PV Financing webinar: Business models for the next generation of solar PV deployment in the EU

#PVbizmodels
@PVFinancing

PV Financing EU-wide webinar, Monday 6 February 2016
SolarPower Europe

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 646554

www.pv-financing.eu
Intro
Sonia Dunlop, Policy Adviser, SolarPower Europe
Agenda

15:05 Power Purchase Agreements in the UK and elsewhere, Elizabeth Reid, Partner, Bird&Bird LLP
Q&A

15:20 The *Mieterstrom* neighbour solar supply model in Germany, Fabian Zuber, L°energy
Q&A

15:35 The collective self-consumption model in France, Julien Courtel, Project Manager, Observ’ER
Q&A

15:50 Next steps, Sonia Dunlop, Policy Adviser, SolarPower Europe

*A recording of the webinar will be available after the broadcast.*
Send us your questions!

With GoToWebinar (preferred):
Use questions box on right hand side of your screen

Get involved via Twitter:
#PVbizmodels
@PVFinancing
@SolarPowerEU
@twobirdsenergy
@soniakdunlop
@EURObserv_ER
Power Purchase Agreements in the UK and elsewhere

Elizabeth Reid, Partner, Bird&Bird LLP
Power Purchase Agreements in the UK and elsewhere

Elizabeth Reid
Partner, UK

6 February 2017
Traditional PPA Models
PPA structure (Wholesale PPA)
PPA Structure (Offsite sleeved PPA)

- GENERATOR
- CORPORATE CONSUMER
- LICENCED SUPPLIER/ BALANCING PARTY
- GRID

PPA for all power produced by Generator

Back to back PPA – Electricity Supplier purchases all power purchased by Consumer, Consumer repurchases power it uses (performing balancing function)

Price

Price

Price

Title to power

Title to power

Title to power
PPA Structure (Onsite private wire)

- GENERATOR
- PPA for Consumer’s power requirements
- CORPORATE CONSUMER
  - power directly from generator to consumer
  - excess power
  - Separate PPA between Generator and Licensed Supplier for excess power not used by consumer
- LICENCED SUPPLIER/BALANCING PARTY
- GRID
- £
## Comparison of traditional PPA structures

<table>
<thead>
<tr>
<th>Business model</th>
<th>Revenues</th>
<th>Capex</th>
<th>Opex</th>
<th>Cost of capital</th>
<th>Scale</th>
<th>Profitability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wholesale PPA</td>
<td>Low: Wholesale market price</td>
<td>Low due to lack of geographical constraints.</td>
<td>Can be high due to access issues with landowner</td>
<td>Dependant on wholesale electricity projections and how volatile or accurate these are.</td>
<td>Plenty of scale possible as all that is need is land, grid and an off-taker.</td>
<td>Was profitable with ROCs and high price forecasts, now not profitable</td>
</tr>
<tr>
<td>Offsite sleeved PPA</td>
<td>Medium: competing with retail prices, but including grid costs</td>
<td>Same as above, although transactional costs high due to complicated legal structure</td>
<td>Same as above</td>
<td>Dependant on credit-worthiness of corporate consumer, which has proven challenging</td>
<td>Similar to above, but transactional costs quite high, so not suited to smaller projects.</td>
<td>Was profitable with ROCs, now may not be profitable</td>
</tr>
<tr>
<td>Onsite private wire</td>
<td>High: competing with commercial retail prices, avoiding grid costs</td>
<td>Potential reductions through e.g. grid efficiencies, but potential challenges from geographical constraints.</td>
<td>Same as above, although rental costs and access may differ on consumer-owned sites</td>
<td>Dependant on credit-worthiness of corporate consumer, which has proven challenging. Additional challenges from “stranded asset” risk</td>
<td>Limited market size, as challenging set of requirements.</td>
<td>In theory profitable, but challenges remain making projects viable.</td>
</tr>
</tbody>
</table>
Innovative PPA Models
PPA Structure (Mini Utility)

- **GENERATOR**
  - 100% PPA for all power produced by Generator
  -title to power

- **UTILITY FUND/BALANCING PARTY**
  - £
  - PPA – Consumer purchases power it uses from Licensed Supplier. Licensed Supplier performs balancing function

- **CORPORATE CONSUMER**
  - 100% to Grid

- **GRID**
  - £
  - power
PPA Structure (Synthetic PPA)

- **GENERATOR**
  - PPA for all power produced by Generator – Generator receives market price for power produced

- **LICENCED SUPPLIER/ BALANCING PARTY**
  - Title to power
  - £

- **GRID**

- **CORPORATE CONSUMER**
  - Contract (e.g. hedge or Contract for Difference) where Generator and Consumer agree fixed price – Generator receives market price under PPA and Generator and Consumer settle difference between market price and fixed price
  - £
  - £
  - £

- Consumer purchases power requirements wholesale from grid
Thank you!

