SOLAR TRADE ASSOCIATION

THE SOLAR INDEPENDENCE PLAN *for Britain*

Blueprint for a New Government

Contents

May 2015. The STA would like to thank the Solar Independence Campaign funders for their support in producing this report. The Solar Trade Association (STA) is a not-for-profit membership association representing the UK solar industry. Our mission is to empower the UK solar transformation and pave the way for solar to deliver the maximum possible share of UK energy by 2030 by enabling a bigger and better solar industry.

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Executive summary

Solar power has seen spectacular growth in Britain and around the world over the last five years. From a negligible level at the time of the last General Election in 2010, solar now provides 1.5% of the UK's electricity, supporting over 30,000 jobs across the country (including the supply chain). Prices have tumbled rapidly, allowing the Government to cut subsidies by about two-thirds during the lifetime of the last Parliament. Solar power continues to be hugely popular, with over 80% of the public supporting it in repeated surveys.

Solar power accounts for only a small proportion of expenditure on renewables. Nevertheless its speed of cost reduction and deployment has surprised policy makers managing limited budgets, and challenged assumptions about the mix of technologies needed to achieve the UK's renewables targets. In addition, constraints to the grid are restricting deployment of solar and other renewables. Together these issues risk stalling progress on the path to zero subsidy.

The world is now moving irreversibly towards a solar future, with huge consequences for the energy sector. Solar promises true energy independence for the UK, particularly when allied with other renewables, electric vehicles and energy storage.

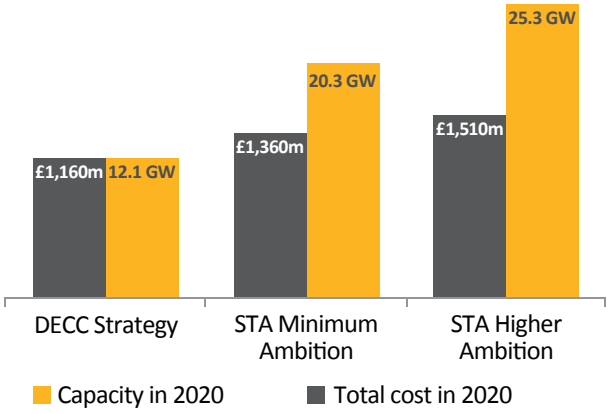
The incoming Government has a tremendous opportunity to embrace this 'solar revolution' and guide it on a path of growth to realise the UK's full solar potential. Strong political support will provide market confidence, leading to stability, further cost reductions, cheaper cost of capital and the ability to drive solar towards zero subsidy. Our plan provides the framework to do this, but what we need is one final push from government to get us there. The result: a healthy, thriving industry that will provide clean solar electricity without public support and deliver export opportunities for UK companies.

Our Solar Independence Plan sets out a strategic approach to policy that will enable all solar sub-markets to thrive and to reach competitiveness with fossil fuels around 2020. Our analysis shows that simple adjustments to existing policies will potentially enable the UK to deliver nearly twice as much solar capacity as current policies and spending commitments will allow, and usher in an era free from subsidies. Accordingly, we strongly recommend that the new Government acts promptly to implement the Plan.


Photo: © Belectric UK

The Plan presents two fully-costed scenarios that deliver considerably more capacity at much lower overall per-unit cost. Our 'Minimum Ambition' scenario could deliver 20 gigawatts (GW) by 2020 for an investment just 17% higher than we estimate the 12GW upper range of DECC's PV Strategy will cost. The 20GW scenario costs £1.4bn in 2020, just £200m more than DECC's 12GW, but delivers an additional 8GW of capacity and many more solar jobs in 2020 (40,200 jobs).

Our 'Higher Ambition' scenario could deliver 25GW of solar in 2020 for a cost of £1.55bn – a further increase of only £150m over the 'Minimum Ambition' scenario but for an additional 5GW of capacity. This 'Higher Ambition' allows the delivery of more than two million solar homes by 2020, 24,000 commercial rooftop and community schemes, and around 2,000 solar farms. It provides 56,900 jobs in 2020. We estimate the cost on consumer bills to be just £13.35 per year in 2020.



There is additional potential for growth if the Government reinstates a meaningful Zero Carbon Homes agenda to incentivise the uptake of solar on new build. Two hundred thousand new solar-equipped homes per year would provide the potential to add up to a further 3GW of capacity by 2020.

Twenty gigawatts of solar capacity will generate 5.6% of UK electricity consumption in 2020, and will deliver 'solar independence' – subsidy free solar – for all rooftop projects, domestic and industrial, by 2020. Large scale solar (solar farms) will be competitive with gas-powered generation by 2018, and competitive with wholesale electricity prices around 2025. Once Britain reaches 'solar independence' it will enable consumers to generate their own electricity from the sun more cheaply than buying power from the grid; a watershed moment in the history of our energy supply.

Analysts such as UBS, Deutsche Bank and the IEA now recognise that solar is set to dominate the world's future power supply. The UK therefore needs to act promptly to strengthen its position if British companies are to secure a share of the booming global market. By following the Higher Ambition scenario, the Government would effectively back the growth of the UK's most jobs-rich energy industry.

Key features of the Solar Independence Plan

- A clear 2020 solar power deployment target
- Stable policy framework with good forward visibility
- Defined strategic objective: grid & socket parity
- More balance between sub-markets
- Increased business & sector growth
- Optimum public value-for-money

BRITAIN'S SOLAR INDEPENDENCE PLAN could cost as little as £12 per household in 2020 under the Minimum Ambition scenario. It will secure at least 40,000 jobs by the end of the next Parliament, bring inward investment in new manufacturing and improve our energy security. It will diversify energy ownership, stimulate competition and innovation across the electricity market and support a sector that is hugely popular across the country. It will cut carbon emissions and in the long term will save consumers money.

The STA has identified six steps that are key to realising the Solar Independence Plan. It is important that all steps are taken since the three main solar sub-markets are interdependent. These need to be implemented in 2015 to deliver our zero subsidy targets.

1. Adjust Feed-in Tariffs to drive growth and target zero subsidy in 2020.
2. Safeguard the Renewables Obligation (RO) for sub-5MW systems to 2017.
3. Allow solar a fairer share of the Levy Control Framework.
4. Adapt Contracts for Difference to benefit solar and SMEs.
5. Incentivise the incorporation of solar into new build houses and offices.
6. Address grid constraints decisively and strategically.

In addition, the STA recommends establishing an industry-Government strategic task force to address key barriers such as grid development, as well as planning for the transition to parity and zero subsidy. We also recommend that the Department for Business, Innovation and Skills (BIS) develops a Solar Industrial Strategy to capture the tremendous economic and employment opportunities of solar (and storage) and to exploit the growing export potential now being explored by the most successful UK companies.

The STA model behind the Solar Independence Plan has been independently verified by experts from Imperial College, London. Additional jobs analysis has been kindly provided by the Centre for Economics and Business Research.

