

ENERGIA HIDROELECTRICA

- Desenvolupament tècnic.
- Evolució Històrica
- Prespectives de Futur.



ENERGIA HIDROELECTRICA

- FONAMENTS FÍSICS.
 - ENERGIA POTENCIAL

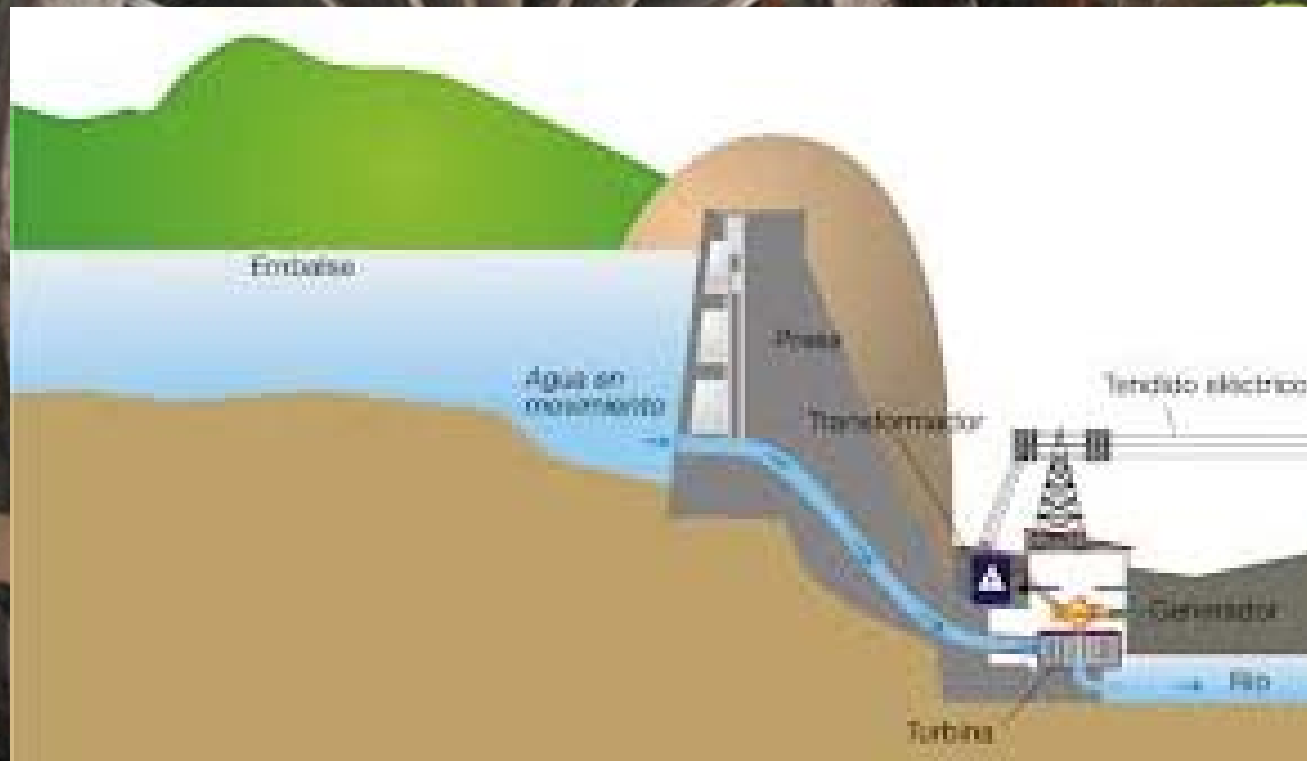
- *Energia Potencial=Masa ·Gravetat·Altura*

- FORMULA DE BERNOULLI

$$\frac{V^2 \rho}{2} + P + \rho g z = \text{constante}$$

ENERGIA HIDROELECTRICA

- Esquema Central



ENERGIA HIDROELECTRICA

- La energia hidraulica energia renovable



ENERGIA HIDROELECTRICA

A large, rustic wooden water wheel is the central focus, partially submerged in a stone-lined channel. The wheel has many spokes and is connected to a wooden structure. In the background, there is a metal railing and a stone wall. The scene is outdoors, with some green plants in the foreground.

