



Hydrogen and Fuel Cell RTD in Austria: Country Picture

Report in the frame of HYSOCIETY project

**WP 1: Creation of the enabling environment to establish
the European hydrogen based society**

**Task 1.0: Identification of on-going projects
and programs**

Günter R. Simader
Georg Trnka

Vienna, July 2004

Impressum

Herausgeberin: Energieverwertungsagentur – the Austrian Energy Agency (E.V.A.),
Otto-Bauer-Gasse 6, A-1060 Wien; Tel. +43 (1) 586 15 24, Fax +43 (1) 586 15 24 - 40;
E-Mail: eva@eva.ac.at, Internet: <http://www.eva.ac.at>

Gesamtleitung: DI Dr. Günter Simader

Lektorat: Dr. Margaretha Bannert

Layout: Mag. Reinhard Jellinek

Herstellerin: Energieverwertungsagentur (E.V.A.)

Verlagsort und Herstellungsort: Wien

Nachdruck nur auszugsweise und mit genauer Quellenangabe gestattet. Gedruckt auf chlorfrei gebleichtem Papier.

CONTENTS

1	Overview of Austrian hydrogen and fuel cell RTD activities	1
2	Overview of Austrian fuel cell and hydrogen projects	6
2.1	Introduction/methodology of data collection	6
2.2	Austrian project participations in EU RTD framework programs (FP)	7
2.2.1	1 MW SOFC – Demonstration of a one MW _e class power system using high temperature fuel cells (SOFCs) combined with micro turbine generators	7
2.2.2	ACCEPT – Ammonia cracking for clean electric power technology	9
2.2.3	AER-GAS – New approach for biomass gasification to hydrogen–an absorption enhanced reforming process	11
2.2.4	AMONCO – Advanced prediction, monitoring and controlling of anaerobic digestion processes behaviour towards biogas usage in fuel cells	13
2.2.5	BIOCELLUS – Biomass fuel cell utility system	15
2.2.6	BIOHPR – Decentralised CHP with the biomass heat pipe reformer	16
2.2.7	CASCADE MINTS – Case Study comparisons and development of energy models for integrated technology systems	18
2.2.8	CLEAN ENERGY FROM BIOMASS – Biomass gasification and fuel cell coupling via high temperature gas clean-up for decentralised electricity generation with improved efficiency	20
2.2.9	CRYOPLANE – Liquid hydrogen fuelled aircraft-system analysis	22
2.2.10	DIRECT – Diesel reforming by catalytic technologies	25
2.2.11	EFFECTIVE – Holistic integration of MCFC technology towards a most effective systems compound using biogas as a renewable source of energy	27
2.2.12	ELEDRIE – Thematic network on fuel cells and their applications for electric & hybrid vehicles	29
2.2.13	EUHYFISE – European hydrogen filling station infrastructure for fuel cell vehicles based on renewable energies	32
2.2.14	FCTESTNET – The fuel cell testing and standardisation network	34
2.2.15	Hydrogen-rich gas from biomass steam gasification	37
2.2.16	HYMOSES – Hydrogen in mobile and stationary devices-safe and effective storage solution	39
2.2.17	HYSOCIETY – The European hydrogen (based) society	41
2.2.18	HYSTORY – Hydrogen storage in hydrides for safe energy systems	43
2.2.19	HYWAYS – Development of a harmonised „European Hydrogen Energy Roadmap“	45
2.2.20	NATURALHY – Preparation for the hydrogen economy by using the existing natural gas system as a catalyst	48
2.2.21	NFCCPP – Numerical fuel cell component performance prediction tool	51
2.2.22	SOFCNET – Thematic network on solid oxide fuel cell technology	53
2.2.23	Solid biomass gasification for fuel cells	56
2.2.24	STORHY – Hydrogen storage system for automotive application	58
2.2.25	VIEWLS – Clear views on clean fuels	60
2.2.26	VLEEM – Very long term energy environment model	62
2.3	National/International public and private funded projects	64

2.3.1	Assessment of advanced technologies for alternative final energy carriers	64
2.3.2	Assessment of alternative hydrogen pathways: Natural gas and biomass	66
2.3.3	Biogas fuelled fuel cell CHP plants	68
2.3.4	BZI – Fuel Cell Information Initiative	69
2.3.5	BZ-VIT – Brennstoffzellen-Vernetzung/Internationalität/Transfer (Fuel cell-know-how transfer project)	70
2.3.6	CDT-BZ – Direct hydrogen fuel cell module for vehicle drives and APU's (5kW)	71
2.3.7	Chrome basis alloy for SOFC fuel cells	73
2.3.8	Combined heat and power plants with fuel cells	74
2.3.9	CRYOTANK – Creating Simulation Tools for Development of Safe Liquid Hydrogen Tanks	75
2.3.10	Development of a method for the mass production of PEM-FC components	77
2.3.11	Direct-methanol fuel cells with circulate electrolytes	78
2.3.12	EasyCell	79
2.3.13	Environmentally friendly urban bus and product delivery traffic systems – clean fuels and zero emissions in city centres	80
2.3.14	FC & H ₂ – the role of fuel cell technology and hydrogen in the future Austrian energy system considering national/International developments/programs/policies	81
2.3.15	FCOIL – liquid fossil fuels for stationary fuel cell applications	82
2.3.16	FUELCELL III – RTD of fuel cells for stationary applications and consumer applications	83
2.3.17	Fuel cell heating systems for residential applications (PEFC)	84
2.3.18	Fuel cell heating systems for residential applications (PEFC)	86
2.3.19	Fuel cell systems for residential application (SOFC)	87
2.3.20	Fuel cell systems with liquid electrolytes	89
2.3.21	H ₂ -gas engine for industrial applications	90
2.3.22	HyCentA	91
2.3.23	Hydrogen generation from synthetic gas and liquid hydrocarbons by RESC process	93
2.3.24	Liquid hydrogen densification process for launchers	94
2.3.25	Liquid hydrogen tank development	95
2.3.26	MASS-MINI-FC	96
2.3.27	PEM fuel cell hybrid vehicle	98
2.3.28	PRO-BZ – Program to generate fuel cell expertise	99
2.3.29	PV hybrid systems with fuel cells for data acquisition and radio stations of utility companies	100
2.3.30	QUANT B – Professional education of teachers and specialists in the sphere of new technologies – fuel cells and high performance batteries	101
2.3.31	Renewable hydrogen in Austria	102
2.3.32	Research engine for the development of hydrogen combustion systems	103
2.3.33	SMOTECH DISPO (5-100) – direct methanol fuel cells	104
2.3.34	Solid oxide fuel cell auxiliary power unit for mobile application	105
2.3.35	Thermodynamic and kinetic characterisation of mixed ionic-electronic conductors	106

3 Austrian contact list of hydrogen and fuel cell RTD companies/institutions 109

1 Overview of Austrian hydrogen and fuel cell RTD activities

This section describes the Austrian RTD landscape of hydrogen and fuel cell activities. Differently to other countries as e.g. the U.S.A. and Japan, Austria has no specific hydrogen and fuel cell program but uses its existing RTD funding instruments and its participation possibilities in the European RTD framework and other programs.

The analysis of the Austrian RTD activities follows a bottom-up approach by identifying ongoing (main emphasis), finished (minor emphasis) and future¹ projects. The basic assumption for the analysis is that the Austrian RTD in the hydrogen and fuel cell fields is mainly driven by third party funds and only to a minor extent by national equity capital. Confidential projects – even when known – have not been considered at all.

61 projects in total have been identified. Out of these 8 projects were completed prior to 2003, 9 projects in 2003, 9 projects were finished by July 2004 and 35 are ongoing or future projects. Not only the number of present and future Austrian hydrogen and fuel cell RTD projects is higher than ever before, at least 60 Austrian companies and institutions were identified being involved in hydrogen and fuel cell RTD activities (see **Figure 1** and Section 3 on page 109).

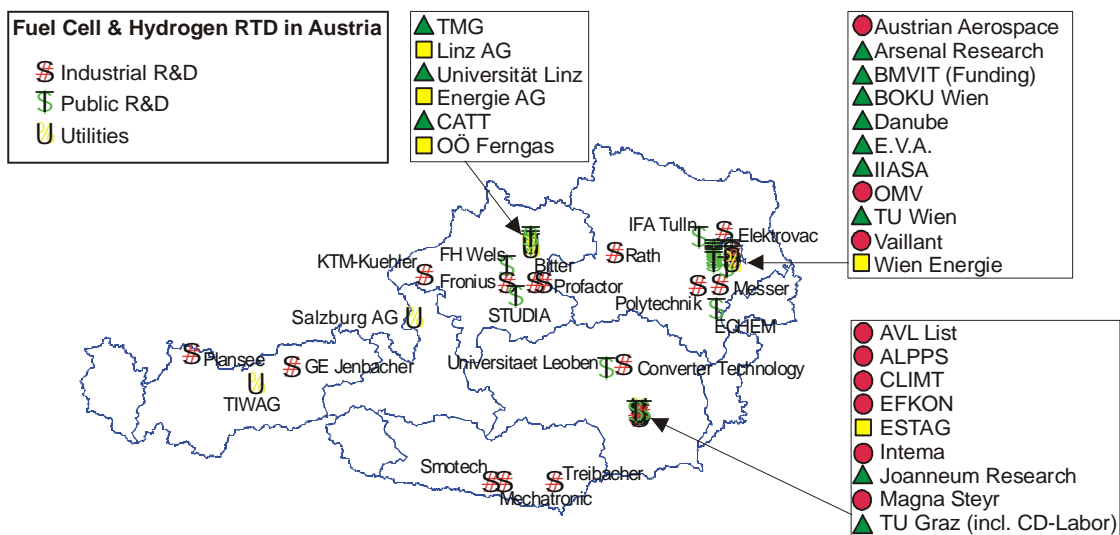


Figure 1 Companies/institutions actively involved in fuel cell and hydrogen RTD² (Source: E.V.A.)

¹ Future projects in the sense of already evaluated projects or in the contract preparation phase (applies mainly for EU projects).

² Institutes and departments of TU Vienna and TU Graz incl. CD Laboratory for fuel cells are not listed singular.

26³ EU funded projects have been identified. Out of these projects 5 were already completed prior to 2003, 2 projects in 2003, 3 projects were finished till July 2004 and 16 are ongoing or future projects. 19 of the ongoing/future projects are national/international public and private funded projects. Estimations for RTD budgets in these RTD fields followed also a bottom-up approach using different information from EC/national publications, personal contacts to public bodies in charge of RTD funds and personal contacts to project co-ordinators/project contacts.

For 2002 the total RTD budget volume is estimated⁴ to 2,7 Mio Euros, for 2003 7,7 Mio Euros and for 2004⁵ to 5,6 Mio Euros. The budget for the Austrian hydrogen and fuel cell RTD of 16,0 million Euros for this 3-years period has reached a historical high. In terms of budget numbers the dependency on EU programs correlate with the number of EU projects (budgets from EU for Austrian institutions/organisations: around 60 % in 2002, 40 % in 2003 and 60 % in 2004). In this context it has to be also mentioned that EU projects exceed average national project fundings considerably.

From this analysis two major conclusions may be drawn:

- (i) The Austrian RTD institutions/organisations could successfully contribute with their know-how to the European RTD priority topics and have/had the capability and the flexibility to participate in the „highly competitive“ European framework programs, and
- (ii) the Austrian RTD is highly dependent on the European RTD FP funds in general (and applied EU FP instruments in particular). Changes in FP 6 budgets and instruments may have consequences on the continuity of the further development both in terms of involved RTD institutions/researchers and yearly available funds.

Austrian organisations in the co-ordination position of EU projects⁶ may mainly be found in fuel cell projects converting the hydrogen from biomass, diesel and ammonia fuels (PROFACTOR, TU-Vienna, ALPPs, INTEMA). One exception is the H₂-storage project (STORHY) from Magna Steyr. The national public funded projects are dominated by the

³ The brackets indicate EU projects that investigate among other topics also hydrogen and fuel cell issues (this applies mainly for the VIEWLs and VLEEM projects). Austrian researchers explicitly named these projects and for this reason they were included in section 2. Executed budget estimations only allocated a small fraction of total budget to the hydrogen and fuel cell budgets.

⁴ These estimations are based on contracted budget numbers that are equally distributed over the project period neglecting any delays of payments (sometimes observed for EU contracts).

⁵ Budgets for 2004 are for projects that have already started or are already in the contract preparation phase (mainly EU projects). These projects will most likely start in 2004. Projects from BMVIT's A3 program line could increase this budget number in case of that projects will start in this year.

⁶ This statement applies for EU 5th RTD FP projects.

A3 program⁷ (in total 8 projects) from BMVIT⁸. More recent project proposals from the program lines “Austrian Program for sustainable technologies” were also included. 3 projects from the program line “Factory of Tomorrow” and one project of the program line “Energy System of Tomorrow” were identified.

Further attention in the fuel cell RTD field belongs to the demonstration projects of residential fuel cell applications of the Austrian gas and electric utility companies (Energie AG, Wien GAS, ESTAG, Salzburg AG) implementing Vaillant (EURO 1 and EURO 2 PEFC demonstrators) and Sulzer Hexis AG (HEXIS 1000 PREMIERE) (see also **Figure 2**). Increasing dynamic may be observed also in the DMFC topic for consumer applications both in terms of public and private initiatives (CD laboratory, SMOTECH company)⁹.

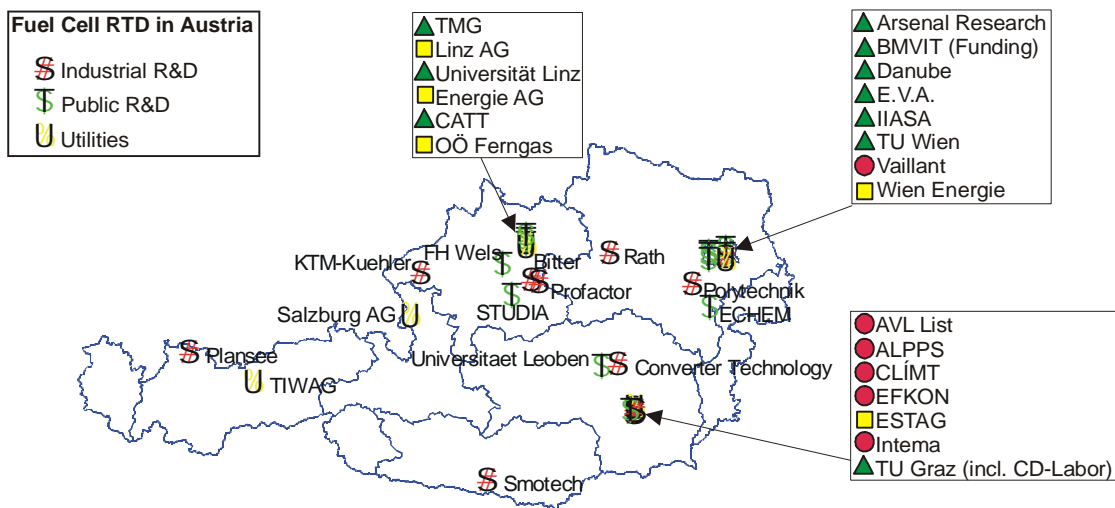


Figure 2 Companies/institutions actively involved in fuel cell RTD, the yellow squares indicate the major involvement of Austrian utility companies¹⁰ (Source E.V.A.)

Although the fuel cell RTD topic shows more projects and companies/institutions involved than the hydrogen RTD (compare **Figure 2** and **Figure 3**), the hydrogen engine of GE Jenbacher is the only development so far that could be successfully implemented by several projects(!) into competitive markets. Further attention in the field of hydrogen RTD belongs also to the project “Hydrogen Center Austria” in Styria. A new competence center on infrastructural RTD topics (incl. filling stations, storage technologies, conversion technologies, etc.) involving major Austrian RTD companies/institutions (Magna Steyr,

⁷ A3 the abbreviation for Austrian advanced, automotive technologies within the program intelligent transportation and service systems.

⁸ BMVIT is the abbreviation for Federal Ministry for Transportation, Innovation and Technology.

⁹ CD is the abbreviation of Christian Doppler Research Laboratory.

¹⁰ Institutes and departments of TU Vienna and TU Graz incl. CD Laboratory for fuel cells are not listed singular

Technical University of Graz, Joanneum Research, ARD Seibersdorf Research, OMV, Steirische Ferngas, etc.) that will come into full operation by the beginnings of 2005. Funding will – most likely – received both public (BMVIT, BMWA, Region of Styria and involved industry).

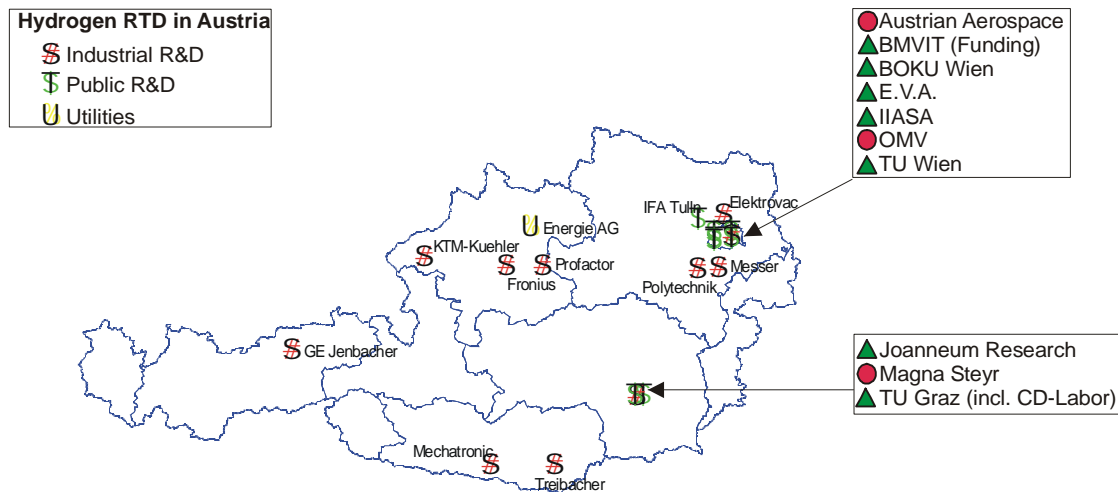


Figure 3 Companies/institutions actively involved in hydrogen RTD (Source E.V.A.)

The focal points of Austrian hydrogen and fuel cell RTD activities may be summarised as follows:

- (i) component and system development for the hydrogen production from biogas and biomass
- (ii) demonstration projects concerning residential fuel cell systems (incl. applications for CHP and data acquisition/radio stations)
- (iii) RTD activities in liquid hydrogen storage systems and storage hydride materials
- (iv) H₂ gas engines deployed in stationary industrial and mobile applications
- (v) PEFC and SOFC component and system development for mobile applications and APUs
- (vi) component development for SOFC plates and systems (incl. modelling efforts)
- (vii) new private/public start-ups in DMFC research activities.

Still weak is the activity level for core stack and/or fuel cell system RTD (exception is the SOFC bipolar plate development of Plansee AG) in Austria. In the Austrian program “Technologies for sustainable development” several proposals have been submitted by Austrian RTD institutes that might possibly overcome these shortcomings. A minor activity level are also reforming/conversion RTD activities of fossil fuels. This topic is expected to receive major attention in the next/future years following European and international fuel

cell and hydrogen vision papers and road maps, strategic research agendas, and deployment strategies.

2 Overview of Austrian fuel cell and hydrogen projects

2.1 Introduction/methodology of data collection

The identified projects are divided into two sections:

- (i) Austrian project participations in EU RTD framework programs, and
- (ii) Austrian public/private national/International funded projects.

The collected project data sets are based on a matrix demanding the following information:

- (i) project administrative information (incl. title, contract number, start and end date, actual phase of the project, contact details about the co-ordinating institution and project partners, funding and budget information)
- (ii) project contents like objectives, geographical focus (national, European, International), project type (differentiating mainly among demonstration and basic R&D projects, accompanying measures, feasibility studies),
- (iii) information concerning the project domain distinguishes among: production, storage and distribution, conversion, or end-use
- (iv) rating of technology (if applicable) by E.V.A. differentiating among:
 - basic principles observed and reported (1),
 - technology concept and application (2),
 - analytical and experimental critical functions identified (3),
 - components validated in laboratory (4),
 - components validated in relevant environment (5),
 - system prototype demonstrated in relevant environment (6),
 - system demonstrated in relevant environment (7), and
 - system verified by successful use (8).
- (v) Identification of challenges and changes (technological, infrastructural, ecological, economic, political, institutional, cultural or geographical). This section will provide an E.V.A. judgement which kind of challenges/changes are necessary to make the introduction or transition of project results possible.

