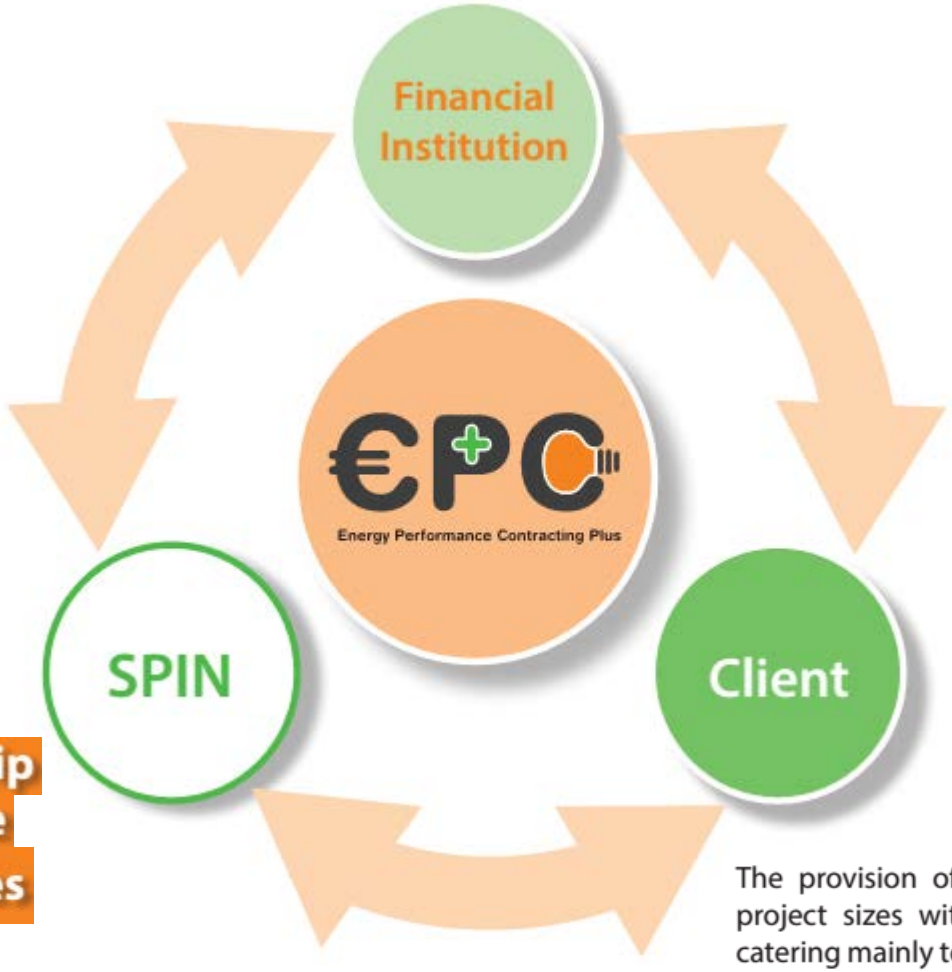
Risk perception



Trasparency and simplification

Risk management and mitigation

The EPC+ project: cooperation vs competition



SME Partnership for Innovative Energy Services

The provision of energy services for low-medium project sizes with medium-high guarantee levels, catering mainly to the private sector, is the gap in the market that the EPC+ service is targeting.

The EPC+ project: results

An EPC+ service is one that is:

- Realized by a SPIN
- Performance-based and
- Innovative, by implementing either:

(1) an existing service in a new sector, (e.g. in the sector of SME's or multifamily buildings),

(2) an innovative service in a sector where performance based projects are already realized and

(3) a combination of both.

Training Material for SPINs

Technical toolbox

Financial tools

The Italian SPIN

Energy Efficiency Network Europe

FE federesco

VPE Validazione Progetti Energetici

Jpe 2010 CONSORZIO PRODUTTIVO SERVIZI ENERGETICI ENERGY SERVICE COMPANY AMBIENTE-ENERGIA

Aura Energy s.r.l.

RENOVA ESCo

COSTRUZIONI COAF S.R.L. ESCo

kairōs NEW ENERGY FOR YOUR BUSINESS

SMEPA

esco® Esco Sardinia

EdS INFRASTRUTTURE Engineering & Construction

brentenergy ENERGY SERVICE COMPANY

esco® Esco Italia S.r.l.

