1. Identification

Call	Date of submission
C1	26/04/2022

1.1. Full name of the project

LowLight PV – Enhancing the uptake of low light, high efficiency photovoltaics for the Baltic Sea Region

104 / 250 characters

1.2. Short name of the project

LowLight PV

11 / 20 characters

1.3. Programme priority

3. Climate-neutral societies

1.4. Programme objective

3.2 Energy transition

1.6. Project duration

Contracting start	22/09/2022	**Contracting end**	31/12/2022
Implementation start	01/01/2023	**Implementation end**	31/12/2025
		Duration of implementation phase (months)	36
Closure start	01/01/2026	**Closure end**	31/03/2026

1.7. Project summary

Photovoltaics (PV) based on sustainable organic materials represents the next-generation solar energy conversion technology, and is the greenest renewable energy technology to date. It encompasses high integration flexibility, very low energy payback times, low cost as well as low environmental impact and high potential for recycling and upcycling. An intriguing feature for organic PV is that unique power conversion efficiencies (PCE) can be achieved under low-light illumination, which goes way beyond what is possible with silicon PV. This makes organic PV an extremely efficient low-light PV technology, which is suitable for indoor and other low-light applications.
When it comes to energy generation via PV, the Baltic Sea region is challenged by relatively low solar light intensities, and at the same time a huge need for efficient energy management that can support a reduced CO2 emission. Organic PV as a green and delocalised energy technology is well-suited for this region. Low-light PV allows one to harvest indoor low-light irradiation, and use that otherwise waste energy to power up Internet-of-Things (IoT) devices supporting energy management in smart housing and factories. This is today limited by barriers on still too low PCE for industrial scale organic PV modules, and lack of knowledge about integration of such new PV technology. In LowLight PV, we will improve, distribute and install LowLight PV pilots in the whole BSR to remove those barriers of implementation.

1,496 / 1,500 characters

1.8. Summary of the partnership

The LowLight PV project partners are stated in chapter 2 of this application and are chosen based on the criteria to best possible minimise barriers for implementation of low-light photovoltaics in the BSR region, which can furthermore be used to support efficient energy management and thus significantly lower CO2 emissions. This includes academic and research institute partners with world-leading competences in research and development of organic photovoltaics, including material development, cell and module fabrication as well as industrial-compatible upscaling. It also includes an innovative industry partner currently producing LowLight photovoltaics modules, and which has the capacity to upscale production within and beyond the LowLight PV project. Finally, it includes public partners in the form of NGO and municipalities with existing large networks, also in the BSR region, for amongst other implementation of renewable energy technologies to support the green energy transition. These partners ensure that the developed LowLight PV pilots are aligned with local and regional masterplans for meeting ambitious aims of lowering CO2 emissions in the coming years in cities in the region. Some of these existing network partners are included as associated partners in the LowLightPV project, with more to come once the dissemination and exploitation activities have been started.
The target groups in LowLight PV are small, medium and larger enterprises, which can use the LowLight PV technology to generate new products, especially within the IoT business, where there is a huge need to generate green power sources for IoT devices that can promote energy efficiency in buildings and factories in the region. This is also companies supporting the upscaled production of such LowLight PV pilots in the BSR region. Schools and higher education and research education institutions are targeted, to educate the young generation but also existing company employees in this new PV technology. This can support future employment needs on this topic. Finally local public authority is targeted, in order to engange local communities and policy makers in supporting the implementation of this new PV technology in the whole BSR region, e.g. by connecting the technology to local masterplans on the green energy transition.
Associate Organisations are stated in chapter 2 of this application.

2,402 / 3,000 characters

1.11. Project Budget Summary

Financial resources [in EUR]		Preparation costs	Planned project budget
ERDF	ERDF co-financing	0.00	2,316,619.33
	Own contribution ERDF	0.00	579,154.86
	ERDF budget	0.00	2,895,774.19
NO	NO co-financing	0.00	0.00
	Own contribution NO	0.00	0.00
	NO budget	0.00	0.00
NDICI	NDICI co-financing	0.00	0.00
	Own contribution NDICI	0.00	0.00
	NDICI budget	0.00	0.00
RU	RU co-financing	0.00	0.00
	Own contribution RU	0.00	0.00
	RU budget	0.00	0.00
TOTAL	**Total Programme co-financing**	0.00	2,316,619.33
	Total own contribution	0.00	579,154.86
	Total budget	0.00	2,895,774.19

2. Partnership

2.1. Overview: Project Partnership

2.1.1 Project Partners

No.	LP/PP	Organisation (English)	Organisation (Original)	Country	Type of partner	Legal status	Partner budget in the project	Active/inactive	
								Status	from
1	LP	University of Southern Denmark	Syddansk Universitet	DK	Higher education and research institution	a)	871,931.31 €	Active	22/09/2022
2	PP	ProjectZero	ProjectZero A/S	DK	NGO	a)	103,761.99 €	Active	22/09/2022
3	PP	Epishine AB	Epishine AB	SE	Small and medium enterprise	b)	421,430.17 €	Active	22/09/2022
4	PP	VTT Technical Research Centre of Finland Ltd.	TEKNOLOGIAN TUTKIMUSKESKUS VTT OY	FI	Higher education and research institution	a)	130,007.12 €	Active	22/09/2022
5	PP	Kaunas University of Technology	Kauno technologijos universitetas	LT	Higher education and research institution	a)	238,614.00 €	Active	22/09/2022
6	PP	University of Tartu	Tartu Ülikool	EE	Higher education and research institution	a)	250,000.00 €	Active	22/09/2022
7	PP	University of Latvia	Latvijas Universitāte	LV	Higher education and research institution	a)	250,000.00 €	Active	22/09/2022
8	PP	Kaunas Science and Technology Park	Kauno mokslo ir technologijų parkas	LT	Business support organisation	a)	125,000.00 €	Active	22/09/2022
9	PP	The Silesian University of Technology	Politechnika Śląska	PL	Higher education and research institution	a)	393,716.80 €	Active	22/09/2022
10	PP	Tartu City Government	Tartu Linnavalitsus	EE	Local public authority	a)	111,312.80 €	Active	22/09/2022

2.1.2 Associated Organisations

No.	Organisation (English)	Organisation (Original)	Country	Type of Partner
AO 1	Bauska municipality Government	Bauskas novada pašvaldība	LV	Local public authority

2.2 Project Partner Details - Partner 1

LP/PP Lead Partner

Partner Status Active

Active from 22/09/2022 **Inactive from**

Partner name:

Organisation in original language
Syddansk Universitet
21 / 250 characters

Organisation in English
University of Southern Denmark
30 / 250 characters

Department in original language
Mads Clausen Instituttet
25 / 250 characters

Department in English
Mads Clausen Institute
23 / 250 characters

Partner location and website:

Address	Alsion 2 (9 / 250 characters)	**Country**	Denmark
Postal Code	6400 (5 / 250 characters)	**NUTS1 code**	Danmark
Town	Sønderborg (11 / 250 characters)	**NUTS2 code**	Syddanmark
Website	www.sdu.dk/da/om_sdu/institutter_centre/mci_mads_clausen (56 / 100 characters)	**NUTS3 code**	Sydjylland

Partner ID:

Organisation ID type	Civil registration number (CPR)
Organisation ID	29283958
VAT Number Format	DK + 8 digits
VAT Number	N/A ☐ DK29 28 39 58 (13 / 50 characters)
PIC	999904616 (9 / 9 characters)

Partner type:

Legal status	a) Public	
Type of partner	Higher education and research instituti	University faculty, college, research institution, RTD facility, research cluster, etc.
Sector (NACE)	72.19 - Other research and experimental development on natural sciences and engineering	

Partner financial data:

Is your organisation entitled to recover VAT related to the EU funded project activities? Yes

Financial data

Reference period	01/01/2021 –	31/12/2021
Staff headcount [in annual work units (AWU)]		4,000.0
Employees [in AWU]		4,000.0
Persons working for the organisation being subordinated to it and considered to be employees under national law [in AWU]		0.0
Owner-managers [in AWU]		0.0
Partners engaged in a regular activity in the organisation and benefiting from financial advantages from the organisation [in AWU]		0.0
Annual turnover [in EUR]		440,185,000.00
Annual balance sheet total [in EUR]		292,459,000.00
Operating profit [in EUR]		8,133,000.00

Role of the partner organisation in this project:

Overall project coordinator and leader of work package 1. The work includes testing new materials (GoA 1.2) in small low light photovoltaic cells (GoA 1.3) developed from industrial compatible and scalable coating methods. Also participates in WP2 on transferring small scale cell development to the production of LowLight PV pilots (GoA 2.1 and GoA 2.4), and participates in WP3 with installation of LowLight PV pilot at SDU (GoA 3.1 and GoA 1.4 for preparation of installations). Also takes part in general dissemination and exploitation (GoA3.2), and will host project meeting plus workshop.
More information about existing activities on organic photovoltaics research and development activities can be found at:
https://www.sdu.dk/en/forskning/c_nanosyd/forskningsomrader/organic+solar+cells

797 / 1,000 characters

Has this organisation ever been a partner in the project(s) implemented in the Interreg Baltic Sea Region Programme?

○ Yes ○ No

State aid relevance

For the partner type selected, the Programme sees a medium to high risk for implementing State aid relevant activities. If the partner is of the opinion that its activities are not State aid relevant, it can ask the MA/JS for a plausibility check on the State aid relevance. Does the partner want to do this?

○ Yes ○ No

2.2 Project Partner Details - Partner 2

LP/PP Project Partner

Partner Status Active

Active from 22/09/2022 **Inactive from**

Partner name:

Organisation in original language ProjectZero A/S

15 / 250 characters

Organisation in English ProjectZero

11 / 250 characters

Department in original language N/A

3 / 250 characters

Department in English N/A

3 / 250 characters

Partner location and website:

Address Alsion 2

8 / 250 characters

Postal Code 6400

4 / 250 characters

Town Sonderborg

10 / 250 characters

Website www.projectzero.dk

18 / 100 characters

Country Denmark

NUTS1 code Danmark

NUTS2 code Syddanmark

NUTS3 code Sydjylland

Partner ID:

Organisation ID type	Civil registration number (CPR)
Organisation ID	29215642
VAT Number Format	DK + 8 digits
VAT Number	N/A ☐ DK29 21 56 42 (13 / 50 characters)
PIC	950688077 (9 / 9 characters)

Partner type:

Legal status	a) Public
Type of partner	NGO — Non-governmental organisations, such as Greenpeace, WWF, etc.
Sector (NACE)	35.11 - Production of electricity

Partner financial data:

Is your organisation entitled to recover VAT related to the EU funded project activities? No

Role of the partner organisation in this project:

ProjectZero mainly contributes to WP3 – around exploitation and dissemination of the OPV technology, and will participate in WP1 while the solution is being prepared, and in WP2 in its implementation in Sønderborg. In carrying out these activities, ProjectZero can benefit from its status as coordinator of the SmartEnCity Network with currently 67 members from all across Europe (http://smartencitynetwork.eu). Furthermore, ProjectZero established a national city network which came from the SmartEnCity Network. It is called Energibyerne (Energy Cities) (https://energibyerne.dk) and involves 7 Danish cities, one of them being Sønderborg, who have as main goal to work together toward self-sufficiency, energy system decarbonisation and climate neutrality in the long run. They meet on regular basis and cooperate on different topics through co-creation, exchange of experiences and knowledge, etc. The Energibyerne will directly benefit from the LowLight PV project proposal.

980 / 1,000 characters

Has this organisation ever been a partner in the project(s) implemented in the Interreg Baltic Sea Region Programme?

○ Yes ○ No

2.2 Project Partner Details - Partner 3

LP/PP	Project Partner		
Partner Status	Active		
Active from	22/09/2022	**Inactive from**	

Partner name:

Organisation in original language	Epishine AB (12 / 250 characters)
Organisation in English	Epishine AB (12 / 250 characters)
Department in original language	N/A (3 / 250 characters)
Department in English	N/A (3 / 250 characters)

Partner location and website:

Address	Wahlbecksgatan 25 (17 / 250 characters)	**Country**	Sweden
Postal Code	58213 (6 / 250 characters)	**NUTS1 code**	Östra Sverige
Town	Linköping (9 / 250 characters)	**NUTS2 code**	Östra Mellansverige
Website	www.epishine.se (15 / 100 characters)	**NUTS3 code**	Östergötlands län

Partner ID:

Organisation ID type	Organisation number (Organisationsnummer)
Organisation ID	559070-0422
VAT Number Format	SE + 12 digits
VAT Number	N/A ☐ SE559070042201 (14 / 50 characters)
PIC	912565913 (9 / 9 characters)

Partner type:

Legal status	b) Private	
Type of partner	Small and medium enterprise	Micro, small, medium enterprises < 250 employees, ≤ EUR 50 million turnover or ≤ EUR 43 million balance sheet total
Sector (NACE)	26.11 - Manufacture of electronic components	

Partner financial data:

Is your organisation entitled to recover VAT related to the EU funded project activities? Yes

Financial data

Reference period	01/01/2021 –	31/12/2021
Staff headcount [in annual work units (AWU)]		32.0
Employees [in AWU]		32.0
Persons working for the organisation being subordinated to it and considered to be employees under national law [in AWU]		0.0
Owner-managers [in AWU]		0.0
Partners engaged in a regular activity in the organisation and benefiting from financial advantages from the organisation [in AWU]		0.0
Annual turnover [in EUR]		110,000.00
Annual balance sheet total [in EUR]		7,460,000.00
Operating profit [in EUR]		-3,300,000.00

Role of the partner organisation in this project:

Epishine will be responsible for scaling up the production process of organic photovoltaic devices and deliver modules to end-users. This work will be done in several steps. In the first step Epishine who will integrate material that has been developed elsewhere in the project into their production process. This will require some development of the material processing to adapt it to the larger scale setting. In the second step photovoltaic modules will be delivered to the end-users in the projects. This will require the input from the end-user as well as production process development to be able to fullfill the need of the end users. In a third step; running in parallel, modules will be integrated, both mechnicallay as well as electronically together with an integration partner (VTT) in the same work package. This integration development will require multiple iterations where several new concepts need to be realized.

930 / 1,000 characters

Has this organisation ever been a partner in the project(s) implemented in the Interreg Baltic Sea Region Programme?

○ Yes ○ No

2.2 Project Partner Details - Partner 4

LP/PP Project Partner

Partner Status Active

Active from 22/09/2022 **Inactive from**

Partner name:

Organisation in original language TEKNOLOGIAN TUTKIMUSKESKUS VTT OY

33 / 250 characters

Organisation in English VTT Technical Research Centre of Finland Ltd.

45 / 250 characters

Department in original language Digital technologies

20 / 250 characters

Department in English Digital technologies

20 / 250 characters

Partner location and website:

Address Tekniikantie 21 / P.O. Box 1000

31 / 250 characters

Postal Code FIN-02044

10 / 250 characters

Town Espoo

5 / 250 characters

Website www.vttresearch.com

19 / 100 characters

Country Finland

NUTS1 code Manner-Suomi

NUTS2 code Helsinki-Uusimaa

NUTS3 code Helsinki-Uusimaa

Partner ID:

Organisation ID type Business Identity Code (Y-tunnus)

Organisation ID 2647375-4

VAT Number Format FI + 8 digits

VAT Number N/A ☐ FI26473754

10 / 50 characters

PIC 932760440

9 / 9 characters

Partner type:

Legal status a) Public

Type of partner	Higher education and research instituti	University faculty, college, research institution, RTD facility, research cluster, etc.
Sector (NACE)	72.19 - Other research and experimental development on natural sciences and engineering	

Partner financial data:

Is your organisation entitled to recover VAT related to the EU funded project activities? No

Role of the partner organisation in this project:

Work package 2 task leader: Printing trials and PV modules with methods developed in WP1 (aid in validation of module processing)
- Converting process development and R2R lasering for EpiShine (vias, patterning foils, and encapsulation)
- Development for project partnerships and demonstrator use
- Characterization of modules with DLIT, PL, EL (ageing trials of modules optional)

380 / 1,000 characters

Has this organisation ever been a partner in the project(s) implemented in the Interreg Baltic Sea Region Programme?

○ Yes ○ No

State aid relevance

For the partner type selected, the Programme sees a medium to high risk for implementing State aid relevant activities. If the partner is of the opinion that its activities are not State aid relevant, it can ask the MA/JS for a plausibility check on the State aid relevance. Does the partner want to do this?

○ Yes ○ No

Justification why the partner's activities are not State aid relevant

"state aid rules applies only to an economic activity, i.e. aid granted for beneficiaries considered as undertakings. An undertaking is defined as an actor that carries out economic activity consisting of offering goods or services on a given market.

VTT carries out economic and non-economic activities in the form of projects. Therefore VTT has separate accounts for these activities, i.e. transparent book-keeping. VTT´s research projects receiving public aid are considered as gratuitous and therefore non-economic in nature. On the other hand, carrying out commercial, non-gratuitous projects is considered as an economic activity and thus these projects can´t receive any form of aid."

692 / 3,000 characters

2.2 Project Partner Details - Partner 5

LP/PP	Project Partner		
Partner Status	Active		
Active from	22/09/2022	**Inactive from**	

Partner name:

Organisation in original language	Kauno technologijos universitetas
	34 / 250 characters
Organisation in English	Kaunas University of Technology
	31 / 250 characters
Department in original language	Medžiagų mokslo institutas
	27 / 250 characters
Department in English	Institute of Materials Science
	31 / 250 characters

Partner location and website:

Address	K. Donelaičio g. 73 (20 / 250 characters)	**Country**	Lithuania
Postal Code	LT-44249 (9 / 250 characters)	**NUTS1 code**	Lietuva
Town	Kaunas (7 / 250 characters)	**NUTS2 code**	Vidurio ir vakarų Lietuvos regionas
Website	www.ktu.edu (12 / 100 characters)	**NUTS3 code**	Kauno apskritis

Partner ID:

Organisation ID type	Legal person's code (Juridinio asmens kodas)
Organisation ID	119595811
VAT Number Format	LT + 9 digits
VAT Number	**N/A** ☐ LT119505811 (11 / 50 characters)
PIC	999844961 (9 / 9 characters)

Partner type:

Legal status	a) Public	
Type of partner	Higher education and research instituti	University faculty, college, research institution, RTD facility, research cluster, etc.
Sector (NACE)	72.19 - Other research and experimental development on natural sciences and engineering	

Partner financial data:

Is your organisation entitled to recover VAT related to the EU funded project activities? No

Role of the partner organisation in this project:

Partner will be involved in the activities planned in WP1 and WP3.

66 / 1,000 characters

Has this organisation ever been a partner in the project(s) implemented in the Interreg Baltic Sea Region Programme?

○ Yes ○ No

State aid relevance

For the partner type selected, the Programme sees a medium to high risk for implementing State aid relevant activities. If the partner is of the opinion that its activities are not State aid relevant, it can ask the MA/JS for a plausibility check on the State aid relevance. Does the partner want to do this?

