



# Safety, Health and Environmental Annual Report 2009

EC Joint Research Centre - Institute for Energy  
June 2010

J. de Haas, T. Timke, K. van Lierop



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The mission of the JRC-IE is to provide support to Community policies related to both nuclear and non-nuclear energy in order to ensure sustainable, secure and efficient energy production, distribution and use.

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## Glossary

|              | <b>Dutch</b>   | <b>English</b>  |
|--------------|--|---|
| <b>AED</b>   | Automatische Externe Defibrillator   | Automatic External Defibrillator  |
| <b>BHV</b>   | Bedrijfs hulpverlening   | In-company Emergency Response Team  |
| <b>CPR</b>   | Commissie voor de Preventie van Rampen door gevaarlijke stoffen              | Committee for the prevention of disasters by dangerous goods              |
| <b>ECN</b>   | Energieonderzoek Centrum Nederland   | Energy research Centre of the Netherlands                                 |
| <b>EHBO</b>  | Eerste Hulp Bij Ongelukken   | First Aid   |
| <b>EMAS</b>  | Eco-Management and Audit Scheme  | Eco-Management and Audit Scheme   |
| <b>EMS</b>   | Milieu Management Systeem  | Environmental Management System   |
| <b>GHG</b>   | Broeikasgassen   | Greenhouse gases  |
| <b>GHS</b>   | Globally Harmonized System (of Classification and Labelling of Chemicals)    | Globally Harmonized System (of Classification and Labelling of Chemicals) |
| <b>HFR</b>   | Hoge Flux Reactor  | High Flux Reactor   |
| <b>HSC</b>   | Commissie voor Veiligheid, Gezondheid en Milieu                              | Health and Safety Committee   |
| <b>IE</b>    | Instituut voor Energie   | Institute for Energy  |
| <b>INO</b>   | Intern Noodplan Onderzoek Locatie Petten                                     | Internal Emergency Plan Research Site Petten                              |
| <b>ISO</b>   | Internationale Organisatie voor Standaardisatie                              | International Organisation for Standardization                            |
| <b>JRC</b>   | Gemeenschappelijk Centrum voor Onderzoek (GCO)                               | Joint Research Centre   |
| <b>KFD</b>   | Kernfysische Dienst  | Department of Nuclear Safety, Security and Safeguards                     |
| <b>MSDS</b>  | Materials Safety Data Sheet  | Materials Safety Data Sheet   |
| <b>NPR</b>   | Nederlandse Praktijk Richtlijn   | Dutch national guideline  |
| <b>NRG</b>   | Nuclear Research and consultancy Group                                       | Nuclear Research and consultancy Group                                    |
| <b>OHSAS</b> | Handleiding voor het opzetten van een ARBO-managementsysteem (vrij vertaald) | Occupational Health and Safety Assessment Series                          |
| <b>OLP</b>   | Onderzoeks- en Bedrijven Locatie Petten                                      | Research Location Petten  |
| <b>RSC</b>   | Reactor Veiligheidscommissie   | Reactor Safety Committee  |
| <b>SCBA</b>  | Ademhalingstoestel   | Self contained breathing apparatus  |
| <b>SES</b>   | Veiligheid, Milieu en Beveiliging (Sector)                                   | Safety, Environment and Security (Sector)                                 |
| <b>SSO</b>   | Veiligheidskundige   | Site Safety Officer   |
| <b>VOC</b>   | Vluchtige Organische Stoffen   | Volatile Organic Compounds  |
| <b>VROM</b>  | Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer        | Ministry of Housing, Spatial Planning and the Environment                 |
| <b>WVO</b>   | Wet Verontreiniging Oppervlaktewater   | Waste water licence   |

## Introduction

This document is the integrated Safety, Health and Environmental Annual Report 2009 of the JRC Institute for Energy, Petten site.

This report describes the safety, health and environmental activities, targets and impacts of the JRC-IE in 2009. The Renewable Energy Unit, part of the Institute located in Ispra (Italy), is excluded from this report, since its safety, health and environment related activities are managed locally by the Ispra Site Directorate. Where 'Institute' or 'IE' is used in this report it refers to the Petten site.

The research activities of the Institute are carried out under the 7th Framework Programme of the European Commission: the non-nuclear programme is valid from 2007 to 2013 and the EURATOM nuclear programme is valid from 2007 to 2011. The Framework Programme is the legal basis for the work of the JRC and thus also of the Institute for Energy. The Framework Programme outlines in general terms the main priorities for Research and Development (R&D) funded by the European Union. Nuclear R&D is approved by the European Council, whereas non-nuclear R&D is approved by a co-decision between the European Council and the European Parliament.

Within the current Framework Programme the activities of the Institute for Energy in Petten have not significantly changed. However there is an increase in the desk top type activity with the creation of a new unit which deals with the area of Energy Security. This change has no impact on safety, health and environmental issues at the Institute.

Over the last couple of years environment, safety, health and well-being have received continuous attention and a high priority within the European Commission and at the Institute for Energy. The Institute's Environmental Management System was implemented and first certified in 2004 according to ISO 14001. The development of a Safety Management System had been completed in 2008 to such an extent, that certification according to OHSAS standard 18001 was achieved in 2009. Environmental and Safety Management are integrated to the overall Quality Management System of the JRC-IE.

With these management systems the IE is continuously striving to be a safer and more environmentally friendly workplace for everyone on site and living in its surroundings.

# SAFETY AND HEALTH

## Background

At the Institute for Energy, Petten site, the implementation of the Commission Decision (C(2006)1623) on 'Establishing a Harmonised Policy for Health and Safety at Work for all Commission Staff' has been finalized.

In order to monitor the compliance of this Decision and to constantly improve the safety at the site, the Institute has set up a safety management system according to the OHSAS 18001 (2007) standard.

This occupational health and safety management system was certified by TNO Certification in November 2009.



## Safety related goals

### **Safety Programme 2009-2011**

In 2009 the institute management has published for the first time a multi-annual Safety Programme for the Petten site.

In this Programme 2009-2011 the management has defined safety targets and goals and has confirmed that it will continue to improve its safety management system (SMS).

The Safety Programme 2009-2011 has been attached to this report as Annex I.