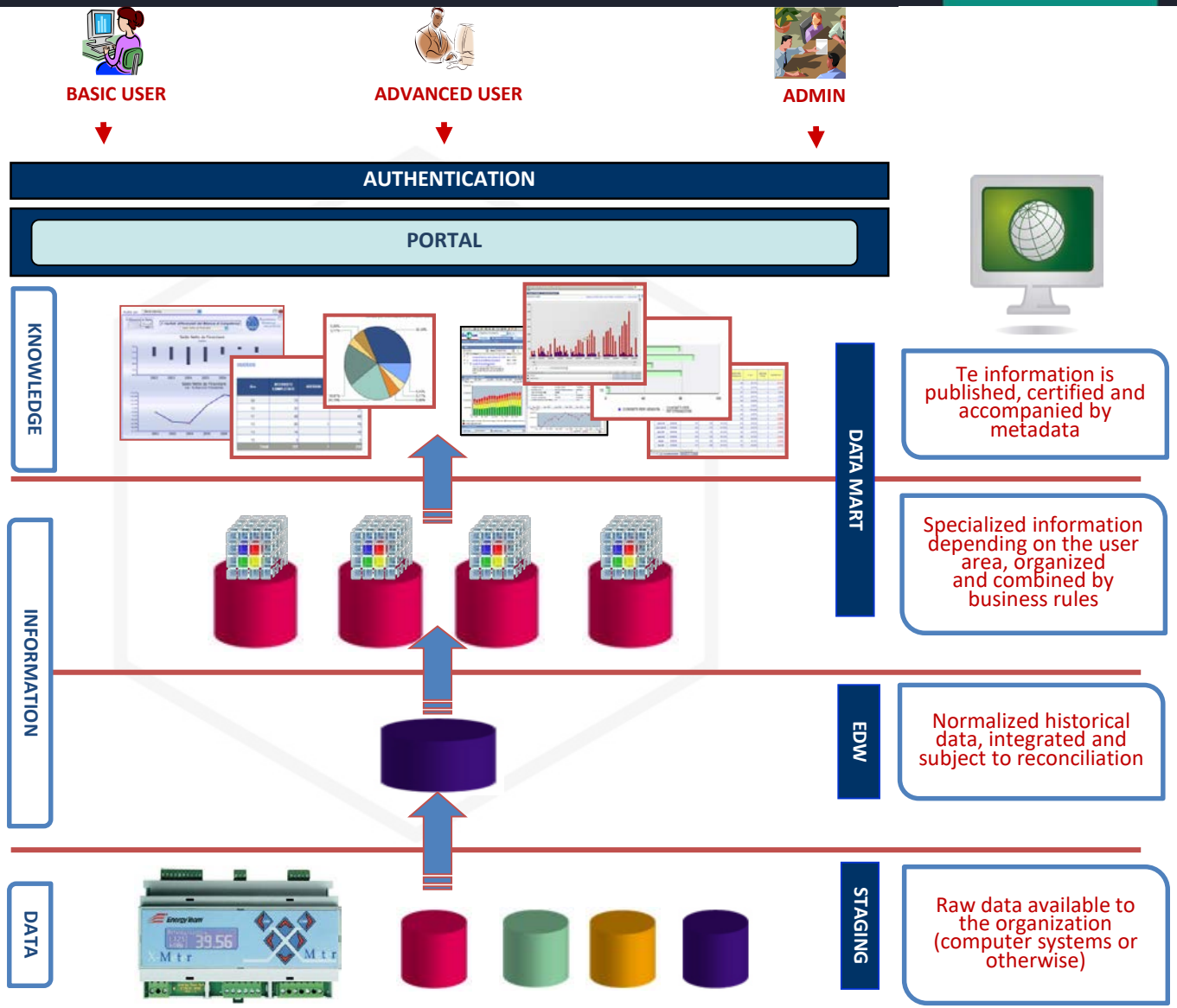
Old case study but still an evergreen

THE INSTALLATION OF AN **INTELLIGENT ENERGY MANAGEMENT SYSTEM** ALLOWS TO:

- ✓ MAKE A REAL-TIME DETECTION OF ALL THE INFORMATION ON ENERGY USE THROUGH VARIOUS TYPES OF **SENSORS** COMMUNICATING WITH **SMART METERS**
- ✓ PROCESS DATA AND MANAGE THE INFORMATION THROUGH THE CENTRALIZED **DATABASE**
- ✓ UNDERSTAND THE ASSESSED SYSTEM AND THE IMPLICATION OF EXTERNAL ELEMENTS SUCH AS CLIMATE OR ATTENDANCIES
- ✓ SUPPORT DECISION-MAKING AND PLAN PROCESSES, STIMULATE BEHAVIORAL CHANGE

The system

- A DBMS integrates and correlates:
  - ✓ Energy measurements;
  - ✓ Environmental data;
  - ✓ Structural features of buildings;
  - ✓ Plant data;
  - ✓ Usage data or production;
  - ✓ Characteristics of the supply contracts.



CHANGE BEST

The System

MOVING FROM PUNCTUAL DATA TO INFORMATION, KNOWLEDGE, CAPABILITY:

- ✓ THE DATA ARE ACQUIRED FROM VARIOUS SOURCES AND INTEGRATED IN A SINGLE ENVIRONMENT, ALLOWING A **CROSS-ANALISYS** OF INFORMATION HAVING DIFFERENT SYSTEMS PROVENIENCE
- ✓ THE FOCUS SHIFTS FROM PUNCTUAL DATA TO KNOWLEDGE BY THE **AGGREGATION OF DATA** ACCORDING TO SPECIFIC CRITERIA AND A REPROCESSING ACTIVITY (KPI, WHAT-IF ANALYSIS, FORECASTING MODELS, ETC.)
- ✓ THE PRESENCE OF SUMMARY AND DETAIL DATA PROVIDES **BOTH A GLOBAL AND ANALYTICAL VIEW** OF CONSUMPTION WITH A HIGH LEVEL OF GEOGRAPHICAL AND HISTORICAL ELABORATION
- ✓ THE SYSTEM OFFERS THE NECESSARY ELEMENTS AND **INDICATIONS** ON THE DIFFERENT POSSIBLE INTERVENTION

CHANGE BEST

Real time measures

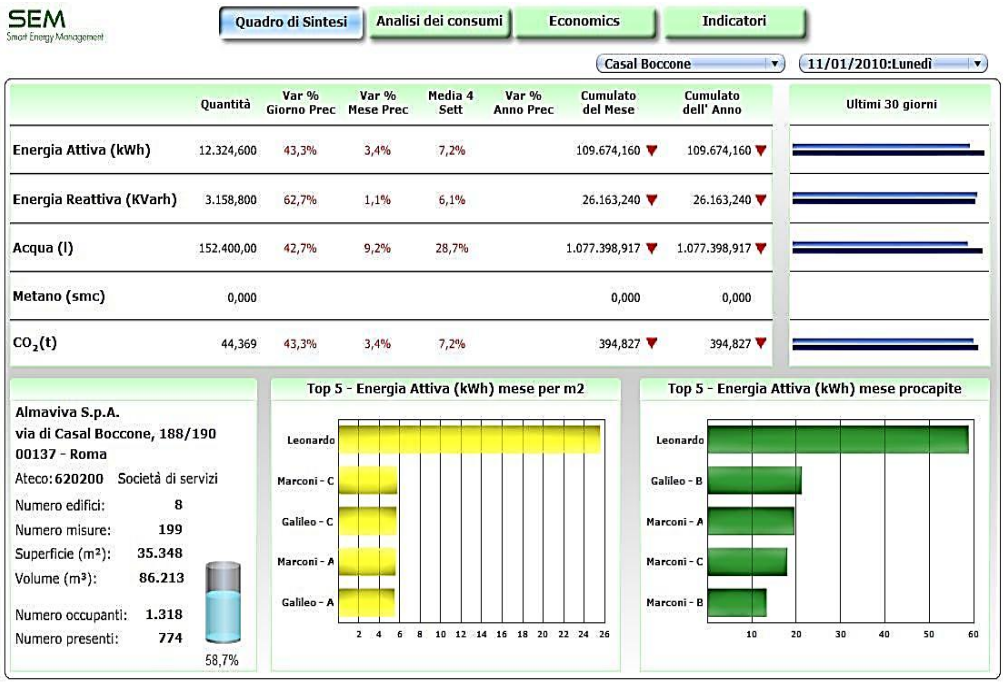
THE SYSTEM:

- ✓ GEOGRAPHICALLY IDENTIFIES ALL MONITORED BUILDINGS
- ✓ GRAPHS EACH BUILDING AND ITS PARTS
- ✓ AGGREGATES GROUPS OF MEASURES IN ACCORDANCE WITH A PERSONALIZED LOGIC
- ✓ SHOWS THE PERFORMANCE CURVE OF EACH DAILY MONITORED PARAMETER AND ITS INSTANT VALUE

CHANGE BEST

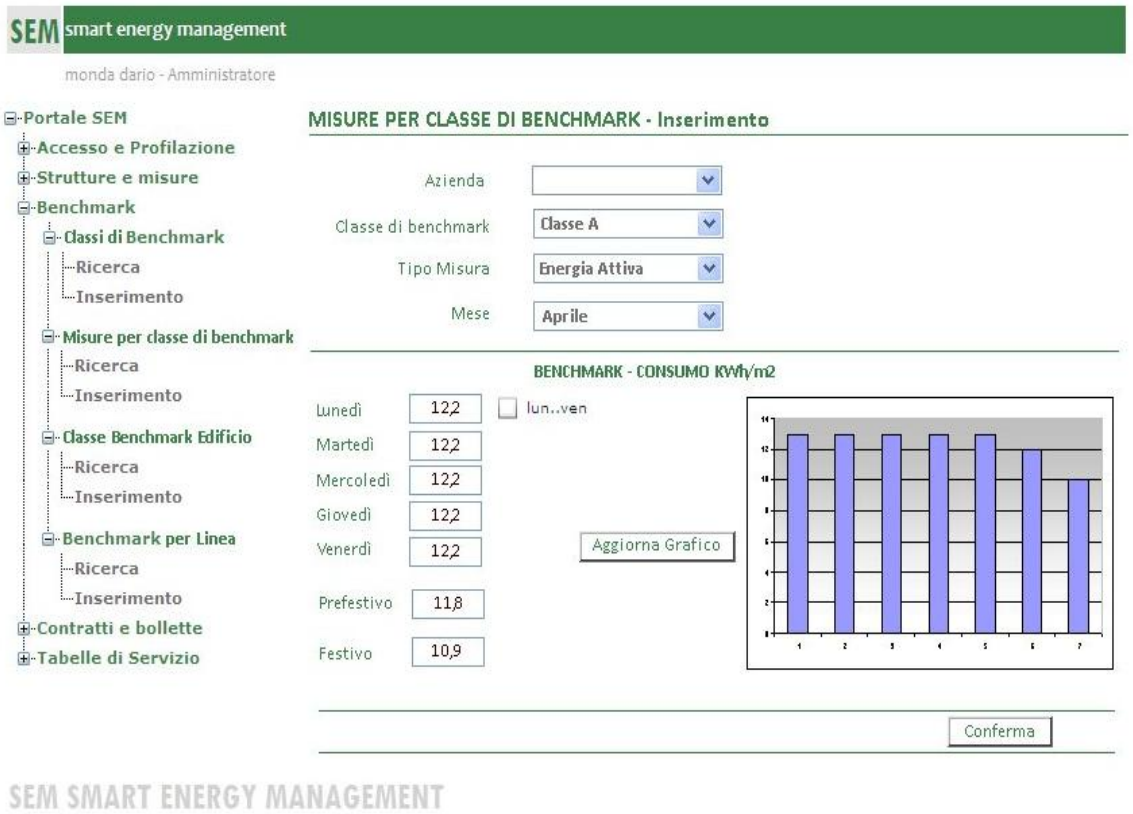
Basic features of the platform

- ✓ MONITORING THE DAILY, MONTHLY AND YEARLY PERFORMANCE OF EACH SINGLE BUILDING'S CONSUMPTION COMPARED TO HISTORICAL DATA OR BUDGET
- ✓ CALCULATE CO2 EMISSIONS, DIRECT AND INDIRECT
- ✓ ANALYZE THE EVOLUTION OF ANY KIND AND SIZE OF DATA AND ITS POSSIBLE ELABORATION
- ✓ HIGHLIGHT PLANNING ERRORS AND ABNORMAL CONSUMPTION
- ✓ OPTIMIZE THE PROCESSES
- ✓ REALIZE PARTIAL REPORTS, EXPORT DATA AND GRAPHS



