



Solar Photovoltaic (PV) Systems: The Investor's Guide

ABSTRACT

This white paper is provided to the business owner, or investor, who wishes to gain comprehensive understanding of an investment in solar energy through the Feed-in Tariff scheme. First, we explain the Feed-in Tariff scheme, as it is the source of the bulk of the return from a solar energy system. We then give a description of the investment opportunity, the risks involved and the benefits, as well as a brief overview of certain key technicalities and the details of 2 case studies. Finally, ING Solar Ltd is proposed as a suitable installer choice for any type of installation.

CONTENTS

Abstract.....	2
Contents.....	2
Feed-in Tariffs explained.....	3
The Solar Investment	5
Return on Investment.....	5
Risk Analysis.....	5
Benefits of an Investment in Solar.....	6
Technicalities	7
Can the grid support the solar energy system?.....	7
What is the shape and structure of the roof?	7
How many electrical supplies are connected to the property?.....	7
The Solar investment: two case studies.....	8
Case Study 1	8
Case study 2.....	9
About ING Solar	10

“ WHAT IS THE FEED-IN TARIFF ORDER 2010

The Feed-in Tariff Order 2010 is meant to promote widespread uptake of a range of small-scale renewable and low-carbon electricity generation technologies.

WHAT IS A FIT?

FIT stands for Feed-In Tarrif. It represents the fixed sum per unit of electricity produced that suppliers are obligated to pay micro-generators under the Feed-in Tariff Order 2010. ”

FEED-IN TARIFFS EXPLAINED

The Feed-in Tariff (FIT) scheme, introduced by the government in April 2010, is designed to help the UK achieve its goal of 15% of country-wide energy generation from renewable sources by 2020. It is designed to trigger a small scale **revolution** in how energy generation is viewed, with micro-generation by home and business owners to take over a significant proportion of the total energy generated in the UK.

Enacted by parliament as “The Feed-in Tariff Order 2010”, the law imposes on licensed electricity suppliers to enter a **25 year agreement** with micro-generators. Under the FIT agreement suppliers are obliged to pay the micro-generator a fixed sum per unit of electricity produced (the FIT rate), and, **in addition**, to buy any excess electricity from the micro-generator. Importantly, the electricity suppliers are also required to be able to take over agreements with micro-generators that were initiated with a different electricity supplier. FIT payments are **inflation** index linked, and can be **tax-free** if the FIT agreement is in the name of a private individual and not a company.

Through the establishment of the “**Levelisation Fund**”, the FIT scheme is constructed so that electricity suppliers are **NOT** competitively disadvantaged by having to make FIT payments to micro-generators. At the end of every FIT year (March 31st), all licensed electricity suppliers declare the total amount of FIT payments they have made and the average FIT expenditure per supplier, weighted by its market share, is calculated. If a supplier’s FIT payments are lower than this amount, then they are required to pay into the Levelisation Fund. If a supplier’s FIT payments are greater than this amount, then they receive money from the Levelisation Fund. This way, the funds going into the Levelisation Fund are always **exactly the same** as the funds leaving the Levelisation Fund, and no electricity supplier is at an advantage or disadvantage vis-à-vis the rest of the industry due to the FIT system.

It is expected that since FIT rates are significantly higher than current electricity market prices, to recoup the FIT costs suppliers will have to **raise** electricity prices. Thus, overall competitiveness within the electricity supply industry is not hurt; however, electricity prices from renewable sources will naturally become more competitive due to the effective price floor created by the added cost to suppliers. This can also be seen as a form of **taxation** on electricity revenues, where the revenue of the tax is streamed to the micro-generators. Therefore, owners of properties that do not micro-generate are at a definite **disadvantage**; they are paying the tax in the form of higher electricity prices, but are not receiving the benefit (FIT income).

The FIT scheme is thus constructed to limit government involvement in the scheme’s implementation and oversight. Although the Office of the Gas and Electricity Markets (OFGEM) is charged with some oversight responsibilities, such as administrating the Levelisation Fund, FITs are expected to fully **integrate** into existing electricity market structures.

