Open Living Lab Days
Krakow, 1 september 2017

Leveraging Behavioral Change for Energy Efficiency in Public Buildings
Green Schools Living Lab and TOGETHER project

Antonio Zonta – Provincia di Treviso

Introduction
The Province of Treviso: localization and figures

Antecedents

The Green Schools Living Lab

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New Ambitions: TOGETHER

The new, participated Energy Management System

A practical application, by
Leonardo Frasson
Marco Pallaro
Edoardo

The province of Treviso

- Population: 884.353 (2016)
- Area: 2.476,68 km²
- Density: 356,62 in/km²
- 8th most populous and 10th most

Estates and Users

Treviso Province Administration Properties

Tipology of buildings	Number of buildings	Total size [m²]	Total size [m³]	Thermal Energy Consumption [GWh/year]	Users
School	110	415.000	1.467.000	24,0	45.000
Institutional	18	35.000	122.000	1,5	500
Total	**128**	**439.600**	1.589.000	**26,5**	**45.500**

Typologies

- **School buildings** related to **38 Schools**, distributed in **12 municipalities of the province of Treviso;**
- **Institutional buildings** mainly belonging to the Province Administration

PROVINCIA DI TREVISO

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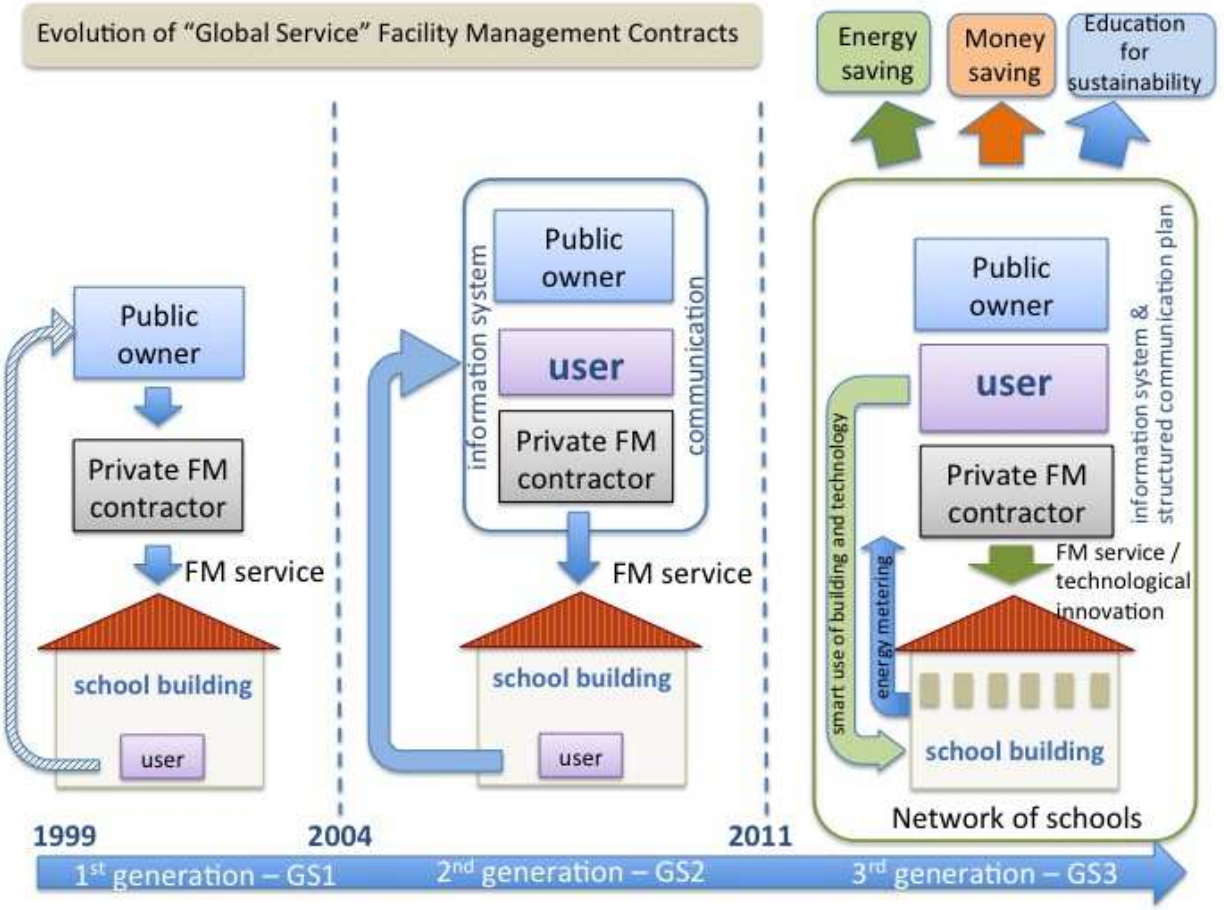
The evolutionary process



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What is a building?

A building is a complex and dynamic object

Its operation requires a daily amount of energy

and maintenance activities,

not independent from how the building is used, and worth money

Which are the elements of a building we can take into consideration to reduce its need for energy, maintenance and money?

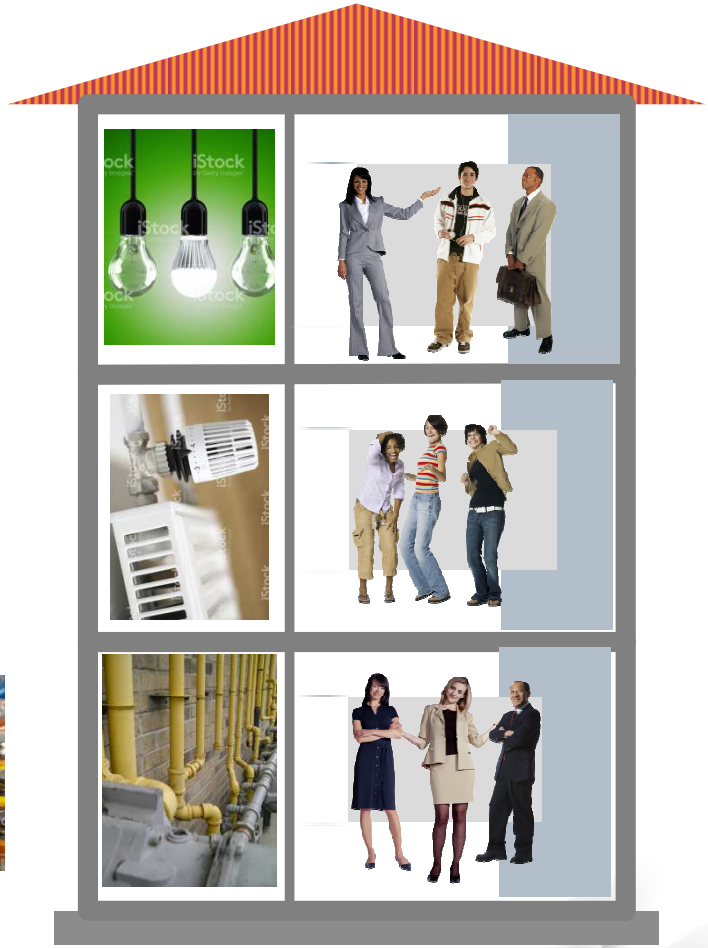
SHELL?

TECHNOLOGIES?

USE OF SPACE?

