ENERGY, ENVIRONMENT
AND SUSTAINABLE DEVELOPMENT

# ECTOS
# Ecological City Transport System
*(EVK-CT-2000-00033)*

## Deliverable no 18

# Final report
# Technical Implementation

**Responsible partner: Icelandic new Energy**

# TECHNOLOGICAL IMPLEMENTATION PLAN

*A Framework for the further development, dissemination and use of*
*the results of EC RTD Projects (including also thematic networks and concerted actions)*

# DATA SHEETS

Preliminary version at mid-term (optional, programme per programme)

**X** Final version before final term (contractual obligation)

**Part 1: Overview and description of your project and its results**
***One form per project*** **Publishable**

**1.1: Executive summary (**to be used for an accurate update of the programme synopsis of projects)
**1.2: Overview of all results**
**1.3: Quantified data on the project**
**1.4.: Assessment of the European interests** : This section enables the co-ordinator to explain the interest for the European Union (the competitiveness of its industries, the usefulness for (part of) its population,…) of the achieved results and of their foreseen impacts.
**1.5.: Expected project impact**

**Part 2: Description of each Result - Search for collaboration through Commission services**
***One form per Result*** **Publishable**

This section will be used to document your result(s) in CORDIS and to inform any appropriate audience

**2.1 : Description of the result(s)**
**2.2 : Quantified data about the result**
**2.3 : Further collaboration, dissemination and use of the result :** This section enables each partner – individually or as a consortium – to describe its needs in further collaboration in view of the dissemination an use of its results(s).

**Part 3: Description of the intentions by each partner**
***One form per partner*** **Confidential**

This section enables each partner – individually or as a consortium – to describe its use and dissemination intentions (including a timetable of its future activities).
**3.1 : Description of the use and the dissemination of result(s), partner per partner**
**3.2 : Quantified data for each partner's main result**

- The Technological Implementation Plan data sheets are available as a predefined form in Microsoft Word format. The file may be downloaded from the European Commission's CORDIS web site at: http://www.cordis.lu/fp5/tip.htm or may be obtained by e-mail from your EC programme help desk or your Project Officer.
- The form should be completed electronically and returned preferably by e-mail to your project officer (Firstname.Lastname@cec.eu.int). Alternatively it can be sent on a diskette to the address provided by your Project Officer :
  - ✓ Part 1, 2 by the project co-ordinator;
  - ✓ Part 3 by the project co-ordinator or by each partner individually, as preferred.

## Part 1 Overview and description of your project and its results

| | |
|---|---|
| **EC PROGRAMME** : | **Energy, Environment and Sustainable Development – "City of Tomorrow and Cultural Heritage"** |
| **PROJECT TITLE & ACRONYM**: | **ECTOS – Ecological City Transport System. Demonstration, Evaluation and Research project of Hydrogen Fuel Cell bus Transportation System of the Future.** |
| **CONTRACT NUMBER :** | **EVK4-2000-00698** |
| **PROJECT WEB SITE (if any) :** | **www.ectos.is** |
| **PARTNERS NAMES :** | **Icelandic New Energy Ltd (Coordinator)**<br>**DaimlerChrysler AG**<br>**Norsk Hydro ASA**<br>**Shell Hydrogen**<br>**University of Iceland**<br>**Technological Institute of Iceland**<br>**Strætó (Reykjavik bus corporation)**<br>**Skeljungur**<br>**Vinnova**<br>**EvoBus**<br>**University of Stuttgart IKP** |

## Executive summary

***Please, synthesise (in 1 or 2 pages) your project original objectives and final outcome.***

### a) Original research objectives

Pollution is becoming one of the great problems of cities and urban local pollution is an ever increasing problem world wide. There is a constant increase in the usage of fossil fuels to power the growing vehicle fleet. The burning of fossil fuels increases the emission of greenhouse gases argued as a possible cause of global warming. This is a growing problem that will be difficult to tackle without a cross-border cooperation. The Kyoto protocol is an international political statement to tackle this problem. Now is the time for international and local companies and society in general to begin working together to execute projects that have the aim to reduce greenhouse gas emissions and local urban pollution and to introduce a clean(er) transportation system. By using regenerative produced hydrogen instead of fossil fuels, pollution from the transport sector can be greatly reduced, to virtually zero.

The overall objective of the ECTOS project is to tackle the problem of local urban pollution, by offering the solution of using hydrogen for powering part of the transport sector, that is with hydrogen fuel cell buses. The purpose is to demonstrate and evaluate a hydrogen based infrastructure for public transport vehicles and the operation of pollution free hydrogen buses in a $CO_2$ free environment in Reykjavik, Iceland.

The overall defined strategic goal of the project is also clear:

- *to prove that it is possible to operate a hydrogen fuel cell transportation system, including hydrogen infrastructure as well as hydrogen vehicles in the city of tomorrow,*
- *to show that it will have benefits for the society at large to operate the future transport system on hydrogen, including socio-, environmental and economical factors.*

### b) Expected deliverables

c) Three hydrogen fuel cell buses in public service in Reykjavík. The buses were operated for almost 2 full years in normal urban transport service in the city of Reykjavík, Iceland.

d) Infrastructure development. A fuelling station was established for production and distribution of hydrogen. It should be noted that it is the worlds first hydrogen station built at a conventional commercial gasoline station.

e) Impact assessment from a broad perspective covering the environmental technological, social, cultural, economic, (etc) dimensions. It is also covering the urban integration of the hydrogen system.

f) Comparative assessment of fuel cell hydrogen buses with other clean alternatives. This is a twofold comparison:

   a. Comparison with regards to the current situation (conventional diesel buses) and also with other types of alternative fuels and different drivelines (ethanol buses, CNG buses, etc.). This includes pollution, noise, fuel economy, life cycle ("well to wheel") analysis etc.

   b. Transport system model analysis, including traffic flow, distances driven, proportion of the fleet, the drive cycle, etc. The results of the model will be used in the life-cycle analysis, for the operation phase, with comparison to other European cities using municipal transit system modelling.

*a)* **Project's actual outcome** ***( in terms of technical achievements or if appropriate task per task)***

1. The project was the worlds first real scale hydrogen transport demonstration, involving not only technical issues but also non-technical issues.
2. A new generation of hydrogen buses were integrated in an urban context. The project demonstrated and proofed that a hydrogen bus system can easily be used and intergrated into a modern urban lifestyle. And since the transport system of Reykjavík is similar to that of most other European countries the conclusions can easily be transferred to other European (world wide) cities. The buses were equipped with a new PEM (Proton Exchange Membrane) hydrogen fuel cell technology. These are state of the art buses in this field and were built by DC (Evobus). The results are currently being used for the development of the next generation of hydrogen buses.
3. Another very important aspects was the erection of a state of the art hydrogen infrastructure for fuelling the hydrogen buses and for testing and evaluation. It was the worlds first hydrogen station built as a pre-commercial station and integrated into the current urban setting of a conventional gasoline station. This project was embedded into a possible series of projects (specifically CUTE) that will examine the new hydrogen fuel cell technology, and other European cities can use the results and experience of operating a new hydrogen infrastructure to implement their own infrastructure. The new hydrogen infrastructure was built by Norsk Hydro at a Shell station (Skeljungur, Shell Hydrogen branded station), where hydrogen is produced, stored and distributed from the same location, with an emission free energy chain. This is one of the key specialities and uniqueness of the project. Skeljungur (Shell Iceland) operated the new fuel facility and SH will evaluate the technical transfer possibilities internationaly. Research into the interplay of the urban electricity supply system and the hydrogen supply system on one hand and the urban passenger transportation logistics have been worked on. Results make a contribution towards future integration of hydrogen infrastructure. It should be noted that incidents have occurred a the hydrogen station, both regarding materials, software and operation. The important learning from the incidents in Iceland as well as issues from the sister plant in Hamburg (part of CUTE) have been fed into the development lines of the infrastructure companies enhancing technical, material and software knowledge and development, moving infrastructure a large step forward to commercialisation benefitting future hydrogen projects.
4. The focus of the project is on the assessment of socio, economic and urban factors influenced by a transformation from one energy source to another. This goal overlaps into all activities of the project. It involves factors such as social acceptance, safety, reliability, cost-benefit analysis, infrastructural cost to society, opinion polls and an overall assessment of the "hydrogen society, national feasibility study". The project shows that the general public (Iceland in this case) is very acceptable to the new technology. From the beginning there was in Iceland a strong governmental support for the project and it was established as one of the key projects to evaluate the potential of creating Iceland as the first hydrogen society in the world. With the positive outcome, specifically showing emission free energy chain and strong social support the government has restated its interest regarding creating the first hydrogen society in the world and increased drastically the support for projects and activities by reducing or elimination VAT on hydrogen related parts and other import taxes, which for an expencive technology, still under development, are only barriers. This is a strong statement which makes RD&D project far more attractive in Iceland than before.

   As a real-scale project, the information gathered are the basis of the impact that a new hydrogen transport system will have on a modern urban society.
5. The project is a mix of socio-economic, technological and environmental factors and the goal was to combine these factors into an extensive comparative assessment research. This comparative assessment will specifically focus on two things:
   a) During the preparation period data was collected for comparison with the new hydrogen system. Using known LCA key data on greenhouse gas emissions, in the whole energy chain, were collected from other alternatives using clean fuels (e.g. ethanol, CNG, etc.) and/or more efficient drivelines for comparison purposes. The results also include a well to wheel analysis between the current situation in Iceland and the new hydrogen system. These studies show that an important progress regarding efficiency has been made, but further development of the technology is needed to fulfill previous claims made by the industry. It can though be expected that a major increase in efficiency will come with the next generation of technology, specifically on the vehicle side.
   b) Simultaneously, a transport system model was used for comparative assessment and evaluation of the effect a similar hydrogen transport system would have on other locations. In this case the cooperation between ECTOS and CUTE have benefitted the project as results from 9 other European cities are used for comparison with the Reykjavík case. Conclusions can then be used for comparison as plans are for further similar projects in Europe (example CUTE$^{plus}$).
   c) It is also evident that the technical transferability to Europe is very easy. Many feared that the specific circumstances in Iceland would not be transferable to Europe, they have now been proven wrong.

