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Energy Oriented Center of Excellence:
toward exascale for energy

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D6.3
Assessment report on dissemination, communication and networking
(includes contributions from all tasks)

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Executive Summary

This deliverable is a mid-term report that describes the main EoCoE-II activities regarding communication (promoting the action and its results) and dissemination (sharing the results) that were carried out during the first half of the project, and outlines updates and adaptations to the plan that was set out in the proposal and in Deliverable D6.2.

The aim of the Energy Oriented Centre of Excellence is to develop and promote a wide range of HPC technologies to contribute to accelerate the transition to a carbon-free economy. This entails, on the one hand, the execution of an ample range of R&D on key energy challenges; on the other, the set-up of effective dissemination and communication strategies capable of reaching all categories of stakeholders, from research to industries, to public bodies and policy makers, and offer to all these information and practical tools to favour the uptake of HPC technologies. To this end, a complex system of activities was planned and carried out.

The **general dissemination and communication of results and knowledge** was delivered by means of a wide range of instruments:

- a **website** addresses readers from industry, academia, and the general public, and offers information on the project's activities and research, news, events and meetings, training and job opportunities, links to scientific communities;
- a periodical **newsletter** is sent to a group of 350 subscribers;
- a company profile for EoCoE was opened on the **LinkedIn** social network, and a continuous stream of posts is being fed. The page collected over 300 followers, and has shown very good results in terms of interest, particularly among people not belonging to research and academia;
- a strong **YouTube** channel, inherited from EoCoE-I. To date the channel offers 76 videos, 20 of which were uploaded by EoCoE-II;
- printed **flyers** were prepared and distributed at several large-scale events in which EoCoE-II participated.

The project's number of **scientific papers** published on international journals with referee is beginning to grow. At the moment 10 papers were published so far, and of course greater progress is expected in the second half of the project when many research activities are completed.

The project's strategy relies heavily on the establishment of a **collaboration with the European Energy Research Alliance** (EERA), an international organization of particular importance, capable of acting as a vehicle for promotion and dissemination on the information and opportunities that the CoE can offer. After widespread discussions and negotiations it was agreed to set up a new HPC Joint Program within EERA, "Digitalisation for Energy", conceived as a transversal JP across most of the Alliance specific areas of interest. The JP has been approved by the EERA Executive Committee, and activities will start in the following months.

A wide range of **networking activities** has been going on in EoCoE-II, in order to enable the consortium to reach out to key stakeholders and facilitate EoCoE-II's impacts and large-scale uptake. The need for a specific expertise in **exploitation** of the project's results was recognized in EoCoE-I. It was therefore agreed in the consortium that a professional external support was needed to maximize the impact of this activity, implement a methodology select and promote a selection of Key Exploitable Results. To this end, the Italian company META Group was hired. Some preliminary results are reported in Annex A.

Project representatives participated in a great number of **events**, conferences, European initiatives. Naturally, the COVID-19 outbreak impacted very strongly in this type of activities.

Links with other CoEs were ensured primarily (but not only) through project FocusCoE, in which several partners of EoCoE-II are present. It should be highlighted that the Coordinator of EoCoE-II was elected as the General Assembly Chair of HPC3, the HPC CoE Council platform. Collaborations and associated proposals are under way with several other CoEs: HiDALGO, POP, MAX, and other projects and organizations.

A key element of EoCoE-II dissemination strategy is the set-up of a **Software as a Service (SaaS) portal**, to provide a service allowing new potential users to see in a hands-on environment how to run HPC applications. Users will work in a "simplified" environment, avoiding going through a complicated process of computing grant request and review. After a thorough analysis, Bull Extreme Factory was chosen as the tool to build the SaaS portal, because of its functionalities that allow a complete user experience. The process of acquisition, tailoring and adaptation to the project's requirements, and implementation at PSNC is underway.

The dissemination package offered by EoCoE-II is complemented by a set of specific actions concerning **Education and training**. The project offered so far 7 webinars, that were recorded and can be accessed via the website and the YouTube channel. Two on-site workshops were organized in the first months of the project. After that, the COVID-19 pandemic strongly affected the workshop, conference and hackathon programme, in which several events, including the second project face-to-face meeting, had to be cancelled.

During the second half of the EoCoE-II project, a larger role will be given to the project's **Advisory Committee (AC)**. A gathering of EoCoE stakeholders, both institutional (EERA, GENCI, and several European research centers) or industrial (ATOS, Nvidia, Intel, etc.), the AC will review the work being done by the EoCoE team, and will offer guidance to ensure the project's approach and objectives are coherent and in line with the evolution of the European HPC ecosystem. Receiving input from an assembly of select stakeholders will go a long way towards securing EoCoE's long-term viability and sustainability. From a dissemination standpoint, the AC will greatly benefit the EoCoE team, as it will allow us to involve several organizations that are central to the HPC domain in the project. The AC will be a privileged entry point into these organizations, allowing us to keep them up-to-date on the research we are carrying out.

Acronyms and Abbreviations

CFD	Computational Fluid Dynamics
ECG	Exascale Co-design Group
ECP	EoCoE Collaborative Platform
ECRA	European Climate Research Alliance
EERA	European Energy Research Alliance
EMMC	European Materials Modelling Council
EOSC	European Open Science Cloud
ETP4HPC	European Technology Platform for HPC
GPU	Graphical Processing Unit
HPC	High Performance Computing
HPC3	HPC CoE Council
IEA	International Energy Agency
JP	Joint Programme (EERA)
LES	Large Eddy Simulation
PRACE	Partnership for Advanced Computing in Europe
PEC	Project Executive Committee
SaaS	Software as a Service
SC	Scientific Challenge
SRA	Strategic Research Agenda
TC	Technical Challenge

Introduction

Purpose and scope of the document

The purpose of this document is to report accurately about: the dissemination, communication, networking and education activities. Main pillars of the EoCoE strategy is the collaboration with EERA and the development of an EoCoE SaaS portal, indeed both activities have their own Task within WP6.

Dissemination and communication activities are essential components in the project EoCoE-II because the last two of its four objectives are about the promotion of high-end exascale tools and the creation of a sustainable European infrastructure to coordinate the deployment of HPC for energy. To this end activities are finalized to :

- communicate about the project and the results to a multiple audience addressing communities beyond the project's own communities. This action is meant to inform and reach out to society to show the benefits of research. This activity started from the very beginning of the project.
- disseminate results with increasing intensity as the project's results become available. In this case, we are addressing scientific communities, industries and other commercial actors.
- enlarge the network of stakeholders of EoCoE, with a particular focus on policy makers and European projects on both HPC and energy. The link that we have now established with EERA it will assure to enlarge even further the number of stakeholders.
- organize training session to push the involvement of stakeholders and start new projects

A subcontract to META Group was started to get support in the exploitation activities of EoCoE as described in Annex A.

The Annex presents the report already submitted by META Group in May, 2020, detailing the activities carried out in the First Phase of the Contract. This part was focused on the use of several project results, and the identification of key exploitable results.

In June 2020, the Second Phase of the Contract started with the focus on dissemination plan support. The core of this part is:

- the support in dissemination of the results to the target groups of identified users outlined in the First Phase;
- identification of early adopters (potential customers outside the partnership) interested in taking part in tests and in acting as industrial testimonials for the use of services;

- identification of the unique value proposition, what makes the novel solution much better than current ones, the pivot to be used for the messages to be delivered during dissemination activities and the finalisation of the most suitable distribution channels to reach customers/users out.

In the Second Phase, the following items will be addressed:

- the Lean Canvas tool that can help in these crucial activities. It focuses on problems, solutions, key metrics and competitive advantages. It is a powerful tool to be used to further develop the

characterization of key exploitable results, prepare the materials to be discussed at meetings and draft the exploitation/business plan for a exploitable result.

- The FactSheet, used to collect the information needed to disseminate project results. It is recommended to use it in order to maximise the potential impact of selected key exploitable results. The idea of the factsheet is to present/describe comprehensively in an easy-to-understand way the exploitable result and to generate appealing 2-pages and/or to invite the solution owners to pitching events or exhibitions. A factsheet template is included in the Annex A

In the Third Phase (January 2021 – June 2021), we will set up a workshop on the Unique Value Proposition and a pitching event. The impact of META support will be assessed, the results and the activities on dissemination will be included in the EoCoE Dissemination Deliverable of months 18 and month 24.

Given the preparatory activities in networking performed till now, the new networking activities will be performed in order to offer the opportunities to META activities to be presented in policy conferences and to EoCoE stakeholders.

Methodological approach

In order to communicate effectively about EoCoE-related activities and achievements, we designed a complete, exhaustive, frequently updated website. The website is the very starting point for any information about EoCoE. Newsletters and LinkedIn profile are tools that are used to enlarge as much as possible the audience of the website. This strategy is confirmed as a successful strategy, as testified by the statistics of the website and of the LinkedIn profile.

Dissemination activities are mainly based on conferences and scientific papers. The trend is now convincing and it will supported until the end of the project. Dissemination activities have slowed down due to the COVID-19 pandemic, but we are hopeful they will restart soon, and gain steam in the upcoming months. More scientific results are becoming available, and their publication as success stories will be a pilar of future dissemination activities. News in newspapers will strengthen the engagement of a wider public and will support and facilitate the networking activities.

The information system is supported by a common repository platform (every project member can access all sections) where all information and documents are collected. An HowTo has been distributed to all participants with a detailed description about the internal procedures to be followed to efficiently and correctly circulate and store the information and the documents.

EoCoE-II has Work Package 6 specifically directed towards dissemination and communication activities. Work Package 6 "Dissemination and Networking" has indeed the following objectives:

- Create core dissemination tools, including a logo, public website, video, poster, e-newsletters and project brochure

- Network with, disseminate and broadly communicate information about the project, its results and its impacts to targeted end-users, regulators, other stakeholders and the general public
- Put in place a stable collaboration with EERA, seen as a key stakeholder in the topics of interest of the project
- Organize and hold the Project Meetings and Workshops, also extended to students, researchers, industrial stakeholders
- Collaboration with PRACE/PATC and other organizations/projects, to address the skills gap in computational science by specialised training and capacity building measures to develop the human capital resources for increased adoption of advanced HPC in academia and industry (including SMEs).

Work Package 6 is structured in five tasks devoted to different but complementary activities of dissemination and communication:

Task 6.1: Dissemination and Communication of results and knowledge
Task 6.2: Establishment of a collaboration with EERA
Task 6.3: Networking with stakeholders and EU HPC landscape
Task 6.4: Design, specifications and implementation of services
Task 6.5: Education and training

In the following sections, the contribution of each task to the EoCoE-II dissemination will be described in details. For each task, the activities done in the first 18 months are reported with a detailed discussion of what the main achievements are, and what the corrections needed for the next period are.

Dissemination and Communication of results and knowledge (Task 6.1)

Several channels of communication have been put in place: website, social media, videos, graphics, publications, events.

Website

The website is the project's main channel of communication, and must address a wide variety of potential users, ranging from project partners themselves, who use it as a reference tool, to HPC specialists, who look for technical-scientific in-depth articles, to members of the general public, who may land on the website for the most diverse reasons and, generally speaking, look for information that can be easily understandable and does not require a strong background of expertise.

The website that was set up in the very first months of the project has met this requirement, addressing readers from industry, academia, and the general public, and offering information on the project's activities and research, news, events and meetings, training and job opportunities, links to scientific communities.

The website, reachable at https://www.eocoe.eu/ is being continuously updated and improved, and was partially reorganized since the project's beginning to better meet the new needs of communication.

The website collected on average about 250 visits per month, serving a total of 665 pages per month. The average time spent by a visitor on the website was around 3 minutes. Visitors are nearly all from Europe and the United States.

Newsletters

Newsletters are used to report the last updates of the website. The advantage of newsletters is that they arrive directly in the mailing box of the interested readers in order to invite them to get more information, with a direct link to the EoCoE website. Three EoCoE newsletters were published on the 13/06/2019, 14/11/2019 and 14/05/2020.

In the 13/06/2019 newsletter, a general overview of the EoCoE-II project was reported. It was sent after the completion of all the website sections. The newsletter reported the Technical Challenges around which the project is organized.

The 14/11/2019 newsletter was gave a general description of the EoCoE-II project and some of its Scientific Challenges:
- EoCoE events and activities (EoCoE presence at SC19)
- Scientific Challenges:
    - Wind for Energy
    - Materials for Energy
    - Water for Energy

The 14/05/2020 newsletter reported information on:
- Success stories: Wind for energy, HPC performance, Fusion
- Webinars:
    - Numerical challenges for the simulation of magnetic fusion plasmas
    - Accelerated hydrologic modeling: ParFlow GPU implementation
    - Paving the way to AMR groundwater simulations with Parflow+p4est
- Hiring opportunities within EoCoE

Anybody can subscribe to the Newsletter from the project's website. The newsletter has on average around 350 subscribers, who receive the material which is sent using a Mailpoet service.

On average, over 30% of the recipients have opened/read the newsletters, and around 10% of the recipients have clicked on one of the links that were published.

Social network: LinkedIn

LinkedIn is the most popular professionaly-focused social network today, with an ample target of users covering academics, industries and policy makers. In May 2019, a company profile has been opened on the LinkedIn social network for EoCoE: https://www.linkedin.com/company/hpc-energy/. This LinkedIn profile is used to promptly disseminate EoCoE news and invite people to visit the EoCoE website for more detailed information.

LinkedIn is used to advertise about the EoCoE webinars, the meetings attended by EoCoE participants, the EoCoE newsletters and about the publications of new scientific and technical results published on international journals. About 40 new posts were published on LinkedIn that has been read by several people interested in the EoCoE activities. Some of them , at the moment 313 decided to follow the LinkedIn page and get informed about the updates. LinkedIn provides useful tools to monitor the level of interest of both the single published posts and of all the activities in a selected period of time.

Considering the last 6 months (30 November 2019 - 30 May 2020) we can report the level of interest of the EoCoE page. In the following Table we report the "Impressions" versus time. "Impressions" means: Views when an update is at least 50% on screen for at least 300 ms, or when it is clicked, whichever comes first. It is interesting to note that in March, April and May we had more 1000 impressions, that means the EoCoE post attracted the interest of a lot of people scrolling on the LinkedIn, on the average more than 30 persons a day.
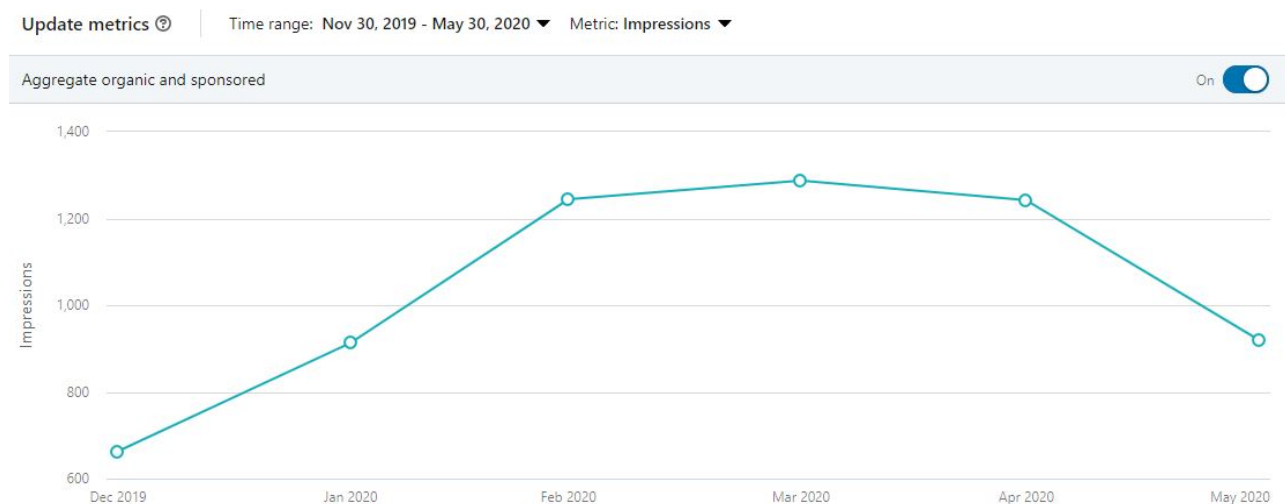
Figure 1: EoCoE LinkedIn impressions per month

It is also very encouraging to report about the "Engagement" rate. "Engagement" is calculated as: (Clicks + Likes + Comments + Shares + Follows) / Impressions. The peak of the Engagement rate was in February with a maximum value of 10. On the average EoCoE had 8.06 for the Engagement rate that is higher than other national institutions, ENEA, for instance, even if EoCoE has a lower number of followers. This value means that people reading the EoCoE posts had the interested to continue reading in the EoCoE page with an average number of actions equal to 10. It means that on the average people reading EoCoE posts is engaged to navigate to look for more information about EoCoE.

LinkedIn also allows a better understanding of who was really interested in the EoCoE pages, i.e. who clicked on the EoCoE posts to look for more information. It is interesting to realize that the greatest part of people that clicked on the EoCoE posts came from outside of the project, and from countries where no partners of EoCoE reside. For instance, in the following Figure we can see that out of 447 people that have scrolled the EoCoE posts, only 144+57= 201 are from research and universities, all the others are from other institutions. Indeed as reported in the following figure there is a large part of the visitors that work for small institutions, that we could address as industries and small companies.
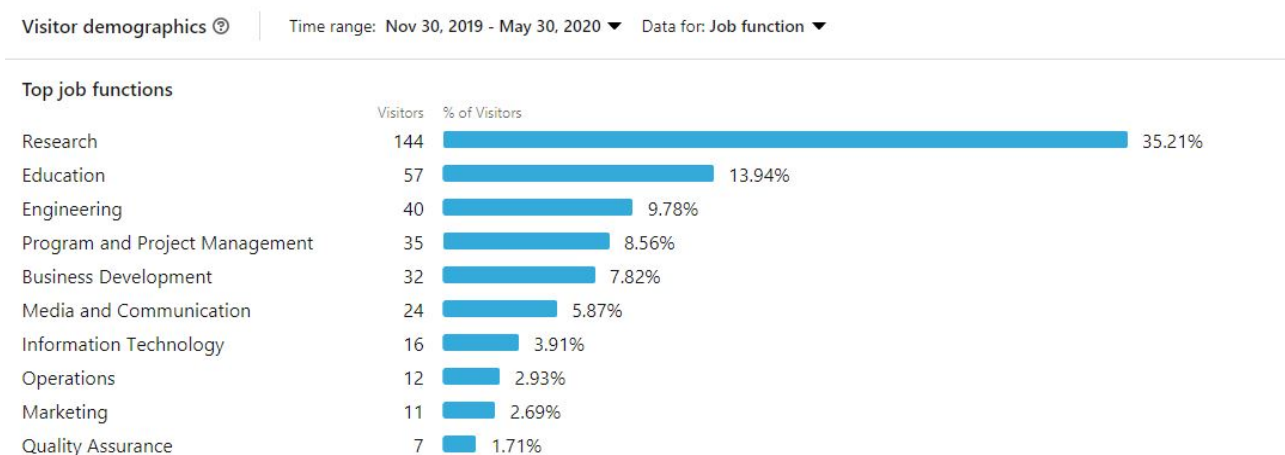
Figure 4: EoCoE LinkedIn visitors by business type
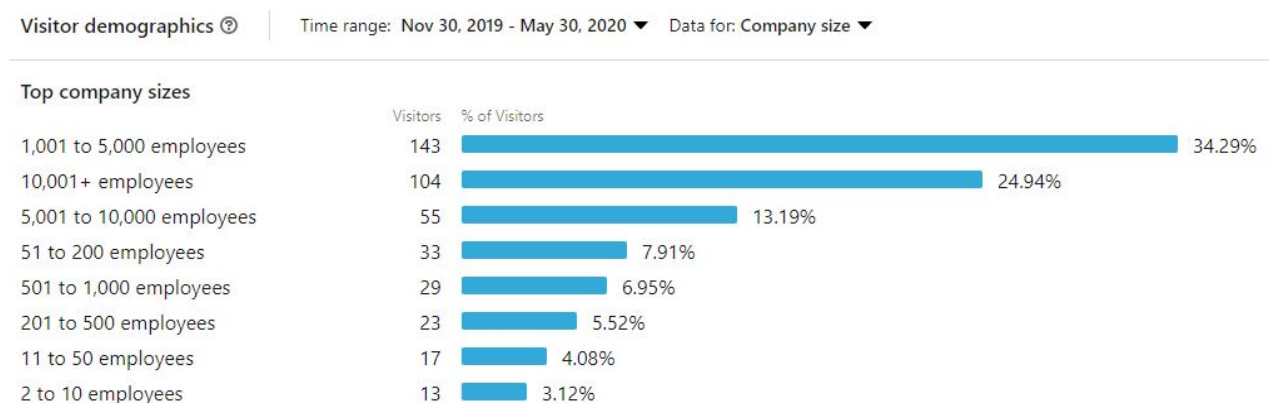
Figure 5: EoCoE LinkedIn visitors by business dimension

Moreover some of the visitors were so interested that decided to be followers too. They are at the moment 311 (on the 2nd of July they were 348). It is interesting to report that out of 311 followers, only 113+35= 148 are from research and higher education.