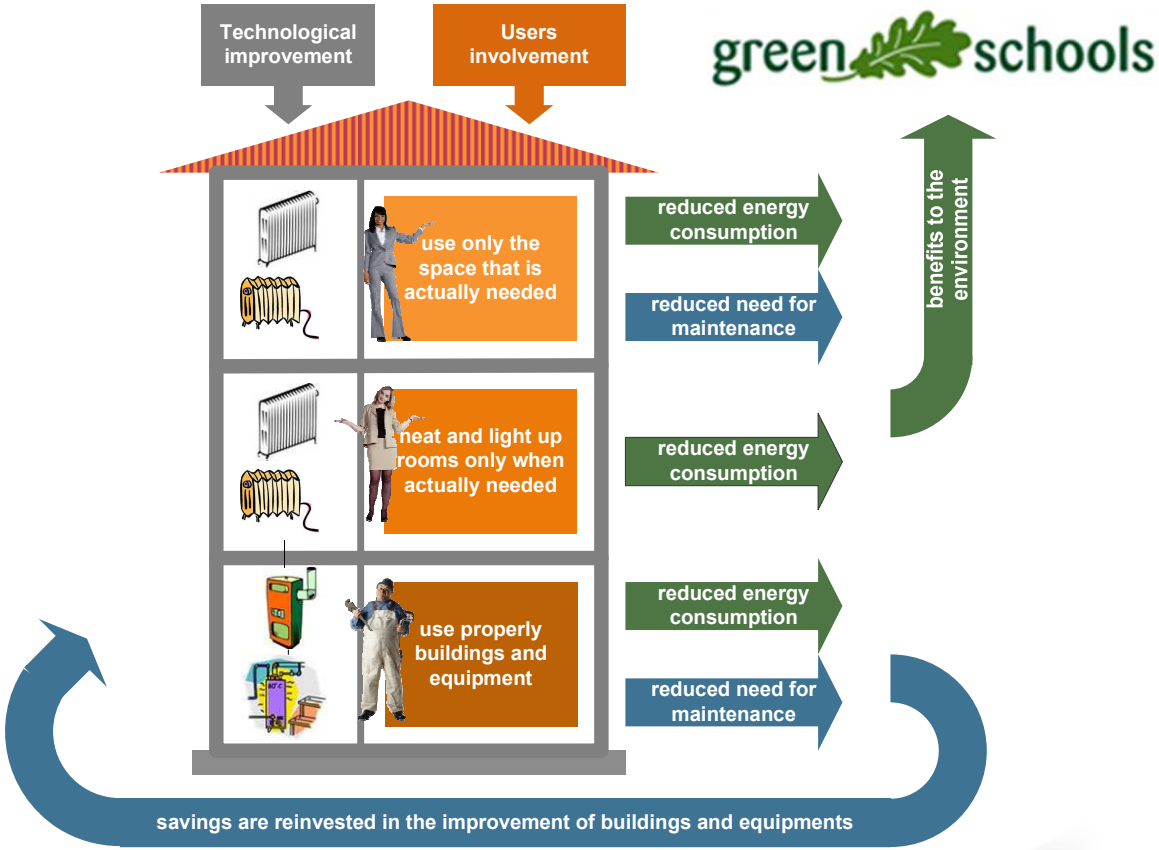
PEOPLE?

OTHER IDEAS?



How should a building work

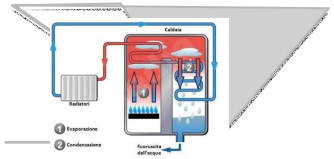
This is the representation of how the operation of a building should be improved. Unfortunately, this process doesn't happen by itself. There are



An energy performance contract between technology and behaviours

Following this approach the Province of Treviso undertook the experience of Green Schools, structured as Project aiming at making school buildings more sustainable by means of an Energy Performance Contract (EP in which **efficiency achieved through a virtuous behaviour of users plays the same role as efficien achieved with technological investments.**

The bid specifications for the contract awarding after public competition were thus specifically tailored order to obtain efficiency goals through a combination of **Technological Innovation and Social Innovation** .



TECHNOLOGICAL

SOCIAL INNOVATION

Approach to new technologies and new forms of organization in which all categories of

The green schools living lab

The social component of the Green Schools project gave rise to the Green Schools Living Lab.

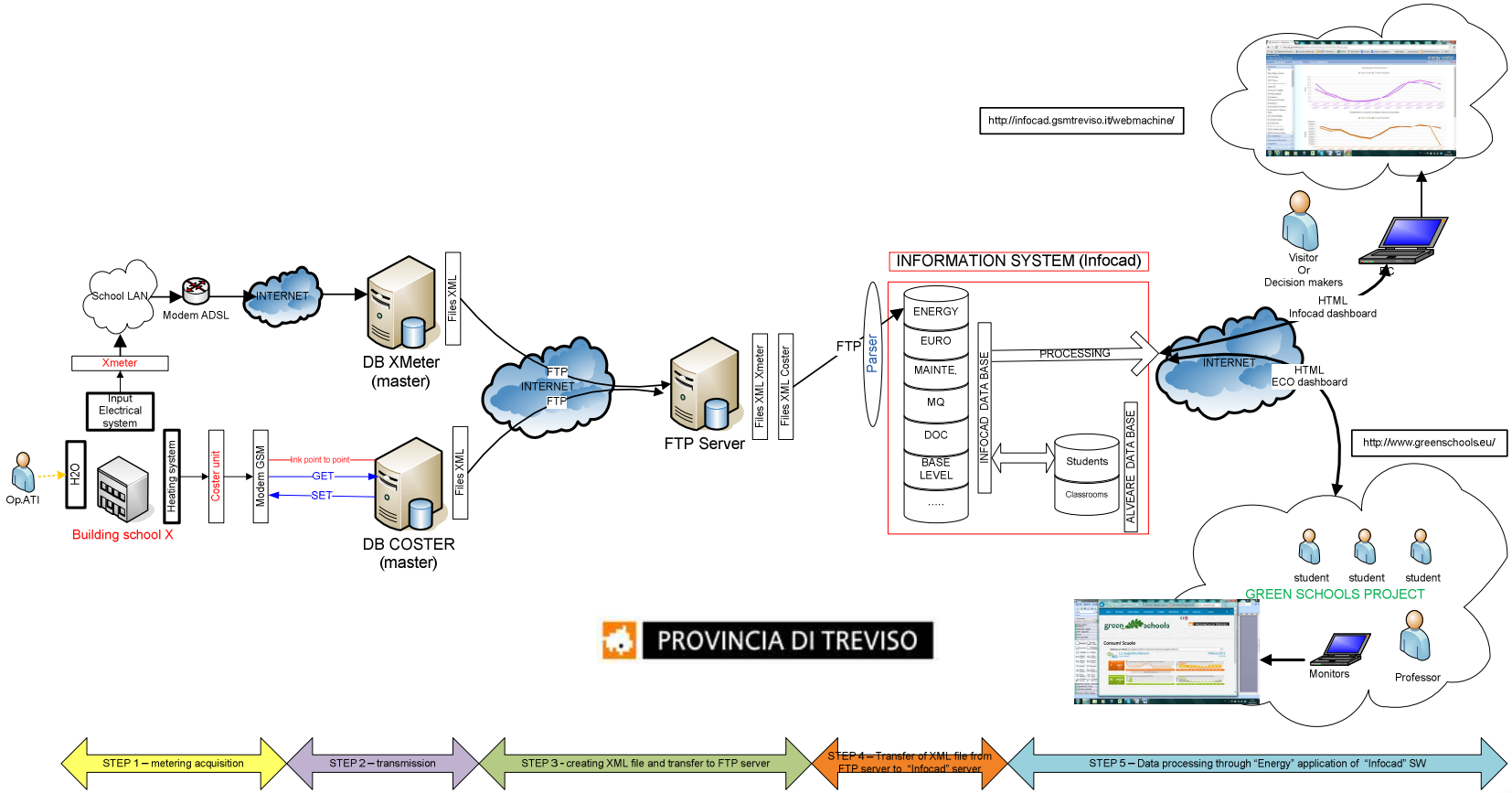
Green Schools LL:

- Aims at changing users behaviour to foster energy saving
- Uses the management of the school building as a model
- Users can actively participate thanks to
  - IT tools used for the managing activities,
  - Specific initiatives, such as the “Green Schools Competition”
- Energy metering is considered a foundamental tool to support Green Schools activities, as it provides feedback to users on the effectiveness of their actions, and measurement of overall results.

