Final report

Virtual Campus Hub. D1.2

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D1.2 Final Report

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This report represents the deliverable D1.2 of project Virtual Campus Hub. The project runs from October 2011 to September 2013. The report is the core of the project's 2nd periodic report, which was submitted to the European Commission on November 4th, 2013.

The project is partially funded by the European Commission under the 7th Framework Programme

Core of the report for the period: Project objectives, work progress and achievements, project management

Project objectives for the period

The project objectives, as included in Annex I to the Grant Agreement are:

Concept and project objective(s)

The Virtual Campus Hub project will develop and implement the tools and e-learning platforms needed to establish a European and potential world-wide Virtual Campus network primarily for technical universities and business schools.

The Virtual Campus network will use the European e-infrastructure network incl. Géant as the communication backbone. The project will formulate end-user demands for high-quality services in support of a global virtual campus network based on a Virtual Campus Hub concept.

The Virtual Campus Hub will be developed through pilot use of the hub elements with special emphasis on the integration of research, innovation and education in sustainable energy.

The Virtual Campus Hub consists of the following components:

(1) A technical platform that can deliver virtual meeting spaces for lectures, conferences, laboratory and numerical exercises, as well as innovation tools, executive learning modules, self-study, etc.

(2) A set of documented best practices for the use of the platform for courses, teaching & learning methods, innovation processes, networking and joint programs, developed through continued complementary on-site activities.

(3) A growing inventory of staff competence and experience gained from using the Virtual Campus Hub for enhancing quality and scaling-up innovation, education and training activities primarily related to sustainable energy, combined with dissemination and communication of the resulting best practices.

The VC Hub project builds on activities and ideas concerning e-learning and virtual campuses that are currently being pursued by several universities and research organizations in Europe and combines the emerging e-infrastructure potential for high quality virtual communication with many types of audiences.

The project is inspired by:

- The Europe 2020 and the SET Plan goals addressing the need to boost and integrate research, education and innovation in the field of sustainable energy.
- The need to scale-up education and training in order to be compatible with the forecasts and predicted shortage of people with required new skills in the energy sector.
- The availability of high speed interconnection opportunities for research and education networks and the advances in end-user virtual communications tools.

- The objective of the project is to deliver a working concept for a Virtual Campus Hub in a form ready to be implemented at partner universities, research organizations with links to industries, businesses and innovation parks. The result will be published in a format that will allow other organizations to implement the Virtual Campus Hub concept.

The objectives and the corresponding deliverables will include:

1) Development of a scientific distributed digital framework concept that supports students and teachers in computer based interactive simulations and related datasets describing examples of science applications.

2) Building-up of an open community of students, professors, teachers and partners using modern communication and collaboration tools, combined with a strictly moderated quality assurance process.

In addition, the deliverables will include (policy) recommendations for:

3) The technical infrastructure needed to deliver high-quality services to networks with joint programs in research, innovation, education and training.

4) Best practice in organizations/work-flows of combined efforts and joint programming in research, innovation, education and training including the managerial and didactic aspects – in the first instance in activities related to sustainable energy and the SET Plan goals.

5) Best practice for making science and engineering available for young students in a way that supports individual learning styles ("blended learning") and makes a scientific career attractive to the students.

The results of the Virtual Campus Hub project will be presented in reports and manuals, at meetings and conferences as well as by web based video presentations, tutorials and e-conferences/-seminars.

Recommendations from the 1st periodic review

Recommendations from the 1st periodic review in December 2012 and the actions taken to meet the recommendations are summarized in the following:

Recommendation #1. With partner #3 (Polito) still not connected to eduGAIN through IDEM and GARR in spite of discussions; it is recommended to implement the federated identity application (eduGAIN) through SURFconext as a first an immediate step as discussed at the meeting – without it the project will fail in its key objective of offering an operational international pilot for virtual incubator. Please provide EC with a plan by 15/2/2013.

Action: Polito has concluded that the users for its pre-incubation support application (StartApp) are overwhelmingly from outside the university. As IdPs from industry or individual external users, e.g. through their eID, are not allowed to make use of the Géant infrastructure for federated identity management (see deliverable D5.4 Virtual Campus Hub technology evaluation report and D6.7

Final report on the Virtual Campus Hub concept for a discussion on this issue), connecting the Polito StartApp to the VCH infrastructure would have been of little added value. So the problem with offering an operational international pilot for a virtual incubator (start-up pre-incubation support) is not so much the connection of the application (StartApp), but the connection of the users that should be able to login to this application (through an industry IdP or through an approved identity of an individual user, e.g. eID). This is a problem that cannot be dealt with by the VCH consortium, but must be dealt with at the Géant or the EU level, as it is poses a barrier for the integration of education, research and innovation in general. As a workaround, Polito has created guest accounts for all users of the StartApp.

Recommendation #2. It is recommended that the project defines a metric for its expected impact and reports on this metric at the final review. One suggestion could be to measure the number of cross-institutional students recruited for each of the offered courses. Another metric should address the impact of the incubator: number of users (including SMEs), active requests, etc. This will be evaluated by the experts at the last review.

Action: A metric spread sheet has been defined for measurement of the project impact. The spread sheet has been filled in by each partner by the end of project month 18, 21, and 24. Parameters in the metric include the number of users for each Virtual Campus Hub application and the Virtual Campus technology. The number of courses and disciplines engaged by the project and the number and type of dissemination activities in the project are also measured. The outcome of the analysis is presented in the deliverable D6.6 Strategy paper.

Recommendation #3. The project proposes some minor changes in manpower allocation between Work Packages without affecting the distribution amongst the partners. 4 more pms from partner #1 to WP3 (from WP2 and WP4) and 1.1 pms from partner #3 moved from WP2 to WP4. It is recommended to accept this proposal. Effect is immediate.

Action: The project work plan has been changed accordingly.

Recommendation #4. The project proposes to reschedule milestone MS14 from month 15 to month 18 and D3.3 from month 14 to month 18. Taking into consideration the delays suffered by WP3 it is recommended to accept this proposal. Effect is immediate.

Action: The project work plan has been changed accordingly.

Recommendation #5. With regard to the dissemination activities, the project visibility should be improved including the web site content. Cooperation and links with relevant initiatives - in the area –such as the Terena event should be tangible and add a real value to the VCH concept and implementation. Overall, the dissemination should be boosted without delay, in line with DoW and agreed dissemination strategy. This will be evaluated by the experts at the last review.

Action: The dissemination has been boosted in the 2nd project year. The project web site has been expanded with several new sections (*About Virtual Campus Hub, Deliverables, News,*

Collaboration, and Contact). The *News* section has been updated continuously with the latest news about the project. The news stories have also been distributed via Facebook and Twitter. The *Collaboration* section shows logos and links to the E-infrastructure community (Géant, eduGAIN, Terena, NRENs), the educational programmes, and the strategic energy networks engaged in the project. Project stakeholders have also been engaged through nine virtual events (see D6.4 Virtual Campus Hub virtual events and through presentations at workshops, meetings, and international conferences. The dissemination strategy has been discussed at the monthly project meetings and written into the meeting minutes. All dissemination activities in Virtual Campus Hub are described in D6.6 Strategy paper.

Recommendation #6. Bearing in mind the internally planned project deadline for finalisation of VCH functionalities and implementation modalities, a "status and recovery action report" should be submitted to the EC by the 15/02/2013.

Action: This report was submitted on February 12, 2013. The PO responded that the project team should proceed with the action plan and make sure that deadlines were met and that the lessons learnt on the technology hurdles/business models/legal aspects were reported to both the AAI community and the EC. Later, a proposition was made for a change of the deliverable date for "D5.3 Virtual Campus Hub technology" and "D5.4 Virtual Campus Hub technology evaluation report" to project month 24. The reason was that improvements of the technology were expected to continue until the end of the project. The proposition was accepted by the PO.

Recommendation #7. It is recommended that the Project Advisory Board is created, as planned in the DoW through twitter as it will open the project to a potentially large audience of advisors.

Action: An account has been setup at both Twitter (https://twitter.com/virtualcampushu) and Facebook (https://www.facebook.com/VirtualCampusHub) with links from the project web site. Stakeholders have been encouraged to comment on the project via these social media but nobody has posted a comment. The number of followers is limited to 13 on Twitter and 14 on Facebook.

Recommendation #8. It is recommended that the project partners make the elaboration of the promised "VC Hub Business model" (part of deliverable D6.6 "strategy paper") a top priority considering the relatively short period remaining. This should include a sustainability plan with licensing costs for third parties content provider as well as considerations on licensing and open access of VCH own developments.

Action: Different business model scenarios for the Virtual Campus Hub concept as a whole have been discussed and reported in D6.7 Final report of the Virtual Campus Hub concept. Sustainability plans have been made for each of the Virtual Campus Hub applications as described in D6.6 Strategy paper. An essential aspect of the Virtual Campus Hub concept is that the connected elements have their own business models and sustainability plans, which fit the requirements of each partner institution (as opposed to having common standards).

Work progress and achievements during the period

WP2 – E-Learning Tools

Work package objectives (from Annex 1)

Development and implementation of e-learning tools in line with the Explore Energy virtual campus concept and vision.

Progress towards objectives and details for each task

WP2 has five tasks and the work has progressed as scheduled in Annex 1 for the reporting period. All tasks have been completed. Achievements in relation to the tasks are summarised in the following.

T2.1: Development and test of remote cascade lab

Development

A remote cascade lab – shortly RCL – has been commissioned that allows the experimental determination of the steady aerodynamic performance of a linear cascade of low pressure turbine blades for various operating conditions (inflow angle, mass flow rate) by means of aerodynamic probe traverse measurements. In order to reduce the development time of the three remote labs and maximize the use of resources, the RCL has been developed using a modular design concept where a module with dedicated instrumentation – the RCL module in this case – is positioned in the common wind-tunnel facility.