2.2 Austrian project participations in EU RTD framework programs (FP)

The data collection concerning EU projects focuses mainly on 5th FP projects. Nevertheless outstanding projects within the 4th FP are listed and when information was available, projects already positively evaluated from the 6th FP.

2.2.1 1 MW SOFC – Demonstration of a one MW_e class power system using high temperature fuel cells (SOFCs) combined with micro turbine generators

1	Acronym and full name of the project	1 MW SOFC Demonstration of a one MW _e class power system using high temperature fuel cells (SOFCs) combined with micro turbine generators
2	Contract number	NNE5/173/1999
3	Start date	1.1.2000
4	End date	31.12.2003
5	Actual phase of project	Completed
6	Co-ordinating Institution	ENERGIE BADEN-WÜRTTEMBERG AG (DE)
7	Contact	KASPER, Klaus J.
8	Type	EU RTD frame work program (5 th FP)
9	Focus	International
10	Funding	EU: 3.89 million € Project Cost: 27.78 million €
11	Information available (publications, internet, reports, other)	EC, « European Fuel Cell and Hydrogen Projects 1999–2002 », Brüssel/03; http://europa.eu.int/comm/research/rtdinfo_en.html (July/03); http://www.cordis.lu/en/home.html (July/03); http://www.hyweb.de/pro (July/03)
12	Objective of project	The objective of the program is to demonstrate in two phases the feasibility of a SOFC power system of the MW class, based on the existing tubular SOFC technology. In the first phase an atmospheric hybrid SOFC/micro turbine generator (MTG) power system will be tested using available MTGs adapted to the requirements of the SOFC module. This will demonstrate an easily sited SOFC system with a high electrical efficiency in the range of 50 to 53% which is very well suited for either all electric or

		<p>combined heat and power production.</p> <p>The second phase will include operation of SOFC module at elevated pressure. During this phase, the MTG will be replaced with those designed for the pressurised operation, leading to an electrical efficiency of up to 60%. This will help to minimise the environmental input of energy production by providing a clean and efficient energy system.</p>
13	Domain covered	Conversion (CHP markets)
14	Rating of technology	<p>Actual: Technology concept and application (2);</p> <p>Planned: System prototype demonstrated in relevant environment (7)</p>
15	List of participants	<ul style="list-style-type: none"> • TIWAG, TIROLER WASSERKRAFT AG (AT) • ENERGIE BADEN-WÜRTTEMBERG AG (DE) • GAZ DE FRANCE (FR) • SIEMENS AKTIENGESELLSCHAFT (DE) • ELECTRICITÉ DE FRANCE (FR) • SIEMENS WESTINGHOUSE POWER CORPORATION (US)
16	Challenges addressed	Techno-economic challenges of the introduction are addressed based on ecological frame conditions.
17	Changes addressed	The project identifies the SOFC technology for its usage in CHP markets (including technological, economical and ecological changes).

2.2.2 ACCEPT – Ammonia cracking for clean electric power technology

1	Acronym and full name of the project	ACCEPT Ammonia cracking for clean electric power technology
2	Contract number	ENK6-CT-2001-00580
3	Start date	1.1.2002
4	End date	31.12.2004
5	Actual phase of project	Ongoing
6	Co-ordinating Institution	INTEMA CONSULT MARKETING DIENSTLEISTUNGS GMBH (AT)
7	Contact	WANCURA, Herbert
8	Type	EU RTD frame work program (5 th FP)
9	Focus	Europe
10	Funding	EU: 1.78 million € Project Cost: 2.92 million €
11	Information available (publications, internet, reports, other)	http://www.hyweb.de/pro (July/03); http://www.cordis.lu/en/home.html (July/03); EC, « European Fuel Cell and Hydrogen Projects 1999–2002 », Brüssel/03
12	Objective of project	The accept proposal suggests to evaluate the potential of ammonia as fuel for fuel cells. The project consists of three parts, one for PEMFC+NH ₃ , consisting of five WPs, one for SOFC+NH ₃ evaluation (one WP) and one for a paper study of NH ₃ feasibility for use with fuel cells (three WPs) including supply chain and safety evaluation and a prospective technology and life cycle emission analysis. The output will be the feasibility of NH ₃ as fuel for the two most prominent fuel cell versions.
13	Domain covered	Testing of ammonia as fuel for fuel cells (conversion)
14	Rating of technology	Components validated in lab (4)
15	List of participants	<ul style="list-style-type: none"> • INTEMA CONSULT MARKETING DIENSTLEISTUNGS GMBH (AT) • AGROLINZ MELEMIN GMBH (AT) • UNIVERSITY OF TECHNOLOGY GRAZ, INSTITUT FUER ELEKTRISCHE ANLAGEN UND HOCHSPANNUNGSTECHNIK (AT) • UNIVERSITA DEGLI STUDI DI ROMA TOR VERGATA (IT)

		<ul style="list-style-type: none">• RISØE NATIONAL LABORATORY (DK)• VITO – VLAAMSE INSTELLING VOOR TECHNOLOGISCH ONDERZOEK NV (BE)• ADVANCED LIGHTWEIGHT ENGINEERING BV (NL)• DFG-ENERGIE, INSTITUTE FUER ENERGIE, OEKOLOGIE UND OEKONOMIE (DE)• NETHERLANDS ENERGY RESEARCH FOUNDATION (NL)
16	Challenges addressed	The introduction of ammonia as energy carrier and the usage of the intermediate produced hydrogen used in fuel cells will be addressed (including technological, infrastructural, ecological, economic, political, institutional and geographical challenges).
17	Changes addressed	The project proposes and addresses ammonia (and hydrogen) as an energy source for fuel cells in future energy markets.

2.2.3 AER-GAS – New approach for biomass gasification to hydrogen–an absorption enhanced reforming process

1	Acronym and full name of the project	AER-GAS New approach for biomass gasification to hydrogen–an absorption enhanced reforming process
2	Contract number	ENK5-CT-2001-00545
3	Start date	3.2002
4	End date	3.2005
5	Actual phase of project	Ongoing
6	Co-ordinating Institution	CENTRE FOR SOLAR ENERGY AND HYDROGEN RESEARCH (DE)
7	Contact	SPECHT, Michael
8	Type	EU RTD frame work program (5 th FP)
9	Focus	Europe
10	Funding	Budget: Proprietary
11	Information available (publications, internet, reports, other)	EC, « European Fuel Cell and Hydrogen Projects 1999–2002 », Brüssel/03; http://europa.eu.int/comm/research/rtdinfo_en.html (July/03)
12	Objective of project	The aims of the project are the development of a new, efficient and low cost single step process (absorption enhanced reforming, AER) for clean biomass conversion into a hydrogen rich gas (H ₂ conc. > 80 vol.%) with low tar content. Also the development and selection of efficient catalytic CO ₂ absorbent bed materials with improved mechanical and chemical stability for the AER process is forced. After all the design of an AER biomass plant with investment costs less than 800 €/kW and energetic efficiency for H ₂ production higher than 75 % is a main target.
13	Domain covered	Conversion
14	Rating of technology	Components validated in lab (4)
15	List of participants	<ul style="list-style-type: none"> • TECHNICAL UNIVERSITY OF VIENNA (AT)

		<ul style="list-style-type: none">• CENTRE FOR SOLAR ENERGY AND HYDROGEN RESEARCH (DE)• FOUNDATION OF RESEARCH AND TECHNOLOGY (GR)• PROPLAN (CY)• UNIVERSITY OF CYPRUS (CY)• UNIVERSITY OF STUTTGART (DE)• PAUL SCHERRER INSTITUT (CH)• IVE WEIMER (DE)
16	Challenges addressed	Increased usage of biomass in our future energy system (techno-economic challenges are addressed based on ecological frame conditions).
17	Changes addressed	The project investigates the increased usage of biomass in the future energy market and identifies all kinds of necessary changes.

2.2.4 AMONCO – Advanced prediction, monitoring and controlling of anaerobic digestion processes behaviour towards biogas usage in fuel cells

1	Acronym and full name of the project	AMONCO Advanced prediction, monitoring and controlling of anaerobic digestion processes behaviour towards biogas usage in fuel cells
2	Contract number	ENK6-CT-2001-00518
3	Start date	1.12.2001
4	End date	30.11.2004
5	Actual phase of project	Ongoing
6	Co-ordinating Institution	PROFACTOR PRODUKTIONSFORSCHUNGS GMBH (AT)
7	Contact	HABERBAUER, Marianne
8	Type	EU RTD frame work program (5 th FP)
9	Focus	Europe
10	Funding	EU: 2.10 million € Project Cost: 3.66 million €
11	Information available (publications, internet, reports, other)	http://www.eva.ac.at/amonco (July/03); http://www.cordis.lu/en/home.html (July/03); http://www.hyweb.de/pro (July/03)
12	Objective of project	The general objective of this project is to develop gas cleaning systems for biogas fuelled fuel cells. The specific objective is the development of a knowledge based decision support tool (DST) with the capability to predict trace gases in dependence of the fermented substrates and a cost-effective cleaning process removing the significant trace gases. While the first feature of the DST is to avoid trace gases from the start, the second feature will be the ability to in-situ control the AD-process towards lowest concentration of trace gases while keeping a maximum yield of CH ₄ . The investigation of the effects of biogas on the different fuel cells will be assessed through single cell tests.

13	Domain covered	Production of hydrogen from biogas and using fuel cells
14	Rating of technology	Components validated in lab (4)
15	List of participants	<ul style="list-style-type: none"> • PROFACTOR PRODUKTIONSFORSCHUNGS GMBH (AT) • E.V.A., THE AUSTRIAN ENERGY AGENCY (AT) • UNIVERSITY OF NATURAL RESOURCES AND APPLIED LIFE SCIENCES (AT) • CONSEJO SUPERIOR DE INVESTIGACIONES CIENTOFICAS (CSIL) (ES) • MATADERO FRIGORIFICO DEL NALON SA (ES) • GASCON APS (DK) • SLOVENSKA POL'NOHOSPODARSKA UNIVERSITA V NITRE(SI) • EBV MANAGEMENT GMBH & CO.KG (DE) • SARIA BIO-INDUSTRIES GMBH FARMATIC BIOTECH ENERGY AG (DE) • BIOGAS BARTH GMBH (DE) • SEABORNE ENVIRONMENTAL RESEARCH LABORATORY GESELLSCHAFT FUER UMWELTTECHNIK MBH (DE)
16	Challenges addressed	<p>Development of biogas fuelled fuel cells (techno-economic challenges are addressed based on ecological frame conditions). Specific technological challenges include the prevention and/or elimination of detrimental trace gas.</p>
17	Changes addressed	<p>The increased usage of biogas via fuel cells is addressed for stationary applications (including technological, infrastructural, ecological, economic geographic changes).</p>

2.2.5 BIOCELLUS – Biomass fuel cell utility system

1	Acronym and full name of the project	BIOCELLUS Biomass fuel cell utility system
2	Contract number	Unknown
3	Start date	1.7.2004
4	End date	31.6.2007
5	Actual phase of project	Contract preparation phase
6	Co-ordinating Institution	TECHNICAL UNIVERSITY OF MUNICH (DE)
7	Contact	HOHENWARTER, Ulrich
8	Type	EU RTD frame work program (6 th FP)
9	Focus	Europe
10	Funding	EU: 2,5 million €
11	Information available (publications, internet, reports, other)	Personal contact (TU-Graz, June/04)
12	Objective of project	Development of a compact (container-type) decentralised biomass fuelled SOFC CHP plant
13	Domain covered	Conversion of hydrogen from solid biomass
14	Rating of technology	Components validated in relevant environment (5)
15	List of participants	<ul style="list-style-type: none"> • TECHNICAL UNIVERSITY OF GRAZ, INST. OF THERMAL ENGINEERING (AT) • TECHNICAL UNIVERSITY OF MUNICH (DE)
16	Challenges addressed	Increased usage of biomass in our future energy system by using solid oxide fuel cell systems.
17	Changes addressed	The project proposes the use of biomass in the energy market (including mainly technological, infrastructural, ecological and economic changes).

2.2.6 BIOHPR – Decentralised CHP with the biomass heat pipe reformer

1	Acronym and full name of the project	BIOHPR Decentralised CHP (combined heat and power systems) with the biomass heat pipe reformer
2	Contract number	ENK5-CT-2000-00311
3	Start date	1.1.2001
4	End date	31.3.2004
5	Actual phase of project	Completed
6	Co-ordinating Institution	TECHNICAL UNIVERSITY OF MUNICH (DE)
7	Contact	KAECK, Friedrich
8	Type	EU RTD frame work program (5 th FP)
9	Focus	Europe
10	Funding	EU: 1.96 million € Project Cost: 2.76 million €
11	Information available (publications, internet, reports, other)	EU, « European Fuel Cell and Hydrogen Projects 1999–2002 », Brüssel/03; http://europa.eu.int/comm/research/rtdinfo_en.html (July/03); http://www.hyweb.de/pro (July/03); http://www.cordis.lu/en/home.html (July/03)
12	Objective of project	<p>The project is aimed at the developing, constructing and testing of two 200 kW prototypes of heat pipe reformers. The work will mainly focus on the solution of the main technical challenge for indirectly heated gasifiers and the realisation of extremely high heat fluxes into a small sized gasification reactor. The application of heat pipes for this purpose will be tested and demonstrated. Both prototypes will be tested with wood pellets, straw pellets and pellets produced from cotton stalk residues. Long-term experiments (72 hours) are planned to test the long-term stability of the heat pipes and to identify technical problems. Another important aim is to reduce the cost for heat-pipe manufacturing. The requirements of small scale gas turbines and fuel cells will be considered. A main emphasis will be put on the dissemination of the heat pipe reformer(HPR).</p> <p>The project includes the basic engineering for a first demonstration plant located in the cotton producing area in Greece where a potential for 500 Bio HPR plants exists even within a very small region. This</p>

		area is the main cotton producing area in the EU. The available biomass feedstock would suffice for a power plant with a thermal input of 100 MW.
13	Domain covered	Conversion of hydrogen from solid biomass
14	Rating of technology	Components validated in relevant environment (5)
15	List of participants	<ul style="list-style-type: none"> • POLYTECHNIK LUFT- UND FEUERUNGSTECHNIK GMBH (AT) • TECHNICAL UNIVERSITY OF MUNICH (DE) • UNIVERSITAET STUTTGART (DE) • NATIONAL TECHNICAL UNIVERSITY OF ATHENS (GR) • DEUTSCHE MONTAN TECHNOLOGIE GMBH (DE) • SAAR ENERGIE GMBH (DE) • BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS (HU) • OSKAR VON MILLER – CONCEPTION, RESEARCH AND DESIGN INSTITUTE FOR THERMAL POWER EQUIPMENT (RO) • HYPERION SYSTEMS ENGINEERING LTD (CY)
16	Challenges addressed	Increased usage of solid biomass in our future energy system by using heat pipe fuel cell and gas turbine technologies.
17	Changes addressed	The project proposes the use of biomass in the energy market including the usage of heat pipe, fuel cell and gas turbine technologies (including mainly technological, infrastructural, ecological and economic changes).

2.2.7 CASCADE MINTS – Case Study comparisons and development of energy models for integrated technology systems

1	Acronym and full name of the project	CASCADE MINTS Case study comparisons and development of energy models for integrated technology systems
2	Contract number	SSP6-CT-2003-502445
3	Start date	1.1.2004
4	End date	31.12.2006
5	Actual phase of project	Ongoing
6	Co-ordinating Institution	UNIVERSITY OF ATHENS (GR)
7	Contact	RIAHI, Keywan
8	Type	RTD
9	Focus	International
10	Funding	EU
11	Information available (publications, internet, reports, other)	personal contact (IIASA/February/04)
12	Objective of project	CASCADE MINTS is a project involving the development and use of energy and energy/economy models with special emphasis on analyzing technological developments. It involves extensive development and use of detailed energy models that have received assistance from previous framework programs of DG Research. The ultimate aim of this part of the project is to enable perspective analysis of the conditions under which a transition to an energy system dominated by hydrogen is possible.
13	Domain covered	Accompanying measure
14	Rating of technology	not applicable
15	List of participants	<ul style="list-style-type: none"> • INTERNATIONAL INSTITUTE FOR APPLIED SYSTEMS ANALYSIS – IIASA (AT) • ENERGY RESEARCH CENTRE OF NETHERLANDS (NL) • CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE – LEPII/EPE (FR) • INSTITUTE FOR PROSPECTIVE TECHNOLOGICAL STUDIES – JOINT RESEARCH CENTRE (ES) • PAUL SCHERRER INSTITUT (CH) • ZENTRUM FUR EUROPAISCHE WIRTSCHAFTSFORSCHUNG (DE)

		<ul style="list-style-type: none">• DEUTSCHES ZENTRUM FUER LUFT-UND RAUMFAHT (GERMAN AEROSPACE CENTER) (DE)• UNIVERSITAET STUTTGART -INSTITUTE OF ENERGY ECONOMICS AND THE RATIONAL USE OF ENERGY (DE)• CENTRALE RECHERCHE SA – ECOLE CENTRALE PARIS, LAB. ERASME (FR)
16	Challenges addressed	The role of energy and hydrogen in a future energy system by modelling analysis.
17	Changes addressed	All kind of changes will be tried to be involved in these modelling efforts.

2.2.8 CLEAN ENERGY FROM BIOMASS – Biomass gasification and fuel cell coupling via high temperature gas clean-up for decentralised electricity generation with improved efficiency

1	Acronym and full name of the project	CLEAN ENERGY FROM BIOMASS Biomass gasification and fuel cell coupling via high temperature gas clean-up for decentralised electricity generation with improved efficiency
2	Contract number	ENK5-CT-2000-00314
3	Start date	1.3.2001
4	End date	29.2.2004
5	Actual phase of project	Completed
6	Co-ordinating Institution	UNIVERSITA DEGLI STUDI-L'AQUILA (IT)
7	Contact	GERMANA, Antonio
8	Type	EU RTD frame work program (5 th FP)
9	Focus	Europe
10	Funding	EU: 1.56 million € Project Cost: 2.6 million €
11	Information available (publications, internet, reports, other)	EC, « European Fuel Cell and Hydrogen Projects 1999–2002 », Brüssel/03; http://europa.eu.int/comm/research/rtdinfo_en.html (July/03); http://www.hyweb.de/pro (July/03); http://www.cordis.lu/en/home.html (July/03)
12	Objective of project	The project is aimed at studying, developing and testing the integration of biomass gasification and molten carbonate fuel cell for distributed power generation. The research activities include the assembly and operation of a pilot plant (made of an internally-circulating, catalytic fluidised-bed gasifier, a novel hot gas clean-up system and a 125 kW _{el} MCFC) and an ancillary work program in key areas, which includes cold modelling of the gasifier, detailed simulation of the overall system and catalyst upgrading. The program is addressed at fully assess the technical feasibility of economically viable units for wide scale industrial applications.
13	Domain covered	Conversion of hydrogen from solid biomass
14	Rating of technology	System prototype demonstrated in relevant environment (gasifier and gas cleaner) (6);

		Components validated in lab (fuel cells) (4)
15	List of participants	<ul style="list-style-type: none"> • TECHNICAL UNIVERSITY OF VIENNA (TUV), INSTITUTE OF CHEMICAL ENGINEERING (AT) • UNIVERSITY OF L'AQUILA, CHEMICAL ENGINEERING (IT) • UNIVERSITY COLLEGE LONDON(UCL), CHEMICAL ENGINEERING DEPARTMENT (UK) • UNIVERSITY OF STRASBOURG, ECOLE DE CHIMIE, POLYMERES ET MATERIAUX (ECPMS) (FR) • ANSALDO FUEL CELL (AFCO) (IT) • SCHUMACHER UMWELT-UND TRENNTECHNIK GMBH (SUT) (DE) • ITALIAN NATIONAL AGENCY FOR NEW TECHNOLOGY, ENERGY AND THE ENVIRONMENT (ENEA) (IT)
16	Challenges addressed	Increased usage of biomass in our future energy system (techno-economic challenges are addressed based on ecological frame conditions).
17	Changes addressed	The project investigates the increased usage of biomass in the energy market and identify all kinds of necessary changes.