### **Safety Plan 2009**

In the Annual Safety Plan it is described on which activities the Institute management has focused in 2009.

|   |
|---|
| <b>Implementation European Commission Decision C(2006) 1623</b>           |
| Review the set of safety rules for IE – Petten site                       |
| Finalize the risk assessment for all posts                                |
| Review the risk assessments for all workplaces                            |
| <b>Certification OHSAS 18001</b>  |
| Document review by certification body                                     |
| Certification audit OHSAS 18001   |
| <b>Create program 2009-2011</b>   |
| Determine the objectives for the coming years                             |
| <b>Annual Safety Report</b>   |
| Prepare and complete the report of 2008                                   |
| <b>Safety Awareness Campaign</b>  |
| Prepare a safety awareness campaign (define a program, select a company). |
| Launch the safety awareness campaign                                      |



All subjects of the plan were achieved with one exception; the launch of the safety awareness campaign was delayed and started in the beginning of 2010.



In addition to the annual safety plan, but as part of the programme, the Institute has strengthened its emergency preparedness by training a number of staff members in the use of "Automatic External Defibrillators" and placing four of these devices at different strategic places on site.

*AED at the Institute for Energy*

## **Inspections and audits**

At the Institute, Petten Site, various inspections and audits were carried out by staff of the Institute and by external bodies.

There is a well-established practice for the inspections made by the Management, internal auditors, and members of the Sector Safety-Environment-Security.

Frequent workplace visits were performed by the European Commission Medical Service. These visits are primarily intended for personal medical checks but are also used to inspect work places or to give advice on general health related issues.

External inspections were performed by the different local and national inspection bodies. In November 2009, the Institute passed the OHSAS 18001 based Safety Management System certification audit. Based on the inspection and audit reports action plans were drawn up and the required actions were carried out.

For an overview of the 2009 inspections and audits see the table under Environment.

## **Safety Related Committees**

### ***Health and Safety Committee***

The Joint Committee on Health and Safety (HSC) of the Institute is an advisory body for management and staff regarding health and safety matters.

The committee deals on a regular basis with near-accident and accident reports, with safety related remarks of staff and with review of documents belonging to the health and safety management system of the Institute.

In addition to this standard agenda, in 2009 major topics during the committee meetings were the implementation of the Commission Decision C(2006)1623, preventive measures against the spread of the Mexican Flu (H1N1) and the workplace ergonomics in relation with physical strain.

## **Reactor Safety Committee**

The task of the RSC is to advise the directors of JRC-IE, NRG and ECN on all nuclear safety aspects related to any of their nuclear facilities on the Petten site.

This includes all work and experiments in and around the research reactors and other nuclear facilities as well as facility operations, modification and testing. Licensing documentation, including safety related procedures and instructions affecting the Safety Technical Specifications or safety related procedures and instructions of a facility, which have to be sent to the competent authorities, are also to be reviewed.

The RSC also has the authority to investigate, request additional information and give advice on matters the committee itself believes to be relevant for nuclear safety, including matters brought to the attention of the Committee.

## **Safety related training and instructions**

One of the main preventive actions is safety related training and instruction to individuals or groups of persons. There is a standard general programme directed at both new and present staff and external persons working on site. Besides this, specialised information and training is provided to specific groups and persons.

Each new staff member (about 80 in 2009) receives general safety instructions on their starting day using as a basis the film 'General Safety Regulations at the Research Location Petten'. This is followed by more detailed instructions by the Site Safety Officer (SSO) on the Institute's Safety and Environmental Regulations within six weeks after their arrival. Job-specific instructions are given by the Unit/Sector to which new staff members belong.

Contractors and external companies working at the JRC-IE receive the document 'Safety regulations for third parties working at the JRC-IE Petten site' before starting their work. All external persons arriving to work on site either have direct supervision by the internal work responsible or are shown the above mentioned film 'General Safety Regulations at the Research Location Petten' and are given job-specific instructions.

To keep staff updated and to increase awareness, representatives of the SES sector provide information on safety and/or environment related matters during Unit meetings. The SES also organises so called toolbox meetings to specific groups of staff members like laboratory managers, in line with the requirements of our safety and environmental management systems.



*Self-Contained Breathing Apparatus (SCBA) Training*

The JRC-IE has organized internal and external safety related training for its staff in 2009 as shown below.

| <b>Course name</b>  | <b>Duration</b> | <b>Nr. of participants</b>            |
|---|-----------------|---------------------------------------|
| <b>Radiation Protection:</b>  |                 |                                       |
| Radio Protection/Health Physics Courses (Refresher Course) according to Article 15 "Besluit Stralingsbescherming" | ½ day           | 25                                    |
| The 2007 Recommendations of the International Committee on Radiological Protection                                | 1 day           | 1                                     |
| <b>Safety:</b>  |                 |                                       |
| Drafting Explosion Safety Documents   | 1 day           | 1                                     |
| Defensive Advanced Driver Training  | 1 day           | 1                                     |
| Training on Changes to NPR 7910   | 1 day           | 1                                     |
| Forklift truck safety training  | 1 day           | 6                                     |
| <b>Emergency preparedness and first aid:</b>  |                 |                                       |
| AED   | ½ day           | 22                                    |
| SCBA refresher course   | 2 x ½ day       | 6                                     |
| Standby Duty Acting Director Emergency training   | 2 x ½ day       | 8                                     |
| First Aid (EHBO) refresher course   | 10 hours        | 10                                    |
| Emergency Response Team (BHV) refresher course  | 1 day           | 10                                    |
| Team Leader Emergency Response Team (refresher course)  | 1               | 2                                     |
| INO training and exercises  | 3 x ½ day       | 10                                    |
| Evacuation exercise (all buildings)   | 2 times         | All staff incl. visitors, contractors |
| <b>Security:</b>  |                 |                                       |
| External Security Organization ("EBO") table-top exercises  | 6 x ½ days      | 2                                     |
| <b>Management systems:</b>  |                 |                                       |
| Auditor training ISO 9001   | 2 days          | 10                                    |
| Auditor Training OHSAS 18001  | 1 day           | 6                                     |
| Auditor Training ISO 14001  | 1 day           | 6                                     |
| S-H-E training in labs  | ½ day           | 20                                    |

## Operational emergency preparedness

To increase the emergency preparedness of all staff, as in previous years, evacuation exercises were held twice in all buildings. One exercise was done to improve the cooperation between the in-company emergency staff (BHV) and the site fire brigade. This was also the annual exercise in the framework of the site emergency plan (INO). For the members of the Management on the standby duty scheme so-called 'Table-Top' exercises were organised by the SES sector, in order to train the Management for their tasks during emergency situations.