Scenarios 2020

12GW
DECC Strategy scenario

2020 Household bill impact: **£10.32**

1.7 million solar homes
13,000 commercial rooftops
750 solar farms
9,600 jobs
3.4% of 2020 electricity demand

Zero Carbon Homes bonus: 3GW in 2020

20GW
STA Minimum Ambition scenario

2020 Household bill impact: **£12.05**

2 million solar homes
17,000 commercial rooftops
1,800 solar farms
40,200 jobs
5.6% of 2020 electricity demand

25GW
STA Higher Ambition scenario

2020 Household bill impact: **£13.35**

2.1 million solar homes
24,000 commercial rooftops
2,300 solar farms
56,900 jobs
6.9% of 2020 electricity demand

Photo: © Solarsense

Fulfilling potential, eliminating subsidy: Why Britain needs a Solar Independence Plan

The overall aim of government energy and climate strategy is to satisfy the energy 'trilemma': ensuring security of supply, keeping bills down and achieving decarbonisation. Solar power can play a central role in delivering all three elements of the trilemma; but in order to fulfil its potential, Britain needs a Solar Independence Plan. The Plan has five central aims:

- Maximise delivery of clean energy at low, stable and predictable cost
- Remove the need for solar subsidies
- Establish a clear, stable environment for investors
- Create a vibrant, balanced British industry bringing benefits to the national economy
- Answer the public appetite for solar renewable energy

Maximise delivery of clean energy at low, stable and predictable cost

Solar is a clean, carbon-free form of electricity generation, central to the transition to a low carbon economy. The global market is expected to increase 10-fold over the next 20 years, and the International Energy Agency (IEA) predicts that solar could dominate the global energy mix by 2050[1]. UBS and Deutsche Bank make similar predictions, with Deutsche Bank estimating $5 trillion[2] of investment in solar power globally to 2035. China and India are each planning to install 100GW of solar capacity within the next five to seven years.

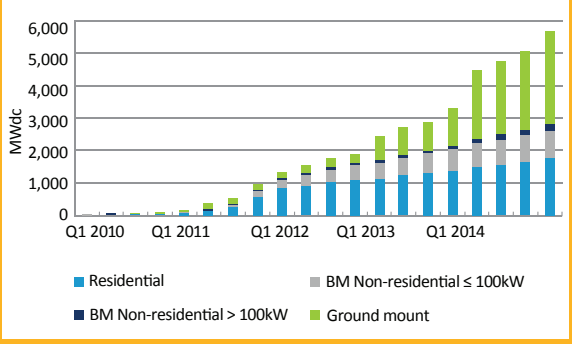
The UK has been a leading nation. Solar capacity has risen from negligible levels at the time of the

Photo © Solarcentury

What scale of solar power?

Categorisation of solar power by size can be confusing. Solar is a modular technology so it is relatively cost-effective at all scales, as well as safe and practical to deploy almost everywhere. It is therefore difficult to categorise neatly.

- 'Domestic' refers to homes equipped with installations up to 4kW in size, with some larger properties up to 10kW.
- The term 'commercial rooftops' covers a very broad range, from 10kW (or somewhat larger) installations on schools and farm buildings through to 50–250kW on businesses, public buildings, supermarkets and commercial buildings. These mid-sized projects attract a diverse mix of investment from commercial companies, communities and the public sector. Solar installations on larger commercial buildings (often referred to as industrial buildings) from 250kW to 5MW are far less common in the UK than in other countries (see graph below). This is mainly due to the current structure of the Feed-in Tariff as well as many non-financial barriers (see Annex 3).
- 'Large-scale solar' is categorised by DECC as projects larger than 5MW which are usually ground-mounted, although it is possible for very large solar roofs to exceed 5MW. Large-scale solar is driven by institutional investors, but there are increasing opportunities for local communities to invest at this scale, including on the basis of shared ownership with commercial developers.



'BM' = building mounted. Graph: IHS.

2010 General Election to 5.7GW today, according to official figures. It generates 6% of all renewable electricity, or 1.5% of all UK generation[3] – enough to power 1.7 million homes[4]. More up-to-date industry data suggests that these are underestimates, with the true installed capacity around 7–8GW, providing 10% of renewable generation. This is a world-class achievement, and something the government should be very proud of.

However the global market is racing ahead and we are keen for the UK to keep its place. The Committee on Climate Change calls for "virtual decarbonisation" of the power sector by 2030[5], and so the policy landscape in the UK needs to sustain the industry's exceptional cost reductions and maximise the part that solar power can play in achieving this objective. The Government's UK Solar Strategy envisages up to 12GW being installed by 2020, a projection that should now be made more ambitious given current deployment.

STA analysis shows that simple measures such as restructuring the Feed-in Tariff (FIT) can substantially increase the capacity of solar installed per unit of support. Furthermore, accelerating upgrades to the grid – which will be needed at some stage anyway – can enable solar to be delivered more quickly and at lower cost.

Increasing solar's 'bangs per buck' will lead to faster and more cost-effective decarbonisation of the electricity system, reduce reliance on imported fossil fuels, and accelerate the transition to low, stable electricity bills characteristic of a power system dominated by renewables.

Remove the need for subsidies

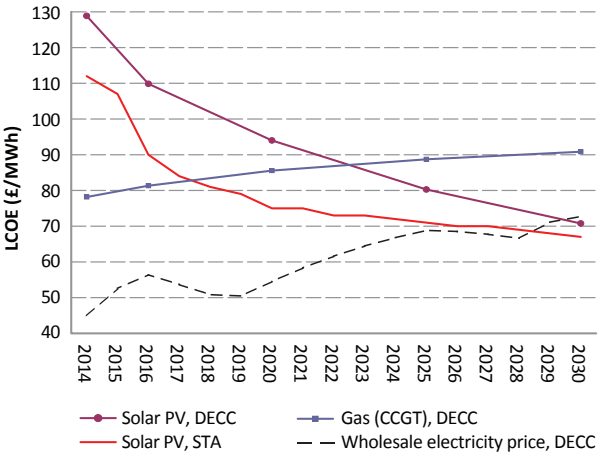
Like any innovative industry that serves a national purpose, solar power has needed public support in order to develop. Continuing that support longer than absolutely necessary is in no-one's interest, and the STA has always backed policies that give the right level of support – neither too much, nor too little.

Costs have come down at an unprecedented rate as a result of both falls in module pricing and investment by UK companies in efficient supply chains and installation methods. As a result, the cost of producing electricity from the sun is falling faster than the cost of any other generation technology. During the last Parliament the level of public financial support for large-scale solar installations has come down by 65% and for domestic installations by 70%.

Support is going to be necessary over the next few years but if it is targeted optimally, the need for subsidies will fall quickly and predictably as companies grow and mature. A key aim of effective support should be to develop all sub-markets of solar – large-scale, commercial rooftop and domestic rooftop – in concert, as there are strong interdependencies.

With stable support, STA analysis (below) shows large-scale solar is set to become the cheapest major low carbon source of power by 2018[6] on a Levelised Cost of Energy (LCOE) basis (our analysis is independently supported by a recent Fraunhofer Institute analysis[7]). But this can only happen if government facilitates its continuing growth. The Solar Independence Plan sets out measures that will allow solar to reach competitiveness with fossil fuels in all sub-markets around 2020.

