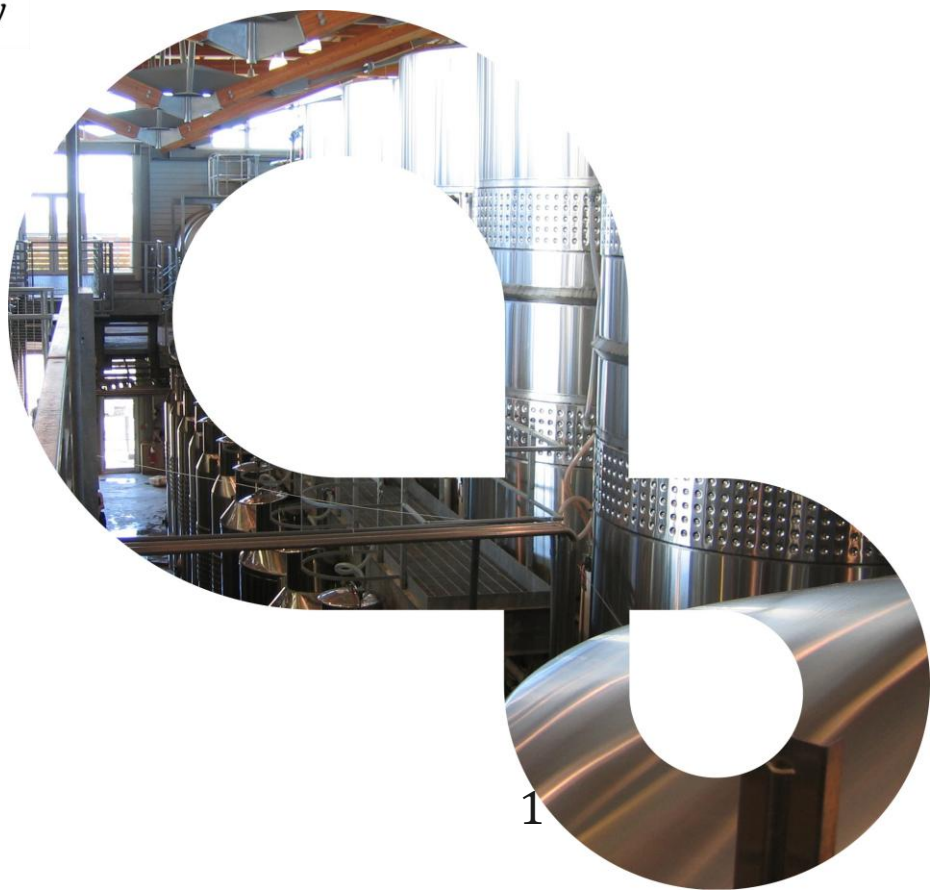
Key Actors Meeting

June 25th 2014, Brussels

tesla Transfering Energy Save Laid on Agroindustry

Focused Processes and Energy Efficiency



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

WP4: INDUSTRIAL PROCESSES

- **NEED**: Integrating in the agro-food industrial processes the knowledge on the state of the art in the field of energy efficiency improvement.

- **BARRIER**: Experience shows that the methodologies developed for other industries are often unable to fit to the specificities of agro-food industry.

- **EXAMPLE**: Seasonality or the energy consumption associated with processes that are linked with quality attributes of food products and food raw materials