○ Yes ○ No

2.2 Project Partner Details - Partner 6

LP/PP	Project Partner

Partner Status	Active		
Active from	22/09/2022	**Inactive from**	

Partner name:

Organisation in original language	Tartu Ülikool (14 / 250 characters)
Organisation in English	University of Tartu (19 / 250 characters)
Department in original language	füüsika instituut (18 / 250 characters)
Department in English	Institute of Physics (21 / 250 characters)

Partner location and website:

Address	W. Ostwaldi 1 (14 / 250 characters)	**Country**	Estonia
Postal Code	50411 (6 / 250 characters)	**NUTS1 code**	Eesti
Town	Tartu (6 / 250 characters)	**NUTS2 code**	Eesti
Website	www.fi.ut.ee (12 / 100 characters)	**NUTS3 code**	Lõuna-Eesti

Partner ID:

Organisation ID type	Registration code (Registrikood)
Organisation ID	74001073
VAT Number Format	EE + 9 digits
VAT Number	N/A ☐ EE100030417 (11 / 50 characters)
PIC	999895013 (9 / 9 characters)

Partner type:

Legal status	a) Public	
Type of partner	Higher education and research instituti	University faculty, college, research institution, RTD facility, research cluster, etc.
Sector (NACE)	72.19 - Other research and experimental development on natural sciences and engineering	

Partner financial data:

Is your organisation entitled to recover VAT related to the EU funded project activities?	Yes

Role of the partner organisation in this project:

WP3 leader, partner in WP1 and WP2

35 / 1,000 characters

Has this organisation ever been a partner in the project(s) implemented in the Interreg Baltic Sea Region Programme?

○ Yes ○ No

State aid relevance

For the partner type selected, the Programme sees a medium to high risk for implementing State aid relevant activities. If the partner is of the opinion that its activities are not State aid relevant, it can ask the MA/JS for a plausibility check on the State aid relevance. Does the partner want to do this?

○ Yes ○ No

Justification why the partner's activities are not State aid relevant

Project activities of this partner (leading the development and implementation of task 1 in the work plan and participation in the execution of tasks 2,3, and 4) are not part of the University's ordinary basic research and educational activities, usually funded with State Aid. Project activities mentioned would not be carried out without the project funding. Also, there will not be any development of business activities in the project that could be considered as developing services leading to profitable activities after the project. Results of the project are aimed to be freely accessed by the municipalities, citizens, businesses, and industries.

655 / 3,000 characters

2.2 Project Partner Details - Partner 7

LP/PP Project Partner

Partner Status Active

Active from 22/09/2022 **Inactive from**

Partner name:

Organisation in original language Latvijas Universitāte

21 / 250 characters

Organisation in English University of Latvia

20 / 250 characters

Department in original language Ķīmiskās fizikas institūts

26 / 250 characters

Department in English Institute of Chemical Physics

29 / 250 characters

Partner location and website:

Address Raina bulvd. 19

15 / 250 characters

Postal Code 1586

4 / 250 characters

Town Riga

4 / 250 characters

Website www.lu.lv

9 / 100 characters

Country Latvia

NUTS1 code Latvija

NUTS2 code Latvija

NUTS3 code Rīga

Partner ID:

Organisation ID type	Unified registration number (Vienotais reģistrācijas numurs)
Organisation ID	90000076669
VAT Number Format	LV + 11 digits
VAT Number	N/A ☐ LV90000076669 (13 / 50 characters)
PIC	999871830 (9 / 9 characters)

Partner type:

Legal status	a) Public	
Type of partner	Higher education and research instituti	University faculty, college, research institution, RTD facility, research cluster, etc.
Sector (NACE)	72.19 - Other research and experimental development on natural sciences and engineering	

Partner financial data:

Is your organisation entitled to recover VAT related to the EU funded project activities? No

Role of the partner organisation in this project:

University of Latvia will be involved in all work packages. University of Latvia will participate in characterisation of systems for low-light photovoltaic performance; will be actively involved in pilot development and installation of solar panels in Latvia. University of Latvia will host outreach activities, will be active in dissemination and exploitation of the project achievements. One project meeting will be hosted by the University of Latvia.

454 / 1,000 characters

Has this organisation ever been a partner in the project(s) implemented in the Interreg Baltic Sea Region Programme?

○ Yes ○ No

State aid relevance

For the partner type selected, the Programme sees a medium to high risk for implementing State aid relevant activities. If the partner is of the opinion that its activities are not State aid relevant, it can ask the MA/JS for a plausibility check on the State aid relevance. Does the partner want to do this?

○ Yes ○ No

2.2 Project Partner Details - Partner 8

LP/PP	Project Partner		
Partner Status	Active		
Active from	22/09/2022	**Inactive from**	

Partner name:

Organisation in original language	Kauno mokslo ir technologijų parkas (36 / 250 characters)
Organisation in English	Kaunas Science and Technology Park (35 / 250 characters)
Department in original language	N/A (3 / 250 characters)

Department in English N/A

3 / 250 characters

Partner location and website:

Address K. Petrausko g. 26

19 / 250 characters

Country Lithuania

Postal Code 44156

6 / 250 characters

NUTS1 code Lietuva

Town Kaunas

7 / 250 characters

NUTS2 code Vidurio ir vakarų Lietuvos regionas

Website www.kaunomtp.lt

16 / 100 characters

NUTS3 code Kauno apskritis

Partner ID:

Organisation ID type Legal person's code (Juridinio asmens kodas)

Organisation ID 303562022

VAT Number Format LT + 12 digits

VAT Number N/A ☐ LT100009138419

14 / 50 characters

PIC 932475648

9 / 9 characters

Partner type:

Legal status a) Public

Type of partner Business support organisation — Chamber of commerce, chamber of trade and crafts, business incubator or innovation centre, business clusters, etc.

Sector (NACE) 70.22 - Business and other management consultancy activities

Partner financial data:

Is your organisation entitled to recover VAT related to the EU funded project activities? No

Role of the partner organisation in this project:

Involvement in project management (WP1) on partner level - participating in project meetings, workshops, contributing to overall project reporting, etc.
Piloting and evaluation solutions (WP2) - assisting technical partners in testing of modules, collecting and provision of feedbacks;
Transfer solutions (WP3) - contribution to a dissemination and exploitation schemes for the LowLight PV pilots considering defined target groups; contribution to a life-cycle assessment and sustainability of the LowLight PV pilots; contribution to a life-cycle assessment of the LowLight PV pilots and technology

598 / 1,000 characters

Has this organisation ever been a partner in the project(s) implemented in the Interreg Baltic Sea Region Programme?

○ Yes ○ No

2.2 Project Partner Details - Partner 9

LP/PP	Project Partner
Partner Status	Active
Active from	22/09/2022
Inactive from	

Partner name:

Organisation in original language	Politechnika Śląska (20 / 250 characters)
Organisation in English	The Silesian University of Technology (38 / 250 characters)
Department in original language	Wydział Chemiczny (18 / 250 characters)
Department in English	Faculty of Chemistry (21 / 250 characters)

Partner location and website:

Address	ul. ks. M. Strzody 9 (21 / 250 characters)	**Country**	Poland
Postal Code	44-100 (7 / 250 characters)	**NUTS1 code**	Makroregion południowy
Town	Gliwice (8 / 250 characters)	**NUTS2 code**	Śląskie
Website	www.polsl.pl/rch (16 / 100 characters)	**NUTS3 code**	Gliwicki

Partner ID:

Organisation ID type	Tax identification number (NIP)
Organisation ID	6310200736
VAT Number Format	PL + 10 digits
VAT Number	N/A ☑ (0 / 50 characters)
PIC	999899087 (9 / 9 characters)

Partner type:

Legal status	a) Public	
Type of partner	Higher education and research instituti	University faculty, college, research institution, RTD facility, research cluster, etc.
Sector (NACE)	72.19 - Other research and experimental development on natural sciences and engineering	

Partner financial data:

Is your organisation entitled to recover VAT related to the EU funded project activities? No

Role of the partner organisation in this project:

Design of active materials (non-fullerene acceptors) and stability studies on OPV materials and completed devices

114 / 1,000 characters

Has this organisation ever been a partner in the project(s) implemented in the Interreg Baltic Sea Region Programme?

○ Yes ○ No

State aid relevance

For the partner type selected, the Programme sees a medium to high risk for implementing State aid relevant activities. If the partner is of the opinion that its activities are not State aid relevant, it can ask the MA/JS for a plausibility check on the State aid relevance. Does the partner want to do this?

○ Yes ○ No

2.2 Project Partner Details - Partner 10

LP/PP Project Partner

Partner Status Active

Active from 22/09/2022 **Inactive from**

Partner name:

Organisation in original language Tartu Linnavalitsus

19 / 250 characters

Organisation in English Tartu City Government

21 / 250 characters

Department in original language Linnamajanduse osakond

22 / 250 characters

Department in English Department of Communal Services

31 / 250 characters

Partner location and website:

Address Raekoja plats 1a

16 / 250 characters

Postal Code 50089

5 / 250 characters

Town Tartu

5 / 250 characters

Website www.tartu.ee

12 / 100 characters

Country Estonia

NUTS1 code Eesti

NUTS2 code Eesti

NUTS3 code Lõuna-Eesti

Partner ID:

Organisation ID type	Registration code (Registrikood)
Organisation ID	75006546
VAT Number Format	EE + 9 digits
VAT Number	N/A ☐ EE100670291 (11 / 50 characters)
PIC	996380024 (9 / 9 characters)

Partner type:

Legal status	a) Public	
Type of partner	Local public authority	Municipality, city, etc.
Sector (NACE)	84.11 - General public administration activities	

Partner financial data:

Is your organisation entitled to recover VAT related to the EU funded project activities? No

Role of the partner organisation in this project:

Tartu City as a project partner will take part in all WP-s and will pilot a low light PV solution in Tartu on public building.

127 / 1,000 characters

Has this organisation ever been a partner in the project(s) implemented in the Interreg Baltic Sea Region Programme?

◉ Yes ○ No

2.3 Associated Organisation Details - AO 1

Associated organisation name and type:

Organisation in original language
Bauskas novada pašvaldība
25 / 250 characters

Organisation in English
Bauska municipality Government
30 / 250 characters

Department in original language
Attīstības un būvniecības departaments
38 / 250 characters

Department in English
Development and Building department
35 / 250 characters

Legal status
a) Public

Type of associated organisation
Local public authority
Municipality, city, etc.

Associated organisation location and website:

Address
Uzvaras iela 1
14 / 250 characters

Country
Latvia

Postal Code
LV-3901
7 / 250 characters

Town
Bauska
6 / 250 characters

Website
www.bauska.lv/en
16 / 100 characters

Role of the associated organisation in this project:

The local government will involve its institutions in project activities in order to facilitate the introduction of inventions, including educational institutions as an associated partner. Placing designed items in local government premises and helping to test and promote innovation and green thinking accordingly. Participate in the development of the Interreg 6B proposal “Low-light PV”, which works at low light intensity and which is currently not exactly in the industry, as well as the installation and testing of finished products also install and test finished products in different environments, with an indoor accent.

631 / 1,000 characters

3. Relevance

3.1 Context and challenge

The BSR is in need of a fossil-free energy generation system with a significantly high degree of decentralisation in order to support the large rural areas. Photovoltaics convert most directly energy from the sun into electrical energy whereever needed, but photovoltaics are challenged in the BSR due to low solar light intensities. The project aims at enhancing the use of PV in the BSR by introducing highly efficient, low light organic photovoltaics (OPV). This will significantly reduce the spill of energy via artificial indoor lighting and make especially houses in the rural areas more autark and smart. This is for same reason targeting specifically green energy to power up Internet-of-things (IoT) devices, which can support efficient energy management in buildings and factories in the region. Such IoT devices has a huge market forecast for the coming years (see below figure), however, there is no green battery technology to follow these forecasts. Therefore, direct powering by LowLight PV modules harvesting otherwise waste light energy has a huge potential for these applications in the BSR region For this opportunity to be realised, the project tackles technological (scale up and implementation) as well as acceptance challenges.
Both, the individual citizens in rural areas that plan smart houses, as well as the citizens of the bigger cities that are living in larger appartement blocks, shall directly benefit from the outcome of this project. Indoor OPV is an important ingredient for architectural planning all the way from individual houses to cities. Being an essential part of fossile-free energy generation technology, a further spread of indoor OPV is expected to also have a positive effect on overall energy planning - and help more cities in the BSR on their way to zero emission. The project will help to overcome both technological and acceptance barriers that at present hinder the distribution of the technology.

1,952 / 2,000 characters

3.2 Transnational value of the project

Solving the technological and acceptance challenges for the distribution of OPV in the BSR region asks directly for transnational collaboration. Acceptance challenges can be best solved by best practice examples, and by active inclusion of key actors from different sectors. Here, Denmark (Sønderborg) has been a frontrunner in the last more than ten years on the way to zero carbon emission via its municipality driven Project Zero. Sønderborg has intensively collaborated with the municipality of Tartu (Estonia), which is therefore also part of the present project. There do exist also intense collaborations on the technological aspects of PV integration between the universities of Tartu, Kaunas and Riga and the university of Southern Denmark.
In the same context, distribution and implementation of a novel PV technology requires close collaboration between potential end-users and institutions and companies producing the technologies. Here Sweden, Finland and Denmark have strong competences of Roll-to-Roll (R2R) print technologies for upscaling and production of new organic, low-light photovoltaics, supported also by partners in e.g. Poland and Lithuania on more fundamental aspects of the technology. Including target groups in preparing and developing LowLight PV solutions for the BSR region thus requires intense transnational collaboration across the whole region.
In LowLight PV, the aim is to go beyond state-of-the-art in low-light photovoltaics, and incorporate end-users in developing new application areas for the BSR region, where there is a large need especially targeting IoT devices for efficient energy management. This can only be done via a project that supports the collaboration between academic, public and private partners across the whole BSR region.

1,788 / 2,000 characters

3.3 Target groups

Target group	Sector and geographical coverage	Its role and needs
Local public authority	Field of responsibility: Installation sites for LowLight photovoltaics; Field of responsibility: Network on LowLight photovoltaics; Field of responsibility: Behaviour change and social acceptance; Initially in particular Tartu, Sønderborg, Kaunas but expanded to all BSR region during the project 300 / 500 characters	The target group will be multiplier of the LowLight photovoltaics technology and support social acceptance. The target group needs to have LowLight photovoltaics pilots installed in public buildings and show case to large existing networks, stakeholders and decision makers. Needs to engage in dissemination and exploitation workshops during the project, and needs to connect the LowLight photovoltaics technology to local municipality masterplans. 454 / 1,000 characters
Education/training centre and school	Field of responsibility: Education in renewables, photovoltaics and electronics; Field of responsibility: Behaviour change and social acceptance; Whole BSR region 165 / 500 characters	The target group will educate students and the public on LowLight photovoltaics and support behaviour change and social accetance of the technology. It needs to receive information about the LowLight photovoltaics technology developed and include in educational activities. 275 / 1,000 characters
Higher education and research instituti	Field of responsibility: Education and research in low-light photovoltaics and IoT electronics; Field of responsibility: Installation sites for LowLight photovoltaics; Denmark, Estonia, Lithuania, Latvia and Poland – new countries may be involved in new activities and projects arising from the LowLight PV project. 318 / 500 characters	The target group will educate students on low light photovoltaics technology and establish new research and development activities on the topic. It needs to work on LowLight PV development and installations, and be a test site for the LowLight PV pilots. Needs to engage with the public and industries to develop further the technology in the future. 353 / 1,000 characters
Large enterprise	Economic sector: Energy efficiency and management; Economic sector: photovoltaics; Whole BSR region targeted in the project. 127 / 500 characters	The target group will be potential end-users for large volume installations of the LowLight PV technology. It Needs to engange in technology and exploitation workshops and engage in new application scenarious and technology adaptation. 236 / 1,000 characters
Small and medium enterprise	Economic sector: electronics and IoT devices; Economic sector: photovoltaics; Economic sector: Roll-to-Roll (R2R) print technology; Initially Sweden, and expanded to all BSR countries during the project via the workshops 225 / 500 characters	The target group will either be deliverers of equipment to LowLight photovoltaics production, produce LowLight photovoltaics products or be end-users of LowLight photovoltaics. The target group needs to be informed about and included in the LowLight PV pilots production and application. 291 / 1,000 characters

3.4 Project objective

Your project objective should contribute to:

Energy transition

The objective of the LowLight PV project is to distribute low-light photovoltaics technology in the BSR region to support a transition to increased renewable energy and a significant reduction of CO2 emissions in the region. In the LowLight PV project, we will develop and produce low light photovoltaics modules, and install LowLighPV pilots at various (10 installation sites) places in the BSR region. The public authorities will receive LowLight PV pilots and information about the technology, application areas and future potential will be communicated via workshops that support the public in being a multiplier for the LowLight PV technology. This is will be used to support further exploitation with the public authorities as multiplier. Industry target groups wil take part in the development of the technology and be potetial end-users of the technology via new installations and also new application areas during and following the project. The development and installation of pilots will provide new business opportunities for all companies that work on energy harvesting or electronics that can benefit from the energy harvesting. This is for example the hugely growing Internet-of-Things (IoT) areas, where devices can be directly powered by the LowLight PV pilots and be utilized for e.g. efficienct energy management. Industry partners will receive information about the technology and pilots, and participate the technology and exploitation workshops. Schools and education and research institutes will take part in developing the LowLight PV technology, and use the competence development to educate students, researchers and companies about the technology, as well as establish new activities on low-light photovoltaics. The involvement of the target groups will therefore both support the development of the low-light photovoltaics technology, and directly foster a widespread use of LowLight photovoltaics in the BSR.

1,937 / 2,000 characters

3.5 Project's contribution to the EU Strategy for the Baltic Sea Region

Please indicate whether your project contributes to the implementation of the Action Plan of the EU Strategy for the Baltic Sea Region (EUSBSR).

(•) Yes ( ) No

Please select which Policy Area of the EUSBSR your project contributes to most.

PA Energy

Please list the action of this Policy Area that your project contributes to and explain how.

Action 4 Increasing the share of renewable energy including marine renewable energy

„Continue work on the integration of renewable electricity into the power system and explore possibilities of cooperation in concrete areas [...]."
Organic PVs can be used flexibly in many areas. The solar electricity generated by the PVs contributes tot he EU strategy of reducing greenhouse gas emission.

"Promote the concept of "do no significant harm" to the environment for the use of renewable energy and promote synergies with reducing emissions of air pollutants."
Organic PVs are using solar energy for energy production. There is no toxic emission. It is also not necessary to destroy forests and other habitats of animals to install them. They can be installed into everyday life, outside and inside of buildings as well, due to their higher range of function (concerning light wavelength).

"Engage in sharing more best practice on renewable energy communities and renewable self consumption, the integration of renewables in the building, industry, district heating and cooling sectors [...]."
As mentioned above organic PVs can be installed into buildings, green houses and other architecture. They do not necessarily need sun light to function but do also work with indoor lights. Due to their flexibility the application areas of OPVs are numerous.

1,361 / 1,500 characters

If applicable, please describe which other Policy Areas of the EUSBSR your project contributes to and how.

