



# *Asturias-Spain:* *"Priority projects in Spanish* *Coal Regions"*

COAL REGIONS IN TRANSITION PLATFORM

Bilaterals and Platform Meetings

Working Group Meetings

Mrs. María Belarmina Díaz Aguado  
General Director of Mining and Energy

Regional Ministry of Economy, Industry and Tourism

Principado de Asturias Government

Brussels – 5th-6th November 2018

# WHO ARE WE?? TOWARDS MINING 4.0 AND INDUSTRY 4.0

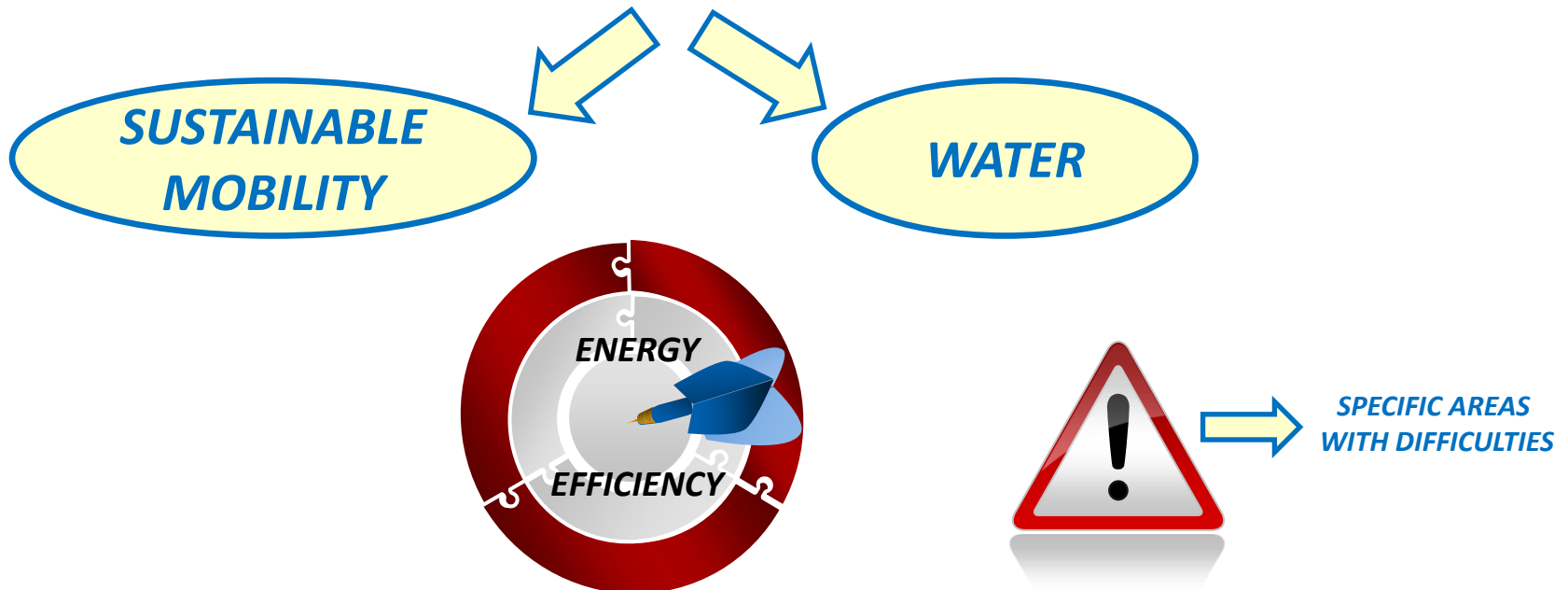
*Not only miners... Metal workers*



## WHAT??

**EFFICIENCY+ NEW ACTIVITIES + SUSTAINABLE INDUSTRY+  
TECHNOLOGICAL DEVELOPMENT+ ADDED-VALUE PROJECTS +  
GREEN CIRCULAR ECONOMY**

## Strategic Proposal: HOW???



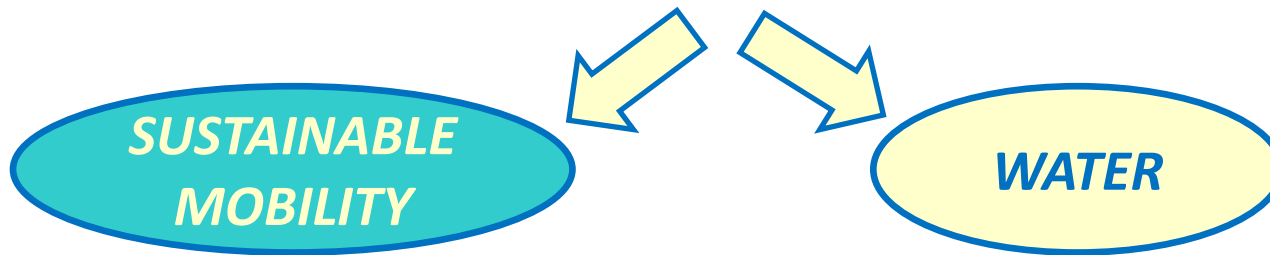
# WHO ARE WE?? TOWARDS MINING 4.0 AND INDUSTRY 4.0

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### Strategic Proposal: HOW???



# HOW??? Priority projects for Asturias



GOBIERNO DEL  
PRINCIPADO DE ASTURIAS

Development of the basic network for fast recharging points

## Initial requirements

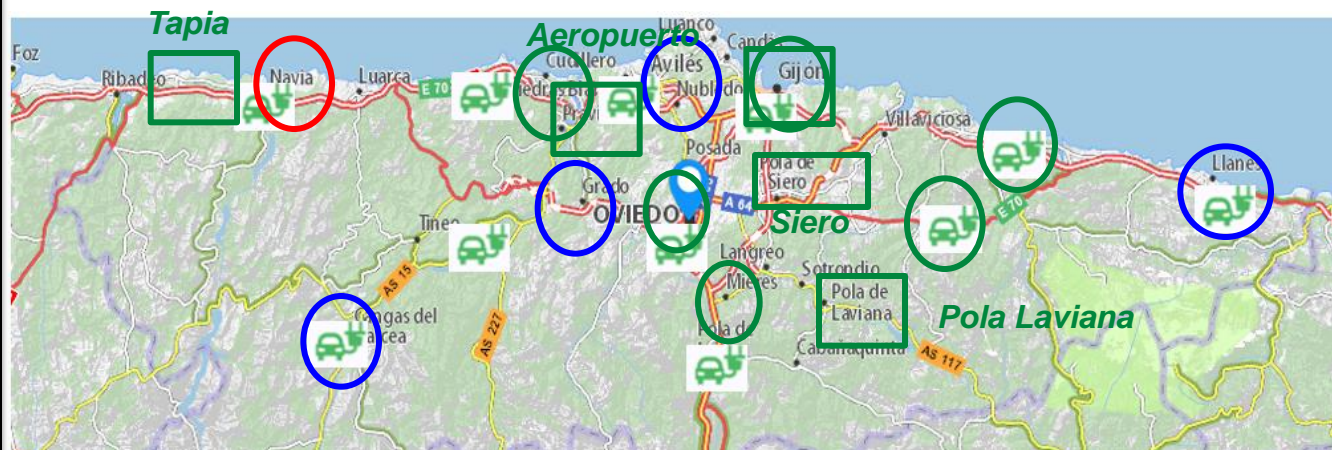
Distance < 50 km

Public access  
network

Location on main  
roads and highways

### CURRENT NETWORK (50 kW)

1. Llanes
2. Ribadesella
3. Gijón -Roces
4. Gijón -Centro
5. Avilés
6. Cudillero
7. Navia
8. Oviedo (22 kW)
9. Mieres
10. Cangas del Narcea (22 kW)
11. Grado
12. Cangas de Onís
13. Tapia de Casariego
14. Aeropuerto
15. Pola de Laviana
16. Siero



Payment through mobile APPS  
Fast charging (80% battery in 30 minutes)