As per Table 1, FIT rates are lower for larger sized systems. Importantly, the FIT rates are currently scheduled to be reduced over time as well. This does not affect FIT agreements that have already been signed.

	PV	PV	PV	PV	PV	PV
	≤ 4 kW newbuild*	≤ 4 kW retrofit*	> 4 to 10 kW	> 10 to 100 kW	> 100 kW to 5 MW	Stand alone*
1/4/10 to 31/3/11	36.1	41.3	36.1	31.4	29.3	29.3
to 31/3/12	36.1	41.3	36.1	31.4	29.3	29.3
to 31/3/13	33.0	37.8	33.0	28.7	26.8	26.8
to 31/3/14	30.2	34.6	30.2	26.3	24.5	24.5
to 31/3/15	27.6	31.6	27.6	24.0	22.4	22.4
to 31/3/16	25.1	28.8	25.1	21.9	20.4	20.4
to 31/3/17	22.9	26.2	22.9	19.9	18.6	18.6
to 31/3/18	20.8	23.8	20.8	18.1	16.9	16.9
to 31/3/19	19.0	21.7	19.0	16.5	15.4	15.4
to 31/3/20	17.2	19.7	17.2	15.0	14.0	14.0
to 31/3/21	15.7	18.0	15.7	13.6	12.7	12.7
Tarrif Time (Years)	25	25	25	25	25	25

Table 1: FIT Rates

* “Retrofit” means installed on a building which is already occupied ;“New Build” means where installed on a new building before first occupation ; “Stand-alone” means not attached to a building and not wired to provide electricity to an occupied building.

THE SOLAR INVESTMENT

Return on Investment

The percentage annual return on an investment in a solar energy installation is determined by dividing the total annual return by the total cost of purchase and installation. The aggregated annual return on investment over 25 years, minus the cost of the investment equals the net present value of the investment. Since the FIT payments are inflation-index linked the figures are naturally in current terms and do not need to be adjusted.

Both the cost and the return will depend on the physical attributes of the property, the size of the installation and the products chosen. The annual return also depends on the FIT rate, and the amount of generated electricity that is used versus the amount that is exported. In general, the larger the system, the lower the cost per kilo-watt and the greater the percentage annual return on the investment. The price at which excess electricity is sold back to the grid is currently 3 pence per kilo-watt-hour.

Generally speaking, the percentage annual returns from small solar energy systems of up to 4 kilo-watt are between 8-12% with a net present value of £10,000-£25,000. For larger systems, costs go down and the annual return on investment can go up to mid-teen returns, or even higher (see case studies below).

WE MINIMIZE YOUR RISK

- All equipment employed by ING Solar comes with manufacturer warranties
- Solar modules come with power output guarantees
- ING Solar Ltd offers a workmanship warranty underwritten by REIGA

Risk Analysis

A common misconception is to assume that since the FIT scheme was enacted by parliament, than a primary risk to the investment is an alteration or withdrawal of the legislation. Although this is indeed a risk to investors who plan on entering a FIT agreement in the future, this is **not** a risk to investors who have already entered a FIT agreement with an electricity supplier. The FIT agreement is a **legally enforceable** contract between the micro-generator and the electricity supplier, it is entered into and binding for 25 years, and once signed is not subject to any legislative, or executive decisions by parliament or government.

Because the Feed-in Tariff Order 2010 requires all electricity suppliers with 50,000 customers or more to make themselves available to registering and providing FIT payments to new, or existing, micro-generators, the risk that any single electricity suppliers ceases to exist, or for some reason ceases to pay FITs, is **not** a risk to the investment. A FIT agreement with one supplier can be **transferred** to another supplier who will resume FIT payments for the remainder of the agreement's life time.

The risk that companies will attempt to find a way to cheat on FIT payments is mitigated by the existence of the Levelisation Fund mechanism (see Feed-in Tariffs explained). In any event, the electricity meter that comes with a solar energy system allows full supervision of expected payments. Outstanding payments are legally pursuable under breach of contract.

