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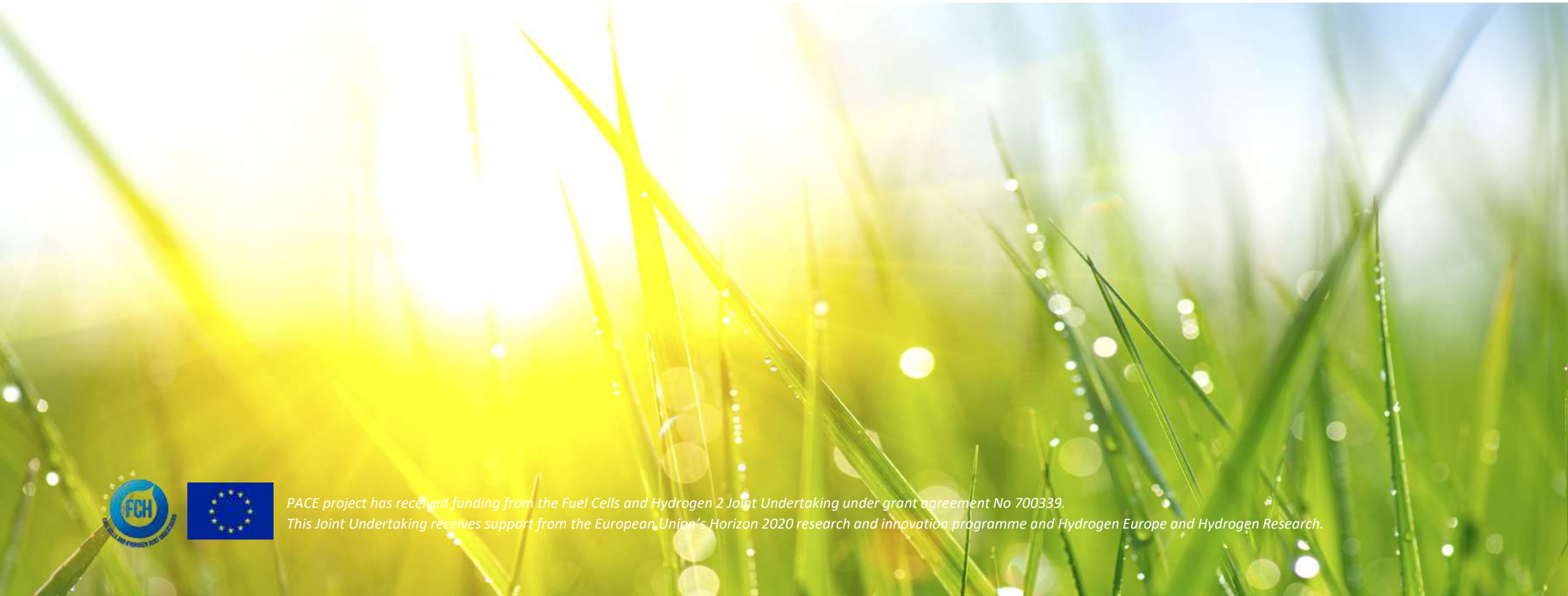
Pathway to a Competitive European Fuel Cell micro-CHP Market

The FC mCHP Market in the UK: Regulatory Considerations and Support Schemes

George Carew-Jones – Element Energy



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Fuel Cell micro-CHPs prevalence globally

The FC mCHP Market in the UK

- Circa. **10,000 units** have been installed across **Europe** to date, including:
  - **1168** units installed under **PACE** by end of April 2020;
  - **>1000** units installed under the preceding **ene.field** project;
  - **>4500** units installed under the German **KfW433** Programme.

ene.field
Fuel Cells x Combined Heat and Power

KFW

エネファーム
ENE·FARM
パートナーズ

- Circa. **400,000 units** have been installed in **Japan** to date as part of the **ene.farm** project.
- Additional markets with units deployed: USA (e.g. New Jersey Clean Energy CHP fund); Canada.

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Fuel Cell micro-CHP prevalence in Europe

The FC mCHP Market in the UK

- **More than 10,000 units have been installed across Europe** in households and SMEs.
- This map shows the distribution of the first **857 units** installed as part of the PACE project up to October 2019.
- Units have been installed in **9 different countries**
- As of August 2020, **69 units have been installed in the UK** under PACE.