A LEAN & GREEN PERSPECTIVE

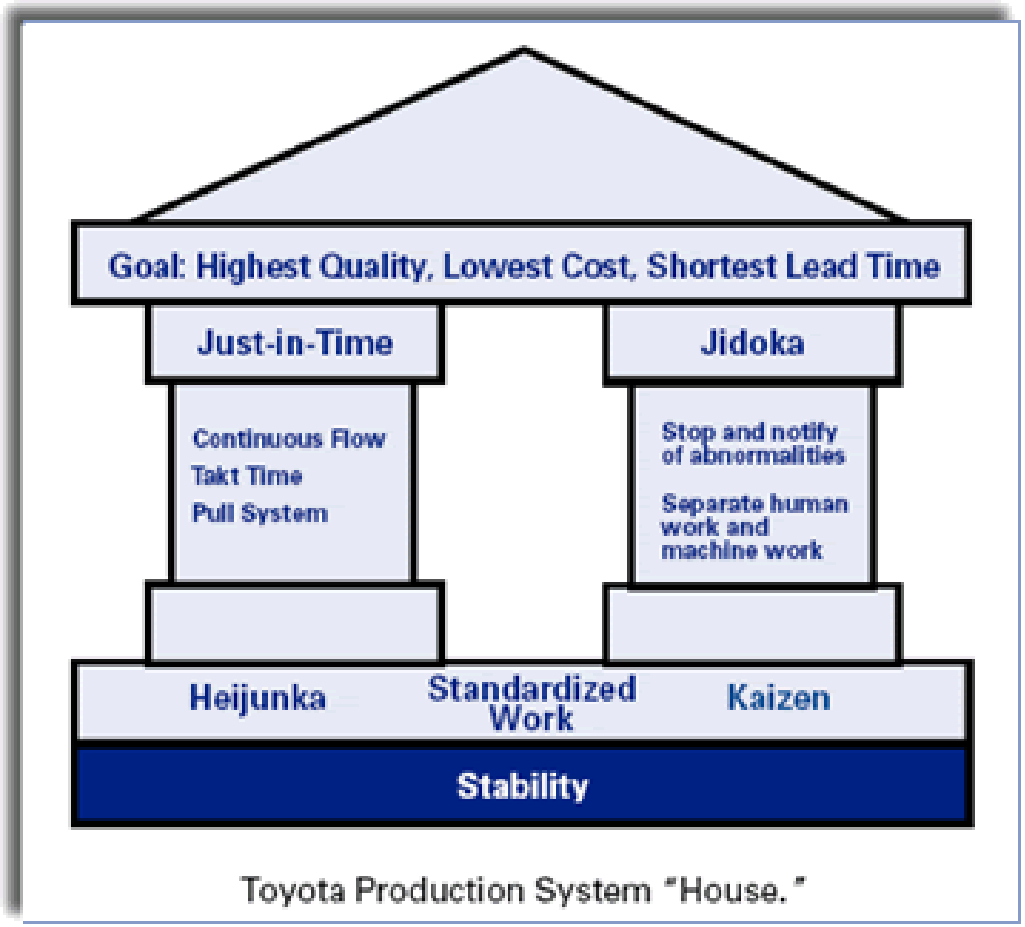
- **A SYSTEMS APPROACH**: Improvements in operational efficiency contributes to improve energy efficiency. Likewise energy efficiency improving technologies should enhance operational efficiency.

- **BARRIER**: Organizations tend to create separated units (silos) for **operational management** and for **environmental management** despite the strong links between the performance and the key performance indicators for both "fields".

- **A LEAN & GREEN PERSPECTIVE**: The Lean & Green Thinking considers that operational and environmental performance should be improved simultaneously in a "radical" way for enhancing value generation and delivery.

A LEAN & GREEN PERSPECTIVE

- **LEAN PRODUCTION:** The term "lean" in the "Lean and Green" name comes from the Lean approach to operational excellence, **a set of principles, strategies, methodologies and tools** initially developed by Toyota Motor Corporation.



Toyota Production System "House."

Source: Marchwinski (2009), Lean Enterprise Institute

A LEAN & GREEN PERSPECTIVE

- **LEAN PRODUCTION DISSEMINATION**: As one of the most effective approaches for implementing Total Quality Management strategies, Lean initiatives have proliferated across countries and industries. A relatively large number of success cases has been documented in the agro-food sector.

A LEAN & GREEN PERSPECTIVE

- **GREEN PRODUCTION**: It can be defined as a set of principles, strategies methodologies and tools that integrates **product and process design** issues with **operations management** issues in order to identify, quantify, assess, and manage the **flow of environmental waste** both for reducing environmental impact and for improving resource efficiency as much as possible.