Installed

In operation

To be constructed

Conduc-  
por Asturias



## List of energy projects

*Improve competitiveness, create employment and to reduce emissions*

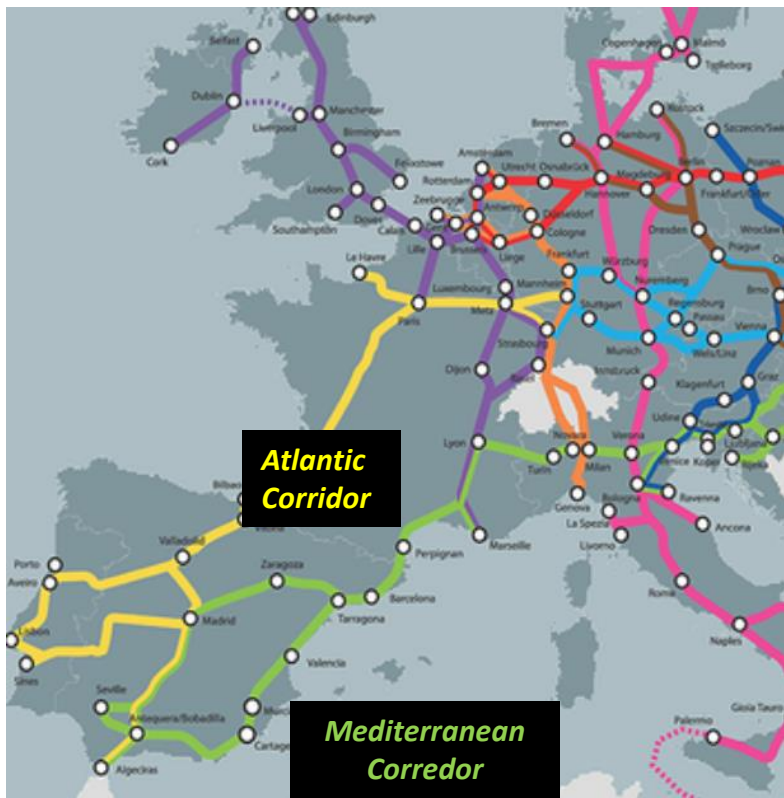
- **Cantabrian e-corridor**



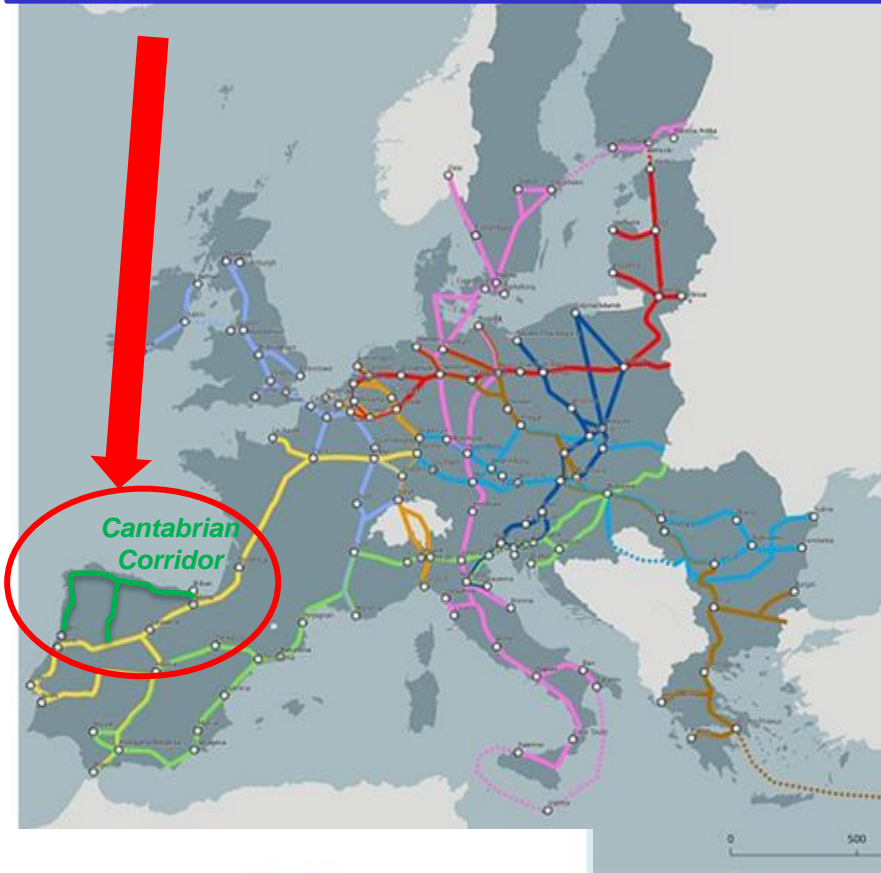
# Project proposal for the development of a Cantabrian e-corridor

To connect the North of Spain and Portugal with main European e-corridors

**CORRIDORS WITH CURRENT DESIGN**



**Cantabrian e-corridor to connect the coal regions between them and with European e-corridors**



- Core Network Corridors**
- A (Baltic - Adriatic)
  - B (North Sea - Baltic)
  - C (Mediterranean)
  - D (Orient/East-Med)
  - E (Scandinavian - Mediterranean)
  - F (Rhine - Alpine)
  - G (Atlantic)
  - H (North Sea - Mediterranean)
  - I (Rhine - Danube)



# Project proposal for the development of a Cantabrian e-corridor

**25 Fast and High Power charging points across the North-West** area of the Iberian Peninsula linking this part of the territory with the Atlantic and Mediterranean Core network Corridor

- 20 in Cantabrian Coast
- 5 in North Atlantic Coast



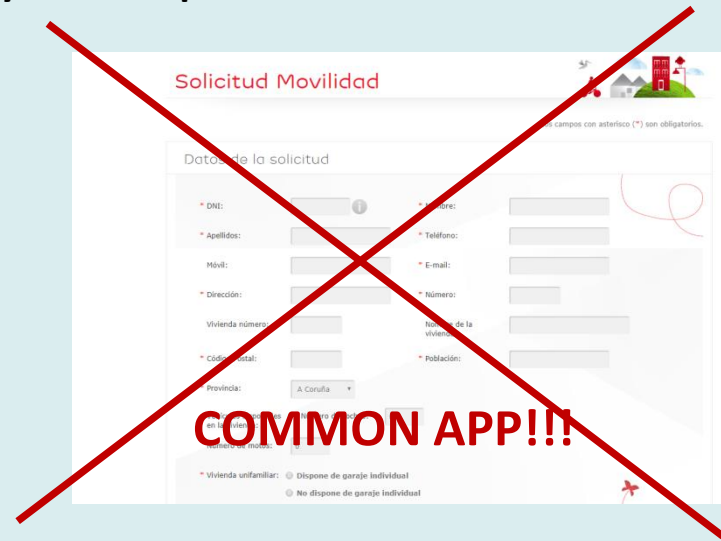
## Definition of a model of public-private cooperation

- Public Administrations in coal regions and other necessary ones: Basque Country
- Charging infrastructure manufacturers + mobility services providers,
- Electrical distribution companies
- ICT suppliers.
- Other stakeholders

## Estimated investment: 1,5-5 M€

- Public-private cooperation
- Funding:
  - National and regional Administrations
  - EU funds: DG MOVE-B, Coal Platform

## Project period: 2 years (from 2019)



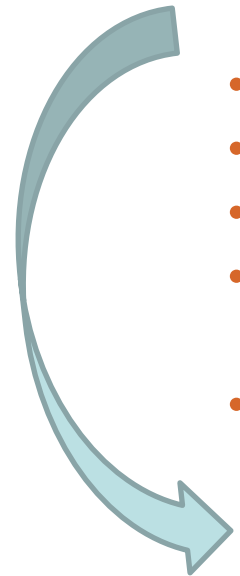
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- Initiative would contribute to the improvement of the existing charging infrastructures, but also would be an excellent opportunity to integrate:
  - New High Power Charging (HPC) technology for e-Transport
  - Clean Energy to charge the EVs generated partially by photovoltaic and hydraulic hybridization
  - Interoperable system that will allow the entirely integration: Common APP



### ADVANTAGES OF PROPOSAL

- Support of Regional Governments
- Transferability
- Industrial area of sustainable mobility expertise
- Acquisition of new **knowledge and expertise of integration of renewable energies hybridization and sustainable transport**
- **Integration** with other mobility infrastructures, mainly those for **marine transport**





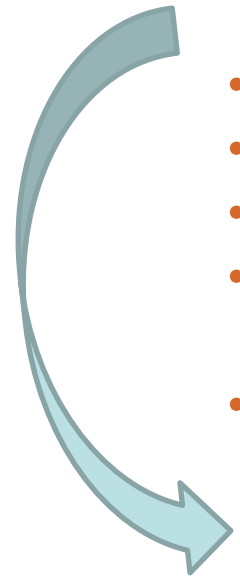
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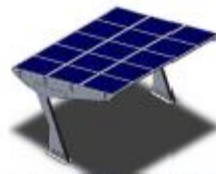


# Project proposal for the development of a Cantabrian e-corridor

## Desarrollo de las estaciones de recarga FAEN



Instalación fija



Baterías de  
acumulación



Instalación  
aislada

Hibridación  
de  
soluciones

Experimentación

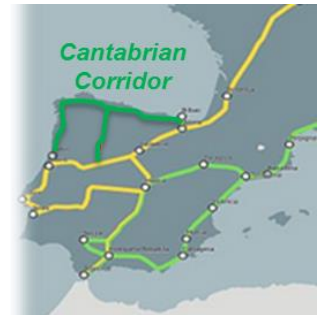
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EN  
in Asturiana  
energía



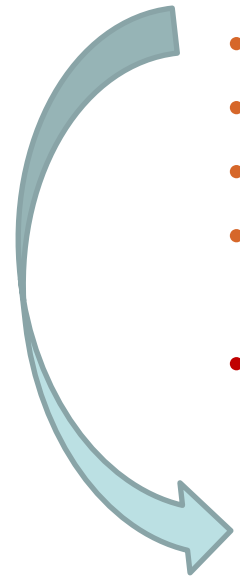
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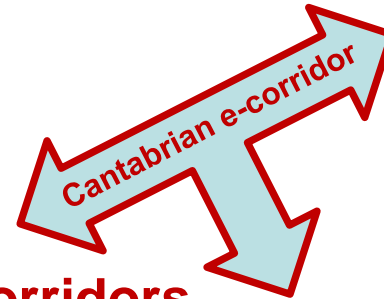
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## List of energy projects