Policy Area Innovation, Action 1 Challenge-driven innovation

Our project is helping to address one of the great environmental challenges of the 21st century in the Baltic Sea region. Building on a solid background, a stronger innovation ecosystem is created through the development of common solutions. It contributes to creating opportunities for sustainable growth in the Baltic Sea Region.

395 / 1,500 characters

3.6 Other political and strategic background of the project

Strategic documents
UN SDGs 07 Affordable and clean energy Aim of this project is the production of an organic PV prototype integrated into buildings. The energy produced comes from the energy of the light that hits the OPV. There are no emissions and no other toxic substances emitted. This helps to make cities more climate-neutral and slowly but surely get away from fossil fuels, which have a huge impact on climate and the rise of temperature in the atmosphere. 448 / 500 characters
UN SDGs 11 Sustainable cities and communities 13 Climate action After the recent sanctions against Russia on gas, it has been seen that it is even more important to be less dependent on fossil fuels and to promote sustainable energy sources on a larger scale. Our project contributes to increase the amount of PVs at the market in relation to fossil fuels, which have been shown to have a strong influence on the increase in temperature and climate change in the world. 473 / 500 characters
European Green Deal The EGD aims to put the European Union on a pathway to reach at least 55% of GHG reduction by 2030 and requires bold action to accelerate the decarbonisation of our energy supply. Proven technologies like wind and solar photovoltaics will have to bridge the gap. Accelerating the deployment of solar photovoltaics is a “no regrets” choice as it has one of the lowest electricity generation costs. This project will contribute to achieving this goal of the European Green Deal. 499 / 500 characters

3.7 Seed money support

Please indicate whether your project is based on a seed money project implemented in the Interreg Baltic Sea Region Programme 2014-2020.

○ Yes ◉ No

3.8 Other projects: use of results and planned cooperation

Full name of the project	Funding Source	Use of the project outcomes and/or planned cooperation
Epishine LEH (grant agreement 872155) 39 / 200 characters	H2020 6 / 200 characters	Project ran 2019-2021 with the aim of increasing the maturity of the production of light energy harvesting modules. This project will build on to the findings from the H2020-project as the production process will essentially be the same. 238 / 1,000 characters
CITYSOLAR 9 / 200 characters	H2020 5 / 200 characters	Project runs from 2020-2023, development of semi-transparent photovoltaics for window. Synergy with some of the development steps although a different device architecture is used here. 186 / 1,000 characters
RollFlex 9 / 200 characters	Interreg 5A Deutschland-Danmark 31 / 200 characters	Project ran from 2016-2020. Developmen of Roll-to-Roll (R2R) technology in the South Danish and North German region, including development of organic photovoltaics from R2R technology. LowLight PV will benefit from some of these developments on scalable organic solar cell development. 286 / 1,000 characters

Full name of the project	Funding Source	Use of the project outcomes and/or planned cooperation
SmartEnCity Network 19 / 200 characters	H2020 5 / 200 characters	SmartEnCity brings together currently 67 city members from all across joining forces to make Smart Zero Carbon Cities a reality in Europe. Its main objective is to develop a highly adaptable and replicable systemic approach for transforming European cities into sustainable, smart and resource-efficient urban environments. This is achieved through the integrated planning and implementation of measures aimed at improving energy efficiency in main consuming sectors in cities, while increasing their supply of renewable energy and demonstrating the benefits. Thus, this project's consortiums perfectly well represents the target groups of LowLight PV and an interface may enhance the uptake of the therein developed technology solution. 737 / 1,000 characters
2Imprezs 8 / 200 characters	Interreg NSR 12 / 200 characters	Project ran 2018-2021. The project implemented energy saving measures in existing school buildings across the NSR to reduce energy consumption and costs and increase comfort. Students of participating schools engaged through a cross-border energy challenge initiative. The behavioural change programme is supported by the adoption of energy efficiency measures at schools. School stakeholders and 2imprezs experts cooperated to work out technical and financial solutions needed to evolve to energy-efficient schools. The network, tools and competences developed in this project will be a great benefit for LowLight PV having also schools as a target group. 656 / 1,000 characters

3.10 Horizontal principles

Horizontal principles	Projects's direct impact
Sustainable development	positive
Non-discrimination including accessibility	positive
Equality between men and women	positive

4. Management

Allocated budget 10%

4.1 Project management

☑ **Please confirm that the lead partner and all project partners will comply with the rules for the project management as described in the Programme Manual.**

If relevant, please indicate any other important aspects of the project management, e.g. external entity supporting the lead partner in the management of the project, advisory board, steering committee, any other relevant working groups, etc.

Project Steering Committee: consists of one representative from each partner, main function: to supervise the progress and quality of activities, the goal achievement, the budget use and any potential risks and mitigation measures. Stakeholder Advisory Group to focus on the target groups, and their role in meeting project goals.

Support by an external service provider
Project kick-off
6 monthly project meetings
Online management and collaboration platform

465 / 500 characters

4.2 Project financial management

☑ **Please confirm that the lead partner and all project partners will comply with the rules for the financial management and control as described in the Programme Manual.**

If relevant, please indicate any other important aspects of the financial management, e.g. external entity supporting the lead partner, positions planned for financial management, involvement of special financial experts (e.g. for public procurement), etc.

The Project Financial Management is organised by LP involving financial officers from all partners. LP ensures that internal procedures for all PP's finance officers are in place, which define the time schedule and quality requirements on FL controls, documentation of occurred costs, correct usage of time records, procurement procedures for external services and equipment, and timely reporting. The PFM will be supported by an external service provider.
Initial finance officer's meetings

494 / 500 characters

4.3 Input to Programme communication

☑ **Please confirm that you are aware of the obligatory inputs to Programme communication that must be submitted along the pre-defined progress reports, as described in the Programme Manual.**

If relevant, please describe other important aspects of project communication that you plan to introduce, e.g. a communication plan, opening and closing events, social media channel(s) etc.

For reaching out to the target groups, esp. as part of WP3, a communication plan is set up that considers all target groups specified in this project application. Communication measures are derived taking into account the specifics of the participating organisations and countries. As a joint measure, a matchmaking conference and closing event is organised. Social media activities are conducted by the consortium and multipliers representing the target groups throughout the project's runtime.

498 / 500 characters

4.4 Cooperation criteria

Please select the cooperation criteria that apply to your project. In your project you need to apply at least three cooperation criteria. Joint development and joint implementation are the obligatory ones you need to fulfill in your project.

Cooperation criteria	
Joint Development	☑
Joint Implementation	☑
Joint Staffing	☑
Joint Financing	☐

5. Work Plan

Number	Work Package Name
1	Preparing solutions

Number	Group of Activity Name
1.1	Strategic and cooperative project management
1.2	Low-light photovoltaics materials
1.3	Low-light Photovoltaics cell and module architecture
1.4	Definition of installation sites in relation to the target groups

Number	Work Package Name
2	Piloting and evaluating solutions

Number	Group of Activity Name
2.1	Low-light photovoltaics module development
2.2	Industrial manufacturing of LowLight PV modules
2.3	Electronic integration of LowLight PV modules
2.4	Lifetime and stability testing of LowLight PV modules and pilot prototypes

Number	Work Package Name
3	Transferring solutions

Number	Group of Activity Name
3.1	Installation and energy yield assessment of LowLight PV pilot prototypes
3.2	Dissemination and exploitation schemes for the LowLight PV pilots considering defined target groups
3.3	Life-cycle assessment sustainability of the LowLight PV pilots

Work plan overview

Period:	1	2	3	4	5	6	Leader
WP.1: Preparing solutions							**PP1**
A.1.1: Strategic and cooperative project management O.1.1: Technology workshops		O		O		O	PP1
A.1.2: Low-light photovoltaics materials O.1.2: Novel LowLight PV organic molecules	O	O	O	O			PP9
A.1.3: Low-light Photovoltaics cell and module architecture O.1.3: LowLight PV module layout for industrial processing	O	O	O	O			PP1
A.1.4: Definition of installation sites in relation to the target groups D.1.4: Report on LowLight PV pilot installation sites, including detailed installation scheme		D					PP5
WP.2: Piloting and evaluating solutions							**PP3**
A.2.1: Low-light photovoltaics module development D.2.1: Realisation of LowLight PV cell with power conversation efficiency >20% under low-light conditions				D			PP3
A.2.2: Industrial manufacturing of LowLight PV modules O.2.2: Ten LowLight PV modules with power conversion efficiencies of 13% and 17%, respectively, delivered		O		O			PP3
A.2.3: Electronic integration of LowLight PV modules O.2.3: Integrated LowLight PV pilot			O		O		PP4
A.2.4: Lifetime and stability testing of LowLight PV modules and pilot prototypes O.2.4: Stable integrated LowLight PV pilot under simulated operation conditions						O	PP3
WP.3: Transferring solutions							**PP6**
A.3.1: Installation and energy yield assessment of LowLight PV pilot prototypes O.3.1: Installed LowLight PV pilot protoypes and corresponding energy yield assessment				O		O	PP6
A.3.2: Dissemination and exploitation schemes for the LowLight PV pilots considering defined target groups D.3.2: Communication tools, reporting and workshops to showcase the LowLight PV pilot technology	D		D	D		D	PP10
A.3.3: Life-cycle assessment sustainability of the LowLight PV pilots O.3.3: Business plan for the LowLight PV pilots and technology					O	O	PP3

Outputs and deliverables overview

Code	Title	Description	Contribution to the output	Output/ deliverable contains an investment

O 1.1	Technology workshops	The output will be 3 physical technology workshops where target group members (public and private) will join to receive information about the LowLight PV technology. This will be done via presentations and demonstrations on use-case scenarios, and possibilities in terms of applications. The technology workshops will be a central element in receiving inputs from the extended and transnational BSR network on the LowLight PV utilization and deployment. It will be used to promote the technology in the full BSR region, but also collect inputs to WP1 on the preparation of LowLight PV solutions, e.g. requests on new functional requirements for the LowLight PV pilots. All project partners will participate in the workshops and take part in presenting the technology to the target groups. Participation from schools, at different levels, and the broader public, will support broad knowledge and acceptance of the technology, and it will also be used to establish educational activities and student projects around the different aspects of LowLight PV. This is important as a future mass market penetration would require employees educated in such new PV technology. It is also important to establish projects on specific subparts of the technology, which can produce further inputs to WP1 on new solutions for next generation LowLight PV.		
O 1.2	Novel LowLight PV organic molecules	To support the material development, a report on the materials system will be made to support the development of the beyond state-of-the-art LowLight PV, as it will define the materials needed to reach the targeted levels. It will consider the requirements on fully scalable and industrial production, set by the company partner Epishine, as well as the inputs from the target groups on the use cases and applications, which defines e.g., spectral range and product lifetime. It will also consider any mechanical flexibility requirements, which is possible to tune via the choice of materials. In the report there will be details on all materials systems needed to develop the second-generation LowLight PV pilots, including electron donor and acceptor molecules, electrode materials, transparent conductive oxides, transport interlayer materials and barrier/encapsulation materials. It will also include inputs on standard characterization results of these, for example by optical spectroscopy and cyclic voltammetry. The report will also include details on processing of the materials, in an industrial setting. The report will be made with inputs from all project partners included in the GoA (as described above), and thus have transnational aspects embedded. The responsible for developing the report will be Silesian University of Technology, who will coordinate the work. The report will be available to all project partners and be a strong support for the sustainability aspects of the project, as it defines the materials systems needed to go beyond state-of-the-art for low light photovoltaics in the BSR region, which could lead to new synergies and industrial collaborations well beyond the project duration. New organic molecules utilized as light absorbers in the active layer in organic solar will be synthesized, and will be the main output in this GoA. These will contribute to the energy conversion process to generate free charge carriers and thus electricity from the photovoltaic cells. The molecules will be synthesized specifically for LowLight PV, which requires a tuned absorption spectrum as compared to conventional organic photovoltaics. The molecules will also be made with considerations of industrial processing compatibility as well as final product lifetime. The molecules will be synthesized with the purpose of increase the power conversion efficiency beyond state-of-the-art for low light photovoltaics, reaching in the LowLight PV project values up to 17% (GoA 1.3). The molecules will thus set the standard for the next generation low light photovoltaics, which can benefit the whole BSR region. Patents and scientific publications will be targeted for this scientific and technical output, and the results will be communicated to all associated project partners at the larger project meetings.		Yes
O 1.3	LowLight PV module layout for industrial processing	The module layout is important for the final LowLight PV pilot, as it defines the technical as well as visual design of the pilot, which both are important for actual pilot production in WP2, and also for the visible appearance of the LowLight PV pilot, which is relevant for the end-users. Therefore, the above inputs from the target groups (transnational) via the technology workshop is important for reaching this output. The module layout will be defined on the basis of beyond state-of-the-art efficiency for scalable low light photovoltaics, obtained in this GoA. To reach this, updated materials and device architectures will be defined and optimized in the OPV device stack, which is also based on significant background knowledge, competence and experience from the LowLight PV partners working on OPV development in GoA 1.2 and GoA 1.3. The power conversion efficiency will be measured under 1 sun AM1.5G as well as simulated indoor light spectrum of 500 lux, and reported along with the full OPV cell structure. The results will be utilized for the final module layout, which will be based on the cell architecture made to reach this efficiency. The result will be communicated to all project partners, associated partners and LowLight PV network and target groups (transnational), and will open up for new applications of LowLight PV due to the increased power output. A report will detail physical subcell layout, size and dimensions of subcell, cell architecture and also laser scribing areas and interconnects, which is important for the electrical output of the LowLight PV pilots. Compatibility with industrial scale-up will be considered with inputs from Epishine. The report will be made between LowLight PV project partners working on PV materials, cell development, module architectures, industrial production and end-use to take into consideration all aspects that can influence module layout design.		

D 1.4	Report on LowLight PV pilot installation sites, including detailed installation scheme	The report will detail the installation sites including details on the electrical installation of the LowLight PV pilots. This will be done with inputs from all installation sites, which considers the use-cases and applications targeting the different target groups. Technical details on the LowLight PV modules, needed to make the electrical integration of the LowLight PV pilots, will be provided from the GoA 1.3 in works package 1. The purpose of the report is to ensure compatibility between the LowLight PV pilot solutions and the intended installations, and it can thus be used as a guide for the actual installations. It will also be made available to associated partners and target groups, whom can then see and learn about how to make and benefit from LowLight PV pilot installations in the BSR region.	Installed LowLight PV pilot protoypes and corresponding energy yield assessment (O3.1) - see WP3	
D 2.1	Realisation of LowLight PV cell with power conversation efficiency >20% under low-light conditions	The purpose of this delivery is to enable the further scale up and process development in GoA 2.2. The module performance is pending the performance of the individual cell and the most economic way of improving module performance is to start at the cell-level. The realization of this delivery will depend on the result where it might, depending on the results in WP1, be more interesting to iterate a number of material combination than just the final pick. This result on cell level will thus be achieved using industrial-compatible techniques (important for GoA 2.2) and based on the developments made in WP1 where screening of various cell architectures and materials will be made. The deliverable will be communicated to partners, associated partners and target groups as well, to continuously support the preparation of new LowLight PV pilots facilitated by this progress.	Ten LowLight PV modules with power conversion efficiencies of 13% and 17%, respectively, delivered	
O 2.2	Ten LowLight PV modules with power conversion efficiencies of 13% and 17%, respectively, delivered	The purpose of this output is to further the development of other activities in the project by supplying modules for further integration (GoA 2.3), installation (GoA 3.1), testing and work (GoA 2.4 and GoA 3.1). Epishine will, in at least two batches (20 modules in total, month 12 and month 24), deliver modules to GoA 2.3 for further work on electronic integration, and to WP3 to start the work on pilot installations. The latter batch will include modules that go beyond state-of-the-art in power conversion efficiency for industrial modules (17%), and thus be very valuable to target groups as it opens up for new LowLight PV applications. The outcomes will be delivered to relevant partners (GoA 2.3, GoA 2.4 and GoA 3.1) and communicated also to associated partners and target groups.		
O 2.3	Integrated LowLight PV pilot	In order to present some of the ideas and concepts that came into fruiting during the project, a report on the electronic integration will be made. The report will contain sketches, preliminary specifications regarding dimensions, material as well as rudimentary cost-benefit analysis of the concepts. The report will be based on the outcomes of the workshop(s) held with the end-users in WP3. The purpose of this output is to be able to show that there are possible routes for truly scalable and aesthetically pleasing material integrated modules. The content will be a demo case of a successfully scalable concept for integration of modules from GoA 2.2 using various material and electronic concepts. The output will be shared with project partners, associated partners and target groups.		
O 2.4	Stable integrated LowLight PV pilot under simulated operation conditions	In O2.4, realisation of a LowLight PV module with <10% performance drop after 1000h light irradiation, and 24h thermal treatment at 80 degrees Celcius will be targeted. The modules produced in GoA 2.3 will be subjected to ligth and heat according to commonly agreed protocols to accelerate aging to be able to assess the aging of the modules. The performance before and after treatment will be measured according to set standards and the resulting change in performance will be used for further improvement of encapsulation etc to improve the stability. The purpose of O2.4 is to be transparatent about the performance of the LowLight PV modules, especially important when integrated into pilot systems. This transparency will eventually lead to increased market penetration of the product. The stability data can be made available through scientific papers, white papers, press releases, conference presentations, application notes, data sheets etc.		

