

SRC – the societal and economic impacts of the consortium project

### THE THIRD OBJECTIVE

<p><b>The name and abbreviation of the project: Cloud computing as an enabler of large scale variable distributed energy solutions: Bright Clouds – Dark Clouds (BCDC)</b></p>
<p><b>The consortium leader:</b> Maria Kopsakangas-Savolainen</p>
<p><b>1. The impact objective</b>  <b>PROMOTING FLEXIBILITY AND COMMUNALITY IN CHANGING ELECTRICITY MARKETS</b>          (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).</p>
<p><b>2. What program questions (A, B, C, or D) does this objective address?</b>  <i>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?</i>          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.</p>
<p><b>3. Means</b>          Our Interaction plan implies, that by 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 on Twitter and experts' blogs supported by Kaskas Media's training. This practice has secured multidisciplinary science communication as the WPs follow monthly and weekly 'Blog&amp;Tweet turns'. Recently also blogging in pairs across the WPs' borders has increased, which enhances interdisciplinary practices. Empowering researchers to public communication requires constant training as editorial help, checking, discussing informally, and giving feedback along with information about website and social media analytics. This has helped gaining a new researcher's role and responsibility with the Community. BCDC also publishes plenty of news about scientific and popularized publications, taking part in events, etc., and shares these on Twitter to inform and enhance discussions between energy actors. [  <a href="http://www.tietojohtaminen.com/sites/default/files/tietoasiantuntija_05_2017_low.pdf">http://www.tietojohtaminen.com/sites/default/files/tietoasiantuntija_05_2017_low.pdf</a> (pp. 22-23)]. The researchers and communication professionals' perceptions of BCDC's communication are investigated in a doctoral thesis of Interaction team's former Communication specialist Kaisu Koivumäki, 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, in 2018 support planning BCDC's communication activities further (<a href="http://www.bcdcenergia.fi/blogi-ja-uutiset-science-communication-just-do-it/">http://www.bcdcenergia.fi/blogi-ja-uutiset-science-communication-just-do-it/</a>). BCDC</p>

Newsletter was launched as a response to the AB members' request. It has now established itself as a significant channel for informing all interested in BCDC's research and contribution to societal dialogue. For mapping our knowledge-base to enhance interdisciplinary new conceptions, a Clean Energy Research (CER) terminology was compiled for the Helsinki Term Bank in the Arts and Sciences ([http://tieteentermipankki.fi/wiki/Clean\\_Energy\\_Research](http://tieteentermipankki.fi/wiki/Clean_Energy_Research)) and became a pilot of the National Library's ontology service FINTO in rooting terminologies from the Helsinki Term Bank into FINTO. The process of compiling the CER terminology has been investigated by Interaction team. The findings were presented in the international CoLIS-conference in June 2019, and in the SRC's conference on wicked problems in Oct 2019, and this research continues. Our Interaction plan states that the external communication is implemented in collaboration with the communications' units of the home organisations, the strategic partners, and partly with the AB firms. This multi-organisational structure has been successful as, with the communication specialists of the disciplines involved, a stronger competence is in the BCDC Community's reach. This communication network was initiated by face-to-face meetings with Director and/or Communication managers/specialists from the home organisations and the strategic partners with participation from Kaskas Media agency. This specialists' network also functions as a meeting point for highly esteemed professionals and colleagues. Today, these relations are well-established and embedded into the tasks of Interaction team's Planning officer Kaisa Ikonen, and contacts within this network are regular via email. The most important contents are researchers' monthly blog posts, which are shared with the home organisation of the blogging researcher and possibly with the strategic partners and the AB firms. In 2016, BCDC started collaboration for connecting the Faculties of Humanities and of 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 published on the University's main website. In a joint meeting, these faculties' staff shared best practices at the University of Oulu for the first time in 2016. These discussions also effected the Oulu University Profile Four research proposal 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 organisations' media links along with their strong insight [[http://www.syke.fi/fiFI/Tutkimus\\_kehittaminen/Ilmastomuutoksen\\_hillinta\\_ja\\_muutoksiin\\_sop\\_eutuminen/Kotitaloudet\\_pitavat\\_tarkeana\\_sahkonkulu\(41887\)](http://www.syke.fi/fiFI/Tutkimus_kehittaminen/Ilmastomuutoksen_hillinta_ja_muutoksiin_sop_eutuminen/Kotitaloudet_pitavat_tarkeana_sahkonkulu(41887))]. The network ensures continuous visibility for BCDC news and blogs at the home organisations and strategic partners' web-sites, and e.g. on Fingrid Magazine (online) and their related social media streams. In the research project 'Iisisti Energinen', together with SITRA, the municipality of Ii, a pioneering municipality in striving for carbon neutrality, and Iin Energia Ltd., local households that have or are interested in having home energy management systems (HEMS), have been interviewed. Also their interaction with the system providing demand response capability has been analysed for proposing implications for the future design of HEMS in 2019. Doctoral student Sanna Tuomela presented these results in Motiva's Information Day, and in an esteemed international conference in 2019. In this project Doctoral student Teija Keränen has examined differences in everyday energy information literacy of Finns and residents of Ii. A blog about the results on the BCDC website gained attention also in social media and was further published by Finnet liitto and the Finnish Clean Energy Association. Teija Keränen's article published in *Kaleva* newspaper on clean traffic transition in the light of energy information literacy has also been shared on Twitter.