*a)* **Broad dissemination and use intentions for the expected outputs** *(such as industrial development, standards, regulations and norms, improvement of environment, health, working conditions, employment, net economic benefits, etc)*

As stated as one fo the main goals of the ECTOS-project is to make results know to the public, of course focusing on cities and local authorities, and of course industries working in the field of hydrogen. More generally it provides input into the discussion of a potential hydrogen society in reaching a sustainability goal using hydrogen as the main fuel for the future. It is important that ECTOS results are channelled into a large range of European cities. INE is the lead partner regarding dissemination activities and will co-ordinate that between the other partners.

Dissemination activities have gone beyond all plans. International presentations of the project are well over 100 from various partners, of them INE has done over 50. There have been enourmous amount of site visits to the project, with over 2000 visitors and over 20 study groups. Also there have over 400 media visits to the project and almost 10 documentaries (30 minutes or longer) have been made. This has resulted that the project has reached all continents of the world (except Africa) and more than 1000 news stories have been written regarding the project (if internet news flashes are included). In Iceland the project outcome has been well covered by the media and also education material has been provided from the project to the school system, both lower and higher education.

The project also created a web site www.ectos.is and a annual newletter.

Two conferences were held by the project, first at the opening of the hydrogen refuelling station with over 200 participants and almost 80 internation journalists and then the closing conference at the end of April with almost 200 participants.

Dissemination cooperation has also been with the CUTE program in Europe which means that the general information of this largest hydrogen bus and infrastructure project in the world (ECTOS and CUTE) have made more information available to industry, authourities and the public than most other projects. Not to forget that the key information gathered in the project have continously throughout the project benefitted the industry for technical and non-technical enhancement of the hydrogen economy. The information gathered will lead the partners to the next steps and next activities in the field of hydrogen. Already CUTE$^{plus}$ is becoming a reality. Also the outcome of the ECTOS project have created a platform for the government of Iceland to create a future Hydrogen Road Map for Iceland and spin-off projects have already started. Other technical partners are continously using the gathered data and experience to advance the current stage of technology and therefore the results will be used for a long time and support the commercialisation of the hydrogen technology in the future.

## 1.2 Overview of all your main project results

***See further details in deliverable list***

| No. | Self-descriptive title of the result | Category A, B or C* | Partner(s) owning the result(s) (referring in particular to specific patents, copyrights, etc.) & involved in their further use |
|---|---|---|---|
| 1 | ECTOS – Socio, Economic and Environmental evaluation methodology. "An approach to Socio-Economic & Environmental Studies Accompanying a Demonstration of a Public Transport System Using Fuel Cells and Hydrogen as a fuel and Running a Commercial Hydrogen Fuel Station 2001-2005." | B | Icealndic New Energy Ltd.<br>University of Iceland |
| 2 | Hydrogen Refuelling Station | A | Icelandic New Energy Ltd<br>Norsk Hydro<br>Skeljungur |
| 3 | Hydrogen fuel cell buses | A | Icelandic New Energy Ltd<br>Daimler Chrysler<br>EvoBus<br>Straeto bs<br>Raesir hf |
| 4 | Impact assessment and comparative assessment of fuel cell buses with other alternatives including LCA and well to wheel | B | Icelandic New Energy Ltd<br>University of Iceland<br>Institute for Technological Reserch Iceland<br>University of Stuttgart |
| 5 | | | |
| 6 | | | |
| 7 | | | |
| 8 | | | |
| 9 | | | |
| 10 | | | |

* A: results usable outside the consortium / B: results usable within the consortium / C: non usable results

## 1.3 Quantified Data on the dissemination and use of the project results

| Items about the dissemination and use of the project results (consolidated numbers) | Currently achieved quantity | Estimated future* quantity |
|---|---|---|
| # of product innovations (commercial) | 0 | 10 |
| # of process innovations (commercial) | 1 | 1-4 |
| # of new services (commercial) | 1 | 1-4 |
| # of new services (public) | 2 | 2-5 |
| # of new methods (academic) | 1 | 5-10 |
| # of scientific breakthrough | 0 | 0 |
| # of technical standards to which this project has contributed | 4 | 5-10 |
| # of EU regulations/directives to which this project has contributed | 0 | 1-3 |
| # of international regulations to which this project has contributed | 0 | 1-3 |
| # of PhDs generated by the project | 7 | 20+ |
| # of grantees/trainees including transnational exchange of personnel | 6 | 20+ |

*# = number of … / * "Future" means expectations within the next 3 years following the end of the project*

## 1.4. Comment on European Interest

All projects are expected to meet European interests. This section should provide an appraisal of your project in terms of European added value and support to the implementation of European Union policies.

### 1.4.1. Community added value and contribution to EU policies

**a. European dimension of the problem**

(The extent to which the project has contributed to solve problems at European level)

Global greenhouse gas emissions are an ever growing problem. The project focus is on demonstrating a $CO_2$ free public transportation system using hydrogen and fuel cells on board 3 buses which will be operation in the normal public bus system in Reykjavik Iceland. The main focus is on evaluting this new type of technology as well as the distribution system for hydrogen fuel in the future.

Simultaneously the project adressed the implications of such a new system regarding social-, economic & environmental aspects. It is of utmost importance to include such an evaluation for the future exploitations of results generated from such an extensive research and demonstration project. The studies are made in a way that they can be applied to other European projects or countries.

There has been a strong cooperation with a sister project CUTE in Europe and therefore the information gathered have a very wide European dimension and have been disseminated to wide European audience and also to global audience.

If such a transport system can be wiedly introduced using renwable energy, or even energy available in Europe, then the project does not only contribute to reducing CO2 emissions in Euorpe but also adresses the security of energy supply.

**b. Contribution to developing S&T co-operation at international level. European added value**

(Development of critical mass in human and financial terms; combination of complementary expertise and resources available Europe-wide)

For the execution of a project like ECTOS it has been necessary to create a broad European critical mass. No single company is in the position to executue such a project and therefore by establishing a group of industrial companies, energy companies, academia, public bus operators etc. the results will have a much real-scale impact. The know-how of such a project is also of a much higher value by putting the critical mass together. Also in financial resource terms it would have been difficult to establish a project of this scale. The dissemination of results also had higher impact (value) and will be more viseble through dissemination activities of such a critical mass.

In the project there is a strong emphasis on an intergrated approach, combining social-, economic and environmental research with industrial activities in Europe. By operating the project in Iceland it provides the project with a real scale environment which further compliments the resource use and value of the project.

This critical mass was strengthen even further with the establishment of CUTE, and combined CUTE and ECTOS have created on of the largest project group in Europe, exchanging information almost on daily bases through out the project operation.

**c. Contribution to policy design or implementation**

(Contribution to one or more EU policies; RTD connected with standardisation and regulation at Community and/or national levels)

It is a comparative assessment project and results will be applicable to Europe. When demonstrating and evaluating so many different factors with the purpose of dissemination on a European scale the project partners are convinced that an European support is necessary to achieve a large scale project like ECTOS. Each individual company is not prepared to carry all the cost of doing an comparative assessment on all the different issues, but by combining forces it will be possible.

The project is in good compliance and aware of major environmental, transport and energy policies of the European Union. In general the whole project is in compliance with the policy (--) of "*Energy, Environment and Sustainable Development*", for example the policy of "*Integrating the environment into Community energy policy*", from 14/10/98. The three main objectives of Community energy policy that take account of the environmental dimension are:

- to promote energy efficiency/saving;
- to increase the share of production, and use, of cleaner energy sources;
- to reduce the environmental impact of the production and use of energy sources.

Also the project is in good compliance with the Communication "Developing the citizen network" **(COM(98) 431 final)** which aims to "...support the role of **local and regional passenger transport** in contributing to economic development and employment, reducing congestion, using less energy, producing fewer pollutants, making less noise, reducing social exclusion and improving quality of life"

By putting together a large European consortium it will give all the partners the benefit of cross section evaluation and comments. In that sense, when transforming a society from one energy resource to another it is important that the information from such a large scale fundamental transformation will be developed and interpreted by a wide range of different researchers and institutions. That will give the results more value and hopefully strengthening the possibility of transforming Europe into a "hydrogen society" in the near future. Such an development will make Europe more energy efficient which brings Europe closer to sustainable development and more environmentally friendly way of living.

More recent policy statements for example looking at the report from the high level group on hydrogen and also at the European hydrogen platform the project injects considerable know-how and informaiton into such bodies which will benefit all future hydrogen projects. This project along with CUTE, CEP (Berlin) and others in Europe are of very high importance to evaluate the future use of hydrogen in the EC. Information from the projects can be used regarding future policy making in the field of hydrogen and energy, and in that sense progressing with the EC policy of energy security and reduction of greenhouse gas emissions.

Also the projects should strengthen the future strategic research agenda as the information do combine RD&D issues, both technical and non-technical.

## 1.4.2. Contribution to Community social objectives

**a. Improving the quality of life in the Community :**

Issues such as safety, environmental and resource conservation and better energy usage (efficiency) are of utmost importance. These are the core socio-, economic and environmental factors that will be estimated in this project. For example, the operation of the vehicles and the filling station had to be done in good cooperation with the whole project group as the gathered infromation would be used for different purposes by different partners. This applied both to environmental impacts as well as safety and reliability. Also taken into consideration is the public acceptance of the new hydrogen bus, from the perspective of the users (passengers and operators). Also there is a strong emphasis on social acceptance regarding a commercial filling station. The hydrogen refuelling station is erected in a way like future installation could be in the future to evaluate this important feature, i.e. the future energy distribution network for transportation. What is the public opinion of the project as part of an effort to reduce harmful emissions and thus "thinking globally and acting locally". Concrete conclusions show that with the correct set of education and dissemination of information to the public affected the project. In the Iceland case the project showed that the public can be motivated towards using the new fuel and also confirmed that the new hydrogen system can be integrated safely into a modern society and that the public can feel safe and even encouraged to use the system rather than the conventional system. Currently more projects should be established to continue with this work.