*Improve competitiveness, create employment and to reduce emissions*



- **Cantabrian e-corridor**
- **Connections with EU gas corridors**
- **e-Corridor for Natural and National Parks (protected areas)**
- **Energy self-sufficiency in Redes National Park**
- **Zero carbon tourism**
- **Physical Energy storage**
- **Recovery of Industrial heat:**
  - from paper production
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# Project on gas mobility and Connections with EU gas corridors

## Connections with EU gas corridors of North of Spain for natural gas, synthetic gas and biogas

### Gasoductos integrados en el sistema europeo

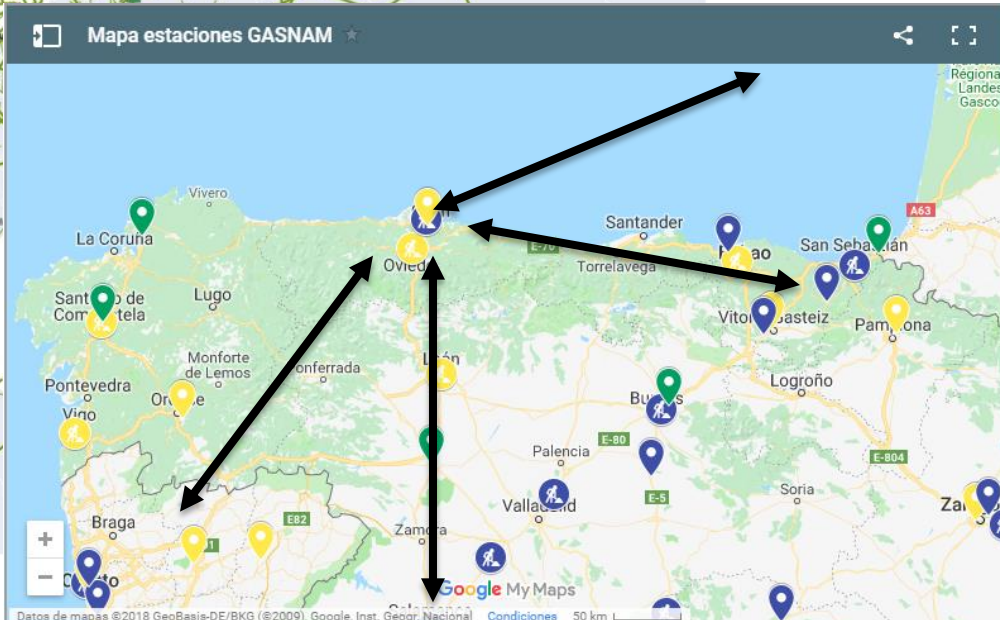
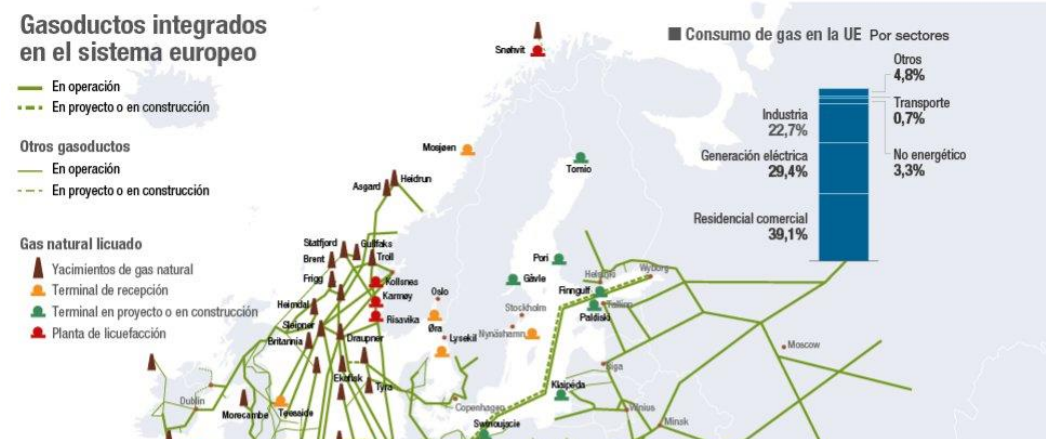
- En operación
- - - En proyecto o en construcción

### Otros gasoductos

- En operación
- - - En proyecto o en construcción

### Gas natural licuado

- ▲ Yacimientos de gas natural
- ▲ Terminal de recepción
- ▲ Terminal en proyecto o en construcción
- ▲ Planta de licuefacción



### Estado estaciones de gas natural

#### Abiertas:

- GNC
- GNL
- GNC-GNL

#### Próximas aperturas:

- GNC
- GNL
- GNC-GNL

Fuente: Eurogas, 'Informe Estadístico 2014'

# Project on gas mobility and Connections with EU gas corridors

## Open regional seaports to international routes



1. *Connect with other hub seaports in UE.*
2. *Adapt infrastructures to future traffic needs.*
3. *Develop new business and added values from the existing natural gas infrastructure.*



## *Project on gas mobility and Connections with EU gas corridors*

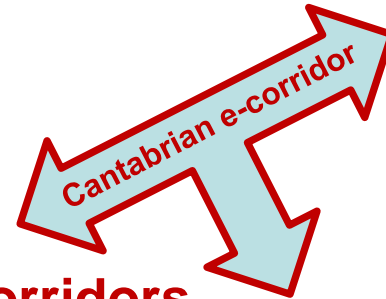
Train by LNG. First proof of Spain in Asturias.  
Some routes are not electrified

- 1. Reduce internal environmental impacts.*
- 2. Reduce internal transport costs and increase the offer of services.*
- 3. Offer alternatives to present transports services.*



## List of energy projects

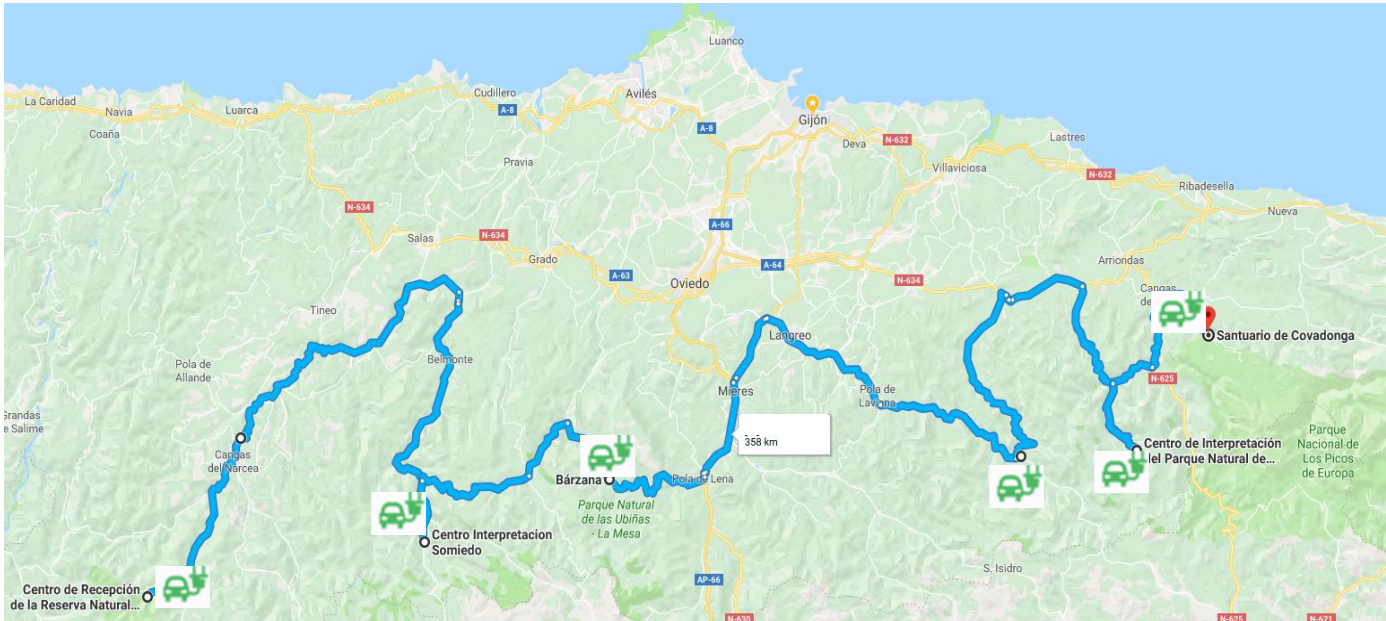
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# e-Corridor for Natural and National Parks (protected areas)

Charging points located in interpretation centres of Natural Parks. Corridor of 358 km.