<https://www.finnet.fi/energiatiedon-lukutaidon-5-ata/>  
<https://www.lahienergia.org/energiatiedon-lukutaidon-5-ata-harppauksilla-myonteisiin-energia-arien-muutoksiin/>

<https://twitter.com/bcdcenergia/status/1183570845714788352>.

#### 4. Observations on concrete effects

By Nov 2019 altogether 172 blog-posts or news have been published by the BCDC researchers on the BCDC website. The PI has published 13 Story-posts. BCDC has shared 1 592 tweets and retweets. BCDC has 470 followers. The new hashtags of #energiasää and #energiasääennuste are established. Both Finnish and English are used publicly. The BCDC Energy sites have been viewed 84 987 times, and average time spent on the site is 2 min 29 sec. The energy weather forecast (EWF) has been viewed 29 278 times. Since 2019, BCDC teams' doctoral candidates are interviewed before their public viva (<http://www.bcdcenergia.fi/tutkimustulokset/vaitoskirjat/>). On BCDC YouTube channel, 16 videos of 'Keep On Talking' podcasts and featurettes are published. In these are visited the biggest solar power station in the Northern Finland, the roof of wind mill, and HEMS owner households in Ii municipality, that was shared also in Micropolis newsletter on Nov 2019. The number of viewers of these videos has increased significantly being 2 518 times by Nov 2019. The consortium's communication network has published several posts that have been produced and shared with BCDC. Of these, for example, our 18 blogs on Finnish Clean Energy Association's site have had 1 386 viewers. We also have published our partners' blogs. The communication collaboration has led to strong mutual trust: BCDC has direct access to the University of Oulu home page, where we have published 49 times, and we are allowed to self-assess the content we share. In Oct 2018 BCDC researchers participated in and supported the University of Oulu's sustainability-themed Pure Fact campaign as blog writers and social media commentators, and introduced their research on video. In 2019, they participated in the University's sustainability event, and the PI of Interaction team was as invited speaker in a sustainability themed international conference in Bangladesh. The BCDC Newsletter has 105 subscribers, and it is also shared on Twitter in every two/three months. In the web-based *Tekniikka&Talous* 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 was the launching of EWF on June 13<sup>th</sup> 2016, which was widely published in June and again in October in Finnish media. Altogether 120 news about EWF or BCDC were published in media, online or print and other news-sites and TV in 2016 (<http://areena.yle.fi/1-3512978>). In Finnish Meteorological Institute's (FMI's) media monitoring from June 2016, EWF was one of the most significant news stories. In summer 2019 EWF themed article was published in *Tiede-lehti* (<https://www.tiede.fi/artikkeli/tilaajille/energiasaa-ennustaa-paisteet-ja-tuulet>) and the Finnish Broadcasting Company Yle's News site (<https://yle.fi/uutiset/3-10891971>), which boosted the viewers' number of BCDC EWF site. The PI of Meteorology team is being invited to talk about EWF in national events on renewable energy, and an interdisciplinary study of its development has been published in an esteemed international, peer-reviewed journal. Of significance is, that The Institute for the Languages of Finland picked Energiasääennuste as a new word in their Finnish words database ([https://www.kotus.fi/sanakirjat/kielitoimiston\\_sanakirja/uudet\\_sanat/vuoden\\_sanapoinnot/sanapointoja\\_2016](https://www.kotus.fi/sanakirjat/kielitoimiston_sanakirja/uudet_sanat/vuoden_sanapoinnot/sanapointoja_2016)). Moreover, the news release [[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 presenting the research at the Finnish Energy Authority and placing BCDC on the service Energiatohokkuudesta kilpailukykyä maaseudulla <http://energiatohokkaasti.fi/content/hankkeet-ja-kehittajat>. Former PI, Prof. emeritus Rauli Svento has been interviewed in national media, e.g. *Ekonomi* and *Kaupalehti* (2017). The PI Maria Kopsakangas-Savolainen has published a timely article on data as energy disruption enabler in *Tieteessä tapahtuu* (<https://journal.fi/tt/article/view/85192>) and about electricity economy for solving climate change