O 3.1	Installed LowLight PV pilot protoypes and corresponding energy yield assessment	Full output title: Installation of 10 LowLight PV pilot prototypes at pre-defined installation sites that addresses the target groups. Energy yield assessment of LowLight PV pilot prototypes. Each pilot-prototype is a small application, equipped with low light photovoltaic-solar cells which are powering the low-current devices like IoT systems, wireless sensors etc, usually powered with alcalaine batteries or accumulators. For comparision, in the pilot site are presented both traditional battery povered device and a new low light photovoltaic solar cell powered one. Both devices real energy consumtion is measured and recorded. The device's working quality is monitored. The replacement of batteries for IoT devices is a huge societal challenge. The IoT devices are needed for e.g. efficiency energy management and indoor climate in buildings, and the forecasted market growth on that segment is huge (see figure 2 in attachment). However, this challenges battery supply, and also brings along negative environmental impact for upscaled battery production. The utilization of green energy harvesting is therefore supporting the green energy transition both by implementation of renewable energy technologies, but also by facilitating efficiency energy management at large scales in the BSR region. In each pilot installation, the energy yield is assessed in real working conditions, both for the first generation and for second generation photovoltaics. This includes measuring and tracking electrical performance over time in a real working environment to complete a full assessment.The obtained data-sheets with the results will be part of the pilot documentations, in project terms part of the final output O3.1. This will be delivered before the time when the final output is ready and, thus, can be used as input in workshops already during the project. Installation will be made in places with public access. People from target groups have possibility to come to these places and have a real experience how effective the prototypes are in real everyday working situations. In last year of the project, the new generation photovoltaics will also be installed in pilot sites, so then is possible to compare also the difference of two photovoltaic generations. Thus, the final installed pilot solution will be ready starting from the last year of the project.		
D 3.2	Communication tools, reporting and workshops to showcase the LowLight PV pilot technology	Three deliverable parts are aimed at: a) Material include both printed and webbased material tailored to the target groups. Webbased material: a webpage, newsletters, activities via social media accounts - LinkedIn and Twitter will be used and others will be considered. These SoMe profiles will link to existing profiles from parter organisations, and research groups, to enhance visibility and widespread off project results and outcomes. Printed material e.g. leaflets, brochures etc. are developed for distribution at workshops organised during the project and other events. b) One report on dissemination and exploitation plan and activties in the midle of project's timeline. Local municipality partners will provide information about their existing marketing tools and distribution channels to be used to distribute information about the project. The input from this target group is necessary for developing the concept for dissemination, tailoring the approach of communication materials and their distribution. The local municipalities and technology partners will also provide input on the regional stakeholders interested in the strategic development and/ or use of low light photovoltaic solutions in their products. c) 10 workshops (in all 10 pilot installation sites) describing the results, approaches and findings obtained in pilot demonstrations and giving the public the opportunity to have hands-on experience with pilot solutions. The people usually have experience about using the devices powered by batteries. They are probably also aware about operation and maintenance costs that are incurred by providing replacement batteries and replacing them in these devices. In workshops we introduce much more environmenat friendly alternatives of using low light PV cells. All PP are actively involved in communicating low light PV solutions to regional companies and in organising regional workshops with industry to market the project findings to the regional companies.	Business plan for the LowLigh PV pilots and technology	
O 3.3	Business plan for the LowLight PV pilots and technology	The purpose of this output is the present a rudimentary business plan based in the activities within this project. The business plan will, as mentioned in GoA 3.3, including data from other parts of the project and consist of a comprehensive description of the pilot, a cost-benefit-analysis and a market analysis. The description of the pilot will describe the device as such including dimensions etc, and the setting, circumstances, and conditions during the pilots. The measured low light photovoltaic energy production compared to illumination data collected during pilots' work (that means about one year of continuous data from each pilot), durability and stress-test information from the same period, will be compared with the cost of the LowLight PV installations. The market and market reception will be presented as well. Important part of this output is also to provide a life-cycle analysis showing the environmental impact of the LowLight PV pilot. The pilot will, as mentioned above include real data from the production and installation part of the life cycle as well over one year of continuous operations. As the lifetime of the pilot will be longer than the length of the project only estimates of end-of life data will be included. The life-cycle analysis could serve as a basis for a deeper discussion of material and process choices in future projects and as well as a communication tool on the vital importance of the life cycle aspect of emerging technologies.		

Work package 1

5.1 Preparing solutions

5.2 Aim of the work package

The aim of this work package is to prepare solutions to help address the identified challenge. You can either develop entirely new solutions or adapt existing solutions to the needs of your target groups. Prepare your solutions in a way that you can pilot them in Work Package 2. Consider how you involve your target groups in preparation of the solutions.
Organise your activities in up to five groups of activities to present the actions you plan to implement. Describe the deliverables and outputs as well as present the timeline.

5.3 Work package leader

Work package leader 1 PP 1 - University of Southern Denmark

Work package leader 2 PP 9 - The Silesian University of Technology

5.4 Work package budget

Work package budget 35%

5.5 Target groups

	Target group	How do you plan to reach out to and engage the target group?
1	Local public authority Field of responsibility: Installation sites for LowLight photovoltaics; Field of responsibility: Network on LowLight photovoltaics; Field of responsibility: Behaviour change and social acceptance; Initially in particular Tartu, Sønderborg, Kaunas but expanded to all BSR region during the project 300 / 500 characters	The academic partners will host various outreach activities targeting local public authorities, taking advantage of already existing frameworks established. For all the public events generated at partners, feedback on ideas for new utilization areas for LowLight PV solar modules will be collected. Additional visits from local public authority will be arranged to show the technology to local public decision makers. This will be communicated via email using existing channels for such visits at academic partners. Again inputs on possible new use cases of LowLight PV will feed into WP1. 591 / 1,000 characters
2	Education/training centre and school Field of responsibility: Education in renewables, photovoltaics and electronics; Field of responsibility: Behaviour change and social acceptance; Whole BSR region 165 / 500 characters	The academic partners will host various outreach activities targeting schools, taking advantage of already existing frameworks established. This is for example 'Forskningens Døgn' at SDU, where schools and the broader public (target group 1) are invited to presentations about the LowLight PV project. Here they can also visit labs physically, and see how the LowLight PV solar modules are being developed. This will be communicated via newsletters, social media and the project website. For all the school events generated at partners, engagement of students will lead to education in LowLight photovoltaics supporting acceptance, as well as new ideas at schools for LowLight PV installations (physically at the schools). Here the past Interreg project 2Imprezs, with SDU as partner, will provide synergies as new ways of engaging schools in new organic photovoltaics was developed, via new tools and by engaging school children in the process. This may lead to new LowLight PV solutions. 992 / 1,000 characters
3	Higher education and research institution Field of responsibility: Education and research in low-light photovoltaics and IoT electronics; Field of responsibility: Installation sites for LowLight photovoltaics; Denmark, Estonia, Lithuania, Latvia and Poland – new countries may be involved in new activities and projects arising from the LowLight PV project. 318 / 500 characters	Bachelor and Master thesis projects on LowLight PV technology will be arranged at the academic project partners. This includes investigating new materials and device architectures for the LowLight PV solar cells, which is in addition to the research and development already included in the project. New findings could input to the project and support the development of future LowLight PV pilots. 397 / 1,000 characters
4	Large enterprise Economic sector: Energy efficiency and management; Economic sector: photovoltaics; Whole BSR region targeted in the project. 127 / 500 characters	Epishine, as an industrial partner, will be leading the production of two generations of LowLight PV pilots, and additional small and medium sized companies, as potential end-users, will be included in the preparation of LowLight PV solution. 243 / 1,000 characters

	Target group	How do you plan to reach out to and engage the target group?
5	Small and medium enterprise Economic sector: electronics and IoT devices; Economic sector: photovoltaics; Economic sector: Roll-to-Roll (R2R) print technology; Initially Sweden, and expanded to all BSR countries during the project via the workshops 225 / 500 characters	Small and medium sized companies, as potential end-users, will be included in the preparation of LowLight PV solution. This is companies using the LowLight PV technology to power up Internet-of-the-Things (IoT) products, e.g. for efficient energy management in smart housing. This will be done via the existing, and in LowLight PV project extended network (associated partners), where information about technology workshops with network partners will be communicated (newsletters, social media, emails). In the technology workshops, potential end-users can input on novel applications using the unique low light photovoltaics modules, and this will then feed in to especially the development of the second generation LLPV pilots. This can e.g. be requests on specific light spectral range, mechanical flexibility, lifetime, etc., which needs to be considered in WP1 during the preparing of LowLight PV solutions. 912 / 1,000 characters

5.6 Activities, deliverables, outputs and timeline

No.	Name
1.1	**Strategic and cooperative project management**
1.2	**Low-light photovoltaics materials**
1.3	**Low-light Photovoltaics cell and module architecture**
1.4	**Definition of installation sites in relation to the target groups**

WP 1 Group of activities 1.1

5.6.1 Group of activities leader

Group of activities leader PP 1 - University of Southern Denmark

A 1.1

5.6.2 Title of the group of activities

Strategic and cooperative project management

45 / 100 characters

5.6.3 Description of the group of activities

This GoA entails the strategic and cooperative project management for the different GoAs included in WP1-3. For a full overview of the LowLight PV WPs and GoAs with related partners, management and target groups, see figure 1 in the attachment.

A sharepoint will be established (month 1) to handle internal project communication, which also collects the different partner presentations during the project, along with reporting on project progress. This includes partner presentations at the six months project meetings, as well as bi-monthly work package meetings (each WP leader coordinate the presentations). The presentations act as reports on the progress in each WP and will be the base for any potential risk mitigation activities. The sharepoint will be a central element in the further scientific and technical outputs in the different work packages. All project partners will get access to the sharepoint. The sharepoint will also contains information about the project, i.e. Gannt Chart, deliverables, and outputs.

In addition to the larger project meetings every six months (overall project management), bi-monthly work package meetings will be planned for and coordinated in this GoA. For the work package meetings, each work package leader coordinates presentation about project results, including progress on deliverables and outputs. In case of any delays or deviation from planned activities, risk mitigation strategies will be discussed and activated if needed (responsibility of work package leader).

Three technology workshops in total will be coordinated in this activity (O1.1). These technology workshops include the target groups and are made to facilitate inputs from the target groups on the LowLightPV pilot development. This is in particular industrial end-users, who can utilize the LowLight PV technology for e.g. powering up sensors and Internet-of-Things (IoT) devices used for efficient energy management in smart housing which is a hugely growing market area (see figure 2 in the the attachment). The workshops will be communicated broadly to include partners from the extended, transnational LowLight PV network.

Technical and scientific Risk management will be coordinated from this GoA and be based on the progress reports made at the bi-monthly work package meetings. Clearly pre-defined risks for each GoA will be considered along with the overall progress made in each work package, and possible activation of risk mitigation strategies will be discussed with work package leaders at the bi-monthly meetings. For the bi-monthly meetings, a representative from each partner should be present.

2,638 / 3,000 characters

5.6.5 This group of activities leads to the development of an output ✔

O 1.1

Title of the output

Technology workshops

20 / 100 characters

Description of the output

The output will be 3 physical technology workshops where target group members (public and private) will join to receive information about the LowLight PV technology. This will be done via presentations and demonstrations on use-case scenarios, and possibilities in terms of applications.

The technology workshops will be a central element in receiving inputs from the extended and transnational BSR network on the LowLight PV utilization and deployment. It will be used to promote the technology in the full BSR region, but also collect inputs to WP1 on the preparation of LowLight PV solutions, e.g. requests on new functional requirements for the LowLight PV pilots. All project partners will participate in the workshops and take part in presenting the technology to the target groups.

Participation from schools, at different levels, and the broader public, will support broad knowledge and acceptance of the technology, and it will also be used to establish educational activities and student projects around the different aspects of LowLight PV. This is important as a future mass market penetration would require employees educated in such new PV technology. It is also important to establish projects on specific subparts of the technology, which can produce further inputs to WP1 on new solutions for next generation LowLight PV.

1,342 / 3,000 characters

Target groups and uptake of the solution presented in this output

Target groups	How will this target group apply the output in its daily work?
Target group 1 Small and medium enterprise Economic sector: electronics and IoT devices; Economic sector: photovoltaics; Economic sector: Roll-to-Roll (R2R) print technology; Initially Sweden, and expanded to all BSR countries during the project via the workshops	Installation of LowLight PV technology to replace batteries in different products depending on the company profile. This can e.g. be by connecting the LowLight PV pilots to power up IoT devices in low light conditions. This is a market with a forecasted huge revenue, and it is an application well suited for the BSR region, where both production and deployment of green low light photovoltaics is attractive. The workshops will support this adaption of LowLight PV technology for companies in the BSR region. 509 / 1,000 characters
Target group 2 Large enterprise Economic sector: Energy efficiency and management; Economic sector: photovoltaics; Whole BSR region targeted in the project.	see "small and medium enterprise" 33 / 1,000 characters
Target group 3 Education/training centre and school Field of responsibility: Education in renewables, photovoltaics and electronics; Field of responsibility: Behaviour change and social acceptance; Whole BSR region	Gain information about new LowLight PV technology either for educational purposes (schools), or to support a broader acceptance (local public) of new renewable energy technologies in the BSR region. This will also support local masterplans on the green energy technologies, which is already established in several BSR cities. 325 / 1,000 characters

Target groups	How will this target group apply the output in its daily work?
Target group 4 Local public authority Field of responsibility: Installation sites for LowLight photovoltaics; Field of responsibility: Network on LowLight photovoltaics; Field of responsibility: Behaviour change and social acceptance; Initially in particular Tartu, Sønderborg, Kaunas but expanded to all BSR region during the project	see "education/training centre and school" 42 / 1,000 characters
Target group 5 Higher education and research institution Field of responsibility: Education and research in low-light photovoltaics and IoT electronics; Field of responsibility: Installation sites for LowLight photovoltaics; Denmark, Estonia, Lithuania, Latvia and Poland – [illegible] involved in new activities and projects arising from the LowLight PV project	Bachelor and Master projects and courses based on the LowLight PV technology. Important for educating potential future employees in the technology, and for support studying new aspects of the technology in student projects. 223 / 1,000 characters

Durability of the output

Workshops of similar kind are already being organised by some of the academic partners. The inclusion of the LowLight PV technology on the workshops will strengthen the strategic directions for both the academic and industrial partner organisations, as this is in-line with already defined strategies on green energy transition. As such, workshops with the technology focus on new renewable energies, as it is the case for LowLight PV, can be maintained at little extra financial support. This will therefore be maintained by the project partners directly, and likely also lead to new R&D and/or industrial innovation activities within similar topics.

651 / 1,000 characters

5.6.6 Timeline

Period:	1	2	3	4	5	6
WP.1: Preparing solutions						
A.1.1: Strategic and cooperative project management						
O.1.1: Technology workshops						

5.6.7 This deliverable/output contains productive or infrastructure investment

WP 1 Group of activities 1.2

5.6.1 Group of activities leader

Group of activities leader PP 9 - The Silesian University of Technology

A 1.2

5.6.2 Title of the group of activities

Low-light photovoltaics materials

34 / 100 characters

5.6.3 Description of the group of activities

New molecules intended for LowLight PV cells and modules will be synthesised in this WP. This includes in particular new types of electron acceptor molecules considering both fullerene and non-fullerene types. Additionally, the donor-acceptor molecules on the basis of diphenylethenyl substituted arylamines with fluorenone, anthraquinone, or truxenone scaffolds will be designed and synthesised providing a simple and green-chemistry inspired protocols in order to reduce costs and adverse environmental impact. Furthermore, the self-assembled monolayer of active molecules having high mobility and tuneable HOMO-LUMO orbitals, enhanced morphological and UV stability will be synthesized and tested to improve the efficiency and durability of the final device. Design considerations will be spectral match in terms of light absorption to the intended LowLight PV pilot use-cases, and also processing and operational stability considering the fully scalable industrial processing and final installation applications. The new molecules will lead to higher power conversion efficiencies than currently possible for low light photovoltaics, and thus support the development of the beyond state-of-the-art performance levels for the second generation Low Light PV pilots. For the new molecules, inputs from target groups on installation sites and possible new applications is crucial, as it defines the parameters considered in the design phase. This information will be provided via the technology workshops, as described in GoA 1.1.

In addition to the molecules synthesised in this work package, materials for electrodes, interlayers and encapsulation will be screened in this WP. This is mainly already commercially available materials, where material supply chains are already established by both academic and industrial partners in the project. Screening will be done via thin film characterization techniques, e.g., optical spectroscopy, but also via integration in small scale test cells (GoA 1.3). Metal oxide-based interlayers will be developed in the project using Roll-to-Roll (R2R) vacuum sputtering, which facilitates high throughput processing and low costs. This will be compared to solution processed interlayers, also done using scalable coating. Also here, the inputs on new pilot installations and applications from the target groups will be important to guide the developments (e.g., on transparency region for the interlayers). Stabilizing additives will also be selected, considering that industrial processing in air is required, and taking into account the inputs on the lifetime of the LowLight PV pilots and applications, as defined via the workshops in GoA 1.1.

The activities in this GoA will include contribution from PP working directly with the materials synthesis (SDU, SUT, KTU), but also PP working on scale-up and industrial production (VTT, EPI), as well as partner working on LowLight PV installations (UL, UT, KTU), as this directly affect the materials choices.

2,999 / 3,000 characters

5.6.5 This group of activities leads to the development of an output ✔

O 1.2

Title of the output

Novel LowLight PV organic molecules

35 / 100 characters

Description of the output

To support the material development, a report on the materials system will be made to support the development of the beyond state-of-the-art LowLight PV, as it will define the materials needed to reach the targeted levels. It will consider the requirements on fully scalable and industrial production, set by the company partner Epishine, as well as the inputs from the target groups on the use cases and applications, which defines e.g., spectral range and product lifetime. It will also consider any mechanical flexibility requirements, which is possible to tune via the choice of materials.

In the report there will be details on all materials systems needed to develop the second-generation LowLight PV pilots, including electron donor and acceptor molecules, electrode materials, transparent conductive oxides, transport interlayer materials and barrier/encapsulation materials. It will also include inputs on standard characterization results of these, for example by optical spectroscopy and cyclic voltammetry. The report will also include details on processing of the materials, in an industrial setting.

The report will be made with inputs from all project partners included in the GoA (as described above), and thus have transnational aspects embedded. The responsible for developing the report will be Silesian University of Technology, who will coordinate the work. The report will be available to all project partners and be a strong support for the sustainability aspects of the project, as it defines the materials systems needed to go beyond state-of-the-art for low light photovoltaics in the BSR region, which could lead to new synergies and industrial collaborations well beyond the project duration.

New organic molecules utilized as light absorbers in the active layer in organic solar will be synthesized, and will be the main output in this GoA. These will contribute to the energy conversion process to generate free charge carriers and thus electricity from the photovoltaic cells. The molecules will be synthesized specifically for LowLight PV, which requires a tuned absorption spectrum as compared to conventional organic photovoltaics. The molecules will also be made with considerations of industrial processing compatibility as well as final product lifetime.

The molecules will be synthesized with the purpose of increase the power conversion efficiency beyond state-of-the-art for low light photovoltaics, reaching in the LowLight PV project values up to 17% (GoA 1.3). The molecules will thus set the standard for the next generation low light photovoltaics, which can benefit the whole BSR region. Patents and scientific publications will be targeted for this scientific and technical output, and the results will be communicated to all associated project partners at the larger project meetings.

2,838 / 3,000 characters

Target groups and uptake of the solution presented in this output

Target groups	How will this target group apply the output in its daily work?
Target group 1 Small and medium enterprise Economic sector: electronics and IoT devices; Economic sector: photovoltaics; Economic sector: Roll-to-Roll (R2R) print technology; Initially Sweden, and expanded to all BSR countries during the project via the workshops	Companies involved in the LowLight PV production will directly use the materials to improve products. Potential other companies in the PV field could also use these in their future work. This includes also BSR companies developing production tools for organic photovoltaics, which indirectly will benefit from an increase market share for low light photovoltaics, arising as a result of the beyond state-of-the-art performance coming from these materials. 455 / 1,000 characters
Target group 2 Large enterprise Economic sector: Energy efficiency and management; Economic sector: photovoltaics; Whole BSR region targeted in the project.	See "small and medium enterprise" 33 / 1,000 characters
Target group 3 Education/training centre and school Field of responsibility: Education in renewables, photovoltaics and electronics; Field of responsibility: Behaviour change and social acceptance; Whole BSR region	See "higher education and research institution" 47 / 1,000 characters
Target group 4 Higher education and research institution Field of responsibility: Education and research in low-light photovoltaics and IoT electronics; Field of responsibility: Installation sites for LowLight photovoltaics; Denmark, Estonia, Lithuania, Latvia and Poland – new countries may be involved in new activities and projects arising from the LowLight PV project.	The academic partners will use the outputs on new materials for beyond-state-of-the-art low light photovoltaics in academic course materials as well as in new bachelor and master projects. This includes optimized synthetic routes for these materials, and ways to process photovoltaic devices from them. 302 / 1,000 characters

Durability of the output

The activities in this GoA will include contribution from partners working directly with the materials synthesis (SDU, SUT and KTU), but also partners working on scale and industrial production (VTT and EPI), as well as partner working on LowLight PV installations (UL, UT and KTU), as this directly affect the materials choices. Finally, partners working mainly on project dissemination and exploitation activities (PZ, KBP, TM) will use the output on new materials in these activities. The synthesis activities are part of strategic directions for the synthesis partners, and as such it is expected that this activity will continue beyond the project duration. The outputs are also expected to lead to additional funding possibilities, also in direct industrial activities.