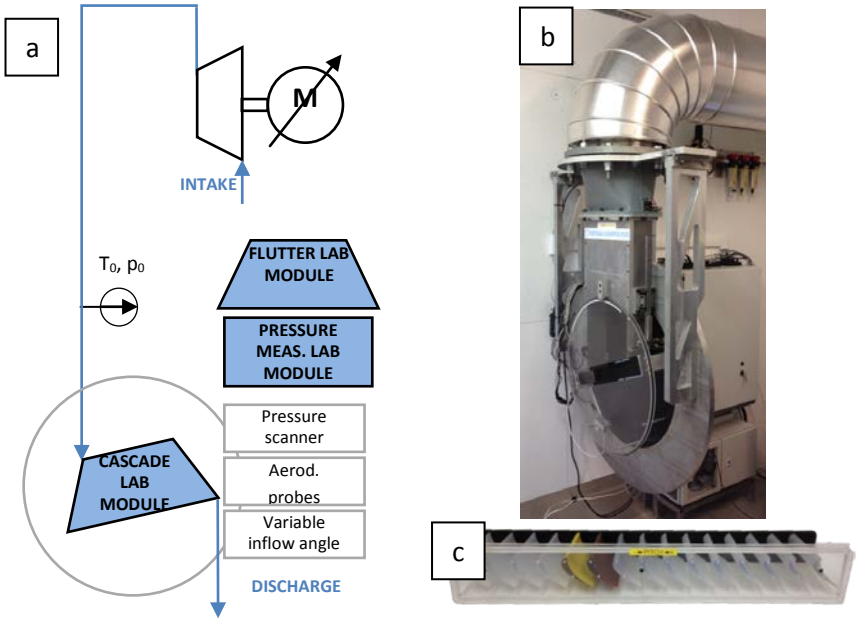

Figure 1: a) modular design of the three remote labs, b) a) RCL test rig c) RCL module

Users can remotely operate the real laboratory equipment, observe the experiment, and acquire accurate test data from their private computer (or tablet) through a dedicated graphical user interface (GUI) and a number of network cameras installed in the lab room.

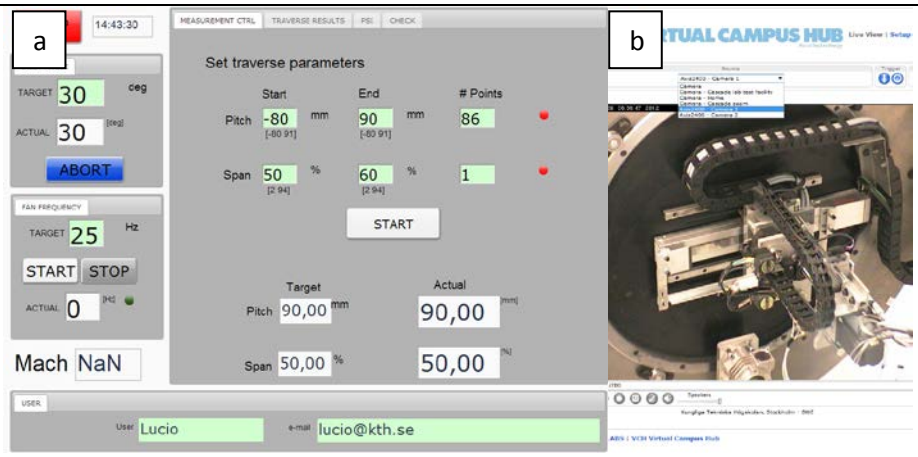

Figure 2: a) GUI for remote operation, b) view from network camera for observation

A remote cascade laboratory exercise has been developed that focuses on different aspects of gas turbine design and operation and is structured as a series of tasks of increasing complexity thus being suitable for integration in both introductory and advanced courses on turbomachinery. The exercise includes multimedia self-study material (images, 3D videos, etc.), online reservation, an online self-assessment test as pre-requisite for the control of the lab, tutorials with self-study questions at the end of each task, tools for data analysis, and an online evaluation form with questions concerned with the achievement of the intended learning outcomes and the learner's perception of the remote laboratory activity.

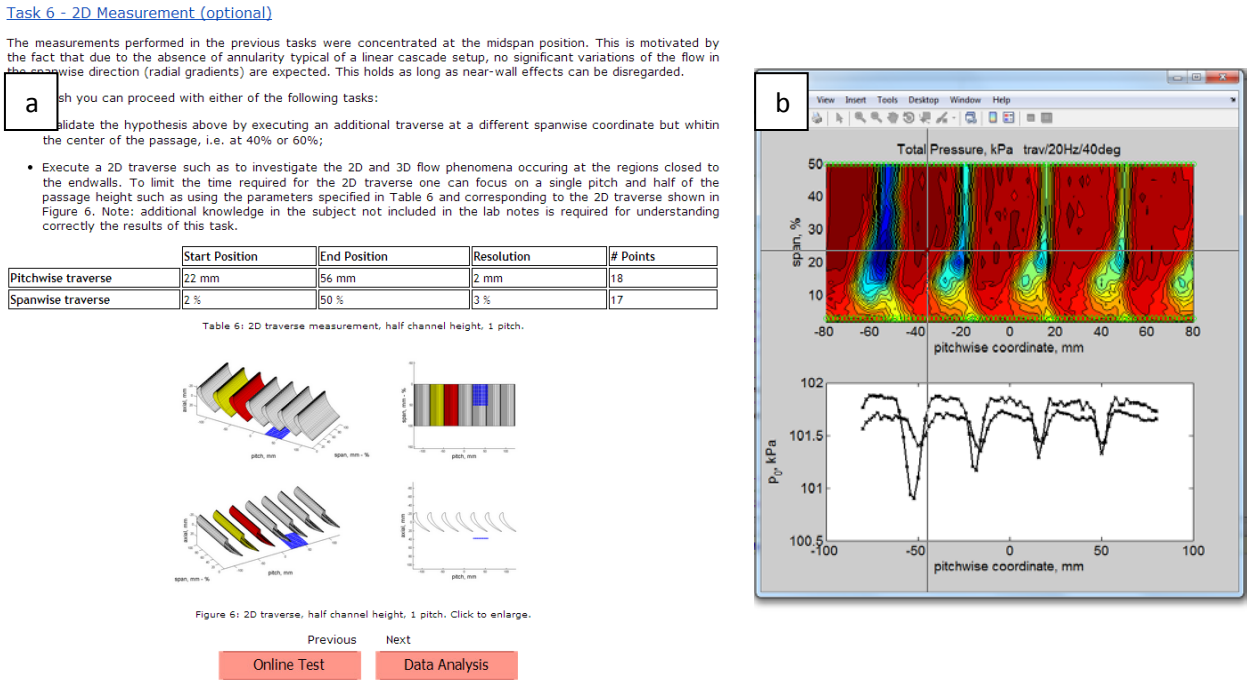

Figure 3: a) RCL exercise on web portal, b) interactive tool for data analysis

The remote cascade lab exercise is presently integrated and used on a regular basis in four courses on turbomachinery at KTH, is offered for testing to external students, researchers and professionals in industry, and is available on the web portal dedicated to the remote labs. The development of the RCL throughout the project is documented in D2.3.

Test

The remote cascade lab has been extensively tested (to date more than 250 users) both within ongoing courses at KTH as well as with users from all of the partner institution in the VCH project. Online evaluation forms, monitoring of the activities, interviews with the lab instructors have been used for the technical evaluation of the lab as well as for the assessment of the pedagogical methodology used in the exercise.

The test of the RCL in documented in D3.2 and in D2.3. It contributes to the objectives for WP2 as well as for WP3 and WP6.

T2.2: Development and test of remote pressure measurement lab

Development

A remote pressure measurement lab – shortly RPML – has been commissioned that allows gaining experience with the use of present experimental technologies and methodologies used in steady state pressure measurements in turbomachinery.

Similarly to the RCL, a RPML module with dedicated instrumentation has been developed and integrated in the existing wind-tunnel facility at KTH. Users can remotely operate the RPLM, observe the experiment, and acquire accurate test data from their private computer through a dedicated graphical user interface (GUI) and the network cameras installed in the lab room.

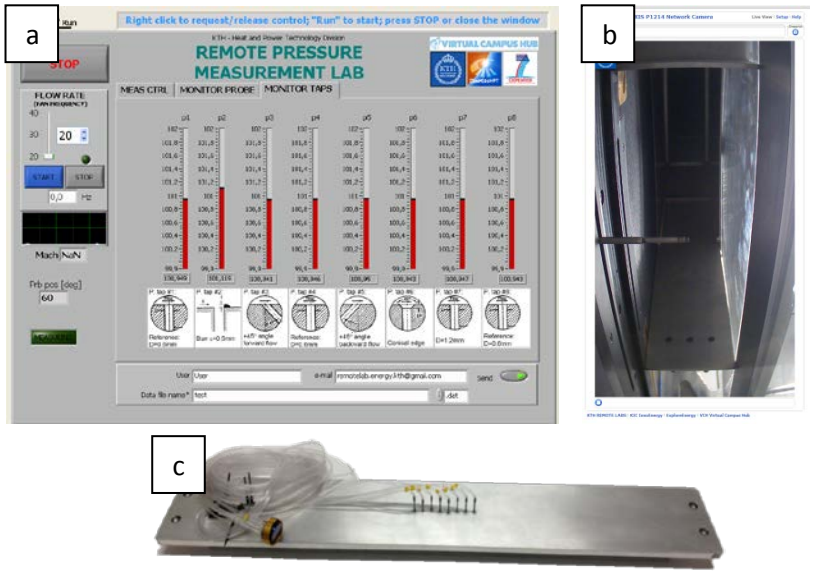

Figure 4: a) GUI for remote operation, b) camera for monitoring of probe, c) RPML module.