Besides the standby rota of the Management, several other relevant function groups are on an emergency rota system e.g. for the Plant Simulation Testing Laboratory, Fuel Cell Testing facility and the Infrastructural Service.

At the level of the Petten research location, collaboration between the different companies and institutes on-site has taken place to prepare and execute site emergency exercises. Lessons learnt during this process are implemented.



*The JRC-IE BHV emergency team*

## Near accidents and accidents

Within the Institute an internal reporting system is in use for near accidents and accidents. The purpose of this system is to get information on potential and actual hazards and to continuously improve the health and safety situation. Over the last three years no accidents with reporting obligation towards the authorities have occurred at the Institute.

### *Near accidents reporting*

| Main causes                           | 2007 | 2008 | 2009 |
|---------------------------------------|------|------|------|
| Organisational                        | 11   | 17   | 14   |
| Technical                             | 17   | 17   | 14   |
| Human                                 | 6    | 6    | 8    |
| Total number of near accident reports | 34   | 40   | 36   |

The number of near accident announcements over the past three years is in the same order of magnitude. Also the distribution over the three main causes is similar.

## Work permits

The established work permit system is a suitable tool to improve the safety and health of workers at work and it covers the following types of work and areas:

|                   |   |
|-------------------|---|
| Controlled areas  | All areas where special instructions based on the possible risks in this area are needed.   |
| Excavation work   | For work at which the knowledge of the existence of underground cables, pipes, drain system, etc. is essential.   |
| Naked flame       | For work involving the use of naked flame, or other activities involving the risk of fire, or work when dust is created which smoke detectors can see as smoke. |
| Confined space    | Work in confined spaces such as pits, tanks, reservoirs, crawling spaces or spaces with inadequate or no ventilation.   |
| Working on height | For work on height >2.5 m where there is a risk of falling or of falling objects and for activities that can cause falling like opening floors.                 |

Work permits are for a limited period of time. However, for JRC-IE staff annual work permits for specific activities and places can be issued after subject related safety training. Such general work permits were issued to staff of the Infrastructure sector concerning working on heights.

The following work permits were given out:

| Type of work permit | 2007 | 2008 | 2009     |          |
|---------------------|------|------|----------|----------|
|                     |      |      | External | Internal |
| Controlled area     | 5    | 13   | 6        | 0        |
| Excavation          | 15   | 20   | 38       | 1        |
| Naked flame         | 42   | 27   | 27       | 6        |
| Confined space      | 6    | 5    | 9        | 0        |
| Working on heights  | 55   | 87   | 72       | 9 *      |
| Total               | 123  | 152  | 152      | 16       |
|                     |      |      | 168      |          |

\* ) including annual work permits

Note 1) work permits can cover more than one day and more than one person. The number of work permits per year depends on the kind of activities going on at the Institute.

Note 2) for 2009 the numbers are split into external permits (for work carried out by external companies) and internal permits (for work carried out by JRC-IE staff).

The number of work permits per year is still increasing though less than in previous years. It is clear that the majority of work permits is given to external companies. Since April 2008, notes are sent to the responsible unit head if work is performed for which the required work permit either was missing or was not complied with. There were 8 such instances in 2008 (April-

December) and 6 in 2009 corresponding to 7% and 4% of the total number of work permits granted in the respective period, showing an increased compliance with the safety system.



*Example of excavation work at JRC-IE for which a work permit is required.*

## Radiological workers

About 20% of the Institute staff is registered as radiological worker. The measurement and registration of their exposure to ionising radiation is contracted to NRG. All doses were well below the limits as defined in the Council Directive 80/836/Euratom and amending Directives.

The table below shows the data of the cumulative doses. It includes the dose of external staff. About one third of the radiological workers are so-called category B-workers with an annual dose limit of 6 mSv. Two third are radiological workers in the A-category, with an annual dose limit of 20 mSv. For comparison a non-radiological worker (citizen) has an annual dose limit of 1 mSv.

*Table Dose of exposed people*

| Year | Dose (mSv) |         | Number of persons |         |         |          |
|------|------------|---------|-------------------|---------|---------|----------|
|      | Cumulative | Average | Total             | < 1 mSv | 1-6 mSv | 6-20 mSv |
| 2007 | 6,57       | 0,12    | 54                | 54      | 0       | 0        |
| 2008 | 8,15       | 0,14    | 57                | 57      | 0       | 0        |
| 2009 | 5,99       | 0,11    | 53                | 53      | 0       | 0        |

From the table it is clear that the situation is not changing compared with previous years. All the radiological workers received a dose well below the legal limits.

## Health related activities

The staff members of the Institute are under the supervision of the Medical Service of the European Commission in Luxembourg. The frequency of visits to Petten by the company doctor is about once every six weeks.

One task of the company doctor and his staff is to perform the annual medical examinations of all staff; another one is to advise on work related matters. In this advisory role inspections of working places were carried out.

The Medical Service is also carrying out annual vaccination campaigns against seasonal influenza. In addition to this in 2009 vaccination campaigns against the H1N1 influenza were organised on site.

At the level of the European Commission health, safety and wellbeing related information to all staff members is distributed. Topics in 2009 were e.g. the New Influenza (H1N1), workplace ergonomics and teleworking.

Outside working hours, staff members of the institute have the possibility to participate in a number of sport activities organised by colleagues like football, volleyball, horse riding and tennis.

### **Gym facility**

The institute has facilitated a gym where staff members can follow classes under the supervision of a qualified instructor.

Since the opening of the gym in 2006, an increasing number of staff members have been making use of this facility. In 2009 about 30% of the Institute staff members continued to use the facility. The IE staff use the facility either to follow their personal training programme developed in consultation with the qualified resident gym instructor or participation in the different group lessons (mainly Body Balance classes). Again these classes are under supervision of a qualified instructor. The total amount of instruction time in 2009 was 480 hours. All gym activities take place outside core hours.

The gym facility is a demonstration of the importance the management place in the health and wellbeing of the staff. In 2009 both the doctor of the medical service and the gym instructor met with the Institute's Health and Safety Committee to explain how they collaborated in order to improve the wellbeing of staff. The Health and Safety Committee supported the activities and also made some valuable suggestions as to how the facility could be further promoted. One of the suggestions was the development of a dedicated Intranet section on the Institute's web site in 2010.