776 / 1,000 characters

5.6.6 Timeline

Period:	1	2	3	4	5	6
WP.1: Preparing solutions						
A.1.2: Low-light photovoltaics materials						
O.1.2: Novel LowLight PV organic molecules						

5.6.7 This deliverable/output contains productive or infrastructure investment ☑

	Investment no.	I1.2_1	

Title	Glovebox for stability studies (30 / 100 characters)
Description	Inert glovebox utilised for conducting intrinsic stability studies for the new materials developed in LowLightPV (112 / 500 characters)
Country	Poland
Responsible project partner(s)	PP 9 - The Silesian University of Technology
Justification	Needed in order to separate out possible extrinsic degradation mechanisms from intrinsic ones, and is thus vital in the development of the industrial relevant materials to be utilized for the beyond state-of-the-art LowLight PV pilots (234 / 500 characters)
Transitional relevance	Tested on materials level at PP9, but the outcome, namely the new materials, are utilized for development of LowLight PV cells and modules at partners, and for industrial production at PP3, which at the end will reach the pilots installed at multiple partner sites across BSR. (276 / 500 characters)
Benefits	All target groups defined in this project will benefit, as this infrastructure is essential for ensuring the beyond state-of-the-art performance for the new LowLight PV pilots developed in the project. (201 / 500 characters)
Location	At the PP9 partner at Silesian University of Technology (55 / 250 characters); Gliwicki
Location ownership	Prof. Pavel Troshin, Silesian University of Technology (54 / 250 characters)
Ownership	PP9 at the Silesian University of Technology (44 / 500 characters)
Maintenance	PP9 at the Silesian University of Technology, standard glovebox maintenance will be performed including regeneration and cleaning when needed. (142 / 500 characters)
Climate proofing	☑ Ensured ☐ N/A

WP 1 Group of activities 1.3

5.6.1 Group of activities leader

Group of activities leader PP 1 - University of Southern Denmark

A 1.3

5.6.2 Title of the group of activities

Low-light Photovoltaics cell and module architecture

53 / 100 characters

5.6.3 Description of the group of activities

In this GoA the cell and module architecture to be used for pilot production in WP2 will be defined. Standard and inverted cell architecture will be considered, on the basis of the GoA 1.2 defined materials. Devices will be tested on cell level, where data on electrical performance will be collected. Several characterization techniques will be performed to support the optimization on cell level, which includes transient and steady-state optical spectroscopy as well as electrical characterization, e.g. transient photovoltage and photocurrent. All LowLightPV cell developments will comply with scalable coatings to comply with the pilot production requirements in WP2 (GoA 2.1 and GoA 2.2).

Module layout will be defined in this GoA (O1.3) and be made to comply with the industrial production of the LowLight PV pilots in WP2. Here existing module layout from Epishine will be considered. This work is strengthened by the experience on OPV module development from scalable coating technologies already present by three project partners (VTT, EPI and SDU). This work therefore also directly defines the manufacturing strategy employed to transfer the chosen materials and OPV devices to the final pilot production in work package 2. The fabrication compatibility to an existing manufacturing line from the industrial partner Epishine will be considered when defining the final module layout, and solutions planned accordingly with the academic partners.

Stability of OPV cells will be tested by using multiple ISOS protocols, where ISOS-T, ISOS-L and ISOS-O protocols will be used to test influence from heat, light and oxygen, respectively. Model predictions from these stability tests on pilot product lifetime will be made. Also, feedback to the material GoA 1.2 will be made, in case certain materials and thin films are not compatible with the stability requirements. The stability tests will be supported by e.g. optical spectroscopy characterization (e.g. absorption, photoluminescence and FTIR) to localize any unwanted degradation mechanisms (photooxidative degradation, photocatalytic degradation at interfaces, etc). This will directly feed into WP2 where the industrial modules and thus LowLight PV pilots are realized and tested, i.e. the initial screening of materials and device architectures are performed in GoA 1.2 and GoA1.3 before transferring to industrial scale development and production in WP2.

Outputs from the cell level on LowLight PV performance will be communicated broadly to the network (associated partners) and target groups via the technology workshops. This serves the purpose of updating the target groups about the progress made on low light photovoltaics in the BSR region, and what the improved performance levels can be used for in terms of possible applications. At the workshops, the inputs from the targets group on estimated required performance, stability and pilot design will feed back into the cell and modules development made in this GoA.

2,997 / 3,000 characters

5.6.5 This group of activities leads to the development of an output ✔

O 1.3

Title of the output

LowLight PV module layout for industrial processing

52 / 100 characters

Description of the output

The module layout is important for the final LowLight PV pilot, as it defines the technical as well as visual design of the pilot, which both are important for actual pilot production in WP2, and also for the visible appearance of the LowLight PV pilot, which is relevant for the end-users. Therefore, the above inputs from the target groups (transnational) via the technology workshop is important for reaching this output. The module layout will be defined on the basis of beyond state-of-the-art efficiency for scalable low light photovoltaics, obtained in this GoA. To reach this, updated materials and device architectures will be defined and optimized in the OPV device stack, which is also based on significant background knowledge, competence and experience from the LowLight PV partners working on OPV development in GoA 1.2 and GoA 1.3. The power conversion efficiency will be measured under 1 sun AM1.5G as well as simulated indoor light spectrum of 500 lux, and reported along with the full OPV cell structure. The results will be utilized for the final module layout, which will be based on the cell architecture made to reach this efficiency. The result will be communicated to all project partners, associated partners and LowLight PV network and target groups (transnational), and will open up for new applications of LowLight PV due to the increased power output. A report will detail physical subcell layout, size and dimensions of subcell, cell architecture and also laser scribing areas and interconnects, which is important for the electrical output of the LowLight PV pilots. Compatibility with industrial scale-up will be considered with inputs from Epishine. The report will be made between LowLight PV project partners working on PV materials, cell development, module architectures, industrial production and end-use to take into consideration all aspects that can influence module layout design.

1,923 / 3,000 characters

Target groups and uptake of the solution presented in this output

Target groups	How will this target group apply the output in its daily work?
Target group 1 Small and medium enterprise Economic sector: electronics and IoT devices; Economic sector: photovoltaics; Economic sector: Roll-to-Roll (R2R) print technology; Initially Sweden, and expanded to all BSR countries during the project via the workshops	They will interact with LowLight PV partners on developing a design that fits to their end use scenarious. As the technology allows for flexibility in PV module design (shape, size, color) it opens up for unique possibilities for companies as end-users. 253 / 1,000 characters
Target group 2 Large enterprise Economic sector: Energy efficiency and management; Economic sector: photovoltaics; Whole BSR region targeted in the project.	see above 9 / 1,000 characters

Durability of the output

Project partners have over the past years attracted significant funding on OPV development (e.g. SDU, VTT, EPI, KTU, SUT), which includes work on cell and module architectures. In this project, this is utilized to develop beyond state-of-the-art low light photovoltaic pilot installations to the BSR region, to make widespread use of this promising technology in the whole BSR region. LowLight PV project partners have worked on similar conventional photovoltaics installations, and also generated large networks on green energy (UL, TM, KBP, PZ, UT), which can support this widespread of the LowLight PV technology. It can be expected that the success of this project, along with the defined strategic directions of the project partners, will therefore lead to a sustainability of the project within this topic.

813 / 1,000 characters

5.6.6 Timeline

Period:	1	2	3	4	5	6
WP.1: Preparing solutions						
A.1.3: Low-light Photovoltaics cell and module architecture						
O.1.3: LowLight PV module layout for industrial processing						

5.6.7 This deliverable/output contains productive or infrastructure investment ☐

WP 1 Group of activities 1.4

5.6.1 Group of activities leader

Group of activities leader PP 5 - Kaunas University of Technology

A 1.4

5.6.2 Title of the group of activities

Definition of installation sites in relation to the target groups

66 / 100 characters

5.6.3 Description of the group of activities

In this GoA, a minimum of 10 installation sites to be utilised for LowLight PV pilot installations will be defined and prepared for the pilots developed in WP2. Pilot installations will be made two times during the project (minimum of 10 LowLight PV pilots each time), to facilitate and show two generations of the LowLight PV technology reaching power conversion efficiencies of 13% (current industrial state-of-the-art) and 17% (beyond state-of-the-art, output D1.3), respectively.

The GoA will take into account the prepared solutions of WP1, in particular the electrical outputs and design of the LowLight PV modules, to connect the technical solutions (finally the LowLight pilots produced in WP2) to the installation sites. Communication with all transnational sites for Low Light PV installations will be conducted, and possible adaptation plans for the use-case at the specific installation site will be put forward at the work package 1 meetings. This allows that end-users and target groups feed back to the preparation of solutions, and thus ensures that the final produced LowLight PV pilots will be adaptable by the end-users in the project.

The GoA will lead to a report deliverable that defines the installation sites with corresponding installation scheme (D1.4). This will also be used as a guide for the actual installations to ensure full compatibility between the in WP2 produced LowLight PV pilots, and the in WP3 made LowLight PV installations.

Potential risks are lack of clear definition at early stage on the installation of the LowLight PV pilots at the specific installation site. Here existing knowledge on low light photovoltaic installations from Epishine will minimize such risks, as the company already have available examples of product installations for the current low light photovoltaic modules they produce (first generation). Furthermore, a kit for electrical integration is also available to partners from month 1 of the project, which can support with the definition of the final LowLight PV installations. Representatives form each installation site will be invited to the work package meetings to discuss further details needed to clarify and detail the final LowLight PV pilot installations.

2,240 / 3,000 characters

D 1.4

Title of the deliverable

Report on LowLight PV pilot installation sites, including detailed installation scheme

87 / 100 characters

Description of the deliverable

The report will detail the installation sites including details on the electrical installation of the LowLight PV pilots. This will be done with inputs from all installation sites, which considers the use-cases and applications targeting the different target groups. Technical details on the LowLight PV modules, needed to make the electrical integration of the LowLight PV pilots, will be provided from the GoA 1.3 in works package 1. The purpose of the report is to ensure compatibility between the LowLight PV pilot solutions and the intended installations, and it can thus be used as a guide for the actual installations. It will also be made available to associated partners and target groups, whom can then see and learn about how to make and benefit from LowLight PV pilot installations in the BSR region.

812 / 2,000 characters

Which output does this deliverable contribute to?

Installed LowLight PV pilot protoypes and corresponding energy yield assessment (O3.1) - see WP3

96 / 100 characters

5.6.5 This group of activities leads to the development of an output ☐

5.6.6 Timeline

Period:	1	2	3	4	5	6
WP.1: Preparing solutions						
A.1.4: Definition of installation sites in relation to the target groups						
D.1.4: Report on LowLight PV pilot installation sites, including detailed installation scheme						

5.6.7 This deliverable/output contains productive or infrastructure investment ☐

Work package 2

5.1 Piloting and evaluating solutions

5.2 Aim of the work package

The aim of this work package is to pilot, evaluate and adjust solutions. Plan one or several pilots to validate the usefulness of the solutions prepared in Work Package 1. Start Work Package 2 early enough to have time to pilot, evaluate and adjust solutions, together with your target groups. By the end of this work package implementation the solutions should be ready to be transferred to your target groups in Work Package 3.
The piloted and adjusted solution should be presented in one project output.
Organise your activities in up to five groups of activities. Describe the deliverables and outputs as well as present the timeline.

5.3 Work package leader

Work package leader 1 PP 3 - Epishine AB

Work package leader 2 PP 4 - VTT Technical Research Centre of Finland Ltd.

5.4 Work package budget

Work package budget 25%

5.4.1 Number of pilots

Number of pilots 20

5.5 Target groups

	Target group	How do you plan to reach out to and engage the target group?
1	Local public authority Field of responsibility: Installation sites for LowLight photovoltaics; Field of responsibility: Network on LowLight photovoltaics; Field of responsibility: Behaviour change and social acceptance; Initially in particular Tartu, Sønderborg, Kaunas but expanded to all BSR region during the project 300 / 500 characters	Local public authority will act as a multiplier for the produced LowLight PV pilots, and via network events and installation sites support the exploitation process. They are also potential end-users on public buildings, and as end-users they will feed into the further developments made in WP2, which is also based on the end-user feedback. 341 / 1,000 characters
2	Education/training centre and school Field of responsibility: Education in renewables, photovoltaics and electronics; Field of responsibility: Behaviour change and social acceptance; Whole BSR region 165 / 500 characters	n/a 3 / 1,000 characters
3	Higher education and research institution Field of responsibility: Education and research in low-light photovoltaics and IoT electronics; Field of responsibility: Installation sites for LowLight photovoltaics; Denmark, Estonia, Lithuania, Latvia and Poland – new countries may be involved in new activities and projects arising from the LowLight PV project. 318 / 500 characters	The academic partners in the project will be engaged in various workshops. 74 / 1,000 characters

	Target group	How do you plan to reach out to and engage the target group?
4	Large enterprise Economic sector: Energy efficiency and management; Economic sector: photovoltaics; Whole BSR region targeted in the project. 127 / 500 characters	In LowLight PV, one novel Low-light Photovoltaics Pilot type that surpass state-of-art in power conversion efficiency will be developed. The pilot will be developed between all LowLight PV project partners and includes all steps in the the development process from new materials and devices, to industrial scale manufacturing, installation and testing. The pilot type will be realised in 20 different pilot prototype versions, which will be installed at 10 different installation sites at partners and stakeholders around the BSR region. The installed pilots will be utilised to showcase the technology for further exploitation routes beyond the LowLight PV project. Enterprises will be made aware of the project, and the results through whitepapers, linkedin, website, press releases etc. Results will also be included into sales and marketing material. Input from end-users, also large enterprises, will feed into the further developments in WP2, i.e. based on the end-user feedback . 987 / 1,000 characters
5	Small and medium enterprise Economic sector: electronics and IoT devices; Economic sector: photovoltaics; Economic sector: Roll-to-Roll (R2R) print technology; Initially Sweden, and expanded to all BSR countries during the project via the workshops 225 / 500 characters	In LowLight PV, one novel Low-light Photovoltaics pilot type that surpass state-of-art in power conversion efficiency will be developed. The pilot will be developed between all LowLight PV project partners and includes all steps in the the development process from new materials and devices, to industrial scale manufacturing, installation and testing. The pilot type will be realised in 20 different pilot prototype versions, which will be installed at 10 different installation sites at partners and stakeholders around the BSR region. The installed pilots will be utilised to showcase the technology for further exploitation routes beyond the LowLight PV project. Enterprises will be made aware of the project, and the results through whitepapers, linkedin, website, press releases etc. Results will also be included into sales and marketing material. Input from end-users, also SMEs, will feed into the further developments in WP2, i.e. based on the end-user feedback . 973 / 1,000 characters

5.6 Activities, deliverables, outputs and timeline

No.	Name
2.1	**Low-light photovoltaics module development**
2.2	**Industrial manufacturing of LowLight PV modules**
2.3	**Electronic integration of LowLight PV modules**
2.4	**Lifetime and stability testing of LowLight PV modules and pilot prototypes**

WP 2 Group of activities 2.1

5.6.1 Group of activities leader

Group of activities leader PP 3 - Epishine AB

A 2.1

5.6.2 Title of the group of activities

Low-light photovoltaics module development

43 / 100 characters

5.6.3 Description of the group of activities

In this GoA the outcomes in WP1 (see GoA 1.2, 1.3) will be successfully transferred to industry production at Epishine. Larger scale production puts some restrictions on processing conditions (such as solvents and deposition techniques) as well as increase complexity going from single-cell to serial connected modules which require a certain amount of work. Several LowLight PV partners, also industrial at Epishine, has gained extensive know-how on the introduction of new material from previous projects. This includes a lot of industrial-compatible and scalable development of various organic photovoltaic cells and module architectures, also for low light conditions and applications, see for example https://doi.org/10.1038/s41560-019-0448-5; https://doi.org/10.1002/cssc.202101611; https://doi.org/10.1002/cssc.202101336; https://doi.org/10.1088/2058-8585/ab6e73 along with research group and company websites.
Here, through careful planning, and based on the outcomes in WP1, Epishine will be able to adjust the material and processing conditions necessary for industrial production. As it is not possible to foresee all effects the work will be based on experimental work at the laboratory scale at several partners, where new material combination will be iterated. In each iteration, the process condition will be changed and the resulting performance will be studied using standard evaluation such as I-V-measurement at various light intensities, thickness measurements, absorbance measurements etc. The next iteration will be based on the result the previous one until acceptable performance has been reached. All LowLight PV pilot development partners will, on a regular basis be updated, on the progress on industrial module development and will thus increase their understanding of the up-scaling requirement, which will be beneficial for their future work. The outcome of GoA 2.1 will be a concept ready for pilot scale production (GoA 2.2).

1,959 / 3,000 characters

D 2.1

Title of the deliverable

Realisation of LowLight PV cell with power conversation efficiency >20% under low-light conditions

99 / 100 characters

Description of the deliverable

The purpose of this delivery is to enable the further scale up and process development in GoA 2.2. The module performance is pending the performance of the individual cell and the most economic way of improving module performance is to start at the cell-level. The realization of this delivery will depend on the result where it might, depending on the results in WP1, be more interesting to iterate a number of material combination than just the final pick. This result on cell level will thus be achieved using industrial-compatible techniques (important for GoA 2.2) and based on the developments made in WP1 where screening of various cell architectures and materials will be made. The deliverable will be communicated to partners, associated partners and target groups as well, to continuously support the preparation of new LowLight PV pilots facilitated by this progress.

880 / 2,000 characters

Which output does this deliverable contribute to?

Ten LowLight PV modules with power conversion efficiencies of 13% and 17%, respectively, delivered

98 / 100 characters

5.6.5 This group of activities leads to the development of an output ☐

5.6.6 Timeline

Period:	1	2	3	4	5	6
WP.2: Piloting and evaluating solutions						
A.2.1: Low-light photovoltaics module development						
D.2.1: Realisation of LowLight PV cell with power conversation efficiency >20% under low-light conditions						

5.6.7 This deliverable/output contains productive or infrastructure investment ☐

WP 2 Group of activities 2.2

5.6.1 Group of activities leader

Group of activities leader PP 3 - Epishine AB

A 2.2

5.6.2 Title of the group of activities

Industrial manufacturing of LowLight PV modules

48 / 100 characters

5.6.3 Description of the group of activities

In this GoA, Epishine will, with the assistance from the project partners in GoA 2.3 and WP 3, perform scale up process development of the concept realized in GoA 2.1. This type of joint development has previously been tested in Epishines H2020 project (Grant agreement No 872155) where the need of the market (verified through a number of customer project with both smaller and bigger companies) was invoked in an iterative process where modules produced for the customer project, and further development, was based on the customer feedback. Likewise, in this project the input from the end-users in WP 3, as well as the stakeholders in the integration part (GoA 2.3) will be key for a successful project. To enable a good communication, we aim to keep a number of workshop (see WP1) and study visits by the partners in the project to synchronize the expectations with the available solutions.