Graph comparing the Levelised Cost of Energy of Solar Power with Gas and Wholesale Electricity Prices.



The graph above shows the projected falling costs of generating electricity from solar over the next 15 years, based on the LCOE which considers the full capital and operational expenditure over the lifetime of the project, excluding any impact of subsidies. The solar and CCGT data has been taken from DECC's most recent analysis[8] (2013) and then compared with their prediction for wholesale electricity prices (updated in 2014). We have used the same LCOE methodology as DECC in our own calculations, but have used more up-to-date cost data from our members. This shows the LCOE is much lower than DECC calculates. Using our data, solar is shown to be cost competitive with CCGT in 2018 and within £1/MWh of the wholesale price between 2025 and 2028. For a more detailed analysis, please see our published report The Cost Reduction Potential of Large-Scale Solar PV.

Establish a clear stable environment for investors

Investor confidence is absolutely critical to reducing the cost of solar power. Recent analysis shows that it can have a greater impact on cost than even the solar resource[9]. The International Energy Agency recommends that policymakers set long-term targets for PV deployment[10] and support the delivery of targets with 'predictable market structures and regulatory frameworks'. Targets are particularly helpful to the industry because they establish clarity about the level of government commitment and give investors confidence in the stability of political support.

However, the last few years have seen instability in the policy framework that has dented the confidence of investors in large-scale solar: introduction of a new support regime (Contracts for Difference, CfDs) that is not well suited to small businesses and the premature use of competitive tendering. As a result, from 1st April 2015, the large-scale market has been effectively eliminated for this financial year and will


Photo: © Belectric UK

need CfDs to achieve any growth in future. Near term, this drop in deployment will not be replaced by growth in the commercial rooftop market, as investment barriers remain. Without improvements to this picture, as presented in the Plan, the UK risks a pattern of boom and bust, prolonging uncertainty in the nondomestic market.

It is vital that policy considers investors in all sub-markets. There is a strong interdependence between them, and each boasts its own unique advantages. For example, solar farms have been instrumental at driving the dramatic cost reductions witnessed world-wide. Commercial rooftop schemes are likely to reach 'socket parity'[11] first since this highly cost-effective scale competes with retail electricity prices. Domestic installation empowers the public to take charge of their power supply better than any other technology, and evidence suggests it drives wider beneficial behavioural change on energy use.

It should be borne in mind that solar involves different kinds of investor. The British industry is made up of 2,000 mostly small and medium sized enterprises (SMEs) that have brought entirely new kinds of investor into the electricity market. The Solar Independence Plan puts due emphasis on these important new investors in the electricity market. By backing them, the Government would be moving with the changing tide towards more distributed power generation, reducing the risk of stranded centralised assets. It would also help unlock the wider benefits for consumers of far greater competitive tension and innovation in the power markets. Government ministers have spoken of their desire to move from the 'Big Six' to the 'Big 60,000' – solar can make a huge contribution to that objective.

Our Solar Independence Plan features stable, predictable conditions that will maximise investor confidence and so lower the cost of solar electricity. A key component of the Plan is careful, realistic consideration of all sub-markets and of their path to parity, allowing the full mix of benefits to be realised.

Photo: © Belectric UK

Solar panel manufacturing at Viridian Solar's factory near Cambridge. A proactive industrial strategy could increase the already high UK content of solar power.

Photo © Viridian Solar

Create a vibrant British industry bringing benefits to the national economy

An investment in the UK solar industry is an investment in the UK economy. Recent analysis shows that 62% of capital and operational expenditure (capex and opex) in large-scale solar flows to domestic industries[12], stimulating economic output and sustaining employment within the UK. This flow to domestic industries is expected to rise to over 70% in 2030, thanks to increased efficiencies and changes in the relative costs of components. The potential for UK manufacturing, innovation and an expanding UK supply chain could increase this further; there are already signs that this is beginning to happen.

To put this in context, the UK content for large-scale solar capex alone is 45% today, higher than UK content capex ratios for either nuclear or offshore wind[13]. Rooftop solar has a particularly high labour content, so its ratio of UK capex/opex is even higher. The solar power industry boasts the highest jobs intensity of major low-carbon sources overall[14]. The UK industry was estimated by the Department for Business, Innovation & Skills to employ a head count of 34,400[15] people both full-time and part-time, including in the supply chain, in 2013[16]. The Centre for Economics and Business Research estimate 38,200 people were employed full time in the solar industry and its supply chain in 2014, assuming a near 3GW market in that year.

A one million pound investment in solar creates twice as many companies as other forms of low-carbon energy[17]. Solar technology is now owned by over 650,000 consumers. Solar therefore diversifies energy ownership, competition and innovation across the electricity market. Decentralised, smaller technologies can often deliver policy objectives better and more cheaply than large-scale centralised generation, and should therefore receive at least the same level of policy attention and resourcing.

British industry at its best is characterised by competence and innovation that drives the export of skills. A strategic plan that increases the competitiveness of our domestic sector gives the UK a better chance of strengthening its position in an astonishing global market. There are already examples of UK companies building on the

experience they have gained in the home market to win significant business overseas.

Timely investment – as we advocate in our Solar Independence Plan – will strengthen the UK's position in the global green technology market. If the UK invests adequately in solar now, it will encourage more enterprise, innovation, manufacturing and market share for UK SMEs, resulting in greater tax revenues and employment. A strategy of waiting for international module prices to fall is fundamentally flawed and puts the UK industry at risk because low-cost solar depends less and less on module pricing and increasingly on an efficient UK supply chain and installation methods.

Under the Solar Independence Plan 20GW scenario, the UK solar sector would employ more than 40,000 people by 2020[18], with large scale solar alone adding £6.5bn of Gross Value Added (GVA) to the UK economy[19]. The 25GW scenario produces even bigger benefits to the UK economy and UK companies.

Answer the public appetite for solar energy

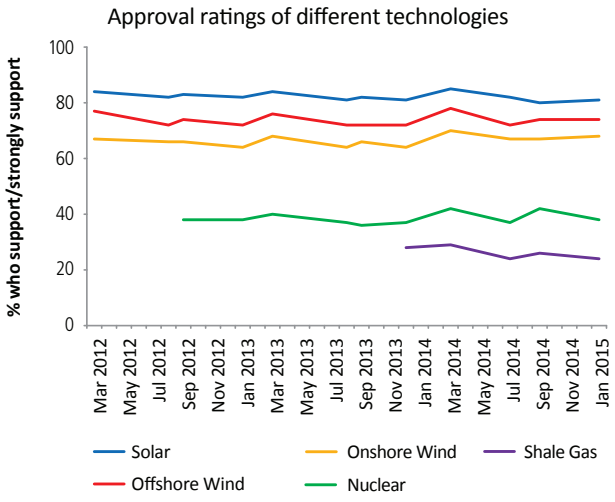
Surveys show repeatedly that solar power is the UK's favourite means of generating electricity, attracting more public support than any other energy technology (more than 80% in DECC Public Attitudes Tracking Surveys). A recent Mintel Poll shows that eight in 10 people want to see solar installed on new houses[20]. Even solar farms, sometimes wrongly labelled 'unpopular', attract the highest levels of public support in polls on local energy options at the utility scale. For example, a YouGov poll commissioned by the STA put public support at over 70% for good quality solar farms. In fact the popularity of solar farms is understood by MPs of all parties; a recent survey shows that 72% of MPs thought that a solar farm would be the first choice of local people for a local energy development, dwarfing those believing that wind or shale gas would emerge as a first choice (9% and 6% respectively)[21].