A remote pressure measurement laboratory exercise has been developed that focuses on (i) the influence of different pressure tappings on the pressure measurements, (ii) the use of an electronic pressure scanner and (iii) the angle sensitivity of a three-hole wedge probe. Similarly to the RCL, the RPML exercise includes interactive self-study material, online reservation, and an online evaluation form of the lab.

The remote pressure measurement lab exercise is presently integrated and used on a regular basis in the Measurement Techniques course offered at KTH and is available to the public on the web portal dedicated to the remote labs.

The development of the RPML throughout the project is documented in D2.3.

Test

The remote pressure measurement lab has extensively been tested (85 users) within the ongoing course at KTH. Online evaluation forms, monitoring of the activities, interview with the lab instructor have been used for the evaluation of the lab as well as for the assessment of the pedagogical methodology used in the exercise.

The test of the RPML in documented in D3.2 and in D2.3. It contributes to the objectives for WP2 as well as for WP3 and WP6.

T2.3: Development and test of remote flutter lab

Development

A remote flutter lab – shortly RFL – has been commissioned that focuses on the experimental investigation of the aeroelastic properties of a linear cascade of low pressure turbine blades and on the phenomenon of flutter in turbomachinery.

Similarly to the RCL and RPML, a RFL module with dedicated instrumentation has been developed and integrated in the existing wind-tunnel facility. Users can remotely and autonomously operate the real laboratory equipment, observe the occurrence of flutter under certain operating conditions, and acquire accurate test data from their private computer (or tablet) through a dedicated graphical user interface (GUI) and the network cameras installed in the lab room.

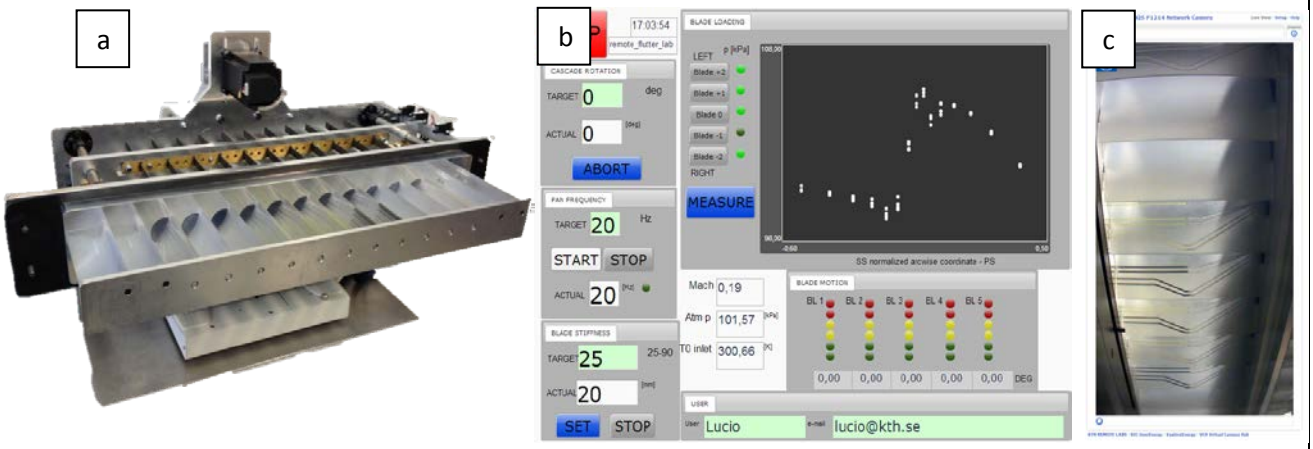

Figure 5: RFL, a) RFL module, b) GUI for remote operation, c) view from network camera

A remote flutter laboratory exercise has been conceived that trains users in performing the complete procedure required for the determination of the aeroelastic properties of the cascade. The occurrence of flutter for certain conditions enables an intimate study on the concept of critical reduced frequency and of travelling wave mode. In addition to the features offered in the RCL exercise, the remote flutter lab exercise includes dynamic CAD models and a 3D virtual guided tour of the lab for an enhanced perception of reality.

Starting from 2014, the remote flutter lab will be integrated on a regular basis in the Thermal Turbomachinery course offered at KTH. Presently the RFL exercise is available on the web portal dedicated to the remote labs.

D2.3 documents the development of the RFL until May 2013.

Test

The remote flutter lab has been tested by a number of researchers (4 at the present time) in the aeroelasticity research group at KTH, while the pedagogical methodology used in the exercise has been used as study case in the PhD-level course Educational Aspects in Energy Technology at KTH and critically evaluated by a group of seven PhD students, one lecturer, and one professor.

T2.4: Development and test of examination tool for combination of a large pool of multiple answers on "simple questions"

Continuous examination tools in the form of large pools of multiple answers on "simple" multiple choice questions (MCQs) have been developed covering various topics related to energy technology.

The generation of the MCQs has started from transforming existing open ended kind of questions to MCQs and then implementing them in Bilda, the learning management system (LMS) in use at KTH. JavaScript routines have been developed in order to randomly select a specified number of multiple correct and incorrect alternatives from a pool consisting of generally 10 alternatives, of around 5 correct and 5 incorrect. MCQs developed during the various course editions have then been collected in databases that, depending on the specific course, consist of few tens and up to a hundred of different MCQs. The MCQs are used to conduct automatically corrected exercises, assignments and exams in which a number of questions are chosen randomly by the system (in this case Bilda) from the existing database.

The MCQs tools have been presented to students in various forms in several courses offered at KTH: as exercises, as self-assessments (contributing to the final score in the exam) and as part of the final course exam. Course evaluation forms, comparison with paper-based exams, discussion with students and course assistants have been used for the assessment of the MCQs and for proposing guideline on their implementation in existing courses.

The MCQs developed during the course of the project are part of the databases of MCQs that are used on a regular basis in the ongoing courses offered at KTH included in Table 1. A number of MCQs has been made available for demonstration purposes to the VCH partners via guest accounts created in Bilda.

The development and test of the MCQs is documented in D2.3 and D3.2. It contributes to the objectives for WP2 as well as for WP3 and WP6.

T2.5: Development and test of algorithms, and a database of energy calculation exercises, for automatic correction of "minor mistakes" while allowing the students to receive credits for the parts with "correct thinking"

Continuous examination tools in the form of calculation exercises for automatic correction have been developed and used in various courses related to energy technology at KTH. The exercises are programmed using JavaScript such that there is a parallel calculation process by the program where the student's answers will be first considered to be checked against a correct value within a specified tolerance range. This means, if the student follows the correct procedure to arrive at a certain value which might even be a wrong value (numerically), the program gives points for that particular answer based on the fact that the student used correct procedure and equations. This method is named as "Twin-Tracking".

As for the MCQs, the calculation exercises for automatic correction have been presented to students in

various forms in several courses offered at KTH and their implementation and used assessed in various ways both from a students as well as trainer's perspective.

The calculation exercises developed in Bilda during the course of the project are part of the databases that are used on a regular basis in the ongoing courses offered at KTH included in Table 1. A number of exercises have been made available for demonstration purposes to the VCH partners via guest accounts created in Bilda.

The development and test of the calculation exercises for automatic correction is documented in D3.2. It contributes to the objectives for WP2 as well as for WP3 and WP6.

Courses at the HPT Division at KTH	MCQs			Calculation Type			Year	Students active in the course
	Exercises	Assignments	Exam	Exercises	Assignments	Exam		
Sustainable Power Generation			√			√	2012	~ 120
Combustion Theory		√	√		√	√	2012	25
Applied Heat and Power Technology		√	√		√	√	2012	90
Renewable Energy Technology		√	√		√	√	2012	~230
Turbomachinery	√	√	√		√	√	2012	125
Thermal Turbomachinery	√	√	√			√	2013	48
Jet Propulsion Engines	√	√	√		√	√	2012	33
Airbreathing Propulsion II	√	√	√			√	2013	8
Rocket propulsion	√	√	√	√	√	√	2013	22

Table 1: Statistics of automatically corrected assessments at HPT

Significant results

Significant results achieved in WP2 include:

- Commissioning of three fully functioning and remotely operable laboratories with focus on turbomachinery applications
- Pioneer implementation of novel web technologies (websocket) for the distant control of experimental test rigs without any end-user software installation required
- Development of a remote laboratory exercise model that include online self-assessments, interactive learning material (3D videos, CAD models, etc.), tools for data analysis, and online evaluation forms for a comprehensive learning experience

- Integration of four remote laboratory exercises in ongoing courses at KTH for an estimated minimum number of more than 200 users/year in the next few years
- Deployment of the laboratory exercises on a dedicated web portal and test with users from all of the partners in the VCH as well as with external students, researchers and professionals in the field
- Development of sophisticated MCQs with random choice of number and nature of possible correct and incorrect alternatives out of a large database
- Development of calculation exercises for automatic correction with partial grading for student's correct thinking
- Use on a regular basis in 9 courses of the continuous examination tools for online exercises, self-assessments, exams
- Guidelines on the implementation and use of the continuous examination tools
- Access to a selection of MCQs and calculation exercises to the VCH partners

Deviations from Annex I

The original deadline (month 14) of MS12 (*Lab exercises developed*) was postponed of 2 months with the approval of the partners and of the Commission because of the delay in the commissioning of the remote flutter lab. This did not have consequences for the remaining tasks nor for the other objectives in the project. The original deadline (month 18) of D2.2 and D2.3 (*Implementation of e-Learning Tools* and *Report on pedagogical improvement*) was postponed of 2 months with the approval of the partners and of the Commission due to coupling with progress in WP5. Partners finally agreed to decouple the outcome of D2.2 and D2.3 from WP5 and consider them fulfilling the requirements stated in Annex I given the fact that users from all of the partner institutions had used the e-learning tools (deployment of e-learning tools within VC Hub, D2.2) and that documented experience including cross-institutional activities was available for a comprehensive assessment of the pedagogical improvement of the e-learning tools (final consolidated report on pedagogical improvement of the e-learning tools, D2.3).

