FlexiGrid

Project Acronym:	FlexiGrid
Project Full Name:	Enabling flexibility for future distribution grids with high penetration of variable renewable penetration– FlexiGrid
Grant Agreement:	No 864048
Project Duration:	42 months (starting 1 November 2019)

Dissemination Activities Report

Deliverable 1.7 at

Coordination Agreement activity development

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0.1	191211	Ioannis Bouloumpasis	Creation
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2	200117	Anh Tuan Le	Final version

Deliverable abstract

NESTNet (NSERC Energy Storage Technology Network) is led by Ryerson University, involving a network of 15 universities and 26 industry and government partners., while focusing on the future of energy storage, which is an essential technology in the Canadian transition to clean energy.

The objectives of collaboration between FlexiGrid and NESTNet is to increase the understanding of different technological needs and developments, and different market environments as well as policy and regulations in Europe and Canada, while maximizing the impacts and values to stakeholders from both projects through the synergies that could be achieved from each project by facilitating exchanges of researchers, sharing of expertise, supporting deployment activities and joint meetings .

In this document, we outline the collaboration activities discussed and agreed between FlexiGrid and NESTNet consortia representatives. These activities include study visits, physical and web meetings, as well as exchange of knowledge and expertise between the two projects. We also detail the initial collaboration activities that have been scheduled until Month 7, when the first update is scheduled for this deliverable. Finally, different alternatives regarding the future collaboration activities are presents, based on the potential continuation of NESTNet project.

Project overview

The overall objectives of FlexiGrid are:

- **To develop an integrated architecture** for flexibility measures and electricity grid services provided by storage of electricity, vehicle charging, power to-heat, demand response and variable generation to enable additional decarbonisation.
- **To define, test, deploy and demonstrate markets and market mechanisms** that incentivise flexibility, in particular for mitigating short-term and long-term congestions or other problems in the distribution network such as voltage issues
- **To drive cooperation** between distribution system operators, Transmission System Operators (TSOs), consumers and generators by defining market interactions, facilitating the integration of wholesale and retail markets and cross sector interactions
- **To deploy smart grid technologies** to enable the architecture and markets, bringing actors together to participate as distributed energy sources, driving increased resilience of the electricity grid, increased system security, greater observability, higher automation and improved control of the grid
- **To enable future technical and commercial innovation** by identifying barriers to innovation, developing pathways to regulatory and policy reform, developing business models, and through strategic collaboration.

Market platforms and technologies will provide **flexibility** to distribution system operators in order to ensure a secure, stable and affordable operation of the electrical distribution grids. This will accelerate the process for **grid-edge transformation to enable the Distribution System Operators' (DSOs) role as a market catalyst**, thus increasing flexibility of the distribution grids to cope with challenges of increasing penetration of variable renewable generation. By leveraging digital, smart grid technologies, FlexiGrid will provide a transparent data management platform by broadcasting real-time information on the conditions of the network to **optimize observability** of the grid. This will be the base for **market implementations**, taking into account trading of energy and grid services from **various flexibility options**, especially synergies in cross-energy carriers and innovative charging schemes of electric vehicles and storage solutions, among other distributed energy resources. FLEXI-GRID will create market, social and environmental impacts by **validating pathways for replication of market-based solutions** that support policy development, exploitation of technologies and implementation recommendations.

Four demonstrations in Bulgaria, Sweden, Switzerland and Turkey across Europe cover a wide range of flexibility options to be tested for maintaining resilient and reliable distribution grids. Replication of developed technologies in these demonstrations will address comprehensively technical challenges and regulatory boundaries, thus tackling systematically such barriers to bring up the Technology Readiness Level (TRL) of the solutions.