2.2.9 CRYOPLANE – Liquid hydrogen fuelled aircraft-system analysis

1	Acronym and full name of the project	CRYOPLANE Liquid hydrogen fuelled aircraft-system analysis
2	Contract number	G4RD-CT-2000-00192
3	Start date	1.4.2000
4	End date	31.3.2002
5	Actual phase of project	Completed
6	Co-ordinating Institution	DAIMLER CHRYSLER AEROSPACE AIRBUS GMBH (DE)
7	Contact	SZODRUCH, Joachim
8	Type	EU RTD frame work program (5 th FP)
9	Focus	Europe
10	Funding	EU: 2.82 million € Project Cost: 4.47 million €
11	Information available (publications, internet, reports, other)	http://www.cordis.lu/en/home.html (July/03); http://www.hyweb.de/pro (July/03)
12	Objective of project	<p>The objectives of the project included the following aspects:</p> <ul style="list-style-type: none"> • Practical solutions (configurations) for all categories of commercial aircraft • Architecture and quantitative analysis of new systems, including computer mode for fuel system simulation and weight estimate • Engine concepts with emphasis on minimising NO_x • Definition of airport infrastructure to fuel production and distribution • Analysis of safety and environmental compatibility • Transition scenarios, global and regional <p>The project provided a comprehensive analysis of complex and interrelated aspects. It produced technical concepts, solutions and tools. It indicated possible introduction strategies for Europe.</p>
13	Domain covered	Using liquid hydrogen for aeroplanes (end use)
14	Rating of technology	Components validated in lab (4)

15	List of participants	<ul style="list-style-type: none"> • MI DEVELOPMENTS AUSTRIAN SPACE TECHNOLOGY (AT) • DAIMLER CHRYSLER AEROSPACE AIRBUS GMBH (DE) • CENTRO ITALIANO RICERCHE AEROSPAZIALI SCPA (IT) • FRAUNHOFER-GESELLSCHAFT ZUR FÖRDERUNGDER ANGEWANDTEN FORSCHUNG E.V. (DE) • TECHNISCHE UNIVERSITAET BERLIN (DE) • ARISTOTLE UNIVERSITY OF THESSALONIKI (GR) • EADS – CONSTRUCCIONES AERONAUTICAS S.A. (ES) • CRANFIELD UNIVERSITY (UK) • TECHNISCHE UNIVERSITEIT DELFT (NL) • GERMAN AEROSPACE CENTRE (DE) • UNIVERSITY OF OSLO (NO) • AIR LIQUIDE SA (FR) • LINDE AG (DE) • COMMISSION OF THE EUROPEAN COMMUNITIES (IT) • UNIVERSIDAD POLITÉCNICA DE MADRID (ES) • BODENSEWERK GERÄTETECHNIK GMBH (DE) • ALENIA AEROSPAZIO – UN'AZIENDA FINMECCANICA SPA (IT) • THOMSON- CSF SEXTANT (FR) • BAE SYSTEMS (OPERATIONS) LTD (UK) • TECHNISCHE UNIVERSITAET MUNCHEN (DE) • TECHNISCHE UNIVERSITAT HAMBURG-HARBURG (DE) • SHELL HYDROGEN B.V. (NL) • AEROSPATIALE MATRA AIRBUS (FR) • SNECMA MOTEURS (FR) • SECONDO MONA SPA (IT) • GRIMM AEROSOL TECHNIK GMBH & CO. KG (DE) • FFA – THE AERONAUTICAL RESEARCH INSTITUTE OF SWEDEN (SE) • FACHHOCHSCHULE AACHEN (DE) • ADVANCED PRODUCTS N.V. (BE) • HYDROGEN TECHNOLOGY AND TEST CENTER (DE) • DORNIER LUFTFAHRT GMBH (DE) • BUNDESANSTALT FUR MATERIALFORSCHUNG UND MATERIALPRÜFUNG (DE) • MTU MOTOREN- UND TURBINEN-UNION MÜNCHEN
----	----------------------	---

		GMBH (DE)
16	Challenges addressed	Introduction of hydrogen in air planes (identification of all kind of changes).
17	Changes addressed	The project investigates hydrogen as fuel for airlines (including the identification of all kind of necessary changes).

2.2.10 DIRECT – Diesel reforming by catalytic technologies

1	Acronym and full name of the project	DIRECT Diesel reforming by catalytic technologies
2	Contract number	ENK6-CT-2002-00644
3	Start date	1.12.2002
4	End date	30.11.2005
5	Actual phase of project	Ongoing
6	Co-ordinating Institution	ALPPS FUEL CELL SYSTEMS GMBH (AT)
7	Contact	CLAASSEN, Dirk Peter
8	Type	EU RTD frame work program (5 th FP)
9	Focus	Europe
10	Funding	EU: 1.8 million € Project Cost: 3.6 million €
11	Information available (publications, internet, reports, other)	EC, « European Fuel Cell and Hydrogen Projects 1999–2002 », Brüssel/03; http://europa.eu.int/comm/research/rtdinfo_en.html (July/03); http://www.cordis.lu/en/home.html (July/03); http://www.hyweb.de/pro (July/03)
12	Objective of project	The “DIRECT” consortium develops a diesel fuel operated SOFC with high efficiency and reliability as well as sulphur tolerance. It will be packaged for the use as auxiliary power unit for vehicles and deliver five kW _e . Attention will be paid to the best possible use of the waste energy for other applications in the vehicle or for improving the efficiency of the system. Beside diesel the system will be able to use alternative fuels like bio diesel and synfuel.
13	Domain covered	Using fuel cell technology as an auxiliary power unit for vehicles (end use)
14	Rating of technology	Technology concept and application (2)
15	List of participants	<ul style="list-style-type: none"> • CONVERTER TECHNOLOGY DEVELOPMENT- AND PRODUKTION GMBH (AT) • AUSTRIAN RESEARCH CENTERS – ARSENAL RESEARCH GMBH (AT) • ALPPS FUEL CELL SYSTEMS GMBH (AT) • CENTRO RICERCHЕ FIAT S.C.P.A. (IT)

		<ul style="list-style-type: none">• PROTOTECH AS (NO)• MIRA LTD (UK)• LEYLAND PRODUCT DEVELOPMENTS LTD (UK)• SUED-CHEMIE AG (DE)
16	Challenges addressed	The project addresses the replacement of conventional auxiliary power units by fuel cell technology (including mainly techno-economic challenges).
17	Changes addressed	The project mainly proposes techno-economic changes. bio diesel and synfuel are also principally investigated as energy source (including mainly economic changes).

2.2.11 EFFECTIVE – Holistic integration of MCFC technology towards a most effective systems compound using biogas as a renewable source of energy

1	Acronym and full name of the project	EFFECTIVE Holistic integration of MCFC technology towards a most effective systems compound using biogas as a renewable source of energy.
2	Contract number	ENK5-CT-1999-00007
3	Start date	1.7.2000
4	End date	30.6.2004
5	Actual phase of project	Completed
6	Co-ordinating Institution	PROFACTOR PRODUKTIONSFORSCHUNGS GMBH (AT)
7	Contact	TROGISCH, Steven
8	Type	EU RTD frame work program (5 th FP)
9	Focus	Europe
10	Funding	EU: 2 million € Project Cost: 3.55 million €
11	Information available (publications, internet, reports, other)	EC, « European Fuel Cell and Hydrogen Projects 1999–2002 », Brüssel/03; http://europa.eu.int/comm/research/rtdinfo_en.html (July/03); http://www.cordis.lu/en/home.html (July/03); http://www.hyweb.de/pro (July/03)
12	Objective of project	The aim of the project is to use biogas as a fuel for molten carbonate fuel cells (MCFC). A pre-processing unit will have to guarantee the gas standards for the MCFC. An experimental prototype has been installed in Austria.
13	Domain covered	Molten carbonate fuel cell technology based on biogas (conversion, end use)
14	Rating of technology	Components validated in lab (4); Partly in relevant environment (5)
15	List of participants	<ul style="list-style-type: none"> • PROFACTOR PRODUKTIONSFORSCHUNGS GMBH (AT) • STUDIA-SCHLIERBACH STUDIENGRUPPE FUER INTERNATIONALE ANALYSEN (AT) • LINZ AG (AT)

		<ul style="list-style-type: none"> • CENTRO DE INVESTIGACIONES ENERGETICAS, MEDIAMBIENTALES Y TECNOLOGICAS (ES) • MTU MOTOREN- UND TURBINEN-UNION MÜNCHEN GMBH (DE) • SLOVENSKÁ POL'NOHOSPODÁRSKA UNIVERSITA V NITRE (SI) • URBASER S.A. (ES) • SEABORNE ENVIRONMENTAL RESEARCH LABORATORY GESELLSCHAFT FUER UMWELTTECHNIK MBH (DE) • CAND AGRO MOGENS HEDEGAARD (DK)
16	Challenges addressed	Development of biogas fuelled driven fuel cells (including techno-economic challenges are addressed based on ecological frame conditions).
17	Changes addressed	The increased usage of biogas via fuel cells is addressed for stationary applications (including technological, infrastructural, ecological, economic geographic changes).

2.2.12 ELEDRIIVE – Thematic network on fuel cells and their applications for electric & hybrid vehicles

1	Acronym and full name of the project	ELEDRIIVE Thematic network on fuel cells and their applications for electric & hybrid vehicles.
2	Contract number	ENK6-CT-2000-20057
3	Start date	1.12.2000
4	End date	30.11.2003
5	Actual phase of project	Completed
6	Co-ordinating Institution	ASSOCIATION EUROPEENNE DES VEHICULES ELECTRIQUES ROUTIERS (BE)
7	Contact	MAGGETTO, Gaston
8	Type	EU RTD frame work program (5 th FP)
9	Focus	EU
10	Funding	EU: 699.534 € Project Cost: 721.326 €
11	Information available (publications, internet, reports, other)	EC, « European Fuel Cell and Hydrogen Projects 1999–2002 », Brüssel/03; http://europa.eu.int/comm/research/rtdinfo_en.html (July/03); http://www.hyweb.de/pro (July/03); http://www.cordis.lu/en/home.html (July/03); http://www.eledrive.org (July/03)
12	Objective of project	Eledrive is a thematic network devoted to exchange information on fuel cell, electric and hybrid vehicles. It will bring together representatives of the car, components and infrastructure, motor and fuel development industry, key research organisations, national and International representatives and market and user representatives. This high level expert platform will co-ordinate actions and exchange of information to create synergies at European level in order to accelerate the development and the introduction on the market.
13	Domain covered	Accompanying measure for electric and hybrid vehicles
14	Rating of technology	Not applicable
15	List of participants	<ul style="list-style-type: none"> • INTEMA CONSULT MARKETING DIENSTLEISTUNGS GMBH (AT)

		<ul style="list-style-type: none"> • ASSOCIATION EUROPEENNE DES VEHICULES ELECTRIQUES ROUTIERS (BE) • UNIVERSITY OF SHEFFIELD (UK) • NETHERLANDS ORGANISATION FOR APPLIED SCIENTIFIC RESEARCH – TNO (NL) • CITELEC (BE) • ENERGY RESEARCH CENTRE OF THE NETHERLANDS (NL) • ITALIAN AGENCY FOR NEW TECHNOLOGY, ENERGY AND THE ENVIRONMENT (IT) • AEA TECHNOLOGY PLC. (UK) • PEUGEOT CITROËN AUTOMOBILES S.A. (FR) • NETHERLANDS AGENCY FOR ENERGY AND ENVIRONMENT (NL) • INSTITUT FRANCAIS DU PETROLE (FR) • ASSOCIATION SUISSE DES VEHICULES ELECTRIQUES ROUTIERS (CH) • COMITATO ELETTROTECHNICO ITALIANO (IT) • AVERE FRANCE (FR) • APVE – ASSOCIACAO PORTUGUESA DO VEICULO ELETRICO (PT) • REGIENOV – RENAULT RECHERCHE ET INNOVATION (FR) • SAFT S.A. (FR) • FORSCHUNGSGESELLSCHAFT KRAFTFAHRWESEN MBH AACHEN (DE) • UNIVERSITAET KAISERSLAUTERN (DE) • ZETEK POWER PLC (UK) • WORLD FUEL CELL COUNCIL E.V. (DE) • ALSTOM TRANSPORT S.A. (FR) • NORSTART (NO) • HELLENIC INSTITUTE OF ELECTRIC VEHICLES (GR) • ELECTRABEL S.A. (BE) • UNIVERSITY OF APPLIED SCIENCES OF WESTERN SWITZERLAND (CH) • AGENCE DE L'ENVIRONNEMENT ET DE LA MAITRISE DE L'ENERGIE (FR) • BIRKA SUPPORT AB (SE) • SITCHTING EUROPEAN NATURAL GAS VEHICLE ASSOCIATION (NL) • AB VOLVO TECHNOLOGICAL DEVELOPMENT CORPORATION (SE)
--	--	---

		<ul style="list-style-type: none"> • AACHEN UNIVERSITY OF TECHNOLOGY (DE) • CEST PROGRAMMES LTD. (UK) • UNIVERSITY OF ROME "LA SAPIENZA" (IT) • CENTRO RICERCHE FIAT S.C.P.A. (IT) • VRIJE UNIVERSITEIT BRUSSEL (BE)
16	Challenges addressed	Socio-economic analyses with the goal to investigate the market uptake of fuel cell, electric and hybrid vehicles.
17	Changes addressed	The project identifies non technological barriers (mainly infrastructural, political and institutional changes).

2.2.13 EUHYFISE – European hydrogen filling station infrastructure for fuel cell vehicles based on renewable energies

1	Acronym and full name of the project	EUHYFIS European hydrogen filling station infrastructure for fuel cell vehicles based on renewable energies
2	Contract number	JOE3987043 (NNE-JOULE-C)
3	Start date	1.1.1999
4	End date	31.3.2000
5	Actual phase of project	Completed
6	Co-ordinating Institution	PLANET – PLANUNGSGRUPPE ENERGIE UND TECHNIK NOTTEBAUM & PARTNER GBR. (DE)
7	Contact	STEINBERGER-WILCKENS, Robert
8	Type	EU RTD frame work program (4 th FP)
9	Focus	Europe
10	Funding	Budget: Proprietary
11	Information available (publications, internet, reports, other)	http://www.hyweb.de/pro (July/03); http://www.cordis.lu/en/home.html (July/03); http://www.euhyfis.com/ (September/03)
12	Objective of project	The aim of the project was to develop a filling station ready to supply fuel cell vehicles with hydrogen from renewable energy sources, namely wind and hydro power. The system consisted of an integrated chain from renewable hydrogen production to compressor storage and fuelling unit.
13	Domain covered	Storage and distribution
14	Rating of technology	Components validated in lab (4)
15	List of participants	<ul style="list-style-type: none"> • EFKON ENGINEERING GMBH (AT) • PLANET – PLANUNGSGRUPPE ENERGIE UND TECHNIK NOTTEBAUM & PARTNER GBR. (DE) • FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V. (DE) • BAUER KOMMPRESSOREN GMBH (DE) • INGENIEURSBURO INNOGAS BV (NL) • CASALE CHEMICALS S.A. (CH) • ARGO INGENIEURGEMEINSCHAFT GMBH (DE) • L-B-SYSTEMTECHNIK GMBH (DE)

		<ul style="list-style-type: none">• THE UNIVERSITY OF MILANO (IT)
16	Challenges addressed	The main research tasks were system design and layout, identifying and meeting safety requirements, improving hydrogen compressor technology in order to reduce costs, and especially adapting the electrolyser to strongly fluctuating power inputs, e.g. wind energy.
17	Changes addressed	The project proposed mainly technological changes, although the work is accompanied by ecological and efficiency evaluations.

2.2.14 FCTESTNET – The fuel cell testing and standardisation network

1	Acronym and full name of the project	FCTESTNET The fuel cell testing and standardisation network
2	Contract number	ENK5-CT-2002-20657
3	Start date	1.1.2003
4	End date	31.12.2005
5	Actual phase of project	Ongoing
6	Co-ordinating Institution	EC JOINT RESEARCH CENTRE INSTITUTE FOR ENERGY (NL)
7	Contact	LEMAITRE, Patrice
8	Type	EU RTD frame work program (5 th FP)
9	Focus	Europe
10	Funding	EU: 2.07 million € Project Cost: 2.21 million €
11	Information available (publications, internet, reports, other)	EC, « European Fuel Cell and Hydrogen Projects 1999–2002 », Brüssel/03; http://europa.eu.int/comm/research/rtdinfo_en.html (July/03); http://www.cordis.lu/en/home.html (July/03); http://www.hyweb.de/pro (July/03)
12	Objective of project	The objective of the current proposal is to create a network of national and industry research organisations involved in development and testing of fuel cells, fuel cell systems and fuel cell applications. This network will produce proposals for harmonisation of test procedures at the level of fuel cell systems down to stacks and cells. For its accomplishment FCTESTNET will concentrate on two main areas the definition of assessment parameters for objective validation and comparison of fuel cell systems, stacks and cells; the evaluation of the limitations of the existing test procedures and the harmonisation of the measurement methodologies.
13	Domain covered	Accompanying measure for the developing and testing procedures of fuel cells
14	Rating of technology	Not applicable
15	List of participants	<ul style="list-style-type: none"> • AVL LIST GMBH (AT) • ECHEM CENTRE OF COMPETENCE IN APPLIED

		<p>ELECTROCHEMISTRY GMBH (AT)</p> <ul style="list-style-type: none"> • EC JOINT RESEARCH CENTRE INSTITUTE FOR ENERGY (NL) • NETHERLANDS ORGANISATION FOR APPLIED SCIENTIFIC RESEARCH – TNO (NL) • IMPERIAL COLLEGE OF SCIENCE, TECHNOLOGY AND MEDICINE (UK) • FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V. (DE) • CONSEJO SUPERIOR DE INVESTIGACIONES CIENTIFICAS (ES) • CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE (FR) • INSTITUTE OF MECHANICAL ENGINEERING AND INDUSTRIAL MANGEMENT (PT) • INSTITUTO SUPERIOR TECNICO (PT) • NATIONAL RESEARCH COUNCIL OF ITALY (IT) • GKSS – FORSCHUNGSZENTRUM GEESTHACHT GMBH (DE) • CATELLA GENERICS AB (SE) • ASSOCIATION POUR LA RECHERCHE ET LE DEVELOPPEMENT DES METHODES ET PROCESSUS INDUSTRIELS (FR) • GERMAN AEROSPACE CENTRE (DE) • ENERGY RESEARCH CENTRE OF THE NETHERLANDS (NL) • ROYAL INSTITUTE OF TECHNOLOGY (SE) • FEV MOTORENTECHNIK GMBH (DE) • DORNIER GMBH (DE) • UNIVERSITE DE TECHNOLOGIE DE BELFORT-MONTBELIARD (FR) • INSTITUT NATIONAL DE RECHERCHE SUR LES TRANSPORTS ET LEUR SÉCURITÉ (FR) • UNIVERSITE DE LIEGE Country: BELGIUM (BE) • CENTRE FOR RENEWABLE ENERGY SOURCES (GR) • DIGATRON INDUSTRIE-ELEKTRONIK GMBH (DE) • CENTRO DE INVESTIGACIONES ENERGETICAS, MEDIAMBIENTALES Y TECNOLOGICAS (ES) • AACHEN UNIVERSITY OF TECHNOLOGY (DE) • GERMANISCHER LLOYD AG (DE) • REINZ-DICHTUNGS GMBH (DE) • ECOLE NATIONALE SUPÉRIEURE DE CHIMIE DE PARIS (FR)
--	--	--

		<ul style="list-style-type: none"> • EUROPEAN ASSOCIATION OF AUTOMOTIVE SUPPLIERS (BE) • UNIVERSITAET KARLSRUHE (TECHNISCHE HOCHSCHULE) (DE) • SWISS FEDERAL INSTITUTE OF TECHNOLOGY (CH) • ITALIAN AGENCY FOR NEW TECHNOLOGY, ENERGY AND THE ENVIRONMENT (IT) • ENBW ENEGIE BADEN-WUERTTEMBERG AG (DE) • NEDSTACK FUEL CELL TECHNOLOGY BV (NL) • BALLARD POWER SYSTEMS AG (DE) • INNOVATION SUPPORT AND PARTNERS (NL) • ALPHEA (FR) • MTU FRIEDRICHSHAFEN GMBH (DE) • C.R.F. – SOCIETA CONSORTILE PER AZIONI (IT) • DELPHI AUTOMOTIVE SYSTEMS LUXEMBOURG SA (LU) • VDI – THE ASSOCIATION OF ENGINEERING (DE) • PAUL SCHERRER INSTITUT (CH) • LLOYD'S REGISTER OF SHIPPING (UK) • ANSALDO FUEL CELLS S.P.A. (IT) • UNIVERSITY OF APPLIED SCIENCES HAMBURG (DE) • TECHNICAL RESEARCH CENTRE OF FINLAND (FI) • ECOLE NATIONALE SUPÉRIEURE DES MINES DE PARIS (FR) • CESI – CENTRO ELETTRONICO SPERIMENTALE (IT) • FORSCHUNGSZENTRUM JUELICH GMBH (DE) • INSTITUTO NACIONAL DE TECNICA AEROESPACIAL ESTEBAN TERRADAS (ES) • KEMA NEDERLAND BV (NL) • CENTER FOR SOLAR ENERGY AND HYDROGEN RESEARCH BADEN-WÜRTEMBERG (DE) • COMMISSARIAT A L'ENERGIE ATOMIQUE (FR) • VITO – VLAAMSE INSTELLING VOOR TECHNOLOGISCH ONDERZOEK NV (BE) • UNIVERSITA DEGLI STUDI DI PERUGIA (IT)
16	Challenges addressed	Testing procedures and forthcoming standards.
17	Changes addressed	All kind of changes will be identified by this project.

