SolarPower Europe feedback paper to the New European Bauhaus Co-Design process

Solar Power Europe's recommendations for the New European Bauhaus:

- Create a multidisciplinary ecosystem where start-ups and traditional businesses can pilot and prototype new concepts, but also scale them up across Europe.
- Adopt two principles as core to the New European Bauhaus: democratisation and form follows function.
- Deploy sustainable technologies into beautiful buildings through integrated urban and energy system planning, also in rural settings.
- Improve construction and building standards, integrate sustainability within building codes, and foster supply chain innovation.

We are now embarked on an ambitious journey to reach climate neutrality by 2050. While the upcoming Fit for 55 Package will be key to deliver higher climate and energy ambition, **SolarPower Europe is committed to ensure the** New European Bauhaus ("NEB") **serves to inspire, develop, promote, and scale-up the solutions to deliver a beautiful, sustainable, and inclusive world**.

Project: Original Bauhaus school in Dessau following renovation

Solar the perfect partner for the Bauhaus. It is **both one of the lowest-cost energy sources in Europe and highly versatile and modular**, which allows solar PV technologies to be integrated into almost all infrastructures and agricultural activities. There is a significant untapped potential for solar to support the EU's ambitious decarbonisation targets in an aesthetic way, boosting innovation and job creation in the EU. In the same way that solar was part of the renovation of the original Bauhaus school in Dessau, which deployed modules invisible from street-level that respected the UNESCO heritage status of the building[i], the solar sector will be accompany the rebirth of the Bauhaus in Europe.

On-site solar on buildings **in the EU could generate between 680 TWh and 1,300 TWh, both on rooftops and on façades**. **Building Integrated Photovoltaics ("BIPV")** in particular have a significant potential to contribute to the objectives of the European Green Deal[ii]. Highly innovative, "made in Europe" and with strong market prospects BIPV embodies the vision of the NEB, demonstrating that sustainability can go hand in hand with good design.

Solar also contributes to sustainable rural development through Agrisolar, the integration of a solar project within agricultural activities. Agrisolar offers a turnkey solution to reduce greenhouse gas emissions from the energy sector, deploy additional solar capacity, promote more sustainable agricultural practices, reduce the environmental impacts of agriculture, and drive rural development[iii].

This input paper is divided into two sections: the first outlines what the NEB should do, the second focuses on the key challenges that should be addressed by the initiative. Throughout the paper, various building blocks are used to show the role of solar within the NEB. Blue blocks show successful projects which demonstrate how solar contributes to sustainable, beautiful, and inclusive living spaces. Yellow blocks include solutions which already contribute to the objectives of the NEB, or which could be scaled up through the initiative. Finally, red blocks point to concrete challenges that must be addressed by the NEB.

Objectives of the New European Bauhaus

1. Create a multidisciplinary ecosystem where start-ups and traditional businesses can pilot and prototype new concepts, but also scale them up across Europe.

While photovoltaic technologies have achieved a high-level of technical maturity, driving a 90% decrease in prices since the year 2000, new emerging technologies are pushing the boundaries of solar, increasing its versatility and modularity. These include technologies such as **Sunstyle**, a solution which integrates solar PV within a roof tile, which, following a fish-scale pattern, elegantly generates electricity and insulates buildings[iv]. These have already been selected to **equip the French pavilion at the universal exhibition Expo 2020 Dubai**, set to take place in 2021 and 2022.

The NEB **must enable the uptake of products, technologies, and solutions which are already available**. Although solar is the leading energy generation source in terms of deployment, users of solar, such as architects, designers, engineers, and farmers are not always fully aware of how to make the most out of innovations such as BIPV and Agrisolar. This could be overcome through the launch of a "**New European Bauhaus Label" that helps proven solutions to scale up across the EU**.

Project: French pavilion at Dubai Expo with coloured Sunstyles (Akuo)

The NEB should also create **a space to innovate, pilot, and develop new concepts that will contribute to** build beautiful, sustainable, and inclusive societies. It should provide spaces (both real and virtual) for those who are interested to connect, exchange, and feedback on solutions that can contribute. For example, **MorphoColor**, developed by the Fraunhofer ISE, replicates the phenomenon that causes the shimmering shades of blue or green of the wings of the morpho butterfly and enables the manufacture of PV panels in homogenously uniform colours[v].

Solution: MorphoColor technology (Fraunhofer ISE)

The NEB should also aim to **promote solutions that will jointly enable the clean anergy and sustainable agriculture transitions**. Rural communities are facing specific socio-economic, development and energy transition challenges, while agriculture is one of the most climate-dependent socio-economic sectors, with climate change affecting the sector in complex ways. Agrisolar solutions such as Amarenco's solar barns deployed in Corsica, empowered farmers, increased food, agriculture, and energy independence on the island. The barns financed by the revenues generated by the solar system, providing needed services for the farmers, were designed to fit into the local architectural style.