CHANGE BEST

Back office



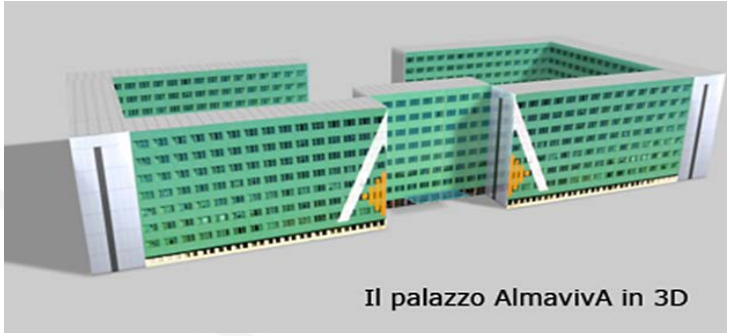
In the Manager's area, the administrator is able to:

- ✓ enter new data, with details of sites, buildings and lines to be monitored
- ✓ manage users' pirofile
- ✓ manage contracts, acquire data from billing, simulate different scenarios of consumption
- ✓ insert reference values (benchmarks) for a class of buildings, comparing the measurements

CHANGE BEST

Results

80 DATA ACQUISITION DEVICES DISTRIBUTED IN 7 BUILDINGS AND CONNECTED VIA LAN, MORE THAN 80 DIFFERENT REAL-TIME MEASUREMENTS, DB REMOTE SERVER IN THE COMPANY'S DATA CENTER, SAME INFRASTRUCTURE AND APPLICATIONS ARE AVAILABLE IN THE WEB MODE.



- ✓ ALMAVIVA HAD A YEARLY SAVING OF APPROXIMATELY 23% OF ELECTRICITY CONSUMPTION ONLY DUE TO THE RATIONALIZATION OF ITS WORKING UNITS (AS A CALL CENTER)
- ✓ THE ASSESSMENT, MONITORING AND MAINTENANCE OF EQUIPMENTS AND PLANTS FURTHER REDUCED CONSUMPTION OF ANOTHER 10%
- ✓ THE IDENTIFICATION OF CRITICAL MANAGEMENT OF CONDITIONING AND UPS BROUGHT A FURTHER SAVING OF ANOTHER 12%

YEAR	MTEP	EMPLOYEES	MTEP X UNIT
2008	323	1000	0,32
2009	351	**2000**	**0,18**

CHANGE BEST

BUSINESS IMPLEMENTATION

FEATURES, PROS AND CONTRAS:

- ✓ **APPLICATIONS AND CLIENTS:** BUILDINGS, OFFICES, PUBLIC SECTOR, COMPANIES, HOSPITALS, HOSPITALITY AND SPAS, AIRPORTS, GENERATION PLANTS, TRANSPORT, ETC
- ✓ **CONTRACTUAL RELATIONSHIPS:** AUDITING, PURCHASE, RENTING

REVENUE	OPERATING COSTS	GROSS MARGIN
100	67	33

THE CLIENT'S INVESTMENT IS EQUIVALENT TO ABOUT THE 3% OF THE ECONOMIC VALUE OF ITS ANNUAL ENERGY CONSUMPTION

CHANGE BEST

Energy efficiency: a behavioural change

Energy efficiency projects implemented by enterprises

- support management and control
- boost quality enhancement
- free financial resources to be used for the core business

C

Thank you!

The Italian ESCo Association

Piazza della Libertà, 9 - 50129 Florence - Italy

Tel: +39 055 2344262 - Fax: +39 055 2639736

presidenza@federesco.org - www@federesco.org