2.2.15 Hydrogen-rich gas from biomass steam gasification

1	Acronym and full name of the project	No project acronym available Hydrogen-rich gas from biomass steam gasification
2	Contract number	JOR3970196 (NNE-JOULE-C)
3	Start date	1.3.1998
4	End date	30.11.2000
5	Actual phase of project	Completed
6	Co-ordinating Institution	TECHNICAL UNIVERSITY OF VIENNA (AT)
7	Contact	HOFBAUER, Hermann
8	Type	EU RTD frame work program (4 th FP)
9	Focus	Europe
10	Funding	Budget: Proprietary
11	Information available (publications, internet, reports, other)	http://www.hyweb.de/pro (July/03); http://www.cordis.lu/en/home.html (July/03)
12	Objective of project	This project was directed at the development of a fluidised bed gasification process for the production of a hydrogen rich gas from biomass. It was proposed to design and build a pilot scale unit that could integrate with a commercially available fuel cell power plant.
13	Domain covered	Extracting hydrogen rich gas from biomass and usage in PAFCs (conversion)
14	Rating of technology	Parts of the project based on an existing project: System prototype demonstrated in relevant environment (6); Some parts are new: Components validated in lab (4)
15	List of participants	<ul style="list-style-type: none"> • TECHNICAL UNIVERSITY OF VIENNA, INSTITUTE OF CHEMICAL ENGINEERING (AT) • AE ENERGIETECHNIK GMBH (AT) • UNIVERSITY COLLEGE LONDON (UK) • UNIVERSITÀ DEGLI STUDI - L'AQUILA (IT) • CLC SRL (IT) • ITALIAN AGENCY FOR NEW TECHNOLOGY, ENERGY AND THE ENVIRONMENT (IT) • UNIVERSITE LOUIS PASTEUR, STRASBOURG (FR)

16	Challenges addressed	Increased usage of biomass in future energy systems (PAFC for CHP based on biomass) (techno-economic challenges were addressed based on ecological frame conditions).
17	Changes addressed	The project investigated the increased usage of biomass and fuel cell technology in the energy market and identified all kinds of necessary changes.

2.2.16 HYMOSES – Hydrogen in mobile and stationary devices-safe and effective storage solution

1	Acronym and full name of the project	HYMOSES Hydrogen in mobile and stationary devices-safe and effective storage solution
2	Contract number	ENK6-CT-2002-00653
3	Start date	1.11.2002
4	End date	31.10.2005
5	Actual phase of project	Ongoing
6	Co-ordinating Institution	ELECTROVAC FABRIKATION ELEKTROTECH. SPEZIALARTIKEL GMBH (AT)
7	Contact	MAUTHNER, Klaus
8	Type	EU RTD frame work program (5 th FP)
9	Focus	EU
10	Funding	EU: 2.45 million € Project Cost: 4.27 million €
11	Information available (publications, internet, reports, other)	EC, « European Fuel Cell and Hydrogen Projects 1999–2002 », Brüssel/03; http://europa.eu.int/comm/research/rtdinfo_en.html (July/03); http://www.hyweb.de/pro (July/03); http://www.cordis.lu/en/home.html (July/03)
12	Objective of project	The objective of the “HYMOSES” consortium is to develop advanced hydrogen storage materials with the main focus on metal hydrides (MHs), nanostructured carbon materials and composite materials. The consortium is also involved in prototyping of vessels and tanks, fuel handling and production, conducting life cycle analysis of the techno-economic viability of the developed materials and to assess the future prospects of the hydrogen economy.
13	Domain covered	Storage systems for hydrogen (storage)
14	Rating of technology	Components validated in lab (4)
15	List of participants	<ul style="list-style-type: none"> • ELECTROVAC FABRIKATION ELEKTROTECHNISCHER SPEZIALARTIKEL GMBH (AT) • MECHATRONIC SYSTEMTECHNIK GMBH (AT) • PLANSEE AG (AT)

		<ul style="list-style-type: none">• UNIVERSITE DE POITIERS (FR)• UNIVERSITAET STUTTGART (DE)• DAIMLERCHRYSLER AG (DE)• ROYAL INSTITUTE OF TECHNOLOGY (SE)• SOCIETA ITALIANA ACETILENE E DERIVATI SPA (IT)• CONSEJO SUPERIOR DE INVESTIGACIONES CIENTIFICAS (ES)• CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE (FR)
16	Challenges addressed	Advanced hydrogen storage systems will be investigated (including mainly techno-economic challenges).
17	Changes addressed	The project identifies mainly technological and economic changes for safe and effective hydrogen storage systems.

2.2.17 HYSOCIETY – The European hydrogen (based) society

1	Acronym and full name of the project	HYSOCIETY The European hydrogen (based) society
2	Contract number	NNE5-2001-00641
3	Start date	1.2.2003
4	End date	31.1.2005
5	Actual phase of project	Ongoing
6	Co-ordinating Institution	INSTITUTO SUPERIOR TECNICO (PT)
7	Contact	DA GRACA CARVALHO, Maria
8	Type	EU RTD frame work program (5 th FP)
9	Focus	Europe
10	Funding	EU: 1.62 million € Project Cost: 2.11 million €
11	Information available (publications, internet, reports, other)	EC, « European Fuel Cell and Hydrogen Projects 1999–2002 », Brüssel/03; http://europa.eu.int/comm/research/rtdinfo_en.html (July/03); http://www.hysociety.net (July/03)
12	Objective of project	The objective of “HYSOCIETY” project is to prepare an action plan to overcome potential barriers and to quantify the technological, social, economic and environmental impacts for a European hydrogen society.
13	Domain covered	Accompanying measure
14	Rating of technology	Not applicable
15	List of participants	<ul style="list-style-type: none"> • E.V.A., THE AUSTRIAN ENERGY AGENCY (AT) • UNIVERSITE DE LIEGE (BE) • VLAAMSE INSTELLING VOOR TECHNOLOGISCH ONDERZOEK (BE) • EUROPEAN ELECTRIC VEHICLE ASSOCIATION (BE) • TECHNICAL RESEARCH CENTRE OF FINLAND (FI) • CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE (FR) • FRAUNHOFER INSTITUTE SYSTEMS AND INNOVATION RESEARCH (DE) • LB-SYSTEMTECHNIK (DE)

		<ul style="list-style-type: none"> • POWERTECH (DE) • NATIONAL TECHNICAL UNIVERSITY OF ATHENS (GR) • ICELANDIC NEW ENERGY (IS) • ENEA (IT) • ENERGIONDERZOEK CENTRUK NEDERLAND (NL) • ROGALAND RESEARCH (NO) • ENERGY RESEARCH SINTEF (NO) • INSTITUTO SUPERIOR TECNICO (PT) • SOLUCOES RACIONASDE ENERGIA (PT) • INSTITUTO NACIONAL DE TECNICA AEROSPACIAL (ES) • SYDKRAFT (SE) • IMPERIAL COLLEGE OF SCIENCE, TECHNOLOGY AND MEDECINE (UK)
16	Challenges addressed	Socio-economic analysis for the development of an action plan for hydrogen as energy carrier in most promising energy sectors
17	Changes addressed	The project proposes hydrogen as a future energy carrier. It identifies all mayor necessary changes.

2.2.18 HYSTORY – Hydrogen storage in hydrides for safe energy systems

1	Acronym and full name of the project	HYSTORY Hydrogen storage in hydrides for safe energy systems
2	Contract number	ENK6-CT-2002-00600
3	Start date	1.11.2002
4	End date	31.10.2005
5	Actual phase of project	Ongoing
6	Co-ordinating Institution	INSTITUTE FOR ENERGY TECHNOLOGY (NO)
7	Contact	SKJELTROP, Arne
8	Type	EU RTD frame work program (5 th FP)
9	Focus	Europe
10	Funding	EU: 2.37 million € Project Cost: 4.25 million €
11	Information available (publications, internet, reports, other)	http://milos.ipta.demokritos.gr/hystory/ (July/03); http://www.cordis.lu/en/home.html (July/03); EC, « European Fuel Cell and Hydrogen Projects 1999–2002 », Brüssel/03; http://europa.eu.int/comm/research/rtdinfo_en.html (July/03); personal contact (Treibacher Industrie AG/July/03)
12	Objective of project	The project focuses on three classes of metal hydrides with a view to improving and optimising their H ₂ storage properties for effective use in stationary energy systems. Zr-based, Ti-V-Ni multiphase compounds are used. In the first phase a laboratory prototype tank will be designed and in the second phase a full scale tank will be developed and tested. Activated magnesium hydrides are used. The design of a laboratory scale tank is foreseen. Complex metal hydrides (mixed ionic-covalent compounds are used). The design of a small scale tank will be realised.
13	Domain covered	Storage
14	Rating of technology	Components validated in lab (4)

15	List of participants	<ul style="list-style-type: none">• TREIBACHER INDUSTRIE AG (AT)• INSTITUTE FOR ENERGY TECHNOLOGY (NO)• CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE (FR)• NATIONAL CENTRE FOR SCIENTIFIC RESEARCH (GR)• DEPARTMENT OF STRUCTURAL CHEMISTRY (SE)• STATKRAFT SF (NO)• SCMM RENE AUMAS SA (FR)• ABB AB (SE)• KOCKUMS AB (SE)
16	Challenges addressed	The project investigates mainly hydrogen storage system materials (including techno-economic challenges).
17	Changes addressed	Mainly techno-economic changes are addressed.

2.2.19 HYWAYS – Development of a harmonised „European Hydrogen Energy Roadmap“

1	Acronym and full name of the project	HYWAYS Development of a harmonised "European Hydrogen Energy Roadmap"
2	Contract number	FP6-2002-ENERGY-1
3	Start date	Forthcoming
4	End date	3 years project
5	Actual phase of project	Contract preparation phase
6	Co-ordinating Institution	LB SYSTEMTECHNIK GMBH (DE)
7	Contact	BÜNGER, Ulrich
8	Type	EU RTD frame work program (6 th FP)
9	Focus	Europe
10	Funding	EU: 4,00 million € Project Cost: 10,965 million €
11	Information available (publications, internet, reports, other)	LBST info material (August/03)
12	Objective of project	HyWays is an integrated project to develop the European Hydrogen Energy Roadmap. It will be based on a comparative analysis of regional hydrogen supply options and energy scenarios, including renewable energies. An integrated toolbox of proven simulation models including E ² database, MARKAL, ISIS, GEM-E3 and COPERT III will investigate technical, socio-economic and emission challenges and impacts of realistic hydrogen supply paths under consideration of technological and economical needs.
13	Domain covered	Integrated Project
14	Rating of technology	Not applicable
15	List of participants	<ul style="list-style-type: none"> • E.V.A., THE AUSTRIAN ENERGY AGENCY (AT) • LB SYSTEMTECHNIK (DE), • AIR LIQUIDE (FR) • AIR PRODUCTS (UK) • BMW (DE) • BP (UK) • DAIMLER CHRYSLER-(DE)

		<ul style="list-style-type: none"> • DET NORSKE VERITAS (NE) • EDF (FR) • ENERGÍA HIDROELÉCTRICA DE NAVARRA S.A. (ES) • GENERAL ELECTRIC OIL&GAS NUOVO PIGNONE-(IT) • HEX-ION (NL) • INFRASERV-HÖCHST (DE) • LINDE (DE) • MESSER-GRIESHEIM (DE) • NORSK HYDRO (NE) • OPEL (DE) • REPSOL (ES) • STATKRAFT (NO) • TOTALFINAELF (FR) • VANDENBORRE TECHN. (BE) • VATTENFALL EUROPE (DE) • BETA-UNIVERSITY (FR) • FRENCH ATOMIC ENERGY COMMISSION – CEA (FR) • ENERGY CENTER NETHERLANDS – ECN (NL) • ENEA (IT) • FRAUNHOFER ISI (DE) • ICSTM (UK) • INSTITUTO DE ENGENHARIA MECANICA (PT) • ZENTRUM FÜR EUROPÄISCHE WIRTSCHAFTSFORSCHUNG – ZEW (DE) • INSTITUTO NACIONAL DE TECNICA AEROSPAICIAL (ES) • DEUTSCHE ENERGIEAGENTUR – DENA (DE) • CENTRE FOR RESEARCH AND TECHNOLOGY (GR) • ICELANDIC NEW ENERGY LTD. (IS) • NOVEM (NL) • VITO (BE) • VTT (FIN) • WESTERN NORWAY RESEARCH INSTITUTE (NO) • TURKISH SCIENTIFIC AND TECHNOLOGICAL COUNCIL – MAMAARA RESEARCH CENTER (TR)
16	Challenges addressed	Socio-economic analysis for the development of a roadmap of hydrogen as energy carrier in our future energy system.

17	Changes addressed	The project proposes hydrogen as a future energy carrier. It identifies all mayor necessary changes.
----	-------------------	--

2.2.20 NATURALHY – Preparation for the hydrogen economy by using the existing natural gas system as a catalyst

1	Acronym and full name of the project	NATURALHY Preparation for the hydrogen economy by using the existing natural gas system as a catalyst
2	Contract number	FP6-2002-ENERGY-1 (Prop.-Nr.: 502661)
3	Start date	Forthcoming
4	End date	Unknown
5	Actual phase of project	Contract preparation phase
6	Co-ordinating Institution	N.V. Nederlandse Gasunie (NL)
7	Contact	Unknown
8	Type	EU RTD frame work program (6 th FP)
9	Focus	Europe
10	Funding	EU: 11,0 million € Project Cost: 34.784 million € (requested)
11	Information available (publications, internet, reports, other)	Personal Information (GE Jenbacher/August/03)
12	Objective of project	The aims of NATURALHY are to test all the critical components of a full hydrogen system by adding hydrogen to natural gas in existing networks. This transitional approach will provide further experience with the transmission of mixtures of hydrogen and natural gas and, by means of innovative separation technologies, the hydrogen utilisation in end use applications, including transport.
13	Domain covered	Integrated Project
14	Rating of technology	System prototype demonstrated in relevant environment (6)
15	List of participants	<ul style="list-style-type: none"> • GE JENBACHER (AT) • N.V. NEDERLANDSE BV (NL) • HÖRSKOLAN I BORAS (SE) • BP GAS MARKETING LTD (UK) • CEA (FR) • CEMPAGNIE D'ETUDES DES TECHNOLOGIE DE L'HYROGENE (UK) • COMPUTATIONAL MECHANICS INTERNATIONAL (UK) • COGEN EUROPE (BE)

		<ul style="list-style-type: none"> • CENTRO SVILUPPO MATERIALI SPA (IT) • DBI GAS- UND UMWELTTECHNIK BMGH • PUBLIC GAS CORPORATION S.A. • DANISH GAS TECHNOLOGY CENTRE • ECN (NL) • ECO CERAMICS (NL) • SWISS FEDERAL LABORATORIES FOR MATERIALS TESTING AND RESEARCH (CH) • SWISS FEDERAL INSTITUTE OF TECHNOLOGY OF LAUSANNE (CH) • SWISS FEDERAL INSTITUTE OF TECHNOLOGY, MEASUREMENT AND CONTROL LABORATORY (CH) • EXERGIA (GR) • FC AND H2 RESEARCH @ TU BERLIN (DE) • FZ JÜLICH (DE) • GDF (FR) • PIL LTD. (UK) • NUOVO PIGNONE SPA (IT) • EUROPEAN GAS (BE) • HEXION BV (NL) • THE HALTH AND SAFETY EXECUTIVE (UK) • ISTANBUL GAZ DAGITIM SANAYI VE TICARET A.S. (TR) • INST. FRANCAIS DU PETROLE (FR) • INST. DE SOLDATADURA E QUALIDADE (PT) • INST. DE ENGENHARIA MECANICA (PT) • ITALGAS S.P.A. (IT) • UNVERSTIY OF LEEDS (UK) • LOUGHBOROUGH UNIVERSITY (UK) • LUNDS UNITERSITET (SE) • TUBITAK MARMARA RESEARCDH CENTER ENERGY SYSTEMS (TR) • NATURGAS MIDT-NORD (DK) • NETHERLANDS STANDARDIZATION INSTITUTE (NL) • NATIONAL TECHNICAL UNIVERSTIY OF ATHENS (GR) • NORWEGIAN UNI OF SCIENCE AND TECHNOLOGY (NO) • OIL AND GAS INSTITUTE (PL) • PANET (DE)
--	--	--

		<ul style="list-style-type: none"> • ECOLE D'INGENIEUR DE METZ (FR) • POZNAN UNI (PL) • SAVIKO CONSULTANTS APS (DK) • SHEFFIELD UNIVERSITY (SE) • SHEFFIELD HALLAM UNIVERSITY (SE) • SVENSKT GASTERKNISKT CENTER (SE) • SYDKRAFT GAS AG (SE) • SCHWEIZ. VEREIN DES GAS UND WASSERFACHES (CH) • SHELL HYDROGEN B.V. (NL) • STATOIL ASA (NO) • SQS PORTUGAL (PT) • TOTAL FINA ELF S.A. (FR) • NETHERLANDS ORGANISATION FOR APPLIED SCIENTIFIC RESEARCH (NL) • X/OPEN COMPANY LTD. (UK) • TRANSCO PLP (UK) • DELFT UNIVERSITY OF TECHNOLOGY (NL) • TURBEC AG (SE) • UNI OF WARWICK (UK) • SORGAS BRUIATORI S.R.L (IT) • ZENTRUM FÜR EUROPÄISCHE WIRTSCHAFTSFORSCHUNG (DE)
16	Challenges addressed	All kind of challenges and changes will be investigated in order to introduce increased hydrogen in NG networks and its end-usages.
17	Changes addressed	See above

2.2.21 NFCCPP – Numerical fuel cell component performance prediction tool

1	Acronym and full name of the project	NFCCPP Numerical fuel cell component performance prediction tool
2	Contract number	ENK5-CT-2002-00692
3	Start date	1.1.2003
4	End date	31.12.2005
5	Actual phase of project	Ongoing
6	Co-ordinating Institution	FEV MOTORENTECHNIK GMBH (DE)
7	Contact	LEPPERHOFF, Gerhard
8	Type	EU RTD frame work program (5 th FP)
9	Focus	Europe
10	Funding	EU: 2.18 million € Project Cost: 4.12 million €
11	Information available (publications, internet, reports, other)	EC, « European Fuel Cell and Hydrogen Projects 1999–2002 », Brüssel/03; http://europa.eu.int/comm/research/rtdinfo_en.html (July/03); http://www.cordis.lu/en/home.html (July/03); http://www.hyweb.de/pro (July/03)
12	Objective of project	The target of this project is to create a modular simulation model of a complete fuel cell system with simplified models of each component for different fuel cell applications. Based on this simplified model each partner is able to remove the simple module of each component, put a very detailed, self - developed module of his component into the simulation and achieve information about the component behaviour in the complete system.
13	Domain covered	Performance prediction tool for fuel cell components and systems
14	Rating of technology	System demonstrated in relevant environment (7)
15	List of participants	<ul style="list-style-type: none"> • AVL LIST GMBH (AT) • FEV MOTORENTECHNIK GMBH (DE) • ROYAL INSTITUTE OF TECHNOLOGY (SE) • AACHEN UNIVERSITY OF TECHNOLOGY (DE) • DENSO EUROPE B.V. (NL)

		<ul style="list-style-type: none"> • PIERBURG A.G. (DE) • FORSCHUNGSGESELLSCHAFT KRAFTFAHRWESEN MBH AACHEN (DE) • EUROPEAN ASSOCIATION OF AUTOMOTIVE SUPPLIERS Country: BELGIUM (BE) • ROBERT BOSCH GMBH (DE) • BEKAERT SA/NV (BE) • JOHNSON MATTHEY PLC (UK) • INTELLIGENT ENERGY LTD (UK) • LIEBHERR AEROSPACE LINDENBERG GMBH (DE) • MAGNETI MARELLI POWERTRAIN SPA (IT) • MIRA LTD (UK)
16	Challenges addressed	The development of a simulation model for fuel cell systems (including mainly technological challenges).
17	Changes addressed	Mainly technological changes will be identified by this project.