A less polluting hydrogen transportation system will have positive impact on the quality of life in a broad sense. Air quality will improve. Diseases related to the poor air quality are expected to be reduced. Other positive impacts might be mentioned such as oil leakages will be less of a threat which can have positive impacts on water and soil, etc. Not to forget the security of supply for energy in the EC.

**b. Provision of appropriate incentives for monitoring and creating jobs in the Community (including use and development of skills) :**

Currently there is a strong political and industrial participation in developing the hydrogen technology to an acceptable solution for the general public. For Europe it is of high importance to take a leading position in developing this new industrial tools, not only to reduce harmful emissions from transport, but also to take a global leadership in developing this future technology of fuel cells and hydrogen. By creating a critical mass in executing real scale project like the ECTOS, and also CUTE, project the EC is developing results of high value which hopefully in the near future will lead to creation of new industries connected to the future technology. I.e. the goal of a project like hydrogen fuel cell bus demonstration and commercial hydrogen filling station hopefully will give the positive outcome expected from such a project. Therefore this could lead to a compatative advantage for companies inside the EC and in that sense creating new R&D projects leading to creation of new jobs in the EC.

**c. Supporting sustainable development, preserving and/or enhancing the environment (including use/conservation of resources) :**

The setting of the project in Iceland were still abundant untapped renewable energy resources can be used to produce hydrogen via electrolysers, creates a venue were "close to zero" emission will be added to the athmosphere by operation the hydrogen buses. The technology used in the project is state of the art technology for production of the hydrogen and for the buses themselves. There for "sustainable development" is a key word in the ECTOS project.

Energy efficiency and resource management is given high priority and the investigation in the ECTOS project about the outcome of research such as well-to-wheel have given results showing that by using the new technology and renewable energy harmful emissions can drastically be reduced. Also in the CUTE project it has been demonstrated that other energy sources can also be used, which are available in Eurpe, and therefore further added to sustainable development within the EC. Therefore this research and demonstration project is almost unique in the sense that for the first time the transportation energy chain will be virtually zero and if positive outcome, Iceland could further develop its transportation system to a virtually zero emission system. The know-how from such can then be transferred to other European countries which can utilize the conclusions as renewable energy will become cost competitive with other energy carriers on the mainland (Europe).

Further research on the use of renewable energy in combination with hydrogen will therefore support sustainable development in Europe for generation to come. It is evident that renewable energy is vital for such development and therefore in future project sites like Iceland can show a system which can in the future be the key for Europe´s sustainable development

## 1.5. Expected project impact (to be filled in by the project coordinator)

**Remark:** **by replying to the following questions, the coordinator is asked to express his best estimation regarding the impact of the project.**

**Overall Policy Impact**[1]

| EU Policy Goals | I<br>SCALE OF EXPECTED IMPACT OVER THE NEXT 10 YEARS[2]<br>-1 0 1 2 3 | II<br>other<br>Not applicable to project | II<br>other<br>Project Impact too difficult to estimate |
|---|---|---|---|
| 1. Improved sustainable economic development and growth, competitiveness Θ | 2 | | |
| 2. Improved employment Θ | | | x |
| 3. Improved quality of life and health and safety Θ | 2 | | |
| 4. Improved education Θ | 2 | | |
| 5. Improved preservation and enhancement of the environment Θ | 3 | | |
| 6. Improved scientific and technological quality Θ | 3 | | |
| 7. Regulatory and legislative environment Θ | | | x |
| 8. Other _____ Θ | | | |

[1] Coordinator should respond to section I or, if appropriate, to section II. If the project has had no impact, a "0" should be entered in section I. Scores other than zero in section I will prompt a more detailed subquestion on a separate screen. However, you may access in any case the subquestions by clicking on the symbol" Θ "following each main question.

[2] Indication for scale as follows: -1 represents negative impact, 0 no impact, 1 small positive impact, 2 medium positive impact , 3 is a strong positive impact

Indicate your replies below by putting in each box the number corresponding to the score you chose:

| 1. Economic development and growth, competitiveness | Scale of Expected Impacts over the next 10 years (2) | |
|---|---|---|
| | By Project End -1 0 1 2 3 | After Project End -1 0 1 2 3 |
| a) Increased Turnover for project participants | 1 | 2 |
| - national markets | | |
| - international markets | -1 | 2 |
| b) Increased Productivity for project participants | -1 | 1 |
| c) Reduced costs for project participants | -1 | 0 |
| d) Improved output quality/high technology | | |
| e) | 0 | 0 |

| 2. Employment | Scale of Expected Impacts over the next 10 years (2) | |
|---|---|---|
| | By Project End -1 0 1 2 3 | After Project End -1 0 1 2 3 |
| a) Safeguarding of jobs | 1 | 2 |
| b) Net employment growth in projects participants staff | 1 | 2 |
| c) Net employment growth in customer and supply chains | 1 | 1 |
| d) Net employment growth in the European economy at large | 0 | 2 |

| 3. Quality of Life and health and safety | Scale of Expected Impacts over the next 10 years (2) | |
|---|---|---|
| | By Project End -1 0 1 2 3 | After Project End -1 0 1 2 3 |
| a) Improved health care | 0 | 2 |
| b) Improved food, nutrition | 0 | 0 |
| c) Improved safety (incl. consumers and workers safety) | 0 | 1 |
| d) Improved quality of life for the elderly and disabled | 1 | 1 |
| e) Improved life expectancy | 0 | 1 |
| f) Improved working conditions | 0 | 2 |
| g) Improved child care | 0 | 0 |
| h) Improved mobility of persons | 0 | 1 |

| 4. Improved education | Scale of Expected Impacts over the next 10 years (2) | |
|---|---|---|
| | By Project End -1 0 1 2 3 | After Project End -1 0 1 2 3 |
| a) Improved learning processes including lifelong learning | 1 | 2 |
| b) Development of new university curricula | 1 | 3 |

| 5. Preservation and enhancement of the environment | Scale of Expected Impacts over the next 10 years (2) | |
|---|---|---|
| | By Project End -1 0 1 2 3 | After Project End -1 0 1 2 3 |
| a) Improved prevention of emissions | 2 | 3 |
| b) Improved treatment of emissions | 1 | 3 |
| c) Improved preservation of natural resources and cultural heritage | 1 | 3 |
| d) Reduced energy consumption | 2 | 2 |

| 6. S&T quality | Scale of Expected Impacts over the next 10 years (2) | |
|---|---|---|
| | By Project End -1 0 1 2 3 | After Project End -1 0 1 2 3 |
| a) Production of new knowledge | 2 | 3 |
| b) Safeguarding or development of expertise in a research area | 2 | 2 |
| c) Acceleration of RTD, transfer or uptake | 3 | 2 |
| d) Enhance skills of RTD staff | 3 | 3 |
| e) Transfer expertise/know-how/technology | 2 | 2 |
| f) Improved access to knowledge-based networks | 0 | 1 |
| g) Identifying appropriate partners and expertise | 2 | 2 |
| h) Develop international S&T co-operation | 2 | 2 |
| i) Increased gender equality | 0 | 0 |

| 7. Regulatory and legislative environment | Scale of Expected Impacts over the next 10 years (2) | |
|---|---|---|
| | By Project End -1 0 1 2 3 | After Project End -1 0 1 2 3 |
| a) Contribution to EU policy formulation | 2 | 2 |
| b) Contribution to EU policy implementation | 2 | 2 |

| 8. Other (please specify) | Scale of Expected Impacts over the next 10 years (2) | |
|---|---|---|
| | By Project End -1 0 1 2 3 | After Project End -1 0 1 2 3 |
| | | |

I, **project co-ordinator**, confirm the published information contained in this part 1 of the TIP.

**Signature**: **Name: Jón Björn Skúlason**

**Date: 01.04.03** **Organisation: Icelandic New Energy Ltd.**

## Part 2 Description of each result

***A separate part 2 must be completed for each result. This may be done by the partner responsible for the result or by the project co-ordinator.***

***The part 2 must be consolidated at the consortium level and transmitted to the Commission by the co-ordinator.***

**PARTS 2 WILL BE DISSEMINATED BY THE COMMISSION**

## 2.1 : Description of the result(s), one form per result

The ECTOS project results are compiled in different deliverables (this list is provided here below). In the list there are a no. of results but many of them have been compiled into the main deliverables. Specifically deliverable 17 puts together a full impackt assessment and to be able to do so then the key outcomes from all other deliverables is used. This means that in this Part 2 all key results are described but there is not a separate chapter for each deliverable.
This first part is assembled by the coordinator, Icelandic New Energy Ltd. and deals specifically with those results generated from INE. Others follow in separate chapters. Specifically the part on Deliverable 17 is of high importance.

| **Deliverable No**[3] | **Deliverable title** | **Delivery date**[4] | **Nature**[5] | **Dissemination level**[6] |
|---|---|---|---|---|
| | | | | |
| 2. | Establishing methodology for impact and comparative assessment | 4 | Me | Pu |
| | | | | |
| 4. | Dissemination Plan | 8 | Re | Pu |
| 5. | Delivery of operational hydrogen fuelling station | 18 | Eq | Pu |
| 6. | Report on maintenance structure and equipment | 20 | Re | Re |
| 7. | Midterm "Environmental study" (Air quality and $CO_2$ emission levels from choosen routes in Reykjavik) | 24 | Re | Pu |
| 8. | Delivery of 3 hydrogen fuel cell buses | 24-26 | Eq | Pu |
| 9. | Mid-term assessment report + draft of TIP | 28 | Re | Re |