- Caracteristiques com energia renovable.
- Avantatges.
 - Pot ser regulable inclús acumulable.
 - Es predible en el curt termini.
 - Es una tecnologia madura es economica.
- Desavantatges.
 - No es predible a llarg termini.
 - Te efectes sobre el Medi Natural

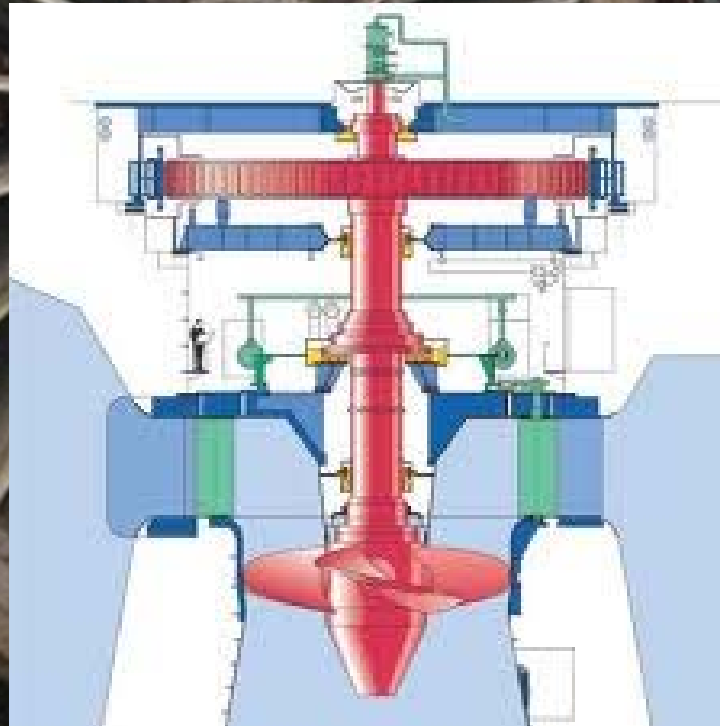
ENERGIA HIDROELECTRICA

A large, traditional wooden water wheel is the central focus of the image. It is constructed from thick, weathered wooden planks and is mounted on a sturdy wooden frame. The wheel is positioned in front of a stone wall with a metal railing above it. To the right, there is a stone archway. In the foreground, there are some green plants with yellow flowers. The overall scene suggests a historical or traditional hydroelectric power source.

- Tipus de centrals.
 - Peus de presa.
 - Canals de reg.
 - Centrals fluents.
 - Centrals Bombeig.