Elizabeth Reid
Partner, Bird & Bird
elizabeth.reid@twobirds.com
(00 44 20) 7905 6226
Q&A

Elizabeth Reid, Partner, Bird&Bird LLP
The *Mieterstrom* neighbour solar supply model in Germany

Fabian Zuber, L°energy
“Mieterstrom”
Fabian Zuber | l°energy
6th Februar 2017

The neighbour solar supply model in Germany

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 646554
About l°energy | local energy markets

l°energy

- l°energy is a Berlin based consulting company.
- We offer Market Analysis and Business Development for local energy markets.
- Fabian Zuber is founder of l°energy and has over 12 years experience in the renewable energy market.

References

Project Partners
Local energy markets gain importance

Regional supply
District supply
Neighbour supply
Self supply

Digitalization

Community supply
Producer
Prosumer
Consumer

Consumer
Prosumer
Producer
Prosumer
Prosumer

Fabian Zuber | l’energy | „Mieterstrom“ | 6th Februar 2017
1. Neighbour solar supply is based on **locally generated electricity** from PV plants and/or combined heat and power (CHP).

2. Electricity is **used directly by the tenants** in multi-family houses or commercial buildings.

3. Mieterstrom-products are usually a **mix of direct supply and grid supply**.

4. A building can have **participating and non-participating tenants**.

**Mieterstrom: The neighbour solar supply model in Germany:**

Source: Mieterstrom-Leitfaden 2016, BSW
Comparison of business models

<table>
<thead>
<tr>
<th>BUSINESS MODELS</th>
<th>ON-SITE CONSUMPTION AND LEASE MODEL</th>
<th>NEIGHBOUR SOLAR SUPPLY</th>
<th>REGIONAL ELECTRICITY, BOROUGH ELECTRICITY AND NEIGHBOURHOOD ELECTRICITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply relationship</td>
<td>The plant operator and final power consumer must be the same entity. Note: This is established through the lease contract or sale of the PV installation to the power consumer.</td>
<td>Supply to third parties</td>
<td>Supply to third parties</td>
</tr>
<tr>
<td>Grid use and grid charges</td>
<td>No use of the public grid. Consequently, no grid charges are due.</td>
<td>No use of the public grid. Consequently, no grid charges are due.</td>
<td>Use of the public grid. Grid charges are due.</td>
</tr>
<tr>
<td>EEG levy (tax)</td>
<td>Up to 40% of the EEG levy is due. For small installations the &quot;small installation regulation&quot; applies where electricity from installations with a maximum capacity of 10kWp up to an on site consumption of 10 MWh/year, is 100% exempt from the EEG levy.</td>
<td>100% of the EEG levy is due, although this is due to change shortly (with the EEG amendment 2017) and the installation will be power will be exempted from a percentage of the levy.</td>
<td>100% of the EEG levy is due.</td>
</tr>
<tr>
<td>EEG remuneration or feed-in tariff</td>
<td>For the self-consumed quantity of electricity, in accordance with EEG, no remuneration is paid.</td>
<td>For the directly-consumed quantity of electricity, in accordance with EEG feed-in tariff, no remuneration is paid.</td>
<td>The quantity of electricity fed into the grid will be remunerated at the valid EEG feed-in tariff rate for 20 years.</td>
</tr>
</tbody>
</table>

Specifics of Mieterstrom:
- Delivery to a third party (no person identity)
- No use of the grid
- No grid charges
- 100 % EEG levy (6.35 €Ct/kWh)
- No EEG–feed–in–tariff is paid for directly used electricity

Source: EU–WIDE SOLAR PV BUSINESS MODELS 2016, PV FINANCING project | November 2016
Political Framework: Support to come?

1. Providers of the neighbour solar supply model deliver electricity to final consumers and must therefore satisfy the requirements of a licensed supplier as stipulated in the Energy Industry Law (EnWG).

2. Political framework is unclear and inconsistent.

3. Specific support programs at regional level have been implemented in several states in 2016 / 2017.

4. Amendment of the Renewable Energy Law (EEG 2017): The federal government is authorized, through legislative decree to reduce the EEG surcharge that operators of solar installations must currently pay (only for PV on residential buildings).

5. Newest proposal by the government is to skip decree and implement a “Mieterstrom”-law instead that would implement a tariff for directly used electricity.