Value chain development with the integration of end-user need (WP3) will be a result of this synergistic approach, which will pave the wave for future collaborations where the need is in focus, rather than just technological possibilities. As Epishine is a component supplier with no ambition to create end-user product it is of vital importance to bring in the general market need and ideas in the development process. And also important to bring in external expertise, such as VTT, to bring in competence regarding the actual interface between components and the application.

For a fruitful collaboration it is important to create an understanding of the other partners in the project about the possibilities and limitations of a scaled-up process. The work will be based in Epishines standard 50x50 mm modules (see figure 3 in attachment) where the size, dimensions and number of cells per module is fixed but the contacting method etc. can be adjusted to the application. The up-scaling of new material tested in GoA 1.3 and realized in industrial compatible cells in GoA 2.1 is, however, not trivial and will require a number of iterations to work properly, meaning the performance, stability and yield should be within reasonable limits; limits which will be set during the above-mentioned workshops (tested for new materials in WP1 and for industrial modules in GoA 2.4). The process development will include full pilot scale runs in Epishines unique production process facility in Linköping, Sweden. As the cost of material used in these runs as well as machine lease and consumables is significant, the number of iterations will be reduced to a minimum by careful planning and using Epishines long expertise in process development, and the outcomes of GoA 1.3 and GoA 2.1. Once the process development has enabled a stable process modules will be delivered to GoA 2.3 for electronic integration, to GoA 2.4 for stability investigations and later GoA 3.1 for pilot installations.

2,886 / 3,000 characters

5.6.5 This group of activities leads to the development of an output ✔

O 2.2

Title of the output

Ten LowLight PV modules with power conversion efficiencies of 13% and 17%, respectively, delivered

99 / 100 characters

Description of the output

The purpose of this output is to further the development of other activities in the project by supplying modules for further integration (GoA 2.3), installation (GoA 3.1), testing and work (GoA 2.4 and GoA 3.1).
Epishine will, in at least two batches (20 modules in total, month 12 and month 24), deliver modules to GoA 2.3 for further work on electronic integration, and to WP3 to start the work on pilot installations.
The latter batch will include modules that go beyond state-of-the-art in power conversion efficiency for industrial modules (17%), and thus be very valuable to target groups as it opens up for new LowLight PV applications. The outcomes will be delivered to relevant partners (GoA 2.3, GoA 2.4 and GoA 3.1) and communicated also to associated partners and target groups.

793 / 3,000 characters

Target groups and uptake of the solution presented in this output

Target groups	How will this target group apply the output in its daily work?
Target group 1 Small and medium enterprise Economic sector: electronics and IoT devices; Economic sector: photovoltaics; Economic sector: Roll-to-Roll (R2R) print technology; Initially Sweden, and expanded to all BSR countries during the project via the workshops	By supplying the other partners in this project, VTT will be able to start the work (further described in GoA 2.3) on the electronic integration. Other small and medium sized enterprises will deliver inputs to the end-user requirements via the defined workshops. 262 / 1,000 characters
Target group 2 Higher education and research institution Field of responsibility: Education and research in low-light photovoltaics and IoT electronics; Field of responsibility: Installation sites for LowLight photovoltaics; Denmark, Estonia, Lithuania, Latvia and Poland – new countries may be involved in new activities and projects arising from the LowLight PV project.	By supplying the other end-users in the project, including the universities it will enable testing and future integration of the modules into the final applications. The hands-on testing of a realised module with the specified performance will trigger new ideas of application and further research, including the formation of new collaboration and common grant proposals. 371 / 1,000 characters

Durability of the output

The improved module performance could, depending on the cost-benefit analysis be included in Epishine's standards process thus enable improved market penetration and increased sales. The initiated collaboration could form a basis for future funding applications to national, regional and international funding agencies.

320 / 1,000 characters

5.6.6 Timeline

Period:	1	2	3	4	5	6
WP.2: Piloting and evaluating solutions						
A.2.2: Industrial manufacturing of LowLight PV modules						
O.2.2: Ten LowLight PV modules with power conversion efficiencies of 13% and 17%, respectively, delivered						

5.6.7 This deliverable/output contains productive or infrastructure investment ☐

WP 2 Group of activities 2.3

5.6.1 Group of activities leader

Group of activities leader PP 4 - VTT Technical Research Centre of Finland Ltd.

A 2.3

5.6.2 Title of the group of activities

Electronic integration of LowLight PV modules

45 / 100 characters

5.6.3 Description of the group of activities

In this GoA the project will address the complex task of integration of modules. This is of uttermost importance as the modules will be needed to be included into a system consisting of external electronics as well as mechanical integration of the modules to various materials. The thin and flexible modules have properties which opens a wide avenue of integration possibilities. Based on the material integration expertise of VTT together with the module know-how of LowLight PV partners, in particular Epishine for industrial modules, work will be done to develop material integrated modules. The work will include testing of several types of material integration concepts such as in-moulding etc. As the electronic integration from the flat flexible modules to semi-rigid printed circuit-board is of equal importance there will be work on finding suitable methods such as laser ablation etc to enable appropriate electronic contacts on the modules. This will require a close interaction with the end-users in WP3 to identify concepts which are suitable for the end users and at least one workshop will be dedicated to discussuing the alternatives. Bi-monthly (online) updates on the current state of the project will enable the active participation of all parties. Although some concepts already have been identified there is a need for several iterations where modules will be sent from Epishine to VTT for integration testing and the result will be evaluated. Once methods have been found integrated modules will be sent to the end-users in WP3 for end-user testing.

Example of material integrated electronics (https://www.plasticstoday.com/injection-molding/dupont-tactotek-collaboration-targets-growing-mold-electronics-market) is shown in figure 4 in the attachment.

1,779 / 3,000 characters

5.6.5 This group of activities leads to the development of an output ✔

O 2.3

Title of the output

Integrated LowLight PV pilot

28 / 100 characters

Description of the output

In order to present some of the ideas and concepts that came into fruiting during the project, a report on the electronic integration will be made. The report will contain sketches, preliminary specifications regarding dimensions, material as well as rudimentary cost-benefit analysis of the concepts. The report will be based on the outcomes of the workshop(s) held with the end-users in WP3.

The purpose of this output is to be able to show that there are possible routes for truly scalable and aesthetically pleasing material integrated modules. The content will be a demo case of a successfully scalable concept for integration of modules from GoA 2.2 using various material and electronic concepts. The output will be shared with project partners, associated partners and target groups.

792 / 3,000 characters

Target groups and uptake of the solution presented in this output

Target groups	How will this target group apply the output in its daily work?
Target group 1 Small and medium enterprise Economic sector: electronics and IoT devices; Economic sector: photovoltaics; Economic sector: Roll-to-Roll (R2R) print technology; Initially Sweden, and expanded to all BSR countries during the project via the workshops	Sensor manufacturers are usually small companies with limited competence on material integration. The demo case(s) will lead to a higher level of acceptance of the organic electronics as a whole and particulary organic photovoltaics. 234 / 1,000 characters
Target group 2 Higher education and research institution Field of responsibility: Education and research in low-light photovoltaics and IoT electronics; Field of responsibility: Installation sites for LowLight photovoltaics; Denmark, Estonia, Lithuania, Latvia and Poland – new countries may be involved in new activities and projects arising from the LowLight PV project.	Integrated modules could lead to increased research interest into the design aspects of organic photovoltaics, which again can support the further development and realization of integrated organic electronics and photovoltaics. 227 / 1,000 characters
Target group 3 Large enterprise Economic sector: Energy efficiency and management; Economic sector: photovoltaics; Whole BSR region targeted in the project.	Even larger enterprises within sensor technology will be able to use the information like the small and medium sized enterprises. As the aesthetics play a large role in the market acceptance the “look and feel” of the pilots are of major important. 248 / 1,000 characters

Durability of the output

The demo cases can be added to Epishines growing list of successful material integrations and can be posted on epishines social media (twitter: @epishine , linkedin : facebook homepage: www.epishine.com etc). It will also be disseminated to target groups for further exploitation, which will also support a longterm durability of the output.

343 / 1,000 characters

5.6.6 Timeline

Period:	1	2	3	4	5	6
WP.2: Piloting and evaluating solutions						
A.2.3: Electronic integration of LowLight PV modules						
O.2.3: Integrated LowLight PV pilot						

5.6.7 This deliverable/output contains productive or infrastructure investment

WP 2 Group of activities 2.4

5.6.1 Group of activities leader

Group of activities leader PP 3 - Epishine AB

A 2.4

5.6.2 Title of the group of activities

Lifetime and stability testing of LowLight PV modules and pilot prototypes

75 / 100 characters

5.6.3 Description of the group of activities

The purpose of this group of activities is to ensure the long-term performance of the LowLight PV modules as well as the pilot prototypes. All compontents have a certain life time and it is as useful to have a long-life time as to assess it as the life time will have an impact on the application; i.e., it makes more sense to invest in stability increasing procedures for long term installation (such as a fire alarm) than a less durable end-product (e.g., electronic tickets). Moisture and oxygen is generally detrimental to electronics and it is important to find ways to minimize the exposure of the material to moisture and oxygen during processing and operation. The long-term stability of organic photovoltaic is mainly related to two separate challenges; the internal stability which is related to stack architecture, the manufacturing process and the electronic material making up the stack. The external stability is mainly related to the type of encapsulation procedure where the module is placed within barrier foils. As the electronic and mechanical integration will interact with the modules the type of integration method will also be a deciding factor. Lifetime and stability testing will be performed according to ISOS protocols (https://www.sciencedirect.com/science/article/abs/pii/S0927024817301666) , and follow both ISOS-L and ISOS-T protocols for light-soaking and thermal stability. Identification of possible degradation mechanisms will also take place in this activity, to replace or optimise further any material, layer or interface causing the degradation and thus deviation from target aims. Low light J(V) and 1 Sun characterization will be performed as well as DLIT, PL, EL measurements on select modules.

1,736 / 3,000 characters

5.6.5 This group of activities leads to the development of an output ✔

O 2.4

Title of the output

Stable integrated LowLight PV pilot under simulated operation conditions

72 / 100 characters

Description of the output

In O2.4, realisation of a LowLight PV module with <10% performance drop after 1000h light irradiation, and 24h thermal treatment at 80 degrees Celcius will be targeted. The modules produced in GoA 2.3 will be subjected to ligth and heat according to commonly agreed protocols to accelerate aging to be able to assess the aging of the modules. The performance before and after treatment will be measured according to set standards and the resulting change in performance will be used for further improvement of encapsulation etc to improve the stability.

The purpose of O2.4 is to be transparatent about the performance of the LowLight PV modules, especially important when integrated into pilot systems. This transparency will eventually lead to increased market penetration of the product. The stability data can be made available through scientific papers, white papers, press releases, conference presentations, application notes, data sheets etc.

951 / 3,000 characters

Target groups and uptake of the solution presented in this output

Target groups	How will this target group apply the output in its daily work?
Target group 1 Small and medium enterprise Economic sector: electronics and IoT devices; Economic sector: photovoltaics; Economic sector: Roll-to-Roll (R2R) print technology; Initially Sweden, and expanded to all BSR countries during the project via the workshops	Sensor manufacturers are usually small companies with limited bandwidth to perform long term studies, such as aging. With proof at hand of the stability this will lead to a higher level of acceptance of the organic electronics as a whole and particulary organic photovoltaics. 277 / 1,000 characters
Target group 2 Higher education and research institution Field of responsibility: Education and research in low-light photovoltaics and IoT electronics; Field of responsibility: Installation sites for LowLight photovoltaics; Denmark, Estonia, Lithuania, Latvia and Poland – new countries may be involved in new activities and projects arising from the LowLight PV project.	The information on stability can trigger more basic research into the fundamentals of degradation patterns in organic photovoltaic. Similar work does exist (https://pubs.rsc.org/en/content/articlelanding/2022/MA/D2MA00120A) but can be more accelerated as the industry need will increase with more application being shown in these kind of projects 346 / 1,000 characters
Target group 3 Large enterprise Economic sector: Energy efficiency and management; Economic sector: photovoltaics; Whole BSR region targeted in the project.	Larger enterprises within sensor technology will be able to use the information like the small and medium sized enterprises. Some of the main supplier materials relevant to encapsulation etc are very large companies (e.g. https://www.energy.gov/sites/prod/files/2017/02/f34/rowe_oled_longbeach2017.pdf) and this information will trigger more development of new material with even better performance. 400 / 1,000 characters

Durability of the output

Epishine will make sure the gathered information is used to update application notes and data sheets of their products. When included in Epishines product the stability data will be freely available on Epishines website www.epsihine.com. The outcomes will also be disseminated to target groups for further exploitation, which will enhance the durability of the output.

369 / 1,000 characters

5.6.6 Timeline

Period:	1	2	3	4	5	6
WP.2: Piloting and evaluating solutions						
A.2.4: Lifetime and stability testing of LowLight PV modules and pilot prototypes						
O.2.4: Stable integrated LowLight PV pilot under simulated operation conditions						

5.6.7 This deliverable/output contains productive or infrastructure investment

Work package 3

5.1 Transferring solutions

5.2 Aim of the work package

In Work Package 3, communicate and transfer the ready solutions to your target groups. Plan at least one year for this work package to transfer your solutions to the target groups, considering their respective needs. Select suitable activities to encourage your target groups to use the solutions in their daily work.
Organise your activities in up to five groups of activities. Describe the deliverables and outputs as well as present the timeline.

5.3 Work package leader

Work package leader 1 PP 6 - University of Tartu

Work package leader 2 PP 3 - Epishine AB

5.4 Work package budget

Work package budget 30%

5.5 Target groups

	Target group	How do you plan to reach out to and engage the target group?
1	Local public authority Field of responsibility: Installation sites for LowLight photovoltaics; Field of responsibility: Network on LowLight photovoltaics; Field of responsibility: Behaviour change and social acceptance; Initially in particular Tartu, Sønderborg, Kaunas but expanded to all BSR region during the project 300 / 500 characters	We will prepare demonstrators in places with public access, where the interested persons can have hands-on experience of using LowLight PV powered devices compared to the same devices powered by traditional batteries. The demonstrator places will be both at academic partners and in local public municipalities places, where the installation site owners can feedback to the installation itself to customize it to the end-user. 427 / 1,000 characters
2	Education/training centre and school Field of responsibility: Education in renewables, photovoltaics and electronics; Field of responsibility: Behaviour change and social acceptance; Whole BSR region 165 / 500 characters	We communicate our findings and experience of LowLight PV-use also in websites, social media platforms, write popular articles, will give radio interviews, write brochures. With that, we will support broad knowledge and acceptance of the LowLight PV technology also for schools. We offer laboratory works based on pilot's components for first year students of Science and Computer Engineering curricula. For talented students from secondary schools, we offer the research projects using the same equipment. We use the existing frameworks of science-interested students like GLOBE program schools etc. The developed pilot solutions in installation sites will be also included in popularization events, when our universities are open to public. Like during the "Night of Scientists" events. These activities will lead to involvement from schools in the pilot installations, and can lead to new use cases, also as schools act as potential end-users. 946 / 1,000 characters
3	Higher education and research institution Field of responsibility: Education and research in low-light photovoltaics and IoT electronics; Field of responsibility: Installation sites for LowLight photovoltaics; Denmark, Estonia, Lithuania, Latvia and Poland – new countries may be involved in new activities and projects arising from the LowLight PV project. 318 / 500 characters	Education and new research projects on the installed pilots will be made at several institutions, potentially leading to new R&D directions and new types of installations feeding into the work conducted in WP3. In addition, higher education and research institutions are potential end-users that can feed into WP3 about customized installations for their sites. Outreach will be done as above and via internal communication at academic partners. 445 / 1,000 characters

	Target group	How do you plan to reach out to and engage the target group?
4	Large enterprise Economic sector: Energy efficiency and management; Economic sector: photovoltaics; Whole BSR region targeted in the project. 127 / 500 characters	The in WP1 prepared and WP2 piloted two generations of LowLight PVs can be integrated in products of the companies producing IoT or other low-power-use products that today need batteries, but instead can benefit a lot from green energy harvesting, especially upon market upscale. We will carry on the workshops, make presentations, prepare websites and brochures to make these companies aware of this possibility and current capabilities of these LowLight PV solutions. As end-users, companies will also feed into WP3 about potential modifications in the installations made during the project. These inputs will take place during the established workshops. 656 / 1,000 characters
5	Small and medium enterprise Economic sector: electronics and IoT devices; Economic sector: photovoltaics; Economic sector: Roll-to-Roll (R2R) print technology; Initially Sweden, and expanded to all BSR countries during the project via the workshops 225 / 500 characters	The in WP1 prepared and WP2 piloted two generations of LowLight PVs can be integrated in products of the companies producing IoT or other low-power-use products that today need batteries, but instead can benefit a lot from green energy harvesting, especially upon market upscale. We will carry on the workshops, make presentations, prepare websites and brochures to make these companies aware of this possibility and current capabilities of these LowLight PV solutions. As end-users, companies will also feed into WP3 about potential modifications in the installations made during the project. These inputs will take place during the established workshops. 656 / 1,000 characters

5.6 Activities, deliverables, outputs and timeline

No.	Name
3.1	**Installation and energy yield assessment of LowLight PV pilot prototypes**
3.2	**Dissemination and exploitation schemes for the LowLight PV pilots considering defined target groups**
3.3	**Life-cycle assessment sustainability of the LowLight PV pilots**

WP 3 Group of activities 3.1

5.6.1 Group of activities leader

Group of activities leader PP 6 - University of Tartu

A 3.1

5.6.2 Title of the group of activities

Installation and energy yield assessment of LowLight PV pilot prototypes

72 / 100 characters

5.6.3 Description of the group of activities

Installation of the LowLight PV pilot protoypes considering the installation plan and scheme in GoA 1.4, and the developed LowLight PV pilot prototypes manufactured in GoA 2.2 and integrated in GoA 2.3.
In addition, the pilots must be equipped with measurement devices to be able to measure the PV-produced electricity and environmental conditions like luminocity on the pilot sites.

In this GoA, the pilot LowLight PV systems produced in GoA2.2 will be installed in minimum of 10 sites defined in GoA1.4.
Pilot installations will be first done with current industrial state-of-the-art photovoltaics (efficiency about 13%) and updated to new beyond state-of-the-art - Output O2.2 - technology photovoltaics (efficiency about 17%). The installation includes all relevant electronics for the targeted application and connection to real application system, for example IoT device for efficiency energy management.