[3] Deliverable numbers in order of delivery dates: D1 – Dn
[4] Month in which the deliverables will be available. Month 0 marking the start of the project, and all delivery dates being relative to this start date.
[5] Please indicate the nature of the deliverable using one of the following codes:
**Re** = Report **Da** = Data set **Eq** = Equipment
**Pr** = Prototype **Si** = Simulation **Th** = Theory
**De** = Demonstrator **Me** = Methodology **O** = other (describe in annnex)
[6] Please indicate the dissemination level using one of the following codes:
**PU** = Public
**RE** = Restricted to a group specified by the consortium (including the Commission Services).
**CO** = Confidential, only for members of the consortium (including the Commission Services).

| Deliverable No[7] | Deliverable title | Delivery date[8] | Nature[9] | Dissemination level [10] |
|---|---|---|---|---|
| 10. | Description of design and operation of the fuelling station | 36 | Re | Re |
| 11. | Report on specification and features of the fuel cell buses | 40 | Re | Re |
| 12. | Assessment and evaluation of socio-economic factors | 48 | Re | Pu |
| 13. | Transferability of technology on European level | 48 | Re | Pu |
| 14. | Final "Environmental study" | 48 | Re | Pu |
| 15. | Cost-benefit analysis for the new infrastructure | 48 | Re | Pu |
| 16. | Life-cycle analysis (fuel cell buses, infrastructure, etc.) for different cities | 50 | Re | Pu |
| 17. | Complete comparative assessment of fuel cell buses with other alternatives | 52 | Re | Pu |
| 18. | Final report and TIP | 54 | Re | Co |
| 19 | Final publishable report Cordis | 54 | Re | Pu |

[7] Deliverable numbers in order of delivery dates: D1 – Dn

[8] Month in which the deliverables will be available. Month 0 marking the start of the project, and all delivery dates being relative to this start date.

[9] Please indicate the nature of the deliverable using one of the following codes:

**Re** = Report **Da** = Data set **Eq** = Equipment
**Pr** = Prototype **Si** = Simulation **Th** = Theory
**De** = Demonstrator **Me** = Methodology **O** = other (describe in annnex)

[10] Please indicate the dissemination level using one of the following codes:

**PU** = Public
**RE** = Restricted to a group specified by the consortium (including the Commission Services).
**CO** = Confidential, only for members of the consortium (including the Commission Services).

**No. & TITLE OF RESULT** (same as in table 1.2)

| No. | Self-descriptive title of the result |
|---|---|
| 1 | Final reporting<br>Summary |

**CONTACT PERSON FOR THIS RESULT**

| | |
|---|---|
| Name | Jón Björn Skúlason |
| Position | General Manager |
| Organisation | Icelandic New Energy Ltd. |
| Address | Borgartúni 37 |
| Telephone | +354-588-0310 |
| Fax | +354-588-0315 |
| E-mail | skulason@newenergy.is |
| URL | |
| Specific Result URL | |

**SUMMARY** *(200 words maximum)*

***Provide an overview of the result which gives the reader an immediate impression of the nature of the result, its relevance and its potential; Briefly describe the current status/applications of the result (if appropriate) with non confidential information on entities potentially involved.***

Setting out goals and objectives of a project of this size and nature was a difficult thing 4½ years ago. However the project partners agree that a successful demonstration of both hydrogen fuel cell buses and hydrogen refuelling infrastructure has taken place, proving that the current stage of technology can be integrated into the modern society of today. In Iceland it has also been demonstrated that this has been done in a $CO_2$ free nature, i.e. the production of hydrogen and the running of the fuel cell buses add no greenhouse gases to the environment. Integrating the infrastructure has also been successfully proven at a conventional gasoline station, in a pre-commercial way. The strategic goal was also to show in what way the future society might benefit in social, economic and environmental terms by using hydrogen as a fuel instead of conventional fossil fuels. Throughout the project it has been shown that social and environmental benefits are very visible. However, the current stage of technology does not yet make it commercially economical. Indications are though that the cost of the new technology will come down in the near future and therefore not far into the future the city of tomorrow will benefit in social, economical and environmental way by using hydrogen instead of fossil fuels.

As further developments in the field of hydrogen continues communities/societies/countries need to prepare for future changes and prepare for hydrogen as the potential key energy carrier of the future.

***Please categorise the result using codes from Annex 1***

| **Subject descriptors** | | | | | |
|---|---|---|---|---|---|

## CURRENT STAGE OF DEVELOPMENT

***Please tick one category only ?***

| | |
|---|---|
| Scientific and/or Technical knowledge (Basic research) | ☐ |
| Guidelines, methodologies, technical drawings | ☐ |
| Software code | ☐ |
| Experimental development stage (laboratory prototype) | ☐ |
| Prototype/demonstrator available for testing | ☐ |
| Results of demonstration trials available | x |
| Other (please specify.): | ☐ |

## DOCUMENTATION AND INFORMATION ON THE RESULT

***List main information and documentation, stating whether public or confidential.***

| **Documentation type** | **Details (Title, ref. number, general description, language)** | **Status: *PU*=Public *CO*=Confidential** |
|---|---|---|
| Report | Summary on conclusions | PU |
| | | |
| | | |
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| | | |

**INTELLECTUAL PROPERTY RIGHTS**

| **Type of IPR** | **KNOWLEDGE:**<br>**Tick a box and give the corresponding details (reference numbers, etc) if appropriate** | | | | | **Pre-existing know-how**<br>**Tick a box and give the corresponding details(reference numbers, etc) if appropriate** | |
|---|---|---|---|---|---|---|---|
| | **Current** | | | | **Foreseen** | **Tick** | **Details** |
| | **Tick** | **NoP [1)]** | **NoI [2)]** | **Details** | **Tick** | | |
| Patent applied for | ☐ | | | | ☐ | ☐ | |
| Patent granted | ☐ | | | | ☐ | ☐ | |
| Patent search carried out | ☐ | | | | ☐ | ☐ | |
| Registered design | ☐ | | | | ☐ | ☐ | |
| Trademark applications | ☐ | | | | ☐ | ☐ | |
| Copyrights | ☐ | | | | ☐ | ☐ | |
| Secret know-how | ☐ | | | | ☐ | ☐ | |
| Other - please specify : | ☐ | | | | ☐ | ☐ | |

1) Number of **P**riority (national) applications/patents
2) Number of **I**nternationally extended applications/patents

**MARKET APPLICATION SECTORS**

***Please describe the possible sectors for application using the NACE classification in Annex 2.***

| **Market application sectors** | | | | | |
|---|---|---|---|---|---|

## 2.2. Quantified data about the result

| **Items (about the results)** | **Actual current quantity [a]** | **Estimated (or future) quantity [b]** |
|---|---|---|
| Time to application / market (in months from the end of the research project) | | |
| Number of (public or private) entities potentially involved in the implementation of the result : | | |
| of which : number of SMEs : | | |
| of which : number of entities in third countries (outside EU) : | | |
| Targeted user audience: # of reachable people | | |
| # of S&T publications (referenced publications only) | | |
| # of publications addressing general public (e.g. CD-ROMs, WEB sites) | | |
| # of publications addressing decision takers / public authorities / etc. | | |
| Visibility for the general public | Yes | |

[a] *Actual current quantity = the number of items already achieved to date.*
[b] *Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve within the next 3 years.*

## 2.3. Further collaboration, dissemination and use of the result

*(Optional; to be completed if partner is willing to set up new collaborations, and seeking dissemination support from the CORDIS services.)*

**COLLABORATIONS SOUGHT**

***Please tick appropriate boxes (?) corresponding to your needs.***

| | | | | | |
|---|---|---|---|---|---|
| **R&D** | Further research or development | x | **FIN** | Financial support | ☐ |
| **LIC** | Licence agreement | ☐ | **VC** | Venture capital/spin-off funding | ☐ |
| **MAN** | Manufacturing agreement | ☐ | **PPP** | Private-public partnership | x |
| **MKT** | Marketing agreement/Franchising | ☐ | **INFO** | Information exchange | ☐ |
| **JV** | Joint venture | ☐ | **CONS** | Available for consultancy | x |
| | | | **Other** | (please specify) | ☐ |

**POTENTIAL OFFERED FOR FURTHER DISSEMINATION AND USE**

***Please, clearly describe your input, the value and interest of the applications and the dissemination and use opportunities that you can offer to your potential partner.***

**PROFILE OF ADDITIONAL PARTNER(S) FOR FURTHER DISSEMINATION AND USE**

***Please, clearly describe the profile and the expected input from the external partner(s).***

I confirm the information contained in part 2 of this Technological Implementation Plan and I authorise its dissemination to assist this search for collaboration.

**Signature**: **Name: Jón Björn Skúlason**

**Date: 15.09.2005** **Organisation: Icelandic New Energy**

## Part 2 Description of each result

***A separate part 2 must be completed for each result. This may be done by the partner responsible for the result or by the project co-ordinator.***

***The part 2 must be consolidated at the consortium level and transmitted to the Commission by the co-ordinator.***

**PARTS 2 WILL BE DISSEMINATED BY THE COMMISSION**

## 2.1 : Description of the result(s), one form per result

**No. & TITLE OF RESULT** (same as in table 1.2)

| No. | Self-descriptive title of the result |
|---|---|
| Deli-verable 17 | Overall impact assessment.<br>A compiled report that presents and discusses the main outcomes of the soft sides of the ECTOS project. It combines the +outcomes of the social surveys and acceptance study, the environmental impact assessments such as air quality and Life cycle assessment of the equipment and the fuel chain. Lastly it also combines the cost combination of building and running a hydrogen fuel station. |

**CONTACT PERSON FOR THIS RESULT**

| | |
|---|---|
| Name | Maria Maack |
| Position | Environmental manager |
| Organisation | University of Iceland |
| Address | Raunvísindadeild, Dunhaga 5 |
| Telephone | +354 863 65 09 |
| Fax | +354 588 03 15 |
| E-mail | Maria.maack@newenergy.is |
| URL | www.newenergy.is |
| Specific Result URL | In Icelandic: www.vetni.is |

**SUMMARY** *(200 words maximum)*

***Provide an overview of the result which gives the reader an immediate impression of the nature of the result, its relevance and its potential; Briefly describe the current status/applications of the result (if appropriate) with non confidential information on entities potentially involved.***

The report 17 registers the outcomes of the local public surveys on hydrogen in general both before the bus demonstration began and also towards the end. It highlights conclusions of the public opinion polls. It contains lists of social learning and other benefits The report also dwells on the large scale changes and air quality based evaluation of emissions from the tested vehicle. More environmental aspects are discussed on the bases of the Life Cycle Analysis of the equipment and how environmental effects have been shifted from the drive phase, because hydrogen in ECTOS was made from water, and towards the building phases of the infrastructure and fuel distribution phases. Whereas some of the cost issues are too sensitive to publish and to avoid that too many conclusions be drawn on the real costs of running a prototype system then only proportional costs are shown in the report. On the other hand all benefits such as social learning, issues for educational material and satellite income, from Hydrogen tourism are estimated and accounted for.