The risk of faulty equipment and natural disasters is mitigated through warranties and power output guarantees. All equipment employed by ING Solar comes with manufacturer warranties, solar modules come with power output guarantees as well, and ING Solar Ltd offers a workmanship warranty which is underwritten by REIGA (see <http://www.reiga.org.uk>).

Benefits of an Investment in Solar

Low risk

As all main risk factors are largely mitigated or completely avoided, and because of the structure of the FIT scheme, it appears that there is very little risk involved in a solar energy investment. With a signed contract for 25 years that can be transferred to another electricity supplier in the case of a default on payments, the only scenario in which FIT payments will cease is if the UK goes completely dark and there are no longer electricity suppliers. This seems less likely than a default by the UK government. Therefore, one can conclude that an investment in solar energy today is as safe, if not safer, than an investment in UK government issued bonds. With annual yields for UK 30 year bonds standing at no more than 5%, the double digit return on a solar energy investment is remarkably attractive.

Investment diversification

With global economies bound together ever more tightly, investors and business owners are facing increased difficulties to achieve adequate investment diversification. As the yield from FIT is fixed, it is uncorrelated to shifts in markets or economic volatility. Additionally, all main risk factors are uncorrelated to most asset classes, and particularly to any traditional investment asset classes.

A hedge against rising electricity prices

Electricity prices are expected to rise, not just because of predicted rising demand, short supply and EU taxations on carbon emitting processes, but because of the artificial price floor created by the FIT scheme. To gain the benefit of the FIT scheme and not be disadvantaged by inevitable rising prices in electricity prices, it is in the property owners' clear interest to install FIT registered systems as soon as possible. This results in a government enacted positive-feedback scenario in which the more micro-generators are registered and earn FITs from suppliers, the more prices are pushed higher resulting in greater pressure on property owners to start micro-generating. Therefore, electricity prices are expected to shoot up swiftly in the coming years, and a solar energy system offers the only physical hedge against these price rises.

A green image for your company

Companies are increasingly expected to exhibit environmentally responsible behaviour. The green energy that is produced with a solar energy system is not only an attractive investment in itself, it offers the opportunity to offset your carbon emissions and reduce your overall carbon footprint.

TECHNICALITIES

Can the grid support the solar energy system?

If the solar energy system to be installed is larger than 4 kilo-watts for single phase, or 3.6 kilo-watt **per** phase for triple phase, than the first issue is whether the local electrical grid can support the system. This can be established by submitting a G83 form (downloaded from the [Energy Networks Association website](#)) to the local Distribution Network Operator (DNO). To find out who is the local DNO see the map on the [Energy Networks Association website](#).

What is the shape and structure of the roof?

The physical attributes that need to be known, and if are not known will be measured by an ING Solar site surveyor and/or structural engineer, are as follows.

In the case of a pitched roof:

1. Height of roof from eaves to ridge.
2. Inclination of roof
3. Length of roof from one end to the other
4. Orientation of the roof (any orientation from east to west that is open to the south will provide attractive returns, but south facing is ideal)
5. Can the roof bear the weight of an extra 20 KG per m²?

In the case of a flat roof:

1. The length of the sides of the roof and their orientation
2. Can the roof bear the weight of an extra 25-30 KG per m²?

How many electrical supplies are connected to the property?

As the following case studies demonstrate, a crucial issue to designing a solar energy system that will maximise returns is the number of electrical supplies connected to the property. This is important because, as the FIT rate decreases for larger systems (see Table 1), it is often possible to design large systems that, distributed over multiple supplies, will generate a higher FIT rate than if connected to a single supply only.

ROOF OWNERSHIP

In cases such as apartment blocks where there are multiple residents or tenants, with some areas that are communal, the solar energy system will be connected to the electricity supplies to the communal areas. Thus, it is the free holder who will benefit from the FITs and Export Tariffs.

THE SOLAR INVESTMENT: TWO CASE STUDIES

The following case studies are made with the government's standard assessment procedure (SAP). The SAP is highly conservative, and in ING Solar's experience, depending on the location of the solar installation, it is 10%-30% **lower** than actual returns. Please note that these case studies are presented only as examples. Every site needs to be assessed individually and price quotations are given on a project by project basis.