Dashboard display: High-res & real-time energy data

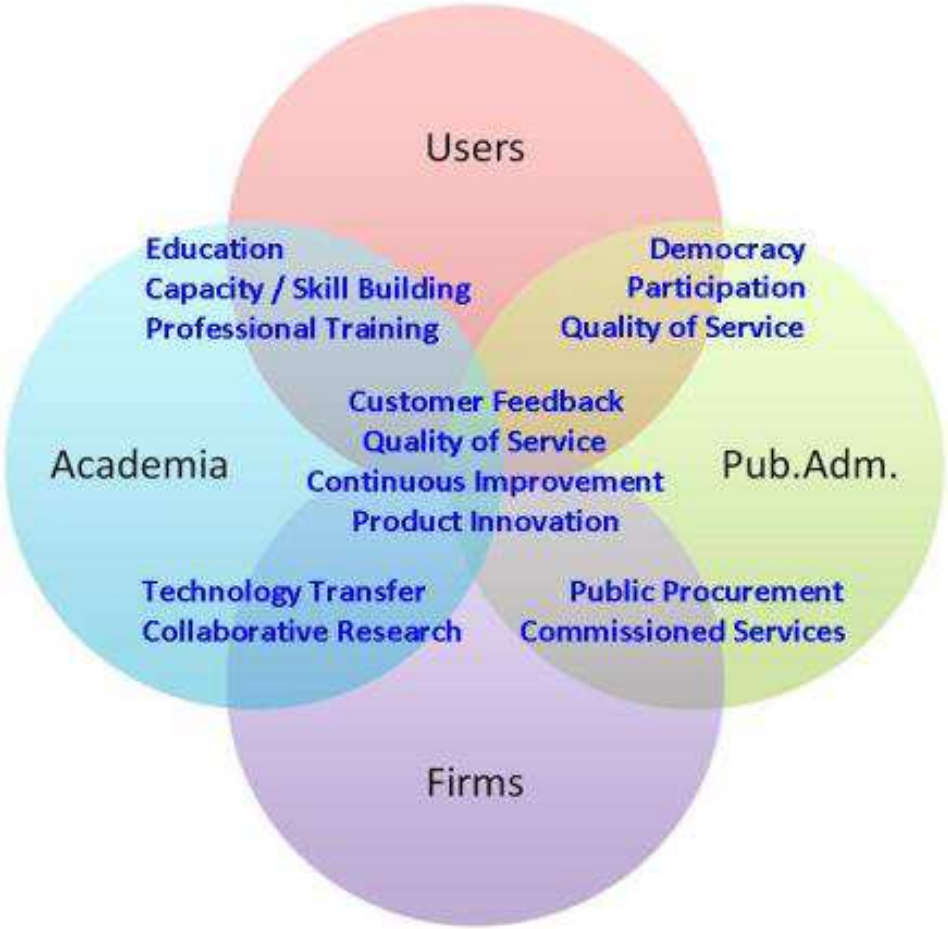
- The availability of high-resolution & real-time data on energy consumption (both thermal and electric) was considered a key factor for success.
- A smart metering system and dashboard displays have been installed in each school building to provide users with real-time evidence of the energy consumption level

Technology for energy consumption data acquisition



the quadruple helix

European Network of Living Labs



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GREEN SCHOOLS COMPETITION

Challenge: Rethinking the evaluation criteria

EVALUATION CRITERIA:

- Thermal consumption
- Electric consumption
- Dissemination initiatives

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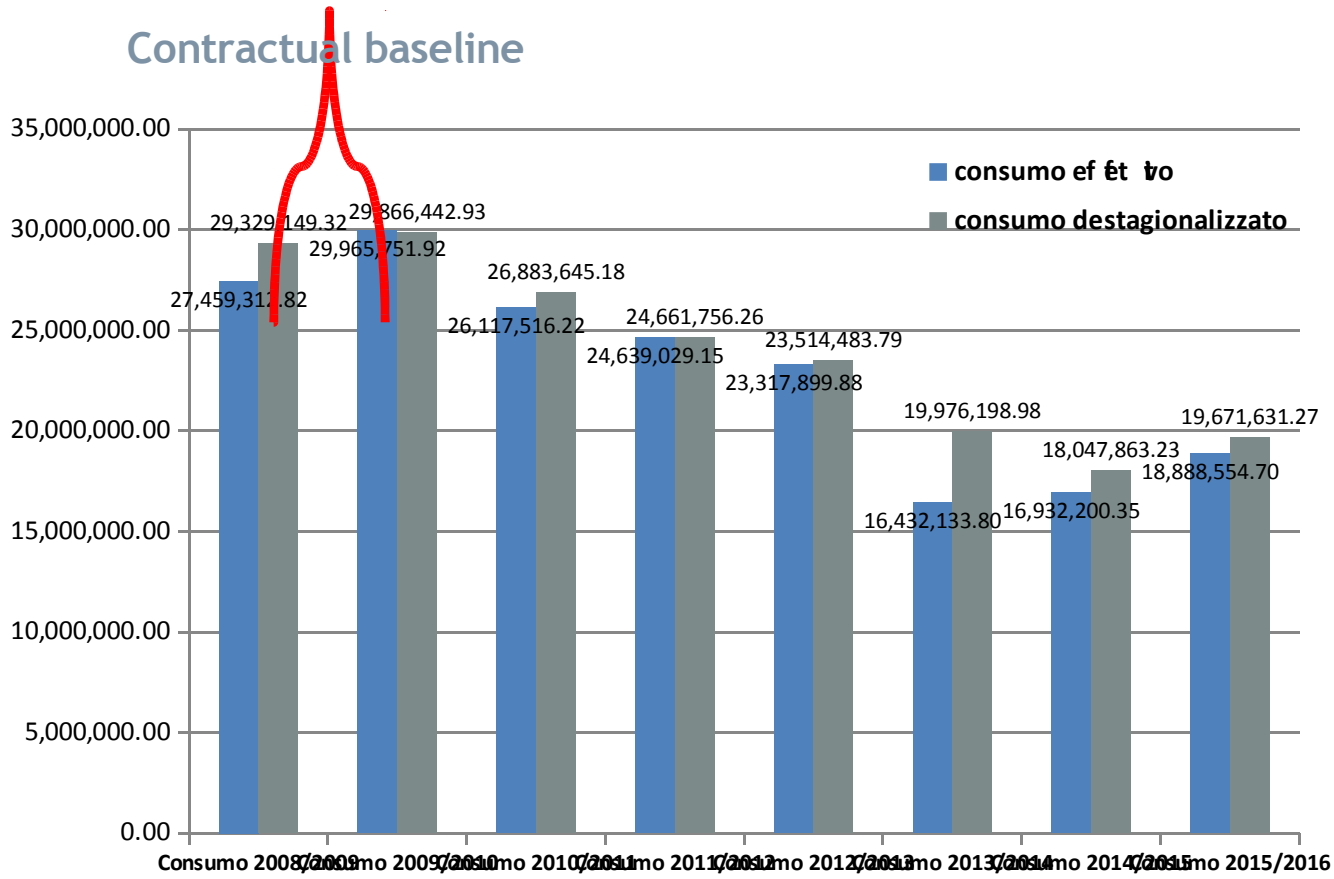
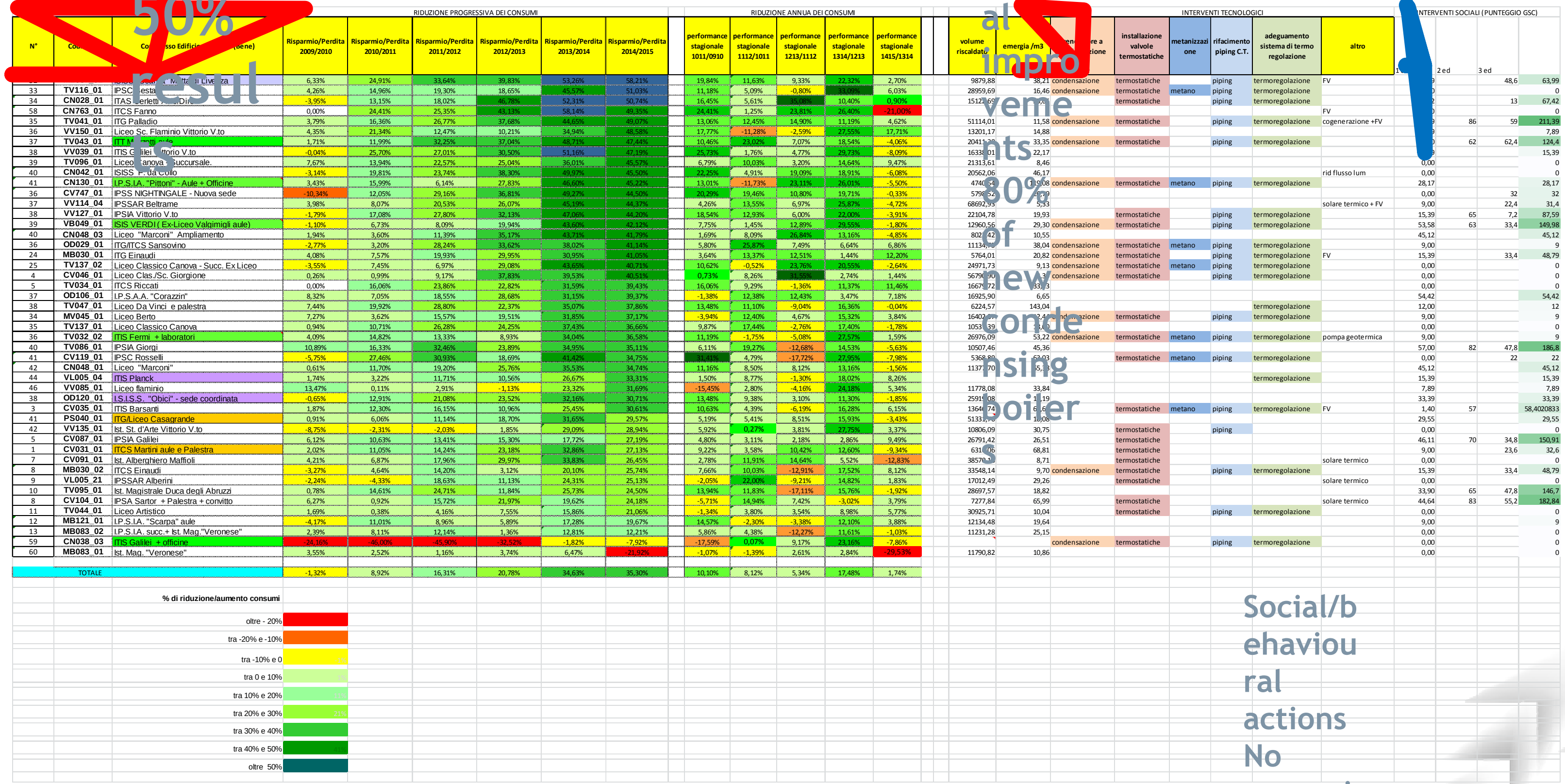
The Aggregated results: Thermal energy consumption decrease



Correlation between actions and results

Top 50% results

65% of technological improvements 30% of new condensing boilers



Social/behavioural actions No appreciable correlation with results

Remarks & lessons learnt from the present phase of Green schools

As proved by the results, the Green Schools experience was so far successfully. The detailed analysis suggest anyhow some remarks:

- The experience was based and focused on an Energy Performance Contract related to Thermal Energy. Users have limited *power of agency* on thermal energy, and consequent limited influence on final results
- Availability of high-resolution energy data is a key-factor for success but the lack of a pre-defined energy saving goal for each school may have affected the level of commitment and the final result
- The results of the Green Schools Competition were made known only at the end of the process, with no intermediate feedback. This may have affected the final result as well.
- Different levels of involvement for different schools

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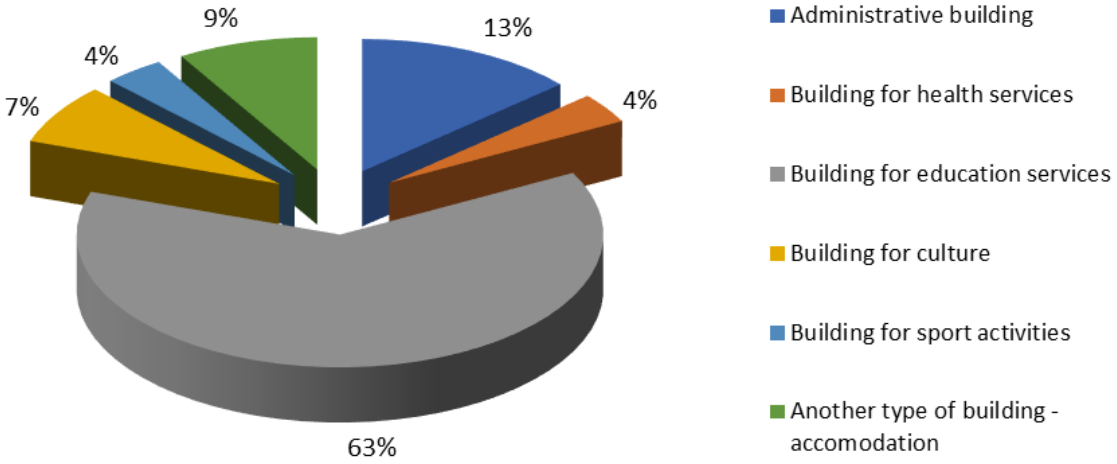
Together

Following and improving the experience of Green Schools

- 8 project partners
- 8 pilot building clusters
- 85 buildings
  - 47 belonging to PPs,
  - 38 belonging to 15 APs



Together key-concepts

- Holistic vision of the building
- Users involvement for specific goals
- High-resolution, real-time energy metering (Smart Metering)
- Behavioural & Analytical DSM
- Financial & Contractual tools/Building Alliance
- Capacity building