Follower Demographics ⊘   Data for: Industry ▾

Top industries

|	Followers	% of Followers
Research	114	37.75%
Higher Education	35	11.59%
Information Technology and Servic...	24	7.95%
Government Administration	19	6.29%
Oil & Energy	14	4.64%
Renewables & Environment	11	3.64%
Computer Software	9	2.98%
Hospital & Health Care	4	1.32%
Semiconductors	4	1.32%
Telecommunications	4	1.32%
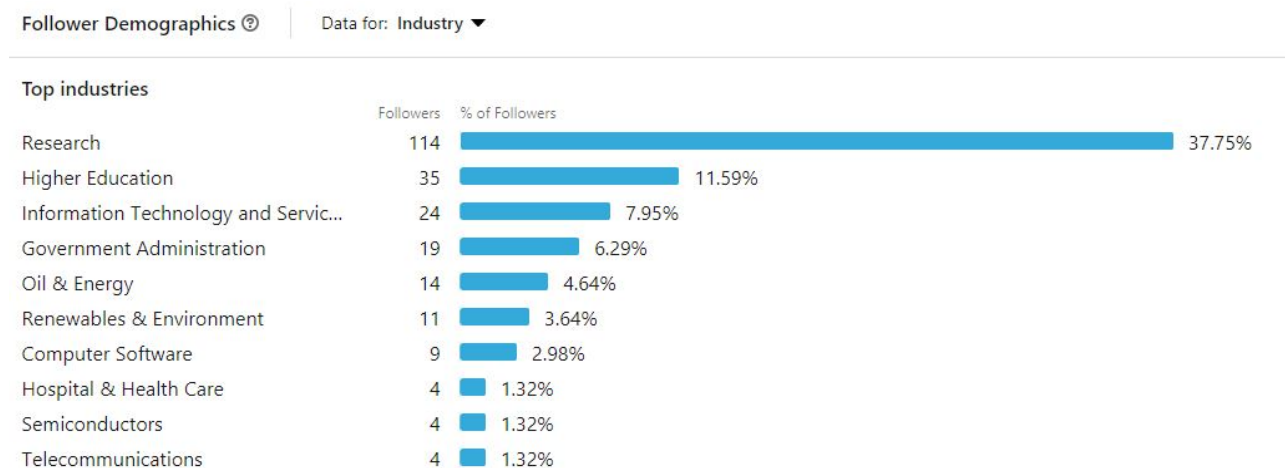
Figure 6: EoCoE LinkedIn followers by business type

Thus, we can conclude that LinkedIn really can be used to promote the EoCoE brand and ensure rapid, efficient, high-impact dissemination across scientific and technological sectors.

EoCoE YouTube channel

The EoCoE YouTube channel has been steadily growing, both in terms of the content the EoCoE team has supplied and in terms of viewers.

Through the first 18 months of the EoCoE 2 project, we uploaded twenty new videos, which we can separate in two categories. The first category is a series of videos professionally shot during the EoCoE consortium meeting held in Brussels, in September 2019. These videos cover every scientific and technical challenges the EoCoE project is tackling, as well as a general presentation of the project; it makes for a vivid snapshot of the project's goals, achievements and strategy, as they were in the fall of 2019. The second category is a collection of every webinar organized by the EoCoE team since the beginning of the project (7 so far, see the webinar section of this document for more details). These webinars cover a large spectrum of scientific and technical topics, from linear algebra solvers to the simulation of magnetic fusion plasmas, and while we are very much aware of the demanding nature of these videos, we are confident they are very representative of our work.

The EoCoE YouTube channel attracts around 280 viewers per month, which amounts to 12 hours of content viewed; this number is climbing, as demonstrated by the 451 views (28 hours viewed) we generated between mid-May and mid-June 2020. The number of subscribers, while still modest, has been growing as well, from 77 to 89 on said period.
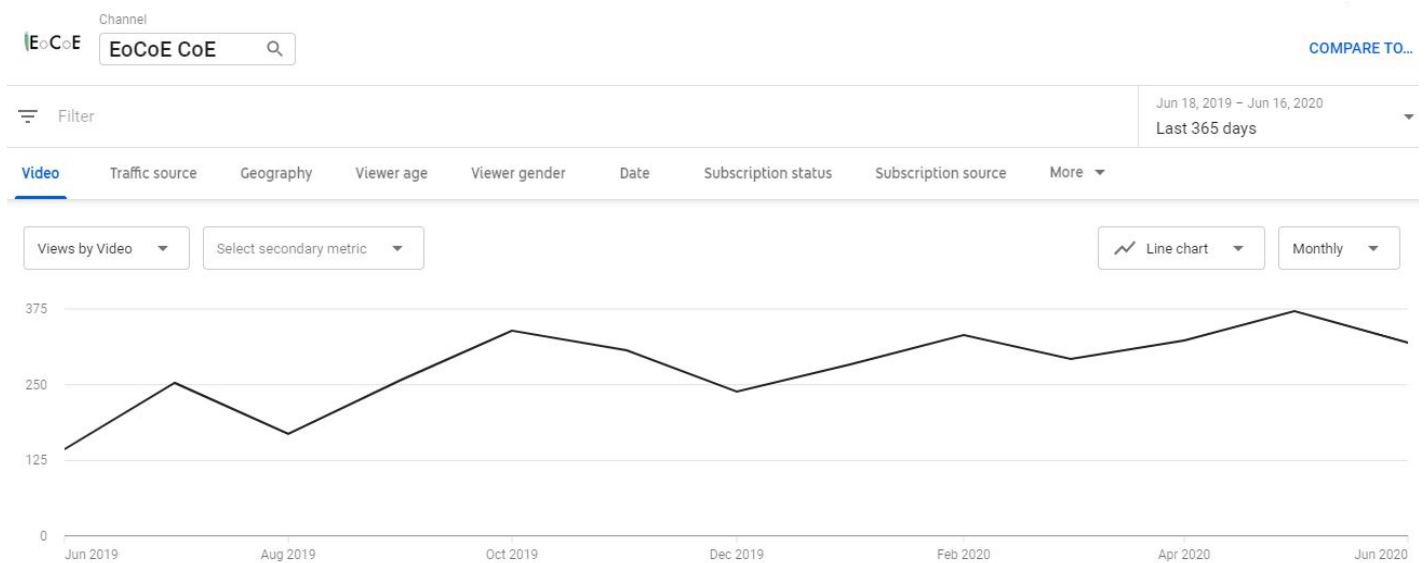
Figure 7: EoCoE YouTube channel views, from June 2019 to June 2020

Viewers mostly come to the EoCoE YouTube channel from their own YouTube research, but we are noticing a steady climb of traffic coming from the channel's page. We usually had 15 to 25 monthly viewers coming from the channel's page until February 2020, and this number has risen to 35 to 60 monthly viewers since March 2020. The EoCoE team sees this evolution as a positive sign, as it illustrates the fact that an increasing number of viewers is now consuming EoCoE content from the channel itself instead of jumping from one content creator to another. Solidifying the EoCoE YouTube channel as a hub for HPC-related content could be a breakthrough for the project's dissemination strategy.
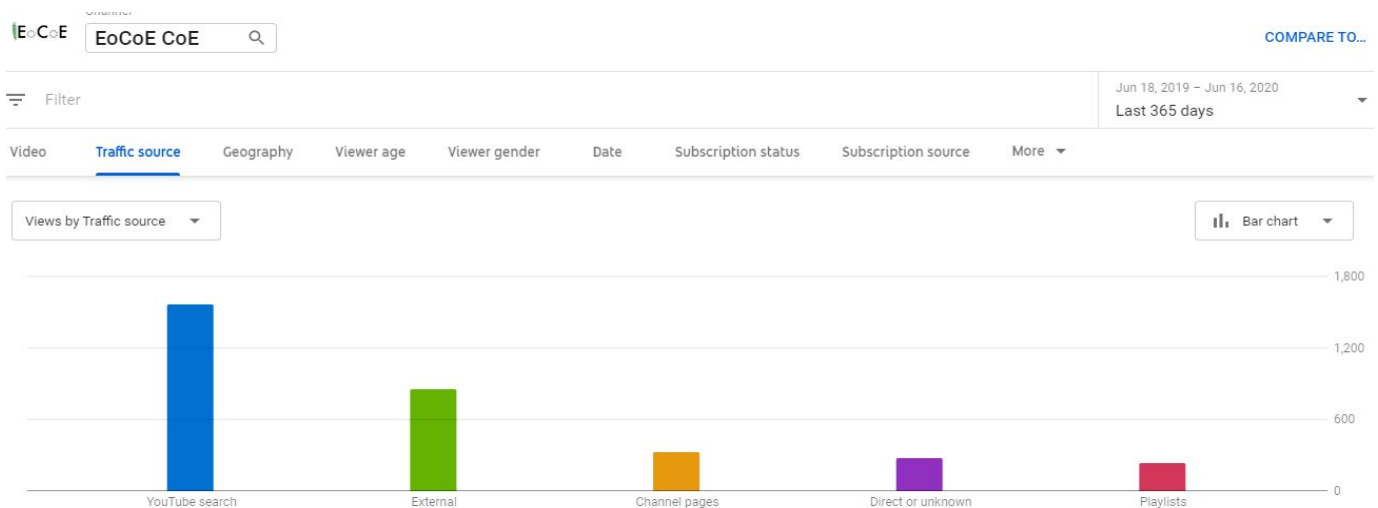
Figure 8: EoCoE YouTube channel traffic sources , from June 2019 to June 2020.

Based on the situation described above, the EoCoE team believes the YouTube channel should progressively take a larger role within the project's overall dissemination strategy. It should systematically be mentioned in dissemination material geared towards a general audience, and newcomers to the project should be directed to the channel, as it is a great starting point to present our work. We are confident the channel will continue to grow and strengthen its role as a all-encompassing conduit to showcase the project's achievements.

Flyers

The EoCoE team designed promotional flyers, had them printed, and made sure to pass them out during the events we participated in. These flyers presented the project's overall goals, a general synthesis, as well as several of the project's achievements in a specific "succes stories" section, using visuals stemming from simulations run by EoCoE members linked to the scientific challenges of geothermal, meteorology, nuclear fusion reactors, wind flow, materials, and hydrological simulations.

400 flyers, acknowledging the support we received from the European Commission, were displayed on the project's organizational booths during several large-scale events among which Teratec, SC2019 and EUSEW 2019, and distributed to the public.

Papers

In the following table the number of scientific papers published on international journals with referee are reported. To better qualify the EoCoE-II performance, a comparison with EoCoE-I is performed. During the first year only two papers were published acknowledging EoCoE-II support. This number is in line with what was performed in the first year of EoCoE-I project. Indeed in EoCoE-I 7 papers were published but it should be considered that in this case it is considered a period of time longer because the project started in October 2015. Moreover some papers in 2019 were erroneously ascribed to EoCoE-I instead of acknowledging the new project. The EoCoE team is optimistic, since eight papers linked to EoCoE-I were already published during the first five months of 2020, thus we could expect that about 16 papers to be published by the end of the year. Should these numbers prove accurate, we would be performing better than during EoCoE-I.

The EoCoE-II papers are equally distributed between Scientific Challenges and Technical Challenges. As soon as new papers will be published, new success stories will be available for the dissemination activities on the website and the newsletter, on social networks and in international conferences.

EoCoE-II	EoCoE-I

Year	Publications	Year	Publications
2019	2	2016	7
2020	8 —> 16	2017	11
2021		2018	18
2022		2019	22
Total	10 —> 18	**Total**	58

Table 1 - Number of scientific papers on international journals

Establishment of a collaboration with EERA (Task 6.2)

To solve the problem of putting in place a program capable of having a significant impact on industrial users and, more generally, on communities that are external to the ones directly involved in the project, we determined, during the first phase of the EoCoE project, that it would be an effective approach to rely on one or more intermediate bodies. These should act as vehicles for promotion and dissemination on the information and opportunities that the CoE can offer.

Both at national and international levels, there is a vast number of agencies, industrial associations, technology transfer organizations that could be contacted to discuss prospective opportunities of collaboration. Among these, we highlighted the European Energy Research Alliance (EERA) as an organization of particular importance, both for its characteristics and for its mode of operation. Collaborating with EERA, and getting to include EoCoE's activities into EERA's programmes, is a major step towards guaranteeing EoCoE's long-term sustainability.

EERA is an international, non-for-profit Association, incorporated in the Belgian law. The purpose of the Association is to strengthen and to expand Europe's capabilities in sustainable energy research by connecting and joining European energy research activities. It aims to optimize the research efforts and overcome fragmentation in European countries, through a number of actions of coordination of different public research programs at regional, member state and European levels. The Association works in the context of the Strategic Energy Technology (SET) Plan.

EERA was founded in 2008 and currently involves over 200 European public research centers & universities from 24 EU member states plus Turkey, Norway and Switzerland. It involves over 50.000 researchers that participate in almost all the energy projects funded by the European Framework Programmes involved. It collaborates with European industry through platforms and partnerships.

EERA's structure relies on Joint Programs (JP, currently 17 ongoing), created by interested organizations that define a joint research agenda. The EERA JPs coordinate research performed by the

participating institutions based on their own resources, but can also obtain supplementary funding from national or EU sources.

Within the first EoCoE phase, the EoCoE consortium had established contacts with EERA, and several methods of collaboration have been discussed, in particular:
1. Set up of a new HPC Joint Program within EERA;
2. Set up of a HPC sub-program within one of the existing JPs;
3. Set up of an HPC coordination body across various existing JPs.

The EoCoE partners saw option 1 as the more ambitious of the three, and they successfully lobbied EERA to give its green light to the creation of a specific JP, "Digitalisation for Energy", that will integrate EoCoE's activities within the scope of EERA, and be the very first transversal EERA JP. EoCoE members went through several back-and-forth with EERA contact points, either remotely or in person, and exchanged their views on the scope and structure of the JP, after we circulated a questionnaire within the EoCoE consortium to have our team's position on the matter.
The JP has been approved by the EERA Executive Committee, under the impulsion of EoCoE, and will allow EoCoE-related activities, including communication and dissemination, to benefit from the privileged links between JPs; it will allow us to identify and carry out common activities of promotion, dissemination, in addition to direct collaboration in projects and scientific endeavors.

The creation of a new JP must be fostered by one or more existing EERA partners. Fortunately, several EoCoE partners are already involved in EERA (CEA, CNRS, CIEMAT, FZJ, FRAU, CNR, ENEA, etc.). ENEA, as a founding partner of EERA, is willing to participate in this action. Full participants in a JP must be EERA partners, have responsibilities and voting rights, and organize activities such as meetings and workshops. Associate participants can take part actively in the daily life of the JP, but do not have positions in its steering bodies.
The EoCoE consortium deems the direct involvement of EoCoE and its partners in EERA to be very effective in facilitating contacts with prospective industrial companies and public organizations interested in the CoE's services and skills. Benefiting from EERA's support, network and means of communication, we will be able to amplify EoCoE's outreach to selected partners, already well established in the field of energy R&D, capable of working in an international scientific environment, and potentially interested in the high-end services offered by EoCoE. Another option we will also consider is the possibility of a direct involvement of EERA as a partner in future projects in partnership with EoCoE.

EERA is 250 members strong, and the profile of its members cover a large spectrum of stakeholders, including research centers, universities, industrial partners and associations. This pool of energy-focused potential contact points will be a boon for EoCoE's dissemination activities, just as EoCoE's prominent part in the "Digitalization for Energy" transversal JP will be a boost for EoCoE's sustainability. Working with EERA will allow our team's achievements and know-how to be disseminated to both the academic and industrial sphere of the energy community, and the transversal nature of the future JP will allow us to demonstrate the usefulness of HPC simulation tools on a vast array of topics.

EERA will also bring an outsider's perspective to the work being undertaken by the EoCoE consortium, as EERA members will figure heavily in the project's Advisory Committee. We are confident this will ensure the direction and strategy we are pursuing are in line with EERA itself, and with the whole European HPC ecosystem.

Networking with stakeholders and EU HPC landscape (Task 6.3)

Networking activities in EoCoE-II enable the consortium to reach out to early technology adopters and other key stakeholders and to facilitate EoCoE-II's impacts and large-scale uptake. The networking activities will follow the best practices for engaging and guiding stakeholders in the creation of a network of experts on HPC simulation for Energy. A schematic view of EoCoE-II's main stakeholders is depicted in the figure below.
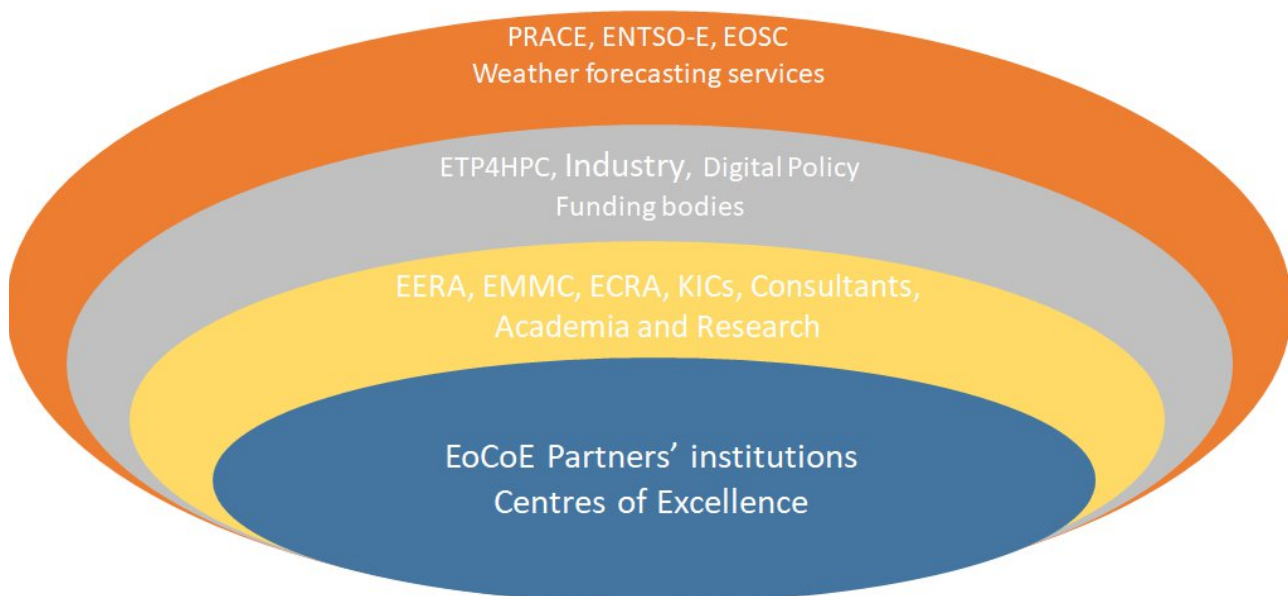
Figure 9: Main categories of EoCoE-II Stakeholders. In blue color are listed primary stakeholders, in yellow color key participants, in grey color Tertiary stakeholders and in orange color Extended Stakeholders

The networking strategy in EoCoE-II is based on three types of actions described in alinea a), b) and c) below.

a) Advertise EoCoE's services to stakeholders

These actions aim at *enlarging the network of experts* in EoCoE-II with users and future collaborators from academia, industry and SMEs, building on existing collaborations links.