The report is a learning tool for those who need supportive material and information before launching fleets and investing in alternative fuel fleets.

***Please categorise the result using codes from Annex 1***

| **Subject descriptors** | 176 | 177 | 122 | 91 | 376 |
|---|---|---|---|---|---|
| **648** | | | | | |

## CURRENT STAGE OF DEVELOPMENT

***Please tick one category only ?***

| | |
|---|---|
| Scientific and/or Technical knowledge (Basic research) | ☐ |
| Guidelines, methodologies, technical drawings | ☐ X |
| Software code | ☐ |
| Experimental development stage (laboratory prototype) | ☐ |
| Prototype/demonstrator available for testing | ☐ |
| Results of demonstration trials available | ☐ x |
| Other (please specify.), Social impact assessment: | ☐ X |

## DOCUMENTATION AND INFORMATION ON THE RESULT

***List main information and documentation, stating whether public or confidential.***

| **Documentation type** | **Details (Title, ref. number, general description, language)** | **Status: *PU*=Public *CO*=Confidential** |
|---|---|---|
| Figures | Presentation of surveys | PU |
| Interview manual, questionnairs | | PU |
| Fuel efficiency testing data | | Partially PU, mostly CO |
| Environmental impact overview | | PU |
| Cost analysis | | PU |
| News letters | | PU |
| Articles | | PU |
| | | |
| | | |

**INTELLECTUAL PROPERTY RIGHTS**

| **Type of IPR** | **KNOWLEDGE:**<br>**Tick a box and give the corresponding details (reference numbers, etc) if appropriate** | | | | | **Pre-existing know-how**<br>**Tick a box and give the corresponding details(reference numbers, etc) if appropriate** | |
|---|---|---|---|---|---|---|---|
| | **Current** | | | | **Foreseen** | **Tick** | **Details** |
| | **Tick** | **NoP [1)]** | **NoI [2)]** | **Details** | **Tick** | | |
| Patent applied for | ☐ | | | | ☐ | ☐ | |
| Patent granted | ☐ | | | | ☐ | ☐ | |
| Patent search carried out | ☐ | | | | ☐ | ☐ | |
| Registered design | ☐ | | | | ☐ | ☐ | |
| Trademark applications | ☐ | | | | ☐ | ☐ | |
| Copyrights | X☐ | | | Pictures | ☐ | ☐ | |
| Secret know-how | ☐ | | | | ☐ | ☐ | |
| Other - please specify : | ☐ | | | | ☐ | ☐ | |

1) Number of **P**riority (national) applications/patents
2) Number of **I**nternationally extended applications/patents

**MARKET APPLICATION SECTORS**

***Please describe the possible sectors for application using the NACE classification in Annex 2.***

| | | | | | |
|---|---|---|---|---|---|
| **Market application sectors** | 63,4 | 73 m | 80 | | |

## 2.2. Quantified data about the result

| **Items (about the results)** | **Actual current quantity [a]** | **Estimated (or future) quantity [b]** |
|---|---|---|
| Time to application / market (in months from the end of the research project) | 0 | |
| Number of (public or private) entities potentially involved in the implementation of the result : | 3 | |
| of which : number of SMEs : | 2 | |
| of which : number of entities in third countries (outside EU) : | 0 | |
| Targeted user audience: # of reachable people | Mio. | |
| # of S&T publications (referenced publications only) | 2 | 3 |
| # of publications addressing general public (e.g. CD-ROMs, WEB sites) | 4 | 0 |
| # of publications addressing decision takers / public authorities / etc. | 4 | |
| Visibility for the general public | **Very high** | |

[a] *Actual current quantity = the number of items already achieved to date.*
[b] *Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve within the next 3 years.*

## 2.3. Further collaboration, dissemination and use of the result

*(Optional; to be completed if partner is willing to set up new collaborations, and seeking dissemination support from the CORDIS services.)*

**COLLABORATIONS SOUGHT**

***Please tick appropriate boxes (?) corresponding to your needs.***

| | | | | | |
|---|---|---|---|---|---|
| **R&D** | Further research or development | ☐ x | **FIN** | Financial support | ☐ |
| **LIC** | Licence agreement | ☐ | **VC** | Venture capital/spin-off funding | ☐ |
| **MAN** | Manufacturing agreement | ☐ | **PPP** | Private-public partnership | ☐ |
| **MKT** | Marketing agreement/Franchising | ☐ | **INFO** | Information exchange | ☐ x |
| **JV** | Joint venture | ☐ | **CONS** | Available for consultancy | ☐ |
| | | | **Other** | (please specify) | ☐ |

**POTENTIAL OFFERED FOR FURTHER DISSEMINATION AND USE**

***Please, clearly describe your input, the value and interest of the applications and the dissemination and use opportunities that you can offer to your potential partner.***

**PROFILE OF ADDITIONAL PARTNER(S) FOR FURTHER DISSEMINATION AND USE**

***Please, clearly describe the profile and the expected input from the external partner(s).***

I confirm the information contained in part 2 of this Technological Implementation Plan and I authorise its dissemination to assist this search for collaboration.

**Signature**: **Name: María Maack**

**Date: August 15, 2005** **Organisation: University of Iceland**

## Part 2 Description of each result

***A separate part 2 must be completed for each result. This may be done by the partner responsible for the result or by the project co-ordinator.***

***The part 2 must be consolidated at the consortium level and transmitted to the Commission by the co-ordinator.***

**PARTS 2 WILL BE DISSEMINATED BY THE COMMISSION**

## 2.1 : Description of the result(s), one form per result

**No. & TITLE OF RESULT** (same as in table 1.2)

| No. | Self-descriptive title of the result |
|---|---|
| 1 | Trial of three fuel cell busses for the ECTOS project in the Icelandic environment. Continuous improvement of the drive train technology. Transfer of learning into the development of prototype of next generation within proposal HyFleet:CUTE.. |

**CONTACT PERSON FOR THIS RESULT**

| | |
|---|---|
| Name | Monika Kentzler |
| Position | Infrastructure Coordinator |
| Organisation | DaimlerChrysler AG |
| Address | Neue Str. 95, 73230 Kirchheim/Teck-Nabern, Germany |
| Telephone | +49-7021-89-4621 |
| Fax | +49-7032-89-4660 |
| E-mail | monika.kentzler@daimlerchrysler.com |
| URL | |
| Specific Result URL | |

**SUMMARY** *(200 words maximum)*

***Provide an overview of the result which gives the reader an immediate impression of the nature of the result, its relevance and its potential; Briefly describe the current status/applications of the result (if appropriate) with non confidential information on entities potentially involved.***

The trial of the three fuel cell busses in Iceland provided valuable learning and experience to DaimlerChrysler. During the 2 years of trials continuous improvements to the fuel cell drive train were made, e.g. the redesign of the inverter and of some valves. The lifetime of new components was tested.

Fuel efficiency testing fed back valuable information for future improvements.

The maintenance concept for the three busses was also improved. The inspection intervals were adjusted to less frequency.

The data collected during this time period and the experiences with the reliability and durability of the fuel cell drive train components will also flow into the prototype development for the fuel cell bus of the next generation. This prototype development is part of the HyFleet:CUTE proposal.

***Please categorise the result using codes from Annex 1***

| | | | | | |
|---|---|---|---|---|---|
| **Subject descriptors** | 245 | 465 | 603 | 605 | |

## CURRENT STAGE OF DEVELOPMENT

***Please tick one category only ?***

| | |
|---|---|
| Scientific and/or Technical knowledge (Basic research) | ☐ |
| Guidelines, methodologies, technical drawings | ☐ |
| Software code | ☐ |
| Experimental development stage (laboratory prototype) | ☐ |
| Prototype/demonstrator available for testing | ☐ |
| Results of demonstration trials available | ☐ x |
| Other (please specify.): | ☐ |

## DOCUMENTATION AND INFORMATION ON THE RESULT

***List main information and documentation, stating whether public or confidential.***

| Documentation type | Details (Title, ref. number, general description, language) | Status: *PU*=Public *CO*=Confidential |
|---|---|---|
| Technical drawings | The technical drawings for the fuel cell drive train | CO |
| Maintenance manual | Maintenenance manual for the maintenance of the fuel cell drive train | PU |
| Fuel efficiency testing data | The results of the efficiency testing in comparison to a diesel bus were presented. The data of the testing is confidential. | Partially PU, mostly CO |
| Lifetime data | The lifetime of new developed components was tested. | CO |
| data logger data | Data is collected from different sources (sensors, gear case, motor etc) | CO |
| Brochure | DaimlerChrysler brochures about Fuel Cell Technology and fuel cell bus technology | PU |
| Articles | Articles in the DaimlerChrysler magazines (high-tech report 02/05) | PU |
| CUTE project technical brochure | CUTE – "hydrogen supply infrastructure and fuel cell bus technology" | PU |
| | | |