issues in the *SRC blog site* (<https://www.aka.fi/fi/strategisen-tutkimuksen-rahoitus2/bllogeja/2019/sahkotalousdesta-ratkaisu-paastojen-hillintaan/>). In the Helsinki Term Bank in the Arts and Sciences, 202 pages of Clean Energy Research terminology are published along with a blog (<http://blogs.helsinki.fi/tieteentermipankki/>) also on the websites of the Finnish Clean Energy Association and the BCDC. Research on this interdisciplinary co-creation is under way in Interaction team. The courses 'Smart Grids 1, 2 and 3' including learning materials by WP1 and WP2 at the University of Oulu, Centre of Wireless Communications (<http://www.oulu.fi/energy/node/41323>) have been conducted with success. Communication workshop course, 29.10. - 5.12.2019, is offered by Kaisu Koivumäki as part of the Master's Degree Programme in Science Communication (TIEMA) at the University of Oulu. Post doctoral researcher Anna Suorsa's doctoral thesis on interaction for knowledge creation, and Doctoral student Teija Keränen's thesis on energy information literacy are presented in appropriate courses of Information Studies degree programme.

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 of 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, defining the joint goals, learning to know and from each other, and staying motivated for collaboration. We continue organising workshops, and the researchers meet across the WPs' boundaries in smaller groups. We interact with our partners by co-creating, thus far we've organized 15 workshops among the BCDC researchers or together with the partners. Implementing our Interaction plan has supported building our Community. We started blogging after the first Kick-offs, and along with 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 (<http://www.skolar.fi/>). Researchers have participated in debating on Twitter and authoring inter-disciplinary popularized expert texts ([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). Blogging has become more varied, e.g. Anders Lindfors' and Santtu Karhinen's interdisciplinary pair blog post on the effects of icing on wind production forecasts, that was inspired by one of the partner's, namely, Fingrid's Senior Expert Mikko Heikkilä's tweet, has improved social media interaction with partners (<https://twitter.com/bcdcenergia/status/1111166133485355008>), and pushed Fingrid to work on their forecasting models (<https://www.fingridlehti.fi/ennustedataa/>). 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. According to the SRC's feedback email in 2017, the PI's first BCDC Story updates resulted in demanding a public research narrative from all the SRC consortia. The competencies in science communication also aim at preparing the researchers to gain an even more widespread sense of community, as the other objective of this Impact Narrative 2 is 'Engaging citizens as active partners in the activities of the BCDC Community' (O2). We strive towards this 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 organisations, firms, and municipalities. A recent example of our communication contacts with wider international energy actors is the tweet of Florian Kühnlenz's dissertation interview, in which the Leipzigian energy aggregator Energy2market (e2m) was tagged. The company shared this tweet and publication to German audiences ([https://twitter.com/e2m\\_Media/status/1189094655520071680](https://twitter.com/e2m_Media/status/1189094655520071680)). The communication network in itself is a novel alliance: instead of competition, the idea is based on sharing the content along with 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 work was appreciated when the SRC's interaction staff 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 network of the communication units, that are well experienced in creating policy impact as e.g. policy briefs, the latest