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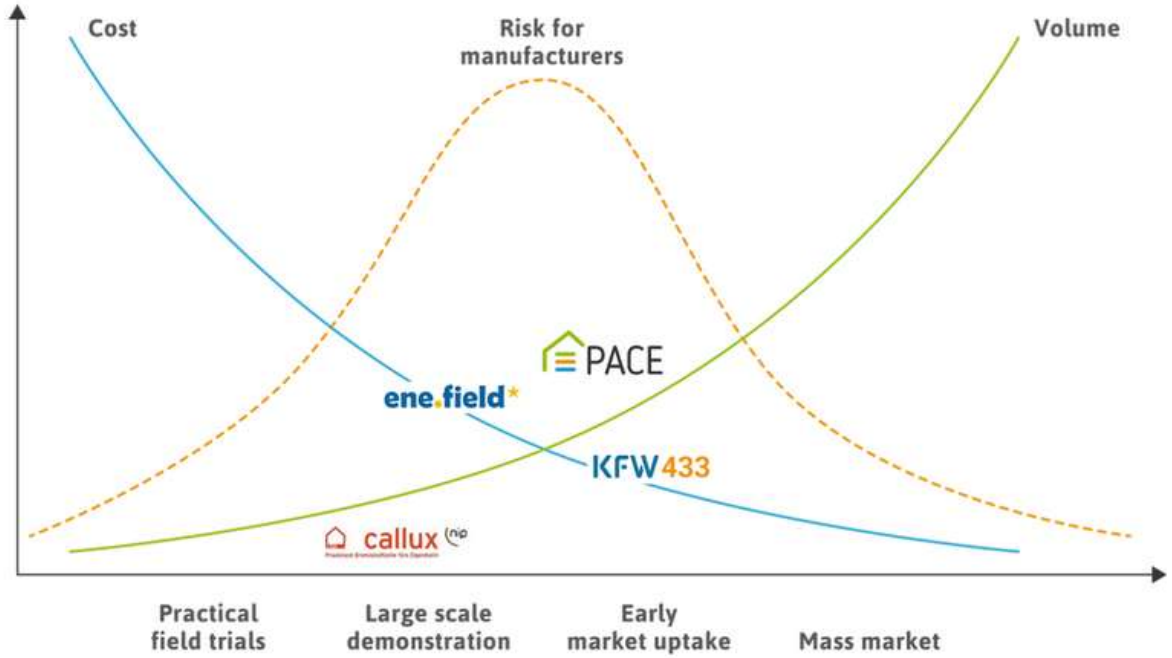
Stationary fuel cells are at a critical stage in market adoption

The FC mCHP Market in the UK

- The technology has passed the phases of **field trial** and **large-scale demonstration** and is now in a phase of **early-to-mass market uptake**.



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- **European manufacturers are showing their commitment** and industrial leadership by launching new products on the market.
- Between 2016-2020, more than **EUR 350 million** was pledged or already invested in stationary fuel cells.
- Further **policy support and incentives are needed to create a level playing field with incumbent and other low carbon technologies.**

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Stationary fuel cells are a fully mature technology

The FC mCHP Market in the UK

- Most PACE **manufacturers** are now offering new '**Generation 2**' or '**Generation Y**' units, which:
  - Have a higher overall **efficiency**;
  - Are cheaper and easier to **mass produce**;
  - Have generally lower **maintenance** requirements and higher **stack lifetimes**.

- Proven **exemplary performance** of stationary fuel cells during previous deployment:
  - > 5.5 million hours of **operation** and 4.5 GWh of **power produced** under **ene.field** [1].
  - >4 million hours of **operation** and 2.5 million kWh of **power produced** under **Callux** project in Germany.