A LEAN & GREEN PERSPECTIVE

- **GREEN PRODUCTION DISEMMINATION**: It is behind the Lean Production dissemination (20 years behind?) but the number of Green Production initiatives is rapidly increasing across countries and industries . Most documented success cases are from large companies that have been implementing Total Quality Management strategies during several decades (Toyota, WalMart, DuPont, Volvo, Sainsbury's, Tesco, Unilever, Marks & Spencer, or General Electric).

- **ECONOMICS RESULTS**: The economic assessment studies carried out show that the returns from Lean initiatives can be vey high. Likewise, the economic benefits of Green improvements usually compensate the investments and costs required for implementing them, sometimes to a large extent.

A LEAN & GREEN PERSPECTIVE

- **LEAN & GREEN PRODUCTION SYSTEMS**: They are production systems designed for improving continuously the business potential to generate value for all its major stakeholders (society included) while having into account the three components of value (Profit, Planet, People). Lean & Green methodologies and tools are used for reducing systematically eight Lean wastes and eight Green wastes.

- **LEAN & GREEN PRODUCTION DISSEMINATION**: Lean & Green production initiatives are relatively recent (less than 10 years). They have been mainly fostered by the Environmental Protection Agency in the USA and by some leading consulting companies at a global scale. Success cases in the agro-food sector have been recently published.

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- **LEAN WASTES**
  - Overproduction
  - Defects
  - Unnecessary inventory
  - Transporting
  - Waiting
  - Inappropriate processing
  - Unnecessary motion
  - Lost people potential

- **GREEN WASTES**
  - Energy consumption
  - Physical wastes
  - Water usage
  - Air emissions
  - Discharges to water
  - Land contamination
  - Noise and nuisance
  - Lost people potential