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1 Collaboration between FLEXI-GRID and NESTNet

1.1 Initial collaboration schedule

FlexiGrid is committed to collaborate with another project titled NSERC Energy Storage Technology Network (NESTNet) led by Ryerson University, and involving a pan-Canadian network of 15 universities and 26 industry and government partners. The stakeholders are focused on the future of energy storage, which is an essential technology in the Canadian transition to clean energy. The project has received funding of CAD 5,2m from the Natural Sciences and Engineering Research Council of Canada (NSERC) and above CAD 3,5m of partner funding . The scope of NESTNet is closely related to the scope of FlexiGrid in terms of developing technology, market solutions, and policy recommendation for enabling energy storage integration into the power systems to enhance the hosting capacity of variable renewable generation. The relevance of the collaboration can be seen in the Figure 1.

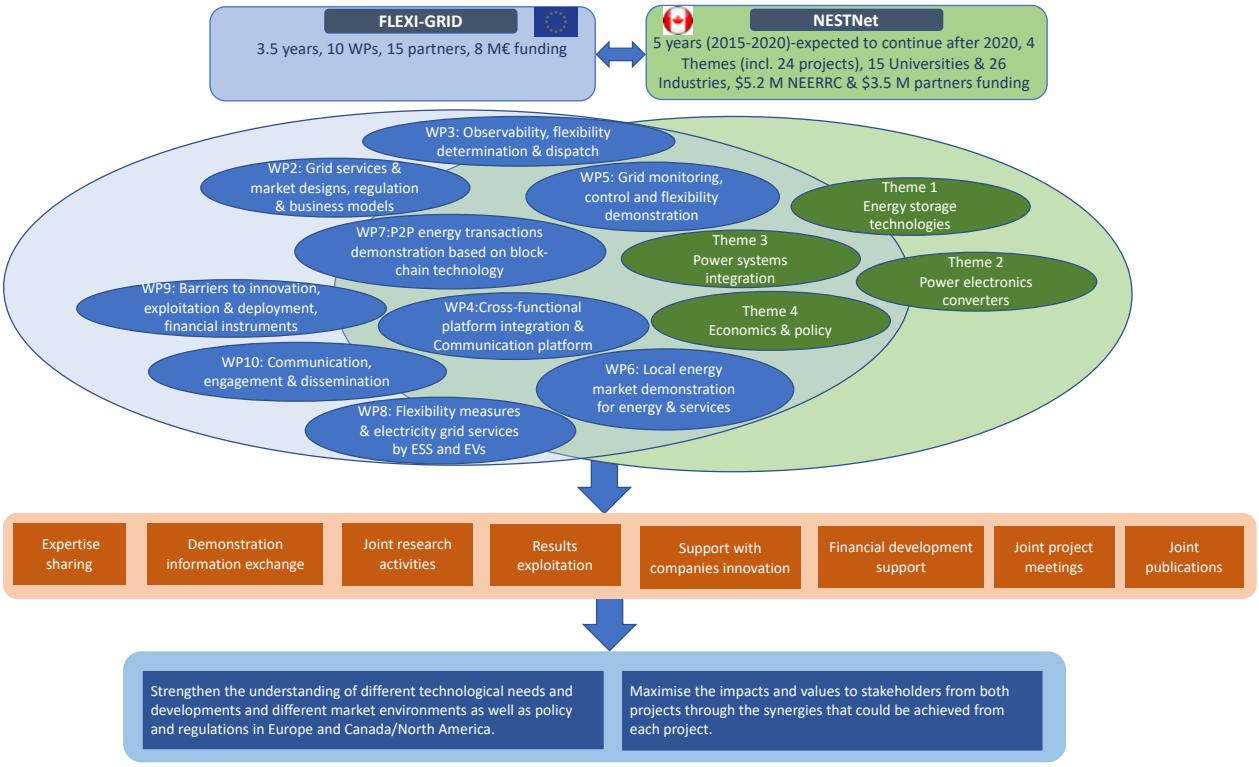

Figure 1: Collaborative activities between FlexiGrid *and NESTNet*

This collaboration aims to:

- Increase the understanding of different technological needs and developments, and different market environments as well as policy and regulations in Europe and Canada/North America.
- Maximise the impacts and values to stakeholders from both projects through the synergies that could be achieved from each project by: Facilitating exchanges of researchers (i.e., short visits of PhD

students and senior researchers), joint research and demonstration activities in common areas to maximise the use of resources (both personnel as well as infrastructure); ii) Sharing of expertise, knowledges, measurements data, models, etc. to the extent possible as agreed by both consortiums; iii) Supporting deployment activities by commercial partners within both projects to bring the innovations closer to the market; and iv) Joint meetings (web as well as face-to-face) from both consortiums.

