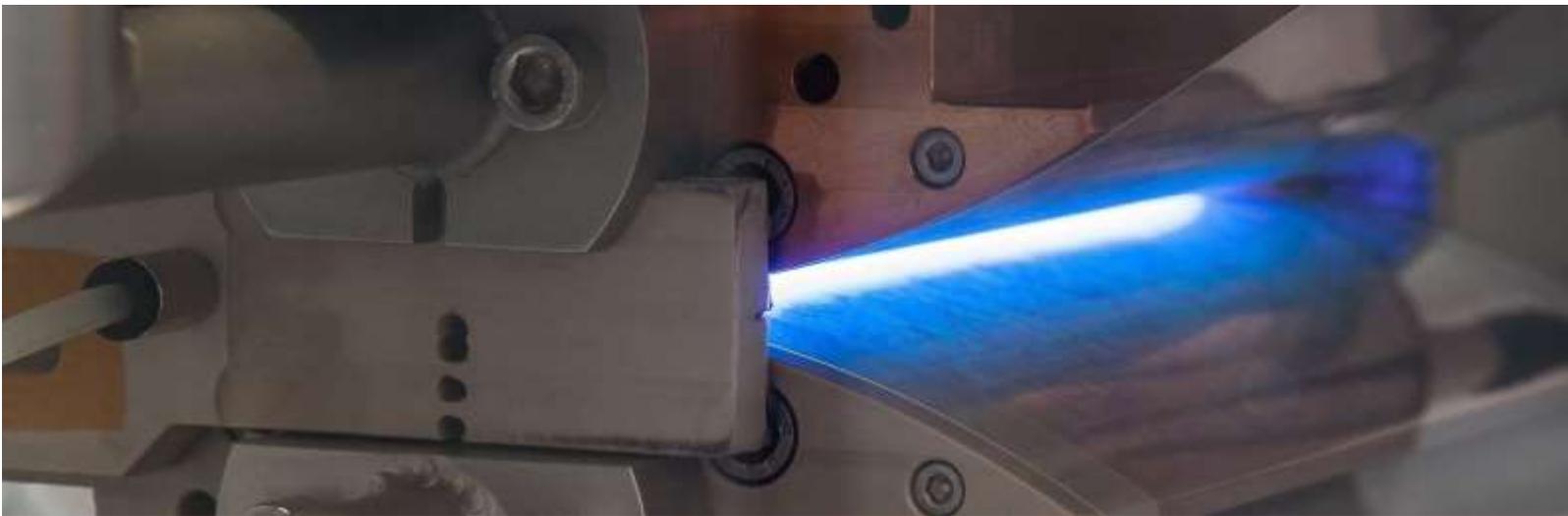




LIFE GREEN PLASMA LAYMEN's REPORT

“Life green plasma” is a project that has been carried out by Fujifilm Manufacturing Europe, Fraunhofer IST and SEMCO-Engineering, companies located in the Netherlands, Germany and France. The starting point of this project is a novel technology platform that has been developed by Fujifilm in the past ten years and that can be used for the manufacturing of novel flexible electronics.

The main objective of the Life Green Plasma project was to promote to the European Industrial Community this new environmental friendly process technology for manufacturing of flexible electronic components. The technology has the promise to substitute several environmental unfriendly vacuum PE-CVD technologies, which substitution has a strong effect on material usage and CO₂ emissions, that could be reduced with more than 90%.



More detailed project objectives are as follows:

First of all the construction of an APG-CVD Process Demonstrator as a move-able prototype system for on-site demonstrations of the performance of the green plasma process. Our demonstrator was suitable to demonstrate quality of product, robustness and flexibility of process, efficiency of material usage, safety & ease of operation, and also the freedom to adapt a process to specific customer requirements.

Next we developed novel products for interested parties and started with the calculations of the potential environmental, technical and economic advantages of green Plasma Technology

Finally we promoted the performance of the novel Green Plasma technology, explaining the environmental advantages, by publication of fact sheets, technical reports, scientific articles, by introduction of a dedicated website, by public announcements, by visits to conferences and exhibitions.



Is there a market for this technology?.

The manufacturing of flexible electronics is an important new business area that has high promises for Europe for the future, with an annual growth of 20% and a predicted annual turnover of 45 Billion \$ in 2021.