Successful UK solar companies are now starting to export their innovation and expertise abroad. This photo shows STA member Solarcentury building a solar farm to displace diesel generators at a tea production factory in Kenya.

Photo: © Solarcentury

Photo: © Forster Energy

DECC Public Attitudes Tracking Surveys



It is therefore important that the most popular and potentially most cost-effective technology is given more emphasis in the policy framework. The transition to a low-carbon power system necessitates major technological change and up-front costs, and can only be delivered if it carries the weight of public support.

The Solar Independence Plan would enable households, businesses and communities to choose solar power that protects them from high fuel price inflation in future years. Shock electricity bill price rises will be a thing of the past. The plan contributes to an electricity market where diversified ownership, competition and innovation thrive.

A solar revolution in the UK will bring many benefits including:

- ✓ tens of thousands of jobs in installation and new manufacturing
- ✓ avoided cost of importing fossil fuels
- ✓ greater energy security
- ✓ reduced greenhouse gas emissions
- ✓ power in the hands of business, communities and the consumer
- ✓ enhanced electricity market competition and consumer choice
- ✓ household and economy insulation from volatile energy prices

The Solar Independence Plan


Photo: © Antony Burdett-Clark, Lightbox Studios

Overview

The STA has developed a detailed budget model for understanding the cost implications of FIT, CfD and RO policy changes, which can estimate costs down to per household level. Our methodology, which has been independently verified by experts from Imperial College London, is detailed in Annex 1. The model incorporates DECC's latest projections of future wholesale power costs, which were recently revised downwards. Future price comparisons are notoriously difficult given the volatility of international fossil fuel markets. Our modelling is based on the best data currently available.

A wide range of possible scenarios can be constructed for solar power growth to 2020. The Solar Independence Plan presents two possible 2020 scenarios based on our assessment of realistic growth potential across the different sub-markets: a 'Minimum Ambition' (20GW) scenario and a 'Higher Ambition' (25GW) scenario. Both scenarios seek to achieve a better balance between the domestic, commercial rooftop and solar farm markets, while enabling significant growth in all sub-markets. All sub-markets benefit from substantially increased business growth potential under both scenarios. We compare our two scenarios with our assessment of the likely deployment breakdown and costs of DECC's 12GW ambition for 2020 set out in its solar strategy.

Model caveats and key assumptions

The STA's model makes assumptions about the levels of deployment that could occur in each

market segment under the different incentive schemes. Clearly the deployment levels depend on a wide range of factors, including the size of the financial incentive but also on a range of non-financial barriers and factors, including market confidence. The assumptions we have made constitute a scenario that we believe is credible; however our model has the flexibility to project incentive costs under any chosen set of deployment assumptions.

For the Feed-in Tariff scheme this is particularly important, as the capacity-based degression mechanism determines the progression of tariffs over time and can be designed by policy-makers to achieve different outcomes. Our chosen scenario triggers more frequent degression in the domestic sector, thereby liberating budget to increase deployment in the currently under-performing commercial rooftop sector. We believe that a policy regime that results in predictable quarterly domestic tariff reductions will encourage households to invest in a solar system sooner rather than later, creating sustainable momentum in the domestic market. Should this not occur, then tariff degression would stall thereby allowing a smaller domestic market to persist, with a similar total impact on the domestic subsidy cost. The Government's clear objective should be to create the policy certainty over the next parliament that encourages this momentum to develop.

In order to calculate the number of installations that will be in place under different scenarios, assumptions were required for the different scales. For domestic (FITs <10kW), a 3kW average installation size was assumed. For Commercial Rooftop (FITs 10kW–5MW rooftop, and RO Rooftop), a 250kW average was assumed. For Solar Farms (FITs standalone, RO ground mount and CfDs), a 5MW average was assumed. For Community Shared Ownership projects an 8MW average size was assumed.

What is the Levy Control Framework?

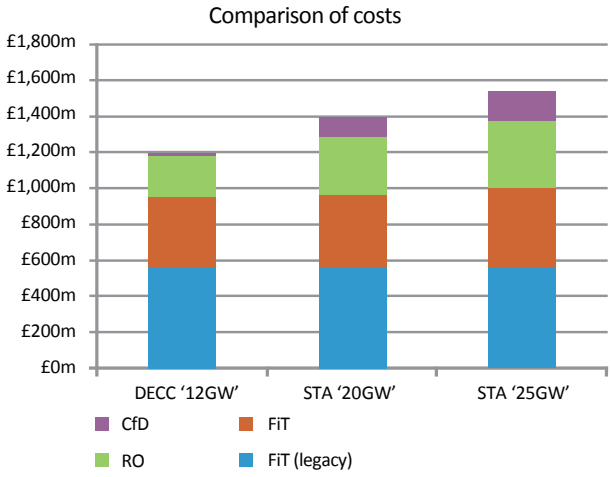
The Levy Control Framework (LCF) was agreed between the Treasury and DECC in 2011 to control the amount of money that can be levied on households so that government "achieves its fuel poverty, energy and climate change goals in a way that is consistent with economic recovery and minimising the impact on consumer bills." The LCF includes support for renewables as well as for carbon capture and storage, nuclear power, and some energy efficiency schemes. The spending cap under the Levy Control Framework is set to rise to £7.6 billion in 2020-21 in 2012 prices (note that all our prices and references in this report are in 2014 prices). Within this cap, government is seeking to incentivise 33% of UK electricity to be supplied by renewables by 2020/21.

Summary of results – all scenarios

Cost to the LCF in 2020	**DECC '12GW'**	**STA '20GW'**	**STA '25GW'**
FIT (Legacy to March 2014)	£555m	£555m	£555m
FIT from March 2014	£401m	£405m	£443m
RO	£228m	£326m	£379m
CfD	£11m	£108m	£168m
Total	**£1,195m**	**£1,394m**	**£1,545m**
Total 2020 generation (GWh)	10,402	16,927	20,881
Annual household cost in 2020	£10.32	£12.05	£13.35
% of LCF budget	14.6%	17.0%	18.9%
% UK electricity demand 2020	3.4%	5.6%	6.9%
Jobs 2020	9,600	40,200	56,900

Apprentices receiving training in fitting roof-integrated solar at Forster's Skills Academy. Forster Energy, a leading developer in Scotland, is chairing the recently established STA Scotland office. Scotland's huge solar potential is now beginning to be recognised.