Solution: Solar barn integrated within local architecture (Amarenco)

2. Adopt two principles as core to the New European Bauhaus: democratisation and form follows function.

To be successful, we believe the NEB must draw from the principles of the original Bauhaus school. Two of these are crucial to inspire people and deliver sustainable, beautiful, useful, and inclusive design: democratisation and "form follows function".

The **NEB must be democratic and egalitarian**, ensuring all citizens and businesses can take part in, and benefit from, the energy transition. On a large scale, the NEB must be accessible to all and strive to **include an ever-increasing mosaic of perspectives, both urban and rural, across ae groups, social and economic classes, and cultural backgrounds**. Furthermore, the NEB should aim to **make sustainable building materials, and renewable and electrified solutions to decarbonise are accessible to all**.

NEB projects should ideally be developed areas in need of regeneration, integrated within their local setting. Concretely, **NEB projects must create a sense of ownership** for those who live and work in their proximity, **inspire citizen action against the climate emergency**, and **deliver concrete benefits for local communities**, for example by providing needed services, creating local jobs, or stimulating the development of local skills required for the sustainable transition.

Solution: Art print on PV panel in the Netherlands (TNO)

This inclusiveness should be combined with an approach that sees **aesthetics as directly derived from use and sustainability**. As Mies van der Rohe, one of the leaders of the original Bauhaus school, noted in 1950, "Architecture depends on its time. It is the crystallization of its inner structure, the sow unfolding of its form. That is the reason why technology and architecture are so closely related. Our real hope is that they grow together, that *someday one will be the expression of the other".*[vi]

In line with these thoughts, **the NEB should promote design which is an expression of citizen movements to fight climate change, such as Fridays for the Future**.

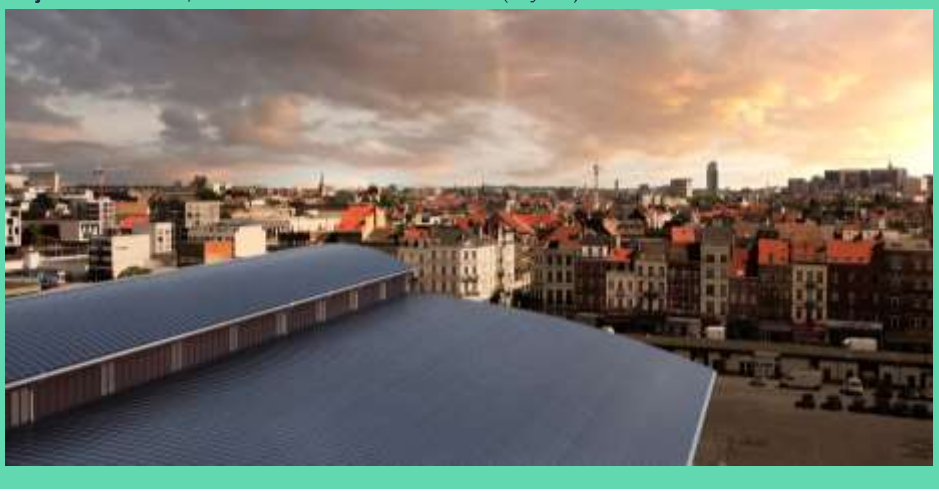
The NEB an **opportunity to bring art into everyday life**. We are inspired by architect Renzo Piano's thought that "the architect walks a knife-edge between art and science, between originality and memory, between the daring *of modernity and the caution of tradition*"[vii]. **Solar systems could include printed art pieces**, as done by TNO solar panels deployed on dikes which protect the Netherlands from flooding[viii].

Agrisolar projects, such as **Akuo's Bardzour project in Reunion Island** (France), are a clear example of how sustainability and inclusiveness will go hand in hand. The solar greenhouses, which were financed by the electricity they generate, are used to grow organic crops in permaculture and are tended to by inmates of a nearby prison, who are trained into sustainable agriculture skills as part of their social reintegration strategy.

Project: Akuo's Agrinergie greenhouses in Reunion Island

Another example, in an urban setting, is the **SolarMarket** project, developed by Skysun in Anderlecht (Belgium). **SolarMarket** is the renovation of the Halles d'Anderlecht, an iconic, listed monument in the heart of Brussels which had unfortunately suffered from neglect. The project is deploying a BIPV system that restores the aesthetics of the original 19th century zinc roof and couples with a breath of modernity. The renovation project was partly financed through a citizen's crowdfunding initiative, which allowed Anderlecht residents to directly invest in, and benefit from, the project. More importantly, **SolarMarket** will revitalize an emblematic social, cultural, and economic meeting spot for local citizens.

Project: SolarMarket, Renovation of Halles d'Anderlecht (Skysun)



Challenges to be addressed:

1. Deploy sustainable technologies into beautiful buildings through integrated urban and energy system planning, also in rural settings.

One of the most important challenges in the transition towards more sustainable and inclusive spaces relates to the interdisciplinary coordination between smart technologies, building design, urban planning, and energy system planning.