Covadonga Sanctuary



**Objective:** to connect National Parks in order to ensure electric mobility in areas of environmental value (usually remote areas)

Investment ≈ 300.000 €



Interpretation Centre of Redes Natural Park

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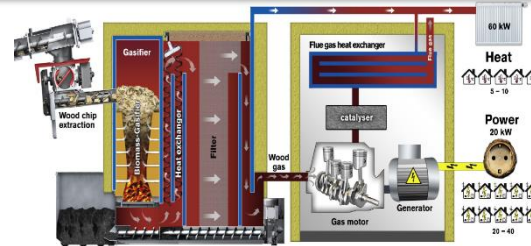
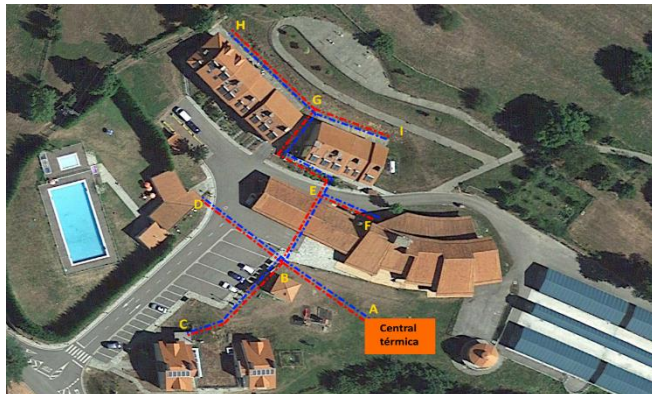
# Energy self-sufficiency in public installations in Redes National Park

*District heating+ biomass cogeneration + photovoltaic + electrical mobility*



**Current situation:**  
*Use of individual systems by conventional fuels*

*0 emissions model+ use of local resources+ new economical activity and employment*



*E-Mobility Charging point+  
Electrical vehicles  
High efficiency Lighting*

*Awareness-raising and spreading strategy.  
Area for attraction of ecological tourism*

## ***Energy self-sufficiency in public installations in Redes National Park***

### **Biomass generation with 3 multifuel boilers (wood chips or pellets)**

- 2 multifuel boilers 100 kW each
- 1 cogeneration module of 20 kWe and 60 kWt

### **Photovoltaic system of kWp**

### **Installation of 2 semi-fast recharge stations for EV**



### **Awareness-raising and dissemination strategy. Interactive APP.**

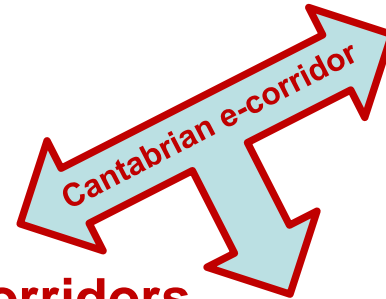
### **Solutions for sustainable mobility**

**Investment≈ 0,5-2 M€**

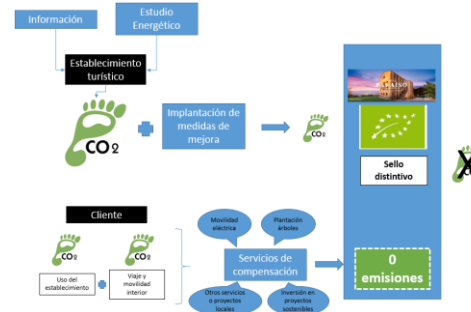


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# Renewable energy storage for renewable power

## Pilot project for Physical Energy storage

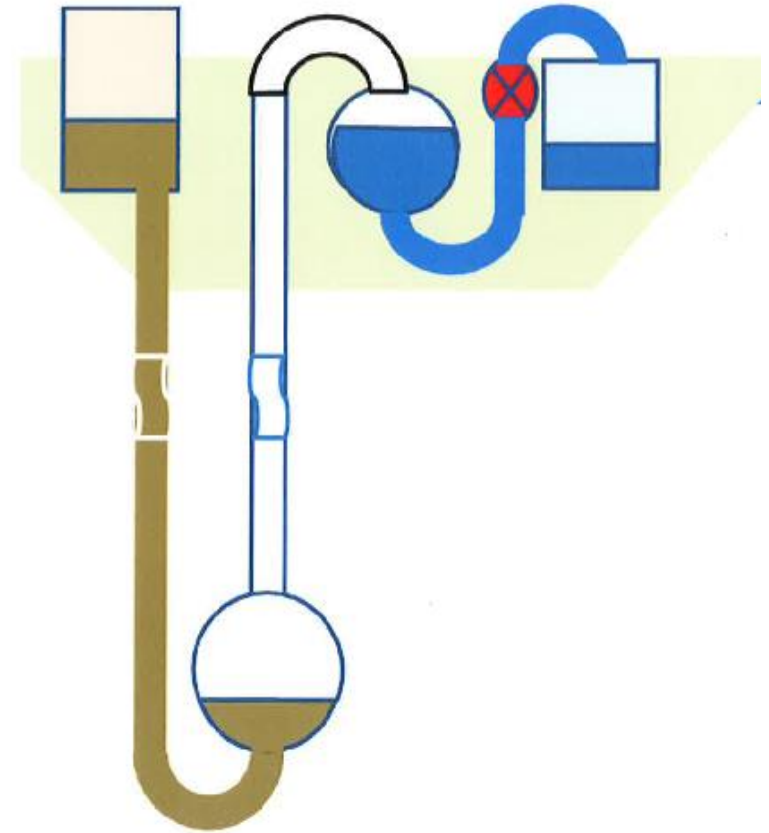
Magellan & Barents plan a pilot project in an Asturian mine.

Storage System by height difference/increase, two storage tanks and compression by slurry pushing another fluid towards a Pelton turbine.

Energy is stored through height increase of slurry (physical way). For high energy demand, slurry goes down pushing against a fluid with goes through the turbine generating electricity at proper time.

### Four key points:

1. Dense fluid slurry: Density  $> 3 \text{ g/cm}^3$
2. High pressure bottom tank: slurry / gas
3. High pressure top tank: gas /water
4. High pressure pump and ultra high head Pelton turbine



# Renewable energy storage for renewable power

## Pilot project for Physical Energy storage

Based on tested tech from Offshore, Mining and Hydro but:

*TECHNOLOGY CHALLENGES: Development Economic Institute of Principality of Asturias has given a 850.000 € grant from Regional Institute:*

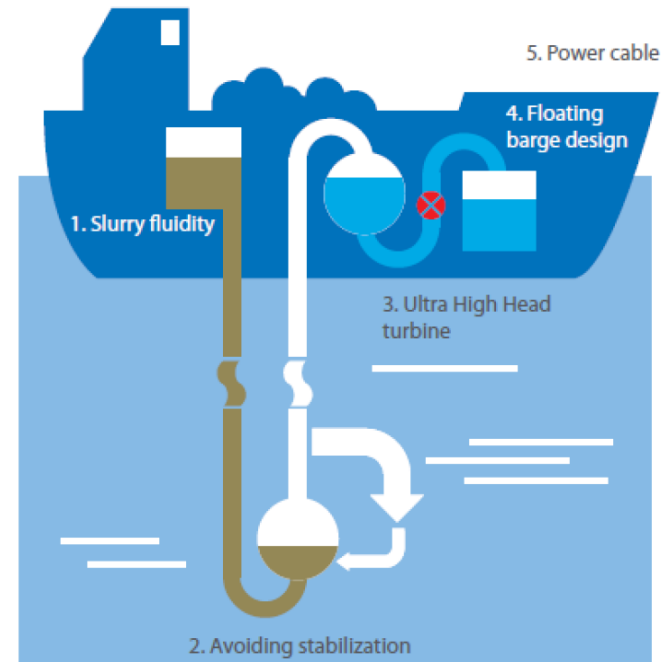
1. Slurry fluidity increasing/decreasing
2. Avoiding slurry stabilization
3. High Pressure tanks behaviour

*But there are other*

*TECHNOLOGY CHALLENGES  
(Project managers with EDP)*

- Ultra high head turbine
- Power cable

Technology challenges:



# Renewable energy storage for renewable power

## Pilot project for Physical Energy storage

Technology can store and generate during hours. Onshore and offshore:

1. Hill + Mine pit (Asturias).
2. Tunnel for emergency ventilators.
3. Avilés Canyon (Asturias).

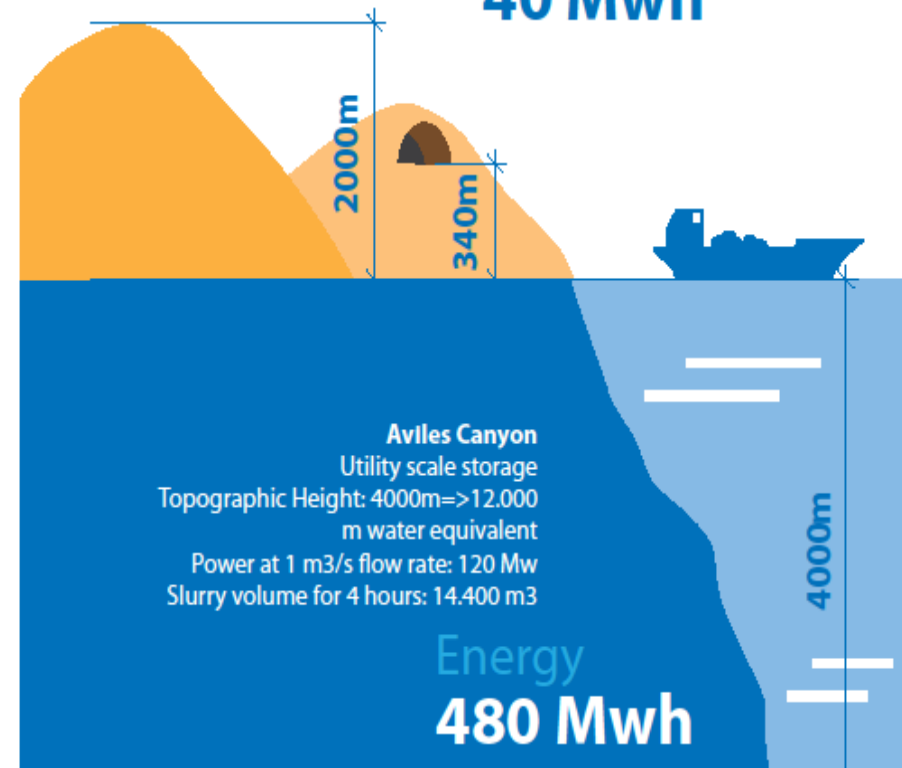


**Hill+Mine pit (Asturias)**  
Topographic Height: 2000m=>6000 m water equivalent  
Power at 1 m<sup>3</sup>/s flow rate: 60 Mw  
Slurry volume for 4 hours: 14.400 m<sup>3</sup>