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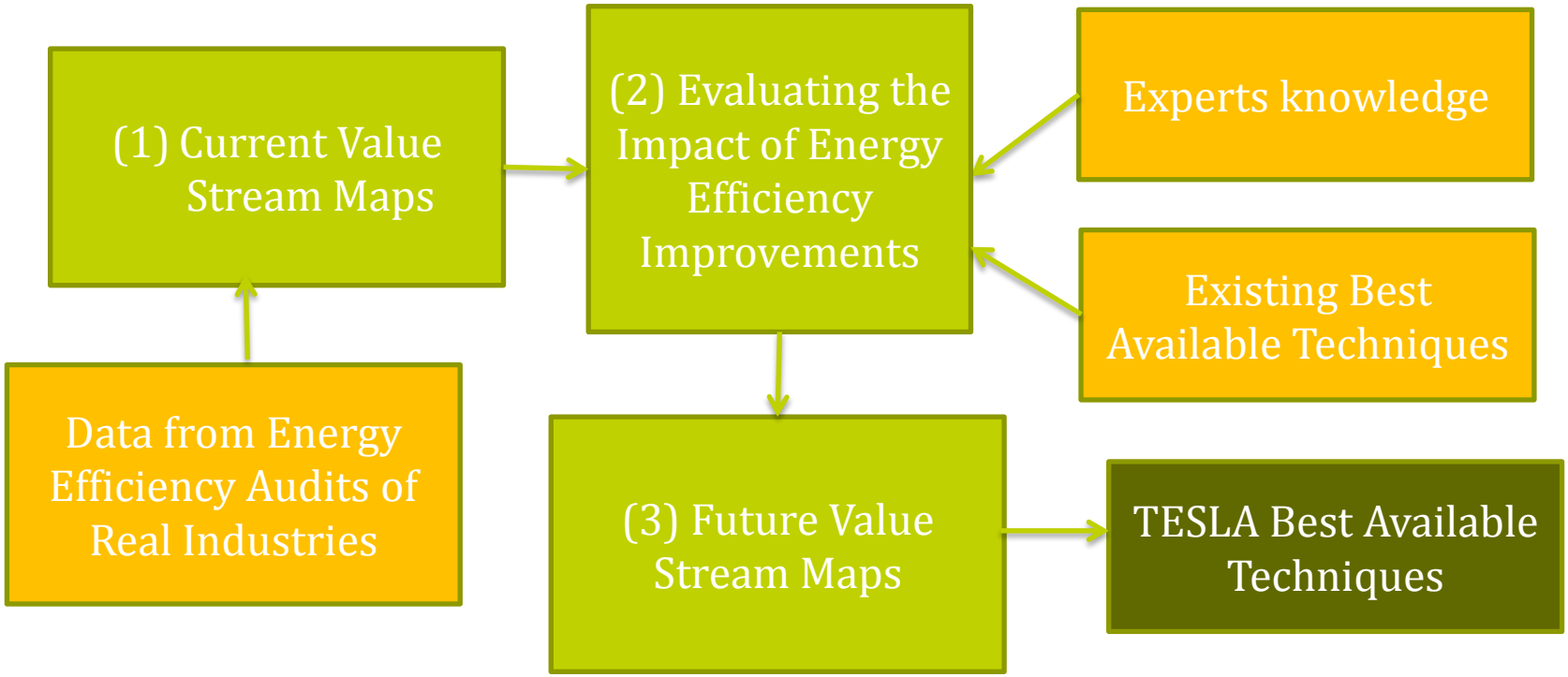
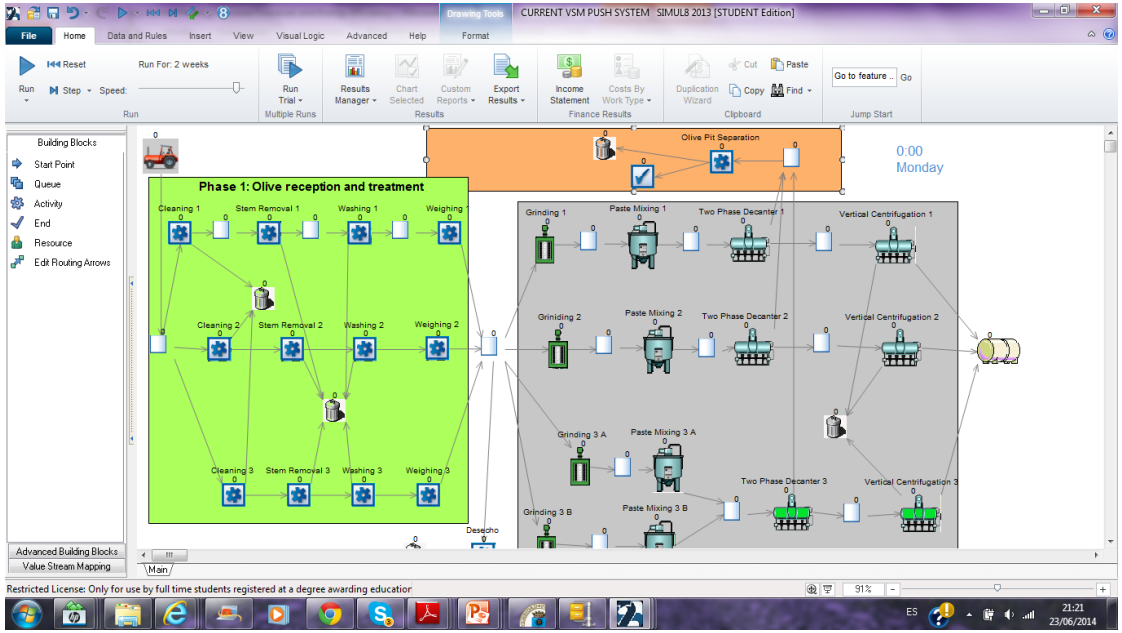
VALUE STREAM MAPPING

- **EXTENDED VALUE STREAM MAPPING**: This Lean & Green methodology will be applied for understanding and assessing the impact of different energy efficiency improvements on the basis of key performance indicators (energy consumption, energy efficiency, energy costs as well as some key operational performance indicators).



BUILDING VS MAPS WITH SIMUL8

- **VALUE STREAM MAPPING WITH SIMUL8**: The **simulation software SIMUL8** is being used to build the Current Value Stream Map for each food industry. Different energy efficiency improvement alternatives are analysed and assessed in a simulation environment. Probabilistic estimates of the impact on key performance indicators are generated. The Future Value Stream Maps are also built with SIMUL8.



❑ ADVANTAGES OF USING SIMULATION:

1. The simulation models developed can be used to assess the impact of different measures for improving energy efficiency **before implementing them**.