2.2.22 SOFCNET – Thematic network on solid oxide fuel cell technology

1	Acronym and full name of the project	SOFCNET Thematic network on solid oxide fuel cell technology
2	Contract number	ENG2-CT-2002-20652
3	Start date	1.1.2003
4	End date	31.12.2005
5	Actual phase of project	Ongoing
6	Co-ordinating Institution	ENERGY RESEARCH CENTRE OF THE NETHERLANDS (NL)
7	Contact	RIETVELD, Bert
8	Type	EU RTD frame work program (5 th FP)
9	Focus	EU
10	Funding	EU: 1.68 million € Project Cost: 2.35 million €
11	Information available (publications, internet, reports, other)	EC, « European Fuel Cell and Hydrogen Projects 1999–2002 », Brüssel/03; http://europa.eu.int/comm/research/rtdinfo_en.html (July/03); http://www.cordis.lu/en/home.html (July/03); http://www.hyweb.de/pro (July/03)
12	Objective of project	The objective of SOFCNET (a thematic network) is the support and acceleration of European industrial development by bringing together all types (from universities to end users) of SOFC involved organisations in Europe. The network promotes knowledge exchange, a better understanding of industrial needs and collaboration, particularly on critical issues for the commercialisation of SOFC – systems. Further the SOFCNET should result in a more efficient use of EU and national RTD resources and contribute to the realisation of a critical RTD mass for solving European energy related problems. The SOFCNET project should accelerate the introduction of efficient and environmentally clean conversion devices into the European energy supply.
13	Domain covered	Accompanying measures
14	Rating of technology	Not applicable
15	List of participants	<ul style="list-style-type: none"> • INTEMA CONSULT MARKETING DIENSTLEISTUNGS

		<p>GMBH (AT)</p> <ul style="list-style-type: none"> • EVA, THE AUSTRIAN ENERGY AGENCY (AT) • ENERGY RESEARCH CENTRE OF THE NETHERLANDS (NL) • UNIVERSITY OF ST ANDREWS (UK) • IMPERIAL COLLEGE OF SCIENCE, TECHNOLOGY AND MEDICINE (UK) • CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE (FR) • UNIVERSITY OF PATRAS (GR) • FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V.(DE) • UNIVERSITY OF TWENTE (NL) • CENTRO DE INVESTIGACIONES ENERGETICAS, MEDIAMBIENTALES Y TECNOLOGICAS (ES) • SWISS FEDERAL LABORATORIES FOR MATERIALS TESTING AND RESEARCH (CH) • ROLLS ROYCE PLC (UK) • SIEMENS AG (DE) • TRACTEBEL SA (BE) • SHELL HYDROGEN B.V (BE) • INSTITUTE OF CHEMICAL ENGINEERING AND HIGH TEMPERATURE PROCESSES – FOUNDATION OF RESEARCH AND TECHNOLOGY HELLAS (GR) • PROTOTECH AS (NO) • INSTITUT FRANCAIS DU PETROLE (FR) • GAZ DE FRANCE (FR) • TECHNICAL UNIVERSITY OF MUNICH (DE) • LANDESHAUPTSTADT DUESSELDORF (DE) • RWE PLUS AKTIENGESELLSCHAFT (DE) • SWISS FEDERAL INSTITUTE OF TECHNOLOGY (CH) • ITALIAN AGENCY FOR NEW TECHNOLOGY, ENERGY AND THE ENVIRONMENT (IT) • ENBW ENEGIE BADEN-WUERTTEMBERG AG (DE) • DELPHI AUTOMOTIVE SYSTEMS LUXEMBOURG SA (LU) • UNIVERSITY OF AVEIRO (PT) • WAERTSILAE CORPORATION OY (FI) • UNIVERSITY OF SHERBROOKE (CA) • UNIVERSITAET KARLSRUHE (TECHNISCHE HOCHSCHULE) (DE)
--	--	---

		<ul style="list-style-type: none"> • ADELAN LTD (UK) • BMW BAYERISCHE MOTOREN WERKE AG (DE) • VDI – THE ASSOCIATION OF ENGINEERING (DE) • COMMISSARIAT A L'ENERGIE ATOMIQUE (FR) • FORSCHUNGSZENTRUM JUELICH GMBH (DE) • SULZER MARKETS AND TECHNOLOGY AG, SULZER INNOTECH (CH) • VALEO CLIMATISATION SA (FR) • UNIVERSITY OF APPLIED SCIENCES HAMBURG (DE) • TECHNICAL RESEARCH CENTRE OF FINLAND (FI) • ALSTOM POWER UK LTD.(UK) • H.C. STARCK GMBH AND CO. KG (DE) • CENTRE DE RECHERCHES POUR L'ENVIRONNEMENT L'ENERGIE ET LE DÉCHET – GIE (FR) • RISOE NATIONAL LABORATORY (DK) • GERMAN AEROSPACE CENTRE (DE)
16	Challenges addressed	Socio-economic analysis for the acceleration of European SOFC industrial development.
17	Changes addressed	The project identifies all kind of changes for SOFC R&D.

2.2.23 Solid biomass gasification for fuel cells

1	Acronym and full name of the project	No project acronym available (program acronym NNE–JOULE-C) Solid biomass gasification for fuel cells
2	Contract number	JOR3960105
3	Start date	1.9.1996
4	End date	28.2.1999
5	Actual phase of project	Completed
6	Co-ordinating Institution	FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V. (DE)
7	Contact	HEINZEL, Angelika
8	Type	EU RTD frame work program (4 th FP)
9	Focus	Austria, Germany
10	Funding	Budget: Proprietary
11	Information available (publications, internet, reports, other)	http://www.cordis.lu/en/home.html (July/03); http://www.hyweb.de/pro (July/03); http://www.tugraz.at (July/03)
12	Objective of project	The objective of the project was to design an electricity generating plant based on solid biomass as a fuel, using a gasifier, a gas upgrading and purification system and a fuel cell. This complete conversion line was investigated in a study and some key components of the gas treatment system were experimentally verified.
13	Domain covered	Conversion and end use
14	Rating of technology	Components validated in lab (4)
15	List of participants	<ul style="list-style-type: none"> • UNIVERSITY OF TECHNOLOGY GRAZ, INSTITUT FÜR ELEKTRISCHE ANLAGEN UND HOCHSPANNUNGSTECHNIK (AT) • OESTERREICHISCHE ELEKTRIZITAETSWIRTSCHAFTS AG (AT) • FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V. (DE) • PREUSSAG NOELL GMBH (DE) • GERHARD – MERCATOR – UNIVERSITÄT GESAMTHOCHSCHULE DUISBURG (DE)
16	Challenges addressed	Increased usage of biomass in our future energy

		system. (Techno-economic challenges were addressed based on ecological frame conditions.)
17	Changes addressed	The project proposed the increased usage of biomass in the energy market including gas upgrading technologies and fuel cells. (Identification of all kind of changes.)

2.2.24 STORHY – Hydrogen storage system for automotive application

1	Acronym and full name of the project	STORHY Hydrogen storage system for automotive application
2	Contract number	FP6-2002-Energy-1
3	Start date	Forthcoming
4	End date	Unknown
5	Actual phase of project	Contract preparation phase
6	Co-ordinating Institution	MAGNA STEYR AG & CO KG (AT)
7	Contact	KRAINZ, Günter
8	Type	EU RTD project (6 th FP)
9	Focus	Europe
10	Funding	EU: 10 million € Project Cost: 17 million €
11	Information available (publications, internet, reports, other)	personal contact (Magna Steyr AG & CO KG/July/03)
12	Objective of project	The goal of the project is to introduce innovative and cost competitive solutions to the market as quickly as possible through research and development as well as demonstration activities, including production technologies. Furthermore, possible spin offs of the STORHY R&D results for stationary hydrogen storage will be examined. The research concentrate in short term to high pressure vessels and cryogen storage vessels and in medium to long term to novel solid storage materials.
13	Domain covered	Storage
14	Rating of technology	Components validated in lab (4)
15	List of participants	<ul style="list-style-type: none"> • MAGNA STEYR AG & CO KG (AT) • AUSTRIAN AEROSPACE GMBH (AT) • CONTRAVES SPACE (CH) • IVW (DE) • BMW (DE) • AIR LIQUIDE (FR) • ENERGIE TECHNOLOGIE (ET) (DE) • LINDE (DE) • MAN TECHNOLOGIES (DE)

		<ul style="list-style-type: none">• VOLVO (SW)
16	Challenges addressed	Advanced hydrogen storage systems will be investigated (including mainly techno- economic challenges).
17	Changes addressed	The project identifies mainly technological and economic changes for safe and effective hydrogen storage systems.

2.2.25 VIEWLS – Clear views on clean fuels

1	Acronym and full name of the project	VIEWLS Clear views on clean fuels
2	Contract number	NNES-2001-00619
3	Start date	2.2003
4	End date	1.2005
5	Actual phase of project	Ongoing
6	Co-ordinating Institution	NETHERLANDS AGENCY FOR ENERGY AND THE ENVIRONMENT (NOVEM) (NL)
7	Contact	GIGLER, Jörg
8	Type	EU RTD program
9	Focus	Europe
10	Funding	Budget: Proprietary Government
11	Information available (publications, internet, reports, other)	http://www.viewls.org (August/03); personal contact (Joanneum Research Forschungsgesellschaft mbH/August/03)
12	Objective of project	The aim of „VIEWLS“ is to ensure a broad and cost-efficient use of bio fuels in the future, with a top environment performance. (The program investigates also liquid hydrogen as a potential fuel of the future.)
13	Domain covered	End-use
14	Rating of technology	Not applicable
15	List of participants	<ul style="list-style-type: none"> • JOANNEUM RESEARCH FORSCHUNGSGESELLSCHAFT MBH (AT) • FEDERAL INSTITUTE OF AGRICULTURAL ENGINEERING (AT) • NETHERLANDS AGENCY FOR ENERGY AND THE ENVIRONMENT (NL) • ENERGY RESEARCH CENTRE OF THE NETHERLANDS (NL) • COPERNICUS INSTITUTE OF UNIVERSITY UTRECHT (NL) • CENTRO DE INVESTIGACIONES ENERGETICAS, MEDIOAMBIENTALES Y TECNOLOGICAS (ES) • UNIVERSITY OF BRITISH COLUMBIA (CA) • COWI-COWI AS (DK) • SWEDISH NATIONAL ENERGY ADMINISTRATION (SE)

		<ul style="list-style-type: none"> • INTERNATIONAL ENERGY AGENCY (US) • INSTITUTE FOR ENERGY AND ENVIRONMENT (DE) • GÖTEBORG UNIVERSITY (SE) • EC BALTIC RENEWABLE ENERGY CENTER (PL) • UNIVERSITY OF AGRONOMIC SCIENCES AND VETERINARY MEDICINE BUCHAREST (RO) • RESEARCH INSTITUTE OR ORNAMENTAL GARDENING (CS) • HUNGARIAN INSTITUTE OF AGRICULTURAL ENGINEERING (HU) • ENVIRONMENT AND ENERGY MANAGEMENT AGENCY (FR) • NATIONAL TECHNICAL UNIVERSITY OF ATHENS (GR) • TRANSPORT & MOBILITY LEUVEN (BE)
16	Challenges addressed	Socio-economic analysis of potential future fuels (also including hydrogen as potential fuel)
17	Changes addressed	Unknown

2.2.26 VLEEM – Very long term energy environment model

1	Acronym and full name of the project	VLEEM Very long term energy environment model
2	Contract number	ENG2-CT-2000-00441
3	Start date	1.2.2001
4	End date	31.7.2002
5	Actual phase of project	Completed
6	Co-ordinating Institution	ENERDATA SA (FR)
7	Contact	CHATEAU, Bertrand
8	Type	EU RTD frame work program
9	Focus	Europe
10	Funding	EU: 390.593 € Project Cost: 783.616 €
11	Information available (publications, internet, reports, other)	http://www.hyweb.de/pro (July/03); http://www.cordis.lu/en/home.html (July/03)
12	Objective of project	The objective was to develop a genuine "very long term energy-environment model" based on long term energy models principles (25-30 years ahead). The work program included system analysis and program analyses. The analyses concerned about the main energy demand and supply new technologies. The main target was to stabilise the CO ₂ concentration. To reach this target the usage of hydrogen played an important role.
13	Domain covered	Not applicable
14	Rating of technology	Not applicable
15	List of participants	<ul style="list-style-type: none"> • VERBUNDPLAN GMBH (AT) • ENERGY RESEARCH CENTRE OF THE NETHERLANDS (NL) • FORSCHUNGSZENTRUM JÜLICH GMBH (DE) • MAX- PLANCK- GESELLSCHAFTZUR FÖRDERUNG DER WISSENSCHAFT E.V. (DE) • ENERDATA SA (FR)
16	Challenges addressed	Socio-economic analysis for the introduction of hydrogen and renewable energies in our future energy system (including all kind of necessary

		challenges).
17	Changes addressed	The project proposes also hydrogen as a future energy carrier. It tries to identify all mayor necessary changes. Verbundplan GmbH announced investigations for hydrogen as fuel produced from Austrian hydro power plants (techno-economic, ecological, infrastructural changes were presented).

2.3 National/International public and private funded projects

The projects in this section represent:

- (i) national funded projects (based on Austrian RTD instruments),
- (ii) projects funded by International RTD programs (other than the EU RTD FP), and
- (iii) national/International projects funded by private raised capital.

2.3.1 Assessment of advanced technologies for alternative final energy carriers

1	Acronym and full name of the project	No acronym available Assessment of advanced technologies for alternative final energy carriers
2	Contract number	Unknown
3	Start date	1.7.2002
4	End date	30.6.2004
5	Actual phase of project	Completed
6	Co-ordinating Institution	INTERNATIONAL INSTITUTE FOR APPLIED SYSTEMS ANALYSIS – IIASA (AT)
7	Contact	SCHRATTENHOLZER, Leo
8	Type	RTD
9	Focus	International
10	Funding	Private
11	Information available (publications, internet, reports, other)	http://www.iiasa.ac.at/Publications/Documents/IR-03-039.pdf (February/04); personal contact (IIASA/February/04)
12	Objective of project	This study has examined the production of hydrogen, electricity and liquid fuels using a coal gasification process. This process could constitute a key building block of integrated energy systems, also known as “energyplexes”, based on the production of synthesis gas (syngas) and capable of having multiple products and use of several feed stocks.
13	Domain covered	Production
14	Rating of technology	Technology concept and application (2)

15	List of participants	<ul style="list-style-type: none">INTERNATIONAL INSTITUTE FOR APPLIED SYSTEMS ANALYSIS – IIASA (AT)
16	Challenges addressed	Mainly technical and economic challenges are addressed.
17	Changes addressed	Techno-economic changes are addressed.

2.3.2 Assessment of alternative hydrogen pathways: Natural gas and biomass

1	Acronym and full name of the project	No acronym available Assessment of alternative hydrogen pathways: Natural gas and biomass
2	Contract number	Not available
3	Start date	1.2002
4	End date	6.2002
5	Actual phase of project	Completed
6	Co-ordinating Institution	INTERNATIONAL INSTITUTE FOR APPLIED SYSTEMS ANALYSIS – IIASA (AT)
7	Contact	SCHRATTENHOLZER, Leo
8	Type	RTD
9	Focus	International
10	Funding	Private
11	Information available (publications, internet, reports, other)	http://www.iiasa.ac.at/Publications/Documents/IR-03-037.pdf (February/04); personal contact (IIASA/February/04)
12	Objective of project	As part of a collaborative study with Tokyo Electric Power Company (TEPCO) on examining future perspectives for fuel cells, a long-term hydrogen-based scenario of the global energy system has been developed. The scenario illustrates the key role of hydrogen in a long-term transition towards a clean and sustainable energy future. In an affluent, low-population-growth, equity and sustainability-oriented hydrogen world, hydrogen technologies experience substantial but plausible performance and costs improvements and are able to diffuse extensively. Corresponding production and distribution infrastructures emerge. The global hydrogen production system, initially fossil-based, progressively shifts towards renewable sources. Fuel cells and other hydrogen-using technologies play a major role in a substantial transformation towards a more flexible, less vulnerable, distributed energy system which meets energy needs in a cleaner, more efficient and cost-effective way. This profound structural transformation of the global energy system brings substantial improvements in energy intensity and an accelerated decarbonization of the energy mix, resulting in relatively low climate impacts.

13	Domain covered	Production
14	Rating of technology	Technology concept and application (2)
15	List of participants	<ul style="list-style-type: none">• INTERNATIONAL INSTITUTE FOR APPLIED SYSTEMS ANALYSIS – IIASA (AT)
16	Challenges addressed	Mainly technical and economic challenges are addressed.
17	Changes addressed	Techno-economic changes are addressed.

2.3.3 Biogas fuelled fuel cell CHP plants

1	Acronym and full name of the project	No acronym available Biogas fuelled fuel cell CHP plants
2	Contract number	Unknown
3	Start date	5.2003
4	End date	12.2004
5	Actual phase of project	Ongoing
6	Co-ordinating Institution	UNIVERSITY OF TECHNOLOGY GRAZ (AT)
7	Contact	HOHENWARTER, Ulrich
8	Type	R&D project
9	Focus	National
10	Funding	Budget: Proprietary
11	Information available (publications, internet, reports, other)	personal contact (University of Technology Graz/September/03)
12	Objective of project	Theoretical and practical R&D activities concerning the biogas usage in fuel cell systems.
13	Domain covered	End-use of fuel cells in stationary applications (with biogas as fuel)
14	Rating of technology	Technology concept and application (2)
15	List of participants	<ul style="list-style-type: none"> • UNIVERSITY OF TECHNOLOGY GRAZ, INSTITUTE OF THERMAL ENGINEERING (AT) • LAND STEIERMARK (ZUKUNFTSFONDS) (AT)
16	Challenges addressed	Mainly technical challenges are covered concerning component development and system integration.
17	Changes addressed	The addressed changes are in parallel to the investigated challenges.

2.3.4 BZI – Fuel Cell Information Initiative

1	Acronym and full name of the project	BZI Fuel Cell Information Initiative
2	Contract number	Proprietary
3	Start date	1998
4	End date	1999
5	Actual phase of project	Completed
6	Co-ordinating Institution	E.V.A., THE AUSTRIAN ENERGY AGENCY (AT)
7	Contact	Simader, Günter R.
8	Type	Know-how transfer project
9	Focus	National
10	Funding	Budget: Proprietary Government
11	Information available (publications, internet, reports, other)	http://www.eva.ac.at (July/03); Report: « Brennstoffzellen-Systeme : Energietechnik der Zukunft »; Workshop proceedings
12	Objective of project	The aim of the project is to disseminate state-of-the-art know how about the latest developments of fuel cell technologies (mobile, stationary applications) to specialists.
13	Domain covered	Accompanying measure
14	Rating of technology	Not applicable
15	List of participants	<ul style="list-style-type: none"> • E.V.A., THE AUSTRIAN ENERGY AGENCY (AT) • AFG, AUSTRIAN FERNGAS GMBH (AT) • UNIVERSITY OF TECHNOLOGY GRAZ (AT) • AVL LIST GMBH (AT) • BMVIT, FEDERAL MINISTRY FOR TRANSPORTATION, INNOVATION AND TECHNOLOGY (AT)
16	Challenges addressed	Techno-economic, environmental, infrastructural challenges were addressed.
17	Changes addressed	The identification of changes was a minor topic of this project.

2.3.5 BZ-VIT – Brennstoffzellen-Vernetzung/Internationalität/Transfer (Fuel cell-know-how transfer project)

1	Acronym and full name of the project	BZ-VIT Brennstoffzellen-Vernetzung/Internationalität/Transfer (Fuel cell-know-how transfer project)
2	Contract number	Unknown
3	Start date	10.2002
4	End date	31.12.2003
5	Actual phase of project	Completed
6	Co-ordinating Institution	CATT INNOVATION MANAGEMENT GMBH (AT)
7	Contact	REITER, Hartwig
8	Type	RTD (A3 Technology program of BMVIT)
9	Focus	National
10	Funding	Budget: Proprietary Government
11	Information available (publications, internet, reports, other)	http://www.fuel-cell-net.at (July/03); http://www.bmvit.gv.at (July/03)
12	Objective of project	The aim of the project is to enlarge the awareness towards fuel cells in the automobile market. A national network will be built up which supports fuel cells in the mobile area and will be used as a national and international contact tool.
13	Domain covered	Accompanying measure
14	Rating of technology	Not applicable
15	List of participants	<ul style="list-style-type: none"> • CENTRAL AUSTRIAN TRANSFER AND TRAINING (CATT) INNOVATION MANAGEMENT GMBH (AT) • DANUBE (AT) • AUTOMOBILCLUSTER TMG (AT) • CLIMT GMBH (AT)
16	Challenges addressed	Enlarging the awareness for fuel cells in the automobile market (including all kind of necessary challenges).
17	Changes addressed	The project identifies mainly institutional changes.