Energy  
**240 Mwh**

**Road Tunnel**  
Replacement of emergency Diesel gensets for ventilators  
Topographic Height: 340m=>1000m water equivalent  
Power at 1 m<sup>3</sup>/s flow rate: 10 Mw  
Slurry volume for 4 hours: 14.400m<sup>3</sup>

Energy  
**40 Mwh**



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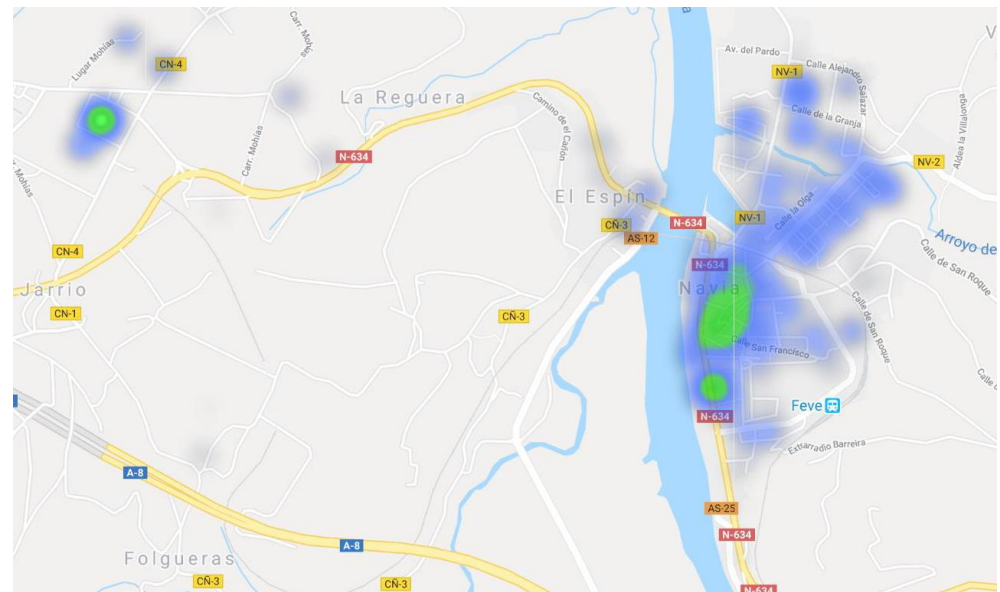
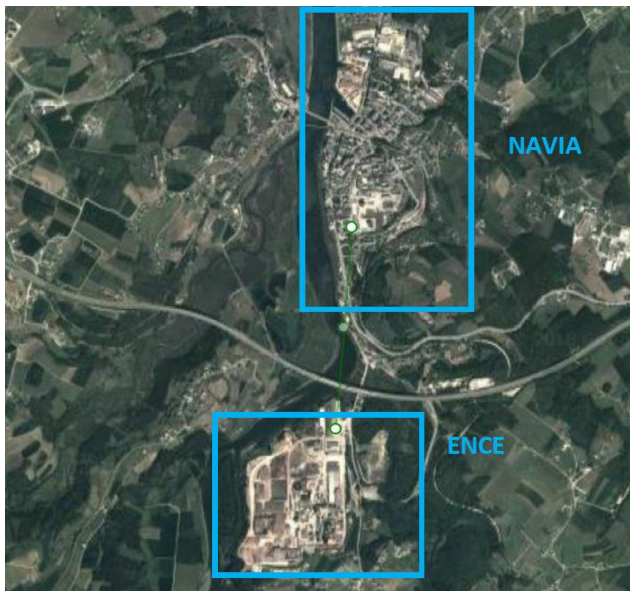
# Projects for Industrial heat Recovery

## Projects for Recovery of Industrial heat for district heating

**Objective: Recovery of Industrial heat from paper pulp industry for urban district heating in Navia**

Thermal requirements: 11.868 MWh/year (housing, public buildings and hospital)

Available heat: 30.000 MWh/year





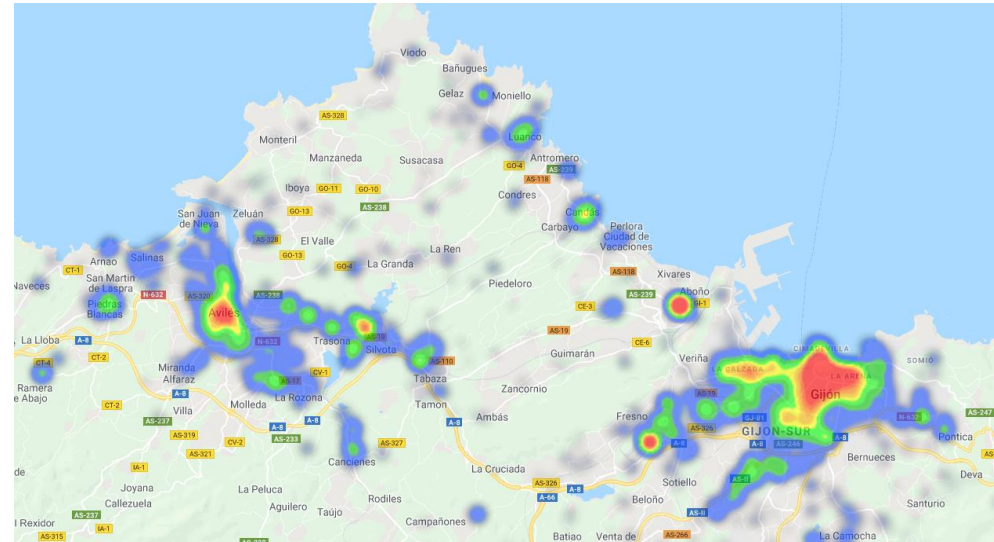
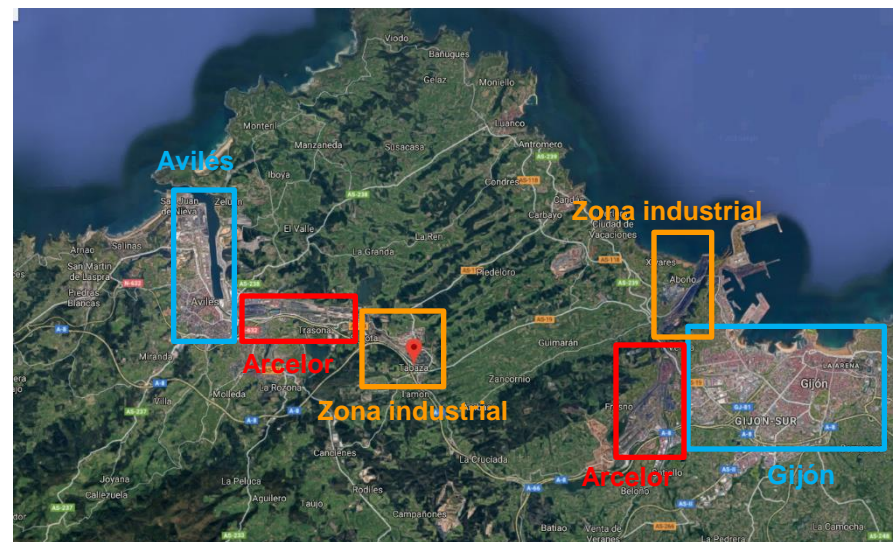
# Projects for Industrial heat Recovery

## Projects for several networks of industrial heat recovery

**Objective: Recovery of Industrial heat from steel industry for industrial parks and urban district heating in Avilés and Gijón**