What EoCoE consortium learned during EoCoE-I project is that the advertisement of EoCoE's services to stakeholders is not only a matter of what the services of EoCoE really are but also how they are offered and how they are presented to stakeholders. Without any doubt, EoCoE's services are recognized by the scientific and technological communities as services of very high quality and matching state-of-the-art in know-how and applications. Moreover, the services of EoCoE are able to provide unique support to implement exascale strategies in the energy field and address successfully

the open technological problems that are holding back the quick energy transition to low-carbon economy. The lesson learned in EoCoE-I was that a different language and attitude is needed to bring EoCoE participants to offer their scientific and technological services. Thus, it was agreed in the consortium that a professional external support is needed to present EoCoE services to stakeholders. To this end, a company was selected, META Group, and a contract with META Group was concluded. META Group will help in raising the average level of knowledge of the EoCoE participants on exploitation strategies and in selecting three key exploitable results that will be the targets for professional actions. As described in details in the Annex A, META Group has provided presentations to the EoCoE community about exploitable results and helped EoCoE to select three exploitable results. The activity will continue in the second half of the project. Dissemination and communication activities will be designed accordingly. This activity will impact also the WP7 activities in what regards to services' design and planning and associated exploitation plans .

The existing collaborations with industrial stakeholders in EoCoE-II using the know how acquired by participating in the project are as follows:

–   BSC collaborates with Iberdrola (https://www.iberdrola.es) on wind resource assessment. As part of this collaboration, the CFD version of code ALYA (https://www.bsc.es/es/computer-applications/alya-system) developed at BSC has been adapted so that Iberdrola can use it as an alternative to commercial software for wind farm assessment. This collaboration is led by Oriol Lehmkuhl in collaboration with Herbert Owen at BSC. With the leadership of Oriol Lehmkuhl, whose main area of research is Large Eddy Simulation (LES), the tools developed within EoCoE-II have gained a momentum in terms of know-how transfer. There is already a use case in Iberdrola where Large Eddy Simulations have been used, and BSC is pushing for a second use case shortly.

–   Vestas has provided a support letter for EoCoE, and its main interest is in work developed by BSC in task T1.1.2. While BSC has vast experience in task T1.1.1 from its collaboration with Iberdrola and European projects such as NEWA, its expertise in task T1.1.2 is much lower. There was some experience from projects for the automotive industry that could somehow be adapted. Oriol Lehmkuhl had simulated rotating wind turbines in his previous job with another code, not Alya. At the beginning of the project, Herbert Owen presented Alya's capabilities to Yavor V. Hristov, manager in Simulation & Modelling, Data Engineering & Analytics in Vestas. For the moment, there has been no further contact with Vestas, but we are working hard, within available resources, to advance with the subtasks within T1.1.2. Within this task, we simulate exactly the actual geometry of the wind turbine blades and tower of a full rotor model. A sliding mesh approach is used to incorporate the rotation of the blades. Their deformation is considered using a Fluid-Structure Interaction (FSI) approach. Figure X shows the wake behind a rotating wind turbine. Further details on the advances of T1.1.2 can be found in D1.2. BSC has preferred to advance further before contacting Vestas again.
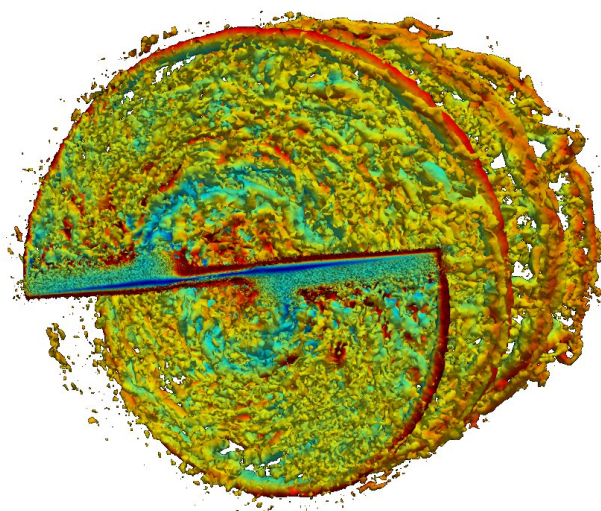
Figure 10: Instantaneous Q criterion iso-surfaces coloured by velocity magnitude for the NREL VI wind turbine

The developments in T1.1.2 have been challenging. During the development of the proposal, due to budget restrictions, the possibility of leaving out T1.1.2 to concentrate only on T1.1.1 was considered. However, Herbert Owen pushed to keep the task despite the challenges due to the interest of the subject and the possibility of entering a new market, wind turbine producers. Moreover, it is worth mentioning that Herbert Owen has started contacts with Michale Sprague leader of the Exawind and Atmosphere2Electrons US projects that have similar objectives to the Wind Scientific Challenge within EoCoE, but a budget that is at least ten times bigger. The difference in budgets should give a better idea of how challenging the developments in T1.1.2 are.

- The work with Vortex Bladeless is now stopped after solving the technical issues in the design of the blade with the collaboration of BSC. Future collaborations are not yet clear since Vortex Bladeless is an SME and will now concentrate in the commercial aspects of their product offer.

- EoCoE was present on the CEA's institutional booth during the Teratec international HPC fair in June 2019. Due to the meeting's international status, several of the project's partners took advantage of this opportunity to meet with members of the project's network - including, but not limited to, meetings with HPC3, Focus CoE, and other CoEs members.

As outreach actions to a general public, we can signal the following:

- Participation in the festival Pint of Science[1] by Herbert Owen, BSC on "HPC-CFD modelling of wind farms". The Pint of Science festival of Barcelona aimed to offer interesting, fun, important talks on the latest scientific research, in a format accessible to the public.And all this

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[1] See https://pintofscience.es/event/supercomputing-blockchain-and-freedom-in-sustainable-world

in a bar! It acts like a platform that allows people to discuss the research with the people who carry it out. It is a non-profit organization, run by volunteers, and was created by a community of postgraduate and postdoctoral researchers in 2012. The festival is held annually for three days simultaneously in bars around the world.

- Herbert Owen from BSC has been as instructor in the program 'Bojos per la ciència' (https://bojos-ciencia.fundaciocatalunya-lapedrera.com/cursos/supercomputacio). It is a course developed by BSC aimed at first year high school students with a scientific vocation interested in STEM careers (Science, Technology, Engineering, Mathematics).

Networking actions in EoCoE-II aim also to *participate in key events* throughout the duration of the first half of the project's lifetime to broaden the visibility of the solutions developed in the project and to lobby for the adoption of world-class simulation tools for cleaner energy solutions. To this intent, EoCoE-II participated in large networking conferences for policy on HPC technologies and on Digitalisation for Energy at European level. The following are the main events where there was participation from the EoCoE-II project:

- Participation at the EU Sustainable Energy Week (EUSEW) 2019 conference: this was the first time that EoCoE-II attended EUSEW and became familiar with the community on energy related projects funded at the EU level. The aim was to contact potential collaborators on the use of digital tools for energy-related challenges and to inform people on the EoCoE-II project (distribution of EoCoE-II flyers).

- Planned to participate at the EUSEW 2020 conference 2020 via the organisation of a joint booth with other CoE projets at the Networking village. The planning and preparation of the booth has been done in collaboration with the FocusCoE project. Due to the cancellation of the face-to-face event, the organisation of a booth will be pursued at the next EUSEW conference in 2021. Still, EoCoE-II has participated at EUSEW 2020 and established contacts with potential future partners.

- Participation to the conference ISC High Performance 2019, June, Frankfurt, DE: EoCoE was present on the PRACE's institutional booth and PSNC (Radoslaw Januszewski) gave a talk on the EoCoE activities there.

- Participation to ISC High Performance 2020: Herbert Owen organised a Birds-of-a-feather (BoF) session titled "HPC and Energy" but due to the cancellation of the event, this BoF session will be done at ISC High Performance 2021. As a consequence of this Herbert Owen has started contacts with Michale Sprague leader of the Exawind and Atmosphere2Electrons US projects.

- Active participation to the conference "Supercomputing 2019", Denver, November 2019: the EoCoE consortium was heavily involved in the 2019 edition of the SuperComputing international conference. The project was advertised on the booths of every participating organization who participated to the conference, i.e. CEA, Jülich SC, Fraunhofer, CINECA (who stood in for ENEA), BSC, DDN and PSNC (posters, presentations and leaflets); over 250 leaflets advertising the project were passed out. We also used this opportunity to strengthen the links between EoCoE and other HPC initiatives, as we hosted meetings with

members of Focus CoE and HPC3, and met with members of PRACE. This was a tremendous opportunity to advertise the work being done in EoCoE and to develop the project's network.

- Active participation to EuroHPC Summit week, May 2019, Poznan, PL: Several EoCoE members participated to the EuroHPC summit week and in particular to the FocusCoE general assembly, to the discussion on the next ETP4HPC SRA and to various workshop on legacy codes or operational services. The EuroHPC Summit week scheduled for April 2020 in Lisbon, PT was cancelled due to the Covid-19 pandemia.

- Participation in networking events of the European Energy Research Alliance (EERA): the aim is to establish a new Joint Programme on Digital Technologies for energy research and to strengthen collaborations with EERA Joint Programmes that have already started to exploit digital tools in their research.

- The EERA JP Nuclear Materials is now leading a CSA European project "Orient NM" jointly supported by SNETP-NUGENIA and EERA-JPNM to prepare a EJP/CEP (co-funded European partnership). Orient-NM project foresees to ask support to EoCoE for what concern the design of scientific challenges in the field of materials modeling.

- EMMC: The European Materials Modeling Council is the European initiative to coordinate the many research and industrial groups actively working in the development and exploitation of materials modeling techniques. In order to promote collaborations and exchange of ideas, M.Celino was invited speaker in a couple of their events.

In addition to this, the scientific and the technical leaders have presented the project EoCoE, its flagship codes and programming tools at scientific conferences in their research domain in order to enlarge the set of users of these codes both in academia and in the industry. See details for the list of these conferences in the Annex B.

EoCoE-II has fostered links with Commission DGs, namely DG Energy and DG Connect, in order to showcase the potentialities of HPC-related technology for the transition of energy provision from renewable sources.

Regarding DG Energy it can be highlighted::

- Participation to the lunch time seminar on "Supercomputing for the power system and RES", 21.03.2019. Most of the participants were from DG Energy and organisations such as ENTSO-E and EERA as well as research projects from the 'Bridge' initiative. The event was called in the follow-up of a Regulation[2] on security of cross-border electricity supply and the role that Digitalisation has to provide tools to ease the implementation of such security measures

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[2] See https://ec.europa.eu/energy/en/topics/energy-security/security-electricity-supply

- Participation to the side event of the EU Electricity Coordination Group[3] (ECG) Meeting – 10 July 2019, Brussels. The three participants in the DG Connect delegation to the ECg meeting (P. Bauer, H. Elbern, F. Haeberlein) gave a summary overview on the use of HPC simulation for their work practices to Mark van Stiphout. After that, a discussion took place on the potential of exploiting simulation and HPC systems to foster energy innovations and the competitive advantage that that can bring to the industry.

Regarding DG Connect it can be highlighted:

- Cluster review meeting with other HPC Centres of Excellence projects of the same call for projects, December 17 and 18, 2019. This review meeting, arranged by DG Connect, was the opportunity to showcase EoCoE's achievements to the other ten HPC CoEs, and discuss our progress on the path to exascale. While the first day revolved around CoEs' progress reports, the second day was a guided discussion, in small groups, following the World Café methodology; this allowed us to dive deeper in several aspects of the work being carried out in EoCoE, to devise intersection points with other CoEs, and discuss potential collaborations. It also allowed us to compare our dissemination methods and online presence to other CoEs' approach to these challenges; topics such as webinars, YouTube channel, and participation to industrial events were part of these discussions. Four EoCoE team members, including the project coordinator, participated in this review.

- Participation in November 2019 in an <u>event organized by DG CNECT – C1</u> "eInfrastructure and Science Cloud" titled "Convergent use of High Performance Computing, cloud, data and Artificial Intelligence resources for earth system modelling". The initiative presented is called "Mission Earth". Since then a dialogue with the unit has occurred in order to define what could be an interesting use case for applications related to Energy. Out of this dialogue, it emerged that a Weather induced "digital twin" for renewable energy security in supply and provision could be a first option.

b) Establish and maintain links with EU HPC projects

The actions described below concern the co-operation with related projects on HPC technology at EU level. Where possible, meetings with representatives from these and any other complementary projects were organised in the framework of the project FocusCoE (Coordination and Support Action of the Exascale Centres of Excellence). The meetings aim at discussing and exchanging best practice regarding scientific, standardisation and economic issues related to projects' results. Networking and exchange of best practices with similar initiatives have also taken place throughout the project during conferences and other events.

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[3] The Electricity Coordination Group is a forum for the exchange of information and coordination of electricity policy measures having a cross-border impact. It also shares experiences, best practices and expertise on security of supply in electricity, including generation adequacy and cross-border grid stability, and assists the Commission in designing its policy initiatives. The group's members represent national government authorities, in particular ministries responsible for energy; national energy regulatory authorities for energy; the Agency for the Cooperation of Energy Regulators (ACER), and the European Network of Transmission System Operators for Electricity (ENTSO-E).

- Several partners from EoCoE-II are also partners in the project FocusCoE, and have therefore actively contributed to create cooperation and synergy among the European HPC ecosystem. Members from EoCoE actively participate in most of the FocusCoE's workpackages, on activities ranging from the outreach to industry, promotion of the participation in industrial sectoral events, promotion and coordination of the offerings on training, communication of success stories and of exploitable results.

- HPC CoE Council (HPC3): FocusCoE, in order to support the European CoEs to effectively fulfil their role within the HPC ecosystem, created the HPC CoE Council (HPC3) platform. HPC3 allows CoEs to collectively define an overriding strategy, as well as a collaborative implementation of their interactions with the European HPC ecosystem; it also allows CoEs to promote and concert their HPC capabilities and services, towards both academic and industrial users. EoCoE-II played a central role in the creation of HPC3, as it supported the idea behind this council since the very beginning; true to this early commitment, the EoCoE coordinator, Edouard Audit, has been elected as the General Assembly Chair, the highest position in the council . Two other CoEs, MaX and BioExcel, are also part of the HPC3 General Assembly.

  One of the aims of HPC3 is to promote and ensure the strong support for application development within the HPC landscape shaped by EuroHPC. Applications are essential in order to yield any science or innovation from a computer and they require important and long-term support. In particular, HPC3 has been advocating for the implementation of a long term vision of application development supported by long term funding. It should allow a closer collaboration between applications and hardware projects, especially the EPI, in order to support a co-design approach; it should give proper support to large legacy codes that are key tools for many scientific and industrial communities and often need to be heavily refactored for new architectures. Given EoCoE's focus on co-design approach and close collaboration between technical scientists and domain experts, HPC3 is another conduit through which EoCoE's work and vision is being disseminated.

- PRACE-6IP project actions and the PRACE 2 High-Level Support Team: Although, EoCoE-II is not involved in code re-engineering actions in project PRACE-6IP, EoCoE-II partners benefit greatly from the computing hours distributed by PRACE to the different technical tasks in EoCoE-II.

- Since mid-2019, a new set of EU Research and Innovation Actions has been launched under the umbrella of the EuroHPC Joint Undertaking (JU), aimed at supporting the procurement of European Exascale systems (e.g. EuroHPC JU Extreme-scale Demonstrators, EuroHPC JU HPC system procurements). This initiative specifically aims to maximise application performance and efficiency in next generation supercomputers with the help of software engineering techniques, programming tools and libraries, and encourages interaction with Centres of Excellence. From the call H2020-JTI-EuroHPC-2019-1, two projects DEEP-IO and DEEP-SEA are connected to EoCoE-II through work on the TSMP (alias TerrSysMP) application suite for which ParFlow is the principle software component.

- eInfraCentral: EoCoE-II submitted a description of the EoCoE services to be published on the eInfraCentral portal website and, after the end of the project, at the EOSC portal.

- EOSC Enhance project: contribution to the EOSC Catalogue with a description of EoCoE's services and featured in the EOSC portal. This participation aims to enhance the visibility of EoCoE's services towards new user communities and the project EOSC Enhance will provide feedback that enables EoCoE to make its services easily discoverable by more user communities.

- HiDALGO: EoCoE and HiDALGO have initiated the process of becoming associate partners. When this process is complete, each CoE will figure on the other's webpage, through a display of its logo and a description of its goals and strategy. This collaboration will extend to the organization of joint events, including training, workshops, and public presentations. For instance, EoCoE and HiDALGO will co-host a workshop in July 2021, during which the EoCoE team will give a presentation on either wind power plants or geothermal energy, as well as a general presentation of our work. Given the connection between the two CoEs, most notably on technical topics, we are confident this budding collaboration will yield interesting results and greatly benefit the promotion of EoCoE's achievements to a larger community.

- POP-CoE : EoCoE and POP are frequent collaborators, as demonstrated by the regular organization of workshops dedicated to performance evaluation and code optimization. Some of the tools presented during these workshops are used and taught by PoP.

- MAX CoE: A collaboration is already started to optimize a specific module of the Quantum Espresso package that has been used by EoCoE to compute physical and chemical properties of materials for PV application. A soon as possible an agreement will be signed.

- CECAM: participation in a series of five events broadcasted live on the CECAM YouTube channel every Thursday 15:00 — 17:00 CEST, starting on June 18 2021. EoCoE will be showcased in a 30 minute presentation in one of these five events. The program will be followed by a common Q&A and will contain a short intermission. The target audience are researchers with an interest in scientific computing.

- EXA2PRO : EXA2PRO is a FET-HPC project which is aiming at developing a programming environment that will enable the productive deployment of highly parallel applications in exascale computing systems. We are very closely connected with this project since one of the main use case of EXA2PRO is the Metalwalls code which was totally refactored during the first phase of EoCoE. Metalwalls has been ported under the EXA2PRO technology and a joint workshop with EXA2PRO is planed in Q2 2021.

- MAESTRO (https://maestro-itn.eu/): one of the collaborators (Thijs Smolders) at University of Bath that collaborates also in EoCoE-II is funded by this project to work in KMC/DMC.

- ENERXICO (https://enerxico-project.eu/) : ENERXICO is a joint project between Europe And Mexico that will develop beyond state-of-the-art high performance simulation tools that can help modernize the energy sector and meet future energy demands. The BSC- CSE department that develops Alya is involved in this project.

- PARSEC (https://parsecproject.org) : PARSEC is not a EU project but is partly financed by European countries; the BSC- CSE department that develops Alya is involved in this project.

- There are also collaborations with projects COMPBIOMED and EXCELLERAT via the BSC-CSE department in the context of research on code Alya.

- A collaborator of EoCoE-II (Thijs Smolders) from University of Bath is also involved in the Innovative Training Network (ITN) MAESTRO on MAking pErovskiteS TRuly exploitable.

- EERAdata project: Co-editing the terms of reference of the new transversal Joint Programme "Digital for Energy" of the EERA association.

c) Link with international initiatives in Exascale and HPC simulation

These are actions to seek to build collaboration links with other research countries outside Europe and include the following aims:

- Build networks of experts related to HPC and to Energy domains;

- Enhance the visibility of the flagship codes in EoCoE towards researchers from other countries/regions outside Europe;

- Organise side events (e.g. "birds-of-a-feather" type of events) at large international conferences to assess the interest in the topic of HPC for Energy, or on a specific energy-related area.

During the first 18 months of EoCoE-II the following actions took place:

- Collaboration with RIKEN (Japan). The EoCoE team strengthened the project's collaboration with RIKEN, through the identification of common topics of interest. These exchanges led to RIKEN hiring a postdoctoral researcher who is stated to work in collaboration with EoCoE; this researcher's goal will be to port the EoCoE flagship code Gysela on the FX64 architecture. As we reach the project's mid-term, this collaboration has already borne fruits, as the Gysela code is now running on the Fugaku Supercomputer. This is a significant achievement for the EoCoE community, as Gysela is one of the first code to be used on this machine.

- Joint Laboratory on Extreme Scale Computing, April 2020, This event was due to happen in April 2020 but was cancelled due to COVID-19. The new date is still not known.

- Collaboration with two US projects that are closely related to the WIND task within EoCoE-II: Exawind and Atmosphere to Electrons. The purpose is to benchmark the code Alya with the code NALU developed within the ExaWind project. However, one needs to be realistic about competing with the NALU code. Whilst Europe has traditionally been a worldwide leader in wind energy, the resources nowadays being invested in the US to take wind energy to the Exascale are approximately one order of magnitude larger than those available in Europe (see Deliverable 1.2 page 12 for more details on this).

Design, specifications and implementation of services (Task 6.4)

The goal of EoCoE SaaS portal is to allow users to test EoCoE application on HPC.