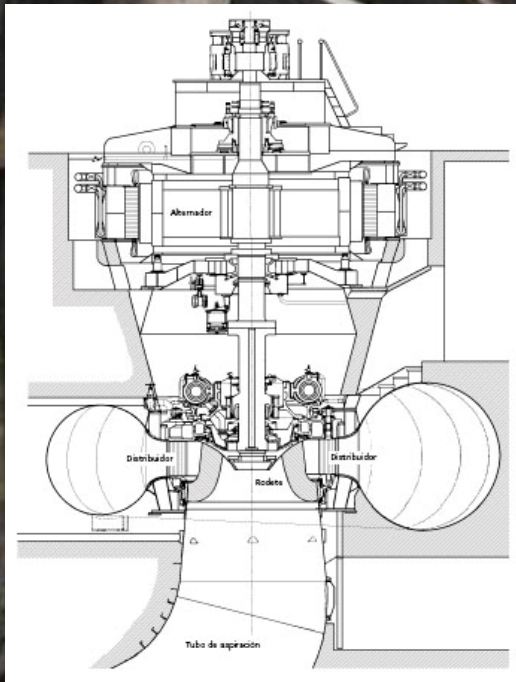
ENERGIA HIDROELECTRICA

- Tipus de turbines hidrauliques.
 - Kaplan. Poc salt – Molt Cabal



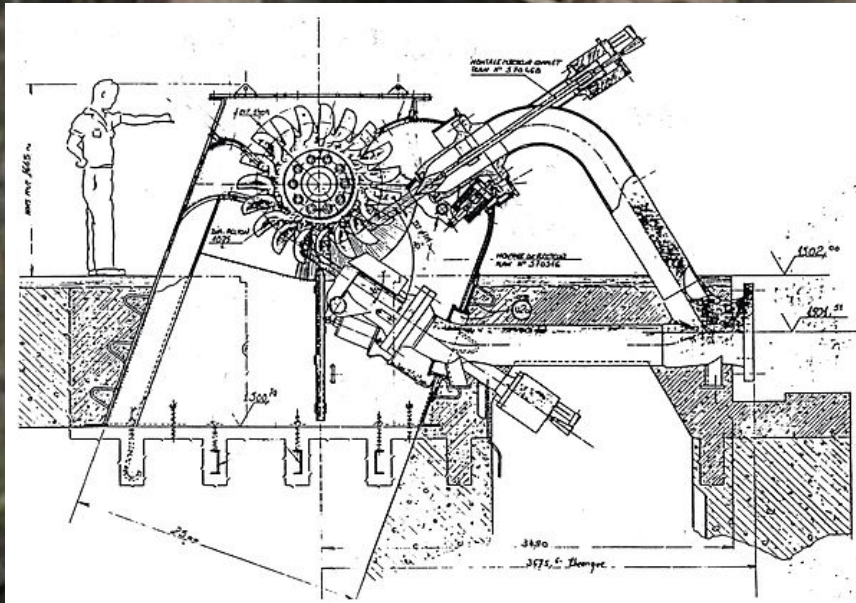
ENERGIA HIDROELECTRICA

- Tipus de turbines hidrauliques.
 - Francis. Cabals i salst intermitjos



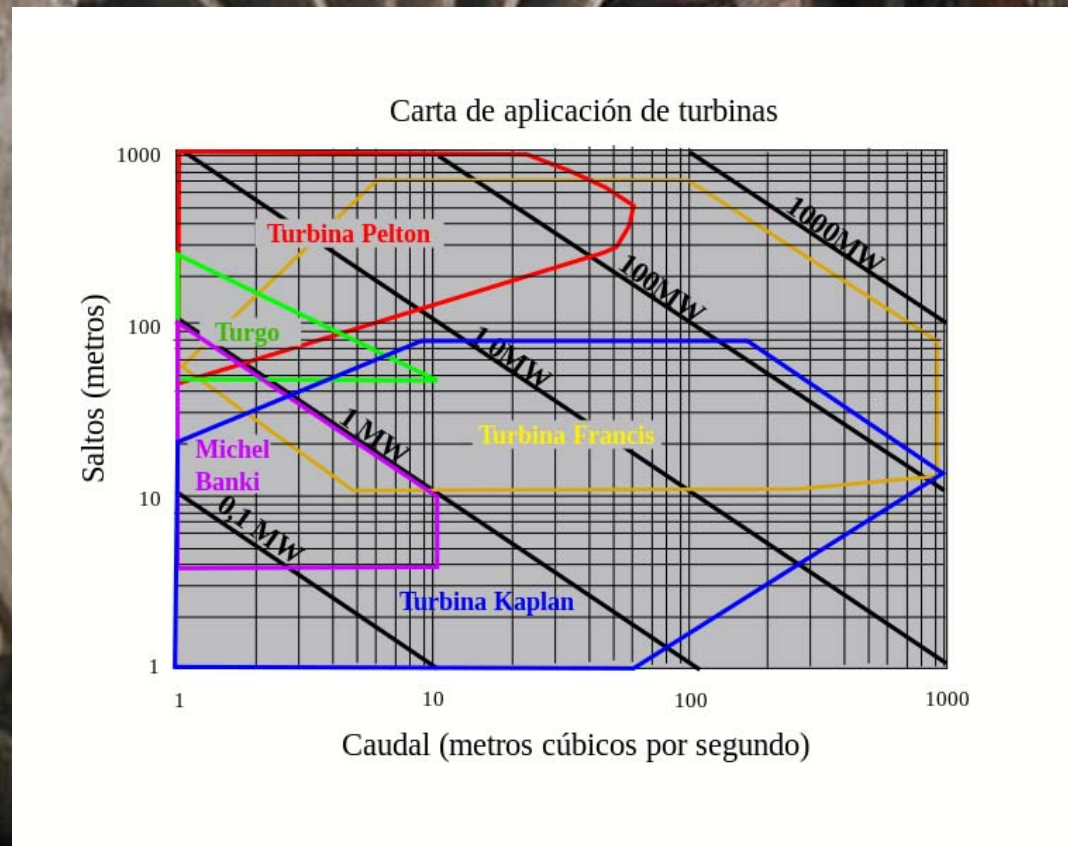
ENERGIA HIDROELECTRICA

- Tipus de turbines hidrauliques.
 - Pelton. Molt Salt – Poc Cabal



ENERGIA HIDROELECTRICA

- Selecció Turbina.





ENERGIA HIDROELECTRICA

- Disseny de plantes.
 - Estudiar el recurs.
 - Cabal i condicions de cabal.
 - Salt i obra civil necessaria.
 - Veure la implantació i cost de la mateixa.
 - Veure l'ús de l'energia
 - Màximes hores utilització. (Sistema aïllat)
 - Regulació i bombeig. (Connectat al sistema)
 - Màxima energia. (Connectat al sistema)

A large, rustic wooden water wheel is the central focus, partially submerged in a stream. The wheel is made of thick wooden spokes and a sturdy rim. It is housed within a stone structure that features a small waterfall on the right side. In the background, there is a wooden walkway with a metal railing. The scene is surrounded by green foliage, including some plants with yellow flowers in the foreground.

ENERGIA HIDROELECTRICA

- Historia aprofitament energia hidraulica
 - Grecs i Perses.
 - Romans
 - Roda Vitruviana.
 - Medulas
 - Edad mitja.
 - Molins fariners
 - Serradores.
 - Fargues.
 - Molins paperers
 - Segona revolució industrial

A large wooden water wheel is the central focus, set within a stone structure. Above the wheel is a wooden walkway with a metal railing. The background shows a stone wall and some green plants in the foreground.

ENERGIA HIDROELECTRICA

- Historia aprofitament energia hidraulica
 - Segona Revolució Industrial.
 - Michael Faraday – Primers estudis electromagnetics.
 - Neuman – Primeres Dinamos.
 - Nicola Tesla – Transmissió corrent altern.
 - Primera Electrificació.
 - Generació local. (Distribuida)
 - Electrificació de poblacions.
 - Aparició de les primeres empreses distribuïdors electricues.
 - Segona Electrificació.
 - El fenomen de la Canadencia a Catalunya.
 - Grans Centrals del Pirineu