Requirements: industrial facilities, housing and public buildings

Available heat: residual gases from steel manufacturing and other heat sources



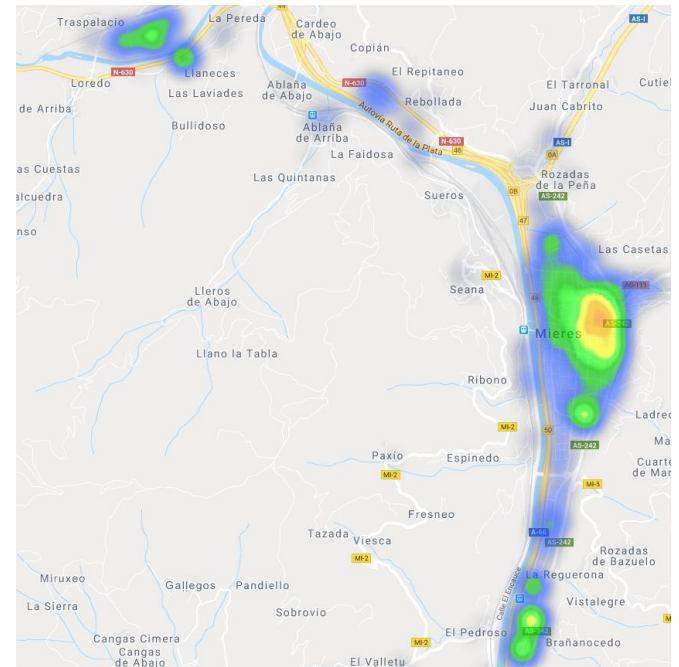
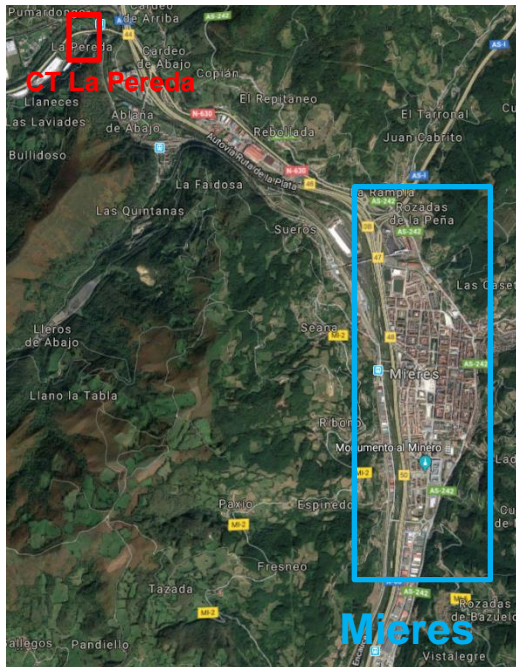
# Projects for Industrial heat Recovery

## Projects for industrial heat recovery

**Objective: Recovery of Industrial heat from power plant for urban district heating in Mieres**

Requirements: housing and public buildings. Improvement in district heating from other energy sources

Available heat: residual gases from power plant



# Projects for Industrial heat Recovery

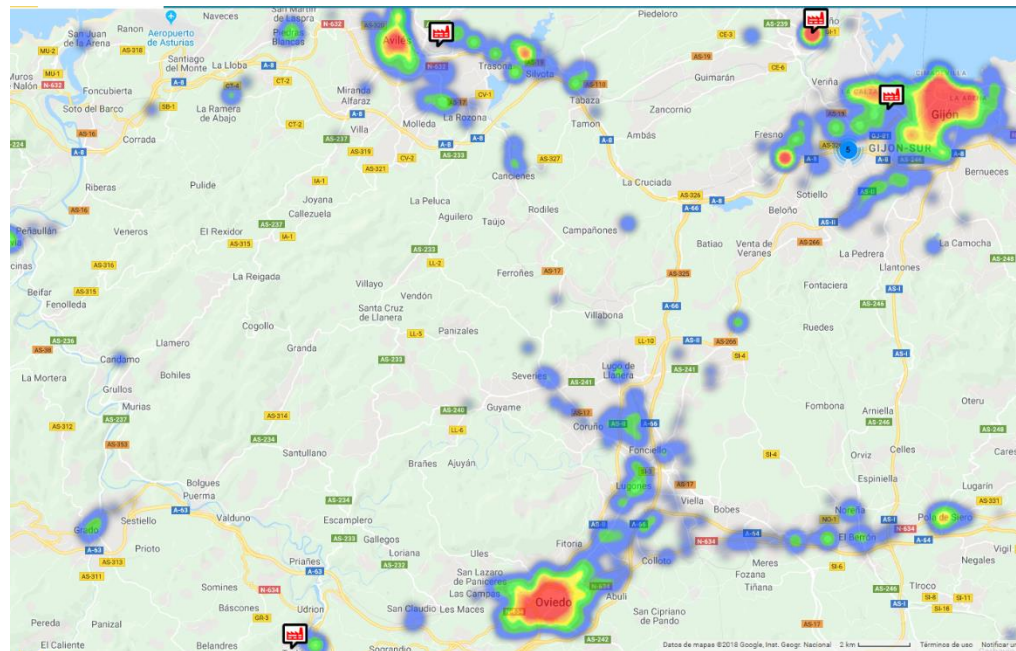
## Several industrial heat recovery Projects for cogeneration

**Objective: Recovery of Industrial heat for cogeneration**

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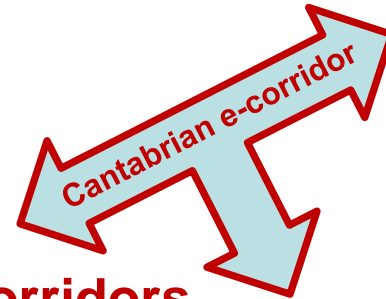
Industrias Doy

Tudela Veguín



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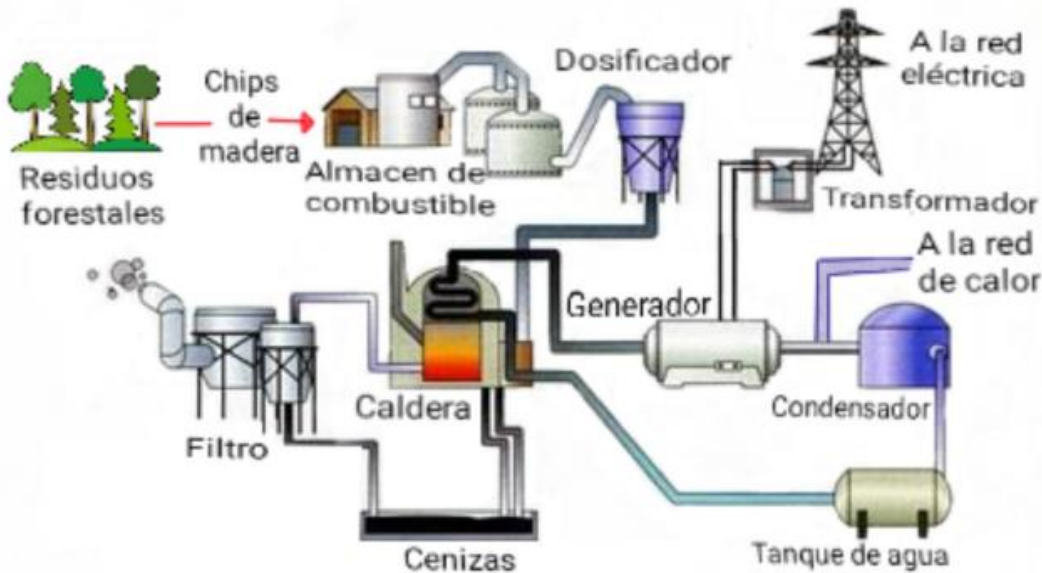
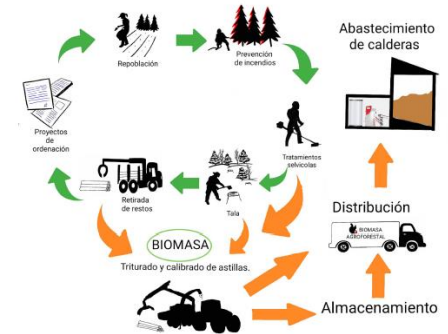


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# Small biomass power plants

**THERMOELECTRIC BIOMASS POWER PLANT:**  
**Rankine or ERC**  
**COGENERATION: 2 MWe and 8 MWt**  
**Rural area**  
**INVESTMENT: 6-8 M€**  
**10 employments in plant and 12 in forests**



### OBJETIVOS:

**Plantación**

Residuo forestal

Madera cortada

Aserradero

Residuos de madera

Chips de madera

Central eléctrica de biomasa

Electricidad

- Consumiendo nuestro propio producto.
- Venta de energía en mercado regulado.
- Venta de energía en mercado libre.

Calor

- Venta de calor a empresas locales a bajo coste.
- Reaprovechamiento para la mejora del rendimiento energético de nuestro producto. WOOD CHIP.

**Medioambientales**

- Suministro propio garantizado.
  - Con recursos disponibles en montes ordenados y bajo las directrices de la silvicultura sostenible.
- Eficiencia energética, energía renovable y local.
- Menor impacto ambiental.
- Aprovechamientos forestales.
- Limpieza de montes.
- Prevención de incendios.
- Ciclo completo, correcto y sostenible del medio.

**Economicas**

- Economía circular.
- Comercialización eléctrica.
- Inversión en la empresa, en el municipio y en la provincia.
- Energía mas barata. Mas ahorro.
- Para el ORC contamos con tecnología de alto rendimiento diseñada por una ingeniería regional.

**Sociales**

- Generación de empleo en el medio rural.
  - En la planta (unos 10 personas)
  - En el monte.
  - Indirectos (unas 12 personas)
- Fijación al territorio 20-25 años.