Together key-concepts

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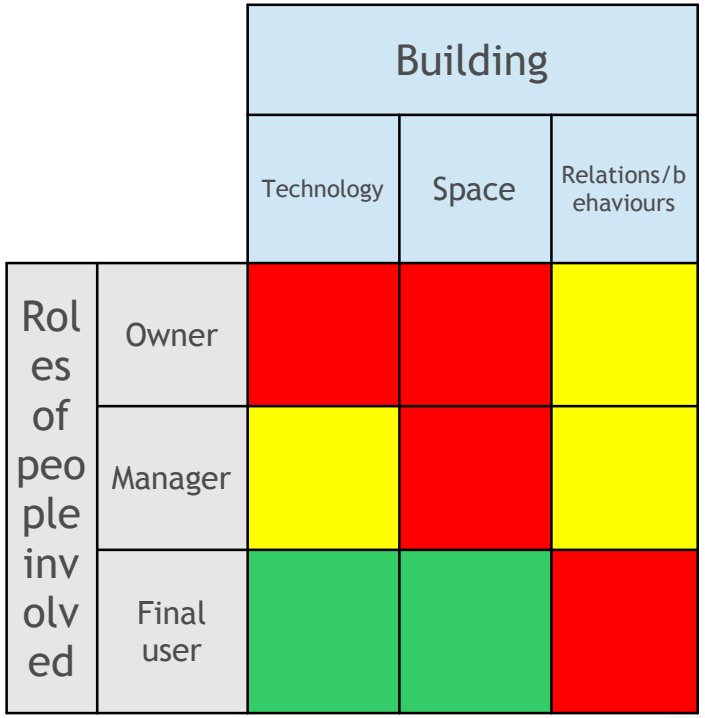

Together key-concepts

- Holistic vision of the building
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- High-resolution, real-time energy metering (Smart Metering)
- **Behavioural & Analytical DSM**
- **Financial & Contractual tools/Building Alliance**
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Behavioural DSM refers to management of the individual energy behaviour of direct consumers,

Analytical DSM focuses on the actions people take to alter energy use as a result of data analysis and being a part of an equipment monitoring.

Motivation to **engagement**: innovative experience

Motivation to **goal**

Engagement: dsm iea equation

RESULT = POTENTIAL X ACCEPTANCE

Together key-concepts

- Holistic vision of the building
- Users involvement for specific goals
- High-resolution, real-time energy metering (Smart Metering)
- Behavioural & Analytical DSM
- Financial & Contractual tools/Building Alliance
- **Capacity building**

X ACCEPTANCE

Motivation - things do not happen by themselves

The main objective of the project TOGETHER is to encourage CE Public Administrations to adopt managerial EE solutions for their Infrastructure stocks buildings included, involving users in the energy management process, tapping into potential energy performance and reaping benefits in terms of payback and public money savings.

Motivation to engagement : being a part of an innovative experience

Motivation to goal

Non sono gli stessi concetti, più o meno, della prima slide ? Inoltre, dobbiamo parlare esplicitamente del ruolo dello sm

Towards a more active users participation (also in the development of new tools)
Cross comparison with other similar experiences in EU

Goals are not very effective if the individual cannot or does not track performance in relation