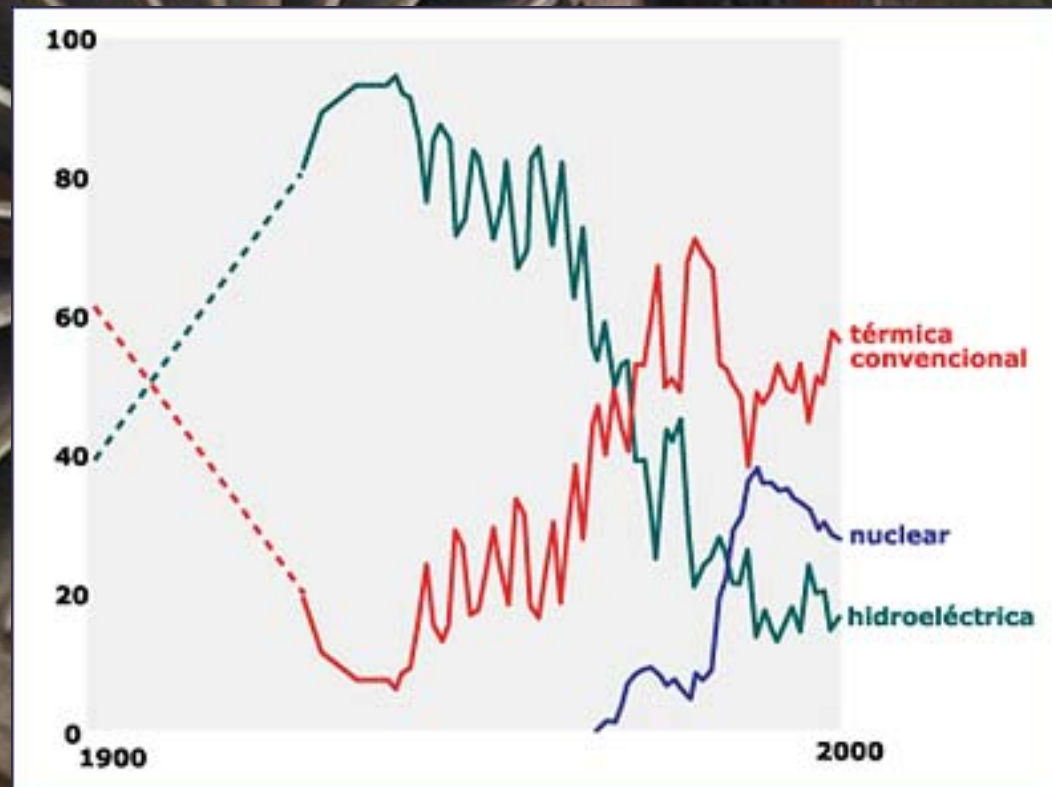
A large, rustic wooden water wheel is the central focus, partially submerged in a stream. The wheel is made of thick wooden planks and has a complex internal structure of spokes and supports. It is housed within a stone structure that features a walkway with a metal railing above it. The surrounding area is lush with green plants and foliage, suggesting a natural or park-like setting.

ENERGIA HIDROELECTRICA

- Historia aprofitament energia hidraulica
 - La Hidraulica a España i Catalunya
 - Barcelona Electric Light and Power. (FECSA)
 - Hidrocantabrico.
 - Iberduero.
 - Hidroelectrica Espanyola.
 - Fenosa.
 - E.N.H.E.R.

ENERGIA HIDROELECTRICA

- El declivi de la energia hidroelectrica.



• Dades Unesa

ENERGIA HIDROELECTRICA

Dades REE 2011
Potencia Instal·lada

		Potencia	% Pot.	Energia	% Energ.	Utilitzacio
Hidraulica		17.563	18%	27.571	11%	17,92%
Nuclear		7.700	8%	57.731	23%	85,59%
Termoelectrica	Carbó	11.700	12%	22.097	9%	21,56%
	Fuel	1.492	1%	-	0%	0,00%
	Cicle Combinado	25.269	25%	50.734	20%	22,92%
Regim Especial	Renovable	27.044	27%	54.753	22%	23,11%
	Hidraulica	2.041	2%	5.283	2%	29,55%
	No Renovable	7.282	7%	30.789	12%	48,27%
TOTAL		100.091	100%	248.958	100%	28,39%

ENERGIA HIDROELECTRICA

Dades REE 2011 - Catalunya
Potencia Installada

		Potencia	% Pot.	Energia	% Energ.	Utilitzacio
Hidraulica		2.104	15%	3.053	7%	16,56%
Nuclear		3.142	23%	21.849	50%	79,38%
Termoelectrica	Carbo	162	1%	14	0%	0,99%
	Fuel	1.178	9%	-	0%	0,00%
	Cicle Combinado	4.240	31%	9.587	22%	25,81%
Regim Especial	Renovable	1.308	10%	2.499	6%	21,81%
	Hidràulica	281	2%	925	2%	37,58%
	No Renovable	1.339	10%	5.622	13%	47,93%
TOTAL		13.754		43.549		

A large, traditional wooden water wheel is the central focus, mounted on a stone structure. Above the wheel is a wooden walkway with a metal railing. The background shows a stone wall with an arched opening and some green plants in the foreground.