Photo: © Forster Energy



The 'Minimum Ambition' (20GW) Scenario

The 20GW target for 2020 represents the previous 'ministerial ambition' set out in the foreword to the UK Solar Strategy in 2014. 20GW by 2020 is realistic for the UK and modest by international standards. For example, by the end of 2014 Germany had installed 38.5GW and Italy 18GW. However, achieving 20GW in the UK by 2020 will require particularly ambitious growth in the commercial sector, and better support under CfDs for large scale installations.

Under the 20GW scenario, our modelling shows that solar would require 17% of spending under the LCF in 2020, rather than 14.6% as DECC currently plans. This requires current planned government investment in solar to be increased by just £200 million, from £1.2bn to £1.4bn by 2020. (See the Summary of Results table on p15.)

Current investment in solar offers value for money; but this can be masked in some analyses by the legacy costs of FITs as a result of the rapid deployment in 2011–12. The chart (left) shows that the legacy costs of the FIT account for nearly half of our estimated DECC expenditure under DECC's 12GW projection. Taking away the generation and associated cost of FIT solar to March 2014, it can be seen that solar can deliver 13% of the renewable power generation target in 2020 of 33% of all UK electricity, for just 10% of the LCF budget. This analysis across *all* solar applications further masks the exceptional cost-effectiveness of large-scale roof and ground-mounted solar.

Our Minimum Ambition scenario therefore increases expected expenditure on solar by just 17% while delivering 8GW (67%) more solar power by 2020. This may be a counterintuitive result, but by restructuring the policy more coherently, allocating funding more efficiently and providing the industry with market certainty, greater confidence for

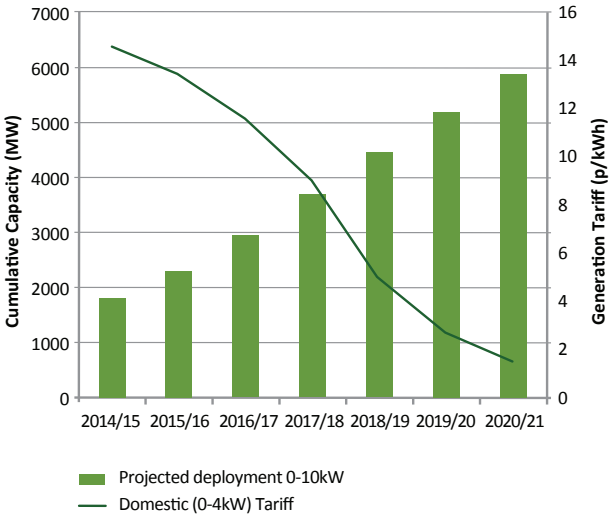
companies to invest will lead to cost reductions. For example, in our model the FIT capacity triggers have been recalibrated to best represent where the industry sees future growth. Inefficient and sub-optimal policy is ultimately expensive for the consumer.

'Minimum Ambition' analysis by Sub-Market: Domestic

In our Minimum Ambition scenario we anticipate that 6GW of solar will be deployed across the domestic sector by 2020. This amounts to 1.7 million solar homes, of which 650,000 were already in place by March 2015. The growth in the market is driven by the removal of barriers, greater consumer awareness and greater market confidence to invest with a clear view of future tariffs – businesses can plan ahead with policy stability, which leads to market efficiency.

The modelled domestic growth and the resulting tariffs are shown in figure 1.

Figure 1: Projected Cumulative Deployment and Tariffs in the domestic sector under the STA Minimum Ambition Scenario.



The graph shows installations steadily climbing year on year, at the same time as tariffs degress (reduce). Our modelling projects that in 2020, domestic tariffs will be around 1.5p/kWh. Even though no subsidy for new installations may be required from 2021, solar should continue to be installed on rooftops as the economics from increased self-consumption will ensure investment makes sense, but with no further burden to the LCF. However, a Government-Industry 'Parity Taskforce' (see Further Measures, page 24) will need to consider if any transitional measures are required to sustain the market as solar crosses the point of parity with grid electricity.

The model accelerates quarterly tariff reductions[22], allowing additional capacity within the same overall 'budget'. Overall the STA's Minimum Ambition scenario enables 260,000[23] (800MW) additional domestic solar homes by 2020 as compared with our modelling of the Government's Solar Strategy.

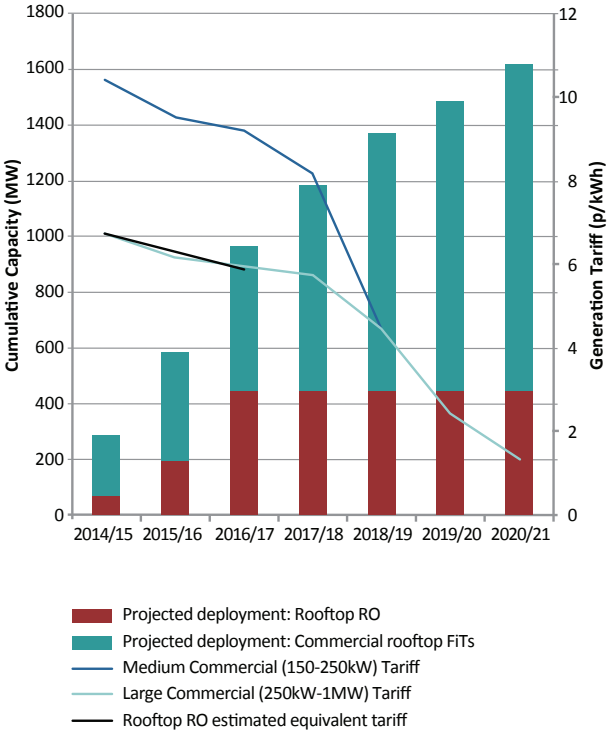
'Minimum Ambition' analysis by Sub-Market: Commercial

The commercial roof sector has been significantly under-deploying due to non-financial barriers such as legal complexities between landlords and tenants and planning requirements, as well as the sub-optimal allocation of funding under the FIT framework itself. However, following extensive advice from the STA and its members, DECC is addressing some of these barriers, and the industry has noted a significant increase in tendering for larger projects. The size of installation that works well for the commercial sector also suits community-led schemes, where there has been keen political support for stronger growth.

To allow for growth in this increasingly cost effective sub-market, we have broken the existing FIT degression bands into more relevant capacity trigger bands. Confidence that the resulting growth can be contained within the existing budget should help Ministers to act more decisively to remove barriers. Please see Annex 2 for detail on how we propose to restructure FITs.

In the commercial sector, companies use the solar power generated during the day at the point of use, so it presents a particularly efficient sub-market both financially and given its minimal use of distribution networks. We estimate current capacity in this sub-market is less than 600MW[24]. To provide much needed stimulation to the mid-sized sector, we have modelled an increased tariff to 8.0p/kWh (from the current 6.16p) in the failing 250kW–1MW band, as historically there has been very little deployment above 250kW as the existing 6.16p/kWh tariff has been too low to make projects economic. Making this important increase barely affects overall costs. This change, combined with the additional expansion in capacity triggers, could deliver over 2.8GW of large rooftop solar by 2020.