2.3.6 CDT-BZ – Direct hydrogen fuel cell module for vehicle drives and APU's (5kW)

1	Acronym and full name of the project	CDT-BZ Direct hydrogen fuel cell module for vehicle drives and APU's (5kW)
2	Contract number	FFF PROJ. NR. 806235
3	Start date	6.2003
4	End date	6.2004
5	Actual phase of project	Completed
6	Co-ordinating Institution	BITTER GMBH & CO (AT)
7	Contact	SCHENNER, Andreas
8	Type	RTD (A3 Technology program of BMVIT)
9	Focus	National
10	Funding	Budget: Proprietary Government
11	Information available (publications, internet, reports, other)	http://www.bitter.at (July/03); http://www.bmvit.gv.at/sixcms/detail.php/template/i_e1/3/_e2/2/_e3/1000/_relid/776/_relid2/780/ (July/03); personal contact (Fronius International GmbH/July/03)
12	Objective of project	The project aims are the development and test of a 5 kW prototype PEM–fuel cell module for mobile applications. The system will be grouped as cascable module for vehicle-suited applications (APU and vehicle primary drive) which is fed by compressed hydrogen fuel. Overall, the partnership intends to create the premise for a series production of a PEM fuel cell system for early markets in the mobile sector.
13	Domain covered	End use
14	Rating of technology	System prototype demonstrated in relevant environment (6)
15	List of participants	<ul style="list-style-type: none"> • BITTER GMBH & CO (AT) • FRONIUS INTERNATIONAL GMBH (AT) • OBEROESTERREICHISCHE TECHNOLOGIE- UND MARKETINGGESELLSCHAFT M.B.H. (TMG) (AT) • ECHEM CENTRE OF COMPETENCE IN APPLIED

		ELECTRCHEMISTRY GMBH (AT) <ul style="list-style-type: none">• JOHANNES KEPLER UNIVERSITY LINZ (AT)• KTM-KÜHLER GMBH (AT)• KIRSTEIN GMBH (DE)
16	Challenges addressed	The project investigates the following challenges: system and fuel costs, hydrogen infrastructure, public awareness regarding potential of hydrogen economy, hydrogen technology standards;
17	Changes addressed	Technical, economic, ecological, infrastructure, institutional changes are addressed.

2.3.7 Chrome basis alloy for SOFC fuel cells

1	Acronym and full name of the project	No acronym available Chrome basis alloy for SOFC fuel cells
2	Contract number	Unknown
3	Start date	1990
4	End date	Not applicable
5	Actual phase of project	Ongoing
6	Co-ordinating Institution	PLANSEE AG (AT)
7	Contact	GLATZ, Wolfgang
8	Type	Unknown
9	Focus	National
10	Funding	Budget: Proprietary Private, partly Government
11	Information available (publications, internet, reports, other)	http://www.plansee.at (July/03); personal contact (Plansee AG/July/03)
12	Objective of project	The aim of this project is to produce chrome based alloys for SOFC fuel cell bipolar plates.
13	Domain covered	End-use of SOFC systems (residential market)
14	Rating of technology	System prototype demonstrated in relevant environment (6)
15	List of participants	<ul style="list-style-type: none"> • PLANSEE AG (AT) • SULZER HEXIS AG (CH)
16	Challenges addressed	Technological and economic challenges are addressed
17	Changes addressed	Mainly technological changes

2.3.8 Combined heat and power plants with fuel cells

1	Acronym and full name of the project	No acronym available Combined heat and power plants with fuel cells
2	Contract number	Unknown
3	Start date	2.2000
4	End date	12.2003
5	Actual phase of project	Completed
6	Co-ordinating Institution	UNIVERSITY OF TECHNOLOGY GRAZ (AT)
7	Contact	HOHENWARTER, Ulrich
8	Type	R&D project
9	Focus	National
10	Funding	Budget: Proprietary
11	Information available (publications, internet, reports, other)	personal contact (University of Technology Graz/September/03)
12	Objective of project	Theoretical and practical R&D activities concerning fuel cell CHP plants involving specific reformer testing and the development data acquisition systems
13	Domain covered	End-use of fuel cells in stationary applications
14	Rating of technology	Technology concept and application (2); Components validated in relevant environment (due to the involvement in a demonstration project) (5)
15	List of participants	<ul style="list-style-type: none"> • UNIVERSITY OF TECHNOLOGY GRAZ, INSTITUTE OF THERMAL ENGINEERING (AT) • STEWAG/STEG (ESTAG GROUP)
16	Challenges addressed	Mainly technical challenges are covered concerning component development and system integration
17	Changes addressed	The addressed changes are in parallel to the investigated challenges

2.3.9 CRYOTANK – Creating Simulation Tools for Development of Safe Liquid Hydrogen Tanks

1	Acronym and full name of the project	CRYOTANK Creating Simulation Tools for Development of Safe Liquid Hydrogen Tanks
2	Contract number	Unknown
3	Start date	2003
4	End date	2003
5	Actual phase of project	Completed
6	Co-ordinating Institution	Magna Steyr
7	Contact	Mr. Krainz
8	Type	RTD (A3 Technology program of BMVIT)
9	Focus	National
10	Funding	Budget: Proprietary
11	Information available (publications, internet, reports, other)	http://www.bmvit.gv.at (September/03)
12	Objective of project	Testing of liquid hydrogen tests is costly, for this reason a simulation tool is developed to optimise the tank design
13	Domain covered	Hydrogen storage
14	Rating of technology	Components validated in lab (4)
15	List of participants	<ul style="list-style-type: none"> • MAGNA STEYR (AT) • CD-LABOR LEOBEN (AT) • MESSER AUSTRIA (AT)
16	Challenges addressed	Mainly technical challenges and changes are addressed
17	Changes addressed	See above

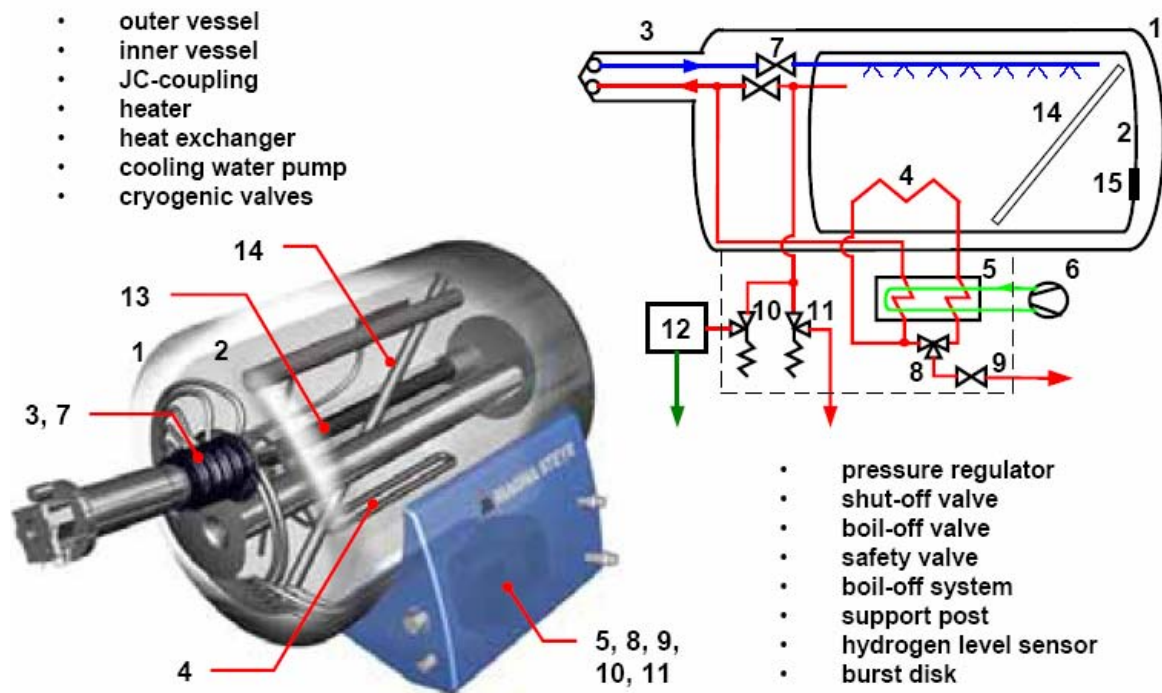


Figure 4 Outline of Magna Steyr's Cryotank (Source: Magna Steyr)

2.3.10 Development of a method for the mass production of PEM-FC components

1	Acronym and full name of the project	No acronym available Development of a method for the mass production of PEM-FC components
2	Contract number	806129
3	Start date	11.2002
4	End date	4.2004
5	Actual phase of project	Completed
6	Co-ordinating Institution	FOTEC FORSCHUNGS UND TECHNOLOGIETRANSFER GMBH (AT)
7	Contact	GRIESMAYER, Erich
8	Type	RTD (at: sol, "Factory of Tomorrow")
9	Focus	International
10	Funding	Private
11	Information available (publications, internet, reports, other)	http://www.fabrikderzukunft.at (May/04); personal contact (BMVIT/May/04)
12	Objective of project	The aim of the project is to clarify if the components of a PEM fuel cell can be produced by a cost efficient mass production method. At present this target hasn't been reached.
13	Domain covered	Conversion
14	Rating of technology	Components validated in lab (4)
15	List of participants	<ul style="list-style-type: none"> • FOTEC FORSCHUNGS UND TECHNOLOGIETRANSFER GMBH (AT) • EICHEM KOMPETENZZENTRUM FÜR ANGEWANDTE ELEKTROCHEMIE GMBH (AT)
16	Challenges addressed	Mainly technical challenges and changes are addressed
17	Changes addressed	See above

2.3.11 Direct-methanol fuel cells with circulate electrolytes

1	Acronym and full name of the project	No acronym available Direct-methanol fuel cells with circulate electrolytes
2	Contract number	Unknown
3	Start date	4.2002
4	End date	6.2004
5	Actual phase of project	Ongoing
6	Co-ordinating Institution	UNIVERSITY OF TECHNOLOGY GRAZ (AT)
7	Contact	KORDESCH, Karl
8	Type	Unknown
9	Focus	International
10	Funding	Budget: Proprietary
11	Information available (publications, internet, reports, other)	http://www.tugraz.ac.at (July/03); personal contact (University of Technology Graz/July/03)
12	Objective of project	The aim of the project is to develop electrodes which work with liquid alkaline electrolytes instead of solid ones. The advantages of this system are : <ul style="list-style-type: none"> • improved water management • improved heath management • lower production costs • avoidance of the methanol crossover A demonstration system is planed to be built with up to 500 Watts.
13	Domain covered	Conversion
14	Rating of technology	Components validated in lab (4)
15	List of participants	<ul style="list-style-type: none"> • UNIVERSITY OF TECHNOLOGY GRAZ, INSTITUTE FOR CHEMISTRY AND TECHNOLOGY OF ANORGANIC MATERIALS (AT) • APOLLO ENERGY SYSTEMS (US) • ENERGY VISIONS (CA)
16	Challenges addressed	The project addresses two mayor challenges. First methanol as energy carrier. Second direct methanol fuel cells.
17	Changes addressed	Acceptance for methanol as an energy carrier (including all necessary mayor changes).

2.3.12 EasyCell

1	Acronym and full name of the project	EasyCell Development of a manufacturing processes for an optimised PEM-FC
2	Contract number	807913
3	Start date	4.2004
4	End date	3.2006
5	Actual phase of project	Ongoing
6	Co-ordinating Institution	FOTEC-FORSCHUNGS-UND TECHNOLOGIETRANSFER GMBH (AT)
7	Contact	LEHNER, Friedrich
8	Type	RTD (at: sol, "Factory of Tomorrow")
9	Focus	International
10	Funding	Private
11	Information available (publications, internet, reports, other)	Ryan O`Hayre, "Lateral Ionic Conduction in Planar Array Fuel Cells", Journal of the Electrochemical Society, 2003; http://www.fabrikderzukunft.at (May/04); personal contact (BMVIT/April/04)
12	Objective of project	It is the aim of the project to develop manufacturing processes for an optimised PEM-fuel cell (polymer-electrolyte-membrane fuel cell). Special attention is put on the management of the used media, on the optimisation of peripheral units and on the right design for mass production. At the end of the project the result, an 'EasyCell' is realized which allows an easy market penetration as a matter of cheap manufacturing.
13	Domain covered	Conversion, End-use
14	Rating of technology	Components validated in lab (4)
15	List of participants	<ul style="list-style-type: none"> • ECEM KOMPETENZZENTRUM FÜR ANGEWANDTE ELEKTROCHEMIE GMBH (AT) • BATTENFELD KUNSTSTOFFMASCHIENEN GMBH (AT) • HIGH TECH PLASTICS AG (AT)
16	Challenges addressed	Mainly technical challenges and changes are addressed
17	Changes addressed	See above

2.3.13 Environmentally friendly urban bus and product delivery traffic systems – clean fuels and zero emissions in city centres

1	Acronym and full name of the project	Environmentally friendly urban bus and product delivery traffic systems – clean fuels and zero emissions in city centres
2	Contract number	Unknown
3	Start date	2003
4	End date	2003
5	Actual phase of project	Completed
6	Co-ordinating Institution	TECHNICAL UNIVERSITY OF VIENNA (AT)
7	Contact	PUCHER
8	Type	RTD (A3 Technology program of BMVIT)
9	Focus	National
10	Funding	Budget: Proprietary
11	Information available (publications, internet, reports, other)	http://www.bmvit.gv.at (September/03)
12	Objective of project	<p>The project involves several objectives:</p> <ul style="list-style-type: none"> • Concepts (incl. modelling activities and infrastructural considerations) for a sustainable improvement of air quality in urban areas by introducing clean fuels and alternative power trains • Deployment strategies for new technologies (incl. cooperations with hightech regions in Bavaria and California)
13	Domain covered	End use in transportation applications
14	Rating of technology	Analytical and experimental critical functions identified (3)
15	List of participants	<ul style="list-style-type: none"> • TECHNICAL UNIVERSITY OF VIENNA (AT) • NEOPLAN (AT) • WIENER LINIEN (AT) • ÖAMTC ACADEMY (AT)
16	Challenges addressed	Techno-economic, environmental, infrastructural challenges were addressed.
17	Changes addressed	All kind of changes are addressed.

2.3.14 FC & H₂ – the role of fuel cell technology and hydrogen in the future Austrian energy system considering national/International developments/programs/policies

1	Acronym and full name of the project	FC & H ₂ The role of fuel cell technology and hydrogen in the future Austrian energy system considering national/International developments/programs/policies
2	Contract number	Proprietary
3	Start date	2003
4	End date	2004
5	Actual phase of project	Ongoing
6	Co-ordinating Institution	E.V.A., THE AUSTRIAN ENERGY AGENCY (AT)
7	Contact	SIMADER, Günter R.
8	Type	Know-how transfer project, strategy project for the public sector
9	Focus	National
10	Funding	Budget: Proprietary Government
11	Information available (publications, internet, reports, other)	http://www.eva.ac.at (July/03); Workshop proceedings (forthcoming)
12	Objective of project	The aim of the project is to support BMVIT by accelerating the Austrian fuel cell RTD (FUEL CELL III project) and to analyse the hydrogen topic as future energy carrier in Austria. This includes the formulation of an Austrian position for the hydrogen topic.
13	Domain covered	Accompanying measure
14	Rating of technology	Not applicable
15	List of participants	<ul style="list-style-type: none"> • E.V.A., THE AUSTRIAN ENERGY AGENCY (AT) • BMVIT, FEDERAL MINISTRY FOR TRANSPORTATION, INNOVATION AND TECHNOLOGY (AT)
16	Challenges addressed	All kinds of challenges are foreseen to be addressed.
17	Changes addressed	Changes within the Austrian RTD policies and energy policies will be analysed.

2.3.15 FCOIL – liquid fossil fuels for stationary fuel cell applications

1	Acronym and full name of the project	FC OIL Liquid fossil fuels for stationary fuel cell applications
2	Contract number	Proprietary
3	Start date	2002
4	End date	2002
5	Actual phase of project	Completed
6	Co-ordinating Institution	E.V.A., THE AUSTRIAN ENERGY AGENCY (AT)
7	Contact	SIMADER, Günter R.
8	Type	Feasibility study
9	Focus	National
10	Funding	Budget: Proprietary Private
11	Information available (publications, internet, reports, other)	Final report available
12	Objective of project	The aim of the project was to investigate the technological status of fuel cell technology for stationary applications and to evaluate the usage of liquid fuels (diesel, oil) in fuel cell systems.
13	Domain covered	End-use
14	Rating of technology	Technology concept and application (2)
15	List of participants	<ul style="list-style-type: none"> • OMV AG (AT) • E.V.A., THE AUSTRIAN ENERGY AGENCY (AT)
16	Challenges addressed	Technological, economic, ecological and political challenges for the usage of liquid fossil fuels in fuel cells systems were addressed.
17	Changes addressed	Increased usage of fossil fuels for the heat market (incl. the analysis of technological, economic, ecological and political changes).
18	Other comments	Prior to this project a similar project was executed by Forschungszentrum Seibersdorf authorised by OMV company. Publications are also available from OMV company.

2.3.16 FUELCELL III – RTD of fuel cells for stationary applications and consumer applications

1	Acronym and full name of the project	FuelCell III RTD of fuel cells for stationary applications and consumer applications
2	Contract number	Proprietary
3	Start date	2000
4	End date	2001
5	Actual phase of project	Completed
6	Co-ordinating Institution	E.V.A., THE AUSTRIAN ENERGY AGENCY (AT)
7	Contact	SIMADER, Günter R.
8	Type	Know-how transfer project, strategy project for the public sector
9	Focus	National
10	Funding	Budget: Proprietary Government
11	Information available (publications, internet, reports, other)	http://www.eva.ac.at (July/03); Report: «FTE von Brennstoffzellen für stationäre Energiesysteme und tragbare Kleingeräte (RTD of fuel cells for stationary applications and consumer applications)»; Workshop proceedings
12	Objective of project	The aim of the project was to develop a national strategy for fuel cell applications in order to increase RTD activities in Austria both for public/industrial companies.
13	Domain covered	Accompanying measure
14	Rating of technology	Not applicable
15	List of participants	<ul style="list-style-type: none"> • E.V.A., THE AUSTRIAN ENERGY AGENCY (AT) • PROFACTOR PRODUKTIONSFORSCHUNGS GMBH (AT) • BMVIT, FEDERAL MINISTRY FOR TRANSPORTATION, INNOVATION AND TECHNOLOGY (AT)
16	Challenges addressed	Techno-economic, environmental, infrastructural, political, institutional challenges were addressed.
17	Changes addressed	Changes within the Austrian RTD instruments were analysed.

2.3.17 Fuel cell heating systems for residential applications (PEFC)

1	Acronym and full name of the project	No acronym available Fuel cell heating systems for residential applications (PEFC)
2	Contract number	Unknown
3	Start date	1.2003
4	End date	5.2004
5	Actual phase of project	Completed
6	Co-ordinating Institution	ENERGIE STEIERMARK HOLDING AG (ESTAG) (AT)
7	Contact	POPOVIC, Nikolaus
8	Type	Demonstration project
9	Focus	National
10	Funding	Budget: Proprietary Private
11	Information available (publications, internet, reports, other)	http://www.ferngas.at (July/03); http://www.vaillant.at (July/03); personal contact (Vaillant Vienna/July/03)
12	Objective of project	The objectives of the project are to integrate a small domestic PEFC heating appliance (EURO 1 system from Vaillant) in a complex heating system, to measure operation and performance and to verify the improvement potential. The system is installed in a hotel in Austria (Styria).
13	Domain covered	End-use (residential markets)
14	Rating of technology	System prototype demonstrated in relevant environment (6)
15	List of participants	<ul style="list-style-type: none"> • ENERGIE STEIERMARK HOLDING AG (ESTAG) (AT) • VAILLANT VIENNA (AT) • UNIVERSITY OF TECHNOLOGY GRAZ, INSTITUTE OF THERMAL ENGINEERING (AT)
16	Challenges addressed	All challenges for market introduction of a natural gas end-use technologies are addressed.
17	Changes addressed	All changes for the market introduction of a natural gas fuelled small scale CHP product are addressed.
18	Other comments	In the feasibility stage of this project several

		studies were carried out by STEWAG in co-operation with E.V.A., the Austrian Energy Agency (not listed in this compendium; information material available from E.V.A.).
--	--	---



Figure 5 Vaillant's 4,5 kW_{el} PEFC residential fuel cell system installed in Hotel Ochensberger (Source: Vaillant Vienna)



Figure 6 Hotel Ochensberger in Styria (Source: Vaillant Vienna)

2.3.18 Fuel cell heating systems for residential applications (PEFC)

1	Acronym and full name of the project	No acronym available Fuel cell heating systems for residential applications (PEFC)
2	Contract number	Unknown
3	Start date	2.2002
4	End date	12.2004
5	Actual phase of project	Ongoing
6	Co-ordinating Institution	WIENGAS GMBH (AT)
7	Contact	WITTEK, Rudolf
8	Type	Demonstration project
9	Focus	National
10	Funding	Budget: Proprietary Private
11	Information available (publications, internet, reports, other)	http://www.ferngas.at (July/03); http://www.vaillant.de (July/03); personal contact (Vaillant Vienna/July/03)
12	Objective of project	The aim of the project is to integrate PEFC (EURO 1 from Vaillant) in domestic / small commercial hydraulic systems in conjunction with district heating.
13	Domain covered	End-use
14	Rating of technology	System prototype demonstrated in relevant environment (6)
15	List of participants	<ul style="list-style-type: none"> • WIENGAS GMBH (AT) • VAILLANT VIENNA (AT)
16	Challenges addressed	All challenges for the market introduction of natural gas end-use technologies are addressed. Interesting feature in challenges: investigation of small scale systems supporting rim areas of the district heating network.
17	Changes addressed	All changes for the market introduction of a natural gas fuelled small scale CHP product are addressed.