### **IE Petten site infrastructure projects related to SHE in 2009**

One sector of the Institute for Energy, Petten site, is dealing with the management of utilities and facilities. Standard tasks of this sector are the organisation of SHE relevant maintenance and certification e.g. ladders, cranes, first aid equipment.

Also larger SHE related projects are launched and/or supervised by this sector, like in 2009 the projects "Legionella prevention" and the first phase of "IE site Traffic Plan". Purpose of the traffic plan is to increase the overall traffic safety on site but also to renew the sewage system while road work is performed.

# ENVIRONMENT

## Background

The Institute for Energy is committed to assess the environmental impact of past, current and planned IE activities, and to minimise the potential harmful effects of such activities where reasonably possible. In order to achieve this and to fulfil legal obligations, an Environmental Management System (EMS) has been set up according to ISO 14001. It has been implemented and certified in 2004 and has been developing ever since. In 2008 several improvements have been made to the system. The EMS is audited internally and externally every year, and no major deviations or non-conformities were found. The licence requires a certified environmental management system conforming to ISO 14001.

The current certification is granted by TNO Certification and dates from 19 March 2007.

## EMAS

EMAS stands for "Eco-Management and Audit Scheme" and is a voluntary scheme for organisations willing to commit themselves to evaluate and improve their environmental performance. Following a pilot started in 2001, the Commission decided in 2009 to extend this environmental management system to all its activities and buildings in Brussels and Luxembourg as described in Decision C(2009) 6873. The JRC has stated that it will take into account the Commission-wide policy towards EMAS, starting with ISO 14001 certification for all sites. The Institute for Energy has been certified for several years now and will continue to improve in this area. The additional registration to EMAS will impose few changes in our way of work and we therefore do not foresee any difficulties.



## Environment related goals

### *Environmental Programme 2009-2011*

Long-term environmental targets and goals have been defined in the IE Environmental Programme 2009-2011. The specific goals for 2009 have been fixed in the Annual Environmental Plan.

The Environmental Programme 2009-2011 has been attached to this report as Annex II.

### *Environmental Plan 2009*

In the Annual Environmental Plan it is described on which activities the Institute management focused in 2009.

|  |
|--|
| <b>Collection, separation, storage, removal and reduction of waste</b> |
| Review waste management to evaluate possibilities to reduce waste      |
| <b>Implement energy saving measures</b>                                |
| Implement energy efficient lighting in building 314                    |
| Improvements of heating installations of 113 and 314                   |



|   |
|---|
| Study the actual needed amount of ventilation flow  |
| Repair/replace compressed air pipe network          |
| Migrate to virtual server technology                |
| <b>Improve monitoring of energy and water usage</b> |
| Gas and water monitoring per building possible      |
| <b>Recertification for ISO 14001</b>                |
| Pass surveillance audit for ISO 14001 in May 2009   |

Not all targets of the Environmental Plan 2009 were achieved. The following items of the plan will be handled in 2010.

- The review of the waste management has undergone delay due to modified purchase regulations. The current contract for the collection and disposal of waste was extended with one year.
- Improvement of heating installations has been executed in building 113. The heating installation of 314 was postponed due to urgent requirements to upgrade the installation in another building.
- With respect to the compressed air system one compressor has been replaced but the replacement of the piping work was interrupted due to the bankruptcy of the contractor. The purchase procedure has to be started again.
- The study of the ventilation needs in buildings will be done as part of the process to obtain the Energy Performance Certificate (EPC) for buildings with more than 1000 m<sup>2</sup>.

All other items are handled according to the planning.

## Environmental licence

The environmental licence was granted in 2005. Since then experience has been gained on its practical implementation. The activities of the institute are also evolving. Therefore from time-to-time updates or additions are needed, the last one was in 2008.

## Inspections and audits

The IE has an audit programme covering a period of three years. In this programme it is defined which areas of the environmental licence are covered during the internal and external audits and inspections.

Internal audits were performed in each Unit of the Institute.

External audits were performed by TNO Certification. They made a periodic Quality and Environmental audit in May and November 2009.

Inspections were performed together with experts from different authorities. The results of these inspections are taken up in action plans. The progress of these action plans are reviewed periodically.

In 2009 the following audits and inspections were performed related to (safety and) environmental matters:

|  | <b>Number</b> |
|--|---------------|
| <b>Internal inspections:</b>   |               |
| Safety and Environmental Unit Tours (inspection by Unit Head and Site Safety Officer)  | 9             |
| Facilities for fire prevention, detection and fire fighting equipment (inspection by site fire brigade)  | 2             |
| EC Medical Service   | 2             |
| <b>External inspections:</b>   |               |
| Environmental Service of the Municipality Zijpe ( <i>Milieudienst Kop van Noord-Holland</i> )  | 1             |
| Regional Water Board ( <i>Hoogheemraadschap Hollands Noorderkwartier</i> )   | 1             |
| Combined inspection by KFD (VROM) and Labour Inspectorate ( <i>Arbeidsinspectie</i> )  | 1             |
| Combined inspection by KFD (VROM) / Labour Inspectorate / Safety Office Municipality of Zijpe / Province of Noord-Holland / Environmental Service of the Municipality Zijpe / Regional Water Board | 1             |
| <b>Internal audits:</b>  |               |
| Internal Audits (with respect to ISO 14001 and OHSAS 18001)  | 8             |
| <b>External audits:</b>  |               |
| External Audit by TNO Certification (with respect to ISO 14001 and OHSAS 18001)  | 2             |

## **Environmental incidents, significant malfunctions**

In 2009 one environmental relevant incident was reported to the environmental service of the municipality.