Figure 2: Cumulative capacity and falling tariffs in the commercial sector under the Solar Independence Plan.



With the existing banding and capacity triggers from January 2015, only 32.5MW per quarter of deployment across all large solar rooftop projects from 50kW to 5MW in size is possible before the first degression level of 3.5% is triggered. Even with a modest increase in deployment, there is a serious risk of hyper-degression with tariffs dropping far faster than anticipated cost reductions. This low capacity trigger risks pushing the industry over a cliff when the market has just started to grow, and it requires urgent attention. Correcting this to enable market growth is key to the success of the Plan. Please see Annex 1 for how new tariff bands and degression triggers are recalibrated in our model.

This issue of hyper-degression will be just as problematic for the stand-alone (i.e. ground-mounted) 17.5MW quarterly capacity trigger. (From January 2015, the 50MW capacity trigger for 50kW and above was split into a quarterly capacity trigger for non standalone (i.e. rooftop) of 32.5MW and a quarterly trigger of 17.5MW for stand alone). Indeed hyper-degression is already in train for stand-alone solar, with tariff levels set to fall 28% this July. This creates a dual problem of limiting rooftop growth and limiting the growth potential of

ground-mounted community invested solar farms which were promoted by the Coalition Government. This is a particular problem for the 5MW+5MW split community ownership proposal, of which there is a keen interest (see community solar page 20).

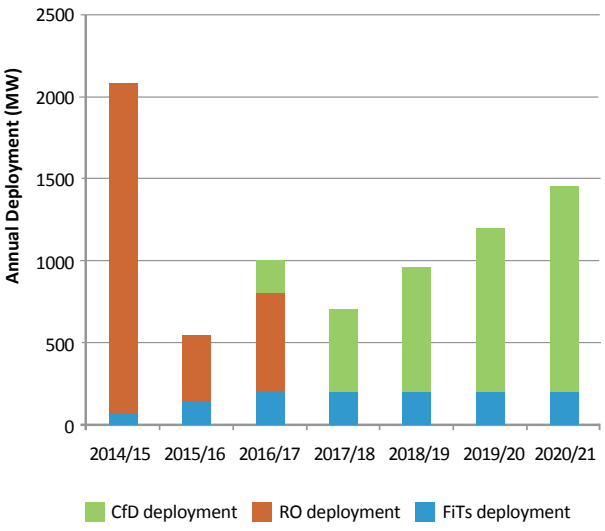
With rooftop RO support due to end in March 2017, it is essential to ensure a smooth financial support transition for installers to switch entirely to FITs in March 2017. The preferred and more economic route to market for projects over 250kW is currently the rooftop RO (1.5 ROCs in 2015/16, 1.4 ROCs in 2016/17) compared to the 6.16p/kWh under FITs. A smooth transition between these two support schemes is necessary to ensure stability and market confidence.

By April 2020, the tariff predicted by our model for large roofs over 250kW is 1.5p/kWh. In a similar way to the domestic sector, this will allow the FIT scheme to come to a close with appropriate transitional arrangements.

'Minimum Ambition' Analysis by Sub-Market: large-scale solar

Our model plans for 8.8GW of solar farm deployment by 2020, up from 2GW of official deployment as at the end of 2014. (In reality we believe that 3GW of large-scale solar was deployed by the end of 2014). We assume that the sub-5MW RO remains open for solar until its closure in March 2017. Additionally, we assume that CfDs are simplified to encourage a more level playing field for SMEs, so that a significant amount of solar capacity can be added through this scheme later in the decade.

Figure 3: Annual deployment for large-scale solar under the Minimum Ambition scenario.

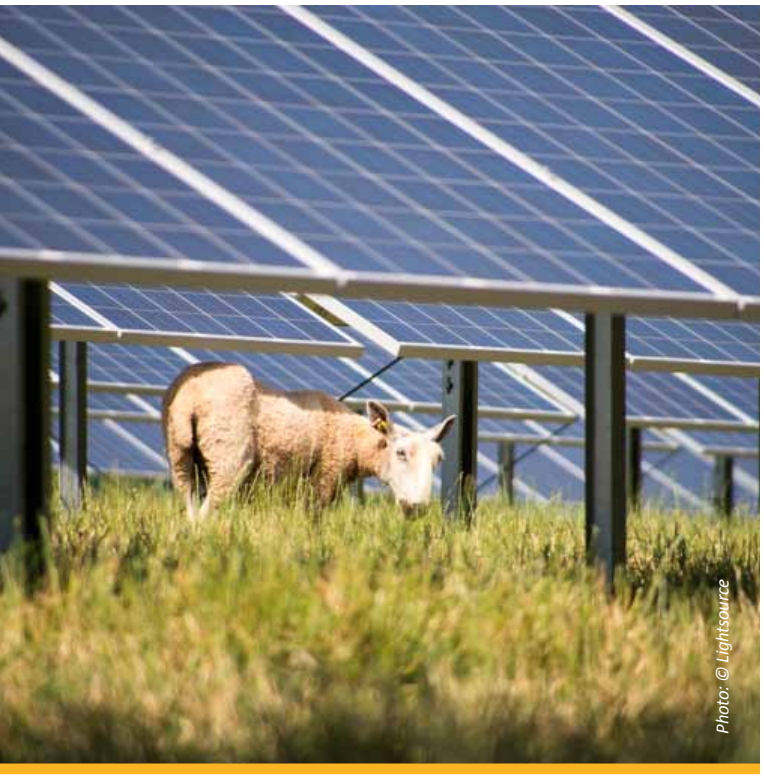


As the RO and CfD subsidy schemes are not structured in the same way as FITs, and due to the complex interaction of large-scale solar with the wholesale electricity market, it is harder to predict when this sector will be 'subsidy free'. It is also harder to define 'subsidy' in the context of CfDs. Our recently released LCOE analysis[25] shows that from a theoretical viewpoint, large-scale solar could be cheaper than new gas CCGT in 2018 and could reach wholesale grid parity sometime around the middle of the 2020s. While the costs of, and technical needs for, grid balancing must be taken into account, the potential exists to realise lower overall electricity costs for consumers by investing in solar power over gas in future.

However, experience overseas shows that increasing volumes of solar and wind power can depress wholesale electricity prices. This benefits consumers[26] but it becomes harder for solar generators to recover their capital costs. Therefore some form of corrective market support may be needed for utility solar power even though it is still saving power consumers money overall. Under these circumstances support should not be considered 'a subsidy'. For example, if CfDs continue beyond 2020 our analysis shows they will be cost-neutral in 2025 when solar crosses the wholesale price of electricity. The need for market interventions may not arise in any event depending on the development of storage technologies which will fundamentally change the interaction of variable renewable power with the market. Storage can operate both locally, in tandem with the PV generation, or at the distribution grid level. Together it promises to allow best use to be made of local variable generation, reducing the cost of network reinforcement as power demand increases over time.