1. **New market**: Business models are being developed only since 2013 – rapidly growing interest since 2016.

2. **Several hundred projects** have been realized or are being planned (PV based projects are less common than CPH).

3. **About 3 million apartments /tenants** are eligible for the supply model.

4. Maximum potential of “Mieterstrom” could lead to approx. **3–4 TWh** of direct PV electricity use.

Sources: HEG, Mieterstrom-Leitfaden 2016, BSW, Prognos & BH&W, Mieterstrom, 2017
Broad variety of players in the market

About 30–40 first movers are active – many new players are entering the market segment

Real estate sector players:
1. The cooperative real estate
2. The municipal real estate
3. The commercial real estate
4. Homeowners’ associations

Energy sector players:
1. Public utilities
2. Energy supply companies
3. Green electricity providers
4. Energy cooperatives
1. Economic profitability under given circumstances is only given in best case scenarios.

2. Direct use of PV electricity usually covers about 50–75% of total production. The rest is fed into the grid.

3. Participating households can usually cover 25 to 35 percent of their own electricity requirements via the PV.

4. Many factors have to be taken into consideration (e.g. participating tenants, size of PV system, location).
Profitability calculation tool: fz@local-energy-markets.de

Mieterstrom Guideline: www.pv-mieterstrom.de/

Fabian Zuber | l’energy | „Mieterstrom“ | 6th February 2017
Q&A

Fabian Zuber, L’energy
The collective self-consumption model in France

Julien Courtel, Project Manager, Observ’ER
Collective self-consumption in France

Julien Courtel, Observ’ER

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 646554
Brief history of self-consumption in France

- 2010, Law NOME
- 2014, Governmental working group
- 2Q15, Energy Transition Law
- August 16, Ordinance on SC

Would you consider investing in a PV installation with self consumption?

- YES 47%
- NO 53%

When?

- 64%
- 26%
- 10%

Source: Enerplan colloquium, 25 May 2016

Public opinion: ✔
Regulatory framework: ✔
Start-ups, SMEs and companies: ✔

France is going to self-consume part of its PV electricity
Collective self-consumption schemes

“Self-consumption is collective when the electricity supply is taking place between one or more electricity producers and one or more end consumers, linked together by a legal entity ...” (beginning of Art. L 315-2, Energy Code).

- Producers and consumers **HAVE TO** be part of a same legal entity.
- The choice of the type of entity is free (company, cooperative, association...)
- The entity in charge of the whole operation:
  - It manages the relationship between consumers and producers
  - It informs the grid operator about the breakdown of consumed electricity among consumers
REX will be key to overcome uncertainties

“The grid operators have to implement technical and contractual process in order to facilitate self-consumption operations” (end of Art. L 315-6, Energy Code).

This is a limitation to some reluctance that may have been observed locally on the part of grid operators

“...and from which the injection and exit points are on the same low-voltage loop of the public distribution grid.” (end of Art. L 315-2, Energy Code).

Geographic coherence and a preservation of suppliers’ interests

“...the electricity supply ...” (end of Art. L 315-2, Energy Code).

If the electricity producer is a “supplier” he will have to comply with many obligations
New ordinance: private grids (16 December 2016)

« A private grid is a distribution network that brings electricity inside a closed site and which supplies one or more non-residential consumers... » (Art 344-1, Energy Code)

A good opportunity for project developers interested in collective self-consumption but were limited by the low-voltage loop

« The private grid operator has to facilitate the use of renewable energies on his grid » (Art 344-5, Energy Code)

2 conditions to be allowed to create a private grid (alternative)

This grid is created for specific « technical or security reasons ».

Companies have to be linked (subsidiary companies).

These new rules create new relationships that need a contractual framework.

Producer

PVFINANCING

Operator

PVFINANCING

Consumer
Thank you for your attention

Julien Courtel
julien.courtel@energies-renouvelables.org
Observ’ER
146, rue de l’Université,
75007 PARIS
France
Q&A

Julien Courtel, Project Manager, Observ’ER
More information and next steps

Sonia Dunlop, Policy Adviser, SolarPower Europe
National contract templates and business model guidelines
Index: national documents

AUSTRIA
Roof rental contract Dachvermietung (Österreich)
Leasing contract Pachtvertrag (Österreich)
Solar cooperative association by-laws Vereinstatuten (Österreich)
Self-consumption model guidelines Leitfaden zu PV-Eigenverbrauchsmodellen
Policy advisory paper Austria Nationales Positionspapier