Case Study 1

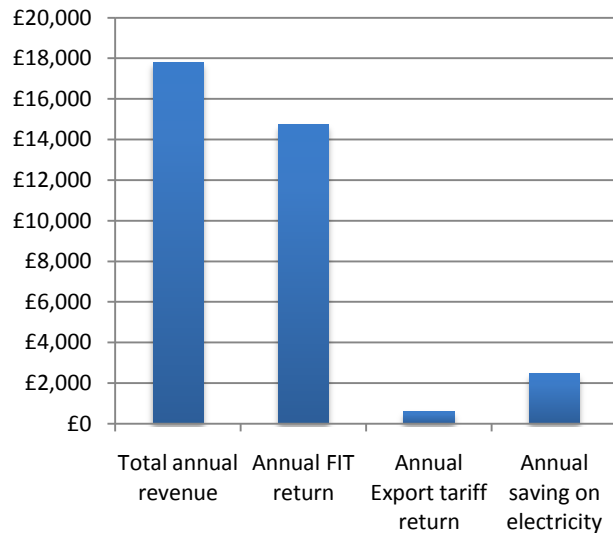
Description

Fairview New Homes Ltd (FNH) approached ING Solar to install solar energy systems for their housing project in High Wycombe. The new project comprised of 17 houses and 2 apartment blocks. By installing solar energy systems, FNH reduced the Dwellings' Emissions Rate (DER), as now required by building regulations, but is also recouping their costs, and earning a tidy profit through the FITs. The total size of the installed system is 57 kilo-watts, where 8 kilo-watts was installed on the houses and the remainder 49 kilo-watts was installed on the two blocks. As FNH only retained free hold ownership of the blocks, and sold the houses, we only take into consideration the 49 kilo-watt installed on the blocks. The significance of the 57 kilo-watts is only in pushing down the cost of installation of the system which was £3,500 per kilo-watt. With a majority of electricity exported, and only a fraction used to power the lighting on the staircases in the two buildings, ING Solar installed an export meter to ensure that FNH received the full export tariffs deserved. The first building, block A, has 5 Staircase halls each with a separate electrical supply, thus 5 electrical supplies. Block B has 4 electrical supplies, one for each staircase hall. Therefore, the FIT rate for the systems on the blocks is 36.1 pence per kilo-watt-hour. Assuming 70% export and 12p per kilo-watt-hour price of electricity from supplier, the returns are as follows:

Proposal 1 Returns

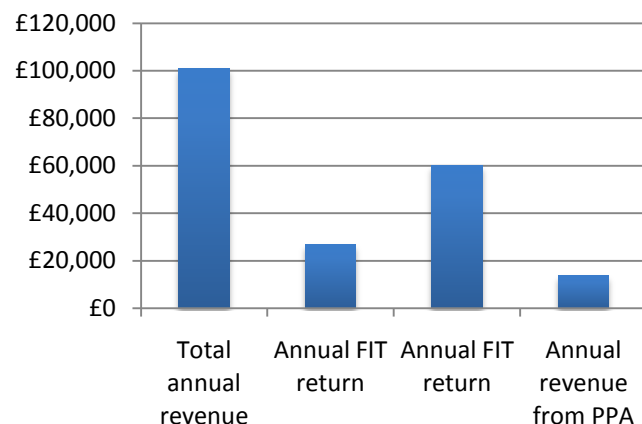
Annual power output	40,846 kilo-watt-hours	Total annual revenue	£17,810
Annual CO2 reduction	22,057 kg	Total cost of installation	£171,500
Annual FIT return	£14,746	% annual return	10.4%
Annual Export tariff return	£613	Net present value	£445,250
Annual saving on electricity	£2,451		

