

SRC – the societal and economic impacts of the consortium project

### THE THIRD OBJECTIVE

**The name and abbreviation of the project: Cloud computing as an enabler of large scale variable distributed energy solutions: Bright Clouds – Dark Clouds (BCDC)**

**The consortium leader:** Rauli Svento

#### 1. The impact objective

PROMOTING FLEXIBILITY AND COMMUNALITY IN CHANGING ELECTRICITY MARKETS  
(consortium level objective)

The traditional electricity market is not two-sided. Users and buyers of electricity are only out takers from the grid. However, technological development is changing this picture as the network is turning from dumb grids to smart grids. This development, already well under way, enables the change of electricity markets to two-sided markets. The big turn is that the smart grids allow each participant to be simultaneously a consumer and producer, that is a prosumer. The objectives (O) for interaction related to this development as outlined in our Interaction plan are: Establishing a BCDC Community (O1), and Engaging citizens as active partners in the activities of the BCDC Community (O2).

#### 2. What program questions (A, B, C, or D) does this objective address?

*B: In order to make the best possible use of a particular disruptive technology, what changes are required in human activity, institutions and operational methods?*

Flexible and changing roles of existing market participants are necessitated. Consumers become active players in the two-sided energy market. New market participants enter and the roles of these and incumbents mix. The traditional energy institutions need to change their roles into flexible and adaptive market participants. A necessary condition is to create a sense of community in order to involve users into the new market contexts. Consumption patterns need to change so that the new market-based equilibriums can be reached. The third objective relates to the markets at the level of community including the perspective of prosumers, that is, consumers as users and producers of energy.

#### 3. Means

Aligned with our Interaction plan is that through enhanced communication and interaction, we aim to form the BCDC Energy Community with well-grounded, shared practices among its members and beyond. To increase transparency of research including knowledge creating processes we have established a publishing schedule for participation in Twitter and experts' blogs supported by Kaskas Media's training. This practice secures multidisciplinary science communication as the WPs follow monthly and weekly 'Blog&Tweet turns'. Empowering of researchers to public communication includes ongoing training as editorial help, checking and discussing informally, which help gaining a new researcher's role and responsibility with the Community. [See

[http://www.tietojohtaminen.com/sites/default/files/tietoasiantuntija\\_05\\_2017\\_low.pdf](http://www.tietojohtaminen.com/sites/default/files/tietoasiantuntija_05_2017_low.pdf) (pp. 22-23)]. The perceptions of the researchers and communication professionals on communication are being investigated in a doctoral thesis of BCDC's former Communication specialist Kaisu Innanen, who presented her preliminary findings in an international science communication conference in New Zealand in 2018. Her doctoral study and research visit to the University of West of England's Science Communication Unit in Bristol, UK, during autumn 2018 supports planning BCDC's communication activities further (<http://www.bcdcenergia.fi/blogi-ja-uutiset-science-communication-just-do-it/>).