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Source: [1] ene.field report: https://gallery.mailchimp.com/4f2cf878a38d152a781d97560/files/8c221a0d-53ef-4d92-b13a-96323162cd6c/ene.field_Summary_Report_1_.pdf

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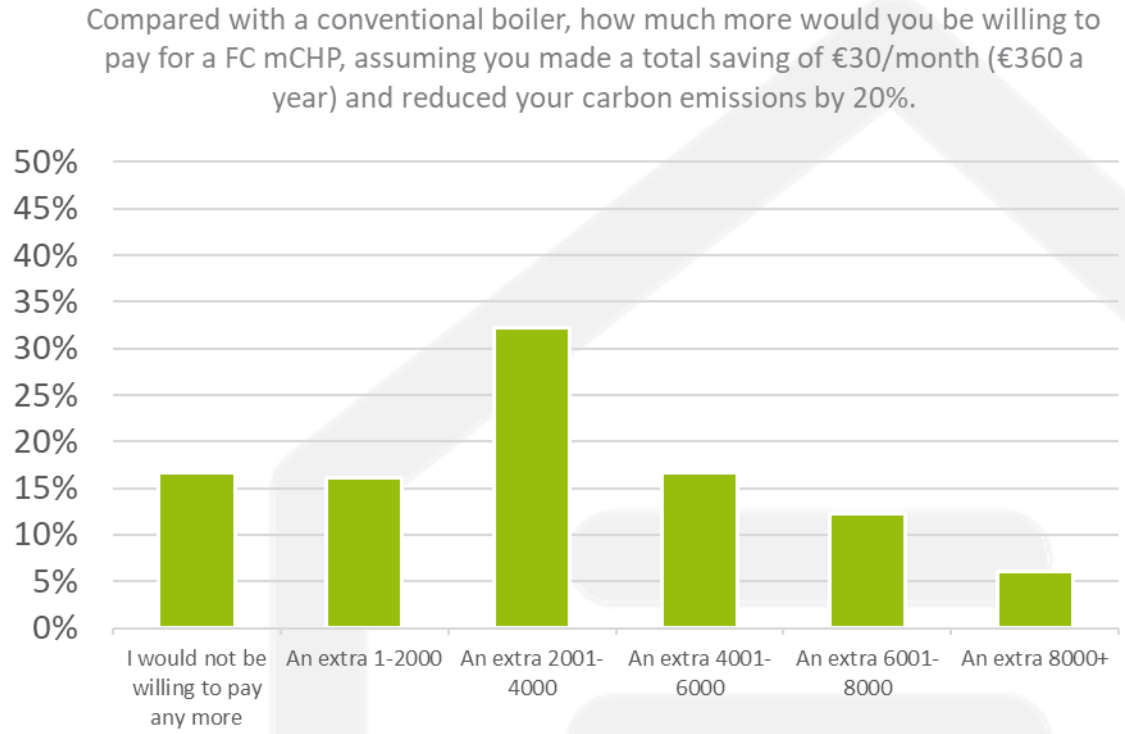
Customer Perceptions – environmental concerns motivate FC mCHP purchases

The FC mCHP Market in the UK

- The three most common primary reasons for buying a Fuel Cell micro-CHP are:
  1. **Overall cost** savings (23%);
  2. **Energy** savings (19%);
  3. **CO_2** emissions reduction (18%).
- Customers generally self-identified as '**green**' and as '**early adopters of new technology**'.
- 77% were willing to **pay a 'little more'** for a product that was less harmful to the environment, but few were willing to pay a 'lot more'
- **>50%** would be **willing to pay an additional €2,000 or more** assuming operational savings (€ 30/month) and reduced carbon emissions (-20%)



- So, whilst carbon reduction is important, cost is also still a key factor

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Source: PACE D2.11: Report 1 on Customer Perceptions to FC mCHP

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UK policy context for stationary fuel cells

- The current UK building stock (25 million homes) has **only 2% low-carbon heating** [1]:
  - At current it will take **700 years** for UK to transition to low-carbon heating [2];
  - The CBI has called for a **ban on new gas boilers** in the UK from 2025. FC mCHP would be exempt from such a plan;
  - Expect **significant policy** targeting this issue over the coming years.

Source: [1] https://energypost.eu/uk-heating-plan-still-means-120-gas-boilers-installed-for-every-low-carbon-system/
[2] https://ukerc.ac.uk/news/committee-launch-decarbonising-heat-in-homes-inquiry/

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FC mCHP funding in the UK

The FC mCHP Market in the UK

- Historically there has been support for FC mCHP purchase and operation in the UK:
  - Up until April 2019, a **feed-in-tariff** (FiT), and the technology was also eligible under the **Green Deal** policy.
- From April 2019, the FiT was closed to new applicants and was replaced by the **Smart Export Guarantee (SEG)** from January 2020. This incentivises electricity export at rates from 3-5.5p/kWh [1], depending on the rate offered by your electricity supplier.
- The '**Green Homes Grant**' (£2bn, Sept 2020-March 2021) announced by the UK government in May 2020 does not cover FC mCHP.