The specific relevance for the collaboration between the two projects lies mainly in Themes-3 and 4 of NESTNet. More specifically, Theme-3 "Power Systems Integration" enables the seamless integration of energy storage into power systems by developing planning tools, operational tools, protection systems, power quality mitigation solutions, and reliability benchmarks. The relevant projects within this theme include: i) Project 3.2 "Optimal planning of energy storage in distribution systems considering the feeder investment model" and ii) Project 3.5 "Operation and control of power system with energy storage". Theme-4 "Economics and Policy" investigates and provides solutions for techno-economic challenges in the successful integration of energy storage into power systems. In addition, it examines policy, regulatory and social challenges faced by storage solutions to enable successful uptake by utilities and societies. The relevant projects within this theme include: i) Project 4.2 "Modelling electricity market prices considering large-scale energy storage penetration"; ii) Project 4.3 "Provision of ancillary services by energy storage systems"; iii) Project 4.4 "Optimal brokerage models for the grid integration of energy storage"; iv) Project 4.6 "Social acceptance of energy storage system".

Specific Collaboration Activities: Upon discussions with representatives from both projects, the following collaborative activities are envisioned, as stated in Table 1 below.

Table 1. Initial collaboration activities between FlexiGrid and NESTNet.

No.	Description	FlexiGrid	NESTNet
1	Sharing of expertise	All	All
2	Exchange of PhD students and senior researchers between partners from two projects (e.g., between CTH and University of Waterloo)	All	All
3	Joint work/ complementary research and demonstration activities: The projects will exchange information about their demo facilities so that the joint demonstration activities can be carried out.	WP4 through WP8	Theme-3: Project 3.2 and 3.5 Theme-4: Projects 4.2, 4.3, 4.4
4	Joint work/Complementary research activities: Market design, Economic and policy:	WP2	Theme-4: Projects 4.2, 4.3, 4.4
5	Joint work/Complementary research activities: Social Acceptance and Customer engagements	WP10	Theme-4: Project 4.6
6	Exploitation support of results	WP9	Relevant industry partners
7	Support with companies Innovation Capacity	WP9	Relevant industry partners
8	Support with development of Financial development	WP9	Relevant to DSOs
9	Joint project meetings: Web-based, three times annually	All	All
10	Joint project meetings: Face-to-face, one time annually	Selection of WP leaders	Selection of WP leaders

11	Joint publications	To be decided later by partners	To be decided later by partners

1.2 Updated collaboration activities

After discussions between Chalmers University of Technology (FlexiGrid partner) and University of Waterloo (NESTNet partner) an updated schedule of the collaboration activities was developed as shown in Table 2.

The collaboration starts immediately: The first web meeting between FlexiGrid consortium members and a representative of NESTNet consortium (Professor Kankar Bhattacharya of University of Waterloo) took place during the Kick-Off meeting of FlexiGrid (December 18th, 2019). And, a study visit of a PhD student of University of Waterloo to Chalmers University of Technology has been scheduled to take place between March 25th, 2020 and April 25th, 2020.

The collaboration activities included in Table 2 have been scheduled assuming an immediate continuation of NESTNet project after its completion (July 2020). Otherwise these activities will be modified accordingly based on future discussions with the NESTNet consortium. Irrespective of NESTNet continuation, FlexiGrid researchers (e.g., from CTH and/or the Technical University of Eindhoven) will be able to visit the respective NESTNet partner facilities (e.g., University of Waterloo and/or Ryerson University) to be hosted by the individual professors and undertake collaborative research.