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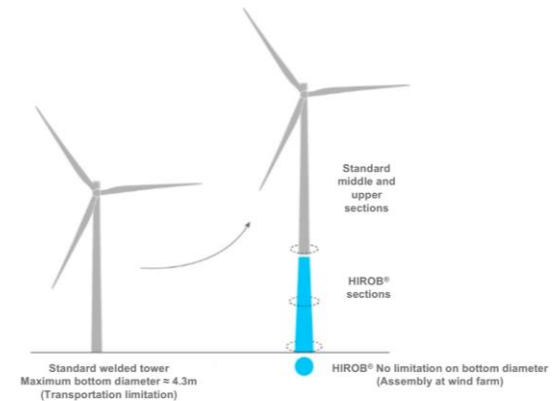
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## Other projects for regional/ local supply chain

### Actions to be performed:

- Working groups on energy storage related with renewable generation:  
**FAEN**
- Great Eolic turbines.
- CO2 capture expertise: **INCAR.**
- Alternative uses of coal.
- Recovery and recycling of raw materials.
- Improvement of energetic efficiency through low water consumption systems: **dry-cool technologies.**
- **TELESCOPE.**
- Water projects

### ArcelorMittal High Tower Solution HIROB® Tower



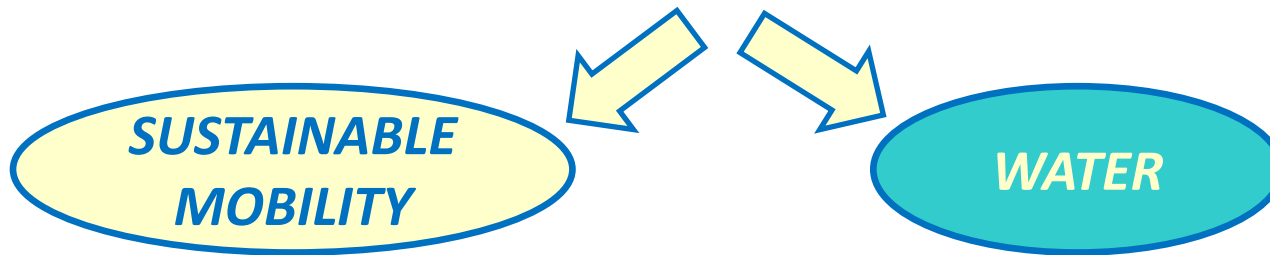
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### Strategic Proposal: HOW???





## ENERGY TRANSITION of the Central Asturian Mining Area



# CIRCULAR ECONOMY



### ▶ CoalAst360Economy



In the future scenario, all the mentioned activities will be integrated in a process of **Circular Economy** for the generation of **Clean Energy** with the aim of **keeping employment and industrial activity in Asturias**.

Nevertheless, the region requires a transition period (2019-2021) in which it is essential **to continue having only one mining well in production in order to keep on carrying out research in the area of eco-combustion by CO<sub>2</sub> capture**. During this period of transition, it will also be **necessary to adapt La Pereda Power Plant for its new uses**.

The Project **CoalAst360Economy** is supported by the Government of the Principado de Asturias through the Ministry of Employment, Industry and Tourism, which is a member of the Coal Mining Regions in Transition Platform

## Water projects

- Give added value to land and industrial areas owned by HUNOSA: greatest land owner in the region.



- Resource from forests: **biomass**, more than 3.800 Ha with over 9.000 t/year, for energetic contracts and services.



- Mine water as thermal energy source: Hospital, Research centre and FAEN and other projects. District heating







# Water projects

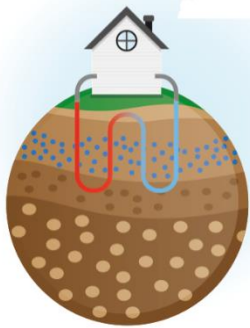
## Future Scenario

2022



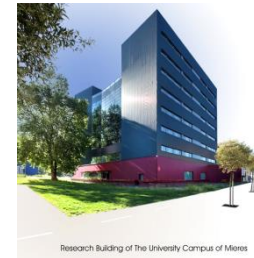
# Geothermal district heating

*District heating through Mine water geothermal energy and forest biomass.*



## Current Geothermal Case Studies:

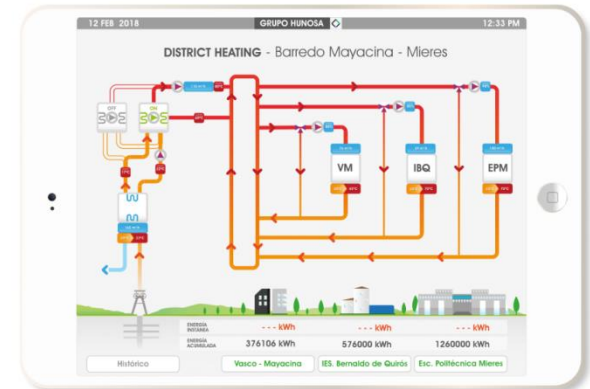
- Research Building of The University Campus of Mieres
- Alvarez Buylla Hospital in Mieres
- Energy Asturian Foundation



## New Projects (under construction):

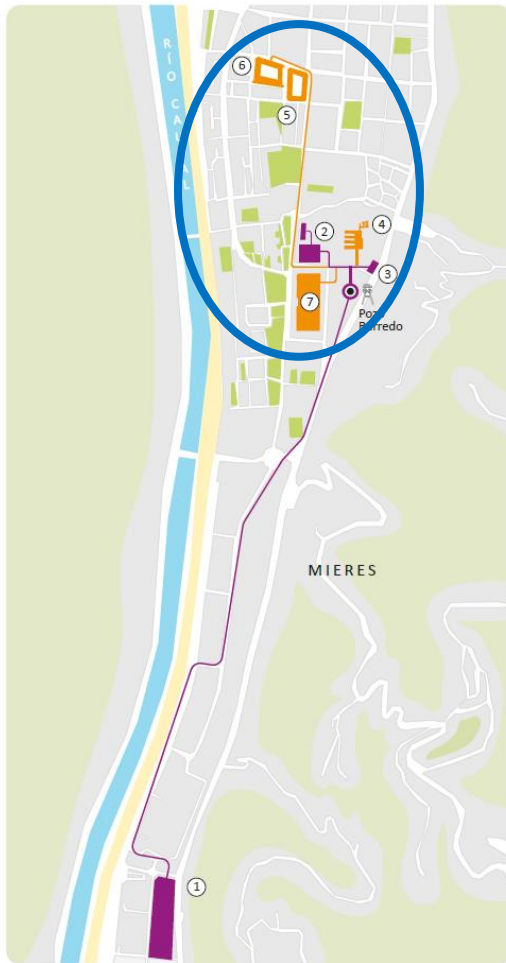
### 1. District Heating Barredo – Mayacina:

- Main University Building in Barredo
- Bernaldo de Quirós High School
- 2 buildings with 117 and 131 flats in Vasco Mayacina



### 2. District Heating La Felguera:

# 1. (GEOTHERMAL District Heating Mieres) CURRENT PROJECT



— Proyectos en Ejecución  
— Proyectos Ejecutados



1- Hospital Álvarez-Buylla



2- Edificios Campus Universitario



3- Fundación Asturiana Energía



4- Instituto Bernaldo Quirós



5- Edificio M9 - Mayacina



6- Edificio M10 - Mayacina



7- Escuela Politécnica Mieres

**Pumping capacity: 860 m<sup>3</sup>/h**

**Needs of geothermal systems: 530 m<sup>3</sup>/h**

**Volume for future development: 330 m<sup>3</sup>/h**

**Average performance(COP and EER) ≈ 6 - 8**

**4MWt installed** entre in the 3 buildings turn the project in the greatest one in Spain.

## **Current (heating)**

**Hospital VAB: 3.000 kW**

**Campus University: 724 kW**

**FAEN: 100 kW**

**Increase in 2MWt installed** for 4 new installations.



# 1. (GEOTHERMAL District Heating Mieres) CURRENT PROJECT

Increase in **2MWt installed** for 4 new installations.

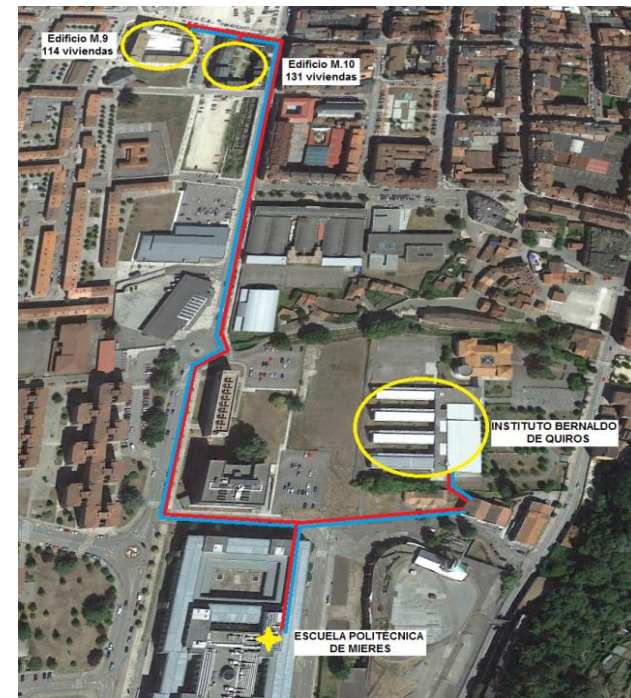
**Enlargement of generation plant 2.000 kW**

IES Bernaldo Quirós high school: heating

Building M9: heating + water preheating ACS

Building M10: heating + water preheating ACS

University school of Mines: heating



Year 2017: DG Mining and Energy, Low Carbon european fund for regional development (EFRD) funding: 503.125 € for total investment of 1.421.541,51 €.

