



## Pilot project on availability, use and sustainability of water production of nuclear and fossil energy

Geo-localised inventory of water use in cooling processes, assessment of vulnerability and of water use management measures

### Project introduction

JAN 2014

# Background

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- > The **European Commission's Water Blueprint** aims to ensure that a sufficient quantity of good quality water is available for people's needs, the economy and the environment throughout the EU.
- > Within this context DG Environment and European Environment Agency are building **Water Accounts** for all river basins in Europe that quantify the various ways in which water is used.
- > The first version of these Water balances was defined in a study in 2011 – 2012. This included estimated water use functions for the power sector and some other sectors of industry. Specifically with respect to **cooling water use in power and industrial sectors**, the existing estimates are not considered sufficient.

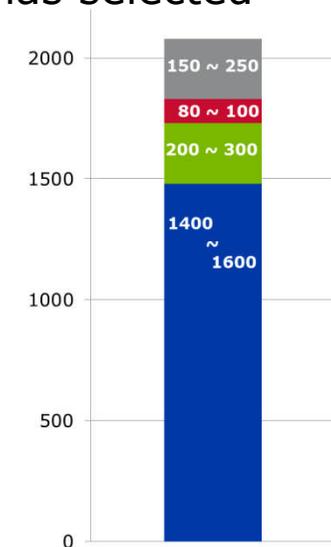
# Objective and scope of this inventory

## > Objective

- To gather reliable data on water use for cooling purposes in energy and industry for the EU countries and to organise this in a database to be compatible with the existing E-PRTR, LCP and WISE (water system) databases.
- Use of database by the JRC Institute for Environment and Sustainability as input in hydro-economic modelling to analyse the potential vulnerability of the economy to changes in water resources availability.

## > The present inventory is a pilot for which DG Environment has selected 4 sectors that play an important role in cooling water use.

- Iron and Steel 
- Refineries 
- Chemical sector 
- Power generation 

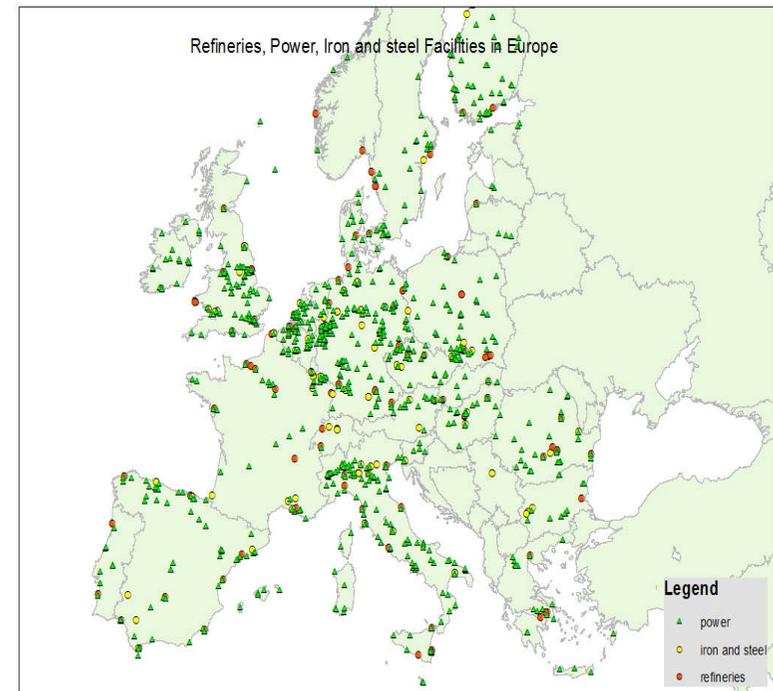


## > Within each sector the pilot study inventory will focus on a selection of the most important facilities

# Deliverables

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- > The database builds on the E-PRTR database and data elements of the database will be geospecific:
  - water intake, water discharge, water consumption, temperature of water intake/discharge and heat load.
  - Time resolution: 2001 – 2012 → the database will be based on monthly reporting, the base year will be 2010.
- > Indicator measuring vulnerability of the sector to changes in water resources availability.
- > Catalogue of mitigation measures database to mitigate vulnerability



# Two parallel tracks: data gathering and water use functions

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- > **Data gathering** on cooling water intake, discharge and consumption by distributing a detailed **questionnaire** through
  - European sector organisations; and
  - validating the acquired data with national sector organisations and water institutes.
  