Table 2. Updated collaboration activities between FlexiGrid and NESTNet

Description	Task & partners in FlexiGrid	Relevant projects & partners in NESTNet	Type of activities	Expected time (FG month/date)
Sharing of expertise	**Task 2.4 (RISE)** Policy framework and business models for adoption to enable markets for flexibility	Project 4.2 (**Montreal**) Project 4.3 (**Waterloo**) Project 4.4 (**Montreal**)	Data/ knowledge exchange	**M16-24** (February 2021-October 2021)
	Task 3.3 (TU/e) Process design for flexibility procurement and dispatch	Project 3.2 (**Ryerson**)	Model/ knowledge exchange	**M6-24** (April 2020-October 2021)
	Task 3.4 (TU/e) Quantification of availability and certainty for various flexibility resources	Project 3.2 (**Ryerson**)	Model/ knowledge exchange	**M12-18** (October 2020-April 2021)
	Task 3.5 (TU/e) Optimal allocation and dispatch of flexibility services	Project 3.2 (**Ryerson**)	Model/ knowledge exchange	**M19-24** (May 2021-October 2021)

Description	Task & partners in FlexiGrid	Relevant projects & partners in NESTNet	Type of activities	Expected time (FG month/date)
	Task 4.3 (SIVECO) FLEXI GRID User-Interface Applications and Visualization services	Project 3.5 (**Waterloo**)	Model/ knowledge exchange	**M8-18** (June 2020-April 2021)
	Task 5.1 (CTH) Technical requirements and defining test cases for the demonstration of grid monitoring, control and flexibility intervention	Project 3.5 (**Waterloo**)	Data/visit	**M3-M9** (January 2020-July 2020)
	Task 6.1 (CTH) Technical requirements and defining test cases for the demonstration of local energy market for exchange of energy and grid services	Project 4.2 (**Waterloo**) Project 4.3 (**Waterloo**) Project 4.4 (**Waterloo**)	Data/visit/ knowledge exchange	**M3-M9** (January 2020-July 2020)
	Task 8.1 (HES) Technical requirements, demonstration preparation, and defining test cases for the demonstration of flexibility measures and electricity grid services provided by local energy storage and EVs	Project 4.3 (**Waterloo**)	Data/ knowledge exchange	**M3-M9** (January 2020-July 2020)
	Task 9.3 (RISE) DSO's Innovation barriers and innovation capacity	Project 4.5 (**York**)	Data/ knowledge exchange	**M7-M24** (May 2020-October 2021)
	Task 10.4 (IMCG) Mission based activities for capacity building	Project 4.5 (**York**)	Data/ knowledge exchange	**M3-M24** (January 2020-October 2021)
Exchange of PhD students and senior researchers between partners from two projects (e.g., between Chalmers University of Technology and University of Waterloo)	**Task 5.1 (CTH)** Technical requirements and defining test cases for the demonstration of grid monitoring, control and flexibility intervention	Project 3.5 (**Waterloo**)	Visit	**M3-M9** (January 2020-July 2020)
	Task 6.1 (CTH) Technical requirements and defining test cases for the demonstration of local energy market for exchange of energy and grid services	Project 4.2 (**Waterloo**) Project 4.3 (**Waterloo**) Project 4.4 (**Waterloo**)	Visit	**M3-M9** (January 2020-July 2020)