Source: [1] https://www.moneysupermarket.com/gas-and-electricity/feed-in-tariff/

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UK regulations on stationary fuel cells

MCS The Microgeneration Certification Scheme

- To be eligible for grant funding, FC mCHP products and installer must be certified under the **Microgeneration Certification Scheme (MCS)**.
- **Contractors** can be searched for on the mcscertified.com website.
- In addition, the **standard installation requirements** for FC mCHP apply:
  - A main gas connection;
  - Connection to the electricity grid;
  - An internet connection;
  - (A smart meter – for SEG).

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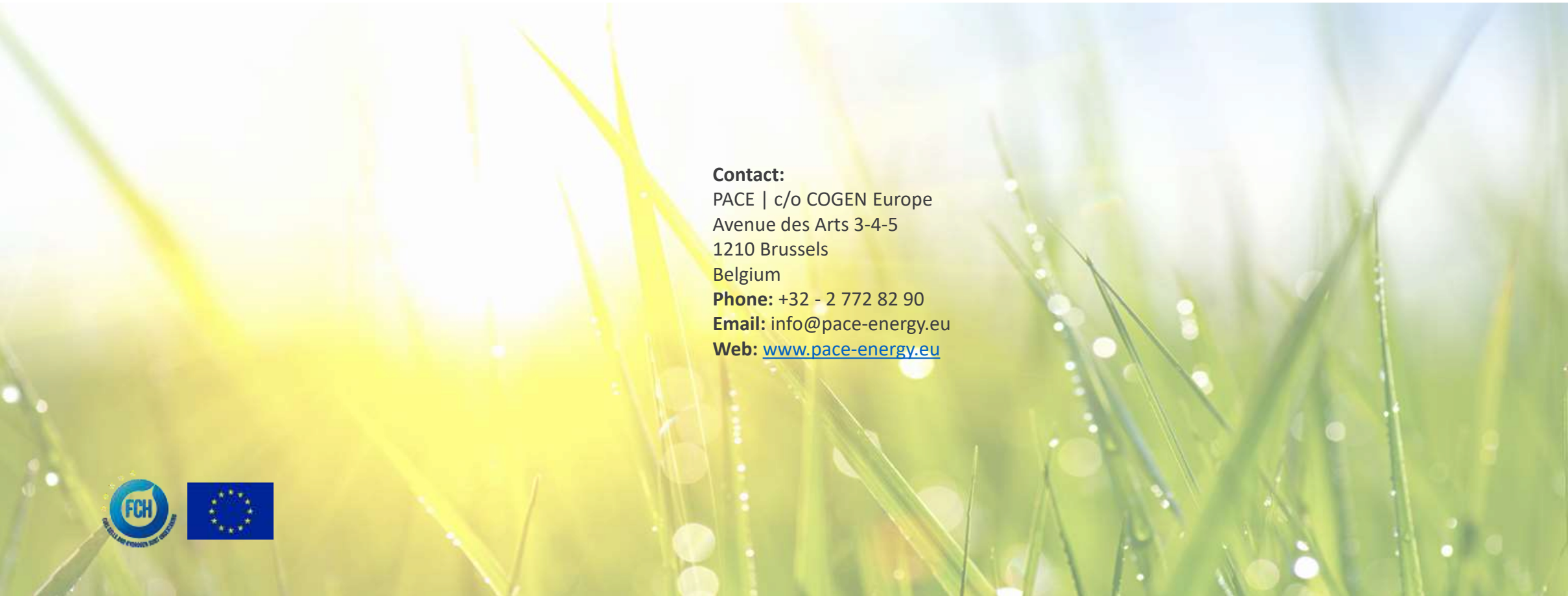

Contact:
PACE | c/o COGEN Europe
Avenue des Arts 3-4-5
1210 Brussels
Belgium
Phone: +32 - 2 772 82 90
Email: info@pace-energy.eu
Web: www.pace-energy.eu