2. SIMUL8 provides a **graphical interface** that allow to experts, managers and technical staff visualizing the impact of different improvement proposals**.**

3. Simulation models can be validated by experts, mangers and technical staff and **easily modified if required**.

❑ ADVANTAGES OF USING SIMULATION:

4. Trials can be designed to obtain the **results in probabilistic terms** (expected values, confidence intervals, risk of getting some outcomes, etc.).

5. Assuming a **risk environment** is more realistic for decision making than assuming a deterministic environment.

6. Simulation can be easily modified for representing the specific characteristics of a particular industry in order to **customize solutions for energy efficiency improvement**.

IMPROVEMENT OPPORTUNITIES

❑ PUSH SYSTEMS VERSUS PULL SYSTEMS:

- ❖ A Push Production System is based in designing industries with a certain production capacity and in trying to maximize production while assuming that as greater the production is as higher the operational efficiency and the system capacity for avoiding stockouts are.

- ❖ From the perspective of the Toyota Production System (the major global benchmark for Lean Production), Push Systems systematically generate **Overproduction, Unnecessary Inventory and Transporting**.

- ❖ Taking into account the relationships between these Lean wastes and Energy Consumption, a Green waste, a Push System is also generating systematically **Excessive Energy Consumption**.

❑ PUSH SYSTEMS VERSUS PULL SYSTEMS:

- ❖ The Toyota Production System was designed as a Pull System where the customer orders set up the production flow by trying that the **Takt Time** (the order arrival rhythm) should harmonically conduct the production rhythm.

- ❖ These are the foundations of the Just-in-Time System that developed and implemented Toyota becoming the world benchmark for operational excellence.

❑ PUSH SYSTEMS VERSUS PULL SYSTEMS:

- ❖ An olive oil mill or a winery are usually paradigms of Push Systems.
- ❖ It is not possible to transform completely an olive oil mill or a winery in an almost perfect Pull System because of some quality restrictions related with optimal time for harvesting or with the limited availability of olive small producers for harvesting.
- ❖ But Overproduction, Unnecessary Inventory or Defects can be reduced by applying certain Lean methodologies and tools.
- ❖ The reduction in these Lean wastes will have an impact on Energy Consumption and on Energy Efficiency.