ENERGIA HIDROELECTRICA

- Perspectives de futur.
 - Econòmiques.
 - Increment del cost de combustible.
 - Necessitat de reducció d'emissions de CO₂
 - No dependencia de l'exterior.
 - Tècniques.
 - La mandera d'emmagatzemar energia a gran escala mes eficient.

ENERGIA HIDROELECTRICA

Veure costos de producció d'energia hidroelectrica.

Taula Compartiva de Costos

Pantà			kW	KWh/any	Ratio Inversió
	Obra Civil	Cost Central	Potencia	Producció	Inv/Prod €/kWh any
Ex. Llosa Cavall	44.667.219,60 €	1.500.000,00	2.675,40	5.618.340,00	8,22
Ribalp	240.000.000,00 €	21.358.621,94	47.619,05	100.000.000,00	2,61

Minicentral

Pantà			kW	KWh/any	Ratio Inversió	Preu Energia
	Obra Civil	Cost Central	Potencia	Producció	Inv/Prod €/kWh any	€/MWh
Regim Ordinari	4.874.000,00 €	2.485.460,00	6.000,00	18.600.000,00	0,40	53,00
Regim Especial	7.954.735,85 €	4.056.458,30	6.000,00	18.600.000,00	0,65	86,50

Generació Aïllada

Generació	€/MWh		kW	kWh/any	Ratio Inversió	
	Cost Inversió	Cost Variable	Potencia	Producció	Inv/Prod €/kWh any	€/MWh
Generadors Gasoil	500.000,00 €	195	1.000	5.600.000	500,00 €	207,500
Hidraulica	7.430.000.000,00 €	21,75	5.600	5.600.000	1.326,79 €	207,500