BCDC Newsletter was launched as a response to the AB members' request. For mapping our knowledge-base to enhance interdisciplinary new conceptions, a Clean Energy Research (CER) terminology has been compiled in the Helsinki Term Bank in the Arts and Sciences ([http://tieteentermipankki.fi/wiki/Clean\\_Energy\\_Research](http://tieteentermipankki.fi/wiki/Clean_Energy_Research)). Currently, our CER terminology is a pilot of the National Library's national ontology FINTO in rooting terminologies from the Helsinki Term Bank into FINTO. Our Interaction plan states that, the external communication is implemented in collaboration with the communications' units of the home organizations, the strategic partners, and partly of the AB firms. We have succeeded with utilizing these resources of our multi-organizational structure. With the communication specialists of the disciplines involved, a stronger competence is in the BCDC Community's reach. Our communication network was initiated by face-to-face meetings with Director and/or Communication managers/specialists from the Finnish Clean Energy Association, CNMF, VATT, FMI, and the Univ. of Helsinki, Dept. of Computer Science, with participation from Kaskas Media agency. This specialists' network also functions as a meeting point for highly esteemed professionals and colleagues. At this point, these relations are well-established and embedded into the tasks of our Planning officer. In 2016 BCDC started collaboration with the staff that takes part in connecting the Faculty of Humanities, Information Technology and Electrical Engineering and Oulu Business School with the University of Oulu's Communications. As a result, the BCDC news and blogs are now published on the University's main website. In a joint meeting the staff of these faculties shared knowledge and best practices together at the University of Oulu for the first time in 2016. These discussions also effected the Oulu University Profile Four suggestion GenZ which was highly ranked (3/13) and financed by the Finnish Academy (6 milj. €). The created communication network allows sharing BCDC research press releases through the highly esteemed organizations' media connections along with their strong insight [see [http://www.syke.fi/fi-FI/Tutkimus\\_kehittaminen/Ilmastonmuutoksen\\_hillinta\\_ja\\_muutoksiin\\_sopeutumisen/Kotitaloudet\\_pitavat\\_tarkeana\\_sahkonkulu\(41887\)](http://www.syke.fi/fi-FI/Tutkimus_kehittaminen/Ilmastonmuutoksen_hillinta_ja_muutoksiin_sopeutumisen/Kotitaloudet_pitavat_tarkeana_sahkonkulu(41887))]]. It ensures continuous visibility for BCDC related news and blogs online at the University of Oulu, FMI, the Finnish Clean Energy Association, and e.g. Fingrid Magazine (online) and their related social media streams. In the research project 'Iisisti Energinen', together with SITRA, the municipality of Ii and Iin Energia Ltd. families with home energy management systems (HEMS), of with an interest in them, have been interviewed and their interaction with the system providing demand response capability, is analysed. The implications for the future design of HEMS will be reported in 2019.

#### **4. Observations on concrete effects**

'BCDC Coffee' meetings have taken place since March 2016. The BCDC research community shares hundreds of files/messages in project communication software Basecamp and chat application Slack. By October 2018 altogether 121 blog-posts or news have been written and published by the BCDC researchers on the BCDC website. The BCDC PI has published 11 Story-posts and BCDC has tweeted/shared 1 164 tweets and re-tweets. BCDC has 359 followers. The new hashtags of #energiasää and #energiasääennuste are established. Finnish and English are publicly equally used. The BCDC Energy sites have been viewed 64 844 times, and time spent on site is 2 min 36 sec in average. Energiasää has been viewed 15 590 times. On BCDC YouTube channel there are altogether 13 videos consisting of 'Keep On Talking' podcasts and a new, more functional Featurette, where the biggest solar power station in North-Finland is visited and highlighted. These BCDC videos are seen 1 356 times (Nov. 22, 2018). The consortium's communication network has published several posts that have been produced and shared with BCDC. Of these, for example, our 14 blogs on Finnish Clean Energy Association's site have gathered 918 viewers. We also have published our partners' blogs; by

Finnish Clean Energy Association, Fortum Ltd., Finnet, Cleworks Ltd., and VaGe Project. The communication collaboration has led to strong mutual trust: BCDC has been granted direct access on the University of Oulu home page on the basis of our own self-assessment of the content to be shared. We have published 34 times on the Univ. of Oulu's BCDC Energiablogi site. In October 2018 BCDC researchers participated in and supported the Univ. of Oulu's sustainability-themed Pure Fact campaign as blog writers and social media commentators, and also introduced their research on video. BCDC Newsletter is published and shared on Twitter in every two/three months.

In the web-based T&T magazine the articles by BCDC researchers have been read over 5 000 times by May 2018.

As a result of communications collaboration, BCDC has reached impressive numbers in media monitoring. The top news from our consortium was the launching of Energy Weather Forecast on June 13<sup>th</sup> 2016, which was widely published in June and again in October in Finnish media. Altogether 120 news about Energy weather or BCDC were published in media, online or print and other news-sites and television in 2016 (see <http://areena.yle.fi/1-3512978> ). In FMI's media monitoring report from June 2016, Energy weather was highlighted as one of the most significant news stories.