EoCoE results include codes and applications for high performance computing. The idea behind the SaaS portal is to prepare a service that will allow potential users to see the real examples how to run applications on HPC. The portal will allow access to all EoCoE applications in one place. First of all, it will allow engineers from SMEs and industries to easily test and see the potential benefit from simulation tools through concrete examples. Users can try to run predefined example problems and modify some parameters to see how they influence the computation, performances and results. Then, they can decide what the next step will be (e.g. apply for standard HPC grant or buy an app licence). With the portal, users can focus on testing EoCoE applications functionality instead of technical and procedural details of their installation, configuration or access to resources. Finally, these simple use cases will eventually provide the opportunity to develop more ambitious collaborations between interested users and scientific teams of EoCoE.

Applications available via the SaaS portal will be run on HPC site on dedicated resources, so users do not need to go through the whole process of computing grant request and review. Because of security reasons, all users accessing HPC must be registered, but the process will be as simple as possible.

 The SaaS portal is not a product in and of itself, and it will not be offered as a solution nor put into production other than one EoCoE demo instance. The SaaS portal will serve as a tool providing working examples of EoCoE applications. It is targeted at EoCoE early adopters and potential customers.

Requirements and potential solutions

The SaaS portal should give a simple access to EoCoE applications. The expected functionalities include:

- Submit jobs using a click-through interface
- Monitor status of the submitted jobs
- Manage input and output data
- Define application template with predefined examples
- Flexible mechanism to manage application templates
- Customizable user interface
- Simple management of individual user account
- Integration with SLURM resource management system

Based on these needs, there are not many products on the market that can be used to prepare the EoCoE SaaS portal. The potential candidates include:

- Bull Extreme Factory
- Adaptive Computing Viewpoint Portal
- Altair Access™
- Products from EU projects (e.g. PSNC QCG portal, ENEA FARO portal)
- Custom solution that can be implemented for EoCoE

	Extreme factory	Viewpoint Portal	Altair Access	portal from other projects	Custom solution
Licence	commercial	commercial	commercial	proprietary	N/A
Job submission and management	yes	yes	yes	yes	yes
data management	yes	yes	yes	yes? (can be bound to local needs)	yes
application templates	yes	yes	yes	yes? (planned for QCG)	not needed
customisable UI	yes	yes	yes	probably yes	no
product modification possible	no	no	no	yes (in cooperation of partners)	yes
users management	yes	yes	yes	yes	yes
SLURM support	yes	abandoned	no	yes	yes
Ready to use	yes	yes	yes	? (can be bound to specific local needs)	no
Visualisation support	yes	yes	yes	yes? (can be bound to local needs	no
Other remarks	quite expensive	dedicated to MOAB. Usage in EoCoE requires buying installation of PBS Pro.	dedicated to PBS Pro. Usage in EoCoE requires buying installation of PBS Pro.	Need some adaptation to EoCoE requirements. Needs licence clarification.	Required some time and effort on implementation.

Table 2. Comparison of potential SaaS portal product

Bull Extreme Factory was chosen as a tool to build the SaaS Portal. The product functionalities include:

- Submit jobs using a click-through interface.
- Manage data and workflow from remote locations.
- Visualize remote data with 3D hardware acceleration with Bull XRV (extreme factory remote visualizer).
- Follow solver convergence by plotting graphs with the log file values.
- Edit scripts and input files directly in browser.
- Sharing of resource usage between teams and projects.
- Sharing of remote visualization sessions for easier collaborations.
- Customized user interface (layout, services, functions, themes).
- Exposing any simulation software using flexible application templates, suitable for commercial, Open Source or in-house codes
- Assign dedicated and protected environments to different user groups with roles and privileges
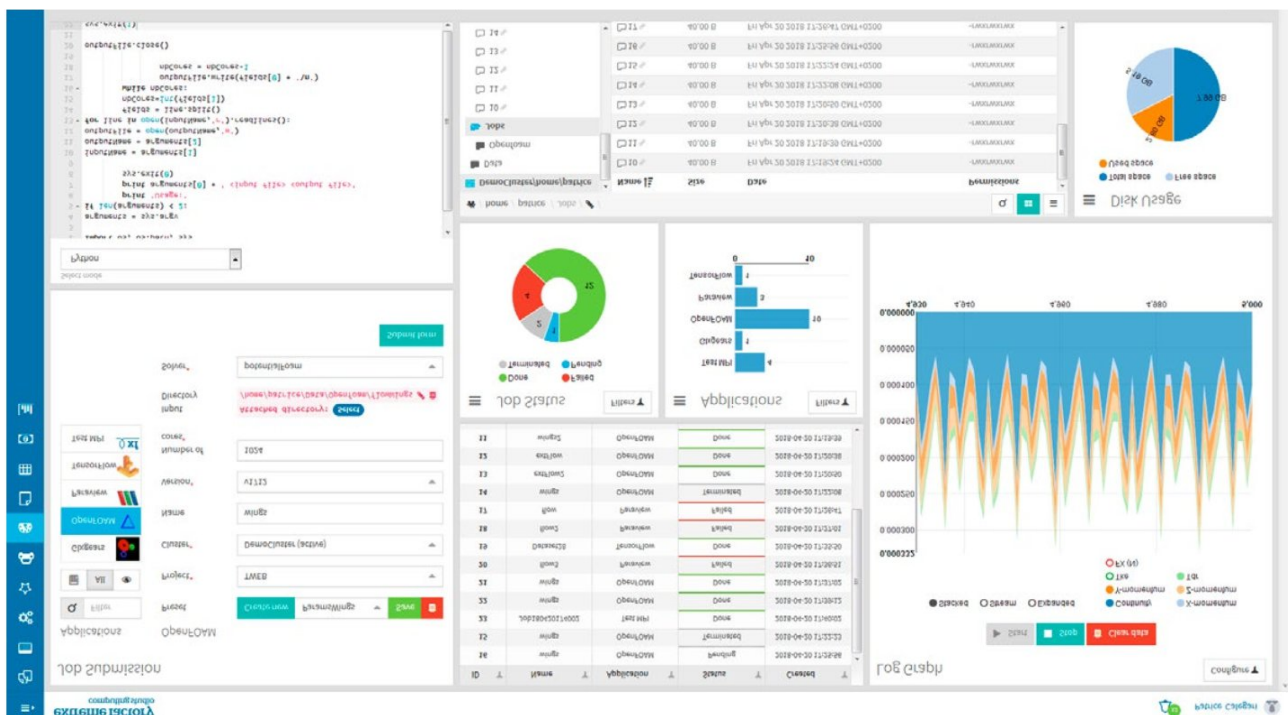

Figure 11. User interface of Extreme Factory. Source: Bull promotional leaflet

Bull Extreme Factory therefore fulfils all EoCoE requirements. Its the most complete solution we found to deploy our own HPC-as-a-Service, with accounting, multi-tenancy, credit management, authorization framework, role based access control, etc.

PSNC started the process of buying the software. The process was not straightforward and the vendor was extremely unresponsive in handling the requests. Moreover, it is not an off-the-shelf product and needs to be tailored to the specific installation sites. For these reasons, an unsatisfactory delay was introduced in the process, which is not yet finished. The price depends on the foreseen number of users, number of application, size of the cluster and visualisation features. Installation must be done by Bull/Atos engineers in cooperation with local site administrators.

Preparation of integration of applications with the portal required some inputs from EoCoE application owners, to determine the best product and then to install prepared use cases. To clarify their needs, EoCoE flagship code developers were asked to fill an application survey. The responses were used to verify the SaaS portal requirements.

In preparation to the SaaS portal installation, some EoCoE applications were installed and successfully tested on the PSNC HPC cluster. Since the development of Alya and ParFlow is already advanced, they were installed in production HPC environment and are ready for integration within the SaaS portal.

Education and training (Task 6.5)

The overall aim of this task is to improve awareness and access to the knowledge achieved within the EoCoE project, through a strong collaboration with PRACE/PATC and other organisations and partners training facilities.

The last few months showed that in today's world it is essential to prepare events both with on-site and remote access. Whereas the run of trainings awaits also project research results, initial set of events has already been performed. The current status of events and trainings provided to reach task goal is available below.

Webinars

Webinars are being announced both on EoCoE and The Community Research and Development Information Service (CORDIS) websites.

WP	Speaker	Name	Date	Webinar views	External	Post-webinar views	Webinar + post-webinar views
WP3	Fabio Durastante	PSBLAS 3.6 - Sparse Matrices Computation & Iterative Solvers for HPC	20/01/2020	26	11	11	37
WP3	Pasqua D'Ambra	MLD2P4: a Package of Parallel Algebraic MultiGrid Preconditioners for Scalable Linear Solvers	24/02/2020	16	5	36	52
WP4	Julien Bigot	PDI - Introduction	06/03/2020	11	2	33	44

		to the Portable data interface		23	11	68	91
WP4	Kai Keller, Leonardo Bautista Gomez	FTI : Using the state-of-the-art multi-level checkpointing library	01/04/2020	23	11	68	91
WP1	Herbert Owen	An introduction to wind resource assessment using CFD with examples : Steps towards using LES at the Exascale.	20/04/2020	41	33	18	59
WP1	Eric Sonnendruecker	Numerical challenges for the simulation of magnetic fusion plasmas	15/05/2020	83	55	66	149
WP1	Jaro Hokkanen	Accelerated hydrologic modelling_ ParFlow GPU implementation	10/06/2020	35		34	69
				Sum: 235			Sum: 467

Table 3 - List of webinars (figures valid on 16.06.2020)

Training events

WP	Type	Name	Date
WP1	Workshop	Joint Workshop Marseille	16/09/2019
WP2	Workshop	Performance Evaluation Workshop Erlangen	10/10/2019
WP2	hackathon	BSC hackathon workshop	31/03/2020-01/04/2020 cancelled

The BSC hackathon workshop, initially planned to take place on March 31 - April 1st, was cancelled due to the COVID-19 pandemic.

The first internal face-to-face meeting took place on 12/09/2020. The second meeting, initially planned on 22-24/04/2020, was cancelled due to the pandemic; hopefully, the next one, planned in September 2020, will allow the EoCoE team to meet in person.

Structure of attendees in terms of countries, stakeholders and gender is as following:

COUNTRY of
training attendees
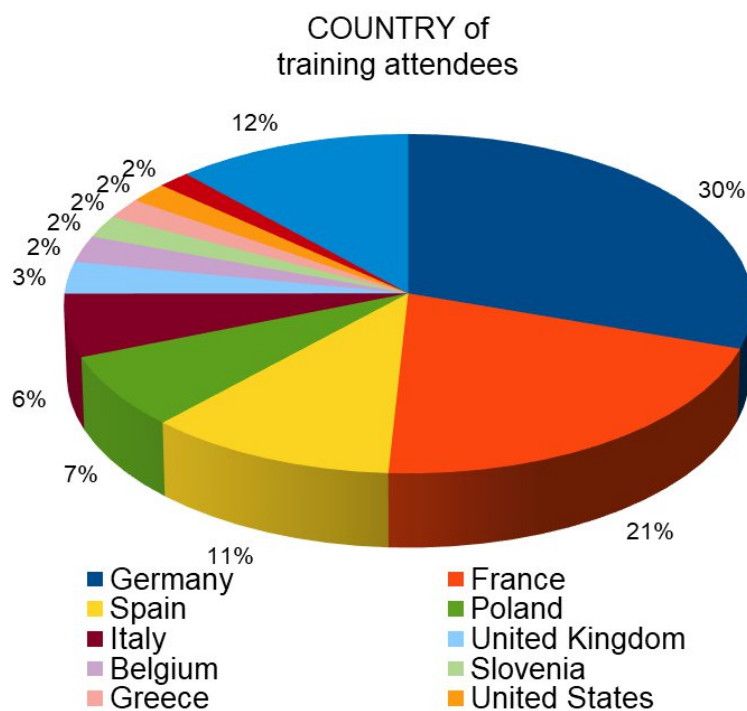
Figure 12. Training attendees country of origin

More than 60 percent of training participants comes from three countries: Germany (30%), France (21%) and Spain (11%).

There are also less than 10 percent representatives from each of the following countries: Poland (7%), Italy (6%), United Kingdom (3%), Belgium (2%), Slovenia (2%), Greece (2%), United States (2%), Czech Republic (2%).

The rest of countries accounts together for 12%.

STAKEHOLDERS* of
training activities
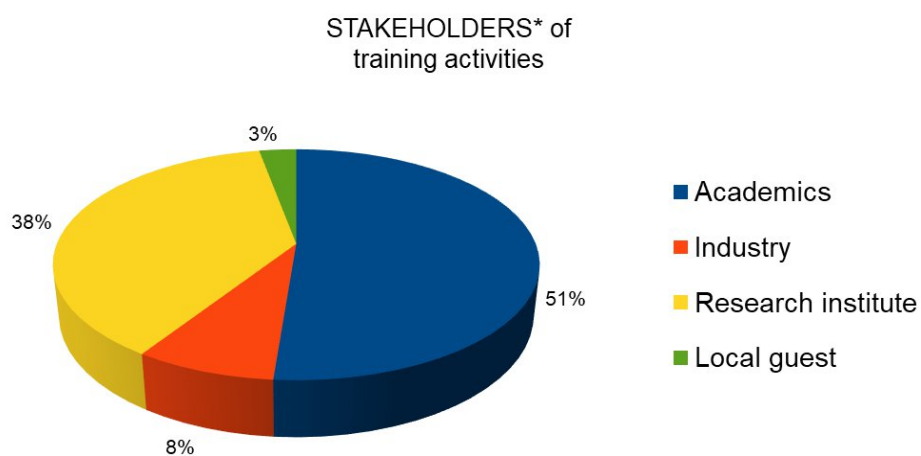
Figure 13. Training attendees by type of stakeholder

The majority of stakeholders are academics (51%) or represents research institutes (38%).
There are also 8% from industry representatives.
In the last position are local guests accounting for 3%.
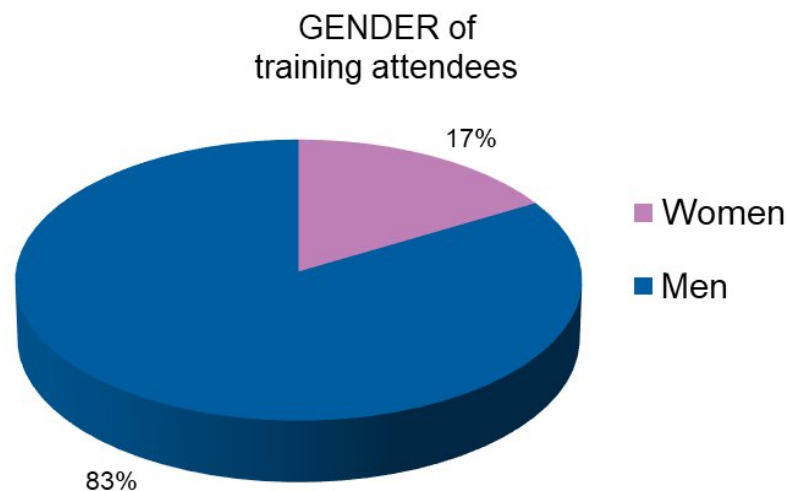
Figure 14. Gender of training attendees

The percentage of women that took part in trainings accounts for approximately 17%. The majority (83%) of participants are men.

Other

A Master student thesis, "Study of the wind profile in a complex and forested terrain", was directly linked to the tools being developed within the EoCoE-II project.

News about HPC-related trainings is being shared each 1-2 months. It included also information about PRACE, partners trainings in the form of e-mail message sent to mailing list of all EoCoE-II members.

Documentation

The courseware of EoCoE II project is available for users and developers. It is being shared and stored with the use of the website tab Learn@EoCoE and the OnlyOffice platform and gathered with the following approach:

- Work Package leaders started to provide workshop materials and tutorials to be published, in order to enable the take up of EoCoE II concepts, methodology, technology components and computational aspects.

- To increase recognisability and outreach, training courses will be advertised also on the PRACE training portal. At this point the portal developed on training on PRACE-IP project WP2 is still under construction.

- Project materials also includes videos in form of webinars which are recorded during each event - including those that are public, touch on teaching codes, and technical HPC ones. These videos are also available on EoCoE project Youtube channel.

Annex A - Exploitation Support first Report for EoCoE-II

(Andrea Di Anselmo - META Group)

Executive summary

This document presents the activities carried out during the Phase 1 of the contract "Supporto alla definizione di target strategici relativi all'Exploitation e alla Dissemination del progetto Europeo EoCoE e sviluppo delle competenze interne".

It describes the preparatory processes, the delivering and the main outcomes resulting from the interaction with the EoCoE partners. It provides recommendations for next steps and background materials for further developing the selected three key exploitable results (KERs) under the point of view of exploitation and dissemination. Additional information and guidelines on tools to be used for further advancing in exploiting project results are added in annexes.

EoCoE II

Project Main Data

TITLE	Energy Oriented Centre of Excellence: toward exascale for energy
ACRONYM	EoCoE II
CONTRACT NUMBER	824158
BUDGET	EUR 8 303 454,75
COORDINATOR	COMMISSARIAT A L'ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES
STARTING DATE	01-01-2019
ENDING DATE	31-12-2021

Project Abstract

The Energy-oriented Centre of Excellence (EoCoE) applies cutting-edge computational methods to accelerate the transition to the production, storage and management of clean, decarbonized energy. EoCoE is anchored in the High-Performance Computing (HPC) community and targets research institutes, key commercial players and SMEs who develop and enable energy-relevant numerical models to be run on exascale supercomputers.

It will draw on a successful proof-of-principle phase of EoCoE-I and will focus its efforts into 5 scientific Exascale challenges in the low-carbon sectors of Energy Meteorology, Materials, Water, Wind and Fusion. This multidisciplinary effort will harness innovations in computer science and mathematical algorithms within a tightly integrated co-design approach to overcome performance bottlenecks and to anticipate future HPC hardware developments.

New modelling capabilities in selected energy sectors will be created at unprecedented scale, demonstrating the potential benefits to the energy industry, such as accelerated design of storage devices, high-resolution probabilistic wind and solar forecasting for the power grid and quantitative understanding of plasma core-edge interactions in ITER-scale tokamaks.

These flagship applications will provide a high-visibility platform for high-performance computational energy science, cross-fertilized through close working connections to the EERA and EUROfusion consortia.

Exploitation in EoCoE II

One of the main objectives of EoCoE-II is to "promote high-end Exascale tools, a co-design software development approach and the **use** of numerical tools". This implies that the teams involved in EoCoE-II planned to devote time and resources to make sure that the **new state of the art technologies, the improved services and tools are used** after the end of the project to achieve the impact as in the Description of Work part of the Grant Agreement.

Activities related to exploitation and use of EoCoE II project results are described in Work Package 7 Management under the Task 7.4 "EoCoE Sustainability Plan activities" to be performed between M12 and M28, with FZJ as Task leader.

CEA, ENEA and FZJ will supervise the elaboration of the sustainability plan for EoCoE-II with the inputs from all partners and from the Advisory Committee (AC) members. This plan will include (but is not limited to):

- **Drafting the EoCoE development roadmap**. This includes: the refinement of services' areas of applications, the identification of the needs of the identified markets and the improvements to be made to the offered services and the business model; the barriers and how to overcome them; prepare the sustainable structure of the EoCoE-II, in close collaboration with EERA.
- **Preparing the financial projections**: investment needed for covering the costs, funding strategies, co-funding opportunities through different stakeholders identified through the networking activities (WP6); including internal sources, public support through EU, national programmes etc., complementary or parallel projects.

Exploitation and Key Exploitable Results

Definitions

Results: any tangible or intangible output of the project activities, such as device, data, knowledge and information whatever their form or nature, whether or not they can be protected.

Communication: the **promotion of the project and its results** to a multitude audience (including the media and the public/society) in a strategic and effective manner.

Dissemination: the **public disclosure of the results** by any appropriate means (other than resulting from protecting or exploiting the results), including by scientific publications in any medium.

Exploitation: the **utilisation of results** – up to four years after the action:

- in further research activities other than those covered by the action concerned, or
- in developing, creating and marketing a product or process, or
- in creating and providing a service, or in standardisation activities.

Describing the key exploitable result – the characterisation tables

To start addressing exploitation it is important to identify the main features of the Key Exploitable Result (KER). The characterisation tables, from the initial one to the KER Form, are a useful tool to fine tune and summarise the main aspects of KER and provide inputs for dissemination purposes. The information collected needs to be updated as the project develops and finalised with the results of the validation and demonstration activities.

The content of the tables should not focus only on the scientific aspects of the KER but should offer a **snapshot** of the most important features related with the **use** of a result, following a problem oriented (demand driven) approach. Each aspect is to be **described in a simple way**, providing data and facts and highlighting the most important characteristics distinguishing the result from the alternative solutions currently available for the **potential users you are addressing**.