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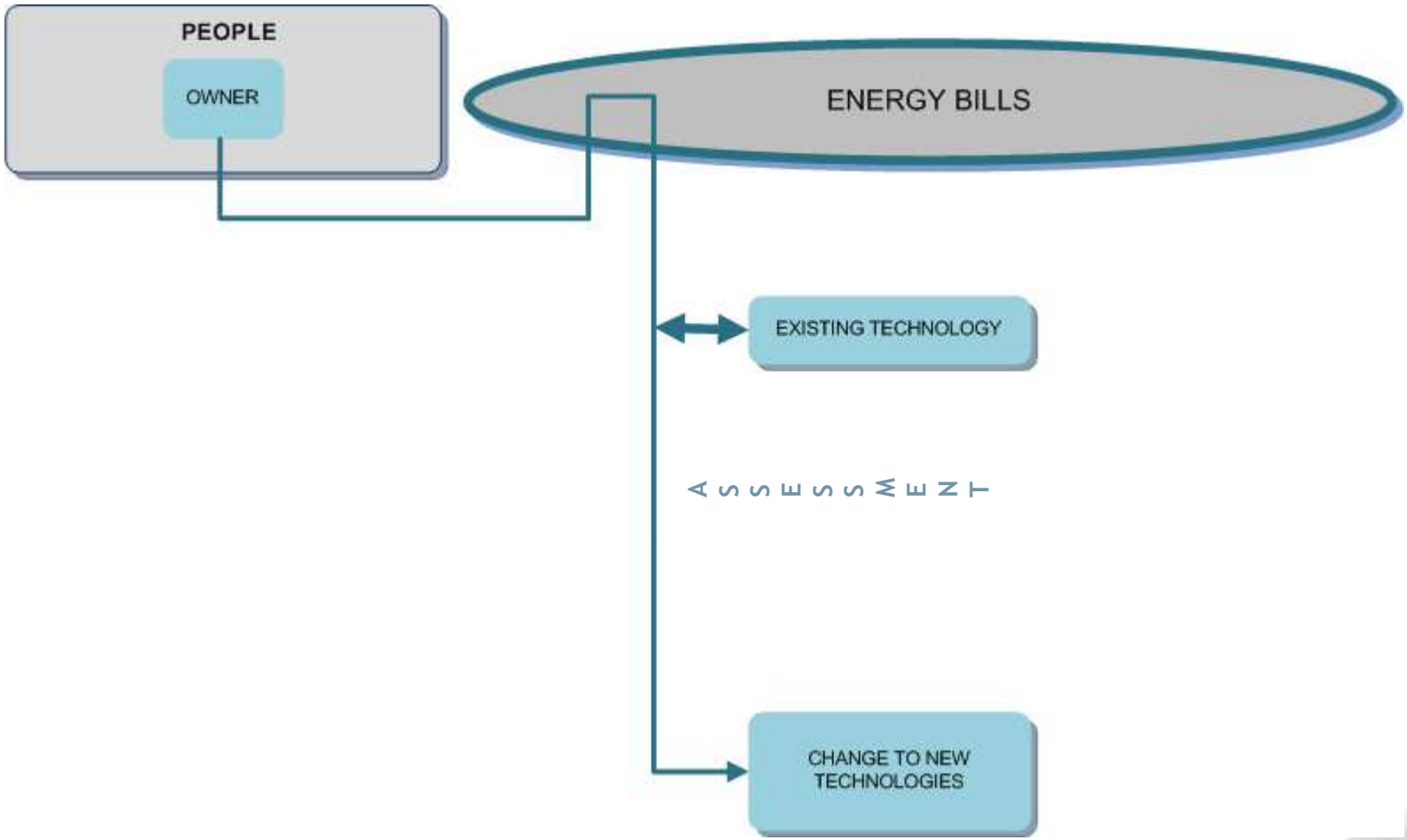
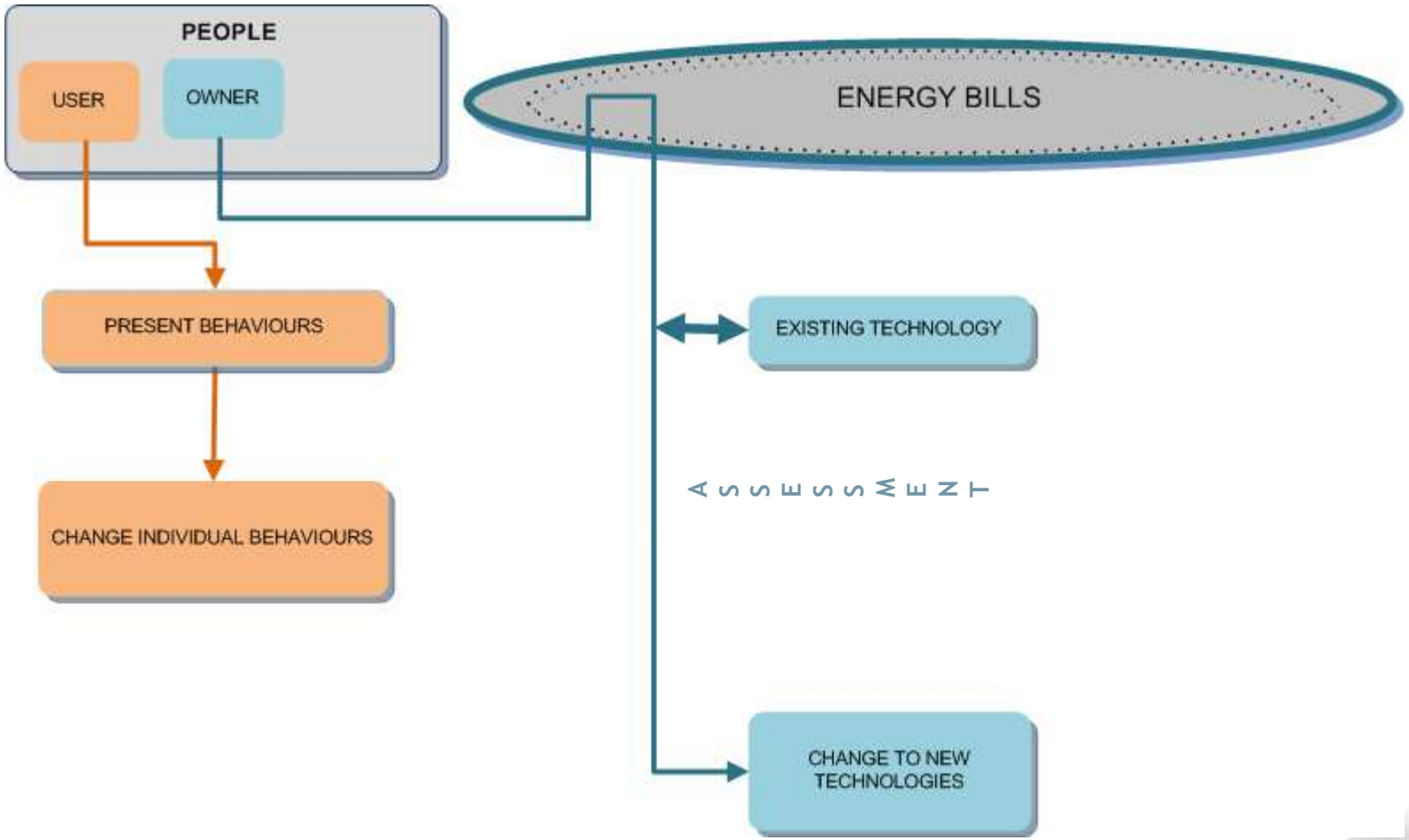
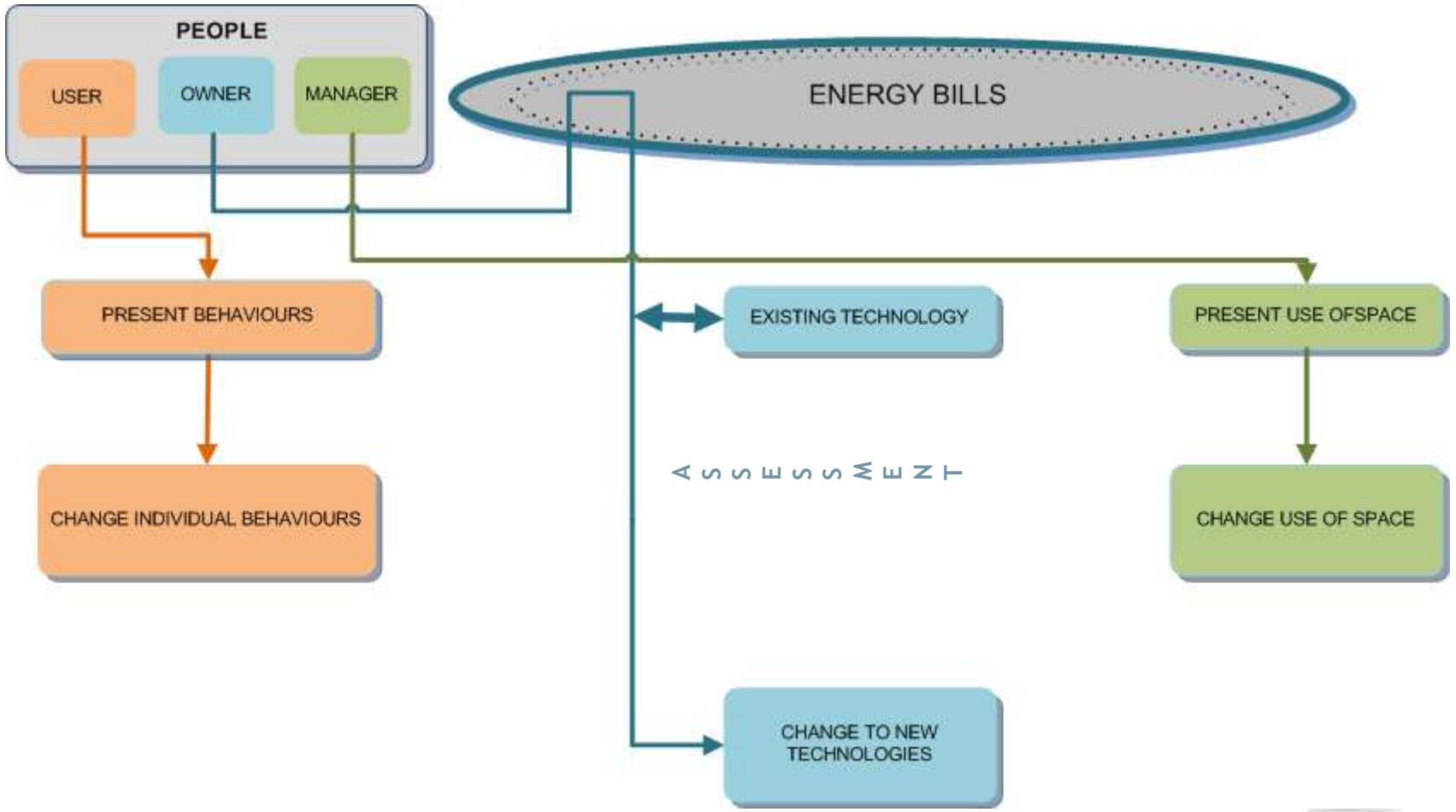
Traditional energy management