2.3.19 Fuel cell systems for residential application (SOFC)

1	Acronym and full name of the project	No acronym available Fuel cell systems for house energy supply
2	Contract number	Unknown
3	Start date	10.2000
4	End date	3.2004
5	Actual phase of project	Completed
6	Co-ordinating Institution	ENERGIE AG OBERÖSTERREICH (AT)
7	Contact	STOCKENREITNER, Robert WILK, Heinrich ZAPPE, Rudolf
8	Type	Demonstration project
9	Focus	National
10	Funding	Budget: Proprietary Private
11	Information available (publications, internet, reports, other)	http://www.energieag.at (July/03); http://www.erdgassooe.at (July/03); http://brennstoff-zelle.net (July/03); personal contact (Energie AG/July/03)
12	Objective of project	The aims of this project are: <ul style="list-style-type: none"> • to acquire knowledge of the use of small fuel cell systems. • to enlarge the competence of the firm. • the strategic use of the fuel cell technology (decentral CHPs). A demonstration system is installed in Attnang-Puchheim.
13	Domain covered	Conversion, end-use
14	Rating of technology	System prototype demonstrated in relevant environment (6)
15	List of participants	<ul style="list-style-type: none"> • ENERGIE AG OBEROESTERREICH (AT) • ERDGAS OBEROESTERREICH (AT)

16	Challenges addressed	All challenges are addressed for the market introduction of natural gas fuelled technologies.
17	Changes addressed	All changes for market introduction of a natural gas fuelled small scale CHP product are addressed.
18	Further remarks	Energie AG will continue its fuel cell program by testing also a PEFC system (EURO 2 from Vaillant) in 2004. A second EURO 2 project will be tested by Salzburg AG.



Figure 7 1 kW_{el} SOFC system of Sulzer Hexis AG (Source: Energie AG)



Figure 8 Technology centre Attnang/Puchheim (Source: Energie AG)

2.3.20 Fuel cell systems with liquid electrolytes

1	Acronym and full name of the project	No acronym available Fuel cell systems with liquid electrolytes
2	Contract number	Unknown
3	Start date	11.2001
4	End date	Unknown
5	Actual phase of project	Ongoing
6	Co-ordinating Institution	UNIVERSITY OF TECHNOLOGY GRAZ (AT)
7	Contact	HACKER, Victor
8	Type	Research and development
9	Focus	National
10	Funding	Budget: Proprietary
11	Information available (publications, internet, reports, other)	http://www.tugraz.ac.at (July/03); personal contact (University of Technology Graz/July/03)
12	Objective of project	The aim of the project is to develop electrodes which work with liquid acid electrolytes instead of solid ones. A target of this project is to reduce the methanol crossover which leads to a better fuel cell performance.
13	Domain covered	Conversion
14	Rating of technology	Components validated in lab (4)
15	List of participants	<ul style="list-style-type: none"> • UNIVERSITY OF TECHNOLOGY GRAZ, INSTITUTE FOR CHEMISTRY AND TECHNOLOGY OF ANORGANIC MATERIALS (AT) • CHRISTIAN- DOPPLER- FORSCHUNGSGESELLSCHAFT (CDG) (AT) • AVL LIST GMBH (AT)
16	Challenges addressed	Two mayor challenges are addressed by this project: (i) to introduce methanol as an energy carrier and (ii) the usage of direct methanol fuel cells.
17	Changes addressed	Public acceptance of methanol as an energy carrier (including all necessary major changes).

2.3.21 H₂-gas engine for industrial applications

1	Acronym and full name of the project	No acronym available H ₂ -gas engine for industrial applications
2	Contract number	Not applicable
3	Start date	1994/1995
4	End date	not applicable
5	Actual phase of project	Ongoing
6	Co-ordinating Institution	GE JENBACHER (AT/USA)
7	Contact	HERDIN, G.
8	Type	Demonstration project
9	Focus	International
10	Funding	Budget: Proprietary Government, Private
11	Information available (publications, internet, reports, other)	http://www.jenbacher.com (July/03); personal contact (Dynea Austria/July/03); personal contact (GE Jenbacher AG/July/03)
12	Objective of project	The aim of the project is to utilise the waste gas of the formalin production. The gas engine converts the hydrogen with a higher efficiency into electric power.
13	Domain covered	Conversion
14	Rating of technology	System verified by successful use (9)
15	List of participants	<ul style="list-style-type: none"> • GE JENBACHER AG (AT/USA) • DYNEA AUSTRIA (AT)
16	Challenges addressed	Introduction of hydrogen as an energy carrier (including technological, infrastructural, ecological, economic, political and institutional challenges).
17	Changes addressed	Technological, infrastructural, ecological, economic, political and institutional changes are addressed.

2.3.22 HyCentA

1	Acronym and full name of the project	HyCentA Hydrogen Center Austria
2	Contract number	Not applicable
3	Start date	2003
4	End date	2009
5	Actual phase of project	Ongoing
6	Co-ordinating Institution	HYCENTA FORSCHUNGS GMBH (AT)
7	Contact	KLELL, Manfred
8	Type	Demonstration project
9	Focus	National/International
10	Funding	Budget: Proprietary Government, Private
11	Information available (publications, internet, reports, other)	“Wasserstoffknoten Steiermark – Potenzial, Aktivitäten und Umfeld” Bericht Nr. I-07/2003/MK 03/I377/01 des Inst. F. VKM u. THD der TU Graz im Auftrag der Steiermärkischen Landesregierung; personal contact (TU Graz/May/04)
12	Objective of project	The aim of the project is to provide test and filling facility for liquid and gaseous hydrogen. The first Austrian research and development center for hydrogen with a filling facility for liquid and gaseous hydrogen is to be erected on the premises of the Graz University of Technology in order to enable research and development tasks in the field of hydrogen and to assure the connection with international hydrogen activities.
13	Domain covered	Production, storage, distribution, conversion and end-use
14	Rating of technology	Not applicable
15	List of participants	<ul style="list-style-type: none"> • TU GRAZ (AT) • JOANNEUM RESEARCH FORSCHUNGS GMBH (AT) • ARC SEIBERSDORF RESEARCH GMBH (AT) • MAGNA STEYR AG&CO KG (AT) • OMV AG (AT) • STEIRISCHE FERNGAS (AT)

		<ul style="list-style-type: none">• FORSCHUNGSGESELLSCHAFT FÜR VERBRENNUNGSKRAFTMASCHIENEN UND THERMODYNAMIK (AT)
16	Challenges addressed	All kind of challenges are addressed.
17	Changes addressed	All kind of changes are addressed.

2.3.23 Hydrogen generation from synthetic gas and liquid hydrocarbons by RESC process

1	Acronym and full name of the project	No acronym available Hydrogen generation from synthetic gas and liquid hydrocarbons by RESC process
2	Contract number	Unknown
3	Start date	1.2002
4	End date	Unknown
5	Actual phase of project	Ongoing
6	Co-ordinating Institution	CHRISTIAN- DOPPLER- FORSCHUNGSGESELLSCHAFT (AT)
7	Contact	HACKER, Victor
8	Type	Research and development
9	Focus	National
10	Funding	Budget: Proprietary
11	Information available (publications, internet, reports, other)	personal contact (University of Technology Graz/July/03)
12	Objective of project	The objective of the project is to generate hydrogen by the reformer sponge iron cycle process (RESC).
13	Domain covered	Conversion
14	Rating of technology	Components validated in lab (4)
15	List of participants	<ul style="list-style-type: none"> • CHRISTIAN DOPPLER- FORSCHUNGSGESELLSCHAFT (CDG) (AT) • OMV AG (AT) • UNIVERSITY OF TECHNOLOGY GRAZ, INSTITUTE FOR CHEMISTRY AND TECHNOLOGY OF ANORGANIC MATERIALS (AT)
16	Challenges addressed	Development of a new hydrogen generation cycle (mainly technological, economical and ecological challenges will be addressed).
17	Changes addressed	Mainly technological (and economical) challenges.

2.3.24 Liquid hydrogen densification process for launchers

1	Acronym and full name of the project	No acronym available Liquid hydrogen densification process for launchers
2	Contract number	ESTEC/Contract No. 16287/02/NL/CK
3	Start date	10.2002
4	End date	9.2003
5	Actual phase of project	Completed
6	Co-ordinating Institution	ESA/ESTEC (NL)
7	Contact	BRUNNHOFER, Klaus
8	Type	RTD on continuous slush production
9	Focus	International
10	Funding	Budget: Proprietary ESA
11	Information available (publications, internet, reports, other)	http://www.magnasteyr.com (July/03); personal contact (Magna Steyr AG & CO KG/July/03)
12	Objective of project	Project goals are the densification of liquid hydrogen, increased density and heat capacity of fuel components to liquid hydrogen. Furthermore smaller tank volumes, longer storage times, lighter tanks, 30% smaller vehicles for the same payload.
13	Domain covered	Production, storage and distribution
14	Rating of technology	Components validated in lab (4)
15	List of participants	<ul style="list-style-type: none"> • MAGNA STEYR AG & CO KG (AT) • ENERGIE TECHNOLOGIE (ET) (DE) • CENTRE SPATIAL DE LIEGE (CSL) (BE)
16	Challenges addressed	Hydrogen as an advanced fuel for space, aeronautic and terrestrial applications (mainly technical and economic challenges).
17	Changes addressed	Techno-economic changes for space applications.

2.3.25 Liquid hydrogen tank development

1	Acronym and full name of the project	No acronym available Liquid hydrogen tank development
2	Contract number	Unknown
3	Start date	1.2001
4	End date	12.2006
5	Actual phase of project	Ongoing
6	Co-ordinating Institution	MAGNA STEYR AG & CO KG (AT)
7	Contact	KRAINZ, G.
8	Type	Demonstration project
9	Focus	International
10	Funding	Budget: Proprietary Government, Private
11	Information available (publications, internet, reports, other)	http://www.magnasteyr.com (July/03); personal contact (Magna Steyr AG & CO KG/July/03)
12	Objective of project	The aim of the project is to built liquid hydrogen storage tanks for automotive applications.
13	Domain covered	Storage
14	Rating of technology	Components validated in lab (4)
15	List of participants	<ul style="list-style-type: none"> • MAGNA STEYR AG & CO KG (AT) • MESSER AUSTRIA GMBH (AT) • AUSTRIAN AEROSPACE GMBH (AT) • BMW GROUP (DE) • ROTAREX (LU) • LINDE AG (DE)
16	Challenges addressed	The project investigates hydrogen storage systems (including mainly techno-economic challenges).
17	Changes addressed	Mainly techno-economic changes are addressed.

2.3.26 MASS-MINI-FC

1	Acronym and full name of the project	<p>MASS-MINI-FC</p> <p>Development of a less resources consuming and energy efficient mass production process for the manufacturing of miniaturized solid oxid fuel cell (SOFC) components</p>
2	Contract number	807912
3	Start date	1.2004
4	End date	3.2005
5	Actual phase of project	Ongoing
6	Co-ordinating Institution	ARC SEIBERSDORF RESEARCH GMBH (AT)
7	Contact	STELZER, Nils
8	Type	RTD (at: sol, "Factory of Tomorrow")
9	Focus	International
10	Funding	Private
11	Information available (publications, internet, reports, other)	<p>http://www.fabrikderzukunft.at (May/2004);</p> <p>personal contact (BMVIT/May/2004)</p>
12	Objective of project	<p>The general objective of this project is the evaluation and the development of a less resources consuming and energy efficient mass production process for the manufacturing of miniaturized solid oxid fuel cell (SOFC) components.</p> <p>The specific technical objectives are as follows:</p> <ul style="list-style-type: none"> • Development and manufacturing of nano scaled SOFC materials for the decrease of the sinter temperature. • Development of suitable feed stocks for co-sintering of nano-scaled SOFC materials. • Evaluation of a less resources consuming mass production, e.g. power injection modelling (PIM), extrusion and dip-coating for manufacturing multi-layered miniaturized ceramic tubes. • Development of an energy efficient co-sintering process for manufacturing miniaturized multi-layered ceramic tubes • Assembling and testing of a SOFC stack

13	Domain covered	Conversion
14	Rating of technology	Components validated in lab (4)
15	List of participants	<ul style="list-style-type: none"> • ARC SEIBERSDORF RESEARCH GMBH (AT) • ALLPS FUEL CELL SYSTEMS GMBH (AT) • GABRIEL CHEMIE GMBH (AT) • ERNST WITTNER GMBH (AT) • TECHNICAL UNIVERSITY OF VIENNA, INST. FOR CHEMICAL TECHNOLOGY AND ANALYSIS (AT)
16	Challenges addressed	Mainly technical challenges are addressed.
17	Changes addressed	Mainly techno-economic changes are addressed.

2.3.27 PEM fuel cell hybrid vehicle

1	Acronym and full name of the project	No acronym available PEM fuel cell hybrid vehicle
2	Contract number	Unknown
3	Start date	10.2002
4	End date	11.2003
5	Actual phase of project	Completed
6	Co-ordinating Institution	AVL LIST GMBH (AT)
7	Contact	RAMSCHA, Erich
8	Type	RTD (A3 Technology program of BMVIT)
9	Focus	National
10	Funding	Budget: Proprietary Government
11	Information available (publications, internet, reports, other)	http://www.bmvit.gv.at (July/03); personal contact (AVL List GmbH/July/03)
12	Objective of project	The objective of this project is to adapt a battery vehicle with a PEM fuel cell hybrid system. The efficiency of the PEM fuel cell technology will be tested.
13	Domain covered	End use
14	Rating of technology	Components validated in lab (4)
15	List of participants	<ul style="list-style-type: none"> • AVL LIST GMBH (AT) • UNIVERSITY OF TECHNOLOGY GRAZ (AT) • DEUTSCHES LUFT UND RAUMFAHRTZENTRUM (DE)
16	Challenges addressed	The development of hybrid vehicles is the main challenge of this project. The usage of fuel cell vehicles is addressed in the energy market.
17	Changes addressed	For the introduction of the fuel cell technology in the automobile market all kind of changes are identified.

2.3.28 PRO-BZ – Program to generate fuel cell expertise

1	Acronym and full name of the project	PRO-BZ Program to generate fuel cell expertise
2	Contract number	Unknown
3	Start date	1.10.2002
4	End date	28.2.2004
5	Actual phase of project	Completed
6	Co-ordinating Institution	ALPPS FUEL CELL SYSTEMS (AT)
7	Contact	LOECKER, Barbara
8	Type	RTD (A3 Technology program of BMVIT)
9	Focus	National
10	Funding	Budget: Proprietary Government
11	Information available (publications, internet, reports, other)	http://www.bmvit.gv.at (July/03); personal contact (ALPPS GmbH/July/03)
12	Objective of project	The aim of the project is to create education programs about fuel cell technologies for all necessary qualification levels. Education proposals and plans are acquired for schools and universities.
13	Domain covered	Accompanying measure
14	Rating of technology	Not applicable
15	List of participants	<ul style="list-style-type: none"> • ALPPS FUEL CELL SYSTEMS GMBH (AT) • FACHHOCHSCHULE WELS (AT) • ECHEM CENTRE OF COMPETENCE IN APPLIED ELECTROCHEMISTRY GMBH (AT)
16	Challenges addressed	Institutional challenges are addressed.
17	Changes addressed	Institutional changes (education packages)

2.3.29 PV hybrid systems with fuel cells for data acquisition and radio stations of utility companies

1	Acronym and full name of the project	No acronym available PV hybrid systems with fuel cells for data acquisition and radio stations of utility companies
2	Contract number	Unknown
3	Start date	Unknown
4	End date	Unknown
5	Actual phase of project	Ongoing
6	Co-ordinating Institution	ENERGIE AG (AT)
7	Contact	WILK, Heinrich
8	Type	RTD
9	Focus	National
10	Funding	Budget: Proprietary Private equity
11	Information available (publications, internet, reports, other)	Publication: IEWT 2003 (February/03); personal contact (Energie AG, FRONIUS/September/03)
12	Objective of project	The objective of this project is to develop a hybrid PV system with PEFC.
13	Domain covered	End use (data acquisition and radio stations in the utility sector)
14	Rating of technology	Components validated in lab (4)
15	List of participants	<ul style="list-style-type: none"> • ENERGIE AG (AT) • FRONIUS (AT)
16	Challenges addressed	The development of PV/FC hybrid systems is the main challenge of this project (mainly technical and economic challenges).
17	Changes addressed	The introduction of hybrid PV/fuel cell systems in the utility markets (introducing RES).

2.3.30 QUANT B – Professional education of teachers and specialists in the sphere of new technologies – fuel cells and high performance batteries

1	Acronym and full name of the project	QUANT B Professional education of teachers and specialists in the sphere of new technologies – fuel cells and high performance batteries
2	Contract number	806220
3	Start date	1.1.2003
4	End date	1.3.2004
5	Actual phase of project	Completed
6	Co-ordinating Institution	ECHEM CENTRE OF COMPETENCE IN APPLIED ELECTROCHEMISTRY GMBH (AT)
7	Contact	VRABIC, Gernot
8	Type	RTD (A3 Technology program of BMVIT)
9	Focus	National
10	Funding	Budget: Proprietary Government
11	Information available (publications, internet, reports, other)	http://www.bmvit.gv.at (July/03)
12	Objective of project	The aim of the project is to develop training modules in the field of fuel cells for different target groups.
13	Domain covered	Accompanying measure
14	Rating of technology	Not applicable
15	List of participants	<ul style="list-style-type: none"> • ECHEM CENTRE OF COMPETENCE IN APPLIED ELECTROCHEMISTRY GMBH (AT) • CENTRAL AUSTRIAN TRANSFER AND TRAINING (CATT) INNOVATION MANAGEMENT GMBH (AT) • TECHNICAL UNIVERSITY OF VIENNA (AT)
16	Challenges addressed	Educational packages will be developed for teachers and industrial specialists.
17	Changes addressed	Mainly institutional changes in the Austrian education system are addressed.

2.3.31 Renewable hydrogen in Austria

1	Acronym and full name of the project	No acronym available Renewable hydrogen in Austria
2	Contract number	Not available
3	Start date	1.2004
4	End date	6.2005
5	Actual phase of project	Ongoing
6	Co-ordinating Institution	JOANNEUM RESEARCH FORSCHUNGSGESELLSCHAFT MBH (AT)
7	Contact	JUNGMEIER, G.
8	Type	RTD ("Energy System of Tomorrow")
9	Focus	National
10	Funding	Budget: Proprietary
11	Information available (publications, internet, reports, other)	http://www.energiesystemederzukunft.at (May/04); personal contact (E.V.A., the Austrian Energy Agency/April/04)
12	Objective of project	The aim of the project is to create a strategy for the production and use of hydrogen from renewable energy in Austria including the identification of demonstration projects illustrating an energy efficient and flexible energy system based on renewable hydrogen.
13	Domain covered	Production, storage, distribution, conversion, and end-use
14	Rating of technology	Not applicable
15	List of participants	<ul style="list-style-type: none"> • JOANNEUM RESEARCH FORSCHUNGSGESELLSCHAFT MBH (AT) • TECHNICAL UNIVERSITY OF VIENNA (AT)
16	Challenges addressed	The main challenge of the project is the evaluation of the different production methods for renewable hydrogen.
17	Changes addressed	All kind of changes are addressed.