Use of Resources

See the financial statements and the summary financial report for an overview of the use of resources for the reporting period.

Corrective Actions

No corrective action to be reported.

WP3: e-Learning Programs and Courses

Work package objectives (from Annex 1)

Selection, implementation, and evaluation of the Virtual Campus Hub elements in ongoing and new sustainable energy educational programs at Master, Ph.D. levels, and in post-educational training. The evaluation will focus on quality (interdisciplinarity, cross-fertilization, mobilization) and scalability, as well as efficiency and effectiveness.

Progress towards objectives and details for each task

WP3 has three tasks. The work has progressed as scheduled in Annex 1 for the reporting period, apart from a 4-month delay of the deliverable D3.3. All three tasks are now completed. Achievements in relation to the tasks are summarised in the following.

T3.1: Survey and selection of on-going and planned educational programs at each of the partners in sustainable energy on Master, Ph.D. levels, and post-educational training, with identification and selection of suitable test cases for implementation of the VCH elements tuned to joint educational programs. Complete month 4.

A survey form was prepared by DTU and distributed to the partners in January 2012. The form was returned with information about on-going and planned educational programmes (12) and courses (150+) in renewable energy, including a rating according to four criteria: cross-fertilisation between learning and innovation, interdisciplinarity, mobility, and scalability. Based on these ratings, three programs were selected as suitable test cases:

- MJ2430 Thermal Turbomachinery course at KTH
- WAsP wind energy course at DTU
- SELECT master program at KTH, Polito, and TU/e

T3.2: Preparation and implementation of VCH elements as test cases in existing educational programs at the partners with combinations of physical and virtual sessions. The tests are chosen to fit into future collaborative educational programs. KTH will lead test from WP2, DTU will lead test to be fitted in Master program related to offshore wind; Polito will lead test related to WP4; TU/e will lead the technology aspects of the tests. All partners will participate in all of the tests albeit at different levels. Complete month 16.

Testing of E-learning applications from VCH has taken place through a series of virtual events. Each application has first been tested internally at the institution where it was developed. The partners have then tested each other's applications and invited participants from the industry to try specific applications. Some of the tests have been repeated once the single sign-on system was in place such that partners could login to each other's applications with the user name and password of their local university. The outcome of the testing is described event-by-event in the deliverable D3.4 E-learning programmes and courses evaluation report. A brief summary is given below.

Testing of remote lab exercises

The MJ2430 Thermal Turbomachinery has represented the main but not the only test case for the remote labs. Other courses related to turbomachinery offered at KTH have been chosen that better fit with the content of the specific laboratories. Common to all of them is being applied sciences and include laboratory

activities as part of the course syllabus. Testing of remote labs is described in D3.2 and D2.3.

Testing of online examination tools

The continuous examination tools of WP2 have been extensively used in several courses at the Energy Technology department at KTH in the form of exercises (for self-study), assignments and exams. The MJ2430 course is characterized by a well-established use of E-learning tools and the continuous examination tools have been included in the local LMS and integrated in the course as follows:

- MCQs in a weekly self-assessment. One point (out of 100) is assigned to a successfully completed self-assessment (at least 75% score).
- Final exam: online exam consisting of one or more calculation exercises and a pool of MCQs chosen randomly out of large database. Students sit in a computer room at the University and ID check is performed manually.

Testing of online examination tools is described in D2.3 and D3.2.

Development and testing of WAsP E-learning course

As part of WP3, DTU has developed a wind energy course called 'WAsP E-learning' with nine course modules that are run over nine weeks. The course is targeted at employees in the wind energy industry and complements an existing physical course in the Wind Atlas Analysis and Application Program (WAsP). Both courses are offered to the industry on commercial terms. More information about the wind energy course is available in D3.2.

Two test runs of the entire WAsP course have been performed; one with 12 participants from DTU and one with 24 participants from the other partners and from the wind energy industry. Once the LMS itslearning got connected via federated authentication and eduGAIN, a test was performed where the course teachers and course participants from the partners logged in again; this time with the user ID of their local university. The test persons provided their feedback to the new login procedure.

The course development in Virtual Campus Hub has inspired others at DTU's Department of Wind Energy to develop online courses for continuous education. Two new courses (WAsP Engineering and HAWC2) have been designed, which follow the same pedagogical and technical format as the WAsP course.

The WAsP course environment can be accessed via the Virtual Campus Hub portal, once the users are registered inside itslearning. Alternatively, it can be viewed through https://www.itslearning.com (select 'DTU Wind Energy' and type in the user name 'guest' and password 'Online2306').

Testing of E-link functionalities

E-link functionalities have been developed and described under WP4. The E-link functionalities, and particularly the business model canvas functionality of StartApp, have been tested by the other partners who have all been granted access to StartApp. For example, DTU has used the application during the development of a business model for the WAsP E-learning course. Further testing has taken place as part of WP4.

Testing of online collaboration tools

In WP5, MS SharePoint has been connected by TU/e to the Virtual Campus Hub infrastructure. The connection has allowed the partners to login to the project team site (after its migration from DTU to TU/e)

with the user name and password of their local institution.

Also in WP5, TU/e and SURFnet have tried to set up a pilot with a so-called unified communications hub (UC hub) The unified communications hub has been tested in connection with student projects on entrepreneurship at TU/e and during the SELECT M.Sc. Project of the Year event in 2012 where students from three of the partners participated.

T3.3 Assessment and evaluation of the test cases; DTU will lead with contributions from the responsible parties for each of the tests from the other partners. Complete month 20.

The virtual events have been evaluated by the teachers and participants involved through digital surveys. The deliverable D3.4 e-Learning programmes and courses evaluation report describes these evaluations and compares the outcome of each virtual event with the corresponding physical process.

Significant results

Results achieved in WP3 so far include:

- Three test cases have been selected out of a larger inventory of renewable energy programmes (12) and courses (150) at the partners.
- An online course in wind energy (WAsP course by DTU) has been developed and tested and is now offered commercially to clients from the wind energy industry. Learning material for two additional online courses (WAsP Engineering and HAWC2) has been prepared.
- Nine virtual events have been carried out where Virtual Campus Hub applications were tested and evaluated in real teaching and collaboration situations. The events have been evaluated against physical processes (see D3.4 e-Learning programmes and courses evaluation report).
- Testing of the E-link functionalities (StartApp by Polito) has been performed by the other partners.
- Best practises for using the E-learning tools and E-link functionalities of Virtual Campus Hub have been documented (see D6.7 Final report of the Virtual Campus Hub concept).

Deviations from Annex I

The delivery date of D3.3 Trial implementation and test of two examples of incubator processes was changed from M14 to M18 through a proposition to the PO in connection with the 1st project review. This was a consequence of delays in WP4 and did not influence other work streams in WP3 or in the project as a whole.

Use of Resources

See the financial statements and the summary financial report for an overview of the use of resources for the reporting period.

Corrective Actions

No corrective action to be reported.

WP4: e-Link Innovation for Decision Makers

Work package objectives (from Annex 1)
The objective of this work package is to integrate, in the e-learning and data sharing functions provided by the Virtual Campus Hub, new interaction modalities that allow involvement and information exchange with innovative SMEs.

Progress towards objectives and details for each task
WP4 has three tasks as scheduled in Annex 1. The work has been delayed by 1-2 months throughout the project period but all three tasks are now completed.

The adopted methodology for WP4 is summarized in the following steps:

- **Identify requirements coming from Entrepreneurs.** To identify, with the involvement of the experts, the specific requirements for both contents and tools to be analyzed during the project (and to be tested in field trials). Such selection should take into account specific priorities (such as the criticality of the process for current SMEs, the effectiveness of possible on-line implementations, the relevance to the Energy sector, the importance towards the success of the enterprise, the needs expressed by the entrepreneurs, etc) and constraints (mainly represented by project timing and budget). Status: *completed.*

- **Identify available information sources.** To identify the information sources of interest for the target enterprises. The VC Hub project acknowledges that such information is very often available (albeit sometimes in non-free forms), but that a clear and easy to research updated list of resources should be identified and evaluated. Resources will range from informational to educational, from legislative/normative to technical, from detailed/specific to general, from managerial to project-oriented. Status: *completed.*

- **Design an Innovation platform.** To analyze the identified requirements and, with a top-down design methodology, to organize them as an architecture of a possible on-line platform offering services to innovative start-ups. This phase must be highly comprehensive and open-ended, and should consider “all” needed functions and contents in a general blueprint. In the next phases, only a subset of such functionalities will be carried over and experimented. The designed architecture will be compatible with the federated architecture proposed in the VCH platform, and will avoid duplicating the effort already existing in the “Virtual Incubator” work package of the previous Explore Energy VC project. The innovation functionalities analyzed in the previous phase should address a wide range of use cases. Some of these use cases will be more interesting to evaluate in the VCH project, because they might bring higher innovation potential. Other use cases, deemed to be less innovative and/or more straightforward, will be left for successive developments. In this step, we will select most innovative / most promising functionalities, and we will implement them, as a subset of the complete platform. Such services will be populated with real data and will be available for trials within the project partners and with selected incubators and startups. Status: *completed.*

- **Dissemination and exploitation.** To host the experimental trials of the developed functionalities. The trials will involve initially the project partners, and the incubator structures linked with the participating universities. Such incubators will be involved as early users of the system, which if successful will be extended after the end of the project. Initial contacts with the incubators have shown that some functionality is of real interest and, if implemented, they are willing to adopt and support them in the long term. Therefore, according to social marketing approaches, the trial phase (free to early users) will also work as dissemination of the project results and of the VC Hub platform. Status: *completed.*

Achievements in relation to the tasks of Annex 1 are summarised in the following.