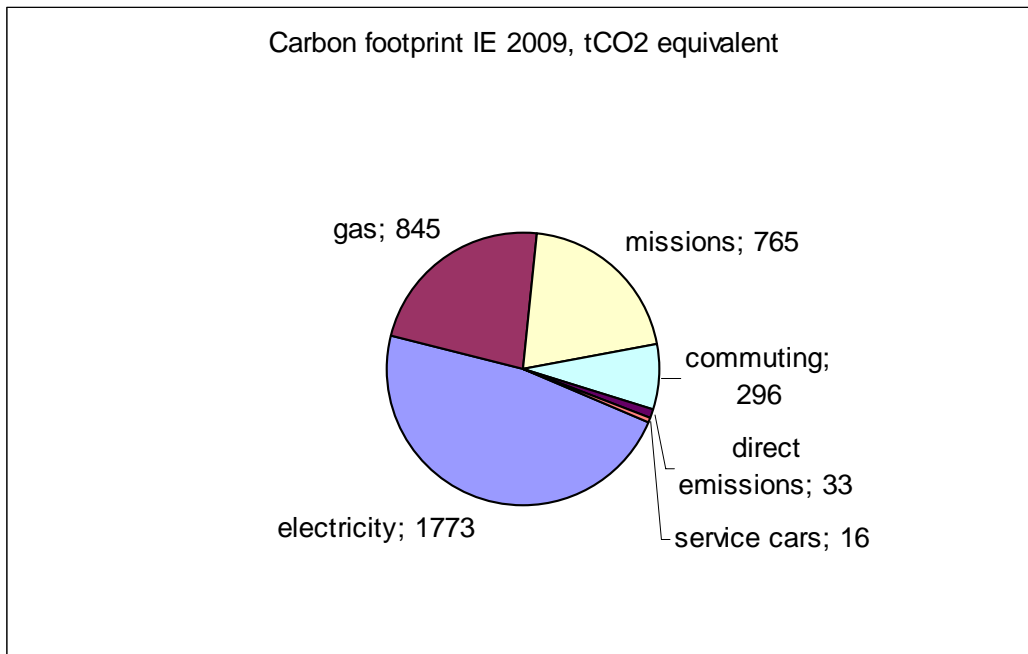
During the renovation project of building 308 the construction company has forgotten to connect the sewer pipe of a toilet group to the sewage system. On request of the municipality an evaluation was made by the State Forestry Service (*Staatsbosbeheer*). The conclusion was that due to the kind of waste water, there were no negative consequences for the environment

## **Carbon Footprint**

One of the tools used to evaluate the environmental impact is the Carbon Footprint: the total set of greenhouse gases (GHG) emissions caused by an organization, event or product. For simplicity of reporting, it is often expressed in terms of the amount of carbon dioxide, or its equivalent of other GHGs, emitted. For IE the contributing factors are energy use on site (electricity and gas), energy use in travelling (missions, commuter traffic and own means of transport) and the direct emission of GHGs. These contributions are summarized below in the table and the figure.

Table Carbon footprint IE 2009

|                  | Ton CO <sub>2</sub> equivalent | Percentage | Source of data                  |
|------------------|--------------------------------|------------|---------------------------------|
| Electricity      | 1773                           | 47.6       | Electricity usage               |
| Gas              | 845                            | 22.7       | Gas usage                       |
| Missions         | 765                            | 20.5       | Number of flights and distances |
| Commuting        | 296                            | 8.0        | Estimate of travel by car/bus   |
| Direct emissions | 33                             | 0.9        | Leak of refrigerant             |
| Service cars     | 16                             | 0.4        | Fuel consumption                |
| Total            | 3729                           | 100.0      |                                 |



## Nature Management

The Petten site is surrounded on three sides by a natural reserve which has been designated as NATURA 2000 area by the Dutch authorities. The four site organisations (JRC-IE, ECN, NRG and Covidien) developed a nature management plan for the site, together with the external company ARCADIS. The goals are to improve the quality of the nature within the site, to establish a common understanding with the authorities on the management of the nature on site, to prepare our contribution to the management plan of the Province and to promote the Petten site, showing that we respect nature. With the present layout of the IE buildings and their appearance, the main impact is on future developments: to keep the group of buildings as much as possible a harmonious entity, to blend in with nature as far as possible and to facilitate the growth of naturally occurring plants.

The open area between the buildings and the Westerduinweg is already for many years kept in the desired state with the help of sheep, the built up area is maintained by an external gardening company. In 2009 there was one special action in the built-up area: the removal of a group of Sea Buckthorn bushes on the west site of building 310.

Sea Buckthorn is a plant that is naturally occurring in the dune area but the plant is highly flammable and the (hard) berries can explode when heated, thus helping a fire to spread quickly. The removal was done in consultation with the State Forestry Service (*Staatsbosbeheer*) that will in 2010 remove all trees within 15 meters of the site boundary. These actions both inside and outside the fence create a wide fire lane to make it more difficult for fires to spread in either direction.



*Sea Buckthorn*

# ENVIRONMENTAL IMPACTS

## Energy use

Table Consumption of gas and electricity

| Year | Gas (m <sup>3</sup> )<br>(excl. HFR) | Gas CO <sub>2</sub><br>emission<br>(tonnes) | Electricity<br>(kWh) (excl.<br>HFR) | Electricity CO <sub>2</sub><br>emission<br>(tonnes) | Nr. days with<br>temperature<br>< 0°C |
|------|--------------------------------------|---|-------------------------------------|---|---------------------------------------|
| 2007 | 439 594                              | 782   | 2 908 900                           | 1 646   | 37                                    |
| 2008 | 473 946                              | 843   | *) 3 196 097                        | *) 1 809  | 58                                    |
| 2009 | 474 488                              | 845   | 3 132 962                           | 1 773   | 65                                    |

\*) The number quoted in last year's report 2008 was 2.491.086 kWh. However, this value was not correct because of an error made due to the transition to new electricity meters. The resulting CO<sub>2</sub> emission value has consequently to be modified as well. New correct values have been included in the table above.

### Electricity

Due to the scope of the institute, the energy consumption fluctuates, mainly depending on the usage of energy by the experimental facilities. The figures shown in the table indicate the total amount of used energy in the Institute. In the future the contributions by offices and installations to the energy consumption should be available after improvement of the building management system.

### Gas

The use of so-called 'graaddagen' for comparison of gas consumption is at the moment not very meaningful, since no strict separation can be made between gas consumption used for processes and for utility purposes.

## Emissions to air

There are two main origins for the emissions to air namely from building facility installations (e.g. heating and air conditioning) and from the use of chemical substances in laboratories.

### Heating installations

The emissions considered are those of CO<sub>2</sub> and of NO<sub>x</sub>. The emission of CO<sub>2</sub> follows directly from the amount of gas used, see the numbers under Energy Use above.

The emission of NO<sub>x</sub> is also related to the amount of used natural gas and to the state of the heating installations. All heating installations are regularly maintained and checked. The newer installations fulfil the requirements according to the Decree on the emission of NO<sub>x</sub> (*NO<sub>x</sub> besluit*). Due to the lack of accurate technical specification sheets from older installations the amount of produced NO<sub>x</sub> can only be estimated. Based on a conservative calculation the emission is around 920 kg.