DECC's PV Strategy appears to forecast very little solar deployment under CfDs, and a much lower deployment than currently under the RO. As our recalibrated FIT budget remains cost neutral under the Minimum Ambition scenario, the additional £200m in 2020 is required to maintain this sub-market (around £100m in each of the RO and CfDs, the former covering large rooftops as well as ground mount). CfDs are a competitive mechanism, and if they can be made to work for the solar sector, then the funding should be made available.

It should be noted that the 8.8GW of large scale deployment projected through our model would take up less than 0.1% of UK land – far less than the 2% of land used by golf courses, for example. In



addition, if government promotes industry guidance which encourages best practice by developers, solar farms will bring co-benefits to the countryside that are completely aligned with Defra objectives, such as stimulating biodiversity and working in harmony with livestock farmers.

'Minimum Ambition' Analysis by Sub-Market: Community Solar

DECC's Community Energy Strategy has focused on shared-ownership of large-scale solar farms with commercial developers, but many communities want to initiate and develop their own schemes. The FIT is the ideal mechanism for this, yet community-led schemes tend to be at the smaller size where returns are economically viable. Correcting the mid-size solar market under FITs will enable communities, including local authorities, to develop more ambitious local schemes, including on rooftops, generating more electricity at lower overall cost.

One area of shared ownership that is attracting great interest from both commercial developers and community energy groups is the opportunity to split ground-mounted FIT schemes up to 10MW in size, with each party owning up to 5MW of capacity. However, the structure of the FIT will not currently allow for any significant growth in this market. Our reworking of the FIT under the Minimum Ambition scenario allows for a tripling of capacity under the stand-alone tariff band, or 1.4GW of capacity by 2020. This band will also be attractive for broader community investment such as bond offers and potentially solar ISAs.

'Minimum Ambition' Analysis by Sector: New Build

With more than 200,000 new homes needed per year to meet the UK's projected 70 million population in 2020, as well as new commercial property, solar on new build has very significant growth potential. New build presents the most cost-effective and aesthetically pleasing opportunity to incorporate rooftop solar. Eight out of 10 people support its incorporation in new homes[27]. The STA does not support the scaling back of the Zero Carbon Homes agenda during the 2010–15 Parliament, which enables house-builders to avoid incorporating cost-effective measures such as solar and insulation.

If the new Government reinstates a more ambitious Zero Carbon Homes agenda, this would have a tremendous potential impact on the new build solar market. A 3.3kW PV array would take an average home from Code 4[28] to a far more meaningful Code 5. For a build rate of 200,000 homes per year this represents 0.66GW of solar capacity per year – more than double the amount incentivised by the Feed-in Tariff in the domestic sector in 2013. Over five years, this could result in 3.3GW of additional solar capacity. It would not be possible to incorporate solar in all circumstances, but this provides a useful proxy of maximum potential new build capacity if a more ambitious Zero Carbon Homes policy were reinstated and new build commercial premises also considered.

Minimum Ambition 20GW 2020 scenario results summary:

- 1.96 million domestic installations (5.8GW)
- 17,000 commercial rooftops (4.2GW)
- 1,800 solar farms (8.8GW)
- 175 shared community ownership schemes (1.4GW)
- £1.4bn or 17% of LCF expenditure in 2020
- £12.05 household cost in 2020
- 5.6% of UK electricity supply
- 40,200 jobs in 2020

‘Higher Ambition’ Scenario (25GW)

There are many compelling reasons to plan for a more ambitious contribution from solar power in 2020. These include further reductions in per-unit costs; its exceptional employment and economic contribution; its popularity; and its technical compatibility with wind on the grid.

If the policy framework provides a more level playing field between technologies and reflects true value for money considerations, solar will naturally absorb a slightly higher proportion of resources. But it would also accelerate solar independence. By providing stable reductions in support over the next five years towards zero subsidy, government will potentially be able to deliver lower bills for consumers from 2020 and beyond (subject to fossil fuel price volatility).

Any government needs to recognise and support technology trends if it wants to stay ahead economically, and it is clear that solar is emerging as potentially the major future global power source. Forward-looking investment in solar now will provide potentially major returns in the future. Therefore, the STA recommends a more ambitious scenario of 25GW by 2020. This scenario only costs £150m more than our 20GW scenario – a relative cost increase of 10.7% for an additional 25% extra deployment – and would require less than 19% of the LCF in 2020.

Our Higher Ambition scenario assumes additional growth in all sub-markets. Overall it results in 2.1 million solar homes, 24,000 commercial roofs, 2,300 solar farms and almost 200 community-owned systems. Pursuing a more ambitious scenario would put us on track for the STA’s 2030 Solar Vision (overleaf).

In the domestic sector, good marketing and a stable and well-understood Feed-in Tariff allows domestic installers to plan ahead and reduce costs, to deliver an additional 400MW (compared with the 20GW scenario).

Cost split of the 25GW scenario

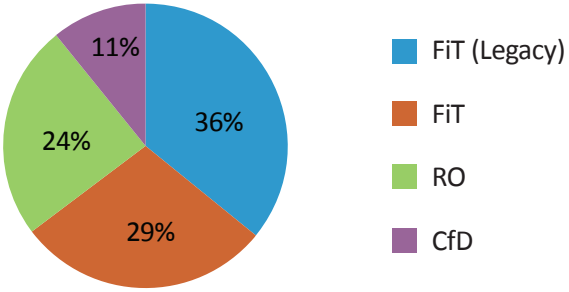



Photo © Solar Impulse / Revillard / Rezo.ch

The commercial sector enjoys stronger growth, with an additional 1.8GW of capacity deployed by 2020 on top of our ‘Minimum Ambition’ scenario. This requires swift and decisive government action to break down barriers to deployment and active promotion of commercial roof-top solar, as well as the provision of a stable policy framework.

The additional deployment for large scale solar comes from providing certainty for sub-5MW schemes and ensuring that CfDs are more appropriate and accessible for SME developers. A further contribution is also included from community shared ownership or investment solar farms under the ground mounted FIT.

Overall these measures lead to 2.7GW of additional solar farm capacity over the Minimum Ambition scenario by 2020, with the majority of development in smaller solar farms.

Higher Ambition 25GW 2020 scenario results summary:

- 2.11 million domestic installations (6.3GW)
- 24,000 commercial rooftops (6GW)
- 2,300 solar farms (11.5GW)
- 192 shared community ownership schemes (1.5GW)
- £1.5bn or 18.9% of LCF expenditure in 2020
- £13.35 household cost in 2020
- 6.9% of UK electricity supply in 2020
- 56,900 jobs in 2020

STA's Solar Vision

The year is **2030...**

Solar power sustained its average 30% yearly growth rate, from providing 1% of world power in 2015. On that basis in three years time (2033) the world will celebrate solar output theoretically matching world power demand.

Strategic solar plans, introduced by all G20 Governments, played an important role in keeping global temperature rises on a trajectory below two degrees – just. Mitigating climate change is today's top political priority as its impacts are now obvious.