T4.1: Analysis of existing virtual material for decision makers and innovation on energy issues, and requirement analysis.

The goal of this task is to identify learning contents, information material, interesting information sources (both free and paid) that are useful to the pre-incubation phase of energy related startups. These contents should cover both technical information, highly specific to the energy sector, and managerial information, including specific business models adopted in the energy sector.

For the first sub-goal of the task, i.e. to collect and organize available digital resources, we followed a two-step methodology:

- First, we proposed a taxonomy of the resources to be collected (reported in deliverable 'D4.1 Interim e-Link evaluation report')
- Second, we proposed a format for collecting data, that lists the categories (meta-data) adopted in data collection and classification (reported in deliverable 'D4.1 Interim e-Link evaluation report')

Politecnico di Torino distributed the suggested format to the partners in July 2012, and collected relevant sources of information as a result of the survey. The list of content is available in deliverable 4.1.

The collected information shows that there is a wide interest in the theme of renewable energy, and confirmed our assumption that a huge variety of information is already available to the target enterprises, and therefore the project should not concentrate in developing new material.

It should, on the contrary, concentrate on designing and developing innovative services to help target enterprises to find relevant and "ad hoc" information. The services should catalogue, comment, give access and create relationships among existing information, representing a powerful tool for discovering and exchanging knowledge.

For the second sub-goal of the task, i.e. identify requirements for innovative on-line functionalities, services and contents that are relevant for innovative SMEs and startups in the energy sector, we involved the I3P company (formally: I3P - Società per la gestione dell'Incubatore di Imprese Innovative del Politecnico di Torino - S.c.p.a.).

The main activity of this sub-task was the identification of innovative ICT services and contents of interest for small and medium enterprises in the energy sector, and was fulfilled through contacts with local enterprises, by involving the project partners, and through the involvement of other (local and European)

project in which I3P is involved.

WP4 addresses topics that are in strong relationships with other projects active in the context of the "Explore Energy" broad initiative. In particular, the project «EXPLORE Energy Virtual Campus» described the definition and creation of a "Virtual Incubator" for on-line handling of the selection and incubation phases of new enterprises. The approach taken in VCH acknowledges the advancements and the developments already put forward by the Explore Energy VC project, and aims at complementary functionalities, that contribute more to the technical side of the entrepreneurial activity, and are more aimed at the pre-incubation phase (preparation of the business plan and identification of the main innovation products or services). In particular, VCH has brought in functionalities related with e-Learning, benchmarking, market information, technical resources, etc.

The result of this sub-task is a list of the most important requirements from a startup point of view. The list, together with the methodology and process, is included in deliverable D4.1.

T4.2: New Virtual Campus Hub elements for decision makers on energy issues.

The goal of this task is to identify and design the on-line tools and functionalities to be adopted by the managerial staff of the innovative companies and by the related incubation and/or funding agencies. A subset of such functionalities will be evaluated with field trials.

We analysed the list of requirements from SMEs (resulting from task T4.1) according to different criteria: criticality to business success, ease of transfer into an on-line service, cost savings for an on-line implementation. The initial suggestions for information sources and on-line services that an innovation platform should provide to its customers include (explanations are in deliverable D4.1):

- Patent databases access
- Market and Industry Databases
- Forums and other social networks tools
- Value network builders or value network maps
- Osterwalder's canvas model
- Smart lists of Web links

After that, we defined the technical infrastructure for the VCH services, both for the functional aspect and the software structure (see deliverable D4.1).

Considering the chosen architecture, we then filtered the list of requirements according to two feasibility criteria: effort required, according to the project timing, and availability of necessary information. The result, included in deliverable D4.1, is the prioritisation of the functionalities.

The e-Link application was then implemented (see deliverables D3.3 Trial implementation and test of two examples of incubator processes and D4.2 E-link functionality integrated into the Virtual Campus Hub) and called "StartApp", a name that is evocative of the "Start-up" nature of the Innovation Teams participating to the platform, and at the same time it remembers that it hosts a collection of "Apps", i.e., specific functions suitable for implementing suitable sub-tasks. The StartApp is an on-line tool for innovative start-ups, that is able to support, in a virtual way, some phases of their learning path towards incubation (the so-called pre-incubation period). The tool is available for at the address http://toce.polito.it/vchub/.

End-user functionalities of StartApp are grouped in two main areas: contents (i.e., articles and information

edited by the expert users of the system) and interactive features (i.e., tools where end-users may create new content and interact with the experts). Most functionalities are only accessible to registered users, therefore logging in is required to view the site contents.

Content functionalities include:

- **Smart List of Web Links (Smart Links).** Useful and handy "content" functionality that gives access to carefully selected "smart lists" of interesting Web links (a kind of "vertical" Webography) that could facilitate the innovative SMEs in the search and navigation on the portion of the Web that contains information relevant to their business. Content resources, in the Smart Links and in other section of the site, are explicitly categorized by a content-based top-down classification. This helps users to select the subset of information that is more relevant to their enterprise. In particular, each of the Smart Links references the proposed Taxonomy, developed as part of WP4 work, and described in Deliverable D4.1.
- **Patents.** For assessing an idea or an innovative technology it is useful to check on existing patents databases similar technologies. Often this give also the opportunity for identifying "who is doing what" in the market area under investigation. The Patent access is therefore another useful "content" functionality that gives access to selected patent databases and to specific queries to search and browse patents related to the specific energy sectors where the startup is investing.
- **Market and Industry.** In order to make a market assessment it is fundamental to have access to updated data sources for getting the most complete picture of the market scenario. The Market and Industry functionality provides access to relevant data, including conferences and market studies.

Interactive functionalities include:

- **Interactive forums (Discuss).** The interactive forum is a space, where all users may discuss among themselves (and with experts) about the different topics. We decided to use an innovative forum platform, that could join the benefits of forum-like interaction, coupled with Facebook-like intuitively, and backed by a reputation system similar to eBay and StackExchange. We implemented the forums based on the extremely innovative platform called Discourse (http://discourse.org).
- **Osterwalder Canvas.** The Osterwalder canvas is an extremely popular formalism for representing the strengths of a technical and business proposition, and for indicating the main relationship of the company with the market and the supply chain; it consists of a graphical formalism composed of 7 boxes. The pre-incubation process requires users to create such a model for their proposed business, and share it with their tutor, in order to improve the business proposition. The StartApp website features an interactive editor to create, edit, share and comment Osterwalder Canvas sheets for any registered User and Team in the system.

A more detailed description of the functionalities is available in deliverable D4.2, that also includes screenshots of the application.

Finally, we experimented and evaluated the "StartApp" web platform". In particular, we conducted a three-tiered test methodology:

1. Technical and functional testing, conducted at Politecnico di Torino.
2. General functionality and informal feedback, conducted within VC Hub project participants.
3. Structured focus groups, involving actual companies in the incubation and pre-incubation phases, and lead by the I3P experts and tutors.

Deliverable 'D4.3 E-link evaluation report' gives full details of the three phases of the experimentation,

reports feedback and assesses the relevance of all the StartApp implemented features.

The results of this evaluation are encouraging, and in particular some features (market and industry database; Osterwalder canvas) were highlighted as highly useful. Some other features, such as the forum, despite their technical and graphical sophistication, were considered less useful, probably because such tools already exist in other contexts, and the need of a "private" and specific forum is not very relevant.

In the forthcoming months, even after the end of the project, the StartApp tool will continue to be available, and will be hosted by Politecnico di Torino. The I3P incubator will have access to StartApp for their internal incubated companies (in the Energy sector), and for the Start Cup competition that will take place in April-May 2014. The other VCH project partners, as well the incubators related to their institution, will also have access to the service.

T4.3 New Virtual Campus Hub elements for start-ups and innovative SMEs.

The goal of this task is to identify and design the on-line tools and functionalities to be adopted by the technical staff of the innovative companies. A subset of such functionalities will be evaluated with field trials.

This task is strictly related to task 4.2, sharing the methodology but customizing the selected functionalities for a different user target. For details of the activities done, please refer to task 4.2.

Significant results

Significant results achieved in WP4 include:

- A list of existing virtual material for decision makers and innovation on energy issues has been created, analysed through a proposed taxonomy

- The general architecture of the VCH platform, both for the functional aspects and the software structure has been designed, working in strict cooperation with end-users (incubators).

- The "StartApp" web platform, an on-line tool for innovative start-ups, that is able to support, in a virtual way, some phases of their learning path towards incubation (the so-called pre-incubation period) has been implemented, with the functionalities identified in the requirement analysis.

- The "StartApp" web platform has been tested and evaluated by real users.

- A plan for sustainability of the "StartApp" web platform has been designed, in cooperation with I3P.

Deviations from Annex I

The original deadlines of the deliverable D3.3 (Trial implementation and test of two examples of incubator processes) and of MS14 (First e-Link & virtual incubator processes ready for industry) were postponed to month 18 with the approval of the partners and of the Commission because of the initial difficulties in

finding a fruitful synergy with the Explore Energy VC project, whose objectives partially overlap with VC H's ones, and of the need to fill a competence gap in the business field. This did not have consequences for the remaining tasks nor for the other objectives in the project.

Use of resources

See the financial statements and the summary financial report for an overview of the use of resources for the reporting period.

Corrective Actions

No corrective action to be reported.

WP5: Virtual Campus Hub Technology

Work package objectives (from Annex 1)
Survey, procurement, implementation, testing and evaluation of the e-Infrastructure components needed to establish a Virtual Campus Hub linked to the European e-science infrastructure.

