The Biofore Company UPM

«Energy Efficiency System at modern Pulp Mill»

UPM Fray Bentos

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UPM Today

The Biofore Company UPM

- 22,000 employees
- 15 countries
- 2010 Sales: MUSD 14.000

Pulp & Energy 4,000 employees	Paper 12,000 employees	Special Materials 6,000 employees
§ Energy § Pulp § Biofuels § Wood & plantations	§ Magazzine § Fine § News § Special	§ labels § Plywood § RFID tags § Compound materials

Active participation in energy generation

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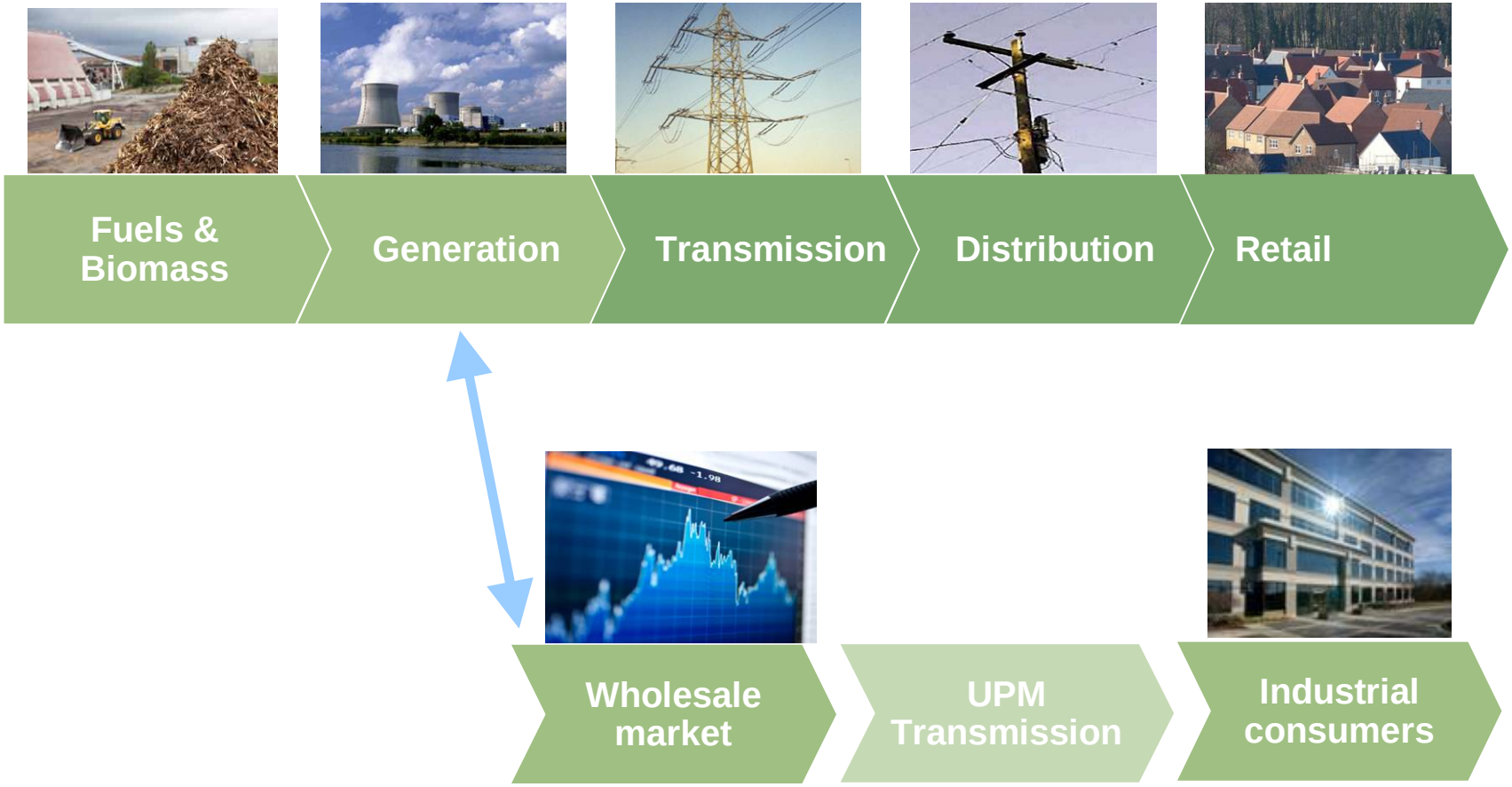