One particular effect was that The Institute for the Languages of Finland picked *Energiasääennuste* as a new word in their Finnish words database (see [https://www.kotus.fi/sanakirjat/kielitoimiston\\_sanakirja/uudet\\_sanat/vuoden\\_sanapoinnot/sanapoimintoja\\_2016](https://www.kotus.fi/sanakirjat/kielitoimiston_sanakirja/uudet_sanat/vuoden_sanapoinnot/sanapoimintoja_2016) ). Moreover, the news release [see [http://www.syke.fi/fi-FI/Ajankohtaista/Tiedotteet/Kotitaloudet\\_pitavat\\_tarkeana\\_sahkonkulu\(41887\)](http://www.syke.fi/fi-FI/Ajankohtaista/Tiedotteet/Kotitaloudet_pitavat_tarkeana_sahkonkulu(41887))] led to requests to present the research at the Energy Authority in Finland and to place BCDC on the service 'Energiatehokkuudesta kilpailukykyä maaseudulla' (see <http://energiatehokkaasti.fi/content/hankkeet-ja-kehittajat>).

The PI Rauli Svento has been profiled and interviewed of BCDC related topics in publications like *Ekonomi* (<http://www.ekonomilehti.fi/taloustiede-raivaa-tieta-uusiutuvalle-energialle/>) and *Kauppalehti* (2017). In the Helsinki Term Bank in the Arts and Sciences, 202 pages of Clean Energy Research lexicon are compiled and a blog published on request from the Helsinki Term Bank (<http://blogs.helsinki.fi/tieteentermipankki/>) appeared also on the web-sites of the BCDC consortium

and the Finnish Clean Energy Association.

The courses 'Smart Grids 1, 2 and 3' including learning materials by WP1 and WP2 at the University of Oulu, Centre of Wireless Communications (see <http://www oulu.fi/energy/node/41323>) have been conducted with good success.

The knowledge of home energy management systems and demand flexibility has increased among the residents of the municipality of Ii due to the collaborative communication on the systems and related issues. Also, the energy efficiency and flexibility have increased in the families who acquired the system. The project and impacts are scalable to larger scale, for increasing demand flexibility.

## 5. Intentional impacts

The interaction objective related to this Impact Narrative 2 is 'Establishing a BCDC Community' (O1). We have created the consortium without earlier connections between the participants. In the beginning the importance of formal and informal face-to-face interaction was and still is evident for sharing ideas, discussing for defining the joint goals, learning to know each other, and staying motivated for collaboration. We continue organising workshops, monthly coffee meetings, and the researchers of WPs meet across the boundaries in smaller groups. We continue engaging with our partners by co-creating and interacting with them, thus far we've organized 12 workshops. Implementing our Interaction plan has supported building our

Community. We started public blogging soon after the first Kick-offs, and in the process of creating the representation of the BCDC, the researchers have agreed on the joint goals and one's role for gaining them. The participatory and engaging model of science communication has motivated, supported and increased the capability of the researchers with excellent outcomes. With embedded routines the researchers' participation in science communication is established and ongoing. Before joining the BCDC Community, many of the researchers had never written an expert blog or tweeted. The monthly blogging led to joint appearance in 2017 on respected science communication site (see <http://www.skolar.fi/>). Researchers' have started participating in authoring interdisciplinary popularized expert texts (see [https://ilmansuojeluyhdistys.files.wordpress.com/2017/01/is\\_4\\_web.pdf](https://ilmansuojeluyhdistys.files.wordpress.com/2017/01/is_4_web.pdf), pp. 11 – 16) and some have advanced in debating in Twitter. There clearly is a BCDC communication model evolving that has reformed the science communication culture in the shape of the project and may be adapted elsewhere. The PI's BCDC Story updates, acknowledged by the SRC, resulted in demanding a public research narrative from all the SRC consortia according to the SRC's feedback email in 2017. The competencies in science communication also have the goal of preparing the researchers to support an even more widespread sense of community, as the other objective related to this Impact Narrative 2 is 'Engaging citizens as active partners in the activities of the BCDC Community' (O2). Towards this, we strive also by building the networked impact professionally with the network of the communications' units. This enables us to communicate, reach and interact with the energy interested publics: citizens and consumers, civic organizations, firms and municipalities. The communication network in itself is a novel alliance: instead of competition, the idea is based on sharing the content as well as the credits and impact indicators. We are not aware of other research projects creating an alliance like BCDC. This was expressed in the meeting with the Communication specialists of three faculties and of the University of Oulu's Communications unit in 2016. The Interaction team's (WP5) work was appreciated further when the persons responsible for the SRC's interaction had a meeting in which BCDC's Communication specialist was invited to present the BCDC communication model to other consortia of the SRC in 2016.