FRANCE
Collective self-consumption contract Modèle d’autoconsommation collective d’électricité (France)
Surplus electricity in collective self consumption electricity contract Modèle de contrat de vente du surplus d’électricité dans le cadre d’une autoconsommation collective (France)
Solar business model implementation guidelines Guide de Mise en Oeuvre de Projets PV en France
Policy advisory paper France Recommandations pour un deployment accru du photovoltaïque en France

GERMANY
Neighbour electricity model implementation guidelines “Geschäftsmodelle Mit Pm-Mieterstrom”
Policy advisory paper Germany Nationales Positionspapier

ITALY
Operational leasing contract for a PV plant Contratto di locazione operativa di impianto fotovoltaico (italia)
Power Purchase Agreement contract for electricity supply through a PV plant Accordo per la costruzione di impianto dedicato e somministrazione di energia elettrica secondo lo schema del sistema efficiente di utenza (italia)
Solar business model implementation guidelines Impianti fotovoltaici: linee guida per l’implementazione
Policy advisory paper Italy Fotovoltaico in Italia, quale politiche di supporto?
Index (contd)

SPAIN
Contract template for the participation in the crowdfunding of a PV installation Contrato de cuentas en participación para la explotación de una instalación fotovoltaica ubicada en (España)
Contract template for representation in the electricity trading market for a prosumer with self-consumption 2 Contrato de representación de mercado para la venta de excedentes de una instalación del autoconsumo (España)
Cooperative by-laws template Plantilla de estatutos corporativa (España)
Solar business model implementation guidelines Pautas de Implementación Nacional
National report on regulatory framework Spain Informe nacional de asesoramiento regulatorio

TURKEY
Contract for lease of PV system FV sistemlerin kirallanması için Örnek Kontrat
Electricity utility, investor and solar supplier contract Kontrat tipi 1: Kamu Hizmetleri(Elektrik), yatırımcı ve solar tedarikçi model I (Türkiye)
Electricity supply contract for solar PV electricity supply and example electricity bill Fotovoltaik Elektrik Arzı ve Örnek Elektrik faturası için Örnek Elektrik Arzı Sözleşmesi (Türkiye)
Solar business model implementation guidelines Ulusal uygulama rehberi
Policy advisory paper Turkey Ulusal Politika Tavsiye Belgesi

UNITED KINGDOM
Power Purchase Agreement (United Kingdom)
Making Solar Pay: the future of the solar PPA market in the UK
UK National Policy Advisory Paper

Click here for full list
EU-wide Solar PV Business Models

Guidelines for Implementation

A guide for investors and developers on how to put into place and finance the top business models for solar PV across the EU.

PV Financing project | November 2016
Deliverable 6.4 – Public – EU Implementation Guidelines

Sonia Dunlop - Alexandre Roesch
SolarPower Europe

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 646584.

EU Policy Advisory Paper

PV Financing Project
Deliverable 6.4 – Public
January 2017

European Union

Author:

SolarPower Europe
Sonia Dunlop
Alexandre Roesch
James Watson

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 646584.

www.pv-financing.eu
Cash flow models

Is a PV system a worthwhile investment for me?

The following calculation tool will answer this question by comparing the cost per kilowatt hour (kWh) PV electric options which may be selected by you. In case the PV electricity will be self-consumed by you as the plant on grid electricity price and the net savings are presented as main result. In case you supply the PV electricity to the PV electricity cost and the net-profit is presented as main result. In addition, some key economic figures.

The underlying excel tools can be downloaded on the bottom right. In order to adjust the calculations to your adjust the sliders below each chart. Your adjustments directly influence the PV electricity cost of the PV enter in the box on the right.

United Kingdom  Self-consumption

How much does your PV system cost per kWp?

If you have received a quote from a PV installer simply divide your total cost by the system size in kWp. Please make sure to include or exclude sales tax as a private individual or a company. Reference values:

Typical residential systems cost between 1,300 - 1,500 €/kWp and commercial systems between 1,100 - 1,3
Forthcoming events and webinars

- National webinars (in national languages) for seven countries: Austria, Germany, France, Italy, Spain, Turkey and United Kingdom
  - Contact the national partners for more information.
  - Italy webinar on Mon 20 February 15:00-16:30.
- Event in Brussels to present results to policymakers in April-May 2017
  - Contact SolarPower Europe for more information.
- Possible national webinars in other EU Member States to disseminate project results
  - Check @PVFinancing on Twitter for more information.
Thank you for joining our webinar

Sonia Dunlop
Policy Adviser, SolarPower Europe
Email: s.dunlop@solarpowereurope.org
Phone: +32 (0)2 709 55 28