Power generation diversification

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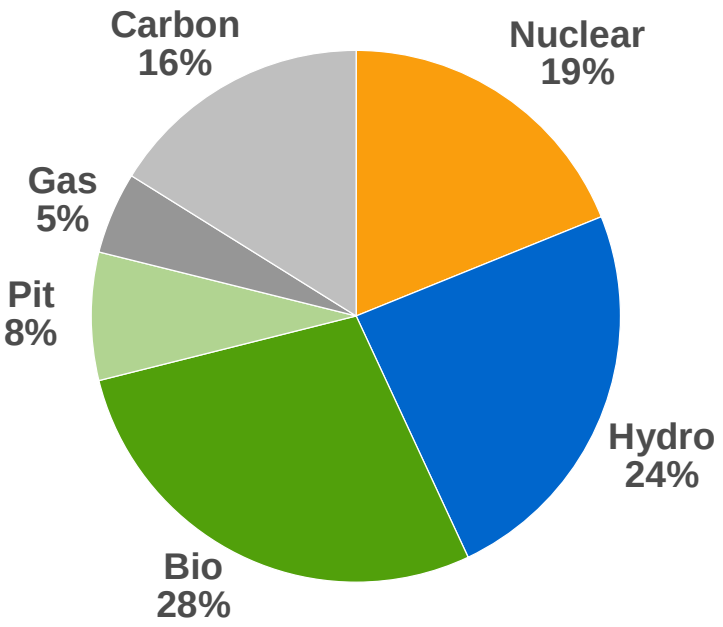
- 2010 Total generation: 14 TWh
- Big producer of renewable energy with low emissions
- Biomass capacity : 1000 MWe
- UPM is 2nd biomass energy generator in Europe
- Biomass enregy generation investments from 2000 until now: 1000 M€
- 30% generation capacity increase from 2000 until now
- 13 new biomass energy cogeneration plants

Installed Power Generation 2010
2959 MW



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Europe Objectives and Statistics

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- 2007 European Gobertments Meeting
- Europe statistics for future
  - 2030:
    - Energy consumption increase 50%
    - 80% of energy consumed will be fosil
- Europe Objectives
  - Reduce green house gases emissions by promoting renewable energy sources 2020:
    - Increase renewable sources by 30%
    - Reduce green house gases emissions by 20% of 1990 emissions
    - Improve Energy Efficeincy by 20%
    - Increase biofuels consumtion for transport purposes by 10%

Uruguay Objectives and Statistics

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- 2010.
  - 20 private generators: intalled capacity 219 MW
    - Wind power: 23 MW
    - Biomass power: 193 MW
    - Natural gas power: 3 MW
  - Private generators are 10% of total generation and 3% is connected to national grid.
- Uruguay Objectives:
  - Diversify Uruguayan power network
  - Decrease national energy crisis situations by decreasing fuel oil dependence
  - Generate regulations for promoting renewable energy generation investments
  - Improve long term statistics predictability
  - 2015: 500 MW Wind power installation
- Uruguay Organizations:
  - MIEM: Energy policy
  - URSEA: Reguations
  - ADME: Administration