2.3.32 Research engine for the development of hydrogen combustion systems

1	Acronym and full name of the project	No acronym available Research engine for the development of hydrogen combustion systems
2	Contract number	Unknown
3	Start date	9.2001
4	End date	Unknown
5	Actual phase of project	Ongoing
6	Co-ordinating Institution	BMW AG (DE)
7	Contact	EICHELSEDER, Helmut
8	Type	Research project
9	Focus	National
10	Funding	Budget: Proprietary
11	Information available (publications, internet, reports, other)	http://www.sae.org (August/03); http://www.tugraz.at (August/03); personal contact (University of Technology Graz/August/03)
12	Objective of project	The aim of this project is to develop a combustion system based on hydrogen fuel (mainly for mobile systems) to investigate fuel consumptions and CO ₂ emissions. A high standard efficiency factor is expected by this system.
13	Domain covered	End-use
14	Rating of technology	Components validated in lab (4)
15	List of participants	<ul style="list-style-type: none"> • UNIVERSITY OF TECHNOLOGY GRAZ, INSTITUTE FOR INTERNAL COMBUSTION ENGINES AND THERMODYNAMICS (AT) • BMW AG (DE)
16	Challenges addressed	Mainly technical and environmental changes are addressed.
17	Changes addressed	Basic RTD project supporting the introduction of H ₂ engine systems.

2.3.33 SMOTECH DISPO (5-100) – direct methanol fuel cells

1	Acronym and full name of the project	SMOTECH DisPo (5-100) Direct methanol fuel cells
2	Contract number	Not applicable
3	Start date	5.2003
4	End date	Not applicable
5	Actual phase of project	Ongoing
6	Co-ordinating Institution	SMOTECH BRENNSTOFFZELLEN GMBH (AT)
7	Contact	SMOLLE; Erwin
8	Type	Not applicable
9	Focus	National
10	Funding	Budget: Proprietary Mainly private and national RTD funds
11	Information available (publications, internet, reports, other)	http://www.smotech.at (July/03); personal contact (Smotech GmbH/July/03)
12	Objective of project	The company produces direct methanol fuel cell systems for the extern energy supply of notebooks, printers mobile phones, etc.
13	Domain covered	End-use
14	Rating of technology	Components validated in relevant environment (5)
15	List of participants	<ul style="list-style-type: none"> • SMOTECH BRENNSTOFFZELLEN GMBH (AT)
16	Challenges addressed	The mayor challenges of this project are: (i) methanol as energy carrier and (ii) direct methanol fuel cells (technological challenges).
17	Changes addressed	Acceptance for methanol as an energy carrier for consumer applications (including all necessary mayor changes).

2.3.34 Solid oxide fuel cell auxiliary power unit for mobile application

1	Acronym and full name of the project	No acronym available Solid oxide fuel cell auxiliary power unit for mobile application
2	Contract number	Unknown
3	Start date	2003
4	End date	2003
5	Actual phase of project	Completed
6	Co-ordinating Institution	AVL LIST GMBH (AT)
7	Contact	THANNER
8	Type	RTD (A3 Technology program of BMVIT)
9	Focus	National
10	Funding	Budget: Proprietary Government
11	Information available (publications, internet, reports, other)	http://www.bmvit.gv.at (July/03); personal contact (University of Technology Graz/July/03)
12	Objective of project	The aim of the project is to investigate the deployment of SOFC technology in the transportation sector. Simulation programs will be developed/used to verify and evaluate the efficiency.
13	Domain covered	End-use
14	Rating of technology	Basic principles observed and reported (1)
15	List of participants	<ul style="list-style-type: none"> • CHRISTIAN DOPPLER FORSCHUNGSGESELLSCHAFT (CDG) (AT) • AVL LIST GMBH (AT) • UNIVERSITY OF TECHNOLOGY GRAZ, INSTITUTE FOR CHEMISTRY AND TECHNOLOGY OF ANORGANIC MATERIALS (AT)
16	Challenges addressed	The deployment of fuel cell vehicles is addressed in the transportation sector (mainly techno-economic challenges)
17	Changes addressed	To introduce the fuel cell technology in the automobile market all kind of changes are identified.

2.3.35 Thermodynamic and kinetic characterisation of mixed ionic-electronic conductors

1	Acronym and full name of the project	Special Research Program Electro active Materials, Project: Thermodynamic and kinetic characterisation of mixed ionic-electronic conductors
2	Contract number	F915
3	Start date	1996
4	End date	2006
5	Actual phase of project	Ongoing
6	Co-ordinating Institution	UNIVERSITY OF LEOBEN (AT)
7	Contact	SITTE, Werner
8	Type	RTD (FWF Project)
9	Focus	National
10	Funding	Government
11	Information available (publications, internet, reports, other)	personal contact (Technical University Graz/November/03); http://www.unileoben.ac.at/~physchem (November/03)
12	Objective of project	<p>The major goal of this project is the detailed defect chemical and kinetic characterisation of mixed conducting oxides in wide temperature and oxygen partial pressure ranges to optimise the design and production of electro ceramic devices. A number of experimental methods for measuring the oxygen non-stoichiometry as well as the oxygen and electronic transport properties of mixed conducting perovskite-type oxides have been developed and applied to study cobaltates and ferrates with high Sr-content. Cobalt-based perovskites $\text{La}_{1-x}\text{Sr}_x\text{CoO}_3$ ($x = 0.4$ and 0.6) show high electronic conductivity, besides tolerating large oxygen vacancy concentrations. This particular feature results in significant ionic conductivity and catalytic activity. Therefore these materials are potentially attractive as cathodes in high temperature solid oxide fuel cells (SOFCs).</p> <p>Further, the iron-based perovskites $\text{La}_{1-x}\text{Sr}_x\text{FeO}_3$ with $x = 0.6$ (and partly $x = 0.8$) were studied. While offering reasonable ionic conductivity at elevated temperatures the ferrates are – in contrast to the cobaltates – chemically stable under highly reducing conditions.</p>

13	Domain covered	Conversion
14	Rating of technology	Basic principles observed and reported (1)
15	List of participants	<ul style="list-style-type: none">• UNIVERSITY OF LOBEN (AT)• TECHNICAL UNIVERSITY OF GRAZ (AT)
16	Challenges addressed	Conductivity of the FC cathode.
17	Changes addressed	Same as for challenges.

3 Austrian contact list of hydrogen and fuel cell RTD companies/institutions

Organisation	Contact	Address	Phone	Fax	E-mail	Website
ALPPS Fuel Cell Systems GmbH	Peter Claassen	Exerzierplatzstrasse 4 A-8051 Graz	+43/316/681284	+43/316/681642	peter.claassen@alpps.at	www.alpps.at
Austrian Aerospace GmbH	Erhard Prechelmacher	Stachegasse 16 A-1120 Vienna	+43/1/80199/2310	+43/1/80199/6950	erhard.prechelmacher@space.at	www.space.at
Austrian Energy and Environment AG	Werner Dietl	Siemensstrasse 89 A-1211 Vienna	+43/1/25045/4575	+43/1/25045/134	werner.dietl@aee.co.at	www.aee.co.at
Austrian Research Centers – Arsenal Research GmbH	Hubert Fechner	Faradaygasse 3 A-1030 Vienna	+43/1/50550/6299	+43/1/50550/6299	not available	www.arsenal.ac.at
AVL List GmbH	Peter Prenninger	Hans-List-Platz 1 A-8020 Graz	+43/316/787/1484	+43/316/787/1480	peter.prenninger@avl.com	www.avl.com
Bitter GmbH & Co	Andreas Schenner	Burgstallstrasse 13 A-4523 Neuzeug	+43/7259/32223/15	+43/7259/32223/70	schenner@bitter.at	www.bitter.at
BMVIT, Federal Ministry for Transportation, Innovation and Technology	Theodor Zillner, Andreas Dorda Michael Hübner	Renngasse 5 A-1010 Vienna	+43/1/53464/3109	+43/1/53464/2230	andreas.dorda@bmvit.gv.at	www.bmvit.gv.at
BWT, Best Water Technology Aktiengesellschaft	Jürgen Johann	Walter Simmerstr.4 A-5310 Mondsee	+43/6232/5011/1860	+43/6232/4058	juergen.johann@bwt.at	www.bwt.at
Central Austrian Transfer and Training (CATT) Innovation Management GmbH	Hartwig Reiter	Hafenstrasse 47-51 A-4020 Linz	+43/732/9015/5429	+43/732/9015/5421	reiter@catt.at	www.catt.at
Christian Doppler Forschungsgesellschaft (CDG)	Johannes Dobinger	Weyringergasse 33/3 A-1040 Vienna	+43/1/5042205	+43/1/5042205/20	dobinger@cdg.ac.at	www.cdg.ac.at
CLIMT GmbH	Peter Claassen	Weizbachweg 33 A-8020 Graz	+43/316/692857	+43/316/692857/4	peter.claassen@aon.at	not available

Organisation	Contact	Address	Phone	Fax	E-mail	Website
Converter Technology Development- und Produktion GmbH	Hr Pelzer	Kaltschmiedgasse 2-6 A-8600 Bruck an der Mur	not available	not available	not available	not available
Danube	Wolfram Allinger-Csollich	Zieglergasse 28 A-1070 Vienna	+43/1/5240606/12	+43/1/5240606/99	wallinger@danube.or.at	www.danube.or.at
ECHEM Centre of Competence in Applied Electrochemistry GmbH	Jürgen Schodl	Viktor Kaplan Strasse 2 A- 2700 Wiener Neustadt	+43/262222266	+43/26222226650	juergen.schodl@echem.at	www.echem.at
Electrovac Fabrikation Elektrotechnischer Spezialartikel GmbH	Ernst Hammel	Aufeldgasse 37-39 A-3400 Klosterneuburg	+43/2243450130	not available	hae@electrovac.com	not available
EFKON Engineering GmbH	Franz Stuhlbacher	Andritzer Reichstrasse 66, A-8045 Graz	+43/316/695675	+43/316/695675/9	engineering@efkon.com	www.efkon .com
Energie AG Oberösterreich	Robert Stockenreiter	Böhmerwald- strasse 3, A- 4021 Linz	+43/732/9000/3328	0800/818001 (Austrian wide)	robert.stockenreiter@energieag. at	www.energieag.at
Energie Steiermark Holding AG (ESTAG)	Nikolaus Popovic	Leonhardstrasse 59 A-8010 Graz	+43/316/358660	+43/316/358660/5919	not available	www.estag .com
Erdgas Oberösterreich	Rudolf Zappe	Neubauzeile 99 A-4030 Linz	+43/732/9011/0	+43/732/9011/9132	not available	www.erdgasooe.at
E.V.A., the Austrian Energy Agency	Günter Simader	Otto-Bauer-Gasse-6 A-1060 Vienna	+43/1/586 15 24/24	+43/1/5861524/40	simader@eva.ac .at	www.eva.ac.at
Fachhochschule Wels	Dieter Meissner	Roseggerstrasse 12 A-4600 Wels	+43/7242/35180/184	+43/7242/72811/3166	d.meissner@fh-wels.at	www.fhs-wels.ac.at
Federal Institute of Agricultural Engineering	Josef Rathbauer	Rotenhauserstrasse 1 A-3250 Wieselburg	+43/7416/52175/43	+43/7416/52117545	josef.rathbauer@blt.bmlfuw.gv.at	www.blt.bmlfuw.gv.at
Fronius International GmbH	Ewald Wahlmüller	Günter Fronius Strasse 1 A-4600 Wels-Thalheim	+43/7242/241/1	+43/7242/241/224	wahlmueller.ewald@fronius .com	www.fronius.at
GE Jenbacher AG	Günther Herdin	Achseestrasse 1-3 A-6200 Jenbach	+43/5244/600/0	+43/5244/600/548	g.herdin@jenbacher .com	www.jenbacher.com

Organisation	Contact	Address	Phone	Fax	E-mail	Website
Intema Consult Marketing Dienstleistungs GmbH	Helmut Wankura	Karlauer Gürtel 24/IV A-8020 Graz	+43/316/76-39-30	+43/316/76/39/2	office@intema.co.at	not available
International Institute for Applied Systems Analysis (IIASA)	Leo Schratzenholzer	Laxenburgerstr.16 A-2361 Laxenburg Austria	+43/2236/807/0	+43/2236/71/313	leo@iiasa.ac.at	www.iiasa.ac.at
Joanneum Research Forschungsgesellschaft mbH	Gerfried Jungmeier	Steyrergasse 17 A-8010 Graz	+43/316/876/1313	+43/316/876/1320	gerfried.jungmeier@joanneum.at	www.joanneum.ac.at
Johannes Kepler University Linz	Gerhard Gritzner	Altenbergstrasse 69 A-4040 Linz	+43/732/2468/8703	+43/732/2468/10	gerhard.gritzner@jku.at	www.uni-linz.ac.at
KTM-Kühler GmbH	Klaus Otahal	Salzburgerstrasse 27 A-5230 Mattighofen	+43/7742/5792/18	+43/7742/5798	otahal@ktm-kuehler.at	www.ktm-kuehler.at
Linz AG	Johann Gimmelsberger	Fichtenstrasse 7 A-4021 Linz	+43/732/3400/7074	+43/732/3400/3299	j.gimmelsberger@linzag.at	www.linzag.at
Magna Steyr AG & CO KG	Peter Hödl Günter Krainz	Liebenauerstrasse 317 A-8041 Graz	+43/316/404/5420	+43/316/404/8373	peter.hoedl@magnasteyr.com	www.magnasteyr.com
Mechatronic Systemtechnik GmbH	Vanessa Paladini	Tiroler Strasse 80 A-9500 Villach	+43/4242/33999/52	+43/4242/33999/10	vanessa.paladini@mechatronic.at	www.mechatronic.co.at
Messer Austria GmbH	Robert Spindlegger	Am Kanal 2, A-2352 Gumpoldskirchen	+43/50603/0	+43/50603/273	robert.spindlegger@messer.at	www.messer.at
MI Developments Austrian Space Technology	Klaus Brunnhofer	Puchstrasse 85, A-8020 Graz	+43/316/404/3134	+43/316/404/3883	klaus.brunnhofer@sft.steyr.com	www.sft.steyr.com
Oberösterreichische Technologie- und Marketinggesellschaft m.b.H. (TMG)	Andreas Hubinger	Hafenstrasse 47-51 A-4020 Linz	+43/70/79810/5082	+43/70/79810/5008	andreas.hubinger@tmg.at	www.cdt.at
OMV AG	Franz Heger	Otto-Wagner-Platz 5 A-1090 Vienna	+43/1/40440/40870	+43/1/40440/20091	franz.heger@omv.com	www.omv.com
Österreichische Elektrizitätswirtschafts AG	Gert Schauer	Am Hof 61 A-1010 Vienna	+43/1/53113/54415	+43/53113/154415	gert.schauer@verbund.at	www.verbund.at
Plansee AG	Wolfgang Glatz	A-6600 Reutte Tirol	+43/5672/600/0	+43/5672/600/500	wolfgang.glatz@plansee.at	www.plansee.com

Organisation	Contact	Address	Phone	Fax	E-mail	Website
Polytechnik Luft- und Feuerungstechnik GmbH	Herbert Brenner	Heinfelderstrasse 69-71 A-2564 Weißenbach	+43/2672/890/0	+43/2674/890/13	h.brenner@polytechnik.at	www.polytechnik.at
Profactor Produktionsforschungs GmbH	Marianne Haberbauer, Steven Trogisch	Wehrgrabengasse 1-5 A-4400 Steyr	+43/7252/884/200	+43/7242/884/244	office@profactor.at	www.profactor.at
Rath AG	Steffen Moehmel	Hafnerstrasse 1 A-3375 Krummnussbaum	+43/2757/2401/59	+43/2757/2401/86	steffen.moehmel@rath-group.com	www.rath-group.com
SMOTECH Brennstoffzellen GmbH	Erwin Smole	Europastrasse 4 A-9524 Villach	+43/4242/90500/2132	+43/4242/90500/2010	erwin.smole@smotech.com	www.smotech.at
STUDIA – Schlierbach, Studiengruppe für Internationale Analysen	Wolfgang Baaske	A-4553 Schlierbach	+43/7582/81981	+43/7582/81981-54	studia@ris.at	www.ris.at/homes/studia
Technical University of Vienna		Karlsplatz 13 A-1040 Vienna	+43/1/58801/0			www.tuwien.ac.at
Institut für Elektrische Anlagen und Energiewirtschaft	Günther Brauner	Gußhausstrasse 25-29/373 A-1040 Vienna	+43/1/58801/37310	+43/1/58801/37399	brauner@ea.tuwien.ac.at	www.ea.tuwien.ac.at
Institut für Verbrennungskraftmaschinen und Kraftfahrzeugbau	Bernhard Geringer	Getreidemarkt 9/315 A-1060 Vienna	+43/1/58801/31530	+43/1/58801/31599	bernhard.geringer@ivk.tuwien.ac.at	www.ivk.tuwien.ac.at
Institute of Chemical Engineering	Hermann Hofbauer	Getreidemarkt 9/166 A-1060 Vienna	+43/1/58801/15970	+43/1/58801/15999	hhofba@mail.zserv.tuwien.ac.at	www.vt.tuwien.ac.at
TIWAG, Tiroler Wasserkraft AG	Michael Zoglauer	Eduard-Wallnöfer-Platz 2, A-6010 Innsbruck, Tirol	+43/506/07/21503	+43/50607/21788	office@tiwag.at	www.tiwag.at
Treibacher Industrie AG	Paul Barbic	A-9330 Althofen	+43/4262/505/425	+43/4262/505/8425	paul.barbic@treibacher.at	www.treibacher.com

Organisation	Contact	Address	Phone	Fax	E-mail	Website
University of Leoben		Franz-Josefstrasse 18 A-8700, Leoben	+43/3842/402/0	+43/3842/402/7702		www.unileoben.ac.at
Department of Physical Chemistry	Werner Sitte	Franz-Josefstrasse 18 A-8700, Leoben	+43/3842/402-4800	+43/3842/402-4802	sitte@unileoben.ac.at	www.unileoben.ac.at/~p hyschem/welcome.html
Institute of Petroleum Engineering	Wilhelm Brandtstätter	Franz-Josefstrasse 18 A-8700, Leoben	+43/3842/402/8200	+43/3842/402/8202	brandstw@unileoben.ac.at	www.unileoben.ac.at/ins titute/petroleu.htm
University of Natural Resources and Applied Life Sciences	Peter Holubar	Gregor Mendelstrasse 33 A-1180 Vienna	+43/1/36006/6212	not available	peter.holubar@boku.ac.at	www.boku.ac.at
University of Technology Graz		Rechbauerstrasse 12 A-8010 Graz	+43/316/873/0	+43/316/873/6562		www.tugraz.at
Institute for Chemistry and Technology of Anorganic Materials	Jürgen Besenhard Karl Kordesch	Stremayrgasse 16/III A-8010 Graz	+43/316/873/8260	+43/316/873/8272	besenhard@tugraz.at	www.ictas.tu-graz.ac.at
CD Laboratory for Fuel Cells	Viktor Hacker	Steyrergasse 21 A-8010 Graz	+43/316/873/8780	+43/316/873/8782	viktor.hacker@tugraz.at	not available
Institute for Internal Combustion Engines and Thermodynamics	Helmut Eichlseder	Kopernikusgasse 24/II A-8010 Graz	+43/316/873/7720	+43/316/873/7700	helmut.eichlseder@vkma.tu- graz.ac.at	fvkma.tu-graz.ac.at
Institut für Elektrizitätswirtschaft und Energieinnovationen	Heinrich Stigler	Infeldgasse 18/I A-8010 Graz	+43/316/873/7900	+43/316/873/7910	stigler@tugraz.at	www.aee.tugraz.at
Institute of Chemical Apparatus Design, Particle Technology and Combustion	Harald Raupenstrauch	Infeldgasse 25/B/1 A-8010 Graz	+43/316/873/7497	+43/316/873/7492	h.raupenstrauch@tugraz.at	www.cis.tugraz.at/amft
Institute of Thermal Engineering	Beate Reetz	Infeldgasse 25/B	+43/316/873/7300	+43/316/873/7305	reetz@tu-graz.ac.at	wt.tu-graz.ac.at
Vaillant Vienna	Georg Patay	Forchheimergasse 7 A-1231 Vienna	+43/1/86360/0	+43/1/86360/590	georg.patay@vaillant.at	www.vaillant.at
Verbundplan GmbH	Gerd Frik	Parkring 12 A-1010 Vienna	+43/1/53605/54820	+43/1/53605/54748	gerd.frik@verbundplan .at	www.verbundplan.at

Organisation	Contact	Address	Phone	Fax	E-mail	Website
Wiengas GmbH – Abteilung: Versuchsanstalt für Gas und Feuerungstechnik	Rudolf Wittek	Otto Herschmannngasse 4 A-1110 Vienna	+43/1/40128/1200	+43/1/40128/9120	rudolf.wittek@wiengas.at	www.wiengas.at