This market for flexible electronics consists among others of products like thin film photovoltaic cells, organic light emitting displays (OLED's), thin film batteries and so on.

These products can be manufactured with use of the novel technology which has been demonstrated by this Green Plasma project.

The European Union policy.

The EU action plan as described in the EPIA publication^[1] shares the vision to establish PhotoVoltaics as a mainstream clean and sustainable technology, providing up to 12 % of the European electricity demand by 2020, up to 20% in 2030 and 30% in 2050. To realize this ambition, the novel Green Plasma technology will now after finalizing this Green Plasma project be of high added value.

Relevance of subsidy.

The requested subsidy was used have the resources available for almost 4 years research to demonstrate, adapt and prepare this novel Green Plasma technology platform for further market uptake by the Industrial Community in Europe.

What has been done in this Green Plasma project?

Construction of an APG-CVD Demonstrator system..

A process demonstrator was constructed as a small machine that generates the green plasma's on a small scale with the purpose to demonstrate all technical features to interested partners.

30 demonstrations for industrial stakeholders

The purpose was to show the options of this technology platform, to proof feasibility of thin layer depositions according to requests from the industrial society,, and to discuss and prepare the options of integration of this technology in more complicated commercial manufacturing systems. Technical problems have been clarified and solved, and the in total 30 demonstrations in this project led to 8 partnerships with industrial partners for further product development and upscaling of the green plasma process for industrial use.

Tailor-made recipe design, as required for technology adaptation to customer needs.

Industrial customers with interest in the technology had specific requests in terms of required product specifications, and based on these requests a number of relevant applications have been developed, for instance (1) moisture barrier layers that transfer cheap polymeric foils into high tech absolute moisture barrier substrates that can effectively protect flexible TV displays against breakdown by moisture.



Communication of the advantages of Green Plasma to the scientific, industrial and for the general public, by

- 30 process demonstrations.
- 38 visits to conferences and exhibitions to promote the green plasma technology.
- The description of the technology and its use in 7 scientific articles
- 8 joint development partners that will try to scale up the process and use of for the production of flexible displays and flexible photovoltaic cells.

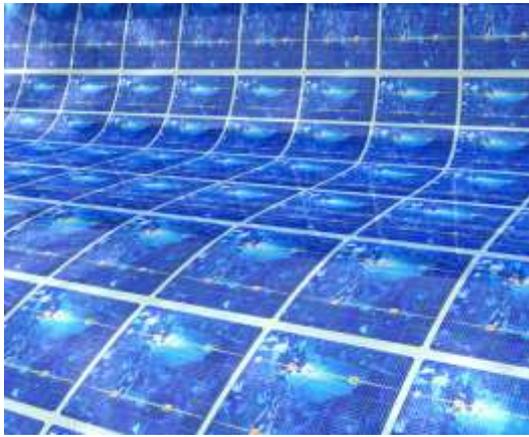
How important is this for the environment?

The developed processes have been analyzed for their environmental effects, with a focus on the use of energy and of chemicals, and in comparison with other technologies that are less advanced. Based on these calculations the expected environmental benefits were calculated and are summarized as follows:

- Reduction of 300.000 ton CO₂ emission / year in Europe (2021).
- Energy savings 360 GW/y (2021)
- Fluor savings: 270 ton/y (2021)

What kind of promotion actions were done?

The technology promotion has been mainly to the European industrial society, as the industry interest is the key for further market uptake of the technology. As explained 38 conferences and Exhibitions, 7 technical publications, 1 book chapter was written and 30 demonstrations of the technology through the novel Demonstrator and the pilot plant have been provided to promote the technology to the most important industrial users., a website was launched, several press releases were done (in the Dutch and English language), a layman's report was made and notice boards were installed, and several fact sheets and brochures were prepared.



Open Innovation Hub. Additionally, the Open Innovation Hub of Fujifilm in the Netherlands was used to disseminate the plasma technology to a wider public. In this Open Innovation Hub daily visitors from all over the world were introduced to a number of 21st century technologies, including the Green Plasma technology.

What will be done next?

We cooperate now with smaller and larger companies to try to make new flexible photovoltaic cells and new flexible display systems. We will produce these products with low costs and with an extreme low environmental burden.

Maybe not all the partnerships will be successful, however, several major problems have been solved now, and there is a good chance that you have beautiful flexible solar cells in your next house that have been manufactured with use of Green Plasma technology.

