

Market consultation Guide for:

R2R Perovskite Pilot Line

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1. Introduction

In preparation for a planned European Tender “ R2R perovskite Pilot Line”, TNO invites you to participate in this Market consultation. Through this Market consultation, TNO aims to gather more information from the market to better understand the feasibility of the Tender and possible solution directions. You will have the opportunity to share your knowledge and experience with TNO.

This guideline describes the TNO organisation, the content, objectives, planning, conditions, and procedural matters of the Market consultation.

After the Market consultation, TNO will decide which Tender procedure is most suitable for awarding .

1.1. Purpose

Before preparing for a Tender, TNO wants to consult the market on how such a Tender can be structured (in broad terms). Within the framework of this Market consultation, specific advice is requested on how the potential market can meet our below mentioned requirements.

The Market consultation is open to all market participants and benefits all parties involved. TNO investigates the possibilities and market perceptions. With the answers to below questions, interested market participants gain insight into, and a good understanding of the contract in an early stage. Furthermore, the answers parties provide during the Market consultation can influence the requirements that will be included in the Tender. In this way, participants can contribute to the Tender's success.

To that note we have formulated Qualifications and Questions. TNO is looking forward to find partners that want to be part of this challenge and wants to find out whether relevant qualifications are available to complete this R2R Pilot Line in a successful manner.

For more details see Annex 01.

1.2. Contact

Contact person for the communication related to the Market consultation is:

Name : F. Wisker
Position : Procurement Advisor
Department : Procurement
E-mail address : frank.wisker@tno.nl
Postal address : Postbus 96800, 2509 JE, Den Haag

1.3. TNO

TNO, Netherlands Organisation for Applied Scientific Research, hereinafter referred to as "TNO", is a modern unit-driven Research & Knowledge organisation, established by law in 1932 to make scientific research applicable to enterprises, government bodies and civil-society organisations and thereby strengthen innovative capacity.

TNO is a public-law legal entity and operates under the ministerial responsibility of the Dutch Minister of Economic Affairs but, as an organisation, performs its tasks independently.

Every day, TNO's employees are working on the development and application of innovative research. TNO provides contract research and specialist consultancy and licenses patents and specialist software. TNO starts up new enterprises to bring innovations to Market.

TNO's strength lies in its ability to combine diverse fields of science to create ground-breaking, sustainable solutions. Increasingly, TNO does so by collaborating with government bodies, industry, other knowledge institutions and civil-society organisations, both nationally and internationally. Through its work, TNO stimulates economic growth and social innovation.

TNO's mission is creating impactful innovations for the sustainable wellbeing and prosperity of society. How TNO fulfils this mission is described in its strategic plan for 2022-2025 (soon to be 2026-2029) and focuses on four societal challenges: a safe and secure society, a sustainable society, a healthy society and the digitalisation of society and industry.

TNO's goal is to connect, change and accelerate: Innovation for Life. For more information on TNO, see: www.tno.nl.

1.4. The TNO Organisation

With TNO's highly ambitious approach comes an organisational form that effectively facilitates this ambition and a culture that challenges employees to innovate and collaborate. The TNO organisation has a unit structure as shown below:



The six organisational units (Units) are market-oriented and recognisable to TNO's customers and partners. The Units are based across the Netherlands with a total of 21 locations/research facilities.

The head office is located in The Hague and accommodates the central staff bodies (Shared Services Organisation) and from where the entire TNO organisation is supported and managed.

Procurement department

Procurement, as part of the Finance & Procurement department, is responsible for organising and executing procurement processes and ensuring that these processes are in line with the TNO objectives.

The Procurement department is effecting this Tender on behalf of TNO in close cooperation with the department Solar Technology & Applications.

2. Planned Tender

2.1. Background information

TNO received approval for a national growth fund, called SolarNL. SolarNL aims to develop and industrialise innovative Solar PV technologies. For the program line on flexible perovskite modules, this includes the realisation of an R&D Pilot Line to demonstrate the feasibility of Roll-to-roll (R2R) perovskite solar production. The ultimate goal of SolarNL is to boost Dutch industry. The R&D R2R Pilot Line will primarily be used by TNO together with eco-system partners for development in the SolarNL project. Based on the acquired knowledge, industrial manufacturing lines will be realised and further developed largely based on the foreground obtained with the R&D line.

2.2. Purpose of the Planned Tender

TNO aims to realise an R&D Pilot Line to demonstrate the technical feasibility of roll-to-roll (R2R) perovskite solar production. While there is equipment, such as a roll-to-roll slot die coater, already available in-house, additional equipment required to shape and operate the Pilot Line will need to be acquired. Where TNO has defined the process requirements, we will need the expertise and input of an external party for the mechanical engineering as well as the connecting software of the entire line. This partner will help us determine the final technical specifications, purchase the necessary machines and software and will be responsible to implement a correctly functioning working Pilot Line over a foreseen time period of approximately a year.