### Cooling installations

As in previous years the maintenance of all cooling installations was outsourced to a certified external company. The objective of this contract is twofold:

- Ensure that installations are leak proof.
- Advise to replace installations at the end of their technical lifecycle.

Due to accounting issues in 2008, this report summarises the two last years: Since 2007, seven installations with R22-coolant were dismantled. The nominal amount of R22 within these seven installations was 38.6 kg. Due to loss of coolant by maintenance and leakage, 3.9 kg were added before removal, so the total amount was 42.5 kg while only 24.6 kg were retrieved for recycling. The loss of R22 accounts for 17.9 kg, which is equivalent to an emission of 33 tonnes of CO<sub>2</sub>.

The total amount of R22-containing air conditioning units located within the institute premises is 15 as of 1 January 2010.

### Volatile Organic Compounds

The used amount of VOC in 2009 was 68 litres, which is comparable with the used amount in 2008 (60 litres). Due to the fact that these substances are used for cleaning purposes and not in processes, it is obvious that the major part (>80%) is vaporized and emitted to air. Only a small amount (ca. 4 litres) was disposed of as liquid chemical waste.

## Waste

Table Type of waste by volume or weight

| Type of waste                          | 2007        | 2008        | 2009                               |
|--|-------------|-------------|------------------------------------|
|  | Amount (kg) | Amount (kg) | Amount (kg)                        |
| Household waste                        | 96 000      | 108 680     | 108 575                            |
| Paper and cardboard                    | 28 780*     | 9 820       | 9 250                              |
| Wood                                   | 4 200       | 4 200       | 5 600<br>Wood A 800<br>Wood B 4800 |
| Glass                                  | 1260        | 0**         | 1 500                              |
| Metal                                  | 15 000      | 2 200       | 3 000                              |
| Small chemicals:                       |             |             |                                    |
| Batteries                              | 70          | 110         | 53                                 |
| Cartridges                             | 40 pieces   | 0**         | 140 pieces                         |
| Laboratory mixed waste                 | 298         | 0**         | 150                                |
| Oil filters; oil containing products   | 10          | 0**         | 0                                  |
| Spray containers, paint                | 22          | 0**         | 15                                 |
| Developer                              | 980         | 0**         | 700                                |
| Oil                                    | 50          | 0**         | 0***                               |
| Medical waste                          | 4           | 17          | 5,4                                |
| Fluorescent lamps ( <i>TL-buizen</i> ) |             |             | 161                                |
| Diesel oil                             |             |             | 7,1 ltr                            |

\* Prior to the renovation an initiative was taken to reduce the amount of paper in the central archive. Also staff members were requested to dispose of as much paper as possible before moving to their new/temporary offices, which resulted in a higher amount of paper that was disposed off in 2007.

\*\* This waste was collected on site, disposal will take place in 2009.

\*\*\* This waste was collected on site, disposal will take place in 2010.

Glass, wood, paper, small chemical waste, chemicals and metal are collected internally at the Institute. Various certified external companies specialized in waste treatment take care of the proper disposal and the recycling of valuable materials.

The Institute donates empty cartridges to charitable organisations.

Old scientific equipment is often made available to high schools for scientific and education purposes.

Packaging material, like foam chips, is removed from incoming packages and reused (about 1.000 litres in 2009).

Wood from different kind of transport packages is reused to make new containers for transport of material and equipment.

## Water

The consumption of water in different buildings was measured. However, for the facilities/laboratories in these buildings it is not reasonable to split the water consumption between household water and process water because the water consumption for processes is very low.

The FCTEST facility is the only facility which has a substantial consumption of water in the work process and is located in building 310. The facility has no separate measurement point, so it is not possible to divide the household water of building 310 from the process water used in the FCTEST facility.

*Table Water consumption in m<sup>3</sup>*

| Building                 | 2007 | 2008 | 2009 |
|--------------------------|------|------|------|
| Total                    | 4407 | 3849 | 2845 |
| 113                      | 51   | 45   | 59   |
| 300                      | 174  | 30   | 51   |
| 308                      | 142  | 267  | 281  |
| 309                      | 340  | 236  | 209  |
| 310 (incl. FCTEST)       | 982  | 1786 | 1171 |
| 311                      | 1    | 4    | 4    |
| 312                      | 675  | 534  | 515  |
| 313                      | 51   | 210  | 209  |
| 314                      | 144  | 65   | 126  |
| 315                      | 114  | 95   | 92   |
| 320                      | 17   | 37   | 32   |
| 325                      | 184  | 130  | 95   |
| 330 (temporary offices)  | 283  | 4    | NA   |
| Construction site        | 366  | 4    | NA   |
| Fire extinguishing water | 884  | 402  | NA * |

Water consumption is stable. Some laboratories in building 310 were used less frequent than in previous years, due to a renovation in that building. The system for the fire extinguishing water was changed into a ring covering the whole research location Petten. The total amount of water put into the ring is known, but cannot be split per company. Therefore no amount can be given for the fire extinguishing water at IE only.

### Emission to water

The discharge of water to the sewers equals the consumption of water plus the water produced and discharged to sewers by the FCTEST facility, minus the water collected from the chemical laboratories in 312 (this building has an additional collection circuit for waste water from the laboratories).

The FCTEST facility produces water and discharges a part to the air:

|   |                    |
|---|--------------------|
| Water produced and discharged to sewage:      | 307 m <sup>3</sup> |
| Water (steam) produced and discharged to air: | 7.1 m <sup>3</sup> |

(The amounts are estimates based on the running hours of the installation.)

The waste water from the chemical laboratories in 312 is collected in separate tanks. These are emptied by an external certified company. The total amount of water taken away in 2009 was 3.8 m<sup>3</sup>.

The total amount of water discharge into the sewers was therefore  $2845 + 307 - 3.8 = 2948 \text{ m}^3$ .

This amount is below the amount allowed according to the licence.

The water is not cleaned before discharging as there is a separate system for the water from the chemical labs. Seen the present activities at the Institute, the amount of solid particles in the water is very limited. The drains contain separator systems to prevent deposits being discharged with the water.

The release of heavy metals and relevant inorganic emissions to the drain system is given in the table below. The measurements are performed by one external company for all the Petten site organisations at different locations within the ECN part of the site where these drains all get together. The drain system has been changed in 2008, before that the measurements also included the waste water coming from the HFR. Now there are separate measurements for the HFR and JRC-IE, but the combined measurements for 2008 give results comparable to those of previous years.