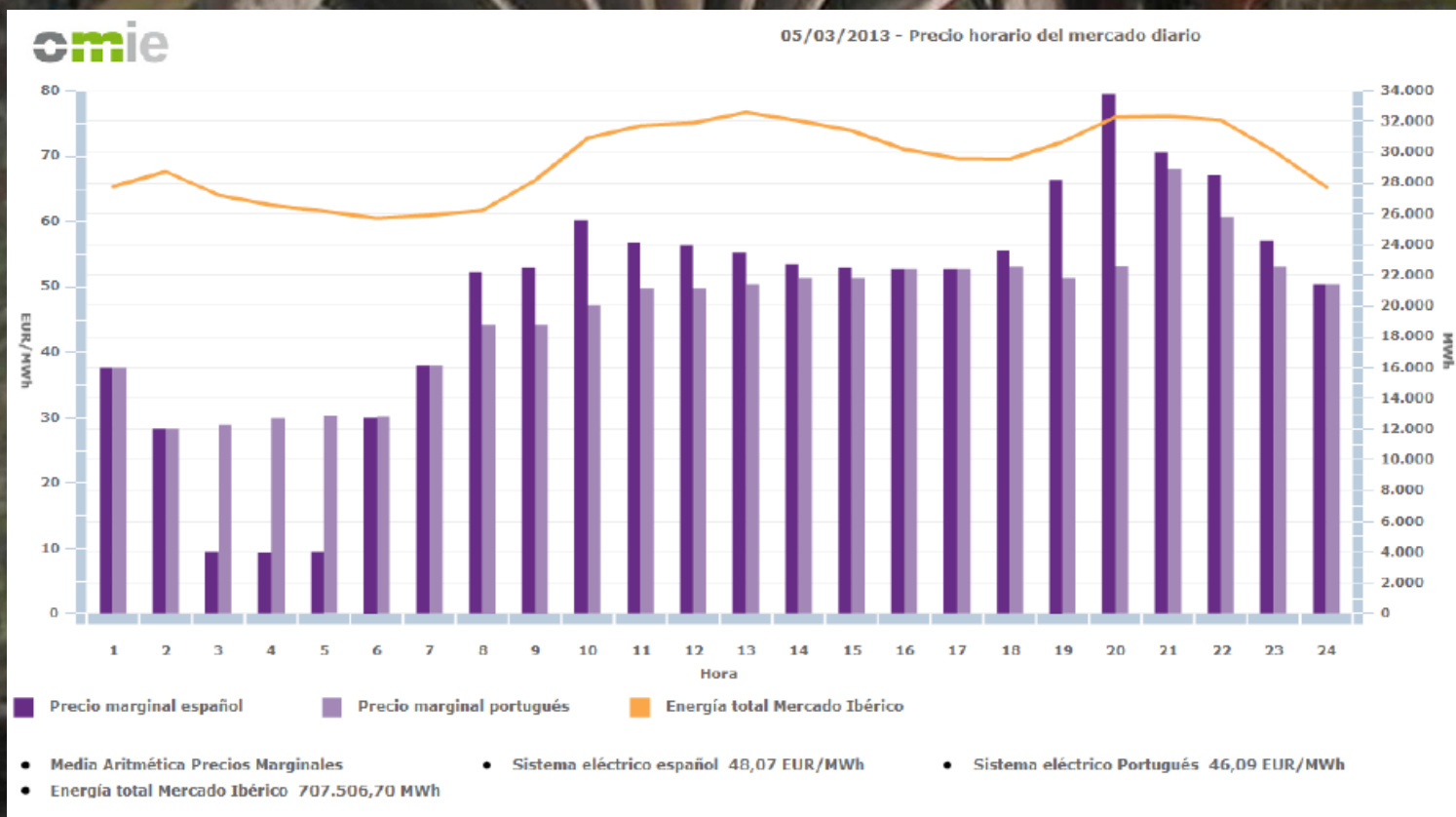
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Estalvi que provoca la producció hidroelectrica en la balança comercial

		Preu	Rendiment	Cost €/kWh	Estalvi Balança Comercial €/año
Gas Natural	32.854,00	3,48	55%	0,00653084	165.049.374,96 €
Fuel	32.854,00	110	35%	0,02264706	620.038.725,49 €