2.3. Scope of the Planned Tender

TNO wants to develop the materials and process techniques in such a way that they can be applied in a roll-to-roll process at a speed of 1- 10 m/min and at a relatively low temperature (<150 degrees C). We optimise the crystallisation of perovskites in the roll-to-roll process and the in-line application of charge extraction, electrode and barrier layers. In addition, we plan to apply laser scribing techniques to pattern the device structure and create a suitable electrical scheme for a photovoltaic module. This requires a number of technical developments, including new techniques for the controlled deposition and crystallisation of the perovskite layer, and the application of the contact layers.

This summary describes the design of the machines and the system to some extent. We will need the knowledge and input of an external company to help us with the engineering of the complete Pilot Line, through which the final technical specifications will be determined and the (parts of the) machines can be bought and built in a time span of just over 1 year. The fact that TNO will combine existing and/or in house machinery with to be developed components indicates that the full R&D R2R Pilot Line will be a first of its kind.

The R2R slot die machine is available in house however needs upgrades. The R2R sputter- and R2R sALD machines will be developed partly using existing equipment that is commercially available in the market from manufacturers in The Netherlands and/or Europe, however in need of further engineering and development to fit our needs for the R2R Pilot Line. For example, an existing R2R sALD machine that is partly potentially compatible for processing perovskite solar foils, could be a starting point for our integrated R2R sALD machine.

Another example is the R2R laser, R2R characterisation and R2R slitting/binning set-ups. These will have to be engineered and built to new specification and then integrated in a data management system to collect, process and analyse the data for this innovative R&D Pilot Line. A systems architecture has been created (including a MBSE model).

Please find a more detailed description in Annex 01.

3. Procedure Market consultation

The Market consultation will be conducted in writing. The invitation to participate is published on TenderNed (www.Tenderned.nl). Based on your responses, TNO may invite parties for verbal explanation. This will be done through email after having received and studied your answers and comments.

3.1. Information round

As a participating party, you can ask questions and/or make comments about the Market consultation documents. Questions can be submitted via email to the contact mentioned in par. 1.2. Questions submitted in any other way will not be processed.

3.2. Way of Submitting

TNO requests that you upload the completed answer form Annex 02 as a Word file (.docx).

The answers provided will not be assessed and are for information purposes only. No value judgments will be made or communicated regarding the submitted answer form. Your answers will not be shared with other market participants.

However, you should be aware that you may provide commercially sensitive information about yourself or other parties that you are not permitted or willing to share. If you do not wish to share this information, you must explicitly indicate this in your answer. If you accidentally choose not to do so and the information is potentially included anonymously in the Tender documents, you cannot hold TNO liable or responsible for this.

3.3. Verbal Explanation

Organisation and Implementation

When required and relevant, TNO will invite selected parties for a verbal explanation. If you are invited, you can participate with two employees.

TNO will invite you to digital Meetings through MS Teams. When scheduling the meeting, we will take your availability into account as much as possible. The available dates for the meeting will be shared in a later stage.

3.4. Planning

Date	Activity	Who
06 January 2026	Publication Market Consultation	TNO
Between 06-01-2026 and 14-03-2026	Q & A with potential Participants	TNO-Participants
14 March 2026	End date	Participants
24 April 2026	Final Answers to Participants	TNO

4. Conditions and Starting points

TNO has compiled this document with great care. If, despite this, you discover any inconsistencies or imperfections, please report these during the information round. Your participation in the Market consultation is not mandatory. If you do participate in the Market consultation, the following conditions and principles apply.

- This Market consultation adheres to the general principles of European public procurement law. These principles are: transparency, non-discrimination, equal treatment, and proportionality.
- This document is intended solely for Market consultation purposes.
- This Market consultation is non-binding, both for participants as well as for TNO.
- Market parties that do not participate in this Market consultation are not excluded from participation in the potential Tender. Nor are Market parties that do participate in this Market consultation in any way excluded or favoured during the potential Tender.
- Market parties who do or do not participate in this Market consultation may derive rights from it.
- TNO will not reimburse any costs for participating in this Market consultation and will not accept any requests for compensation.
- Participating Market parties agree that the information they provide can be processed anonymously in a summary of the results of this Market consultation or in the Tender documents.
- The information you provide becomes the property of TNO and is considered public, unless you explicitly indicate otherwise. The information provided is not subject to copyright or other proprietary rights.
- The information during the Market consultation may differ from the information provided during the potential Tender.
- TNO is in no way obliged to apply the outcomes of the Market consultation.
- By submitting your response form, you unconditionally agree to the terms and conditions as stated in this document.

TNO reserves the right:

- To change the above-mentioned planning
- To temporarily or permanently stop the Market consultation
- To carry out the proposed Tender process in a different way than may have been communicated