- > **Water use functions** to allow estimating corresponding values at facility level, to allow filling any gaps in data gathered.

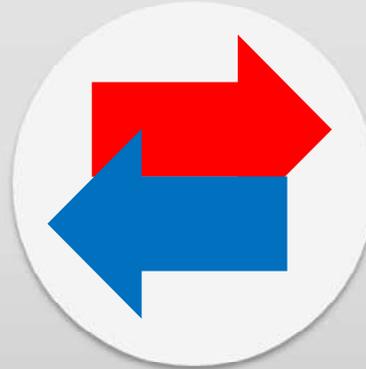
# Data gathering and water use functions

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## Basic information on facility

• IDs and basic



## Information on cooling system & water use



## Water body information

• Water body ID from

Examples of data of interest on a national or regional level to enable data validation in our project:

- Total water consumption (per sector)
- Total water intake (per sector)
- Total cooling water discharge and associated heat load of (per sector)

## Lessons learned (preliminary)

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- > Water use (intake, discharge, consumption) of power plants and industrial facilities varies with technological, geographical and seasonal circumstances, plus market effects. Difficult to assess in detail ex-ante without site specific details.
- > Align in early phase of project with relevant stakeholders (regulatory bodies, companies etc) to identify basis of cooperation: data that can be shared and level of detail
- > Existing databases (E-PRTR, Ecrins) can provide good basis for proxies, but be aware of incompleteness and limitations.
- > Definitions are very important. For example, a clear distinction is to be made between water use and and consumption.

# Timeline

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2013

> October                      Steering Committee meeting  
Alignment with EU sector organisation

> November  
Data gathering (phase 1)

> December

2014

> January                      Interim reporting  
Review interim results and data by Steering Committee



> February  
Follow-up data gathering (phase 2)

> March  
Reporting and data validation

> April  
Finalisation of deliverables and hand-over to EEA

> May

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Please contact us for more information

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# BACK-UP SLIDES

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# Project organisation

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## > Project owners

- Initiative and funding:  
European Commission DG Environment, contact Henriette Faergemann
- Custodian of cooling water database  
European Environment Agency, contact Beate Werner

## > Steering Committee for guidance and review of deliverables.

- DG Environment, European Environment Agency, DG Energy, Eurostat
- EU sector organisations: Eurelectric, Concawe, Cefic, Eurofer
- JRC Institute for Energy & Transport, JRC Institute for Environment and Sustainability, JRC Institute for Prospective Technological Studies

## > Project team

**ECOFYS** **Deltares** **TNO** have joined forces for this assignment:

- team includes senior experts for each of the 4 sectors addressed.
- Ecofys - leading energy consultancy, including power and industrial sectors.
- Deltares - leading research institute in water management, including E-PRTR.
- TNO - leading knowledge institute, including emission inventories.

# How will the information be used?

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## 1. Organising of data in database

- base data on facilities from E-PRTR
- data gathered on cooling water withdrawal, consumption and discharge.
- estimated cooling water withdrawal, consumption and discharge where no data was available.

## 2. Data validation

- Review and validation based on team expertise and
- Validation review cycle with sector organisations
- Validation review by steering committee that includes EU sector organisations

## 3. Publication of final deliverables

- public database listing facilities and corresponding cooling water use;
- report with justification of approach, data validation, context and any qualifications and background on the meaning of data and limitations therein.

# Why is it important to participate?

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1. This offers an opportunity for stakeholders in each sector to ensure that the European Commission water accounts include realistic information on their respective cooling water intake, consumption and discharge.
2. This allows the sectors to demonstrate the key factors and complexities that govern cooling water use, including the possible interaction between cooling and topics such as energy efficiency and emissions.
3. Where no measured data is available, a method for estimating cooling water intake, consumption and discharge will be used. The quality of these estimates and corresponding qualifications and limitations in the validity of extrapolating, will rely on the information that is available.