As this GoA will use the prepared solutions from WP1 and LowLight pilots produced in WP2 in the installation sites in real working environments, it will give to both WPs also feedback about the performance of the pilots. Communication with all transnational sites for Low Light PV installations will be conducted, and possible adaptation plans for the use-case at the specific installation site will be put forward at the work package 1&2 meetings. This allows that end-users and target groups feed back to the preparation of solutions, and thus ensures that the final produced LowLight PV pilots will be adaptable by the end-users in the project.

This GoA will produce at least 10 LowLight PV installations as Output 3.1, which will be operational also after the end of the project.
Part of the output will be a report that defines the energy yield assessments of pilots in installation sites.

Potential risks are simultaneous product developing in WP2 and need for installation and electronics integration already at the same time in early stage of WP3. At later stages, this risk will be already mitigated. The use of the existing knowledge, already existing from first generation prototypes and examples from partner company EpiShine will minimize such risks. Furthermore, a kit for electrical integration is also available to partners from month 1 of the project, which can support with the definition of the final LowLight PV installations, and thus mitigate this risk. Representatives form each pilot-installation-site will be involved also in WP1 and WP2 work packages, will participate there in the WP-meetings, which will speed up the knowledge transfer from WP1 to WP2 and from there to WP3. Further details needed to clarify and details of the final LowLight PV pilot installations will be discussed in these meetings.

2,746 / 3,000 characters

5.6.5 This group of activities leads to the development of an output ✔

O 3.1

Title of the output

Installed LowLight PV pilot protoypes and corresponding energy yield assessment

80 / 100 characters

Description of the output

Full output title: Installation of 10 LowLight PV pilot prototypes at pre-defined installation sites that addresses the target groups. Energy yield assessment of LowLight PV pilot prototypes.

Each pilot-prototype is a small application, equipped with low light photovoltaic-solar cells which are powering the low-current devices like IoT systems, wireless sensors etc, usually powered with alcalaine batteries or accumulators. For comparision, in the pilot site are presented both traditional battery povered device and a new low light photovoltaic solar cell powered one. Both devices real energy consumtion is measured and recorded. The device's working quality is monitored. The replacement of batteries for IoT devices is a huge societal challenge. The IoT devices are needed for e.g. efficiency energy management and indoor climate in buildings, and the forecasted market growth on that segment is huge (see figure 2 in attachment). However, this challenges battery supply, and also brings along negative environmental impact for upscaled battery production. The utilization of green energy harvesting is therefore supporting the green energy transition both by implementation of renewable energy technologies, but also by facilitating efficiency energy management at large scales in the BSR region.

In each pilot installation, the energy yield is assessed in real working conditions, both for the first generation and for second generation photovoltaics. This includes measuring and tracking electrical performance over time in a real working environment to complete a full assessment.The obtained data-sheets with the results will be part of the pilot documentations, in project terms part of the final output O3.1. This will be delivered before the time when the final output is ready and, thus, can be used as input in workshops already during the project.

Installation will be made in places with public access. People from target groups have possibility to come to these places and have a real experience how effective the prototypes are in real everyday working situations.
In last year of the project, the new generation photovoltaics will also be installed in pilot sites, so then is possible to compare also the difference of two photovoltaic generations. Thus, the final installed pilot solution will be ready starting from the last year of the project.

2,374 / 3,000 characters

Target groups and uptake of the solution presented in this output

Target groups	How will this target group apply the output in its daily work?
Target group 1 Small and medium enterprise Economic sector: electronics and IoT devices; Economic sector: photovoltaics; Economic sector: Roll-to-Roll (R2R) print technology; Initially Sweden, and expanded to all BSR countries during the project via the workshops	The pilot prototypes offer, in addition to the energy yield assessment, also hands-on experience for visitors of the pilot installation sites and for students in physics labs or as a research subject. This experience will help to integrate the low light photovoltaics in the products of the companies. This will also increase the public awareness of the possibilities that this new technology offers and readiness to accept the products based on this technology in everyday life. 479 / 1,000 characters
Target group 2 Large enterprise Economic sector: Energy efficiency and management; Economic sector: photovoltaics; Whole BSR region targeted in the project.	see above 9 / 1,000 characters
Target group 3 Local public authority Field of responsibility: Installation sites for LowLight photovoltaics; Field of responsibility: Network on LowLight photovoltaics; Field of responsibility: Behaviour change and social acceptance; Initially in particular Tartu, Sønderborg, Kaunas but expanded to all BSR region during the project	see above 9 / 1,000 characters
Target group 4 Education/training centre and school Field of responsibility: Education in renewables, photovoltaics and electronics; Field of responsibility: Behaviour change and social acceptance; Whole BSR region	see above 9 / 1,000 characters
Target group 5 Higher education and research institution Field of responsibility: Education and research in low-light photovoltaics and IoT electronics; Field of responsibility: Installation sites for LowLight photovoltaics; Denmark, Estonia, Lithuania, Latvia and Poland – new countries may be involved in new activities and projects arising from the LowLight PV project.	see above 9 / 1,000 characters

Durability of the output

The pilots will be kept working also after the project ends, in all pilot installation sites, for the period of 3 years. In case of sustainability issues, these will be documented during the same 3-year period.

210 / 1,000 characters

5.6.6 Timeline

	Period: 1	2	3	4	5	6
WP.3: Transferring solutions						
A.3.1: Installation and energy yield assessment of LowLight PV pilot prototypes						
O.3.1: Installed LowLight PV pilot protoypes and corresponding energy yield assessment						

5.6.7 This deliverable/output contains productive or infrastructure investment

WP 3 Group of activities 3.2

5.6.1 Group of activities leader

Group of activities leader PP 10 - Tartu City Government

A 3.2

5.6.2 Title of the group of activities

Dissemination and exploitation schemes for the LowLight PV pilots considering defined target groups

99 / 100 characters

5.6.3 Description of the group of activities

This GoA includes development of dissemination materials such as websites, social media platforms, popular articles, radio interviews, brochures. It also includes the setup of workshops with the aim of further exploiting the developed LowLight PV pilots and technology to the target groups. Here, local municipalities will be involved in the dissemination and exploitation plan to utilise already existing routes for broad dissemination of new green energy technologies on a local, national as well as regional level.

LowLight PV for IoT, that means the green energy harvesting and power for IoT devices, has a huge relevance (and market) here, and is important also for whole BSR region – it's about energy management in smart housing and green transition in general.

Information and marketing material such as online media (website, social media), print (brochures, flyers, roll-ups) and event specific press material related to technology workshops of GoA1.1 will be developed to describe technology developed in GoA1.2 (Low-light photovoltaics materials) and GoA1.3 (Low-light Photovoltaics cell and module architecture)
The aim of this material is:
1) To inform the identified target groups about the activities of the LowLight PV project;
2) To raise awareness about the possibilities and interest for the use of green energy harvesting and green power in relation to IoT devices in the Baltic Sea Region among the companies and public stakeholders;
3) To help to commercialise new low-light PV technologies and with that to help to tackle the climate change.
4) To promote energy management in smart housing and green transition in general.
5) Initiate dialogue with these target groups.
Technology transfer partners will be highly involved in this task and will provide information on how the material should be adjusted to fit the needs of the country/ region and the target group.
The communication material will be expanded throughout the project lifetime including the publication of the studies from the lifetime and stability testing of pilots (WP2, GoA2.4) thus providing an updated knowledge base of the project findings to all companies and further stakeholders in the BSR.

All partners are actively involved in creating the dissemination material and in communicating low light photovoltaic solutions to regional companies and in organizing regional workshops with industry to market the project findings to the regional companies.

2,454 / 3,000 characters

D 3.2

Title of the deliverable

Communication tools, reporting and workshops to showcase the LowLight PV pilot technology

89 / 100 characters

Description of the deliverable

Three deliverable parts are aimed at:

a)
Material include both printed and webbased material tailored to the target groups.
Webbased material: a webpage, newsletters, activities via social media accounts - LinkedIn and Twitter will be used and others will be considered. These SoMe profiles will link to existing profiles from parter organisations, and research groups, to enhance visibility and widespread off project results and outcomes.
Printed material e.g. leaflets, brochures etc. are developed for distribution at workshops organised during the project and other events.

b)
One report on dissemination and exploitation plan and activties in the midle of project's timeline.
Local municipality partners will provide information about their existing marketing tools and distribution channels to be used to distribute information about the project.
The input from this target group is necessary for developing the concept for dissemination, tailoring the approach of communication materials and their distribution.
The local municipalities and technology partners will also provide input on the regional stakeholders interested in the strategic development and/ or use of low light photovoltaic solutions in their products.

c)
10 workshops (in all 10 pilot installation sites) describing the results, approaches and findings obtained in pilot demonstrations and giving the public the opportunity to have hands-on experience with pilot solutions.
The people usually have experience about using the devices powered by batteries. They are probably also aware about operation and maintenance costs that are incurred by providing replacement batteries and replacing them in these devices.
In workshops we introduce much more environmenat friendly alternatives of using low light PV cells. All PP are actively involved in communicating low light PV solutions to regional companies and in organising regional workshops with industry to market the project findings to the regional companies.

1,996 / 2,000 characters

Which output does this deliverable contribute to?

Business plan for the LowLigh PV pilots and technology

54 / 100 characters

5.6.5 This group of activities leads to the development of an output ☐

5.6.6 Timeline

Period:	1	2	3	4	5	6
WP.3: Transferring solutions						
A.3.2: Dissemination and exploitation schemes for the LowLight PV pilots considering defined target groups	■	■	■	■	■	■
D.3.2: Communication tools, reporting and workshops to showcase the LowLight PV pilot technology	■		■	■		■

5.6.7 This deliverable/output contains productive or infrastructure investment ☐

WP 3 Group of activities 3.3

5.6.1 Group of activities leader

Group of activities leader PP 3 - Epishine AB

A 3.3

5.6.2 Title of the group of activities

Life-cycle assessment sustainability of the LowLight PV pilots

62 / 100 characters

5.6.3 Description of the group of activities

The purpose of this GoA is to assess the sustainability of the LowLight PV pilot. There are several aspects of sustainability, and we will here focus on the environmental aspects through a life-cycle analysis and the techno-economical aspect through a rudimentary business plan. In the life cycle analysis we will build on existing knowledge at Epishine and include the applicable new material and processes, from GoA 1.2-1.3, processing conditions from GoA 2.2, the integration efforts in GoA 2.3, and the end use in GoA 3.1. It is thus of paramount importance that the stakeholder in above mentioned WP´s are transparent with material choices and Epishine will set up a database to collect the relevant information. As the life cycle analysis is, to some extent, based on the boundaries of the system (e.g. should the system include the metallic screws used to fasten the system to a wall in GoA 3.1) which will be set in a workshop with the relevant partners within the project, possibly including external experts on life cycle analysis.

The techno-economical aspect will be covered in a rudimentary business plan, which will include a compilation data from the project and will require the input from all partners in the project and will consist of a full description of the pilot, a cost-benefit analysis and a brief market overview. The full description of the pilot, including photos and description of the installed sites in GoA 3.1, the data from the stability in 2.4, and user data from 3.1 will serve as an introduction of the pilot, which may serve as a role model for future collaborations.
For the cost benefit analysis it is important to understand the total cost of the system, mirroring the environmental aspects mentioned above. As the cost of material will be significant it is important that the applicable material supplying partners in GoA 1.2, 1.3 and 2.1 will provide estimation of cost of an upscaled material, the process, integration and installation providers in GoA 2.2, 2.3 and 3.1 provide credible cost of manufacture, integration and installation. It will be possible to analyze the cost-benefit aspects when the feedback from the pilot installations in GoA 3.1 (the benefits) will be included. To show there is a significant interest in the proposed technology a brief market overview will be based on the feedback from the installation in GoA 3.1 as well as the outcome of the dissemination in GoA 3.2.

2,440 / 3,000 characters

5.6.5 This group of activities leads to the development of an output ✔

O 3.3

Title of the output

Business plan for the LowLight PV pilots and technology

55 / 100 characters

Description of the output

The purpose of this output is the present a rudimentary business plan based in the activities within this project. The business plan will, as mentioned in GoA 3.3, including data from other parts of the project and consist of a comprehensive description of the pilot, a cost-benefit-analysis and a market analysis. The description of the pilot will describe the device as such including dimensions etc, and the setting, circumstances, and conditions during the pilots. The measured low light photovoltaic energy production compared to illumination data collected during pilots' work (that means about one year of continuous data from each pilot), durability and stress-test information from the same period, will be compared with the cost of the LowLight PV installations. The market and market reception will be presented as well.

Important part of this output is also to provide a life-cycle analysis showing the environmental impact of the LowLight PV pilot. The pilot will, as mentioned above include real data from the production and installation part of the life cycle as well over one year of continuous operations. As the lifetime of the pilot will be longer than the length of the project only estimates of end-of life data will be included. The life-cycle analysis could serve as a basis for a deeper discussion of material and process choices in future projects and as well as a communication tool on the vital importance of the life cycle aspect of emerging technologies.

1,485 / 3,000 characters

Target groups and uptake of the solution presented in this output

Target groups	How will this target group apply the output in its daily work?
Target group 1 Small and medium enterprise Economic sector: electronics and IoT devices; Economic sector: photovoltaics; Economic sector: Roll-to-Roll (R2R) print technology; Initially Sweden, and expanded to all BSR countries during the project via the workshops	Based on the results of pilots', obtained in the real everyday environment, the companies can assess the suitability of tested low light photovoltaics technology for their needs and their end user scenarios. 207 / 1,000 characters
Target group 2 Large enterprise Economic sector: Energy efficiency and management; Economic sector: photovoltaics; Whole BSR region targeted in the project.	Based on the results of pilots', obtained in the real everyday environment, the companies can assess the suitability of tested low light photovoltaics technology for their needs and their end user scenarios. 207 / 1,000 characters
Target group 3 Local public authority Field of responsibility: Installation sites for LowLight photovoltaics; Field of responsibility: Network on LowLight photovoltaics; Field of responsibility: Behaviour change and social acceptance; Initially in particular Tartu, Sønderborg, Kaunas but expanded to all BSR region during the project	Full life-cycle assessment of the developed LowLight PV pilot prototypes enables the opportunity to make educated decision about suitability and sustainability of proposed technology solutions. 193 / 1,000 characters

Durability of the output

The busines plan, obtained in this project, will be available for interesting parties also after the project end.
Over the past years, the project partners have attracted significant funding on organic photovoltaics development (e.g. SDU, VTT, EPI, KTU, SUT). This gives a good bases, that these partners continue on the same field also after the project ends.
LowLight PV project partners have also generated large networks on green energy (UL, TM, KBP, PZ, UT). It can be expected that the success of this project, will encourage them to work with green energy solutions also after the project end.

600 / 1,000 characters

5.6.6 Timeline

Period:	1	2	3	4	5	6
WP.3: Transferring solutions						
A.3.3: Life-cycle assessment sustainability of the LowLight PV pilots						
O.3.3: Business plan for the LowLight PV pilots and technology						

5.6.7 This deliverable/output contains productive or infrastructure investment

6. Indicators

Indicators

Output indicators				Result indicators		
Output indicators	**Total target value in number**	**Project outputs**	**Please explain how the solution presented in this output serves the target group(s).**	**Result indicator**	**Total target value in number**	**Please explain how organisations in the target groups within or outside the partnership will take up or upscale each solution.**
RCO 84 – Pilot actions developed jointly and implemented in projects	20	N/A	N/A	**RCR 104 - Solutions taken up or up-scaled by organisations**	8	In this project the pilots are developed jointly between industrial partner and higher education and research institutes, leading to the upscaled production of the LowLight PV pilots. This development and upscaled production is made on the basis innovations made between the partners in WP1, and with inputs from the target groups on functionalities of the LowLight PV modules, i.e. size, shape, power requirements, needed lifetime and possible mechanical flexibility, as well as on the actual installations made. Such customized and joint development is essential to address the pilots to the market needs, and is something partners in the consortium already has experience in. It is therefore key in developing and upscaling solutions that are relevant to the target groups throughout the Baltic Sea Region. The organizations in the target group will interact in the project via the workshops, where results from the project will be put forward, and where inputs on new applications and installations will be discussed. This will foster increased knowledge and technology acceptance, but also a larger uptake and upscale of the solutions, as unique LowLight PV installations can be tailored to end-user needs. Public authorities also act as multipliers in this context, due also to large existing networks, which leads to further widespread and uptake of the develop pilots. Enterprises may form new business cases considering the vast possibilities for LowLight PV installations leading to further technology upscaling. Finally research institutes may form new R&D directions that can expand the product possibilities for low-light photovoltaics in the future. 1,666 / 2,000 characters
		O.1.1: Technology workshops	Target group members, as workshop participants, receive information about the LowLight PV technology via presentations and demonstrations on use-case scenarios. This helps to increase knowledge and acceptance of the technology amongst the different target groups in education and public. In addition, the workshops offer an exchange platform for academic and industrial organisations to further align their strategic directions to end-user expectations and requirements. This will also feed back to the development and production of the LowLight PV pilots. 558 / 1,000 characters			
		O.1.2: Novel LowLight PV organic molecules	Companies involved as well as further enterprises in the BSR can directly use the materials to improve products. Educational and research target groups can consider them for beyond-state-of-the-art low light photovoltaics in course materials, as well as in student and also research based projects. On a meta level, the molecules, synthesised with the purpose of increasing the power conversion efficiency beyound state-of-the-art for low light photvoltaics, set the new standard for the next generation of low light photovoltaics and thus contribute to energy transition in the BSR. 584 / 1,000 characters			

Output indicators	Total target value in number	Project outputs	Please explain how the solution presented in this output serves the target group(s).
RCO 116 – Jointly developed solutions	8	O.1.3: LowLight PV module layout for industrial processing	The final module layout is used as base for the project pilots and thus takes into account the target groups' requirements with regards to technical and visual design. It will be based on the LowLight PV developments made to facilitate beyond-state-of-the-art performance. The module layout is open for use in new applications of low light photovoltais, opening up new unique possibilities for companies and end-users contributing to a green energy transition within photovoltaics. 487 / 1,000 characters
		O.2.2: Ten LowLight PV modules with power conversion efficiencies of 13% and 17%, respectively, delivered	The modules serves the target groups as they are key elements to start the work on electronic integration and thereby considering end-user requirements for the final pilots and installations. Furthermore, The hands-on testing of a realised module with the specified performance will trigger new ideas of application and further research, including the formation of collaborative projects. This will be utilized and exploited further in the workshops established with target groups in LowLight PV. 498 / 1,000 characters
		O.2.3: Integrated LowLight PV pilot	The demo case(s) informs the target groups descriptively on a successfully scalable concept for integration of modules. Larger as well as small and medium sized enterprises, and academic institutions can use the information to improve their research and development activities. This of course also includes planning the use of these in final installations, as it will be case for the installation sites considered in LowLight PV. As the aesthetics play a large role in the market acceptance the “look and feel” of the pilots are of major importance here. 555 / 1,000 characters