## 2. (GEOHERMAL District Heating La Felguera) FUTURE PROJECT



1 - C. Deportivo Juan Carlos Beiro



2 - Edificio C/ Dolores Ibárruri 9



3 - Residencia N.S. del Fresno



4 - Langrehotel



5 - Centro de Salud La Felguera

**Pumping capacity:** 200 m<sup>3</sup>/h  
**Power to be installed:** 1,2 MWt

### Requirements:

**Sport center “Juan Carlos Beiro”:** 700 kW

**Buildings (45 flats):** 200 kW

**Hotel + Geriatric care home:** 700kW

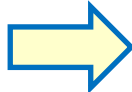
**Health centre area 8:** 500 kW

**Year 2018: DG Mining and Energy, Low Carbon european fund for regional development (EFRD) funding: 1.100.000 € for total investment of 1.700.000 €.**



## Water projects

*Hydraulic energy from mountain mines already closed which have become water storage systems for:*

- *Hydraulical power plants (up to 50 MW under study)*
- *Underground mining hydraulical energy*
  - *Usually closed to inhabited areas*
  - *Open tunnels currently draining significant water flows towards rivers: galleries and mine entries became water sources for rivers*
  - *Good geological knowledge*
  - *Calcareous basins: pH non acid  $\cong 7$*
  - *Fractured basins: great water deposits*
  - *8 to 10 areas have been previously analysed*  *2 study areas:*
    - *Carinsa (Aller Valley)*
    - *Urbies (Turon-Mieres Valley)*
  - *Each project: 20 to 30 persons during construction, mining expertise .*
  - *Pilot prototype required.*

# WHO ARE WE?? TOWARDS MINING 4.0 AND INDUSTRY 4.0

*Not only miners... Metal workers*

## WHAT??

**EFFICIENCY+ NEW ACTIVITIES + SUSTAINABLE INDUSTRY+  
TECHNOLOGICAL DEVELOPMENT+ ADDED-VALUE PROJECTS +  
GREEN CIRCULAR ECONOMY**

**SUSTAINABLE  
MOBILITY**

**Strategic Proposal: HOW???**

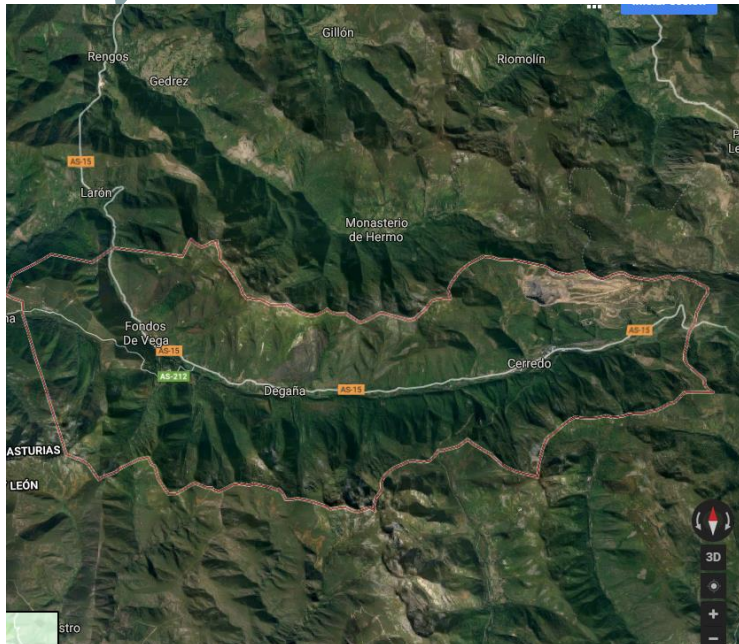
**WATER**

**WHAT ELSE????????**

# WHAT ELSE? WHAT DO WE NEED FROM EC?

Transition of the existing industrial model in this coal mining region to a new model based on, among others, electromobility industry (transport + energy + IC)

**FINANCIAL SUPPORT: FUNDING**  
**SUPPORT: problems we are unable to solve**



**SPECIFIC AREAS  
WITH DIFFICULTIES**

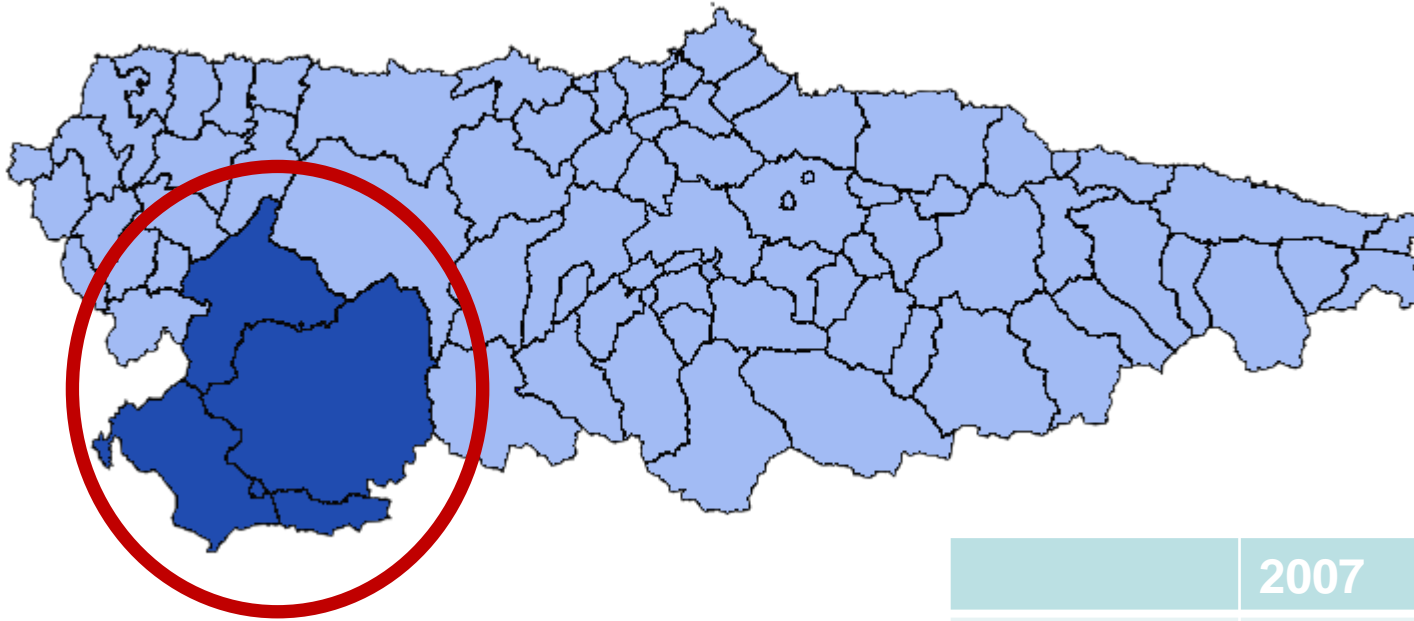


# WHAT ELSE? WHAT DO WE NEED FROM EC?



## WHAT ELSE? WHAT DO WE NEED FROM EC?

### What we expect from European Commission?



### **SOUTH WEST AREA**

*Loss of population: 7.054 inhabitants lost in last 10 years:*

*Loss of 15-25 % of inhabitants while Spain increased 15%*

	2007	2017
<b>Cangas</b>	15.127	12.947
<b>Degaña</b>	1.288	978
<b>Ibias</b>	1.797	1.362
<b>Allande</b>	2.169	1.742
<b>Tineo</b>	11.539	9.700

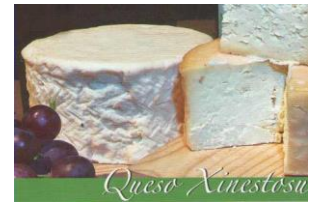


## WHAT ELSE? WHAT DO WE NEED FROM EC?

### What we expect from European Commission?

#### **Some projects: FOOD**

- *Already existing buildings, offices, changing rooms*
- *Fomer open pit mine: “Reguero de los Prados”  
Rengos*
- *Food transformation industry: In mining area, for 15 people.*
  - *Honey: all honey production sold for other regions industry*
  - *Meat: gourmet pre-cooked or Vacuum packaged meat*
  - *Cheese: Asturias is Spanish region with more designation of origin cheeses: 3 non-industrial cheeses.*
- **INVESTMENT: 1.5-3 M€.**



#### **Some projects: ecoparks**

## WHAT ELSE? WHAT DO WE NEED FROM EC?



**FINANCIAL SUPPORT: FUNDING**  
**SUPPORT: problems we are unable to solve**

- *New opportunities: New business models identified*
- *New needs: DISSEMINATION, information and formation*
- *New requirements and challenges: connectivity, networks, big data*
- *We are learning: New networks and corridors*
- *We aim innovation and singular projects*
- *We need to organise in working groups*
- *We want to share experiences and best practices*

**Thank you!!!!**



# *THANK YOU FOR YOUR ATTENTION*

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Brussels – 5th-6th November 2018