The tables are designed to help partners and project teams in achieving impact and in preparing the **D7.6**
Sustainability plan (due at M30) and the D6.3,4 "Assessment reports on dissemination, communication and networking" (due at M18, M36) and more in general to contribute to the preparation of the plan for exploitation and dissemination of the results (PEDR) by concentrating on relevant content.

Once filled in with "validated" content they will provide information on:

- **The novel solution:** Problem solved, Alternative Solutions, Unique Selling Point (advantages or innovativeness introduced compared to already existing solutions, Description of the Result;

- **Market:** Product/Service Market Size, Market Trends/Public Acceptance, Product/Service Positioning; Competitors/Incumbents, Prospects/users/Customers;

- **External factors:** Legal or normative or ethical requirements (need for authorisations, compliance to standards, norms, etc.);

- **IPR Status:** Background (type and partner owner), Foreground (type and partner owner);

- **Exploitation Strategy:** Exploitation Forms (direct use, indirect use (technology transfer, license agreement), standards, etc.), Which partner contributes to what (main contributions in terms of know-how, patents, etc.) Partner/s' expectations;

- **Go to market aspects:** Time to "market", Cost of Implementation (before use), Estimated Product/Service Price and Expected Revenues, Adequateness of Consortium Staff, External Experts/Partners to be involved, Sources of financing after the end of the project (venture capital, loans, other grants, etc.).

The Initial KER Table

The "initial KER table" is designed to start the collection of information that will be then reviewed and further integrated during the project life (see KER Form). Partners in charge of the KER should fill in the content and discuss it with the ones involved in the finalisation of the KER including the partners that will oversee the testing phase.

KER name	
Problem	*Describe the problem you are addressing (the problem your potential users have).* *Potential users are the people, companies, organisations, etc. that you expect will use the result (and generate an impact). They are your "Customers".* *Make sure that the problems described are the actual problems. Identify and validate them together with your "customers" (problem/"customer" fit). Being able to solve problems is key to make sure results are used and that the envisaged impact is achieved.*
Alternative solution	*Describe how your "customer" has solved the problem so far.* *Alternative solutions are important to benchmark the proposed innovation and to get a better insight on competition. Having a picture of the weaknesses and strengths of the alternative solutions, will help you to compare and to quantify the added value of your solution and to have insight on how the alternative solutions are delivered (who is providing them and at which conditions).*
Unique Selling Point USP - Unique Value Proposition UVP	*Describe the competitive advantages, the innovative aspects. What does your solution do better, what are the benefits considering what your user/customer wants, how does your solution solve his/her problem better than alternative solutions, what distinguishes the KER from the competition / current solutions?* *It is important that the UVP is validated and backed with facts and data. Check the UVP with early adopters and collect facts and data from the testing phase of your project to provide sound information on the magnitude of the value that your solution is offering.*
Description	*Describe in a few lines your result and/or solution (i.e.*

	product, service, process, standard, course, policy recommendation, publication, etc.). Use simple wording, avoid acronyms, make sure you explain how your UVP is delivered.
"Market" – *Target market*	Describe the market in which your product/service will be used/can "compete", answering the following questions: - What is the target market? - Who are the customer segments? *To finalise the exploitation plan and prepare the use of the KER a clear identification of the target market is needed, with its segmentation. It should include both a qualitative and quantitative description in terms of size and features. Please consider that geography matters in terms of the market that you want to serve.*
"Market" – *Early Adopters*	Early adopters are the "customers" you are willing to address first. They are usually the ones that feel the problem harder than all the others. (they are not the project partners). *To develop the exploitation model, it is important to look at early adopters and how to go from early adopters to "early majority". Note that innovators are the ones that "use" the "alfa" version (2,5%, often partners in the R&D project); early adopters are the customers ready to "use" the "beta" version (13,5%). New initiatives fail because they are not able to reach early adopters.* *You should be as much precise as you can. Being the early adopters the first ones you would like to reach out with your innovative solution it will be important to be able to connect with them. Make sure your early adopters are consistent with the target market (customers).*
"Market" - Competitors	Who are your "competitors" (note: they are the ones offering "alternative solutions")? What are their strengths and weaknesses comparing to you? *"Competitors" may be different if you envisage licensing as use model rather than directly providing a service or producing and selling a device.*
Go to Market – Use model Discussion to be started in the initial stages	Explain what is your "use model", how the KER will be put in use (made available to "customers" to generate an impact). Examples of use models: manufacturing of a new product, provision of a service, direct industrial use, technology transfer, license agreement, contract research, publications, standards, etc. Note training is a service. *Use model and target market, customers need to be consistent. In the case of licensing, consider that are several different types of licensing agreements that could be used. Discuss the different options with colleagues from the legal department involved in licensing deals. Delivering a service entails the presence of a "competent" organisation with procedures, insurances and certifications ready to offer the services according to the expectations of the potential customers.*

Go to Market - Timing Discussion to be started in the initial stages	*What is the time to market?* *How long it will take, from the end of the project for the result to be fully usable.*
Go to Market – IPR Background Discussion to be started in the initial stages	*What is the Background (type/ partner)?* *Provide information considering also what already agreed in the Consortium Agreement.*
Go to Market – IPR Foreground Discussion to be started in the initial stages	*What is the Foreground (type/ partner)?* *Provide information considering also what already agreed in the Consortium Agreement.*

The KER Form

This template is designed to integrate the information initially collected (preliminary form), after the first revision. The table contains some of the fields of the preliminary form (to be updated) and new ones. Partners in charge of the KER should deal with the content together with the ones responsible for exploitation and in charge of dissemination. The initial set of information should be integrated and validated by the other partners, including the ones from the testing stages. Colleagues from the technology transfer offices and from the business development unit should help in the finalisation of the table.

KER name	
Problem	*Describe the problem you are addressing (the problem your potential users have).* *Potential users are the people, companies, organisations, etc. that you expect will use the result (and generate an impact). They are your "Customers".* *Make sure that the problems described are the actual problems. Identify and validate them together with your "customers" (problem/"customer" fit). Being able to solve problems is key to make sure results are used and that the envisaged impact is achieved.*
Alternative solution	*Describe how your "customer" has solved the problem so far.* *Alternative solutions are important to benchmark the proposed innovation and to get a better insight on competition. Having a picture of the weaknesses and strengths of the alternative solutions, will help you to compare and to quantify the added value of your solution and to have insight on how the alternative solutions are delivered (who is providing them and at which conditions).*
Unique Selling Point USP - Unique Value Proposition UVP	*Describe the competitive advantages, the innovative aspects. What does your solution do better, what are the benefits considering what your user wants, how does your solution solve his/her problem better than alternative solutions, what distinguishes the KER from the competition / current solutions?* *It is important that the UVP is validated and backed with facts and data. Check the UVP with early adopters and collect facts and data from the testing phase of your*

	project to provide sound information on the magnitude of the value that your solution is offering.
Description	*Describe in a few lines your result and/or solution (i.e. product, service, process, standard, course, policy recommendation, publication, etc.). Use simple wording, avoid acronyms, make sure you explain how your UVP is delivered.*
"Market" – *Target market*	*Describe the market in which your product/service will be used/can "compete", answering the following questions:* *- What is the target market?* *- Who are the customer segments?* *To finalise the exploitation plan and prepare the use of the KER a clear identification of the target market is needed, with its segmentation. Please consider that geography matters in terms of the market that you want to serve.*
"Market" – *Early Adopters*	*Early adopters are the "customer you are willing to address first. They are usually the ones that feel the problem harder than all the others. (they are not the project partners).* *To develop the exploitation model, it is important to look at early adopters and how to go from early adopters to "early majority". Note that innovators are the ones that "use" the "alfa" version (2,5%, often partners in the R&D project); early adopters are the customers ready to "use" the "beta" version (13,5%). New initiatives fail because they are not able to reach early adopters.* *You should be as much precise as you can. Being the early adopters the first ones you would like to reach out with your innovative solution it will be important to be able to connect with them. Make sure your early adopters are consistent with the target market (customers).*
"Market" - Size	*What is the market size for your solution?* *What is the percentage of that market you will be targeting?* *It should include quantitative description. If you are dealing with training, provide information on the size of potential beneficiaries. If you deal with policy recommendations provide an estimation of how many people/SMEs will be affected.* *Feel free to propose other ways for an estimation of the size of the market.*
"Market" - Trends	What are the market trends related to your solution? *It should include quantitative data.*
Settings– Acceptance	*What is the public acceptance?* *What is the social impact?* *What is the environmental impact?* *What is the economic impact?*
Settings – Legal and regulatory aspects	*What are the legal requirements?* *What are the normative requirements?* *What are the ethical requirements?*
Go to Market – Use model	*Explain what is your "use model", how the KER will be put in use (made available to "customers" to generate an impact). Examples of use models: manufacturing of a new*

	product, provision of a service, direct industrial use, technology transfer, license agreement, contract research, publications, standards, etc. *Note training is a service.* *Use model and target market, customers need to be consistent. In the case of licensing, consider that are several different types of licensing agreements that could be used. Discuss the different options with colleagues from the legal department involved in licensing deals. Delivering a service entails the presence of a "competent" organisation with procedures, insurances and certifications ready to offer the services according to the expectations of the potential customers.*
"Market" – Competitors	*Who are your "competitors" (note: they are the ones offering "alternative solutions")?* *What are their strengths and weaknesses comparing to you?* *Competitors vary according to the use model. If you envisage licensing as use model rather than direct sale your competitors will be different..*
Go to Market – IPR Background	*What is the Background (type/ partner)?* *Provide information considering also what already agreed in the Consortium Agreement.*
Go to Market – IPR Foreground	*What is the Foreground (type/ partner)?* *Provide information considering also what already agreed in the Consortium Agreement.*
Go to Market– Timing	*What is the time to market?* *How long it will take, from the end of the project for the result to be fully usable.*
Go to Market - Channels	*How will you reach the Early Adopters?* *Identify the channels you will use to connect to early adopters. Channels have to be consistent with what defined in the dissemination plan and with the use model and early adopters. Discuss whether the chosen channels are suitable for your choice of customers and consider whether they will be enough to establish the needed reputation on the market.*
Go to Market - Pricing	*What will be the eventual price of the solution?* *Estimation of price / unit and number of units sold to reach breakeven point (cover costs).*
The Team	*Describe the team responsible for making sure the result is used (responsible to implement the exploitation plan) include, if possible, names and qualifications of the team members.*
The Team – External providers	*If you need to integrate your "team, whom do you need (new) external partners? Which type of external providers?*

- ## The Exploitation Roadmap

This table is designed to help the consortium to identify and plan activities to be performed after the end of the project. The highest risk a consortium faces is not being able to implement the exploitation

and dissemination plan and increase the TRL level or go to market, after the project is ended, due to lack of resources. The exploitation roadmap is designed to address this risk and pave to way toward use and a stronger impact. It should be filled in right after the preparation of the KER Form.

Exploitation roadmap	
Actions	*Briefly describe actions planned to be executed 3-6 months after the end of the project.* *Make sure you do not just focus on technical activities (realisation of a prototype, software interface, etc.) but also consider the finalisation of a business plan, the protection of intellectual property, the collection of authorisations, all it will be needed to start implement what is in your exploitation plan*
Roles	*Roles of partners involved in the actions defined above.*
Milestones	*List the milestones and KPIs to be used for monitoring the implementation of the actions listed above.*
Financials Costs	*Cost estimation to implement planned activities (1 year, 3 years).* *Provide information on the costs/investments needed to bridge the end of the project to the next steps planned and increase TRL or go to market (you may invest in a patent, in the realisation of a prototype, etc.).*
Revenues	*Projected revenues and eventual profits once the KER will be used (1 and 3 years after use)* *Consider revenues you will expect to collect by licensing, or thanks to service provision or sale of devices. They generate the cash flow that will make the use of the result sustainable over time (provide an estimation concerning the first year and what is expected after 3 years, if possible). It is recommended that you estimate the revenues according to your early adopters and potential customers and include the information in the draft exploitation plan.*
Other sources of coverage	*Resources needed to bridge the investment needed to increase TRL and ensure the result is used.* *Financial resources to cover costs incurred before collecting the first revenues (during the "time to market" – see costs) and their sources. Sources can be partners` own budget, other project grants, national/regional incentives, risk capital, loans, etc. Make sure to obtain them at the right timing.*
Impact in 3-year time	*Describe impact in terms of growth/benefits for the society* *Impact is the objective of H2020. Impact should mobilise measurable changes in terms of growth/benefits for the society (i.e. jobs created, investments mobilized, turnover generated).*

Horizon Europe and the importance of exploitation and dissemination

The new European Union Framework Programme for Research and Innovation, Horizon Europe, will run from 2021 to 2027. On the 29th of April 2020, the Commission has published the **Implementation Strategy** for the programme. This Strategy focuses on how the new programme will achieve objectives in practice. One of the objectives is about maximising impact.

Horizon Europe has been conceived to boost the impact of European R&I spending.

Starting with the way the **work programme** is conceived, there will be a **clearer specification of the expected impacts**. Unlike Horizon 2020, these targeted impacts will be given at the level of a call, or group of topics, while expected outcomes will be set out for each topic. These provisions will guide applicants and will ensure that, from the off, projects are lined up along impact pathways. Importantly, while expected impacts will be precise, topics will be open to a range of different pathways to achieve those impacts.

In turn, the proposal evaluation impact criterion will refer to the work programme targeted impacts and require the applicants to specify how their proposal could contribute to these targeted impacts. A **project-specific dissemination and exploitation plan** will be required and evaluated at proposal stage.

As for monitoring and reporting, work will be undertaken to identify appropriate indicators, methodologies and baseline values to implement the Key Impact Pathways (KIP) to better **measure scientific, societal and economic impacts** of projects (including their contributions in meeting the Sustainable Development Goals), while minimising any additional burden on beneficiaries. New indicators will be set up to measure the nearly 30 items that require monitoring and reporting across the programme, in areas such as monitoring of collaborative links or the level of TRLs in collaborative research. Importantly, monitoring and reporting on European Partnerships, will conform to the general provisions for the 'mainstream' parts of the programme, as well as measures for the **exploitation and valorisation of results**.

In addition to the usual obligation to report on **dissemination and exploitation (D&E)**, efforts will be made to incentivise beneficiaries to **continue the reporting on D&E activities beyond the life of the project** itself. These incentives will include the new Horizon Results Platform, helping beneficiaries show-case the outcomes and impacts in an appealing way, as well as the continuation of the Horizon Impact Award and Innovation Radar, creating opportunities for networking and attracting potential users. **The D&E boosters will keep delivering customized services to beneficiaries to enhance their D&E activities and unveil the potential of their results.**

The Exploitation Support

The support provided by META through ENEA is an opportunity for all the partners of EoCoE II to discuss the use of project results and their exploitation routes contributing to maximise impact of EoCoE II.

The selected outcomes of the research work are looked at as Key Exploitable Results (KERs). KERs are results, identified by the partners as the one with a commercial and/or societal significance. They are discussed from exploitation point of view, that is "how they will be used after the end of EoCoE II to generate impact".

Being involved in exploiting EoCoE II results is not only commercialising the novel solutions/services but it is also, in some cases mainly, making sure that they are used and increase their TRL by addressing additional competitive funding programmes in an effective way.

The approach used is the market/customer demand or societal needs/user point of view.

The Exploitation support provides the involved teams with the opportunity to work on:

- The most important elements for exploitation and dissemination;
- The unique value proposition and the use model;
- An implementation roadmap for the activities to be performed after the project end (steps, timing, responsibilities, milestones,financial needs and sources);
- A short presentation of the KER and its exploitation (pitch).

The information collected during the first interaction with the partners is presented in the following chapters together with some first recommendationsfor integrating it.

Selection of KERs

As introduced in previous chapters, KERs, key exploitable results, are those peculiar results that partners consider having the potential to be used by the identified target audiences/"customers" well after the project ends.
To facilitate the identification of KERs to be part of the support provided by META Group different calls have been organised and some preliminary material was shared.

The set of questions below was designed for EoCoE-II to facilitate the discussion on KERs and to better frame exploitation and dissemination within the activities to be carried out by the research teams.

Questions:

- Have you already thought at the work you are performing in EoCoE-II having in mind usable results?
- Have you identified the problems you are addressing with the tools and solutions you are developing and why these novel solutions are better than other available ones to address such problems?

- Have you validated the assumptions you adopted to develop your solutions with the target audiences/"customers"?
- Have you already identified what it is needed and what will be needed, after the end of EoCoE-II, to ensure that your results will be ready for use (in e.g. for further research, services, training, etc.)?

Reflecting on these questions can help to identify and propose the results (tools, services etc.) to be further developed as KERs and that will become the **foundation of the sustainability and dissemination plans of the project**.

KERs considered

The following KERs have been identified by the partnership in order to represent the some of the main categories of results envisaged by EoCoE II.

No.	Name of the KER
1	Software Library for solving linear equations
2	High Fidelity Simulator for wind energy applications (farms and turbines)
3	SaaS Portal

A face to face meeting to discuss the three pre-identified KERs was planned to take place at the consortium meeting scheduled on the in April in Barcelona, Spain. The event was cancelled due to COVID-19 emergency and re-arranged as a series of virtual workshops with each KER Leading Partner:

- on the 31st of March with Yvan Notay, from ULB - KER 1;
- on the 3rd of April with Herbert Owen from BSC - KER 2;
- on the 9th of April with Pawel Wolniewicz, Agnieszka Rausch - KER 3.

It is suggested to further develop, validate and integrate the three identified KERs as discussed during the virtual interactions with the Expert. The recommendations in red that the Expert added to the Characterisation Table's boxes are the "food for thoughts" for the next steps and suggestions on how to better define each KER for dissemination and exploitation purposes.

KER No.1 –Software Library for solving linear equations

Characterization of the result

KER name: Software Library for solving linear equations	
Problem	• Amount of computational time needed • Accuracy • Energy consumption of traditional processors *Being able to address actual problems is the key to make sure that dissemination is effective, and the result is used (and impact is achieved).For the next step it will be important to review the problems as they resulted after the telco on 31/03/2020, (the problem your potential users have – software houses or R&D teams). Please validate them with users. We suggest you contact some of the current users (the ones are using the software for free and some of your commercial clients) and check with them if your assumptions on the problems are correct. Working in team with your Technology Transfer Office colleagues will help you in proceeding faster.*
Alternative solution	• Free high-performing solvers for research purpose. BoomerAMG (part of Hyperdistributed under GLPL) https://computing.llnl.gov/projects/hypre-scalable-linear-solvers-multigrid-methods • Plug in for commercial software SAMG sold together with extensive support. https://www.scai.fraunhofer.de/en/business-research-areas/fast-solvers/products/samg.html *Alternative solutions are strictly linked to the problems the "customers" have and they are key for the identification of the UVP. Please review them once you will have validated the problems. We suggest, as next step, to ask your users also about alternative solutions (weaknesses and strengths of the alternative solutions, who is providing them and what are the conditions).*
Unique Selling Point USP - Unique Value Proposition UVP	• Exascale performances thanks to the implementation of GPU • Easier to use and more robust than free alternatives. • Easy to plug in already available solvers. • Less energy consumption thanks to the implementation of GPU *The UVP is linked to problems addressed and existing solutions, review it accordingly.* *For the next steps please validate the resulting UVP with the users as for the problems and the alternative solutions. Make sure that, by the end of the project, you collect facts and data to support with evidences your UVP (provide sound information on the magnitude of the value that your solution is offering). Having a first draft for the Unique Value Proposition is key for finalising content for dissemination.* *Check the updated UVP with your TTO or with the colleagues from the business development and marketing department.*
Description	A software library that solves systems of linear equations with an aggregation-based algebraic multigrid method on GPUs machines. It is expected to be efficient for large systems arising from the discretization of scalar second order elliptic Partial Differential Equations (PDEs). The method is however purely algebraic and no information has to be supplied besides the system matrix and the right-hand-side. The software has been designed to be easy to use by non-experts (in a black box fashion). It is available both as a software library for FORTRAN or C/C++ programs, and as a Octave/Matlab function. Several levels of parallelism are provided: multi-threading (multi-core acceleration of sequential programs), MPI-based, or hybrid mode (MPI+multi-threading).