Output indicators	Total target value in number	Project outputs	Please explain how the solution presented in this output serves the target group(s).
		O.2.4: Stable integrated LowLight PV pilot under simulated operation conditions	Stability data are made available through scientific papers, white papers, press releases, conference presentations, application notes, data sheets etc. With proof at hand, this will lead to a higher level of acceptance of the organic electronics as a whole and of organic photovoltaics in particular. It therefore supports enterprises in increasing their market share of corresponding products. In addition, it triggers more basic research into the fundamentals of degradation patterns in organic photovoltaics, as well as more development activities with regards to new materials with better durability 606 / 1,000 characters
		O.3.1: Installed LowLight PV pilot protoypes and corresponding energy yield assessment	Installation will be made in places with public access offering energy yield assessment and hands-on experience for visitors of the pilot installation sites, and for students in labs or as a research subject. This offers target groups possibility to gain a real experience how effective the prototypes are in real everyday working situations, and of course how they can support specific and highly needed application areas. This experience will help to integrate the low light photovoltaics in the products of the companies. This will also increase the public awareness of the possibilities that this new technology offers and readiness to accept the products based on this technology in everyday life. 703 / 1,000 characters
		O.3.3: Business plan for the LowLight PV pilots and technology	The business plan and life cycle analysis obtained by this project serve the target groups to make educated decisions about the suitability and sustainability of the proposed low light photovoltaics technology. As it comprises of information on the pilot, a cost-benefit-analysis and a market analyses as well as a life-cycle analysis, it enables to be used by enterprises to asses their needs and their end user scenarios, as well as by public authorities. 459 / 1,000 characters

Output indicators		Result indicators			
Output indicator	**Total target value in number**	**Result indicator**	**Total target value in number**	**Please describe what types of organisations are planned to actively participate in the project. Explain how this participation will increase their institutional capacity. These types of organisations should be in line with the target groups you have defined for your project.**	
RCO 87 - Organisations cooperating across borders	11	**PSR 1 - Organisations with increased institutional capacity due to their participation in cooperation activities across borders**	11	Project partners and associated organisations	Initially the project will have participation from 10 project partners and 1 associated organization. These are comprised of in total 5 academic, 1 industry, 1 research institute, 2 municipalities, 1 NGO and 1 business support organization partner. These types of organizations are also represented in the project target groups, and there will be strong link between the target groups and the project organizations throughout the project. The different organizations that are included as project and associated partners all have the green energy transitions at the core of their strategic directions, however, with different focus areas. While several R&D activities are present at the academic institutions, upscaling and production of technologies are focus areas for the research institute and industry partner. This is supported by the involved business support organization and NGO, which act to support transfer of technologies from higher education and research institutes to industry, and the public municipality partners which acts as multipliers for new technologies, but also support inclusion of new energy technologies in societies, including social acceptance. The LowLight PV project will thus foster a unique synergy which benefits all the involved partners, as the combined solutions, from R&D to pilot installations addressing a societal challenge in the BSR, is only possible via this unique transnational collaborations between the different organizations across the BSR. 1,492 / 1,500 characters
				Other organisations	Throughout the project, new associated partners will be added to project consortium to strengthen the network and increase the support to the further development and widespread installation of LowLight PV solutions in the BSR. This is for example via the SmartEnCity H2020 network (PZ as coordinator), which brings together currently 67 city members from all across joining forces to make Smart Zero Carbon Cities a reality in Europe. Its main objective is to develop a highly adaptable and replicable systemic approach for transforming European cities into sustainable, smart and resource-efficient urban environments. Significant synergy is expected with this network, but also other existing networks that the partners are currently present in. This will increase the number of organizations in LowLight PV, centered around the same type of organizations as currently included, although with more public authorities included as the project develops. 955 / 1,500 characters

7. Budget

7.0 Preparation costs

Preparation Costs

Would you like to apply for reimbursement of the preparation costs?	Yes

Other EU support of preparatory cost

Did you receive any other EU funds specifically designated to the development of this project application?	No

7.1 Breakdown of planned project expenditure per cost category & per partner

No. & role	Partner name	Partner status	CAT0 - Preparation costs	CAT1 - Staff	CAT2 - Office & administration
1 - LP	University of Southern Denmark	Active 22/09/2022	24,000.00	470,216.39	70,532.46
2 - PP	ProjectZero	Active 22/09/2022	0.00	57,509.23	8,626.38
3 - PP	Epishine AB	Active 22/09/2022	0.00	265,407.83	39,811.17
4 - PP	VTT Technical Research Centre of Finland Ltd.	Active 22/09/2022	0.00	72,446.40	10,866.96
5 - PP	Kaunas University of Technology	Active 22/09/2022	0.00	170,280.00	25,542.00
6 - PP	University of Tartu	Active 22/09/2022	0.00	179,568.00	26,935.20
7 - PP	University of Latvia	Active 22/09/2022	0.00	179,568.00	26,935.20
8 - PP	Kaunas Science and Technology Park	Active 22/09/2022	0.00	79,464.00	11,919.60
9 - PP	The Silesian University of Technology	Active 22/09/2022	0.00	255,936.00	38,390.40
10 - PP	Tartu City Government	Active 22/09/2022	0.00	59,856.00	8,978.40
Total			24,000.00	1,790,251.85	268,537.77

No. & role	Partner name	CAT3 - Travel & accommodation	CAT4 - External expertise & services	CAT5 - Equipment	CAT6 - Infrastucture & works
1 - LP	Universitv of Southern De	70,532.46	206,650.00	30,000.00	0.00
2 - PP	ProjectZero	8,626.38	29,000.00	0.00	0.00
3 - PP	Epishine AB	39,811.17	17,000.00	59,400.00	0.00
4 - PP	VTT Technical Research	10,866.96	3,500.00	32,326.80	0.00
5 - PP	Kaunas Universitv of Tec	25,542.00	14,250.00	3,000.00	0.00
6 - PP	University of Tartu	26,935.20	8,561.60	8,000.00	0.00
7 - PP	University of Latvia	26,935.20	7,500.00	9,061.60	0.00
8 - PP	Kaunas Science and Tec	11,919.60	21,696.80	0.00	0.00
9 - PP	The Silesian Universitv of	38,390.40	7,000.00	54,000.00	0.00
10 - PP	Tartu City Government	8,978.40	33,500.00	0.00	0.00
Total		268,537.77	348,658.40	195,788.40	0.00

No. & role	Partner name	Total partner budget
1 - LP	University of Southern De nmark	871,931.31
2 - PP	ProjectZero	103,761.99
3 - PP	Epishine AB	421,430.17
4 - PP	VTT Technical Research Centre of Finland Ltd.	130,007.12
5 - PP	Kaunas University of Tec hnology	238,614.00
6 - PP	University of Tartu	250,000.00
7 - PP	University of Latvia	250,000.00
8 - PP	Kaunas Science and Tec hnology Park	125,000.00
9 - PP	The Silesian University of Technology	393,716.80
10 - PP	Tartu City Government	111,312.80
Total		2,895,774.19

7.1.1 External expertise and services

Contracting partner	Group of expenditure	Item no.	Specification	Investment item?	Group of activities no.	Planned contract value
7. University of Latv	Events/meetings	CAT4-PP7-A-0	Costs for project meetings 26 / 100 characters	No	1.1	4,500.00
7. University of Latv	Communication	CAT4-PP7-C-0	Costs for communication material 32 / 100 characters	No	3.2	3,000.00
2. ProjectZero	National control	CAT4-PP2-F-0	First Level Controller 22 / 100 characters	No	1.1	9,000.00
2. ProjectZero	Events/meetings	CAT4-PP2-A-0	Costs for work package meetings 31 / 100 characters	No	1.1 1.2 1.3 1.4 2.1 2.2 2.3 2.4 3.1 3.2 3.3	8,000.00
2. ProjectZero	Communication	CAT4-PP2-C-0	Costs for communication material 32 / 100 characters	No	3.2	6,000.00
2. ProjectZero	Events/meetings	CAT4-PP2-A-0	Travel costs of external persons 32 / 100 characters	No	1.1 1.2 1.3 1.4 2.1 2.2 2.3 2.4 3.1 3.2 3.3	6,000.00
	Total					348,658.40

Contracting partner	Group of expenditure	Item no.	Specification	Investment item?	Group of activities no.	Planned contract value	
10. Tartu Citv Gove	Events/meetings	CAT4-PP10-A-	Costs for work package meetings 33 / 100 characters	No	1.1 1.2 1.3 1.4 2.1 2.2 2.3 2.4 3.1 3.2 3.3	4,500.00	
10. Tartu Citv Gove	Other	CAT4-PP10-G-	Participations costs for events, conferences, etc. 52 / 100 characters	No	3.1 3.2 3.3	3,000.00	
10. Tartu Citv Gove	Communication	CAT4-PP10-C-	Costs for communication material 34 / 100 characters	No	3.2	6,000.00	
10. Tartu Citv Gove	Other	CAT4-PP10-G-	Creation of local low light PV pilot case in public building 62 / 100 characters	No	3.1 3.3	20,000.00	
4. VTT Technical R	Events/meetings	CAT4-PP4-A-1	Costs for project meetings (one in 2023) 42 / 100 characters	No	1.1	2,000.00	
4. VTT Technical R	Communication	CAT4-PP4-C-1	Costs for communication material 34 / 100 characters	No	3.2	300.00	
4. VTT Technical R	Events/meetings	CAT4-PP4-A-1	Costs for work package meetings 33 / 100 characters	No	1.1 1.2 1.3 1.4 2.1 2.2 2.3 2.4 3.1 3.2 3.3	1,200.00	
5. Kaunas Universit	National control	CAT4-PP5-F-1	First Level Controller 24 / 100 characters	No	1.1	7,500.00	
	Total					348,658.40	

Contracting partner	Group of expenditure	Item no.	Specification	Investment item?	Group of activities no.	Planned contract value	
5. Kaunas Universit	Events/meetings	CAT4-PP5-A-1	Costs for work package meetings 33 / 100 characters	No	1.1 1.2 1.3 1.4 2.1 2.2 2.3 2.4 3.1 3.2 3.3	4,000.00	
5. Kaunas Universit	Communication	CAT4-PP5-C-1	Costs for communication material 34 / 100 characters	No	3.2	2,750.00	
8. Kaunas Science	National control	CAT4-PP8-F-1	First Level Controller 24 / 100 characters	No	1.1	3,996.80	
8. Kaunas Science	Events/meetings	CAT4-PP8-A-1	Costs für matchmaking conference (2024) 41 / 100 characters	No	1.1 3.2	8,200.00	
8. Kaunas Science	Events/meetings	CAT4-PP8-A-1	Costs for work package meetings 33 / 100 characters	No	1.1 1.2 1.3 1.4 2.1 2.2 2.3 2.4 3.1 3.2 3.3	1,500.00	
8. Kaunas Science	Other	CAT4-PP8-G-2	Travel costs of external persons 34 / 100 characters	No	1.1 1.2 1.3 1.4 2.1 2.2 2.3 2.4 3.1 3.2 3.3	5,000.00	
8. Kaunas Science	Communication	CAT4-PP8-C-2	Costs for communication material 34 / 100 characters	No	3.2	3,000.00	
	Total					348,658.40	

Contracting partner	Group of expenditure	Item no.	Specification	Investment item?	Group of activities no.	Planned contract value	
9. The Silesian Univ	Events/meetings	CAT4-PP9-A-2	Costs for project meetings (one in 2024) 42 / 100 characters	No	1.1	4,000.00	
9. The Silesian Univ	Events/meetings	CAT4-PP9-A-2	Costs for work package meetings 33 / 100 characters	No	1.1 1.2 1.3 1.4 2.1 2.2 2.3 2.4 3.1 3.2 3.3	3,000.00	
6. University of Tart	Events/meetings	CAT4-PP6-A-2	Costs for project meetings (one in 2025) 42 / 100 characters	No	1.1	2,061.00	
6. University of Tart	Events/meetings	CAT4-PP6-A-2	Costs for work package meetings 33 / 100 characters	No	1.1 1.2 1.3 1.4 2.1 2.2 2.3 2.4 3.1 3.2 3.3	2,000.60	
6. University of Tart	Communication	CAT4-PP6-C-2	Costs for communication material 34 / 100 characters	No	3.2	1,500.00	
6. University of Tart	Events/meetings	CAT4-PP6-A-2	Conferences 13 / 100 characters	No	3.2	3,000.00	
3. Epishine AB	Events/meetings	CAT4-PP3-A-2	Costs for matchmaking conference (2024) 41 / 100 characters	No	1.1 3.2	5,000.00	
	Total					348,658.40	

Contracting partner	Group of expenditure	Item no.	Specification	Investment item?	Group of activities no.	Planned contract value	
3. Epishine AB	Events/meetings	CAT4-PP3-A-2	Costs for work package meetings 33 / 100 characters	No	1.1 1.2 1.3 1.4 2.1 2.2 2.3 2.4 3.1 3.2 3.3	9,000.00	
3. Epishine AB	Communication	CAT4-PP3-C-3	Costs for communication material 34 / 100 characters	No	3.2	3,000.00	
1. University of Sou	Project management	CAT4-PP1-D-3	External project management 27 / 100 characters	No	1.1	192,600.00	
1. University of Sou	Events/meetings	CAT4-PP1-A-3	Costs for project meetings (2023+2025) 38 / 100 characters	No	1.1	6,000.00	
1. University of Sou	Events/meetings	CAT4-PP1-A-3	Costs for matchmaking conference 32 / 100 characters	No	1.1 3.2	3,000.00	
1. University of Sou	National control	CAT4-PP1-F-3	First level controller 22 / 100 characters	No	1.1	4,000.00	
1. University of Sou	Communication	CAT4-PP1-C-3	Costs for communication material 32 / 100 characters	No	3.2	1,050.00	
	Total					348,658.40	

7.1.2 Equipment

Contracting partner	Group of expenditure	Item no.	Specification	Investment item?	Group of activities no.	Planned contract value	
7. University of Latv	Tools or devices	CAT5-PP7-F-0	Electronic compounds, physical ntegration materials, consumables 64 / 100 characters	No	1.2 1.3	9,061.60	
4. VTT Technical R	Other specific equip	CAT5-PP4-H-0	VTT Technology Platform-Cost-Flexible Electronics. (rent) For use of pilot printing lines needed. 99 / 100 characters	No	2.2 2.3	32,326.80	
5. Kaunas Universit	Tools or devices	CAT5-PP5-F-0	Electronic tools, chemicals for project activities 52 / 100 characters	No	1.2 1.3	3,000.00	
1. University of Sou	Laboratory equipmen	CAT5-PP1-D-0	Materials, chemicals, substrates 34 / 100 characters	No	1.2 1.3	30,000.00	
9. The Silesian Univ	Laboratory equipmen	CAT5-PP9-D-0	Rotary evaporator for synthesis 33 / 100 characters	No	1.2	4,000.00	
9. The Silesian Univ	Laboratory equipmen	CAT5-PP9-D-0	Glove box for stability studies 33 / 100 characters	No	1.2	50,000.00	
3. Epishine AB	Machines and instru	CAT5-PP3-E-0	Roll to roll process equipment 10 iteration x 8 h per batch x200 €/h machine lease cost 90 / 100 characters	No	2.1 2.2 2.4	14,400.00	
3. Epishine AB	Machines and instru	CAT5-PP3-E-0	Production process material 10 iteration x 3000 € material per batch 70 / 100 characters	No	2.1 2.2 2.4	30,000.00	
3. Epishine AB	Laboratory equipmen	CAT5-PP3-D-0	Consumables such as solvents etc 34 / 100 characters	No	2.1 2.2 2.4	9,000.00	
	Total					195,788.40	

Contracting partner	Group of expenditure	Item no.	Specification	Investment item?	Group of activities no.	Planned contract value	
3. Epishine AB	Machines and instru	CAT5-PP3-E-1	Climate chamber 1000 h/ year a 20 €/h 39 / 100 characters	No	2.1 2.2 2.4	6,000.00	
6. University of Tart	Laboratory equipmen	CAT5-PP6-D-1	Pilot: components, measurement devices, example devices powered by th LPV 75 / 100 characters	No	1.2 3.1 3.3	8,000.00	
	Total					195,788.40	

7.1.3 Infrastructure and works

Contracting partner	Group of expenditure	Item no.	Specification	Investment item?	Group of activities no.	Planned contract value	
Please select	Please select	CAT6-PP--01	0 / 100 characters	Please select		0.00	
	Total					0.00	

7.1.4 Investment summary

Investment item no.	Investment title	Total planned value

7.2 Planned project budget per funding source & per partner

No. & role	Partner name	Partner status	Country	Funding source	Co-financing rate [in %]	Total [in EUR]	Programme co-financing [in EUR]	Own contribution [in EUR]	State aid instrument
1-LP	University of Southern Denmark	Active 22/09/2022	DK	ERDF	80.00 %	871,931.31	697,545.04	174,386.27	For each partner, the State aid relevance and applied aid measure are defined in the **State aid section**
2-PP	ProjectZero	Active 22/09/2022	DK	ERDF	80.00 %	103,761.99	83,009.59	20,752.40	
3-PP	Epishine AB	Active 22/09/2022	SE	ERDF	80.00 %	421,430.17	337,144.13	84,286.04	
4-PP	VTT Technical Research Centre of Finland Ltd.	Active 22/09/2022	FI	ERDF	80.00 %	130,007.12	104,005.69	26,001.43	
5-PP	Kaunas University of Technology	Active 22/09/2022	LT	ERDF	80.00 %	238,614.00	190,891.20	47,722.80	
6-PP	University of Tartu	Active 22/09/2022	EE	ERDF	80.00 %	250,000.00	200,000.00	50,000.00	
7-PP	University of Latvia	Active 22/09/2022	LV	ERDF	80.00 %	250,000.00	200,000.00	50,000.00	
8-PP	Kaunas Science and Technology Park	Active 22/09/2022	LT	ERDF	80.00 %	125,000.00	100,000.00	25,000.00	
9-PP	The Silesian University of Technology	Active 22/09/2022	PL	ERDF	80.00 %	393,716.80	314,973.44	78,743.36	
10-PP	Tartu City Government	Active 22/09/2022	EE	ERDF	80.00 %	111,312.80	89,050.24	22,262.56	
Total ERDF						2,895,774.19	2,316,619.33	579,154.86	
Total						2,895,774.19	2,316,619.33	579,154.86	

7.3 Spending plan per reporting period

	EU partners (ERDF)		Total	
	Total	Programme co-financing	Total	Programme co-financing
Preparation costs	24,000.00	19,200.00	24,000.00	19,200.00
Period 1	487,344.89	389,875.89	487,344.89	389,875.89
Period 2	487,344.90	389,875.92	487,344.90	389,875.92
Period 3	498,338.65	398,670.92	498,338.65	398,670.92
Period 4	498,338.65	398,670.92	498,338.65	398,670.92
Period 5	506,156.35	404,925.08	506,156.35	404,925.08
Period 6	394,250.75	315,400.60	394,250.75	315,400.60
Total	2,895,774.19	2,316,619.33	2,895,774.19	2,316,619.33