Progress towards objectives and details for each task
WP5 has three tasks and the work has largely progressed as scheduled in Annex 1, with some exceptions. All tasks have been completed. Task 5.1 (preliminary technology survey report) took longer than planned. One reason was that more time was needed to acquire sufficient knowledge on technical developments related to the Géant infrastructure. Another reason was that the concept proposal for the VCH needed to be consulted with partners and it took more time than expected to find the people with the right expertise on these matters at the different partner institutions. Task 5.2 was completed according to schedule. Completion of task 5.3 was moved from month 18 to month 24 with the approval of the partners and of the Commission. The delay was due to the complexity of getting the connections to VCH working, as well as to the extra efforts needed to involve all relevant stakeholders. Achievements in relation to the tasks are summarised in the following.

T5.1: Survey of available technology and design of the technical concept for a Virtual Campus Hub.

a) *Requirement inventory: determine exactly what needs to be done and which requirements imposed by the contents of the other WP's have to be met.*
b) *Concept proposal for the VC Hub.*

Complete month 3.

A survey of available technology has been done, consisting of two parts:

1. Existing Géant infrastructure and ongoing developments.
2. Inventory of technology available and status of connections to Géant infrastructure at partner institutions.

See deliverable 'D5.1 Preliminary Technology Survey report' and 'D3.1 Prototype implementation of e-learning tools and incubator processes' for a more detailed discussion. T5.1 has been carried out in close collaboration with partners and with SURFnet, the Dutch NREN. The inventory has been translated into a concept proposal, which was consulted with partners.

T5.2: VC Hub technical concept with specifications for the VC Hub inventory/demonstrator; coordination of the implementation of the VC Hub demonstrator for the technical solutions at each of the partners.

a) *Architectural design of the VC Hub*
b) *Technical concept preparation, including requirements*

Complete month 6.

The concept proposal for a VCH (T5.1) has been worked out in an architectural design and a technical concept, which has subsequently been consulted with partners and with all NREN federations involved (SURFconext, WAYF, SWAMID and IDEM GARR). Architectural design and technical concept have been

accepted by all partners and federations involved and therefore have been the basis for the work that has been carried out for T5.3. See deliverable 'D5.2 Technical concept and recommendations for the specifications of the VC Hub Inventory & Demonstrator', as well as deliverable 'D3.1 Prototype implementation of e-learning tools and incubator processes', which discuss translating design and concept into a demo implementation in more detail.

T5.3 Testing and evaluation of the demonstrator used in WP3 and WP4. Recommendations for operation of virtual facilities such as conference room, lecture halls, coffee shop and meeting place.

a) *Implementation of test set-up at the universities involved*
b) *Implementation of pilot VC Hub elements of WPs 2, 3 and 4.*
c) *Testing of Concept*
d) *Finalise design of VC Hub*
e) *Monitoring roll-out VC Hub design at partner universities*

Complete month 18.

Following T5.2, the design of the Virtual Campus Hub has been worked out further according to the concept discussed in 'D3.1 Prototype implementation of e-learning tools and incubator processes'. During this process, a number of challenges were identified, which have been discussed in the *Status and recovery action report Virtual Campus Hub Technology* from February 2013 (cf. recommendation #6 from the 1st project review), and which led to a selection of elements from the VCH concept originally presented that could be turned into a working proof of concept during the period foreseen for this task (see the same report).

The implementation of the integration of the various elements in the Virtual Campus Hub infrastructure has been largely successful, with some exceptions (KTH remote labs could not be connected during the project period, the Polito StartApp was not connected at all and the pilot with a unified communications hub planned by TU/e and SURFnet could not take place). Most of all, the implementation process turned out to be much more complex than expected and it therefore took more time than first expected. In the end, however, a VCH proof of concept environment was realized that counts as the first real example of cross border collaboration in education facilitated by the European network service eduGAIN. Realizing this first example was not only a valuable experience for the project partners, but also for the federations involved, as crossing borders turned out to be new for them as well. In addition, the VCH experience has raised a number of important questions for which both federations and Géant-eduGAIN have no ready-made answers yet. A detailed description of the VCH proof of concept, the implementation process and its evaluation can be found in deliverables D5.3 Virtual Campus Hub Technology and D5.4 Virtual Campus Hub Technology Evaluation Report.

Significant results

Results achieved in WP5 so far include:

- A concept for the virtual campus hub technology that has been accepted by all partners and NREN federations involved. The concept is closely aligned with current developments in the Géant infrastructure and services. In addition, it clearly identifies gaps in the current Géant infrastructure that need to be overcome in order to support the further integration of education, research and innovation.

- Close collaboration between the partner universities and the NREN federations involved.

- A first working example (VCH proof of concept) for cross border collaboration in education facilitated by the European network service eduGAIN (part of Géant) that also demonstrates the scalability of the VCH concept.

- A first working example of the cross border connection of an external cloud service (DTU itslearning) to the Géant infrastructure through eduGAIN

- Experience gained at the project partners and federations involved with realizing cross border connections through eduGAIN, both from a technical and an organizational point of view.

- An agenda with functionalities for federated identity management needed in order to support future cross border collaborations effectively (especially if these collaborations scale up and involve members from outside higher education).

Use of resources
See the financial statements and the summary financial report for an overview of the use of resources for the reporting period.

Corrective Actions
No corrective action to be reported.

WP6: Dissemination and exploitation

Work package objectives (from Annex 1)

Dissemination and exploitation of the Virtual Campus Hub results to ensure their wider use within the European Research Area and beyond.

Progress towards objectives and details for each task

WP6 has four tasks and the activities have progressed as scheduled in Annex 1 for the reporting period. All the tasks are completed and achievements in relation to the tasks are summarised in the following.

T6.1 Develop a strategy for the dissemination of results, the establishment of strong know-how in and between partners on interactive and multimedia learning objects, and the commercial exploitation of the final results. Complete Month 6.

The dissemination and exploitation strategy of VCH is described in the report D6.1 Dissemination strategy paper - preliminary version. The dissemination and exploitation strategy has been updated in connection with the monthly online meetings and at the project's mid-term and final meetings as described in the meeting minutes. A final version of the strategy, which also contains a sustainability plan for the Virtual Campus Hub concept and for each of the Virtual Campus Hub elements, has been published in D6.6 Strategy paper.

The stakeholders in Virtual Campus Hub can be grouped into a number of categories which have very different roles and interests in the project and its outcome. The majority of the stakeholders share a common interest in renewable energy but there is a potential for up-scaling of the Virtual Campus Hub concept to embrace other disciplines. The main stakeholder categories are shown in Table 2.

Table 2. The most important stakeholders and their role in Virtual Campus Hub

Stakeholder	**Role**
The European Commission	Funding agency
University students and lecturers	Users of VCH applications
Professionals from the energy industry	Users of VCH applications
Entrepreneurs and SME's	Users of VCH applications
National Research and Education Networks (NRENs)	Infrastructure providers (middleware)
International E-infrastructure organisations (Terena, Géant, eduGAIN, DANTE)	Infrastructure providers (internet backbone)
University administrations and IT departments	Potential users of the VCH concept (up-scaling)
Joint educational programmes (Erasmus Mundus, Eurotech)	Potential users of the VCH concept (up-scaling)
Strategic alliances for energy and education (SEEIT, KIC InnoEnergy)	Link the VCH objectives with overall strategies

T6.2 Create and maintain a Virtual Campus Hub web site in order to market results and processes to:
(1) Improve the general knowledge on e-learning, use of virtual classroom, laboratories, and conference tools in order to create a strong European e-learning community, and to
(2) Attract and inform potential industry customers and users and stimulate their interest in the project results in order to prepare for their exploitation and commercial use.

A project web site has been setup at www.virtualcampushub.eu. The site has been maintained by DTU throughout the project period. For example, news stories about the project have been published here and the publicly available project deliverables have been uploaded to the site. The web site points to Virtual Campus Hub's social media accounts:

Facebook: https://www.facebook.com/VirtualCampusHub

Twitter: https://twitter.com/virtualcampushu

T6.3 Organize workshops, physical and virtual meetings, and a final conference to share the technical results of the project with the academic community and the industrial community (alliance partners and beyond) as well as a wider community of users, decision makers, students, etc, and to establish liaison with key players in the academic and business communities to create the necessary interest for the deployment of the results. Key academic players will primarily be alliance partners in SEEIT, KIC InnoEnergy, and their industry contacts.

The project team has participated actively in 11 international conferences and workshops throughout the project period and participation in two additional events is planned. An overview of the events is given in the deliverable D6.5 Virtual Campus Hub conference.

The project team has participated in 20 workshops and meetings with stakeholders at the national level. These events are listed in the deliverable D6.3 Virtual Campus Hub workshops and meetings.

A mini-conference was held in connection with the final project meeting of Virtual Campus Hub where stakeholder representatives were invited to comment on the project outcome and relevance.

T6.4 Organize contributions and edit project reports and the report on the Virtual Campus concept. Complete month 24.

DTU has organised contributions to international conferences and project reports and performed the final checks and submissions of all project reports. The deliverable D6.7 Final report of the Virtual Campus Hub concept has been published, which describes the lessons learned through Virtual Campus Hub.

Significant results

Results achieved in WP6 include:

- A dissemination and exploitation strategy has been defined and updated and two strategy reports have been submitted. See D6.1 Dissemination strategy paper - preliminary version and D6.6 Strategy paper.

- A project web site with logo (www.virtualcampushub.eu), Facebook and Twitter accounts have been set up and maintained continuously. See D6.2 Virtual Campus Hub web site.

- The Virtual Campus Hub partners have organised or participated in 20 national meetings and workshops with stakeholders in the project. See D6.3 Virtual Campus Hub workshops and meetings.

- Nine virtual events have been held to demonstrate the use of Virtual Campus Hub applications for real stakeholders (university students and lecturers, industry representatives). See also D6.4 Virtual events.

- Virtual Campus Hub has been presented at 11 international conferences and workshops about E-infrastructure, education, and renewable energy (13 oral presentations, 1 poster presentation, 6 conference papers). See also D6.5 Virtual Campus Hub conference.