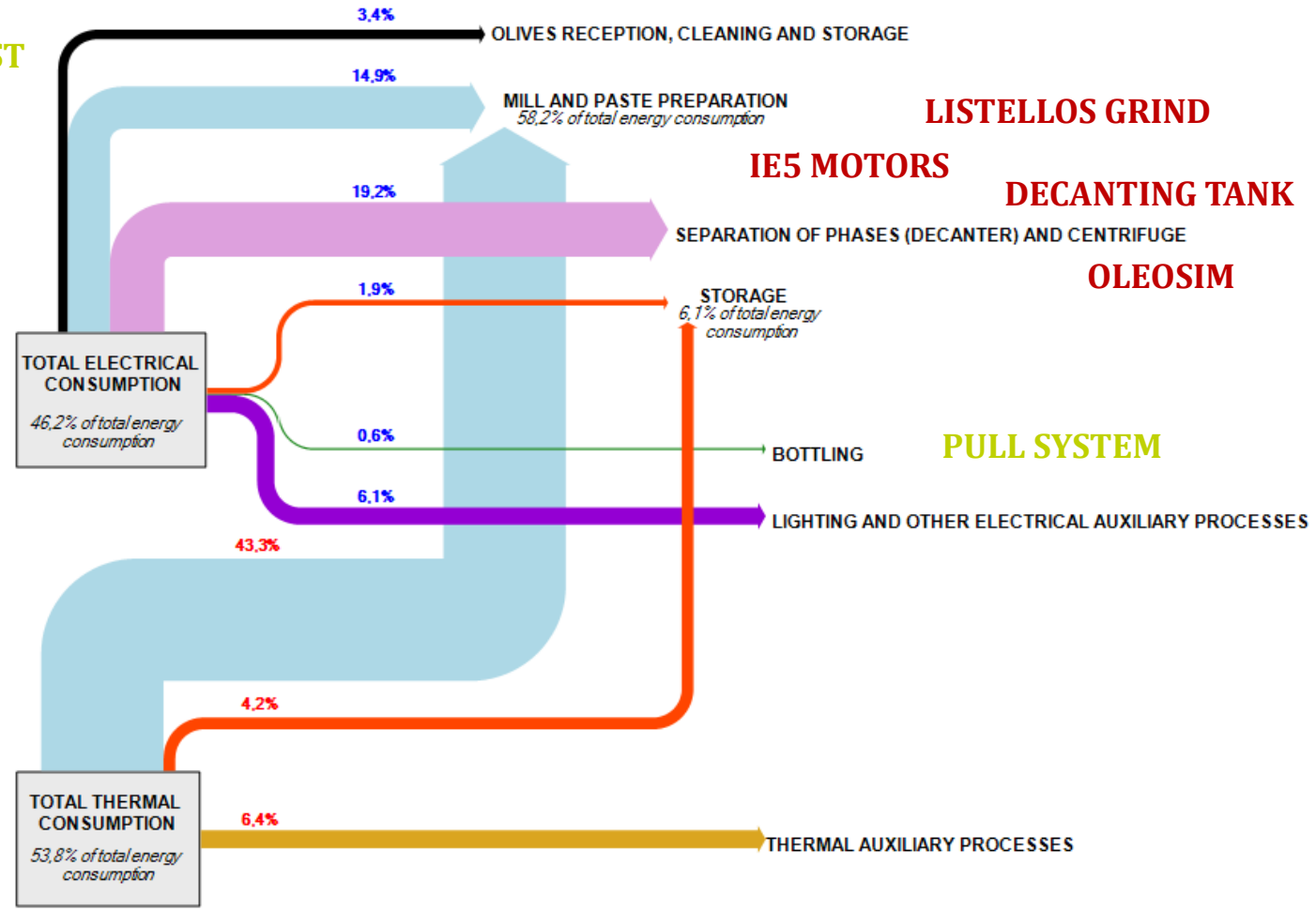
SANKEY DIAGRAM

OLIVE OIL MILLS SUB-SECTOR

KANBAN POST

HEIJUNKA

JIDOKA



LISTELLOS GRIND

IE5 MOTORS

DECANTING TANK

OLEOSIM

PULL SYSTEM

❑ SOME PRELIMINARY RESULTS FOR OLIVE OIL MILLS:

❖ For olive meal oils, different improvement measures have been evaluated and a preliminary Future Value Stream Map have been developed.

❑ For reducing Lean wastes, the improvement measures evaluated are the following ones:

1. Heijunka: Production leveling (avoiding bottlenecks)
2. Jidoka: Automation with a human touch. Designing a automated system for prioritizing the use of the line or lines with a higher energy efficiency.
3. Kanban post: Using a signal system for avoiding overproduction by postponing oil deliveries when certain reception levels are reached.
4. Pull System: Implementing a Just-in-Time system in the bottling processes.

❑ SOME PRELIMINARY RESULTS FOR OLIVE OIL MILLS:

❖ For improving Energy Efficiency, the technologies evaluated are the following ones:

1. Listellos grinds in the three lines (Payback estimated: 5 years).
2. IE5 motors in the paste mixer and in the vertical centrifugation equipment in the three lines (Payback estimated: 3 years).
3. An Oleosim equipment for the three lines (Payback estimated: 5 years).

❑ The Payback estimates has been calculated from the results obtained.

❑ Another alternative is incorporating the technologies only in one line.

❑ FUTURE WORKS:

- ❖ Validating of the simulation models with experts participating in the TESLA project.
- ❖ Customizing the simulation models to another industry (with data from a an energy efficiency audit) in a second country.
- ❖ Validating the new simulation models with experts participating in the TESLA project.
- ❖ Carrying out simulation trials for generating probabilistic results.
- ❖ Integrating the major results and conclusions in the Best Available Practices to be developed in the TESLA project.

Thanks for your attention

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Transfering
Energy Save
Laid on Agroindustry

Co-funded by the Intelligent Energy Europe
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