being involvement in a joint one by the SRC's energy consortia (<http://www.bcdenergia.fi/blogi-ja-uutiset-uusi-politiikkasuositus-hallitusohjelmalla-vauhtia-rakennusten-puhtaisiin-energiaratkaisuihin/>). This excellence is there, when our 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 presented 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 EWF was a significant occurrence and a new concept in Finland in 2016 related to the disruption of the energy markets. We have recognized that people are increasingly aware of the EWF, which is one step further with engaging citizens in the activities of the BCDC community (O2). The phenomenon is evident also online as the EWF keeps spreading to a variety of sites (<http://www.finsolar.net/aurinkoenergia/aurinkoatlas/>  
<https://www.sahkonkilpailutus.fi/blogi/katso-taalta-paikkakuntakohtainen-energiasaaennuste/>  
[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>)

## 7. Background research

In addition to enhancing interaction for co-creation, rigorous research related to these activities is being conducted (<https://www.sitra.fi/blogit/ihmisina-tutkimassa-ja-paatoksia-tekemassa/>). Knowledge creation and interaction as co-creation is examined by Post doctoral researcher Anna Suorsa. Her studies indicate that open interaction between different disciplines of the WPs, firms of the AB, and the Strategic partners was crucial in elaborating the ideas for the novel developments towards the first innovations of the BCDC community, namely the EWF, the Virtual Utility, and the CER terminology. Doctoral student Kaisu Koivumäki (former Innanen) conducts her study 'Researchers as Science Communicators' with a grant from The Finnish Cultural Foundation. In 2019 she presented her research in international conferences, NordMedia2019, and participated in e.g. European Media and Communication Doctoral Summer School ECREA, Estonia. Her research visit at the University of West of England's Science Communication Unit in Bristol, UK, resulted in co-authorship, and the first two articles are under review for publication in international journals. These contribute to her research-based teaching at the Master's Degree Programme in Science Communication (TIEMA), ensure international refining of her PhD project, and strengthen expertise of the WP5. Co-creation and interaction were strong 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 dissertation focuses on the user experience of HEMS and energy practices in the home. Her qualitative data are collected in homes of the municipality Ii, and the first results published in Finland and accepted for publication in a high quality international conference. In her PhD study Doctoral student Teija Keränen introduces the concept of everyday energy information literacy and examines it empirically by extensive surveys among university students (n=1 390) and Finnish households including the ones from Ii municipality (n=2 700). The first results have been published internationally and in Finland. Co-creation was also evident when compiling the CER terminology. This work, initiated by the PI of WP5, Prof. Maija-Leena Huotari, involved all WPs' researchers, the staff of the Helsinki Term Bank in the Arts and Sciences, and the staff of the National Library in Finland. This process has been examined in 2019, and the preliminary finding presented internationally and nationally, and the research continues.

<https://www.tekniikkatalous.fi/teknologiamurrokset/sahkonhinnan-vaihtelu-ei-kiinnosta-sahkoautot-ladataan-paivalla-astiat-pestaan-kun-kone-on-taynna-vain-automaatio-voitehostaa-kotien-kysyntajoustoa-ja-sahkonsaastoa-6750789>

<https://www.tekniikkatalous.fi/teknologiamurrokset/energiatiedon-lukutaidon-tulisi-olla-kansalaistaito-tutkimus-paljasti-eroja-seka-haluissa-etta-kyvyissa-6688435>

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