This is key to deliver a successful energy system integration strategy that maximises the active potential of buildings through unlocking flexibility capacity and increase decentralized renewable electricity generation. Energy system integration will be enabled by solutions such as the **dcbel smart inverter**, which optimises generation of electricity and storage, helps consumers adapt their energy use to changing energy costs, and enables the integration of the energy system[ix]. On-site solar innovations, such as BIPV, BIPV will maximise the productive potential of building envelopes. Notably, **translucent PV cell** technologies such as those developed by TNO, and even fully transparent ones by other players in the solar industry, will enable the deployment of solar on all available building surfaces.

Solution: dcbel smart inverter

Solution: Translucent PV cell (Solliance)

Solutions such as those outlined throughout this paper enable the design and construction of efficient, smart, and sustainable, buildings. The new administrative centre of the city of Freiburg (Germany, pictured below), the **Rathaus im Stühlinger**, completed in 2018, was the world's first public building with a net-zero energy concept, which supplies more energy than it consumes[x]. To generate sufficient energy, the entirety of the building surface had to

Project: Rathaus im Stühlinger, Freiburg (Fraunhofer ISE)

be used productively: vertical PV panels were used as shading devices throughout the building façade (right hand picture).

Challenge: optimising rooftop space to combine solar and green roofs

Sustainable technologies and buildings alone will not deliver sustainable and inclusive living spaces. To deliver effective energy system integration, actions must be articulated through **joint urban and energy system planning**. The role of municipal authorities in setting up dialogues, involving architects, the construction sector, building sector, financing institutions, component producers and utilities, and citizens, will be central to ensure the spaces we live in develop sustainably. One key challenge in this regard will be **how to optimise the use of rooftop and façade spaces to combine solar and green architecture**.

Rural communities should also benefit from this approach. The deployment of Agrisolar innovations, such as **Insolight's dynamic translucent PV modules** which can adapt the level of light which they let through. Deploying these innovations in integrated renewable energy and agricultural cooperatives will empower rural communities to be at the heart of the European Green Deal.

Solution: Insolight dynamic light transmission PV modules

2. Improve construction and building standards, integrate sustainability within building codes, and foster supply chain innovation.

Emerging solar technologies, such as thin film perovskites and organic PV, offer an opportunity to further improve the versatility of solar, enabling its further integration into the built environment. The NEB should aim to remove barriers that hinder the development and scale-up of these technologies, in addition to ensuring building codes in Member States integrate lessons from the NEB community.

Challenge: streamlining certification processes for construction products

Certification processes for construction products are a key barrier for the uptake of innovative construction products[xi], such as BIPV, which must balance beauty, customisation, standardisation, and energy performance. Integrating PV in building skins requires accurate performance assessments in accordance with construction norms and PV standards, depending on the type of use and function of the BIPV product. New integrated performance assessments are required to ensure high product quality, enable further cost reductions, and drive the penetration of BIPV across the EU. As a multidisciplinary project, the NEB is an ideal forum to **foster dialogues between all the technology developers, designers, customers, and standardisation bodies** to develop new approaches to facilitate the mutual recognition of construction products throughout the EU. The development of a NEB label (as explained above) would be a very important step in this regard. Furthermore, the NEB should aim to harmonise performance information and develop certification processes that consider the dual function of BIPV products as both electrical and construction components, a subject being investigated by the EU funded project BIPVBOOST[xii].

To ensure the NEB has a tangible impact on the way aesthetics and sustainability of our built environment, it **should aim to feed into the development of building codes in EU Member States**. As buildings codes are at the core of architectural styles and urban development, it will be essential to ensure NEB outputs are introduced in the regulations which building codes.

Solution: Mass customisation of BIPV products (TNO)

Another research focus of the NEB should be to foster supply chain and construction process innovation. One focus should be to **scale-up mass customisation**, a revolutionary approach to develop BIPV materials inspired by the standardization and serial production of the "heavyweight prefabrication" of the 1970's[xiii]. Mass customisation is

likely to drive cost-reductions in the integration of solar within construction products while further enabling the versatility of solar.

Tackling these issues, a significant industrial opportunity for the European Union, by driving the growth of a domestic BIPV manufacturing industry, such as Akuo's Sunstyle Factory in France.

Project: Sunstyle Manufacturing line in France (Akuo)

Unlocking the full potential of BIPV would enable the scale-up of projects such as the refurbishment of TNO's Solar Integration lab, which showcases how solar innovation can deliver sustainability, good design, and better quality of life. The Solar Integration lab is dedicated to support research and development of solar energy products that can be seamlessly deployed within our living environment. The previous Solar Integration lab (pictured below, left) was in use for over 20 years and featured an iconic curved glass roof which generated solar electricity. This glass roof however negatively affected indoor temperature in the building, making it too hot in summer and too cold in winter. The new Solar Integration lab (pictured below, right) harvests solar energy with solar panels that are an intricate part of the architecture, which blends the straight lines of the building with the colour of the surrounding dunes.

Project: Solar Integration Lab, before and after refurbishment (TNO)

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