Uruguay Energy Network for future

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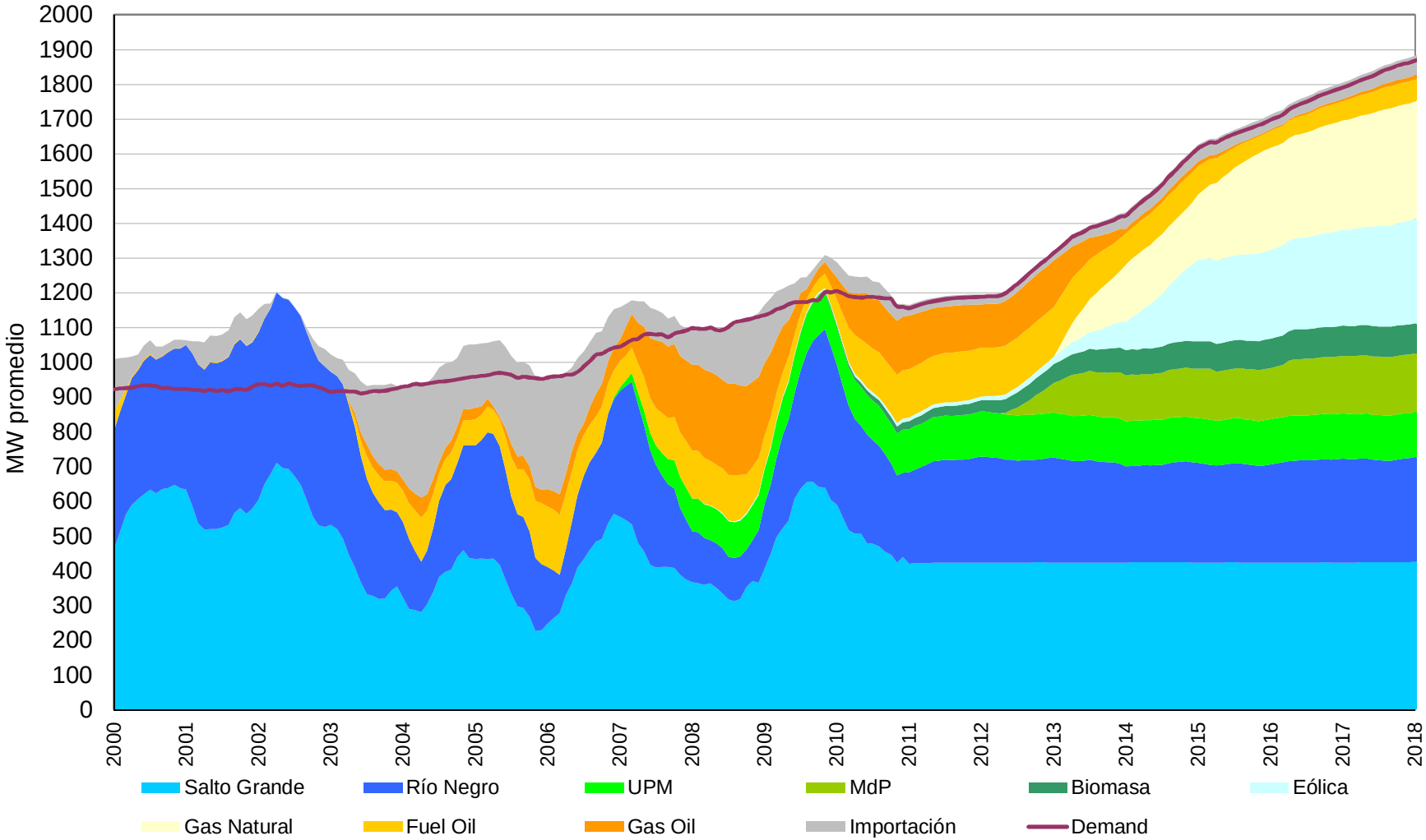

Energy Efficiency by Goverments

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- **MOTIVA:** Finnish energy and industry MInistry
- 1997 – 2006: Voluntary agreement for energy conservation
- 2008 – 2016: Voluntary agreement for **Energy Efficiency**
- http://www.motiva.fi/en/

EFICIENCIA ENERGETICA
URUGUAY
DNETN - MIEM

- **MIEM:** Industry, Energy and Mining Ministry
- **Electricity Saving Plan:** used by MIEM at crisis situation.
- **Energy Efficiency Program:** used to promote efficient energy consumption by final user at all economic sectors.
- http://www.eficienciaenergetica.gub.uy

International Organizations

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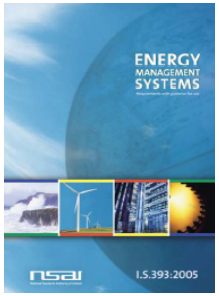
- **UNIDO 2008:** United Nations Industrial Development Organization.
  - Comité técnico: PC 242
- **China: GBT/5587:1995**
  - SAC: Standarization Administration of China
- **EEUU: ANSI MSE:2008:** Energy Management Standard.
  - Voluntary certification by ANSI, third part validation, industry agreement.
- **UK: EEAS:** Energy Efficiency Accreditation Scheme
- **Irland: I.S. 393:2005:** Irish Standard for Energy Managment Systems.
- **CEN: EN 16001:2009:** European Standard for Energy Management Systems.
- **ISO 50001: June 2010**: Final version.