	To be reviewed and integrated after further considerations of the UVP. Please note that a clear and complete description is key for dissemination.
"Market" – *Target market*	• Research teams needing highly performing solvers for research purpose; • Software houses (plugin for the commercial software). (Clients have often some level of expertise on numerical methods to solve linear systems). *To be reviewed. Please identify the target market and the customer segments, It should include both a qualitative and quantitative description in terms of size and features. Please consider that geography matters in terms of the market that you want to serve.The suggestion is also to involve colleagues from the Technology Transfer Office. They can help you with information and data.*
"Market" – *Early Adopters*	Research teams: they need a support in development of a new method, and the use of software and numerical tools. *Identification of Early Adopters is important to build your sustainability plan and to contribute to dissemination. You should further investigate and analyse considering geography, size and providing qualitative and quantitative information. The early adopters are the ones you would like to reach out with your innovative solution. Your TTO can support you in collecting information about the market.*
Go to Market – Use model	Licensing (AGMG has already 20 commercial licenses on the market and about 200 academic license for the non GPU release). When a client orders a license, access is given to the software. Free trials are provided upon request. The form of delivery depends on the case at hand. We privilege object form, but source code may be given when we are confident that this will not be led to piracy. No service delivery.
"Market" – Competitors	• Providers of free software. • Providers of commercial software for numerical simulations *The finalisation of the Competitors is linked with the "alternative solutions" and use model. Please review them once you finalised both of them. Your TTO can support you in collecting information about the competitors.*
Go to Market – Timing	Results are already usable for the non GPU version. *To be further discussed as far as the availability of the GPU version is concerned.*
Go to Market – IPR Background	AGMG - COPYRIGHT © 2012-2018 Yvan Notay– ULB. AGMG solves systems of linear equations with an aggregation-based algebraic multigrid method. It is expected to be efficient for large systems arising from the discretization of scalar second order elliptic PDEs. The method is however purely algebraic and may be tested on any problem. (No information has to be supplied besides the system matrix and the right-hand-side.) *Please provide information considering also what already stated in the Consortium Agreement.*
Go to Market – IPR Foreground	*Please provide information considering also what already agreed in the Consortium Agreement.*

KER No.2 –High Fidelity Simulator for wind energy

Characterization of the result

KER: High Fidelity Simulator for wind energy applications

Problem	- Inability to predict the complex flow physics in windfarms that results in higher costs for wind fields - High level of errors (up to 7 or 8%) leading to high run time and computational cost and to the need to coupling with other phenomena *Problems addressed are key for the characterisation of a result. They need to be discussed and validated with the problem owners. Problem owners will be the early adopters (the first one to address that will take advantage of your result).*
Alternative solution	Every code has an edge in different parts. Exawind (USA) evaluated different codes (SOWFA based on open foam open source CFD code). Computational fluid dynamics (CFD) codes are based on the Weather Research and Forecasting (WRF) Model, a mesoscale numerical weather prediction system for both atmospheric research and operational forecasting applications. Vortex (company selling predictions on wind) uses WRF. Development departments in Iberdrola do not have their code, use commercial ones like Windsim (a solver that employs the PHOENICS CFD solver, which is owned and developed by Concentration Heat And Momentum Limited (CHAM.)). *To be discussed and integrated. Alternative solutions are strictly linked to the problems the "customers" have and are the key for the identification of the UVP. Please investigate the weaknesses and strengths of the alternative solutions, who is providing them and what are the conditions. It will help you to compare and to quantify the added value of your solution and to have insight on how the alternative solutions are delivered.*
Unique Selling Point USP **- Unique Value Proposition UVP**	The best Large eddy simulation (LES) solver for complex geometries (acknowledged by professor Moin CTR Stanford) in terms of accuracy (CPU times are similar to others) for complex geometries. (finite elements and finite modes, unstructured grids): - Increases node level performance. Computational savings of up to 38% have been obtained in the assembly of the matrix for the Navier Stokes equations; - CPU-time reductions of more than 50% in the solver CPU time measured for some LES cases when compared with two iterative solvers, Maphys and AGM). *The UVP is linked to problems addressed and existing solutions. To be further analysed and validated. It is suggested to involve colleagues from the Business Development Department in the Barcelona SuperComputing Centre to better define the UVP.*
Description	Alia is a solver for Large eddy simulation (LES) implementing co-execution on GPUs and CPUs to maximise computational performances. It is easy to configure and compatible with the most used pre and post processing software like ANSA from BETA CAE Systems (private engineering software company) and ParaView (open-source, multi-platform data analysis and visualization application). Working with Iterative solution with Aggregation-based algebraic MultiGrid – AGMG. Alia solves systems of linear equations with an aggregation-based algebraic multigrid method. It is designed to for simulations of wind fields with complex geometry introducing GPU and coupling with rotation meshes (individual wind turbine). It is expected to be efficient for large systems arising from the discretization of scalar second order elliptic PDEs. The used method is purely algebraic and may be tested on any problem. (No information has to be supplied besides the system matrix and the right-hand-side.) http://192.107.71.21/eocoe-eu-old-mirror/www.eocoe.eu/success-stories.html *Please check the Description, once the UVP is finalised. Make sure it explains how the solution delivers its uniqueness to the identified customers. A good description is key also for dissemination.*

"Market" – *Target market*	• Engineering departments in Wind energy companies (Iberdrola); • Wind turbine producers (Vestas (SIMENS-GAMESA, GE); • Companies analysing complex fluid related problems (including wheels – fluid interaction in cars) Mostly in Europe. *It is needed a clear identification of the target market, with its segmentation to finalise the exploitation plan and prepare the use of the KER.* *It should include both a qualitative and quantitative description in terms of size and features. Please consider that geography matters in terms of the market that you want to serve. Involve colleagues from the Business Development Department in the Barcelona Supercomputing Centre to further analyse and investigate the market.*
"Market" – *Early Adopters*	Engineering departments in Wind energy companies (Iberdrola in Spain). *Identification of Early Adopters is important to build your sustainability plan and to contribute to dissemination. Knowing they are the first you will contact to bring the result to use, discuss how you will reach them out involving colleagues from the Business Development Department.*
Go to Market – Use model Discussion to be started in the initial stages	'Provision of a service'. Not a priority to expand the client base. *To be further discussed to agree on procedures, insurances and certifications to offer the service, and the modalities to cover the costs of the service provision. It is suggested to discuss and organise the information needed to fine tune the use model and prepare the implementation roadmap with the colleagues from the Business Development Department.*
"Market" - Competitors	ExaWind is a projects part of the U.S. Department of Energy's (DOE's) Exascale Computing Project (ECP). Aims at advancing fundamental understanding of the flow physics governing whole wind plant performance, including wake formation, complex terrain impacts, and turbine-turbine interaction effects. The objective is to develop a predictive simulation of a wind plant composed of 100 multi-MW wind turbines sited within a 10 km x 10 km area with complex terrain, involving simulations with 100 billion grid points. *The finalisation of the Competitors is linked with the "alternative solutions" and the selected use model. Please identify strengths and weaknesses of your competitors compared to you to highlight your result and its uniqueness. If useful, involve colleagues from the Business Development Department to further analyse and investigate competitors.*
Go to Market - Timing	What is the time to market? *Include information on how long it will take, from the end of the project for the result to be fully usable.*
Go to Market – IPR Background	What is the Background (type/ partner)? *Please provide information considering also what already agreed in the Consortium Agreement*
Go to Market – IPR Foreground	What is the Foreground (type/ partner)? *Please provide information considering also what already agreed in the Consortium Agreement.*

KER No.3 –SaaS Portal

Characterization of the result

KER: SaaS Portal	
Problem	Two sets of problems, depending from the problem

	owners:
	User of simulation codes:
	- Lack of knowledge on the most appropriate applications to run simulations and solve their problems. - Lack of knowledge on incentives available to run applications and use supercomputing centres. - Difficulties in handling technical and procedural details for accessing applications.
	Developers of simulation codes
	Difficulties in making available trials of codes in an easy and efficient way (Easy access to trials for the specific applications)
	Review the problems of your potential users (problem owners). Go back to them to validate their problems. It is suggested to perform interviews with potential early adopters to validate your assumptions on problems.
Alternative solution	**Users of simulation codes** contact the application developers individually asking for access to: - application code; - local HPC (where application is installed). Application developers must agree installation with HPC sites. Users need to apply individually for an account on HPC. Procedure and politics differ between sites. **Developers of simulation codes** make available static information (tutorials) on their products. *Alternative solutions used by the "customers" to solve problems (this box is linked to the "problems" your customers have) are important to get an insight on competition and to identify/quantify the added value of your solution. You have two customers, the ones needing access to the codes and the ones providing the code. Consider this when addressing "market"*
Unique Selling Point USP - Unique Value Proposition UVP	- Single access point to the best applications and computing centres in the renewable energy; - User friendly: - Easy to run trials/tests for users in the renewable energy industry (user can run predefined example and modify some parameters to check the influence in computation, performance and results); - Easy and quick to set up tests for software developers. - Optimised for decision making (users can use result to decide next step (e.g. apply for standard HPC grant or buy app licence)). - Single access point to best competences for numerical simulation in the field of renewable energy (so far, no facilities designed for this in the portal) *The UVP is linked to problems and existing solutions. Make sure your UVP is consistent with the problems identified. The UVP should be validated and backed with*

Deliverable D6.3

	facts and data. Check the UVP with early adopters and collect facts and data to provide sound information on the magnitude of the value that your solution is offering. It is suggested to involve colleagues from the Business Development Department to better define the UVP.
Description	The European portal for numerical simulation in the energy domain. SaaS Portal to access software solutions for the energy sector. It showcases simple and clear use cases (with a limited number of parameters) that users can run as example jobs with limited resources. The portal will be installed in the PSNC computing centres with access to a given amount resources to run the computational jobs submitted. Portal functionalities include: • Registration of users. For security and licencing purposes, all users must be registered and validated; • Examples to will show the basic functionality of the hosted software solutions and their usability; • Possibility to define the parameters for custom simulation even if limited to the most important ones; • Runs with submission and monitoring of test jobs; • Transfer of input data and output results. *To be fine-tuned and completed, after integration and consideration of the UVP. Make sure it explains how the solution delivers its uniqueness to the identified customers. A good description is key also for dissemination.*
"Market" – *Target market*	• Users of codes in the scientific world and business world for energy applications; • Application and simulation developers (computationally demanding applications) in energy domain in Europe. *It is important to identify who will pay to maintain the portal up and running after the end of EoCoE. Please devote time to identify the target market and its segmentation. It should include both a qualitative and quantitative description in terms of size and features. Consider that geography matters in terms of the market that you want to serve.*
"Market" – *Early Adopters*	• EoCoE partnership *Identification of Early Adopters is important to build your sustainability plan and to contribute to dissemination. Partners from EoCoE may not be enough to ensure impact and sustainability after end of project. It will be important to connect with early adopters to ensure coverage of the costs. Make sure your early adopters are consistent with the target market (customers). Please provide qualitative and quantitative information, try to be as much precise as possible.*
Go to Market – Use model	*To be still discussed among partners to finalise the*

	sustainable plan. *It is about how to cover costs that will be incurred to maintain the portal up and running after the end of EoCoE. Costs related to the infrastructure and to the people involved in the management, promotion and update of the portal. Partners will need to agree on how they are going to cover costs to run the portal and promote it after the end of EoCoE. A possibility, if it is free for users, is to raise sponsorship from partners, associations or renewable industry donors. Use model target market and customers need to be consistent. The Explanation must convince the EC.You may involve colleagues from the Business Development Department to better define the use model.*
"Market" - Competitors	*To be analysed and discussed* *The identification of "Competitors" is linked to the use model please go back to this box once you have finalised the use model. Identify who are providing similar services/facilities for the renewable energy sector. Validate your statements with the other partners and early adopters.*
Go to Market - Timing	Portal will be up and running within the lifetime of the project. *To be further discussed.*
Go to Market – IPR Background	*Provide information considering also what already agreed in the Consortium Agreement.*
Go to Market – IPR Foreground	*Provide information considering also what already agreed in the Consortium Agreement.*

Next steps: the Lean Canvas

To contribute to the sustainability plan and to dissemination activities, it is important to further focus on the problems the novel solution is addressing, who are the ones who feel this problem most (the users of the solution, the target group of dissemination activities, your "customers"), the unique value proposition (what makes the novel solution much better than current ones, the pivot for messages to be used for the messages to be delivered during dissemination) and to identify how to reach customers/users out (use mode and distribution channels). It is also important to identify the costs of providing our target groups with the novel solution how to monitor progresses and how to cover costs incurred (sustainability).

The Lean Canvas is a tool that can help in these crucial activities. The Lean Canvas is an adaptation of Business Model Canvas by Alexander Osterwalder which Ash Maurya (http://www.ashmaurya.com/2012/02/why-lean-canvas/) created in the Lean Startup spirit (Fast, Concise and Effective startup). It focuses on problems, solutions, key metrics and competitive advantages.

Among the different type of canvas, the lean business model canvas, by Ash Maurya, is the most suited for R&D projects. It is a powerful tool to be used by consortia to further develop the characterization of their KERs, prepare the materials to be discussed at meetings and draft the exploitation/business plan for a KER.

How to approach the use model

The use model or "business model" is the plan for the creation of impact (successful delivery of a solution), identifying, the intended "customer" base, the result (product/service), sources of revenue and details of financing. It describes the way in which "value" can be extracted from an exploitable R&D result and impact generated.

When working on the "use" model it is important to focus on the following elements:

Your objective
• Why am I doing this thing?
• Which are my goals? (Best and worst scenario)
• Am I really better/different?

Global market	Local market
• Competitors	• Competitors
• Incumbents	• Incumbents
• Investors (geography matters)	• Investors
• Level of investment	• Peculiarities

6-12-18 months plan
• Product roadmap
• Cashflow
• Valuation target
• KPIs
• Next step

Every "customer" has a problem, every problem has a solution

When working on the use model, it is crucial to start from the problem not from the solution. New initiatives (including spin-offs) fail because their offer (a product, a service, a license) is not designed for the intended users, "customers". Every "customer" has a problem; every problem has a solution. Vice versa, not every solution has a problem, not every problem has a customer. Brainstorm and identify the problem (forget the solution) focus on the problem, identify a common definition.

Early Adopters

To develop the exploitation model, it is important to look at early adopters and how to go from early adopters to "early majority". Innovators are the ones that "use" the "alfa" version (2,5%, often the industrial partner in an R&D project); early adopters are the customers ready to "use" the "beta" version (13,5%). Next step is to reach the "early majority" (34%). New initiatives fail before reaching out the early majority and this is connected with the capability to reach early adopters.

Identify the "customers", who will pay, focus on the riskier ones and describe them in the most specific way. Why that customer has that problem is the way to select the assumptions (how they deal with the problem, what are they looking for). Focus on the most important one, the one that, if not validated, will make everything fall down.

UVP

The Unique Value Proposition, or Unique Selling Proposition (USP), is a clear statement describing the benefits of the novel offer, how you solve your customer's needs and what distinguishes you from the competition. It is clearly related to the customers' needs and how their problems are solved so far.

In defining the UVP you do not want a "point of parity" when your features are similar to the ones of the competitors". What counts are the points of difference, what you do, that the others do not and that matters to the customers. You do not want to be better than your competitors, you want to be better for your customers. Do not imitate/mirror competitors. Keep in mind customers, not competitors.

The "Lean Canvas"

For preparing the Exploitation Plan (your business plan) of a R&D result and define the use mode, it is useful to work with the Lean Canvas. The Lean Canvas is an adaptation of Business Model Canvas by Alexander Osterwalder which Ash Maurya (http://www.ashmaurya.com/2012/02/why-lean-canvas/) created in the Lean Startup spirit (Fast, Concise and Effective startup). Lean focuses on problems, solutions, key metrics and competitive advantages.

The canvas is a good tool to focus on the exploitation model and start collecting information for the exploitation plan. Among the different type of canvas, the lean business model canvas, by Ash Maurya, is the most suited for R&D projects. It is a powerful tool to be used by the partners to further develop the characterization of their KERs, prepare the materials to be discussed at consortium meetings and draft the exploitation/business plan for a KER.

The lean canvas helps to fine-tune and develop the exploitation strategy for a KER having in mind four questions:

1. Who is my "customer"?
2. What is "her/his" problem?
3. How does "She/he" solve the problem now?
4. Is our solution more efficient than the current

one?

How to fill out a LEAN CANVAS

The end goal of the lean canvas is that an unknowing third-party will be able to review the information providedand understand what the KER and its use is about. They will understand the problem in focus, the customer groups that you target, the solution you provide, how it differentiates from competitors, how you intend to create value, etc. The lean canvas is very important for an effective implementation of dissemination actions. Due to this, it is very important to avoid the use of highly technical language, abbreviations etc. They can result in third parties not understanding the nature of your KER.

Below a description of the main steps to draft the canvas.

1. **PROBLEM** - find 3 main problems you are addressing.

Explain: *What* is the problem and *why* is it a problem.
Additionally, attempt to add numbers or quantifiable measures that will clearly highlight the scale of the problem.
Describe EXISTING ALTERNATIVES - Find out how they are solving the problem now (today's alternatives)

2. **CUSTOMER SEGMENT** - identify who has the problem, define target customers (do not confuse with users).

Be clear on explaining the geographic location of your customers, the industry in which they are operating in, as well as connecting them to the problem in question.
EARLY ADOPTERS - find a small niche that is having the biggest problem, the ones that suffer the most (early adopters).
These will be the first customers of your solution; Be sure to find as much information about these as possible. Explain the geographic location, connect them to the problem, explain exactly why these will be the first adopters, clarify your current connection to them etc.

3. **UNIQUE VALUE PROPOSITION**

Define your UVP based on the today's alternative, what makes your product/service more efficient for your customers, a single and compelling sentence that makes everybody understand why you are far better (your features need to be compelling to the customers' needs, otherwise are irrelevant to clients).
Ensure that you clearly define how you differentiate from alternative solutions, and why the customer will come to you; Explain the *uniqueness* of your solution.
Provide facts and data, explaining the performance of your product compared to alternative solutions (efficiency increase of 20%, decreased energy consumption of 10%, 30% fewer development costs etc.).

4. **SOLUTION** – outline the main features of your solution.

When your features are similar of the ones of the competitors, this is an equality. What matters are the points of difference! What you do, that the others do not do and are what matters to the clients.
Be sure to explain the format of your solution (is it a machine, an equipment, a software, a service, a process, etc.), what it does, and how it does it.

5. **UNFAIR ADVANTAGE** – what is it that gives you an advantage in front of the competition? Something that can't be easily copied or bought.

This could be IPR, being first movers on new technology that takes years to develop etc. Be sure to explain, *why* the listed points provide you with an advantage. It can be difficult for third-parties to understand if they do not have a wide array of knowledge regarding your industry.

6. **CHANNELS** – How will you reach your customers?

Be sure to investigate whether the chosen channels are suitable for your choice of customers and consider whether they will be enough to establish the needed reputation on the market.

7. **REVENUE STREAMS**

Which will be the main revenue streams when the solution is ready for the market. Explain how each of them will generate revenue and how much you expect to generate from each stream.
Estimate revenues for seed stage after 6 months and after 3 years. Quantify amounts and prices by detailing, for example, the expected amount of services provided and paid, amount of licenses sold at which prices etc.

8. **KEY METRICS**

key activities you will measure to track the success (e.g. units sold, users registered, retaining users, paying customers, number of complaints …)

9. **COST STRUCTURE**

which will be the main costs when the solution is ready for the market (e.g. customer acquisition costs, distribution costs, hosting, people etc). As with revenues, estimate the total costs issued after 6 months and 3 years along with the estimated cost of each "cost-entity". This will connect your revenues to your costs.

After you finish the exercise, test your hypothesis "out the lab", with at least 2 to 3 real potential customers. Validate the following assumptions:

10. Are the problems you assume really the ones? Is your solution to solving their problem?

11. Are the features your solution is offering the ones the market needs and looks for?

12. Are the explanations provided in the canvas sufficient to provide the customer with an understanding of your project?

Write down the feedbacks and update, revise, iterate the CANVAS accordingly.

Lean Canvas by Ash Maurya

Problem 1)	Solution 4)	Unique Value proposition 3)	Unfair Advantage 5)	Customer segment 2)
Top 3 problems	Top 3 features Based on the VP (why it is better than others) Use MVP to test assumptions	Why you are different and worth buying (How you help customer doing his job, accomplish his mission	Can be easily copied or brought? What is the customer retaining costs? Acquisition costs Switching costs	Who is he
His main problem Which job has to accomplish				Distinguish between users and customers (customers buy, users "use")
What and why?				Split in vertical segments Pick the strongest customer segment
	Remember: the first sentence should clarify what it does, how it does it.	Improve his position …. better than others.	See earlier explanation for clarification. ….	
		Provide		Remember geographic location, Industry and connection to problem.
	Key Metrics 8)		Channels 6)	
Existing alternatives to address the same problems	Key aspects/activities you need to measure for a feedback	Explain how you differentiate from alternative solutions and thus the uniqueness of your solution. Provide numbers to the performance of your solutions (see earlier explanation).	How you contact your customers/early adopters, How you deliver value How you promote the value	Early adopters Remember geographic location, Industry, and connection to the problem. + why are they early adopters? What is your relation to these etc.