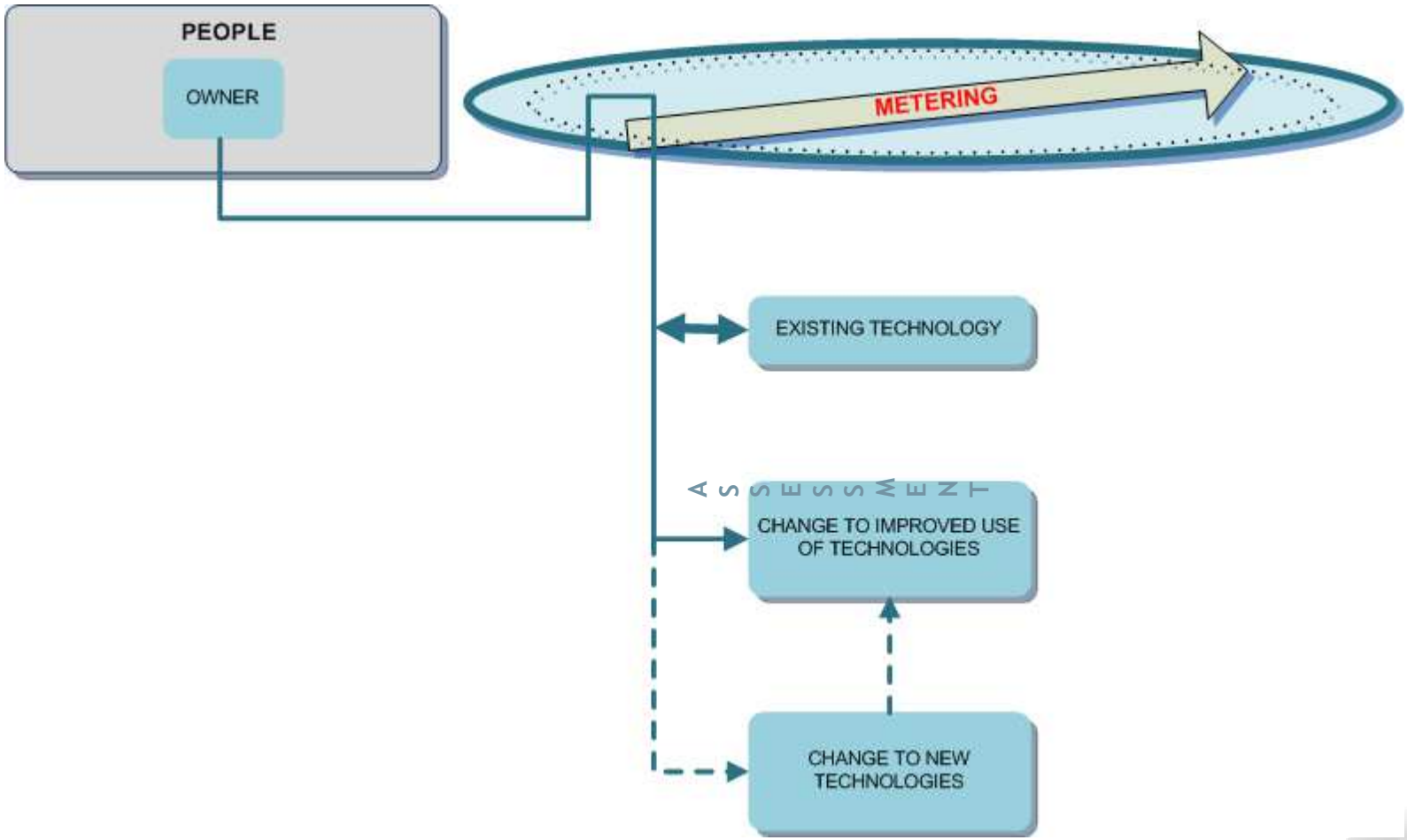
Basic level of users involvement



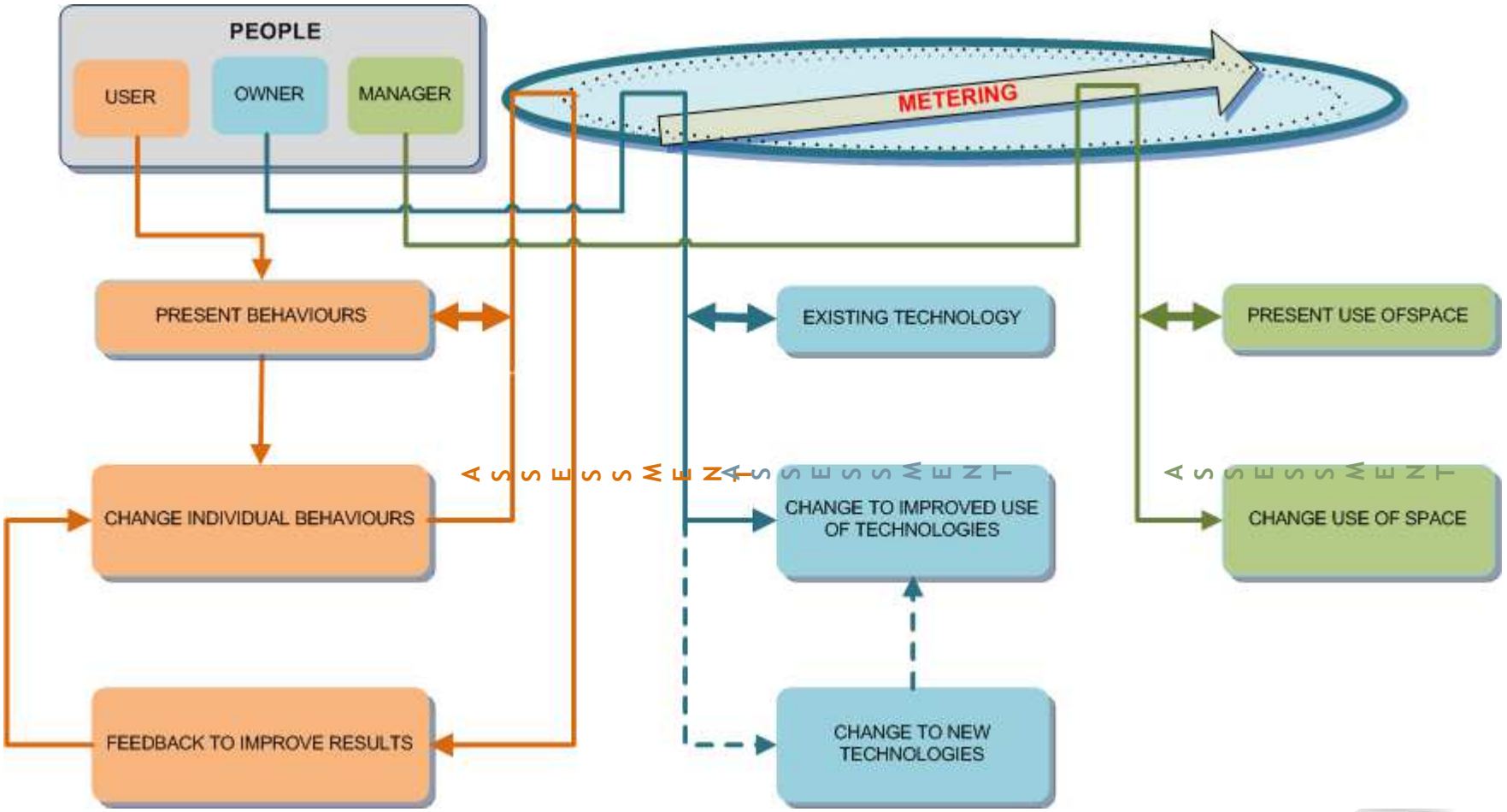
Improved users involvement



Analytical demand side management



Change energy management system analytical & behavioural dsm



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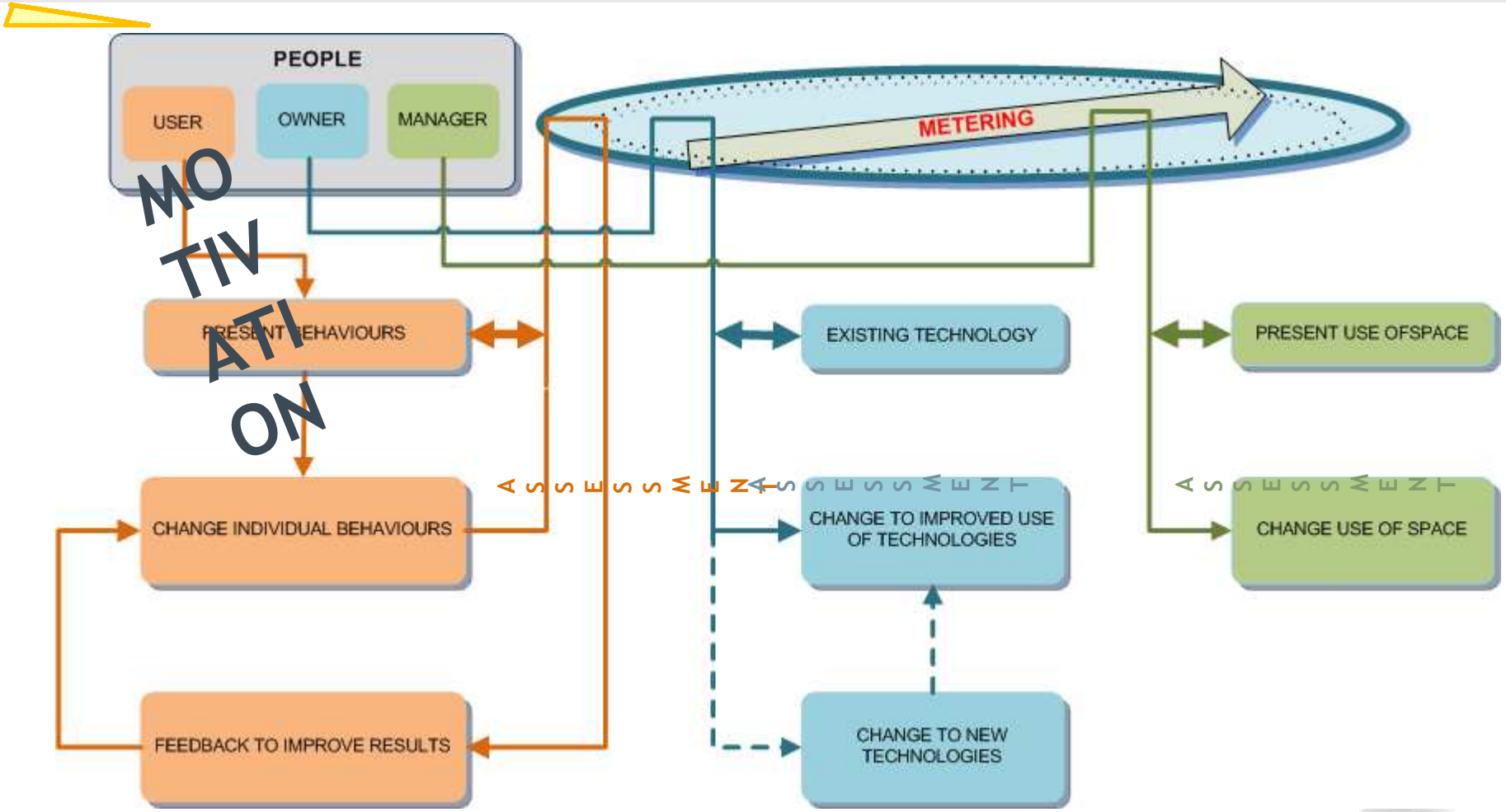

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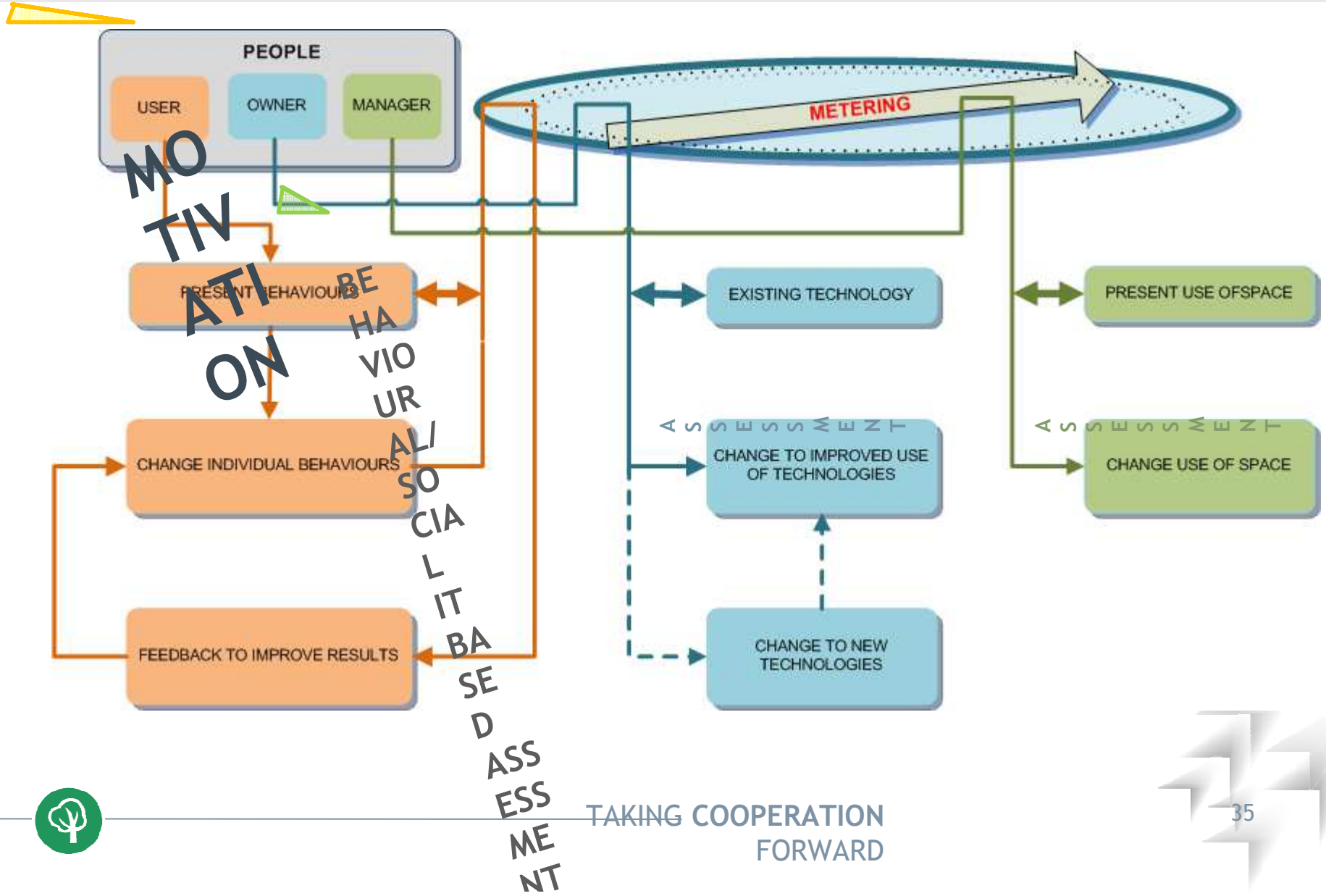

Detecting the potential and goal setting

Motivation generally requires a goal, that means:

1. Detecting the potential
2. Working to fill the gap between present situation and potential

Goal setting (detecting the potential) is relatively simple for technological components, since their behaviour under defined conditions is relatively well predictable

It's more difficult for the behavioural/social component

Users' Participation in the GS LL, namely from three students, Edoardo, Marco and Leonardo, has allowed the development a metodology to detect the potential savings that can be achieved in a school building only with a users' behavioural change.

Detecting the potential and goal setting

After a brief explanation of the metodology they adopted to estimate the potential savings of electricity in school buildings, Edoardo, Marco and Leonardo will help us in a

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