- The deliverable D6.7 Final report of the Virtual Campus Hub concept has been published, which describes the lessons learned through Virtual Campus Hub.

Table 3 gives a quantitative measure of the dissemination activities in Virtual Campus Hub.

Table 3. Dissemination activities during the project lifetime of Virtual Campus Hub

Media	Communication	Number
Web site	News stories	18
Facebook	Likes	14
	Posts by VCH	20
	Posts by others	0
Twitter	Followers	13
	Tweets by VCH	17
	Retweets by others	0
International conferences and workshops	Oral presentations	13
	Posters	1
Publications	Conference papers	6
	Reports	13
	Other publications	2

Deviation from Annex I

A change of the content and delivery date of deliverable D6.5 Virtual Campus Hub conference was made through submission of two propositions to the PO. The project embraces many different disciplines ranging from the technical to the scientific and the business oriented. It might not be easy to reach out to all these different disciplines and stakeholders all at once through a single conference. It was therefore agreed that the project team should fulfil D6.5 through presentations at

a series of international conferences where different target audiences are present. The delivery date was changed to month 24.

Use of Resources

See the financial statements and the summary financial report for an overview of the use of resources for the reporting period.

Corrective Actions

No corrective action to be reported.

Project management during the period

Consortium management tasks and achievements

The consortium management has fulfilled the tasks listed in Articles II.2.3 and Article II.16.5 of the Grant Agreement. Specifically, the following tasks have been carried out during the reporting period:

- All records and financial accounts connected to the project have been kept and will be sent to the Commission upon request.
- The compliance by beneficiaries with their obligations has been monitored. For example, reminders have been sent out to beneficiaries in advance of every delivery date and, if necessary, when deliverables were delayed.
- The consortium agreement has been maintained (no changes in this period).
- Financial statements are being collected and quality checked for the second periodic review.

Problems which have occurred and how they were solved or envisaged solutions

No major problems have occurred during the reporting period.

Changes in the consortium

No changes have occurred during the reporting period.

List of project meetings, dates and venues

Physical and virtual project meetings have been organised by the coordinator on a regular basis. Agendas and minutes for all the meetings are available through the internal MS SharePoint site of the project and in the deliverable 'D6.3 Virtual Campus Hub workshops and meetings'. The meeting type, date, and venue for project meetings in this reporting period are given in Table 4.

Table 4. Project meetings in Virtual Campus Hub during the reporting period

Meeting type	Date(s)	Venue
Brief project meeting following the 1st project review*	03/12/2012	Brussels, Belgium
Online meeting for WP leaders	08/01/2013	Adobe Connect online meeting
Online meeting for WP leaders	20/02/2013	Adobe Connect online meeting
Online meeting about the VCH technology	25/03/2013	Adobe Connect online meeting
Online meeting for WP leaders	06/05/2013	Adobe Connect online meeting
Online meeting for WP leaders	28/06/2013	Adobe Connect online meeting
Project final meeting	05/09/2013	DTU, Roskilde, Denmark

*minutes are not available for this meeting.

Project planning and status

The current project status is that all milestones and deliverables for the reporting period have been fulfilled – although some have been delayed (see section '3.3 Deliverables and milestones tables' for details). This is our basis for ticking the box "The project has achieved most of its objectives

and technical goals for the period with relatively minor deviations" in the declaration of the scientific representative.

Impact of possible deviations from the planned milestones and deliverables

The most serious deviation from the original work plan of VCH is that some services developed (i.e. the remote laboratories and examination tools by KTH and the StartApp by Polito) could not be connected to the VCH environment within the time frame of the project. The impact of this problem is that the VCH concept has only be realised in part as a demo environment. The connection problems were not allowed to affect the testing of applications from KTH and Polito. The tests were carried out as planned but without the federated login.

The project team has put a large effort into realising the connection of all SPs but some of the issues that came up were beyond the control of the team. At KTH, it was impossible to find the technical expertise, internally or externally, to get their E-learning tools connected. The need for highly specialised technical assistance was not foreseen in the planning phase of the project. At Polito, the project team was unable to influence the high-level decision regarding Polito's lack of membership of a national federation. Workaround solutions for KTH and Polito were investigated but turned out to be of little added value. In the end, their services were connected to the VCH portal through simple web links and without the federated authentication. The barriers for connecting SPs to the VCH environment have been described in detail in the deliverable D5.4 Virtual Campus Hub technology evaluation report. The lessons learned are valuable for the E-infrastructure community and might lead to improved practises for connection of SPs in the future.

A second deviation from the work plan is that Polito has not been connected as an IdP to the VCH environment. The consequence is that Polito's students and staff are unable to login to the VCH environment with the ID from their own institution. To overcome this problem, the guest IdPs FEIDE OpenIdp (NO) and SURFguest (NL) have been connected. Polito and other external users can login via these IdPs. Therefore, the deviation from the work plan has limited impact on the project outcome.

A third deviation from the work plan is that WP5 has been delayed by approximately six months. The main reason for this delay was that the connection of IdPs and SPs via eduGAIN turned out to be much more complex than envisioned in the VCH work plan. The existing E-infrastructure was not as mature or standardised as expected and individual solutions had to be found for each connection. Testing of VCH applications was mostly performed without the federated authentication in place as it was decided to follow the original work plan for the VCH virtual events rather than delaying these, too. Once the federated authentication was in place for DTU's wind energy course and the MS SharePoint site at TU/e, additional tests were carried out using the single sign-on system. The consequence of the delay in WP5 was therefore limited.

The development of E-link functionalities has been delayed by 1-2 months throughout the project, which has influenced the dates of completion for some of the deliverables in WP4 and WP3. This delay has little impact on the project as a whole because the development and testing of E-link functionalities has followed its own work stream due to the different nature of this tool compared to

e.g. the E-learning tools. Testing of the StartApp was completed before the end of the project and the objectives of WP4 have therefore been achieved; except for the connection to the VCH environment as described above.

Changes to the legal status of any of the beneficiaries

No changes have occurred.

Development of the Project website

The external project web site is at www.virtualcampushub.eu. The site has been updated regularly with news stories about the project. These stories have also been disseminated via social media (Facebook and Twitter).

Co-ordination activities

The scientific representative of DTU (Merete Badger) has undertaken the following tasks in the reporting period:

- Maintained a MS SharePoint site for use within the project. The site is used for sharing and storage of working documents, meeting agendas and minutes, and deliverables. Milestones, deliverables and meetings are displayed in a list or calendar format and announcements are posted on the front page of the team site.
- Organised physical and virtual project meetings on a regular basis, including the project final meeting. For each meeting, agendas and minutes have been written and distributed via the team site.
- Monitored upcoming milestones and deliverables and discussed the actions required to meet the deadlines with responsible partners.
- Submitted propositions for minor changes in the work plan to the Project Officer.
- Followed up in situations where a milestone or deliverable got delayed e.g. through e-mail reminders and telephone calls to the responsible partners and notification of the Project Officer.
- Reviewed all deliverables before submission.
- Kept in close contact with the Project Officer through e-mails, telephone calls, and at the 10th E-infrastructure Concertation meeting in Brussels.
- Prepared the 2nd periodic report and the final report of the project.
- Planned the 2nd project review in Brussels together with the Project Officer.
- Monitored the work in other related projects (Explore VC, Select CD) and renewable energy alliances (SEEIT, KIC InnoEnergy, Eurotech) in order to identify synergies with VCH.

Communication between beneficiaries

In addition to the project meetings listed above, frequent communication has taken place between all of the beneficiaries via e-mails and telephone conversations. This communication has primarily been handled by the four WP leaders (one from each partner), who have established a very strong collaboration team. Information and tasks are distributed efficiently from the WP leaders to the other members of the project team. In connection with the financial reporting and any other financial issues, the financial controllers at DTU have been in direct contact with financial staff at the partners.

Frequent communication between the project partners, their national federations and external service providers has also occurred. This communication has been essential for achieving the project objectives. In addition, the coordinator has communicated with PR staff at SURFnet about a press release and an infograph on Virtual Campus Hub.

Possible co-operation with other projects/programmes etc.

Related projects

The partners of Virtual Campus Hub have previously worked together in the project Explore Energy Virtual Campus (EEVC, 2010-12). In EEVC, the partners worked towards a vision of establishing a virtual campus with all of the formal and informal elements known from a physical university campus (e.g. lectures and conferences, poster sessions, virtual incubator facilities, and a coffee house).

A range of applications, which mostly focused on synchronous learning and collaboration, were developed in EEVC to demonstrate the virtual campus idea. A major barrier for using the synchronous applications turned out to be that the technology would often fail to support the planned activities. In Virtual Campus Hub and other recent initiatives, this problem has been addressed through a switch towards asynchronous learning and collaboration. Some of the applications from EEVC (e.g. the virtual conference room, coffee house, and incubator) could be implemented in the Virtual Campus Hub as illustrated in Figure 10.