Cost structure 9)	Revenue Streams 7)
Prototyping HR costs, Eng. costs, MFG costs, marketing costs etc. Estimate costs for each "cost-entity" Estimate costs after seed stage 6 months and 3 years.	The different revenue streams How each stream generates revenue Estimation of how much each stream will generate Estimation of revenue at seed stage 6 months and 3 years.

Next steps: dissemination - the FactSheet

The FactSheet is a template used by DGRTD to collect the information needed to disseminate project results. The factsheet is designed to present/describe comprehensively and in an easy-to-understand way the result and to generate two appealing pages.

It is recommended to use it also as part of the dissemination activities of EoCOE II to maximise the potential impact of selected KERs.

- ## FactSheet template

Funding Programme:

Project acronym / solution:

Project full title:

Call Identifier:

Grant Agreement number:

Duration (from/to):

Company/organisation:

Contact Person: (Name, email):

Teaser: (*Short sentence, to grab the attention)*

Keywords:

Description:

(*problem addressed and solution offered for a certain user case*) (*max 2.000 characters*)**:**

Unique Value Proposition:

(What your solution does well /, what are the benefits? What the user wants / how the solution solves his/her problem? What distinguishes it from the competition) (up to 10):

Impacts (expected):

Environmental (e.g. reduction of emissions, energy savings), economic (i.e. economic benefits for the customer/user) and/or social impact (i.e. well-being effects for the community)

Sustainable Development Goals (SDG):

List here:

> **SDG 7**: Affordable and Clean Energy – Clean energy production, energy from waste, renewable fuels, energy distribution and management, energy storage

SDG 9: Industry Innovation and Infrastructure – Industrial processes, materials and chemistry, freight transportation, end-of-pipe industrial pollution management

SDG 11: Sustainable Cities and Communities – Urban and inter-urban mobility, communities' infrastructures, buildings and shelters

SDG 12: Responsible Production and Consumption – Agriculture and farming for food production, circular economy of solid wastes, primary resources management.

Maturity:

1) **Prototype testing 1:1 in lab**: Solution has been conceptualized and validated /or in improvement in an experimental environment or "laboratory" at scale 1:1. For a technology, it corresponds to TRL 6-7.
2) **Prototype testing in the real world**: Solution has been tested in its "final" version with a pilot/demonstration project in real life conditions. For a technology, it corresponds to TRL 7-8.
3) **Initial market commercialization**: Solution has been commercialized in an initial market. For a technology, it corresponds to TRL 9.
4) **Small scale commercialization**: Solution has been commercialized in the market and started to test its scalability in real conditions with external supports and involvements
5) **Medium and large scale commercialisation**: Solution is fully market ready and widely commercialized with clear outcomes of its impact measurable.

Profitability *(Has your solution reached the breakeven point? Are you currently generating profit with your solution? Or by when do you expect to reach the breakeven point and start generating profit)*:

Customers *(who is using or buying your solution or who do you expect to buy/use your solution?)*:

Certificates and assessments *(please indicate the assessments passed and certificates received, any relevant information about its significance and year received)*:

Awards, recognitions *(please indicate award/recognition and year when it was received)*:

Looking for *(e.g. investors, demonstration sites, new markets, customers, etc)*:

Webpage:

Additional information *(e.g. images, graphs, technical details, quotes, videos)*:

Annex A1: Notes of the Interactions

A Yvan Notay / META Group videoconference

31st of March

Participants: Edouard Audit, Massimo Celino, Andrea Di Anselmo, Maddalena Lukasik, Yvan Notay, Andrea Quintiliani, Maria Ramalho, Julien Thélot

General introduction

META is a specialized agency that can help us for industrial outreach, which is not EoCoE's main expertise.

We have selected some test cases, special activities and results within the project that are most suitable to be marketed to a wider audience, including industries. One of Yvan's result is suitable for the process.

The original idea was to work in person during F2F meeting in Barcelona, but the meeting's cancellation, due to the Covid 19 pandemic, means we have to keep the momentum going through videoconferences.

Among other objectives and deadlines, we need to keep in mind the upcoming mid-term review this fall.

META's background

META was born in 1993, as a spin-off to a materials research institutes. Initially, META members were researchers in the field of composite materials; then, they moved to advising consultancy to international organization on innovation, scientific results; they also maintain an investing activity.

META has been working with DG Research for the last 8 years, providing advice on exploitation. META has worked on FP7 and H2020 projects, and has served more than 800 consortia, on more than 2 000 results.

Objectives

The overall objective is to improve how project's results are used. In the end, these results can become services, products sold to market, knowledge that can be used as the background to future research activities, consolidated IP marketed to be used by others, etc.

The way the results are "used" will ultimately depend on TRL level. If the TRL remains low, research teams will work on the identification of a route, a roadmap.

Two-fold objectives, from initial characterization all the way to pitching the results:

1. Better understanding of the next steps (roadmap) + 2) work on dissemination of results

AGMG code

The AGMG code was developed and released before the EoCoE 1 project started. Its project team received a rather small budget in EoCoE 1, and then a larger one in EoCoE 2. The main budget aims to develop a GPU version of AGMG; hopefully, the research team should get significant results within 2 years. The code, as it is now, is exploitable, but is not a direct result of EoCoE.

AGMG is currently receiving support from Brussels-based structure.

AGMG is made available through either a free academic license or a private license. The private license is very cheap, but comes without extensive support.

Perspectives

Paying for research team's salaries (which are currently covered by the university) would require a massive strategical shift, and would involve getting a lot more clients than what we currently have. At this point, any money that comes in is a benefit, whatever license we sell is a bonus.

At this point, how to improve the code's dissemination is unclear.

After the end of the EoCoE support, how does the research team intends to use the results? Licensing, contract research, consultancy?
As EoCoE is not central to the research on AGMG, the idea is to continue as usual: work on software, maintenance, sell license to interested companies. Could we increase dissemination? There are competitors on the market, so the confidence customers place into the providing institution is important. A service provided by a small Belgium university does not inspire the same confidence as a large American lab or as private companies. Underlining the official support the code and team has received from the European Commission is a plus to convince people. Another important EoCoE-related aspect is the porting of the code on GPUs. If it works by the end of the project, it could be an interesting key exploitable result.
The current team is not organized internally to handle a large number of contracts, whether linked to research or consultancy.

A quick, synthetic description of AGMG? A library provides linear system solvers to codes that need to externalize this task. Since it is a difficult task, hard to do efficiently, it is easier to externalize it.

Software library to solve linear equations.

What is the problems this library addresses? Who are its users?
The users are other software developers. The problems they are facing are due to liner systems bottlenecks, difficulties that system face to handle a large number of nodes. It can apply to a large variety of domains.

Market situation

In 2019: 3 licenses sold
In 2020: 1 license sold.
These licenses are usually lifetime licenses. In total, around 20 commercial licenses have been sold, and the team gets around one request a week for free academic licenses. This amounts to roughly 200 licenses since the code has been made available.

Who are the team's competition? One commercial unit of Fraunhofer, which receives massive support and sells an expensive license.

Most of AGMG's private customers were aware of the code's existence because they had previous research contacts with people who had already been granted academic licenses.

There is a very real question of reputation: we need to boost the user awareness of AGMG, and instill confidence in the product's solidity, to be able to compete with bigger labs and private companies.

Why is AGMG a better solution than its competition?

It is hard to compare AGMG with full commercial solutions, as these use different methods in terms of software, when AGMG offers a single-method software. What AGMG does is sometimes directly found as a part of commercial solutions. It is hard to do better than strictly commercial services, which offers maintenance and support, and benefit from the work force behind it.

This being said, AGMG is better than other free solutions: it is lighter, easy-to-use; it is a direct, easy-to-plug library, with a closed environment allowing for an easy development.

Next steps

META will review and integrate what Yvan sent them, based on this conversation, and send the document back to Yvan, as a base for the KER. META will make assumption on the unique value proposition, and will propose tests to validate these assumptions.

Feedback will also allow improvement of the messaging around dissemination.

If we set up a list of questions for academic license users, it would help us identify their needs, what the result does for them. This could be done a bit later, when META has identified potential users, after some back-and-forth around the characterization table.

7.2 Herbert Owen / META Group videoconference

3rd of April

Participants: Edouard Audit, Massimo Celino, Andrea Di Anselmo, Maddalena Lukasik, Herbert Owen, Andrea Quintiliani, Maria Ramalho, Julien Thélot

Introduction

META went through what Herbert wrote, to get more clarity on the unique value proposition; after working on the questionnaire and clarifying some points, META will go back to ENEA to discuss how their work will help with the project's deliverables and exploitation strategy.

Discussions will also address the use of the results after the project's end. Using a result is not limited to commercial use, as a result can be used, for instance, as a base for future research, for contract research, to start a market-oriented service, for licensing, to work on an improvement of the TRL, etc.

ALYA

The main problem currently addressed by ALYA is the topic of the accuracy of the information derived from the simulation model.

Who are the "customers" facing this problem? Iberdrola, for instance, is a worldwide energy producer, owner of wind farms all around the world.
They do have their internal engineering department to establish future wind farms, and rely on external help from Herbert's team.

Code is more than a CFD code, as it can do solid mechanics as well.
Ten years ago, the research team worked with a company to replace Star CCM, but this attempt proved too ambitious; at the time, ALYA was too new, its TRL not advanced enough.
Two objectives: wind flow windfarm CSD and wind turbines + rotating mesh approach (which can prove useful for companies building wind turbines)

The main issue that codes in this domain try to address is the tension between time and accuracy. To increase the accuracy, to work on a finer mesh, is an expensive proposition from a computational standpoint; it is code-heavy and increases the time needed for calculations.

ALYA within the EoCoE project

Within EoCoE, the research team is pushing mainly on the computational side because it is what the European Commission wanted addressed (the EC wanted a 80% computational / 20% physical balance). This being said, and as much as computation is important, tackling the physical side of things is fundamental in the wind domain.

ALYA's market and competition

How is Iberdrola addressing the accuracy issues today?
Iberdrola has its own engineering department, as well as its own developer department. Their developers concentrate on specific, complex parts, and support the engineering department. They consider alternatives, including working with Herbert Owen's team. They use commercial codes, which are less computationally expensive and use bigger meshes than ALYA – ALYA is more efficient.

VORTEX is an engineering / meteorological company; they sell predictions on the wind using computational products, and they use the free WORF code. The differences between ALYA and WORF are real: they use different meshes, and WORF cannot handle complex topography.
The OpenFOAM SOWFA code is the most popular open meteorology code right now.

ALYA is the best LES solver for complex terrain, as acknowledged by prof. Moin (CTR Stanford). (Best in terms of accuracy)

LES codes usually simulate boxes. When you do offshore wind simulation, it is useful, and ALYA cannot compete with this. But when the geometry gets complex, other codes cannot compete with ALYA, which gets nice performances and excellent results on structured grids.

Within EoCoE, the ALYA team has developed strong collaborations with scientists working on solvers, and work with the teams focusing on PSBLAS and MLD2P4 (for GPU capabilities); the ALYA team also works with INRIA on direct solvers

The innovation the team is trying to achieve within the framework of EoCoE is going faster, improving computational capability, for both wind farms and wind turbines applications.
Should ALYA get to exascale, the objective in terms of application would be to simulate an entire wind farm with rotating wind turbines by the end of the project.

What is the **target market** for the new generation of the ALYA code?
In general, the engineering and development departments of large companies dealing with wind.

What is the localization of ALYA's target market
Probably Europe; if General Electrics comes out of the blue to work with the research team, they would work with them, but there is a distinct probability that the target market is more European-focused.

How is the promotion of ALYA organized?
On wind farms, we could get in contact with companies. The research team is reluctant to engage in wide promotion towards industries because of the previous, good contact they have with Iberdrola – they do not want to jeopardize it. If they were to lose Iberdrola as a client, they could get in touch with equivalent companies around the world.
After end of EoCoE, the collaboration with Iberdrola should continue.

In terms of internal resources, one person, in charge of industrial contacts, supports the team. This person will be part of the META process, to give more a business-oriented view of things.

Summary of ALYA in a simple phrase:
High-fidelity simulator for wind energy applications - wind farms and wind turbines

SaaS Portal / META Group videoconference

9[th]of April

Participants: Andrea Di Anselmo, Massimo Celino, Edouard Audit, Pawel Wolniewicz, Maddalena Lukasik, Agnieszka Rausch, Julien Thélot, Maria Ramalho, Andrea Quintiliani

General introduction

META is starting its work on exploitation, on 3 key exploitable results from the EoCoE project, among which the SaaS portal. There are many objectives for exploitation; and one of the benefits is that it shows the European Commission that the KER are indeed used.

Today's meeting will be a guided discussion, starting with the problem EoCoE wants to address with the platform.
Among the topics we will address are these questions:
Who are the "customers" and "users" of the SaaS portal?
What is the "problem" these customers and users are facing and are trying to solve with the portal?

Starting point
The thinking behinf the portal was to create a platform to promote EoCoE applications towards users.
We wanted the portal to be a platform where users could test these applications.

Questions that need to be answered:
- Why do users need to try the applications?
- Has the EoCoE team validated this need or is it more of an assumption

It is an assumption, but it is based on the experience PSNC has with users; PSNC is aware that many people do not even know what supercomputing can do for them, what the applications can do, or even just that the applications exist.
EoCoE intends to give computational solutions to scientific problems; therefore users are science-oriented.

The general issue is a lack of knowledge:
- General knowledge about HPC
- Specific knowledge about what the application can do
- Specific knowledge on how to use the applications

SaaS is a service designed to allow for the use / testing of applications, so users do not have to prepare the use of apps themselves. Apps need heavy technical support (HPC centers, for one), so the SaaS portal is a shortcut that solve the problem of access to these resources.
The usual solution to buy access to machines (runtime) and apps is 1) pay for it or 2) scientific work (application for grants). Applying for grant can be complicated, takes time, with uncertain results.

If the EoCoE portal became the portal to access supercomputing facilities, it would be a place everyone would want to get on; but its focus is more on applications.

Portal usage will entail:
- Install EoCoE applications and restrict their usage to small use cases so potential users can come and try the apps. This is very much a showcase strategy: if users find the application useful, they can contact the EoCoE team and engage in deeper collaboration.

(Why do users need a tryout? Because it is the tool through which they are made aware of the interest of supercomputing, as a solution for their problem.)

- Showcase software solutions for renewable energy beyond the EoCoE team. Experts from outside the project could come and advertise their codes as well.

The set of problems the Portal intends to solve are as follows:

1st level of problem: addressing the public's lack of information on numerical simulation.

2nd level of problem: presenting a solution people who have experience but need to access solver solutions and services.

3rd level of problem: offering access to services to people working in the energy domain.

As a rule, even when we mention the public, we are talking about technicians, about people who are already working on numerical simulations

Given how hard it is to run a demonstration code, the portal gives the possibility to all EoCoE developers to display their applications in a way they could not do on their websites à benefit for solution providers, with an easy-to-use interface.

We do not yet have interviewed potential users to know what they expect from the SaaS; our basis for the concept is more of a general idea.

Potential users of the SaaS portal are:

- Developers of simulation codes
- Users of simulation codes

The portal will need to be optimized to address the needs of both communities.

Portal sustainability

Who will pay for the portal's life beyond EoCoE? The costs of keeping it up and running need to be covered.

PSNC will dedicate moderate resources, and ensure the technical side of the portal is running beyond the project.

Are there any alternative solutions? Could users contact developers directly, as well as local HPC centers, to run codes on their own or with the help of a computer scientist?

The portal allows running tryouts with limited parameter. For instance, the ALYA code, a very complex code, can run heavy simulations on flow; on the portal, we can run ALYA to model windfarms with limited parameters, thus making it easily accessible for users who want to see an example of what the code can do.

Important: users need easy access to run codes + developers need easy setup for their codes

We need to identify the portal's unique value proposition after the project's end.

The portal's advantages are that it makes it easier to run try outs, and easier to set up showcases;
The portal is also a link between EoCoE partners. Since different centers will be using the portal as a showcase, the portal is a marketing opportunity for research teams, so partners should be part of the support/sustainability strategy of the portal.

Having this portal running as soon as possible, preferably at the beginning of next year, is important to convince the EC to keep an eye on this dissemination activity and on the overall impact of the project.

Will the portal focus on energy applications? Yes, we want to advertise it as a portal for renewable energy applications.

EoCoE is also a gathering of the best technicians in the field. Ensuring the access to technicians is a matter of setting up the right framework; the portal is potentially the single best access point to best competencies (when EoCoE ends).

Synthetic description of what the portal is? Pawel will work on it to enrich the questionnaire, with the goal of a 6 lines-description for dissemination purposes. It should be in simple terms, the objective is that people are able to understand it easily.
After the project, we will need to generate traction towards the portal to get something the partners can use to raise funds, or apply to other projects.

TARGET MARKET

At the moment: application developers – their applications are computationally demanding -, currently active in EoCoE. After the project, we will consider opening portal to users from outside project, with demo from other applications. A single portal would create more critical mass, be more impactful, and be easier to use as a basis for future grant applications.

Do we target business users? Business that rely on scientific application could of course be interested as well. Users of simulation codes can be both in the science and research field, and in the business field.

If we aim to become a crucial portal, we will need make it visible and promote it.
Why would an app provider put his/her app on our portal if we have no more than 100 visits, when he/she could put it on a 1.000.000 visits portal?
Extending portal is a future question. At the moment, let's focus on EoCoE applications and developers, and as a second step, consider opening the portal to other energy apps. For instance, we could start with apps from EoCoE partners that are not "EoCoE apps", and then hold discussions with PSNC on the use of the portal.
We could be the European portal for ENERGY simulations. We are related with EERA, we intend to be a main actor of energy in Europe. The portal has a role to play, to reflect this ambition.

After the end of EoCoE, could users pay to keep the portal alive? The portal is not intended to be a shop where you pay to test an app, so it should remain free so people could check if an app answers their needs, to then pay for it.

Would sponsorship work? Could the portal be sponsored by EoCoE partners?

There are actually two sponsorship needs:

- The sponsorship for the portal itself, to keep it up and running,
- The sponsorship for computing time.

In the end, these two things amount to the same thing: without computational time to run test runs, the portal has no added value; the computational power is a fundamental part of the portal.

If we manage to host other energy apps, we could attract other sponsors and make the portal something big in the future.

Annex A2: Commercialisation options and examples of contracts

Licensing

Exclusive:
Only the licensee is able to use the licensed IP or technology (the licensor cannot use or license it);

Sole:
The licensor agrees not to grant any additional licenses but retains the right to make use of the licensed IP.

Non-Exclusive License:
The licensee and the licensor can both use the licensed intellectual property or technology. The licensor is also allowed to negotiate further non-exclusive licenses with other companies.

Franchising

While on the one hand, franchising helps franchisors to expand their business with the need for less investment, on the other hand, it enables franchisees to enter into a market more easily since the business is based on an established brand and/or on a proven business model. Franchising means less risk and low costs for both parties with higher chances of surviving within the first years of business.

In Europe, the regulation of franchising is not harmonized. Also, in most EU Member States there are no independent codes establishing all the rules for this particular partnership. However, this sector has the particularity of being self-regulated in the EU through the European Code of Ethics for Franchising establishing a set of guidelines and principles for both franchisors and franchisees. Therefore, it is important for potential franchisors and franchisees to get to know the requirements that they must meet under their national law and become familiar with the European Code of Ethics for Franchising.

Due diligence: potential franchisees should carry out a due diligence to detect potential risks, which may arise during the franchise. Such an audit may include verification of the related IP, financial and business information about the franchisor, sufficiency of the goods/services, training and assistance to be provided by the franchisor, etc.

Joint ventures (JVs)

JVs are business alliances of two or more independent organisations (ventures) to undertake a specific project or achieve a certain goal by sharing risks. IP has an important role in the creation of such collaborations, since venture bring their own intellectual assets for the success of a JV and they should agree on their initial contributions, responsibilities and obligations within the alliance as set out in JV agreements.