CASE STUDY 1 RETURNS

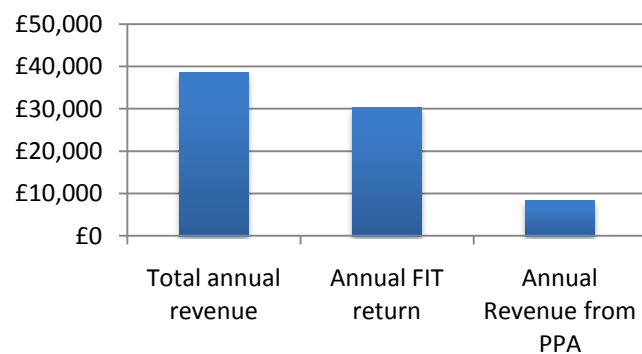


CASE STUDY 2 RETURNS

Proposal 1 Returns



Proposal 2 Returns



Case study 2

Description

The property is a large industrial compound with 10 tenants on long-term leases. Each leased unit has its own electricity supply source. The roof is pitched at 15° angle and is south facing with no shading factors. The roof has the space for, and can bear the weight of, a 300 kilo-watt system. The owner of the property entered a power purchase agreement (PPA) with his tenants to sell them the electricity at 10 pence per kilowatt-hour. The tenants are manufacturing firms and utilise large amounts of energy, thus the owner is confident that close to 100% of his system's output will be purchased by his tenants. ING Solar's price for this project was £2,900 per kilo-watt.

The first proposal from ING Solar was to harness the full space of the roof and install a 300 kilo-watt system. The existence of 10 separate electricity supplies is used to maximise FIT returns in the following way:

7 of the electricity supplies would be connected to 10 kilo-watts each. This means that each one of these systems is generating the higher FIT rate of 36.4 pence per kilo-watt-hour, giving a total of 70 kilo-watts generating FITs at this higher rate. The 3 remaining supplies would be distributed across the remaining 230 kilo-watts to ensure that each supply-connected system is smaller than 100 kilo-watts, and is generating 31.4 pence per kilo-watt-hour in FITs.

The second proposal was to install a smaller system of 100 kilo-watts, which, distributed across 10 electricity supplies would generate the higher FIT rate, and result in a higher percentage return on investment.

Proposal 1 Returns

Annual power output	250,080 kilo-watt-hours	Total annual revenue	£100,874
Annual CO2 reduction	135,043 kg	Total cost of installation	£870,000
Annual FIT return from 70kw at 36.1p	£26,900	Percentage annual return	11.5%
Annual FIT return from 230kw at 31.4p	£60,202	Net present value	£1,651,850
Annual revenue from PPA	£13,772		

Proposal 2 Returns

Annual power output	83,360 kilo-watt-hours	Total annual revenue	£38,679
Annual CO2 reduction	45,014 kg	Total cost of installation	£290,000
Annual FIT return	£30,343	Percentage annual return	13.3%
Annual revenue from PPA	£8,336	Net present value	£676,975

ABOUT ING SOLAR

ING Solar, an Essex based company, has been in the solar energy industry for over three years and is a fast growing company with long term, and wide ranging aspirations. ING Solar is MCS certified, is a member of the Renewable Energy Association Limited (REAL) scheme, and provides a 10 years workmanship guarantee underwritten by REIGA. ING Solar's excellent track record with previous customers is independently verified by a customer survey which was carried out by a third party, and the willingness of many of our past customers to directly communicate their experience to prospective customers speaks well of our product and service.

ING Solar Ltd is an affiliate of the long standing and reputable construction company ING Ltd, as well as the cable insertion and removal company, Nigesta Finishing Ltd. Therefore, ING Solar is financially secure from downturns in business activity and has easy access to large numbers of workmen, making it flexible to smoothly expand operations at times of expanded activity. ING Solar's 4 executive officers have backgrounds managing successful businesses in the fields of electric engineering and construction, and employ an efficient and effective staff to ensure smooth running of logistics and projects management. Management's first priority is, at all times, to maintain ING Solar's personal, high quality and timely customer service.

Contact Details

Head Office

25 Greatfields Road
Barking, Essex
IG11 7TX, UK

Contact Details

Tel: +442085176610

Fax: +442085176611

E-mail: info@ingsolarenergy.co.uk

Web: www.ingsolarenergy.co.uk