Creating the impact on political decision making is supported by the communication network. Many of communication units are well experienced in creating policy impact as e.g. policy briefs, and therefore BCDC has strong experience available in our own community – when the research has further reached the state when policy implications are evident. BCDC agreed with the Hinku-municipalities in 2016 to jointly communicate and organize events with the municipal stakeholders and decision makers about future virtual utility and energy technology disruption timed with the progress of research and testing of the BCDC's Virtual Utility.

The indicators in Section 3 show that by the means represented in Section 2, BCDC has reached a reasonable public. The fact that The Institute for the Languages of Finland picked Energiasääennuste as a new word in their Finnish words database, indicates that launching of the Energy Weather Forecast was a significant occurrence and a new concept in Finland in 2016 related to the disruption of the energy markets. We have recognized that many people are aware of the EWF. This is one step further with engaging citizens in the activities of the BCDC community (O2). The phenomena is evident also online as Energy Weather Forecast keeps spreading - without any effort from the Interaction team - to a variety of sites (see <http://www.finsolar.net/aurinkoenergia/aurinkoatlas/>  
<https://www.sahkonkilpailutus.fi/blogi/katso-taalta-paikkakuntakohtainen-energiasaennuste/>  
[http://www.lounaistieto.fi/ymparistonyt/ymparisto\\_ohjelma/resurssiviisaus/energian-tuotanto/](http://www.lounaistieto.fi/ymparistonyt/ymparisto_ohjelma/resurssiviisaus/energian-tuotanto/)  
<http://www.energiatalous.fi/?p=1076>)

## 6. Nonintentional impacts

One unexpected result stem from early experience within BCDC that shaped our Interaction plan. The multidisciplinary and multi-organizational challenges that emerged are related to regular updating the social media and blogs. As a lesson learned, we know now that communication efforts of a multidisciplinary research project cannot be implemented by outsourcing the task for an independent work package of the project as was outlined in our Interaction plan. What has done instead is that the Interaction team (WP5) and its Communication specialist and Planning officer have enhanced active collaboration with every WP's researchers. This is a precondition for successful interaction and has resulted in the profound process of empowering researchers with communication means. Consequently, the researchers have learnt to communicate about their studies by blogging on the BCDC Energy web-site and beyond, and tweeting, both are done regularly in turns, with increasing success. An open-minded approach, clear organization of tasks, shared workload and easily approachable support provided first by Communication specialist's and then Planning officer's close work with the researchers have been a prerequisite for effective and fruitful science communication. The quality of collaboration of the consortium's communications was put on a test by a sudden media situation in 2016. BCDC Energy was involved in Sitra's vote 'Ratkaisu 100'. Sitra recognized an increase in voting rates (see <http://www.bcdcenergia.fi/energia-haaste-ratkaisu-100-haastekilpailun-karkikaksikossa/>).