Advantages

13. Gives opportunity to exploit and share IP assets with reduced financial investment.
14. Allows companies to access new markets by sharing risks.
15. Creates possibilities to leverage existing technologies and patents developed by each venture.
16. Provides companies with the chances to develop new IP with less investment.
17. Allows utilization of unused IP assets.

Disadvantages

18. There may be an imbalance in expertise, intellectual assets and investment brought into the JV by the ventures.
19. Coping with different management cultures in IP management may be difficult.

Key terms in the JV agreements: background, foreground and access rights

In JVs, the ventures bring into the project their previously owned IP assets - which are known as background - and they should decide on the access rights to their background for other ventures. Furthermore, the project implementation will also generate IP, which is referred to as IP foreground or results. The ownership of foreground/results and determination of access rights should be clarified before entering into a JV partnership together with compensation of IP registration and/or maintenance costs.

Spin-off (newco)

A Spin-off (or newco) is a separate legal entity created by a parent organisation (PO) to bring its IP assets into the market. It is generally an efficient solution for the parent organisations, who may not be fully capable of commercialization of their own IP assets, such as for universities and research institutions. Spin-offs are seen as an important means of technology transfer since they are acting as an intermediary between the research environment and industries while putting research results into the commercial market with a marketable product. Moreover, through spin-offs, research organisations can focus on their main task of "research" instead of "marketing", which is the main task of commercial companies (spin-off).

A spin-off company can be formed by a person external to the PO for the exploitation of the IP asset created by the parent organisation. In this type of spin-off, as the new company is owned by an external professional, the IP assets to be exploited by the new company (spin-off) are generally transferred by licensing, to allow the PO to keep control over them. The external professionals can also be venture capitalists, who foresee a market potential in commercialisation of IP.

Conducting due-diligence

A due diligence study allows the investors to ascertain the ownership of the IP to be transferred and any obligations affecting the transfer.

Material Transfer Agreements (MTAs)

MTAs are used when exchanging tangible materials between parties to secure the IP rights of the material provider against possible disclosure by the recipient party. The material exchanged can

take many forms, such as product samples, prototypes, software, chemical compounds or biological materials etc. Generally, such a transfer occurs during:

20. feasibility studies to check whether the material is compatible with the recipient facilities,
21. research activities on the material in R&D partnerships,
22. provision of samples or prototypes to future clients for trials, etc.

Annex B - Scientific Events

Scientific Events - participation in 2019

Events of relevance to EoCoE-II in 2019									
Event Name	Topic	Type	Date	Venue	Web link	Relevant EoCoE-II WP	EoCoE partner participating	Contact person	Notes
Supercomputing 2019	HPC, Networking, Storage and Analysis	Int'l Conference	Nov 17-22	Colorado, USA		WP1-7	MdS (JSC ?), PSNC	E. Audit for MdS, M.Plociennik for PSNC	
FocusCoE kickoff	CoEs coordination	Workshop	Feb 20-21	Frankfurt, DE		WP7	MdlS	E.Audit, E. di Napoli	
SIAM CSE19		Conference	Feb 24	Spokane, WA, USA	https://www.siam.org/Conferences/CM/Main/cse19	WP1, WP3	FZJ	E. Di Napoli	
European Geosciences Union General Assem	Geology, Water, Meteorology, Energy	Int'l Conference	Apr 7 - 12	Vienna, Austra	https://www.egu2019.eu/	WP1-water	FZJ-IBG3	Stefan Kollet	

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European Geosciences Union General Assembly	Water, Energy	Int'l Conference	Apr 7 - 12	Vienna, Austra	https://www.egu2019.eu/	WP1-water	UNITN	Bruno Majone	3 posters
American Geoohysical Union Fall Meeting	Water, Energy	Int'l Conference	Dec 9 - 13	San Francisco, USA	https://www.agu.org/fall-meeting-2019	WP1-water	UNITN	Bruno Majone	2 posters
EuroHPC Summit week	Policy, funding, operations, research	Conference	May 13-17	Poznan, PL	https://events.prace-ri.eu/event/850/	WP7, WP6	MdlS, FZJ, PSNC	E. Audit, E. Di Napoli, M.Plociennik, P. Wolniewicz	
25th Euro-Par 2019 International European Conference on Parallel and Distrib	Parallel Computing	Int'l Conference	Aug 26-30	Göttingen, DE	http://2019.euro-par.org/	WP2-5			

uted Compu ting									
Europe an Materi als Society Congre ss (EMRS)	Materials	Conferenc e	May 27-31	Nice (FR)	https://www.european-mrs.com/	WP1	ENEA	M. Celin o	
Europe an Materi als Modelli ng Council worksh op	Materials modelling	workshop	June 3-5	Uppsala (SE)	https://sites.google.com/site/emultiscale2019/	WP1	UBAH	M W olf	
Nanoin novatio n	Materials	Conferenc e	Jun 11-14	Rome (IT)	https://www.nanoinnovation2019.eu/	WP1	ENEA	M. Celin o	A session will be organized and F. Buonocore will have a EoCoE talk, http://www.nanoinnovation2019.eu/index.php/programme/symposia-scheduling/12-june-morning/99-programme/233-tt-ii-d
4th Annual Global Confer ence on Energy Efficien cy	Energy	Conferenc e	Jun 1	Dublin	https://www.iea.org/newsroom/events/global-conference-on-energy-efficiency.html?utm_campaign=IEA%20newsletters&utm_source=SendGrid&utm_medium=Email	WP6	ENEA	M. Celin o	
Platfor m for Advanc ed Scientif ic Compu ting Conf.	Scientific Computing	Int'l Conferenc e	Jun 12-14	Zurich, CH	https://pasc19.pasc-conference.org	WP2	FAU, FZJ	G. Welle in	
Teratec forum	HPC	Conferenc e	Jun 11-12	France	http://www.teratec.eu/forum/	WP2, WP6	MdlS	M. Lobet	

GeoMünster 2019 "Past, Present, Future!"	Geosciences (Geothermal)	Conference	Sep 22-25	Münster, Germany	http://www.geomuenster2019.de/index.html	WP1	RWTH	J. Bruckmann	
11th U.S. National Congress on Computational Mechanics	COMPUTATIONAL MECHANICS	Conference	Jul 25-28	Austin (USA)	https://submissions15.usnccm.org/	WP1, WP2	BSC	G. Houzeaux	
19th Annual IEEE/ACM International Symposium in Cluster, Cloud, and Grid Computing	Distributed computing	Int'l Conference	May 14-17	Larnaca, Cyprus	https://www.ccgrid2019.org/	WP4	BSC	Leonardo Bautista-Gomez	
Wind Energy Science Conference	Wind energy	Int'l Conference	Jun 17-20	Cork, Ireland	https://www.wesc2019.org	WP1	BSC	Matias Avila.	
PRACE 6IP Kickoff Meeting	HPC	Workshop	May 28-29	Bratislava, Slovakia	https://events.prace-ri.eu/event/861/	WP1, WP2, WP6	FZJ	Paul Gibbon	Sessions on preparing applications for Exascale and HLST, CoE connections

Precon ditionin g 2019	Applied Mathematics	Int'l Conferenc e	Jul 1-3	Minneap olis (USA)	https://www-users.cs.umn.edu/~saad/Precon19/	WP3	CNR	Salva tore Filipp one	Invited talk in special session
ISFOE 2019	Organic/perovskite materials and cells	Int'l Conferenc e	July 1-4	Thessalo niki (GR)	https://www.nanotexnology.com/	WP1	UBAH	A B Walk er	Invited talk
ICIAM 2019	Applied and Industrial Mathematics	Int'l Conferenc e	Jul 15-19	Valencia	https://iciam2019.org/	WP3	CNR	Pasq ua D'Am bra	Invited talk in special session
64th Annual Confer ence of the South African Institut e of Physics	Physics	Int'l Conferenc e	July 8-12	Polokwa ne (SA)	http://events.saip.org.za/conferenceDispl ay.py?confId=144		UBAH	A B Walk er	Plenary speaker
ParNu m 2019	Parallel Scientific Computing	Int'l Conferenc e	Oct 28-30	Dubrovni k	https://www.fsb.unizg.hr/parnum2019/	WP1	FZJ-JSC	Edoar do Di Napo li	Invited plenary talk
ISOPH OS 2019	Perovskite and organic solar cells	Summer school	Sept 2-6	Tuscany (IT)	http://www.chose.uniroma2.it/ISOPHOS-2019/	WP1	UBAH	A B Walk er	coorganiser; includes handson modelling session
PSCO 2019	Perovskite solar cells	Intl conferenc e	30 Spt-2 Oct	Lausanne (CH)	https://www.psco-conference.org	WP1	UBAH	M Wolf	
Interna tional Sympo sium on Cluste rs and Nano materi alS	Energy Materials	Intl conferenc e	Nov 3-7	Richmon d (US)	https://iscan.vcu.edu	WP1	UBAH	A B Walk er	Invited talk: opportunity to publicise EoCoE-II to US audience
Polaro ns in the 21st	Energy Materials	Intl workshop	Dec 9-13	Vienna (AT)	https://www.cecam.org/workshop1736/	WP1	UBAH	A B Walk er	Invited talk; CECAM workshop

Centur y									
Sustai nable Energ y week	Policy, funding on Energy	Conferen ce	Jun 18- 20	Brussels (BE)	https://www.eusew.eu/	WP6	FZJ	M Ram alho	Attending the policy conference and the networking village
Comp uting Insight UK:"C omputi ng the Future " CIUK 2019	COMPUTATIONA L sciences	UK Conferen ce	5- 6.12.20 19	UK		WP1	U. Bath	M. Wolf	Talk on "Polaronic Effects on Electron Scattering and Mobility in MAPbI3" and Poster by W. Saunders on "Fast electrostatic solvers for kinetic Monte Carlo simulations"
Interna tional Sympo sium on Cluste rs and Nano materi als	Perovskite and organic solar cells	Int'l Conferen ce	43770	Richmon d (USA)		WP1	U. Bath	A. Walk er	Invited talk: Alison Walker "Multiscale Modelling of Charge and Energy Transport in Perovskite Materials and Organic Semiconductors and Devices"
South African Institut e of Physic s Confer ence	Perovskite and organic solar cells	S.Africa Conferen ce	July 2019	Polukwa ne (SA)		WP1	U. Bath	A. Walk er	Plenary talk: Alison Walker "A review of progress on third- generation photo-voltaic cells" and Tutorial talk on "Materials for hybrid organic and inorganic devices"
12th Interna tional Sympo sium on Flexibl e Organi c Electro nics	Perovskite and organic solar cells	Int'l Conferen ce	1- 4.7.201 9	Thessalo niki (GR)		WP1	U. Bath	A. Walk er	Invited talk: Alison Walker "Modelling Charge Transport in Organic Semiconductors"
Perovs kite	Perovskite and organic solar cells	UK Seminar	27.06.2 019	Oxford (UK)		WP1	U. Bath	A. Walk	Invited talk: Alison Walker "Multiscale modelling of charge transport in perovskite solar cell "

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Solar cell and Optoel ectroni cs Day										
	Perovskite and organic solar cells	SW seminar	03-05.06.2 019	Uppsala (SE)			WP1	U. Bath	M. Wolf	Invited Talk on "Polaronic Effects on Electron Transport in MAPbI3"
Perovs kite Solar Cells and Optoel ectroni cs	Perovskite Solar Cells and Optoelectronics	Int'l Conferen ce	30.09-02.10.2 019	Lausann e (SW)			WP1	U. Bath	M. Wolf	Talk: "Polaronic Effects on Electron Transport in MAPbI3"
Interna tional School on Hybrid and Organi c Photov oltaics (Isoph os) 2019	Perovskite Solar Cells and Optoelectronics	Int'l school	2-6.09.20 19	Tuscany , IT			WP1	U. Bath	A. Walk er	Invited talk: "Multiscale modelling of perovskite materials, single junction cells, tandem cells"
LOPE C 2019	Perovskite Solar Cells and Optoelectronics	Int'l Symposiu m	21.03.2 019	Munich, DE			WP1	U. Bath	A. Walk er	Invited talk: "How to develop a real understanding of devices using doped organic semiconductors"
Americ an Geooh ysical Union Fall Meetin g	Water, Energy	Int'l Conferen ce	Dec 9 - 13	San Francisc o, USA	https://www.agu.org/fall-meeting-2019		WP1-water	IBG3-FZJ	Bibi Naz	Talk
Scotis h Allienc e for Geosci	Water, Energy	Int'l Conferen ce	Nov 27-28	Scotland , UK	http://sages19.efconference.co.uk/		WP1-water	IBG3-FZJ	Bibi Naz	Talk

ence, Envioronment and Society (SAGES) 2019									
Telemac User Conference 2019	Water, Energy	Int'l Conference	Oct 15-17	Toulouse, Fr	https://cerfacs.fr/tuc2019	WP1-water	CERFACS	S. Ricci	Organization, talks on data assimilation and uncertainty quantification for hydrodynamics
UNECECOMP	Uncertainty	Int'l Conference	June 24-27	Crête	https://2019.uncecomp.org/	WP1-water	CERFACS	S. Ricci	Talk
SWOT National days	Data assimilation in hydrodynamics	Conference	June 18-19	Bordeaux, Fr		WP1-water	CERFACS	S. Ricci	Talk and poster
Conference on EnKF	Data assimilation in hydrodynamics	Int'l Conference	June 3-5	Bergen		WP1-water	CERFACS	S. Ricci	Talk and poster
90th Annual Meeting of the International Association of Applied Mathematics and Mechanics (GAMM 2019)	Applied Mathematics	Int'l Conference	February 18-22	Vienna, AU			CERFACS	M. Kuehn	Talk on "On a scalable, highly robust domain decomposition method with dynamic load balancing."

MAFELAP 2019	Applied Mathematics	Brunel university event	June 18-21	London, UK			CERFACS	M. Kuehn	Talk on "On an efficient parallel implementation of adaptive FETI-DP with load balancing"
Sparse Days, Toulouse	Applied Mathematics	Fr event	July 11-12	Toulouse, France			CERFACS	M. Kuehn	Talk on "Highly robust iterative, domain decomposition solvers and load balancing aspects in the setup phase."

Scientific Events - participation in 2020

Events of relevance to EoCoE-II in 2020

Event Name	Topic	Type	Date	Venue	Web link	Relevant EoCoE-II WP	EoCoE partner participating	Contact person	Notes
DGG conference 2020	Geophysics/Geothermal Energy	Conference	18.05.-22.05.2020	online event	https://dgg-online.de/tagungen/jahrestagungen-der-dgg/	WP1	RWTH Aachen University	JohannaBruckmann	Annual convention of the German Geophysical Society (DGG); online surrogate event for cancelled meeting
34th IEEE International Parallel & Distributed Processing Symposium	High performance computing	Int'l conference				WP4			
PARCFD 2020	HPC-CFD	Int'l Conference				WP1 WP2	Herbert & Guillaume (BSC) plan to present EoCoE work		Postposed due to COVID-19
Torque 2020	Wind energy	Int'l Conference				WP1	BSC plans to present EoCoE work		Postposed due to COVID-19
PASC 2020	Scientific Computing	Int'l Conference	29.06.-1.07.2020	Genève,		WP1	MPG/CEA		

		e		Switz erland					
WCCM ECCOMAS 2020	Computational mechanics	Int'l Conferenc e				WP1	Guillaume (BSC) plans to present EoCoE work		Postpo sed due to COVID -19
NextGen Materials for Solar PV	Photovoltaics materials	Symposiu m	15/01/2020			WP1	A. Walker	contributed presentations	
6th International Conference on Perovskite Solar Cells and Optoelectronics (PSCO 2020)	Solar Cells	Int'l Conferenc e	Sept 2020			WP1	A. Walker	Part of the scientific committee	
NFM20 Meeting – Symposium "Perovskite I: Solar Cells and Related Optoelectonics"	Solar Cells	Symposiu m	19-23.10.2020	Barce lona		WP1	A. Walker	Invited talk	
Multiscale modelling for soft matter and materials for energy	Materials	Workshop	20.02.2020	Turin		WP1	ENEA	M.Celino	
28th EUCHEM conference on Molten Salts & Ionic Liquids	Materials	Conferenc e	31/5/2020-5/6/2020	Patra s		WP1	M. Salanne		
ISC2020	HPC	Int'l Conferenc e	22/6/2020	Frank furt		WP1, WP2, WP3	Herbert Owen organizing session on HPC for Renewable Energy		Postpo sed due to COVID -19
Meeting of the Italian Group on Scientific Computing	Computational Mathematics	National Conferenc e	11-13/2/2020	Monte catini (IT)		WP3	CNR and UNITOV	P. D'Ambra	
Copper Mountain Conference on Iterative Methods	Computational Mathematics	Int'l Conferenc e	21-26/3/2020	Copp er Mount ain (USA)		WP3	CNR	P. D'Ambra	Postpo sed due to COVID -19
SIMAI Conference	Applied and Industrial Conf.	Int'l Conferenc e	15-19/6/2020	Parm a (IT)		WP3 and WP6	CNR and ENEA	P. D'Ambra and A. Quintiliani	Postpo sed due to COVID -19
XXI Housolder Symposium	Numerical Linear Algebra	Int'l Conferenc e	June 2020	Bari (IT)		WP3	CNR	P. D'Ambra	Postpo sed due to COVID -19
VI ALAMA Workshop	Numerical Linear Algebra	Int'l Conferenc e	July 2020	Madri d		WP3	CNR	P. D'Ambra	Postpo sed due to COVID -19

Fachtagung Energiemeteorologie	Energy Meteorology	German Conference	01/12/2020	Grainau		WP1-2	Fraunhofer	G. Good	Postponed from May to December due to COVID
MRS Fall Boston	Perovskite solar cells	Int'l Conference	28.11.20-4.12.20	Boston (USA)		WP1	U. Bath	A. Walker	Invited talk on "Mesoscopic Modelling of charge transport in perovskite solar cells"
NanoGe Fall Meeting	Perovskite solar cells	Int'l Conference	20-23.10.20	online		WP1	U.Bath	A. Walker	Invited talk on "Effects of grain boundaries on charge transport in perovskite solar cells"
Universidad Pablo de Olavide	Perovskite solar cells	Spanish meeting	20.10.2020	Seville (ES)		WP1	U. Bath	A. Walker	Invited talk: "Electrical transport modeling in photovoltaic emerging

									technol ogies"
ENNA online conference	Perovskite solar cells	Int'l Conferenc e	12.07.2020	online		WP1	U. Bath	A. Walker	Invited talk on "Perov skite and organic solar cells"
Multiscale Modelling of Materials and Molecules	Perovskite solar cells	Int'l Conferenc e	08.06.2020	online		WP1	U. Bath	M. Wolf, A. Walker	Talk on Hybrid and Organi c Photov oltaics
North East Centre for Energy Materials	Organic Photovoltaics	Seminar	26- 29.05.2020	online		WP1	U. Bath	M. Wolf, A. Walker	Talk on "Multi scale modelli ng of organic devices and perovs kite solar cells"
Univ. of St. Andrews Colloquium	Perovskite solar cells	Colloquiu m	06.03.2020	St. Andre ws (UK)		WP1	U. Bath	A. Walker	Invited talk on "Multi scale modelli ng of organic devices and perovs kite solar cells"
Photovoltaics road-mapping: Polarons in the 21st Century	Photovoltaics	Workshop	30.3.2020	Vienn a (AU)		WP1	U. Bath	A. Walker	Invited talk on "Multi scale modelli

									ng of organic devices and perovskite solar cells"
WSC 2020 - Winter Simulation Conference	Modeling - Materials	Conference	13-16 December 2020	Orlando Florida		WP1	CIEMAT - ENEA	Mayo Garcia Rafael - F. Buonocore	
Telemac User Conference 2020	Modeling - Water	Conference	14-16 October 2020	Belgium	https://tuc2020.org/	WP1	CERFACS	S. Ricci	Talk on surrogate modeling and sensitivity analysis
OpenTURNS User meeting	Uncertainty Quantification	Conference	5 + 19/06/2020	online		WP1	CERFACS	S. Ricci	Talk on conference that was cancelled due to virus pandemia
International Conference on Innovative Applied Energy (IAPE'20)		Conference	15-16 Sept 2020.	online	https://iape-conference.com/	WP1	CIEMAT	Rafael Mayo	Invited Talk
Workshop on "Software Engineering"		Workshop	14-15 July 2020.		https://excalibur-sle.github.io/workshop1.html	WP1	FAU	Ruede, Ulrich	walberla