# What type of data will be gathered? (1)

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## > Selection of facilities in each sector

- threshold criteria on plant capacity
- selection of subsectors

## > Time dimension

- base year 2010
- monthly cooling water volumes & temperature
- overall timeframe 2001 - 2011

## > Restrictions

- confidential data will be treated as such
- aggregated or anonymous data can be used in estimating cooling water use.

## > Data gathering team will approach

- EU and national sector organisations
- national (government) bodies responsible for water

### Basic information on facility

- IDs and basic parameters based on E-PRTR
- Geographic location
- Plant type and capacity

### Information on cooling system

- Type of cooling system
- Cooling water volumes withdrawal, consumption and discharge
- Temperature of cooling water withdrawal and discharge.

### Water body information

- Water body ID from ECRINS database.
- Water body type (fresh, sea etc)
- Location of withdrawal and discharge points

## What type of data will be gathered? (2)

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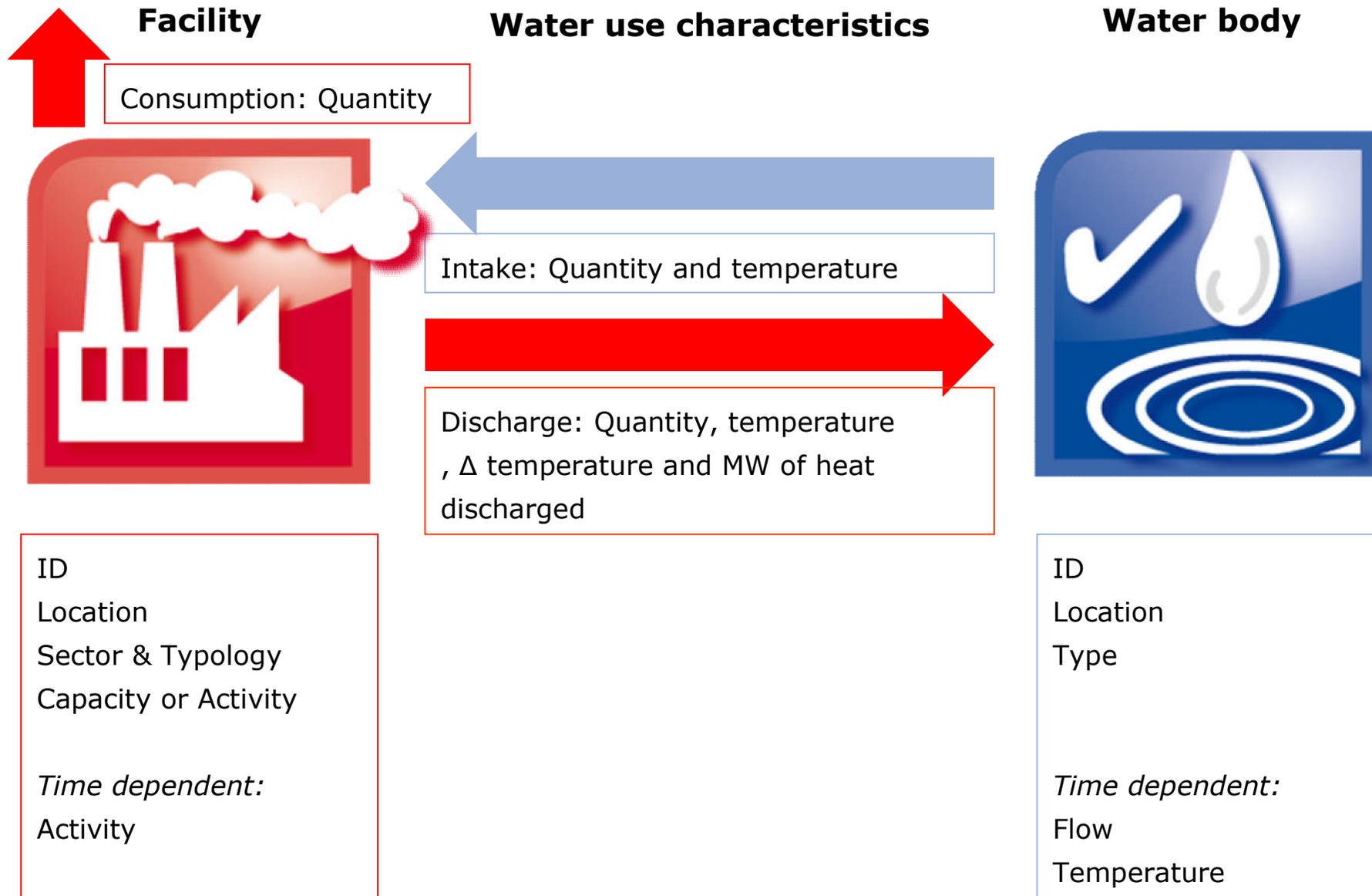
### > Key parameters for each facility:

- location / ID E-PRTR
- Installed capacity
- operating hours for years in the past
- cooling system(s)
  
- Facility or water body specific limits
  - Volume of water withdrawal
  - Volume and temperature (increase) of water discharge
  - Heat load

Examples of data of interest on a national or regional level to enable data validation in our project:

- Total water consumption (per sector)
- Total water withdrawal (per sector)
- Total cooling water discharge and associated heat load of (per sector)

# Cooling water use functions – the basis



# Vulnerability (indicative!!)

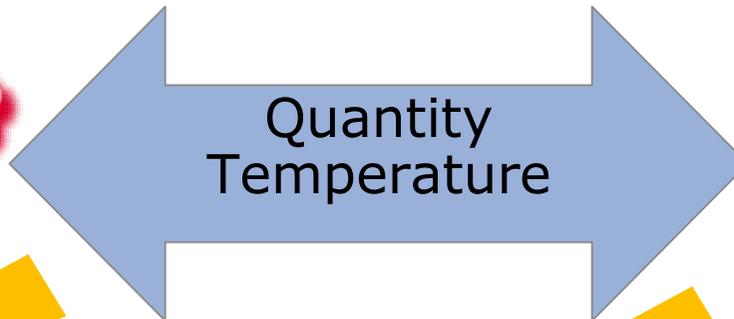
## Facilities



Heat discharge need for multiple facilities

Reduced output

## Water use characteristics



Share of heat load capacity

**Critical >100%**

Very good <10%

## Water system



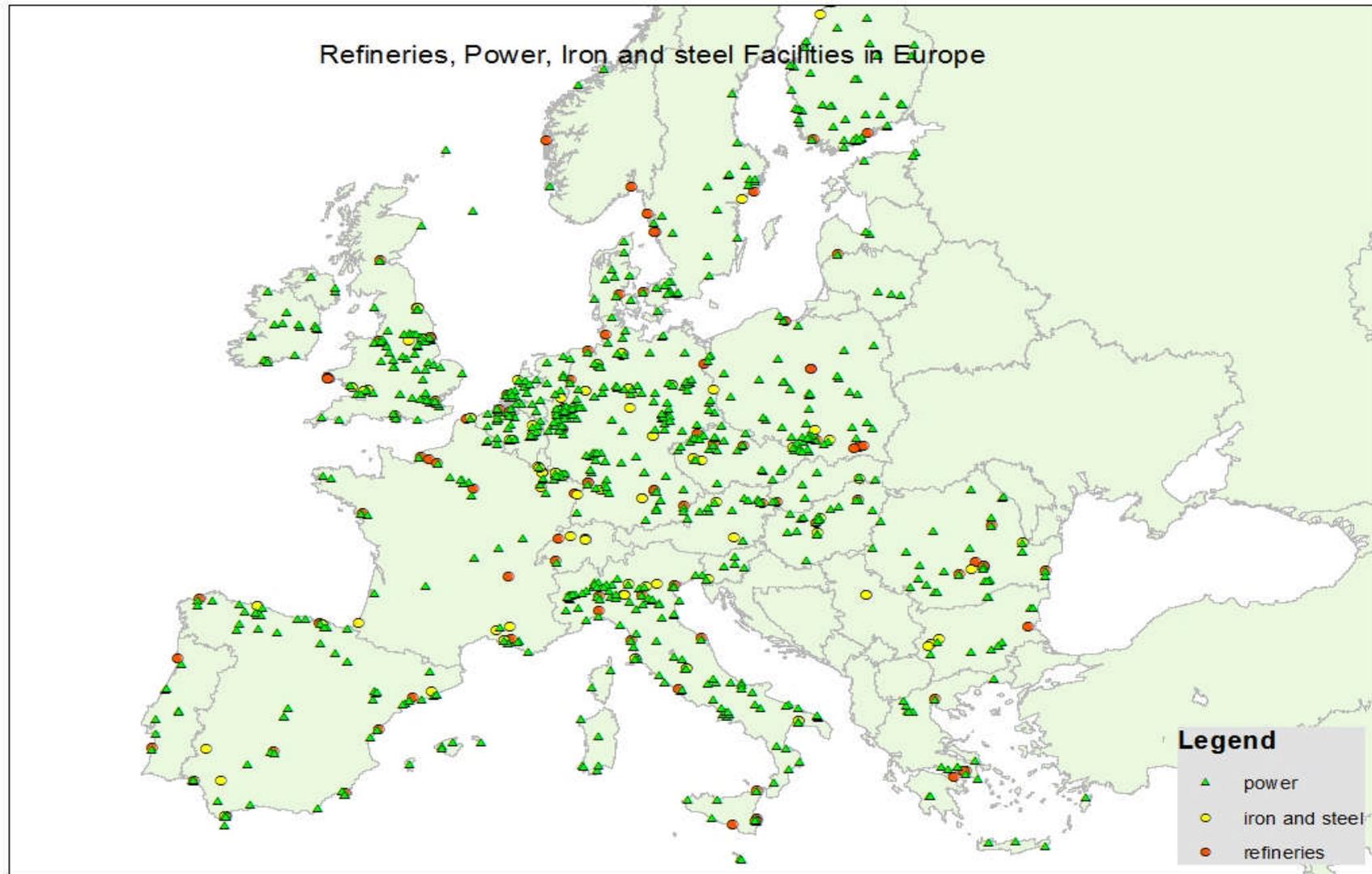
Heat load capacity of water body

MW  
(function of flow and temperature)

Environmental concerns

# Facilities included in the database (ex. Nuclear power and chemical sector)

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## Current status of database

	Power	Iron & steel	Refineries	Chemical
Number of facilities	945	27 primary steel 37 secondary steel	117	(~250)
Estimated share of cooling water use in sector covered by sample	>90%	~100% for primary ~30% for secondary  ~90% total	~100%	n/a
Most important data coverage (estimated or calculated parameters are highlighted <i>italic</i> )	<ul style="list-style-type: none"> <li>• Geographic info</li> <li>• Dominant water body (intake and discharge)</li> <li>• Cooling system</li> <li>• Installed production capacity</li> <li>• Annual production and production profile (2010)</li> <li>• Specific water use (intake, discharge &amp; consumption)</li> </ul>	<ul style="list-style-type: none"> <li>• Geographic info</li> <li>• Dominant water body (intake and discharge)</li> <li>• Installed production capacity</li> <li>• Annual production and production profile (2010)</li> <li>• Specific water use (intake, discharge &amp; consumption)</li> </ul>	<ul style="list-style-type: none"> <li>• Geographic info</li> <li>• Dominant water body (intake and discharge)</li> <li>• Installed production capacity</li> <li>• Annual production and production profile (2010)</li> <li>• Specific water use (intake, discharge &amp; consumption)</li> </ul>	<ul style="list-style-type: none"> <li>• Specific cooling requirement</li> </ul>