Description	Task & partners in FlexiGrid	Relevant projects & partners in NESTNet	Type of activities	Expected time (FG month/date)
Joint work/ complementary research and demonstration activities: The projects will exchange information about their demo facilities so that the joint demonstration activities can be carried out.	**Task 4.3 (SIVECO)** FLEXI-GRID User-Interface Applications and Visualization services	Project 3.5 (**Waterloo**)	Data/ knowledge exchange	**M8-18** (June 2020-April 2021)
	Task 5.1 (CTH) Technical requirements and defining test cases for the demonstration of grid monitoring, control and flexibility intervention	Project 3.5 (**Waterloo**)	Visit/ knowledge exchange	**M3-M9** (January 2020-July 2020)
	Task 6.1 (CTH) Technical requirements and defining test cases for the demonstration of local energy market for exchange of energy and grid services	Project 4.2 (**Waterloo**) Project 4.3 (**Waterloo**) Project 4.4 (**Waterloo**)	Visit/ knowledge exchange	**M3-M9** (January 2020-July 2020)
	Task 8.1 (HES) Technical requirements, demonstration preparation, and defining test cases for the demonstration of flexibility measures and electricity grid services provided by local energy storage and EVs	Project 4.4 (**Montreal**)	Data/ knowledge exchange	**M3-M9** (January 2020-July 2020)
Joint work/ Complementary research activities: Market design, Economic and policy:	**Task 2.4 (RISE)** Policy framework and business models for adoption to enable markets for flexibility	Project 4.2 (**Montreal**) Project 4.3 (**Waterloo**) Project 4.4 (**Montreal**)	Data/ knowledge exchange	**M16-24** (February 2021-October 2021)
Joint work/ Complementary research activities: Social Acceptance and Customer engagements	**Task 10.4 (IMCG)** Mission based activities for capacity building	Project 4.5 (**York**)	Data/ knowledge exchange	**M3-M24** (January 2020-October 2021)
Joint work/ Complementary research activities: Optimal planning	**Task 3.3 (TU/e)** Process design for flexibility procurement and dispatch	Project 3.2 (**Ryerson**)	Data/model/ knowledge exchange	**M6-24** (April 2020-October 2021)
	Task 3.4 (TU/e) Quantification of availability and certainty for various flexibility resources	Project 3.2 (**Ryerson**)	Data/model/ knowledge exchange	**M12-18** (October 2020-April 2021)

Description	Task & partners in FlexiGrid	Relevant projects & partners in NESTNet	Type of activities	Expected time (FG month/date)
	Task 3.5 (TU/e) Optimal allocation and dispatch of flexibility services	Project 3.2 (**Ryerson**)	Data/model/ knowledge exchange	**M19-24** (May 2021-October 2021)
Exploitation support of results	**Task 9.3 (RISE)** DSO's Innovation barriers and innovation capacity	Relevant industry partners Project 4.5 (**York**)	Data/ knowledge exchange	**M7-M24** (May 2020-October 2021)
Support with companies Innovation Capacity	**Task 9.3 (RISE)** DSO's Innovation barriers and innovation capacity	Relevant industry partners Project 4.5 (**York**)	Data/ knowledge exchange	**M7-M24** (May 2020-October 2021)
Support with development of Financial development	**Task 9.3 (RISE)** DSO's Innovation barriers and innovation capacity	Relevant to DSO Project 4.5 (**York**)	Data/ knowledge exchange	**M7-M24** (May 2020-October 2021)
Joint project meetings- web-based, 3 times annually	**WP leaders**	**Theme leaders**	Activities coordination/ knowledge exchange	**M2-24** (December 2019-October 2021) every 4 months
Joint project meetings- physical	**Selection of WP leaders**	**Selection of WP leaders**	Activities coordination/ knowledge exchange	**M12** (October 2020) **M24** (October 2021)
Joint publications	**Task 3.3 (TU/e)** Process design for flexibility procurement and dispatch	Project 3.2 (**Ryerson**)	Data/model/ knowledge exchange	**M6-24** (April 2020-October 2021)
	Task 3.4 (TU/e) Quantification of availability and certainty for various flexibility resources	Project 3.2 (**Ryerson**)	Data/model/ knowledge exchange	**M12-18** (October 2020-April 2021)
	Task 3.5 (TU/e) Optimal allocation and dispatch of flexibility services	Project 3.2 (**Ryerson**)	Data/model/ knowledge exchange	**M19-24** (May 2021-October 2021)
	Task 5.1 (CTH) Technical requirements and defining test cases for the demonstration of grid monitoring, control and flexibility intervention	Project 3.5 (**Waterloo**)	Data/ knowledge exchange	**M3-M9** (January 2020-July 2020)