*Waste water tank*



Table *Inorganic emissions to the sewer system*

| Substance                  | Concentration (g/m <sup>3</sup> ) |      |      |
|----------------------------|-----------------------------------|------|------|
|                            | 2007                              | 2008 | 2009 |
| Chloride(Cl <sup>-</sup> ) | 290                               | 210  | 230  |

Table *Release of heavy metals to the sewer system*

| Metal         | Concentration (mg/m <sup>3</sup> ) |       |       |
|---------------|------------------------------------|-------|-------|
|               | 2007*                              | 2008  | 2009  |
| Cadmium (Cd)  | < 0.4                              | < 1   | < 1   |
| Chromium (Cr) | < 5.0                              | < 5   | < 2.5 |
| Copper (Cu)   | 51                                 | 120   | 120   |
| Nickel (Ni)   | < 5.0                              | < 10  | < 2   |
| Lead (Pb)     | < 5.0                              | < 8   | < 8   |
| Zinc (Zn)     | 69                                 | 110   | 120   |
| Mercury (Hg)  | < 0.1                              | < 0.1 | 0.46  |
| Arsenic (As)  | < 2                                | < 10  | < 10  |

\* Including waste water from the HFR

Based on the requirements of the Waste Water licence (WVO) the IE is annually taking samples of waste water from its laboratories. Nevertheless, the Regional Water Board (Hoogheemraadschap) has discovered in 2009 that the threshold regarding heavy metals, particularly the one of chromium and nickel, had been exceeded. The cause of the pollution could not be traced. Probably the material of the sample pit (stainless steel) had a negative influence on the measurements. Therefore the stainless steel sample pit was replaced with a PVC one. New measurements at this location have given no exceeding values. The samples taken from the sewer system have not shown exceeding values.

As a result of this occurrence the IE has decided to take more frequent waste water samples in laboratories.

## Soil

Considering that the soil investigation campaign of 2004 showed a generally good quality of the soil in the area of the Institute, no actions were required in 2009.

## Storage of dangerous substances and gases

The chemicals and gases are stored according to the CPR 15 and the environmental licence. The capacity has not changed significantly during 2009. The storage facilities are maintained by an acknowledged company on annual basis.





# Safety Programme

## 2009-2011

|                           | Name & Function                           | Date & Signature     |
|---------------------------|---|----------------------|
| Prepared by:<br>Function: | T. Timke<br>IE Safety Officer             | (signed) 19 May 2009 |
| Verified by<br>Function:  | J. de Haas<br>Sector Head SES             | (signed) 20 May 2009 |
| Approved by:<br>Function: | G. De Santi<br>IE Director/Safety Manager | (signed) 20 May 2009 |

| Revision | Date of revision | Author   | Remarks     |
|----------|------------------|----------|-------------|
| 1        | 12.05.2009       | T. Timke | First issue |
|          |                  |          |             |

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## INTRODUCTION

The management of the Joint Research Centre – Institute for Energy of the European Commission has published a safety program for the Petten site.

In the program 2009-2011 the management defines the safety targets and goals and confirms that it will continue to improve the safety management system (SMS).

Internal and external inspections and audits will be performed in order to ensure compliance. The Institute proceeds also with its open information policy by publishing annual safety reports.

IE has selected several safety related focus areas where it wants to improve. The following programme for 2009-2011 indicates the main steps that will be taken.

## PROGRAMME 2009-2011

### 1. Certification according to OHSAS 18001

OHSAS stands for "Occupational Health and Safety Assessment Series" and is a voluntary system for organizations willing to commit themselves to evaluate and improve their safety performance. The JRC-IE Petten site will apply for a certification safety management system according to this standard in 2009.

#### 1.1 Internal audit

- Based to the OHSAS standard an internal audit will be made by trained staff members of the Institute. The corrective actions will be implemented

#### 1.2 Document review

- A certification body will perform a document review of all documents relevant for the Safety management system. Remarks to the documents will be considered.

#### 1.3 Certification audit

- A certification audit will be held.

#### 1.4 Monitoring and improving the safety management system

- By annual internal "safety tours" and internal audits the implementation of the safety management system will monitored and improved.

### 2. Safety awareness campaign

The safety awareness level should rise at IE Petten therefore the management of the Institute has decided to have a safety awareness campaign for all staff members at the Petten site

- Prepare and place an order for a multi annual safety awareness campaign
- Implement the safety awareness campaign

### 3. Risk assessment

The JRC-IE Petten site will finalize the risk assessment as required in the Commission Decision C(2006)1623 establishing a Harmonised Policy for Health and Safety at Work for all Commission staff. More over it is planned to:

- Execute periodical reviews of the hazard identification and risk assessments for workplaces
- Develop a register of general risks with the input from risk assessments which are post related, workplace related, and related to routine tasks at the IE Petten. The register is used to define the residual risks (e.g. fire, flooding, external threats at the Institute.



#### **4. Handling hazardous substances**

The safety awareness level and the quality of risk assessments relating to hazardous substances should rise at IE Petten. There is room for improvement especially in the following areas:

##### 4.1 Ordering hazardous substances

- Submit 100% of all orders of chemicals to SES for advice on the safety impact and for approval before they are ordered.

##### 4.2 Storage of hazardous substances

- Store 100% of all hazardous substances in accordance with applicable safety requirements.
- Remove long-term unused, mislabelled substances

##### 4.3 Handling of hazardous substances

- Ensure that 100% of the users of hazardous substances have direct access to the MSDS of the chemicals they work with and ensure they know and understand the safety hazards relating to the substances.

#### **5. Implement Globally Harmonized System (GHS) for Classification and Labelling of Chemicals**

A new system for the labelling of chemicals is introduced (Commission directive 1272/2008). The JRC-IE Petten site will start to implement this system.

- Information and in-house training will be given to the relevant staff of the JRC-IE Petten on Globally Harmonized System
- The Globally Harmonized System will be implemented

#### **6. Emergency preparedness**

The JRC-IE Petten site will fulfil the requirements of the Commission Decision C(2006)1623 with respect to emergency response by having regularly

- Emergency exercises for all internal and external staff on site
- Emergency training for specific staff members





# Environmental Programme

## 2009-2011

|                           | Name & Function                     | Date & Signature     |
|---------------------------|-------------------------------------|----------------------|
| Prepared by:<br>Function: | J. de Haas<br>Environmental Manager | (signed) 25 May 2009 |
| Verified by<br>Function:  | A. Kuusisto<br>Quality Manager      | (signed) 25 May 2009 |
| Approved by:<br>Function: | G. De Santi<br>IE Director          | (signed) 25 May 2009 |

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|          |                  |            |             |

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### INTRODUCTION

For the third time the management of the Joint Research Centre – Institute for Energy of the European Commission has published an environmental program for the Petten site.