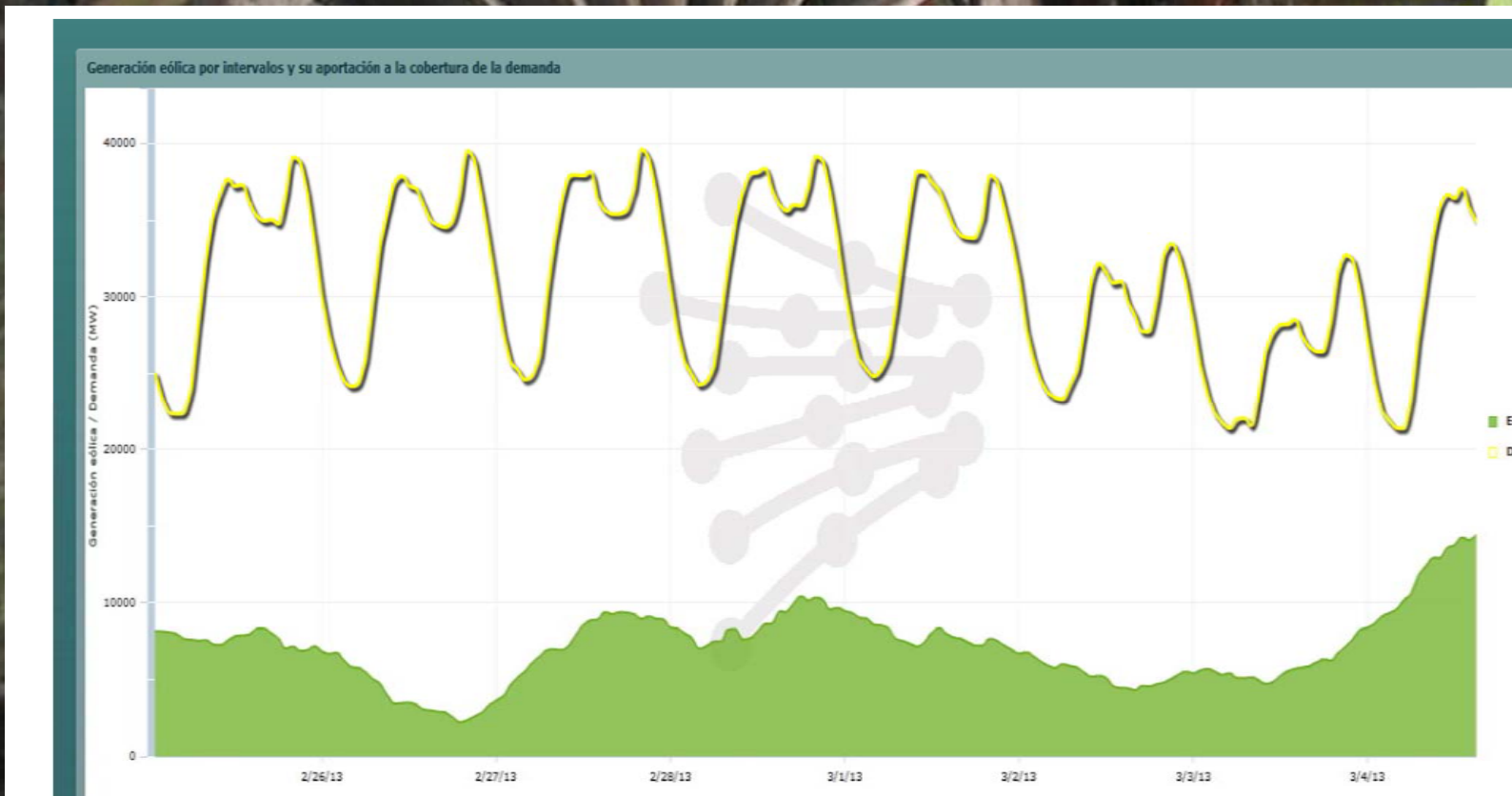
ENERGIA HIDROELECTRICA

Situació emmagatzematge previst i actual



ENERGIA HIDROELECTRICA

Com emmagatzemar l'energia renovable - Comportament Energia Renovable



A large, traditional wooden water wheel is the central focus, partially submerged in a stone structure. Water is seen cascading over the lower part of the wheel. The background features a stone wall with an arched opening and a wooden walkway with a railing above. Green plants are visible in the foreground and to the right.

ENERGIA HIDROELECTRICA

- Caracteristiques de les noves centras de bombeig.
 - No poden tenir un cicle diari.
 - Tenen que tenir gran capacitat d'acumulació.
 - Llocs on es pot implantar :
 - Sau – Susqueda.
 - Mequineça – Ribaroja.
 - Media – El Grado
 - Rialb – Oliana
 - Santa Anna - Canyelles

ENERGIA HIDROELECTRICA

A large, rustic wooden water wheel is the central focus, partially submerged in a stream. The wheel is constructed from thick wooden planks and spokes, showing signs of age and weathering. It is mounted on a sturdy wooden frame. Above the wheel, a stone structure with a metal railing provides a walkway. The background features a stone wall and some green foliage, suggesting a natural or park-like setting.

- L'energia hidroléctrica no es una solució del passat sino que forma part de la solució energètica del futur.
 - S'ha d'aprofitar tot el recurs possible.
 - Ha de servir per a regular el sistema.