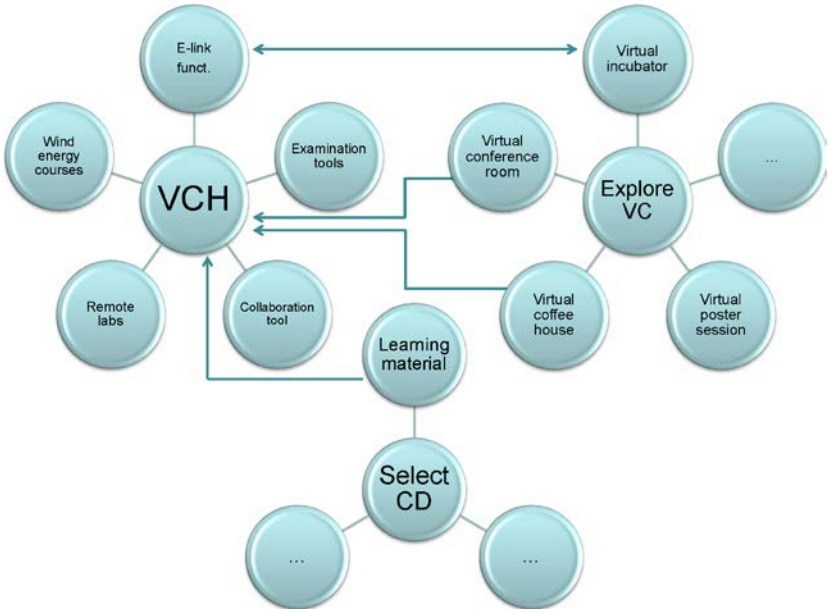

Figure 6. Diagram showing possible synergies between project Virtual Campus Hub and the previous projects Explore Energy Virtual Campus and Select CD.

Three partners of Virtual Campus Hub have been involved in the project Select CD (2010-12) about curriculum development in support of the Erasmus Select M.Sc. programme in sustainable energy.

The learning material has been distributed via the international learning platform CompEdu and could potentially also be linked to the Virtual Campus Hub. The EEVC, Select CD, and Virtual Campus Hub projects can be seen as stepping stones towards a common vision of opening and sharing resources for education in the field of sustainable energy. The three projects and several others can be found through the Explore Energy gateway hosted at KTH. This gateway represents a first attempt to setup a common access point for education, research, and innovation activities related to sustainable energy.

The core activity of VCH is to develop a technical concept for a hub, or infrastructure, which can connect the partners (and potentially other institutions) at the international level. This aspect has not been addressed in any of the previous projects mentioned above. Whereas EEVC and Select CD focus on providing and piloting end user functionalities like the virtual conference room, the virtual incubator and the virtual coffee house, VCH focuses on the infrastructure and presentation facilities that make it possible to "glue" the functionalities together in a coherent whole that can be used seamlessly across borders, be it institutes or countries.

Joint educational programmes

Additional synergies exist between VCH and other networking initiatives in the field of renewable energy, most importantly student mobility programs such as the Select Master Program, Select+ PhD. Program, KIC InnoEnergy Master and PhD Programs, European Wind Energy Master, and Nordic Master in Innovative Sustainable Energy Engineering. Students from some of these joint educational programmes have been directly involved in this project as test users of the VCH functionalities and infrastructure. Students from the Select Master Program, which has been chosen as a test case for VCH, have been particularly engaged in the project.

Strategic energy alliances

Finally, synergies exist between VCH and the strategic alliances SEEIT, KIC InnoEnergy, and Eurotech as the work in VCH is closely related to the strategies formulated by these alliances. Members of the VCH project team hold positions in SEEIT and KIC InnoEnergy and this will ensure that ideas and success stories from VCH will be fed directly into the alliances and to the European Strategic Energy Technology (SET) plan. The strategic alliances might be helpful when it comes to sustaining the project results of VCH. For example, they might be useful for mediating the contact to a SME that will continue the developments of VCH or to funding agencies that might support the further development of the VCH concept.

Deliverables and milestones tables

Deliverables

TABLE 1. DELIVERABLES										
Del. no.	Deliverable name	Version	WP no.	Lead beneficiary	*Nature*	Dissemination level[1]	Delivery date from Annex I (proj month)	Actual / Forecast delivery date Dd/mm/ yyyy	Status No submitted/ Submitted	Comments
D1.1	Mid-term report		1	1	R	PU	11	26/11/ 2012	Submitted	Delivery date changed to 26/11/2012 (submission together with the 1st periodic

[1] **PU** = Public

PP = Restricted to other programme participants (including the Commission Services).

RE = Restricted to a group specified by the consortium (including the Commission Services).

CO = Confidential, only for members of the consortium (including the Commission Services).

Make sure that you are using the correct following label when your project has classified deliverables.

EU restricted = Classified with the mention of the classification level restricted "EU Restricted"

EU confidential = Classified with the mention of the classification level confidential " EU Confidential "

EU secret = Classified with the mention of the classification level secret "EU Secret "

										report)
D2.1	Final report		1	1	R	PU	24	04/11/ 2013	Submitted	Delivery date changed to 04/11/2013 (submission together with the 2nd periodic report)
D2.1	Interim report on pedagogical improvement		2	2	R	PP	12	30/09/ 2012	Submitted	
D2.2	Implementation of e-Learning tools		2	2	D	PU	18	09/07/ 2013	Submitted	
D2.3	Report on pedagogical improvement		2	2	R	PU	18	07/06/ 2013	Submitted	Delivery changed to M20. Proposition to the PO in April 2013.
D3.1	Prototype implementation of e-Learning tools and incubator processes		3	4	P	PP	12	30/10/ 2012	Submitted	
D3.2	Trial implementation and test of two e-Learning tools		3	2	D	PU	14	21/12/ 2012	Submitted	
D3.3	Trial implementation of two incubator processes		3	3	D	PU	14	12/04 2013	Submitted	Delivery changed to M18. Proposition to the PO in connection with the 1st periodic review.
D3.4	e-Learning programs and courses		3	1	R	PU	22	28/07/	Submitted	

	evaluation report							2013		
D4.1	Interim e-Link evaluation report		4	3	R	PP	12	19/11/ 2012	Submitted	
D4.2	e-Link functionality integrated into the VC hub		4	3	D	PU	22	16/09/ 2013	Submitted	
D4.3	e-Link evaluation report		4	3	R	PU	24	31/10/ 2013	Submitted	
D5.1	Preliminary technology survey report		5	4	R	PP	3	27/03/ 2012	Submitted	
D5.2	Technical concept and recommendations for the specifications of the VC Hub inventory and demonstrator		5	4	R	PP	6	27/03/ 2012	Submitted	
D5.3	Virtual Campus Hub technology		5	4	D	PU	18	25/10/ 2013	Submitted	
D5.4	Virtual Campus Hub technology evaluation report		5	4	R	PU	18	29/10/ 2013	Submitted	Delivery changed to M20. Proposition to the PO in April 2013.
D6.1	Dissemination strategy paper - preliminary version		6	1	R	PU	6	30/03/ 2012	Submitted	
D6.2	Virtual Campus Hub		6	1	O	PU	3	27/03/	Submitted	

	website							2012		
D6.3	Virtual Campus Hub workshops and meetings		6	1	O	PP	21	28/06/ 2013	Submitted	Update submitted 27/09/2013
D6.4	Virtual Campus Hub virtual events		6	1	D	PU	21	28/06/ 2013	Submitted	
D6.5	Virtual Campus Hub conference		6	1	O	PU	18	27/09/ 2013	Submitted	Delivery changed to M24. Proposition to the PO in connection with the 1st periodic review.
D6.6	Strategy paper		6	1	R	PU	24	11/10/ 2013	Submitted	Update submitted 17/10/2013
D6.7	Final report on the Virtual Campus Hub concept		6	1	R	PU	24	03/10/ 2013	Submitted	

Milestones

TABLE 2. MILESTONES							
Milestone no.	Milestone name	Work package no	Lead beneficiary	Delivery date from Annex I dd/mm/yyyy	Achieved Yes/No	Actual / Forecast achievement date dd/mm/yyyy	Comments
MS1	Kick-off meeting	1	1	1	Yes	24/10/2011	Minutes are available at VCH team site
MS2	VCH website publicly available	6	1	3	Yes	26/01/2012	Moved to independent site in 08/2012
MS3	Selection of test cases complete - three examples of elements for joint educational and training programs	3	1	4	Yes	30/04/2012	Survey document is available at VCH team site
MS4	Survey of available technology published to partners	5	4	4	Yes	27/03/2012	Reported in D5.1
MS5	Dissemination strategy published - initial version	6	1	6	Yes	30/03/2012	Publicly available at VCH web site
MS6	Analysis of existing virtual material for decision makers on energy issues - preliminary report circulated among partners	4	3	6	Yes	26/09/2012	Presentation during mid-term meeting in Torino. Included in deliverable 4.1 (section 2)

MS7	Analysis of requirements and functional analysis of the necessary new functions inside VCH - preliminary report circulated among partners	4	3	6	Yes	26/09/2012	Presentation during mid-term meeting in Torino. Included in deliverable 4.1 (section 3)
MS8	Technical concept with specifications accepted and agreed by partners	5	4	7	Yes	27/03/2012	Reported in D5.2
MS9	Functional and architectural specification for e-Link available	4	3	12	Yes	19/11/2012	Included in deliverable 4.1 (section 4)
MS10	Technical equipment installed and tested at pilot sites - ready to begin testing and evaluation of course material	5	4	12	Yes	30/09/2012	Testing of learning material has started at KTH and DTU
MS11	Mid-term project meeting - output and minutes to be available for 1st project review	1	1	12	Yes	26-27/09/2012	Minutes are available at VCH team site
MS12	Lab exercises developed	2	2	14	Yes	31/12/2013	
MS13	Trial implementation and test of e-Learning Programs and Courses complete	3	1	14	Yes	28/06/2013	Reported in D6.4 and D3.4
MS14	First e-Link and virtual incubator processes ready for industry	4	3	15	Yes	16/09/2013	Reported in D4.2

MS15	e-Link functions integrated into the VCH (software documentation)	4	3	18	Yes	16/09/2013	Reported in D4.2
MS16	Implementation, testing, evaluation of VCH demonstrator complete	5	4	18	Yes	30/9/2013	Reported in D5.3 and D5.4
MS17	Test of assessment tools	2	2	18	Yes	31/03/2013?	Assessment tools ready for final deployment to courses at KTH
MS18	Final project meeting with agreement on future actions	1	1	24	Yes	05/09/2013	Minutes are available at VCH team site