In the program 2009-2011 the management defines the environmental targets and goals and confirms that it will continue to improve the environmental management system (EMS).

Internal and external inspections and audits will be continued in order to ensure compliance. The Institute proceeds also with its open information policy by publishing annual environmental reports.



IE has selected several environment related focus areas where it wants to improve. The following programme for 2009-2011 indicates the main steps that will be taken.

## PROGRAMME 2009-2011

### 1. Handling hazardous substances

The environmental awareness level and the quality of risk assessments relating to hazardous substances should rise at IE. There is room for improvement especially in the following areas:

#### 1.1 Ordering hazardous substances

- Present 100% of all orders of chemicals to SES for advice on the environmental impact and for approval before they are ordered.

#### 1.2 Storage of hazardous substances

- Store 100% of all hazardous substances in accordance with the environmental license.

#### 1.3 Handling of hazardous substances

- Ensure that 100% of the users of hazardous substances have direct access to the MSDS of the chemicals they work with and ensure they know and understand the environmental impact and preventive measures relating to the substances.

### 2. Collection, separation, storage, removal and reduction of waste

Reduction of the waste volume decreases the environmental impact, and also saves the financial resources. The following actions have been planned:

#### 2.1 Review the waste management and waste disposal process

- Give information on collection, separation, storage, removal and reduction of waste to all staff
- Review waste management to evaluate possibilities to reduce waste.
- Improve the possibility to make samples from the sewage system in laboratories.
- Define a list of the most used heavy metals. Prepare an instruction to reduce the use of heavy metals and when used how to separate them effectively.

### 3. Implement energy saving measures

Building related: In 2007 an energy savings study was performed on the buildings and related installations that were in use at that time. Several improvement measures were suggested and IE committed itself to implement these measures. The ones that remain are taken up in this Programme.

Equipment related: Virtual server technology was introduced in 2008 in the Petten Data Centre. The intention is to replace the existing large number of independent physical servers by a small cluster of machines running many virtual servers. The technology greatly improves the efficient usage of the installed physical systems. This will lead to a lower electricity usage, reduced needs for air conditioning and smaller quantities of environmentally unfriendly materials waste from retired physical machines. The number of servers is expected to reduce by a factor of 2-3.

#### 3.1 Lighting

- Implement LED lights in the street lighting.
- Implement energy efficient lighting in Building 314 (PSTL).

#### 3.2 Adjust the settings of the heating installation

- Adjust the settings of the heating installations in buildings 113, 300, 312, 314 and 325 to optimise the efficiency. An order should be placed with a mechanical engineering contractor.
  - Building 113, 2 central heating boilers with high efficiency.
  - Building 314, replace the control panels of the heating and ventilation to be operated through the Building Management System thus being more energy efficient.

#### 3.3 Adjust ventilation flow to the actual needed amount

- Conduct a study to identify the current ventilation flow in buildings 325, 312 and 314.





- Compare the current situation to the standards for these types of areas. If the standards turn out to be lower the frequency of ventilation will be adjusted/lowered for these buildings to the actual needed amount by the end of 2009.

#### 3.4 Repair/replace compressed air pipe network

- Perform a study to determine the usefulness of the compressors. Are the compressors too heavy for the actions they need to perform? Could it be more efficient to place some smaller compressors on the locations where they are actually used?
- Test the quality of the pipelines to determine if there are leakages.
- Replace the entire compressed air pipe network during the coming years. 2009-2012.

#### 3.5 Migrate to virtual server technology

- Wherever possible, implement new servers in the virtual server environment.
- Gradually replace stand-alone servers by equivalent Virtual Servers during the coming years 2009-2012. It is expected that the majority of servers, including many used for scientific applications, can be migrated to the Virtual Server environment.

### **4. Improve monitoring of energy and water usage**

Improved monitoring will make better efficiency possible.

#### 4.1 Monitoring energy usage of buildings and equipment/installations

- Ensure that all buildings have a possibility to monitor the usage of electricity by the end of 2010.
- Equip installations in certain buildings (314, 325, 310, and 312) with the possibility to monitor the usage of electricity.
- Actions that will be taken:
  - New intelligent water usage meters and gas usage meters in every building.
  - Water, gas and electricity usage meters for each installation.
  - Start with a new application called Energy Monitoring & Control (EMC).

### **5. Determine carbon footprint for the Institute**

A carbon footprint is "the total set of GHG (greenhouse gas) emissions caused directly and indirectly by an individual, organization, event or product" (UK Carbon Trust 2008). Once the size of a carbon footprint is known, a strategy can be devised to reduce it. At present only the gas and electricity usage of the IE-Petten site is converted to CO<sub>2</sub> equivalents.

#### 5.1 Determine carbon footprint

- Make estimates for other possible contributions to the carbon footprint to see which ones are relevant (CO<sub>2</sub> for missions, commuting, company cars; maybe other green house gases)
- Determine a standard set of relevant contributions and calculate the annual carbon footprint in a systematic way.

### **6. Recertification for ISO 14001 and possible registration for EMAS**

EMAS stands for "Eco-Management and Audit Scheme" and is a voluntary scheme for organizations willing to commit themselves to evaluate and improve their environmental performance. The JRC will form an opinion in 2009 on the possible registration for EMAS. Prior to this registration all sites should be ISO 14001 certified. The Institute for Energy has been certified for some years now and will continue to improve in this area.

#### 6.1 Recertification ISO 14001

- Obtain recertification of ISO 14001 in May 2010

*The following actions will be taken if JRC endorses the registration with EMAS:*

#### 6.2 Register for EMAS

- Analyze the requirements for EMAS and determine which are still needed to be implemented at IE.
- Implement the extra requirements needed for the EMAS certification.
- Register for EMAS.



European Commission

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**Abstract**

The Safety, Health and Environmental Annual Report 2009 describes the health, safety and environmental activities, targets, impacts and management system of the JRC - Institute for Energy in Petten.

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