## 7. Background research

In addition to enhancing interaction for co-creation, rigorous research have been conducted related to these activities (see <https://www.sitra.fi/blogit/ihmisina-tutkimassa-ja-paatoksia-tekemassa/>). Knowledge creation and co-creation has been examined by Post doctoral researcher Anna Suorsa by focusing on the role of interaction in the development of the first innovations of the BCDC community, namely the Energy Weather Forecast, the Virtual Utility, and the terminology 'Clean Energy Research'. The preliminary results indicate, that open interaction between different disciplines of the WPs and members of the Advisory Board as well as the Strategic partners had a crucial role in developing the ideas for these novel developments towards innovations. However, when developing the final solutions, more focused processes of interaction and working practices were essential and required the researchers' determination and dedication to conduct the work. In addition, the examination of the knowledge creation processes indicate, that the related Interaction team's active science communication tasks strongly supported the development of the Energy Weather Forecast. Moreover, the activities resulted in excellent outcomes for reaching wider public's attention in Finnish media. In 2018 the international research collaboration has been strengthened as Anna Suorsa has worked together with Professor emeritus John Budd, the University of Missouri, USA, on information literacy and phenomenology. Doctoral student Kaisu Innanen has explored the UK's science communication research ecosystem, established collaboration with the University of West of England's Science Communication Unit in Bristol, and visited The Wellcome Centre for Cultures and Environments of Health, at the University of Exeter, UK. This ensures international refining of her Science Communication PhD project 'Researchers as Science Communicators', and furthers expertise of the WP5. In her PhD study, Doctoral student Teija Keränen introduces the concept of everyday energy information literacy, namely, people's competences and understanding on energy information, and examines it empirically in different populations. The target groups of her extensive surveys are university students and Finnish households. The data were gathered via online survey (January 2017) from all students present for the academic year 2016–2017 at the University of Oulu, Finland (n=11,381) with a response rate of 12.2% (n=1,390). Data from households were gathered via random sample based survey (September 2018) from Finns (n=2000) with a response rate of 16.2% (n=323), and the citizens of the municipality of Ii (n=700), where the response rate was 13.1% (n=92). The data are analyzed by quantitative methods, such as exploratory factor analysis (principal component analysis), calculation of mean factor scores (regression method)

and ANOVA's and t-tests to examine variation of mean factor scores across demographic variables. (See <https://www.tekniikkatalous.fi/teknologiamurrokset/energiatiedon-lukutaidon-tulisi-olla-kansalaistaito-tutkimus-paljasti-eroja-seka-haluissa-etta-kyvyissa-6688435> ) Co-creation and interaction is strongly taking place in the 'Iisisti energinen' project, funded by the Municipality of Ii, SITRA and Iin Energia Ltd, for increasing the energy efficiency and the use of renewable energy among the citizens of the municipality of Ii. Doctoral student Sanna Tuomela's PhD research focuses on the user experience of home energy management systems and energy practices in the home. Her qualitative data are collected in homes of the municipality Ii. (See <https://www.tekniikkatalous.fi/teknologiamurrokset/sahkonhinnan-vaihtelu-ei-kiinnosta-sahkoautot-ladataan-paivalla-astiat-pestaan-kun-kone-on-taynna-vain-automaatio-voitehostaa-kotien-kysyntajoustoja-ja-sahkonsaastoa-6750789> ) Also, Teija Keränen's doctoral study on everyday energy information literacy is a part of the project 'Iisisti Energinen'. It must be noted that co-creation was evident also when the terminology 'Clean Energy Research' was compiled. This work initiated by the PI of WP5, Professor Maija-Leena Huotari, involved all WPs researchers, the staff of the Helsinki Term Bank in the Arts and Sciences, and later also the staff from the National Library. (see <https://blogs.helsinki.fi/tieteentermipankki/2017/04/03/monitieteisesta-tutkimuksesta-tieteidenvaihteluksi-terminologiaksi/> ) This process will be examined during the spring of 2019.

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( <http://InformationR.net/ir/21-4/isic/isics1602.html> )