Description	Task & partners in FlexiGrid	Relevant projects & partners in NESTNet	Type of activities	Expected time (FG month/date)
	Task 6.1 (CTH) Technical requirements and defining test cases for the demonstration of local energy market for exchange of energy and grid services	Project 4.2 (**Waterloo**) Project 4.3 (**Waterloo**) Project 4.4 (**Waterloo**)	Data/ knowledge exchange	**M3-M9** (January 2020-July 2020)
	Task 8.1 (HES) Technical requirements, demonstration preparation, and defining test cases for the demonstration of flexibility measures and electricity grid services provided by local energy storage and EVs	Project 4.3 (**Waterloo**)	Data/ knowledge exchange	**M3-M9** (January 2020-July 2020)

Annex

1. FlexiGrid partners

Partner organisation name	Partner acronym	Contact person	e-mail
IMCG Sweden AB	IMCG	Magnus Andersson	magnus.andersson@imcg.se
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Luxembourg Institute of Science and Technology	LIST	Daniel Koster	daniel.koster@list.lu
Chalmers University of Technology AB	CTH	Anh Tuan Le	tuan.le@chalmers.se
Emaxgroup	EMAX	Thong Vu Van	thong.vuvan@emaxgroup.eu
SIVECO Romania SA	SIV	Carmen Oana	carmen.oana@siveco.ro
Research Institutes of Sweden AB	RISE	Magnus Brolin	magnus.brolin@ri.se
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ENERGO-PRO Energy Services EOOD	EP	Boyan Karshakov	boyan.karshakov@energo-pro.bg
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Technical University of Sofia	TU/s	Valeri Mladenov	valerim@tu-sofia.bg
Osmangazi Elektrik Dagitim Anonim Sirketi	OEDAS	Kemal Burak Cakirer	burak.cakirer@oedas.com.tr
Smart Consulting	SC	Teodor Bobochikov	teodor.bobochikov@entra.energy
Haute Ecole Specialisee de Suisse Occidentale	HES	Jessen Page	jessen.page@hevs.ch
L'Energie de Sion-Region SA	ESR	Gregoire Largey	gregoire.largey@esr.ch
Technology for efficiency	T4E	Safak Baykal	safak.baykal@endoks.com

2. NESTNet partners

All communication activities between FlexiGrid and NESTNet are performed through Dr. Kankar Bhattacharya from the University of Waterloo (kankar.bhattacharya@uwaterloo.ca).

Academic partners	
Partner organisation name	**Partner acronym**
University of Waterloo	Waterloo
Ryerson University	Ryerson
Simon Fraser University	Simon Fraser
University of Calgary	Calgary
University of Alberta	Alberta
University of Saskatchewan	Saskatchewan
University of Windsor	Windsor
University of Toronto	Toronto
York University	York
University of Ontario	Ontario
University of Ottawa	Ottawa
Polytechnique Montreal	Montreal
University of New Brunswick	New Brunswick
Dalhousie University	Dalhousie
Memorial University	Memorial
Industrial, utility and government partners	
Alectra utilities	
Ecamion	
Hydro Quebec	
Hydrostor	
KYLOWAVE	
Natural Resources Canada	
Opusone solutions	
Schneider Electric	
SIEMENS	
Temporal	
TUV SUD	
VERIDIAN CONNECTIONS	
Wind energy Institute of Canada	
Industrial, utility and government collaborators/associate members	
BOMA Canada	
Cowessess First Nation	
ENERGY STORAGE CANADA	
IBM	
Independent Electricity System Operator (ieso)	
MaRS	
Natural Research Council Canada	
NRSTOR	
Ontario Centres of Excellence	
Ontario	

Oshawa Power & Utilities Corporation
SmartGrid Canada
Toronto Hydro