UNIDO
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION



SAC Standardization Administration of China

ANSI American National Standards Institute

CARBON TRUST
Making business sense of climate change

THE NATIONAL ENERGY FOUNDATION

cen
European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

ISO International Organization for Standardization

UNITED STATES DEPARTMENT OF ENERGY

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Real and Nominal Efficiency

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- **REAL** (rEE)
- Any change that minimizes energy consumption per unit of product or service of a company, keeping all rest of consumptions at constant rate.
- **NOMINAL** (nEE)
- Any change inside or outside the process that minimizes energy consumption cost per unit of product or service of a company, keeping all rest of consumptions costs at constant rate.
- **What does it mean for the company?**
- nEE = profitability
- rEE = permanent profitability

Energy Savings vs Energy Efficiency

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- **ENERGY SAVINGS**: minimize actual energy consumption (real saving) to avoid actual energy cost (nominal saving) for consuming that amount in the future.
- It does not impact rEE
- Reduces production or service quality
- Reduces production and worsens profitability
- **ENERGY LOSSES:** the only way of improving EE is by reducing losses
- LOSSES = TECHNICAL+ NON TECHNICAL
  - **Technical:** electric, magnetic, thermal, mecanical, etc.
    - Depend on **process technology**, design and maintenance.
    - Reuced with technical internal actions (engineering, re-engineering and investments).
  - **Non Technical:** bad energy usage, lack of commitement, stealing, etc.
    - Depend on **process management** and cultral habits of operation they do not imply big investments).

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Our Principles

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- ENERGY EFFICIENCY is part of production efficiency and affects on company competitiviness. At corporate level: Energy efficiency is part of UPM Pulp Business Area Environmental RULES.
  - *"UPM aims to reduce its impact on climate change in energy production, procurement and use. This shall be ensured by promoting and investing in energy efficiency to reduce our carbon footprint. Internal energy audits are conducted regularly in all UPM pulp mills, to identify opportunities for improved energy efficiency, to benchmark performance, and to provide information for mill and company target-setting. The mills shall take corrective measures and implement targets based on the audit results."*
- Energy Efficiency MANAGEMENT is part of Operational Management System at the Mill.
- Energy Efficiency COMMITTEMENT is part of Environmental Commitment at the mill*:*
  - *"We generate heat and electric power efficiently and use them sparingly."*
- Energy Efficiency System GUIDELINES are a description of for energy efficiency system at Fray Bentos mill.

How does it work?

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- Plan: Management sets annual targets, check compliance with legal, standard (CE 160001:2009), environmental commitment, as well as authorities and customers requirements (e.g. MIEM, DINAMA, e.g. carbon footprint).

- Do: Team and Committee define the actions derived from targets, define responsible, develop internal audits, reporting and trainings.

- Check: Measure for finding, new opportunities and check actions effectiveness.

- Act: Decide further actions based on measurements and internal audits results.