**INTELLECTUAL PROPERTY RIGHTS**

| **Type of IPR** | **KNOWLEDGE:**<br>**Tick a box and give the corresponding details (reference numbers, etc) if appropriate** | | | | | **Pre-existing know-how**<br>**Tick a box and give the corresponding details(reference numbers, etc) if appropriate** | |
|---|---|---|---|---|---|---|---|
| | **Current** | | | | **Foreseen** | **Tick** | **Details** |
| | **Tick** | **NoP [1)]** | **NoI [2)]** | **Details** | **Tick** | | |
| Patent applied for | ☐ | | | | ☐ | ☐ | |
| Patent granted | ☐ | | | | ☐ | ☐ | |
| Patent search carried out | ☐ | | | | ☐ | ☐ | |
| Registered design | ☐ | | | | ☐ | ☐ | |
| Trademark applications | ☐ | | | | ☐ | ☐ | |
| Copyrights | ☐ | | | | ☐ | ☐ | |
| Secret know-how | ☐ | | | | ☐ | ☐ | |
| Other - please specify : | ☐ | | | | ☐ | ☐ | |

1) Number of **P**riority (national) applications/patents
2) Number of **I**nternationally extended applications/patents

**MARKET APPLICATION SECTORS**

***Please describe the possible sectors for application using the NACE classification in Annex 2.***

| | | | | | |
|---|---|---|---|---|---|
| **Market application sectors** | 34 | | | | |

## 2.2. Quantified data about the result

| **Items (about the results)** | **Actual current quantity [a]** | **Estimated (or future) quantity [b]** |
|---|---|---|
| Time to application / market (in months from the end of the research project) | 0 | |
| Number of (public or private) entities potentially involved in the implementation of the result : | 5 | |
| of which : number of SMEs : | 5 | |
| of which : number of entities in third countries (outside EU) : | 0 | |
| Targeted user audience: # of reachable people | 3 Mio. | |
| # of S&T publications (referenced publications only) | 5 | 3 |
| # of publications addressing general public (e.g. CD-ROMs, WEB sites) | 1 | 0 |
| # of publications addressing decision takers / public authorities / etc. | | |
| Visibility for the general public | **Yes** | |

[a] *Actual current quantity = the number of items already achieved to date.*
[b] *Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve within the next 3 years.*

## 2.3. Further collaboration, dissemination and use of the result

*(Optional; to be completed if partner is willing to set up new collaborations, and seeking dissemination support from the CORDIS services.)*

**COLLABORATIONS SOUGHT**

***Please tick appropriate boxes (?) corresponding to your needs.***

| | | | | | |
|---|---|---|---|---|---|
| **R&D** | Further research or development | ☐ x | **FIN** | Financial support | ☐ |
| **LIC** | Licence agreement | ☐ | **VC** | Venture capital/spin-off funding | ☐ |
| **MAN** | Manufacturing agreement | ☐ | **PPP** | Private-public partnership | ☐ |
| **MKT** | Marketing agreement/Franchising | ☐ | **INFO** | Information exchange | ☐ x |
| **JV** | Joint venture | ☐ | **CONS** | Available for consultancy | ☐ |
| | | | **Other** | (please specify) | ☐ |

**POTENTIAL OFFERED FOR FURTHER DISSEMINATION AND USE**

***Please, clearly describe your input, the value and interest of the applications and the dissemination and use opportunities that you can offer to your potential partner.***

**PROFILE OF ADDITIONAL PARTNER(S) FOR FURTHER DISSEMINATION AND USE**

***Please, clearly describe the profile and the expected input from the external partner(s).***

I confirm the information contained in part 2 of this Technological Implementation Plan and I authorise its dissemination to assist this search for collaboration.

**Signature**: **Name: Monika Kentzler**

**Date: August 15, 2005** **Organisation: DaimlerChrysler AG**

## Part 2 Description of each result

***A separate part 2 must be completed for each result. This may be done by the partner responsible for the result or by the project co-ordinator.***

***The part 2 must be consolidated at the consortium level and transmitted to the Commission by the co-ordinator.***

**PARTS 2 WILL BE DISSEMINATED BY THE COMMISSION**

## 2.1 : Description of the result(s), one form per result

**No. & TITLE OF RESULT** (same as in table 1.2)

| No. | Self-descriptive title of the result |
|---|---|
| 10 | Description of design and operation of the fuelling station |

**CONTACT PERSON FOR THIS RESULT**

| | |
|---|---|
| Name | Knut Harg |
| Position | General Mangaer |
| Organisation | Norsk Hydro Electrolysers AS (NHEL) |
| Address | Heddalsv. 11<br>3674 Notodden |
| Telephone | +47 35093811 |
| Fax | +47 350 14404 |
| E-mail | Knut.Harg@Hydro.com |
| URL | |
| Specific Result URL | |

**SUMMARY** *(200 words maximum)*

***Provide an overview of the result which gives the reader an immediate impression of the nature of the result, its relevance and its potential; Briefly describe the current status/applications of the result (if appropriate) with non confidential information on entities potentially involved.***

There is no international standards covering all aspects in building a filling station. Norsk Hydro Electrolysers has made a manual for basic design with reference to standards used, HSE related questions and operation of the supplied filling station. This manual was sent to the owner of the filling station as part of the operational documentation for the station and part of the deliveries in the EU contract. The result of this work is to give our customers detailed knowledge of how to design and operate a Hydrogen plant.

As suppliers, Norsk Hydro Electrolysers has improved its documentation for future fuelling station projects.

***Please categorise the result using codes from Annex 1***

| **Subject descriptors** | Re | | | | |
|---|---|---|---|---|---|

## CURRENT STAGE OF DEVELOPMENT

***Please tick one category only ?***

| | |
|---|---|
| Scientific and/or Technical knowledge (Basic research) | ☐ |
| Guidelines, methodologies, technical drawings | ☐ |
| Software code | ☐ |
| Experimental development stage (laboratory prototype) | ☐ |
| Prototype/demonstrator available for testing | ☐ |
| Results of demonstration trials available | ☒ |
| Other (please specify.): | ☐ |

## DOCUMENTATION AND INFORMATION ON THE RESULT

***List main information and documentation, stating whether public or confidential.***

| **Documentation type** | **Details (Title, ref. number, general description, language)** | **Status: *PU*=Public *CO*=Confidential** |
|---|---|---|
| Report | Description of design and operation of the fuelling station | CO |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

**INTELLECTUAL PROPERTY RIGHTS**

| **Type of IPR** | **KNOWLEDGE:**<br>**Tick a box and give the corresponding details (reference numbers, etc) if appropriate** | | | | | **Pre-existing know-how**<br>**Tick a box and give the corresponding details(reference numbers, etc) if appropriate** | |
|---|---|---|---|---|---|---|---|
| | **Current** | | | | **Foreseen** | **Tick** | **Details** |
| | **Tick** | **NoP [1)]** | **NoI [2)]** | **Details** | **Tick** | | |
| Patent applied for | ☐ | | | | ☐ | ☐ | |
| Patent granted | ☐ | | | | ☐ | ☐ | |
| Patent search carried out | ☐ | | | | ☐ | ☐ | |
| Registered design | ☐ | | | | ☐ | ☐ | |
| Trademark applications | ☐ | | | | ☐ | ☐ | |
| Copyrights | ☐ | | | | ☐ | ☐ | |
| Secret know-how | ☐ | | | | ☐ | ☒ | Design elements in Cellpack and Dryer/deoxo |
| Other - please specify : | ☒ | | | Confidentila design doc. | ☐ | ☐ | |

1) Number of **P**riority (national) applications/patents
2) Number of **I**nternationally extended applications/patents

**MARKET APPLICATION SECTORS**

***Please describe the possible sectors for application using the NACE classification in Annex 2.***

| **Market application sectors** | | | | | |
|---|---|---|---|---|---|

## 2.2. Quantified data about the result

| **Items (about the results)** | **Actual current quantity [a]** | **Estimated (or future) quantity [b]** |
|---|---|---|
| Time to application / market (in months from the end of the research project) | 0 | 0 |
| Number of (public or private) entities potentially involved in the implementation of the result : ( Significant supplies) | 5-10 | 5-10 |
| of which : number of SMEs : | 3-5 | 3-5 |
| of which : number of entities in third countries (outside EU) : | 1-2 | 1-2 |
| Targeted user audience: # of reachable people | N/A | N/A |
| # of S&T publications (referenced publications only) | 0 | 0 |
| # of publications addressing general public (e.g. CD-ROMs, WEB sites) | 5-10 | 3-5 |
| # of publications addressing decision takers / public authorities / etc. | 0 | 1-2 |
| Visibility for the general public | Yes | |

[a] *Actual current quantity = the number of items already achieved to date.*
[b] *Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve within the next 3 years.*

## 2.3. Further collaboration, dissemination and use of the result

*(Optional; to be completed if partner is willing to set up new collaborations, and seeking dissemination support from the CORDIS services.)*

**COLLABORATIONS SOUGHT**

***Please tick appropriate boxes (?) corresponding to your needs.***

| | | | | | |
|---|---|---|---|---|---|
| **R&D** | Further research or development | ☐ | **FIN** | Financial support | ☐ |
| **LIC** | Licence agreement | ☐ | **VC** | Venture capital/spin-off funding | ☐ |
| **MAN** | Manufacturing agreement | ☐ | **PPP** | Private-public partnership | ☐ |
| **MKT** | Marketing agreement/Franchising | ☐ | **INFO** | Information exchange | ☐ |
| **JV** | Joint venture | ☐ | **CONS** | Available for consultancy | ☐ |
| | | | **Other** | (please specify) | ☐ |

**POTENTIAL OFFERED FOR FURTHER DISSEMINATION AND USE**

***Please, clearly describe your input, the value and interest of the applications and the dissemination and use opportunities that you can offer to your potential partner.***

| |
|---|
| |

**PROFILE OF ADDITIONAL PARTNER(S) FOR FURTHER DISSEMINATION AND USE**

***Please, clearly describe the profile and the expected input from the external partner(s).***

| |
|---|
| |

I confirm the information contained in part 2 of this Technological Implementation Plan and I authorise its dissemination to assist this search for collaboration.