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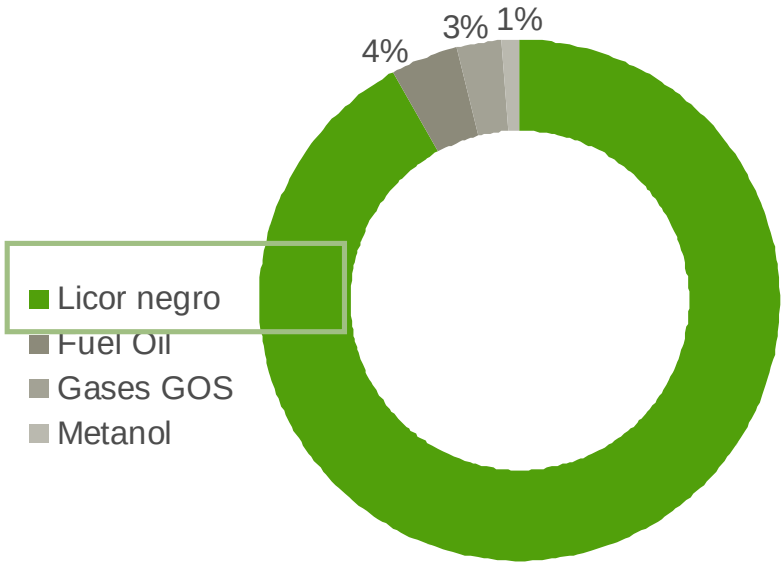
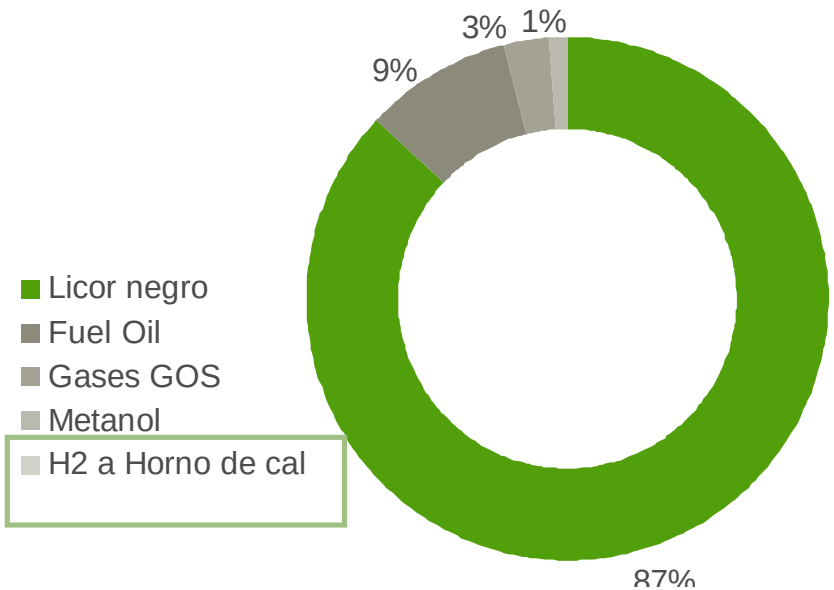
Energy Generation