**Signature**: **Name: Knut Harg**

**Date:** **Organisation:**

## Part 3 Description of the intentions by each partner

***This part 3 must be completed by each partner who is essential for the dissemination and use (i.e. result owners and/or major project contributors and/or major dissemination and use contributors). Each will detail its own use and dissemination intentions concerning the result(s) they are involved with. This description must be made result by result.***

***These different parts may be transmitted to the Commission either assembled at the consortium level, or individually by each partner to safeguard confidential matters if necessary (through any appropriate media). Obviously, when all partners are implementing a single dissemination and use scheme all together, a single part 3 is needed.***

**PARTS 3 WILL ALWAYS BE KEPT CONFIDENTIAL BY THE COMMISSION**

## 3.1 : Description of the use and the dissemination of result(s), partner per partner

***MANDATORY INFORMATION:***

| | |
|---|---|
| **CONTRACT NUMBER:** | **EVK4-CT-2000-00033** |
| **PARTNER'S NAME:** | **Icelandic New Energy Ltd** |

**CONTACT PERSON(S):**

| | |
|---|---|
| **Name** | Jon Bjorn Skulason |
| **Position/Title** | General Manager / Coordinator |
| **Organisation** | Icelandic New Energy Ltd |
| **Address** | Borgartuni 37<br>108 Reykjavik<br>Iceland |
| **Telephone** | +354 588 0310 |
| **Fax** | +354 588 0315 |
| **E-mail** | skulason@newenergy.is |

**No, TITLE AND BRIEF DESCRIPTION OF MAIN RESULT(S)**

| | |
|---|---|
| 1 | The companies main responsibility has been on coordinating the project. In most cases this has been a pleasant job, though unfortunatelly there has been delays on some of the deliveries, the project has picked up speed and is more or less up to date on all deliveries. |
| 2 | Newsletters have been published annually, a brouchere has been printed, dissemination has gone above all plans and a conference was hosted in Reykjavik in connections to the opening of the filling station (over 200 participants and more than 70 media people). |
| 3 | Webpage has been open since the beginning www.ectos.is |
| 4 | |

**FOR EACH MAIN RESULT:**

**TIMETABLE OF THE USE AND DISSEMINATION ACTIVITIES WITHIN THE NEXT 3 YEARS AFTER THE END OF THE PROJECT**

| ***Mention the use and dissemination related activities, the main associated partners, the related milestones and give an indicative timescale*** | | |
|---|---|---|
| **Activity** | **Brief description of the activity, including main milestones and deliverables (and how it relates to data in sections 2.2 and 3.2).** | **Timescale (months)** |
| **Web site** | **Hosted by Icelandic New Energy** | **ongoing** |
| **Dissemination** | **Icelandic New Energy Ltd, has been active in very many conferences (much more than originally intended) hundred of media persons have come to observe the ECTOS and other hydrogen projects. No project in Iceland has ever before gotten the same attention in the recent years.** | **will be ongoing for some years** |
| | | |
| | | |
| | | |

**FORESEEN COLLABORATIONS WITH OTHER ENTITIES**

***Please tick appropriate boxes (?) corresponding to your most probable follow-up.***

| | | | | | |
|---|---|---|---|---|---|
| **R&D** | Further research or development | ☐ X | **FIN** | Financial support | ☐ **X** |
| **LIC** | Licence agreement | ☐ | **VC** | Venture capital/spin-off funding | ☐ |
| **MAN** | Manufacturing agreement | ☐ | **PPP** | Private-public partnership | ☐ X |
| **MKT** | Marketing agreement/Franchising | ☐ X | **INFO** | Information exchange, training | ☐ **X** |
| **JV** | Joint venture | ☐ | **CONS** | Available for consultancy | ☐ **X** |
| | | | **Other** | (Please specify) | ☐ |

## 3.2 : Quantified data for each partner's main result

| Items | Currently achieved quantity [a] | Estimated future quantity [b] |
|---|---|---|
| Economic impacts (in EURO) | | |
| # of licenses issued (within EU) | | |
| # of licenses issued (outside EU) | | |
| Total value of licenses (in EURO) | | |
| # of entrepreneurial actions (start-up company, joint ventures…) | | |
| # of direct jobs created [c] | | |
| # of direct jobs safeguarded [c] | | |
| # of direct jobs lost | | |

[a] *The added value or the number of items already achieved to date.*
[b] *Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve in the future (i.e. expectations within the next 3 years following the end of the project).*
[c] *"Direct jobs" means jobs within the partner involved. Research posts are to be excluded from the jobs calculation*
*# = number of ...*

I confirm the information contained in part 3 of this Technological Implementation Plan and I certify that these are our exploitation intentions

**Signature**: **Name: Jon Bjorn Skulason**

**Date: 27 June, 2003**

## 3.1 : Description of the use and the dissemination of result(s), partner per partner

***MANDATORY INFORMATION :***

| | |
|---|---|
| **CONTRACT NUMBER :** | **EVK4-CT-2000-00033** |
| **PARTNER's NAME :** | **University of Iceland** |

**CONTACT PERSON(S): maria.maack@newenergy.is**

| | |
|---|---|
| **Name** | **Thorstein I Sigfusson** |
| **Position/Title** | Professor of Physics, |
| **Organisation** | Science Institute of the University of Iceland |
| **Address** | Dunhaga 5<br>107 Reykjavik |
| **Telephone** | + 354 8965692 |
| **Fax** | |
| **E-mail** | this@raunvis.hi.is |
| **Name** | **María Maack** |
| **Position/Title** | environmental manager |
| **Organisation** | Icelandic New Energy |
| **Address** | Po box 8192, 128 Reykajvik |
| **Telephone** | + 354 863 65 09 |
| **Fax** | + 354 588 03 15 |
| **E-mail** | Maria.maack@newenergy.is |

**No, TITLE AND BRIEF DESCRIPTION OF MAIN RESULT(S)**

| | |
|---|---|
| 1 | ECTOS / CUTE Methodology for the assessment of the socio- eco and environmental impacts |
| 2 | Total impact assessment of the socio-economic and environmental impact from demonstrating 3 hydrogen fuel cell buses in the public transportation system in Reykajvik Iceland. |
| 3 | |
| 4 | |
| 5 | |

**FOR EACH MAIN RESULT:**

**TIMETABLE OF THE USE AND DISSEMINATION ACTIVITIES WITHIN THE NEXT 3 YEARS AFTER THE END OF THE PROJECT**

ECTOS / CUTE Methodology

| *Mention the use and dissemination related activities, the main associated partners, the related milestones and give an indicative timescale* | | |
|---|---|---|
| **Activity** | **Brief description of the activity, including main milestones and deliverables (and how it relates to data in sections 2.2 and 3.2).** | **Timescale (months)** |
| **Internet** | **A brief description of the Methodology is on the internet of Icelandic New Energy. Those who are interested in seeing the details need to contact Maria Maack and/or IKP in Stuttgart.** | **60** |
| **Presentations for the public / mixed audiences** | **The Methodology has been and will be presented in all presentations made on the ECTOS project, especially from the University of Iceland and the company Icelandic New Energy** | **According to demand - 24** |
| **Education** | **The methodology is presented in courses at the University of Iceland to students particularly in economics and environmental sciences.** | **48 months** |

Total Impact assessment

| *Mention the use and dissemination related activities, the main associated partners, the related milestones and give an indicative timescale* | | |
|---|---|---|
| **Activity** | **Brief description of the activity, including main milestones and deliverables (and how it relates to data in sections 2.2 and 3.2).** | **Timescale (months)** |
| **Internet** | **The outcomes are put in the form of short, illustrated articles on the website of Icelandic New Energy.**<br>**News letters on the ECTOS and Icelandic New Energy are to be found on the website: www.neewenergy.is**<br>**Also extracts make up other promotional material on the internet** | **60 months** |
| **Printed matter** | **The outcomes of the total assessment are briefly described in the ECTOS / Icelandic new Energy publications and promotional material. (1500 issues)**<br>**Article on the whole ECTOS project, not the least the social impacts is pending for being published in the International Journal for Cleaner Production (60.000 issues and web based)** | **24 months** |
| **Presentations for the public / mixed audiences on an international basis** | **The assessment has been and will be presented in all presentations made on the ECTOS project, especially from the University of Iceland and the company Icelandic New Energy**<br>**Presentations for the public are in constant demand, latest example are 13 groups ( 45 individuals each) arriving from the USA during 2005 from the Smithsonian Institute Study vacations.** | **60 months** |
| **Education** | **Parts from the total assessment is used to formulate educational material. This material is made to fit all levels of the educational system in Iceland and is mixed in with technical details. Parts are used for the primary school, others for the secondary school, vocational training sector and university level.**<br>**Already two chapters have been written in text books made to fit the 1st and secondary levels and students at the University have had and will have the reports and articles they can use for their studies**<br>**Parts of the reports are also used for specific** | **60 months** |
| **Media** | **Parts of the total assessment is discussed in most interviews with international media ( Over 200 interviews and articles in int. media are listed on the dissemination list for ECTOS. Still in 2005 the interest to hear about the outcomes and social impacts is very high, but the University cannot give an exact plan about how this will develop in the next years.** | **12 months** |

**FORESEEN COLLABORATIONS WITH OTHER ENTITIES**

***Please tick appropriate boxes (?) corresponding to your most probable follow-up.***

| | | | | | |
|---|---|---|---|---|---|
| **R&D** | Further research or development | ☐ | **FIN** | Financial support | ☐ |
| **LIC** | Licence agreement | ☐ | **VC** | Venture capital/spin-off funding | ☐ |
| **MAN** | Manufacturing agreement | ☐ | **PPP** | Private-public partnership | ☐ |
| **MKT** | Marketing agreement/Franchising | ☐ | **INFO** | Information exchange, training | ☐ |
| **JV** | Joint venture | ☐ | **CONS** | Available for consultancy | ☐ |
| | | | **Other** | (please specify) | ☐ |

## 3.2 : Quantified data for each partner's main result

| **Items** | **Currently achieved quantity** [a] | **Estimated future quantity** [b] |
|---|---|---|
| Economic impacts (in EURO) | 10 | |
| # of licenses issued (within EU) | 0 | |
| # of licenses issued (outside EU) | 0 | |
| Total value of licenses (in EURO) | 0 | |
| # of entrepreneurial actions (start-up company, joint ventures…) | 2 | 3 |
| # of direct jobs created [c] | 3 | 5 |
| # of direct jobs safeguarded [c] | 2 | |
| # of direct jobs lost | 0 | |

[a] *The added value or the number of items already achieved to date.*
[b] *Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve in the future (i.e. expectations within the next 3 years following the end of the project).*
[c] *"Direct jobs" means jobs within the partner involved. Research posts are to be excluded from the jobs calculation*
*# = number of ...*

I confirm the information contained in part 3 of this Technological Implementation Plan and I certify that these are our exploitation intentions

**Signature**: **Name: Thorsteinn I. Sigfússon**

**Date: 15th Aug 2005**

## 3.1 : Description of the use and the dissemination of result(s), partner per partner

***MANDATORY INFORMATION:***

| | |
|---|---|
| **CONTRACT NUMBER:** | **EVK4-CT-2000-00033** |
| **PARTNER'S NAME:** | **DaimlerChrysler AG** |

**CONTACT PERSON(S):**

| | |
|---|---|
| **Name** | Monika Kentzler |
| **Position/Title** | Infrastructure Coordniator |
| **Organisation** | DaimlerChrysler AG |
| **Address** | Neue Str. 95<br>73230 Kirchheim/Teck-Nabern<br>Germany |
| **Telephone** | +49-7021-89-4621 |
| **Fax** | +49-7021-89-4660 |
| **E-mail** | monika.kentzler@daimlerchrysler.com |

**No, TITLE AND BRIEF DESCRIPTION OF MAIN RESULT(S)**

| | |
|---|---|
| 1 | Trial of three fuel cell busses in Iceland for the ECTOS project. Continouos improvement of the drive train technology. Transfer of learning into the development of a prototype of the next generation within the proposal HyFleet:CUTE.. |
| 2 | |
| 3 | |
| 4 | |

**FOR EACH MAIN RESULT:**

## TIMETABLE OF THE USE AND DISSEMINATION ACTIVITIES WITHIN THE NEXT 3 YEARS AFTER THE END OF THE PROJECT

| *Mention the use and dissemination related activities, the main associated partners, the related milestones and give an indicative timescale* | | |
|---|---|---|
| **Activity** | **Brief description of the activity, including main milestones and deliverables (and how it relates to data in sections 2.2 and 3.2).** | **Timescale (months)** |
| **Continuous improvement of fuel cell drive train** | **During the two year testing period continuous improvements were made to the design of the busses. This will be integrated into the design of the prototype of the next generation** | **Ongoing for next 3-4 years** |
| **Testing for lifetime** | **The lifetime of newly developed components was tested in realistic environment. This will be integrated into the prototype of the next generation.** | **Ongoing for next 3-4 years** |
| **Data acquisition** | **The data from the data logger and from the consumption tests will be used for the development of the prototype of the next generation** | **Ongoing for next 3-4 years** |
| **Dissemination** | **DaimlerChrysler has participated and will continue to participate in many conferences and published information on the technology of the busses.** | **Ongoing** |
| **Webpage** | **www.fuel-cell-bus-club.com** | **Fall 2007** |
| **Articles** | **Articles in different internal and external magazines have been published and will continue to be published.<br>The ECTOS project is linked to the CUTE project in Europe (until spring 2006), the STEP project in Perth (until fall 2006) and the FCB Beijing in China (until fall 2007). Therefore continuous communication will be done** | **Fall 2007** |

## FORESEEN COLLABORATIONS WITH OTHER ENTITIES

***Please tick appropriate boxes (?) corresponding to your most probable follow-up.***

| | | | | | |
|---|---|---|---|---|---|
| **R&D** | Further research or development | ☐ X | **FIN** | Financial support | ☐ |
| **LIC** | Licence agreement | ☐ | **VC** | Venture capital/spin-off funding | ☐ |
| **MAN** | Manufacturing agreement | ☐ | **PPP** | Private-public partnership | ☐ X |
| **MKT** | Marketing agreement/Franchising | ☐ | **INFO** | Information exchange, training | ☐ **X** |
| **JV** | Joint venture | ☐ | **CONS** | Available for consultancy | ☐ |
| | | | **Other** | (Please specify) | ☐ |

## 3.2 : Quantified data for each partner's main result

| Items | Currently achieved quantity [a] | Estimated future quantity [b] |
|---|---|---|
| Economic impacts (in EURO) | 0 | Tbd |
| # of licenses issued (within EU) | 0 | 0 |
| # of licenses issued (outside EU) | 0 | 0 |
| Total value of licenses (in EURO) | 0 | 0 |
| # of entrepreneurial actions (start-up company, joint ventures…) | 0 | 0 |
| # of direct jobs created [c] | 6 | Tbd |
| # of direct jobs safeguarded [c] | | |
| # of direct jobs lost | 0 | 0 |

[a] *The added value or the number of items already achieved to date.*
[b] *Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve in the future (i.e. expectations within the next 3 years following the end of the project).*
[c] *"Direct jobs" means jobs within the partner involved. Research posts are to be excluded from the jobs calculation*
*# = number of ...*

I confirm the information contained in part 3 of this Technological Implementation Plan and I certify that these are our exploitation intentions

**Signature**: **Name: Monika Kentzler**

**Date: August 15, 2005**

## 3.1 : Description of the use and the dissemination of result(s), partner per partner

***MANDATORY INFORMATION:***

| | |
|---|---|
| **CONTRACT NUMBER:** | **EVK4-CT-2000-00033** |
| **PARTNER'S NAME:** | **Norsk Hydro Electrolysers AS** |

**CONTACT PERSON(S):**

| | |
|---|---|
| **Name** | Knut Harg |
| **Position/Title** | General Manager |
| **Organisation** | Norsk Hydro Electrolysers AS (NHEL) |
| **Address** | Heddalsv. 11<br>3674 Notodden |
| **Telephone** | +47 35093811 |
| **Fax** | +47 35014404 |
| **E-mail** | Knut.Harg@hydro.com |

**No, TITLE AND BRIEF DESCRIPTION OF MAIN RESULT(S)**

| | |
|---|---|
| 1 | The company's main responsibility has been design, fabrication, delivery, erection and commissioning/start up of the complete electrolyser based hydrogen fuelling station. No major problems have been encountered during the engineering/construction and the commissioning of the plant took place well in advance of the delivery of the hydrogen busses. However during the operational period there have been material issues that have caused unplanned stops and development work to correct these problems |
| 2 | Dissemination has taken place through announcement on Norsk Hydro's and NHEL's web pages, several national and international seminars and conferences as well as visits to the station by several hundred visitors. |
| 3 | A new dispenser design was developed, and represents the first dispenser design for hydrogen specifically. Successful operation of this new unit has given useful experience for future fuelling station |
| 4 | |

**FOR EACH MAIN RESULT:**

## TIMETABLE OF THE USE AND DISSEMINATION ACTIVITIES WITHIN THE NEXT 3 YEARS AFTER THE END OF THE PROJECT

| *Mention the use and dissemination related activities, the main associated partners, the related milestones and give an indicative timescale* | | |
|---|---|---|
| **Activity** | **Brief description of the activity, including main milestones and deliverables (and how it relates to data in sections 2.2 and 3.2)** | **Timescale (months)** |
| **Web site** | **Hosted by Icelandic New Energy** | **ongoing** |
| **Dissemination** | *Icelandic New Energy Ltd, has been active in very many conferences (much more than originally intended) hundred of media persons have come to observe the ECTOS and other hydrogen projects. No project in Iceland has ever before gotten the same attention in the recent years.* | **will be ongoing for some years** |
| **Design and documentation** | **Design, improvements and documentation have been applied to two later European hydrogen station demonstrations: CUTE (Hamburg) and CEP-Berlin** | **Completed** |
| **Design details** | **Elements of design tested and improved in ECTOS have been transferred and applied in design of a large scale electrolyser in the Hystruc project ( NVE5/2001/525) and also implemented in similar commercial units** | **To 2006** |
| | | |

## FORESEEN COLLABORATIONS WITH OTHER ENTITIES

***Please tick appropriate boxes (?) corresponding to your most probable follow-up.***

| | | | | | |
|---|---|---|---|---|---|
| **R&D** | Further research or development | ☒ | **FIN** | Financial support | ☒ |
| **LIC** | Licence agreement | ☐ | **VC** | Venture capital/spin-off funding | ☐ |
| **MAN** | Manufacturing agreement | ☐ | **PPP** | Private-public partnership | ☐ |
| **MKT** | Marketing agreement/Franchising | ☐ | **INFO** | Information exchange, training | ☒ |
| **JV** | Joint venture | ☐ | **CONS** | Available for consultancy | ☒ |
| | | | **Other** | (Please specify) | ☐ |

## 3.2 : Quantified data for each partner's main result

| Items | Currently achieved quantity [a] | Estimated future quantity [b] |
|---|---|---|
| Economic impacts (in EURO) – Estimated Hydro turnover for hydrogen fuelling stations | 3 mill | 5 mill |
| # of licenses issued (within EU) | 0 | 0 |
| # of licenses issued (outside EU) | 0 | 0 |
| Total value of licenses (in EURO) | 0 | 0 |
| # of entrepreneurial actions (start-up company, joint ventures…) | 0 | 0 |
| # of direct jobs created [c] | 0 | 0 |
| # of direct jobs safeguarded [c] | 30 | |
| # of direct jobs lost | 0 | 0 |

[a] *The added value or the number of items already achieved to date.*
[b] *Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve in the future (i.e. expectations within the next 3 years following the end of the project).*
[c] *"Direct jobs" means jobs within the partner involved. Research posts are to be excluded from the jobs calculation*
*# = number of ...*

I confirm the information contained in part 3 of this Technological Implementation Plan and I certify that these are our exploitation intentions

**Signature**: **Name: Knut Harg**

**Date: 31. August, 2005**