- **Thermal Energy**



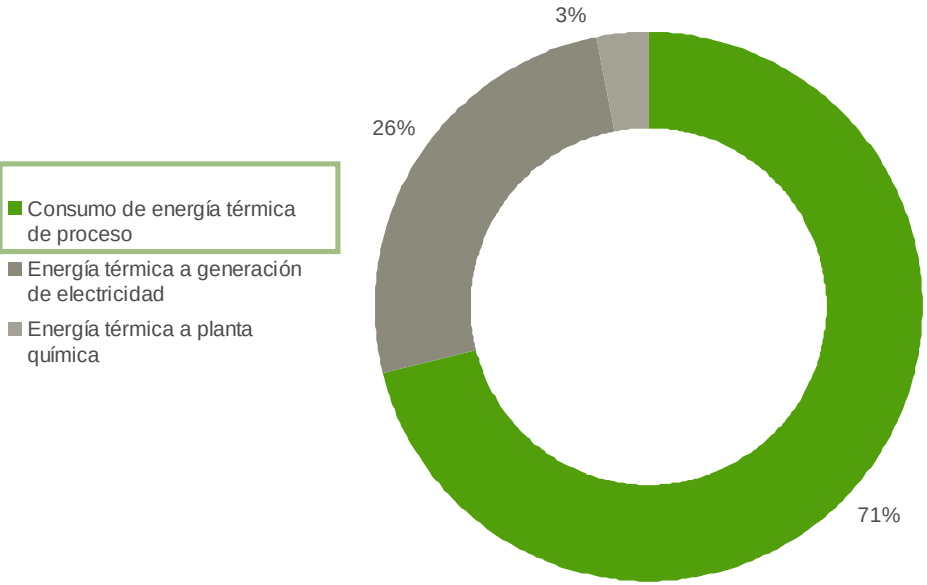
- **Total Energy**



TOTAL = 24 GJ/ADT

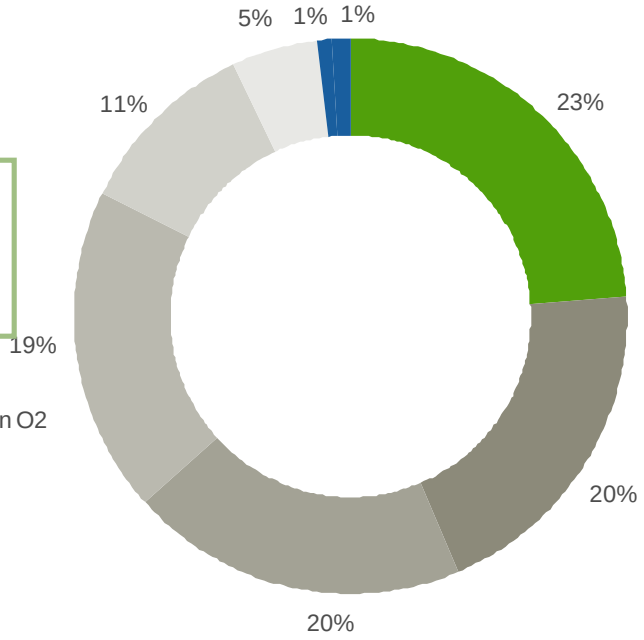
Thermal Energy Usage

- **Boilers efficiency: 76%**



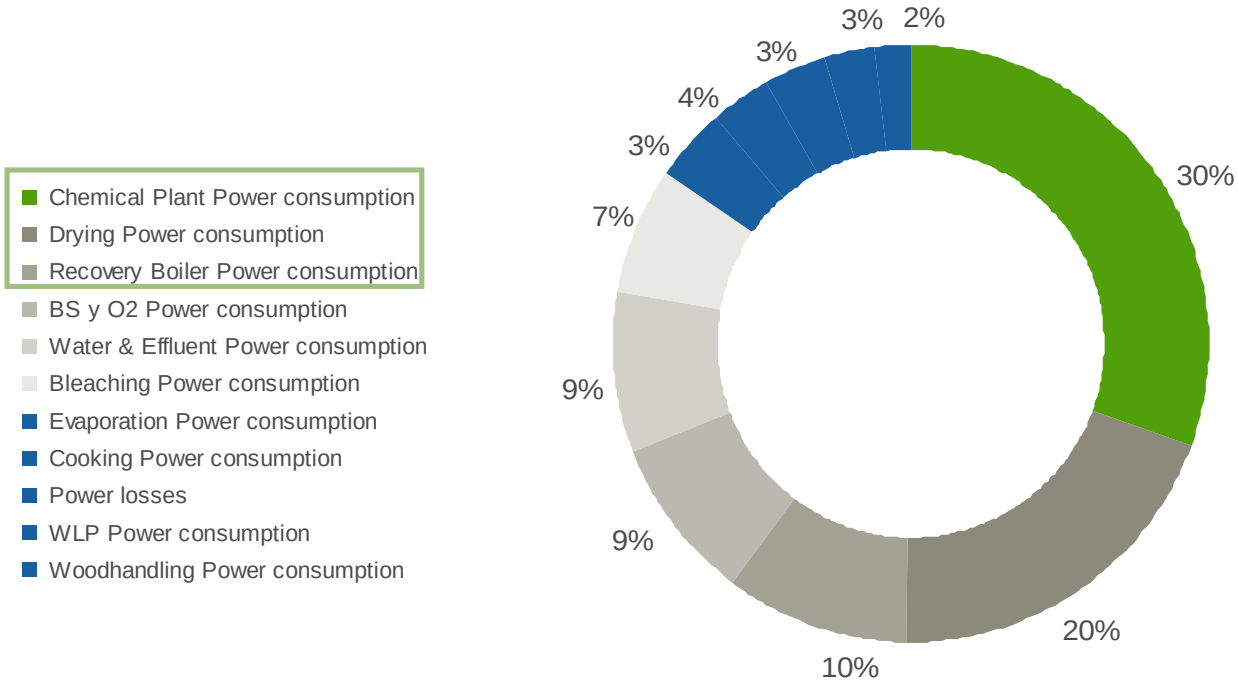
TOTAL = 18 GJ/ADT

- **Process Thermal Consumption:**



TOTAL = 13 GJ/ADT

Process Power consumption



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KPIs

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Fuel oil for steam generation: (same as production target)	**2,4** ± 1,6 kgoe/ADT Reached 2010	(same as Av 2010)
Fuel oil for lime kiln: (same as production target)	**30,0** ± 1,4 kgoe/ADT Not reached 2010	(same as Tar 2010)
Process steam consumption:	**12,8** ± 0,5 GJ/ADT Not reached 2010	(same as Tar 2010)
Process power consumption:	**496** ± 24 kWh/ADT Reached 2010	(same as Av 2010)

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Departments Aspects

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Key Parameters

1. Medium pressure steam consumption / ADT
2. Low pressure steam consumption / ADT
3. Power consumption / ADT

Fiberline

1. Chip bin top temperature
2. Digester top liquor temperature, liquor/wood ratio, transfer extraction flow and temperature
3. Digester bottom consistency
4. Secondary heat balance — improve 3,0MW
5. Washing efficiency, COD load to effluents, blowers consumption — improve 1,0MW
6. O2 delignification steam consumption: — improve 0,5MW
7. Washing filtrates heating optimization
8. Bleaching stages temperature optimization against chemicals consumption

Drying

1. Operative parameters: pulp viscosity, pH increase, white water temperature, Nips and 3rd pressure, against lamination risks
1. Equipment aspects: wires, rolls, Nipco presses types
2. Hot water optimization: use of hot water instead of steam
3. Screening power consumption: — improve 0,07MW
4. Flash steam usage — improve

Departments Aspects

Key Parameters

1. Medium pressure steam consumption / ADT
2. Low pressure steam (SLP) consumption / ADT
3. Power consumption / ADT

Evaporation

1. SLP / ton of evaportaed water
2. Evaporation plant scaling rate (ΔT) and washing sequence
3. Feed black liquor: ds%, T and fiber content from fiberline
4. Biosludge characteristics from effluent treatment

Recovery boiler

1. Minimize Pressure loss setting at feed water line level control valve
2. Minimize furnace under-pressure
3. Minimize oxygen level and temperature at flue gases
4. Minimize continuous blow down
5. Continuous tunning of sootblowing sequence to minimize boiler fouling
6. Increase tertiary air capacity to reduce carry over and boiler plugging
7. Installation of ash leaching system to reduce boiler plugging

Departments Aspects

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Key Parameters

1. Medium pressure steam consumption / ADT
2. Low pressure steam consumption / ADT
3. Power consumption / ADT

Turbines and steam distribution

4. Increase main steam conditions parameters: increases electricity generation and back pressure steam quality, less condensate flowing at the pipelines and less flow to condensate tanks diminishing the risk of flow assisted corrosion
5. Improve steam trap operation
6. Improve SMO sootblowing efficiency by steam de-superheating
7. Optimization of turbines operation, upgrade

White liquor plant

1. Fuel Oil consumption / CaO production at kiln – KPI
2. Steam consumption / LWH production – very low
3. Compressed air consumption / LWH production - high
4. Power consumption / LWH production: vacuum pumps for dregs and lmu filters
5. Gassifier study: would replace 60MWth of fuel oil

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Energy Efficiency Management Actions

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2008

1. Creation of EES Technical Team and Committee
2. Monthly follow up of KPI's at production meetings and EES committee meetings
3. Annual report of mill energy aspects and analysis of main deviations for internal use and annual reports to authorities – Ministry of energy, industry and mining MIEM.
4. Annual list for potential EE projects
5. Training of whole personal of UPM FRB, Andritz, Kemira on general energy efficiency concepts and energy management.

2009

1. Specific training of operators on departments energy aspects and control parameters. October 2009
2. CE 16001 Certification. July 2009
3. On line follow up measurements of steam and power consumption for operators. September 2009
4. Energy assessment of the mill budgeted for 2010, but no decision taken.
5. Targetter systems from Honeywell against energy auditors Pöyry, KSH, API.

Energy Efficiency Management Actions

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2010

1. Active participation in UPM's energy saving campaign Wave 2. January 2010. Competition between mills for less than 0,86year payback energy efficiency projects. 3 VSD installed during 2010 shutdown and working efficiently. Annual savings: 1940 MWh
2. Participation in UPM internal energy audits, at Kymi pulp and paper mill.

2011

1. Active participation in UPM's energy saving campaign Wave 3. June 2010. Competition between mills for less than 2 year payback energy efficiency projects. 1 VSD install during 2011 shutdown. Annual savings: 310MWh
2. Benchmarking: Develop benchmarking with similar mills (Brasil, Chile).
3. Suppliers committement:CE 16001 requires suppliers compromisse to demostrate energy efficiency development to its clients.
4. ISO 50001: Change certification from CE 16001 to ISO 50001. External audit November 2011.