Solar energy is a fact of every-day life, seen on millions of rooftops, in building facades and windows, and in street bays and car-parks for charging electric vehicles. Solar now comes in all colours, shapes and sizes.

Widespread uptake of community-based housing refurbishment programmes has brought solar to millions of low income households, helping to significantly reduce levels of fuel poverty.

The government's inspired decision in 2016 to invest strategically in reinforcing and extending the electricity distribution network opened up huge new opportunities for distributed generation and helped bring solar costs down much faster than anyone had predicted.

The default option for new roofing materials on homes, offices, industrial and public buildings is solar power. It is often seen integrated into new trains, boats, cars and buses, as well as forming railway and motorway sidings.

Solar power keeps the lights on and the economy moving in many countries, where it has significantly lowered energy price inflation and increased international competitiveness.

The air is cleaner, as coal power stations and diesel-run vehicles were phased out and electric vehicles have boomed alongside solar, improving the health of millions.

Solar is key to the 'energy internet' which is fed by millions of solar producers who also consume and store power in buildings and vehicles, and who help network management by connecting intelligent appliances that respond to real-time cost information.

Pensioners are thriving in their retirements thanks to pension funds mainstreaming investment in solar power. Many more people are enjoying the rewards of their solar ISAs and banks routinely provide low-interest finance to homes, communities and businesses wanting to invest in solar.

Shock energy bills are a thing of the past. Many households are now self-reliant in power through a combination of solar, battery storage and electric vehicles. All new homes are built to zero emission standards and require little heating.

Solar power is being carefully deployed by farmers and land conservation managers to stabilise farmer incomes and restore poor soil quality. The decline in British wildlife and wild plants has been reversed and many solar farms are recognised as vital sanctuaries for biodiversity.

A network of communities and local authorities has sprung up across the UK that used solar as their first stepping stone to producing more renewable energy than they need. These communities now sell 100% clean power directly to other nearby towns and villages.

The UK is enjoying energy security in abundance and international relations are flourishing, undistorted by conflict over fossil fuels. An international aid programme, to which we contribute, is close to providing solar power to all of the one billion people who did not have access to any electricity grids in 2015.

British solar firms are major players internationally, thanks to the wise decision made by the incoming 2015 Government to implement the STA's Solar Independence Plan!

Delivering the Solar Independence Plan

The STA has modelled two credible scenarios to get solar power to zero subsidy around 2020. We hope the new Government will recognise that the technological tide has turned strongly towards solar power internationally and that the UK needs to act swiftly to stabilise and strengthen its domestic market outlook. 10–12GW remains the Government's Solar Strategy target, but with industry data suggesting that 7–8GW is already installed by the end of March 2015[29], there is a definitive need to update this target early in the new Parliament to reflect a realistic new range. Without a formal update of the targets, the possibility remains for further constraining measures to prevent growth, investment will go elsewhere, and the potential for building a vibrant industry will be at serious risk.

For the rooftop markets, parity (and therefore zero subsidy) is achieved with the retail ('socket') price of electricity. For large scale ground mount, grid parity can be defined as the point when solar generators can compete with new gas powered generation. At this point, large scale will still need a subsidy under CfDs (new gas generation also requires subsidy). However, in theory, at the point where the CfD strike price crosses the wholesale electricity price, no subsidy will be required – this is anticipated around the mid 2020s. The complex interaction of variable renewables with the power markets means some form of market intervention may be needed even when solar power investment is saving consumers considerable sums of money overall (although cost-effective storage will transform market interaction). Achieving parity for all sub-markets requires a stable and consistent policy framework that supports relatively stable annual deployment to deliver a clear target of 20GW (ideally 25GW) of solar by 2020. The recently updated IEA Solar Roadmap underlines the importance of clear targets for successful solar policy.

Government policy and resourcing remains oriented towards large centralised power and large players. Nevertheless, steps can be taken within the existing policy framework to support solar power and its diverse investors much more actively. This would encourage existing SMEs as well as new investors into solar including businesses, farmers, communities and the public sector. To achieve these goals, the STA has identified six essential steps that will help to deliver the Solar Independence Plan. Sub-markets in solar power have strong inter-linkages so it is important that all steps are taken together.

Photo: © Lightsource

Six steps the new Government needs to take in 2015

1 Adjust Feed-in Tariffs to drive growth and target zero subsidy in 2020: The proposed changes to the FIT mechanism are detailed in Annex 2. These intelligent changes make the best use of available finance within the constrained FIT budget by reallocating underutilised degression and allowing for higher growth across commercial rooftops and more ambitious community projects, both of which feature strongly in DECC's current strategy and which provide excellent value for money. *Our adjustments mean all applications of solar will see substantially more business per unit of public support*. Even the 'Minimum Ambition' scenario will allow an additional 3.1GW of installations under FITs at no extra cost to the LCF and at the same time deliver socket parity around 2020.

2 Safeguard the Renewables Obligation for sub-5MW systems to 2017: With the RO for 5MW+ solar removed two years before other technologies, the STA is calling on DECC to provide assurance to investors that the sub-5MW ground mount and roof mount RO is secure and will have sufficient budget allocated to allow for growth[30]. This is currently the lifeline for most of the non-domestic industry. Either removal of the RO or continued uncertainty will dent investor confidence still further and constrain the industry.

3 Allow solar a fairer share of the Levy Control Framework: The existing £65m per allocation round is not sufficient to sustain mature technologies under CfDs. Given a stable policy framework solar is on a pathway to zero subsidy, but as yet it cannot compete with onshore wind on price (although it is a whisker away from being able to do so). These cost-effective technologies warrant a higher budget in the short term in the interests of public value for money and they should be allowed to compete for a greater allocation of resources. Our 'Higher Ambition' scenario also necessitates a modest increase in FIT funding.

4 Adapt Contracts for Difference to benefit solar and SMEs: Amendments are needed to the CfD process to provide better access for the SMEs that dominate the solar sector. The current process is more complex, and requires up-front risk and investment that is challenging for SMEs. Changes needed may include: increasing auctioning frequency (every six months); increasing the commissioning window in line with other pot 1 technologies; simplifying eligibility criteria; and stipulating milestone delivery dates appropriate for solar. There may also be a case for technology minima – ring-fencing a minimum allocation of capacity for specific technologies to ensure some level of market confidence and continuity.

5 Incentivise the incorporation of solar into new build houses and offices: Integrating solar into new buildings is particularly cost effective as scaffolding and labour are already on site. Building Integrated solar PV (BIPV) can displace the cost of roofing materials as well as providing pleasing aesthetics. Scotland is introducing stronger building standards that are likely to increase use of solar on new build this October. We call on DCLG to reinstate a more ambitious Zero Carbon Homes agenda and promote solar in commercial new build developments by setting demanding on-site standards in the 2016 uplift of Building Regulations.

6 Address grid constraints decisively and strategically: The RIIO-ED1 price controls on the 14 Distribution Networks need to better incentivise timely and fairly-priced grid connections. DNO business models are misaligned to existing deployment rates and this is already creating significant difficulties for solar (and other renewables) at all scales. Fixing the limitations imposed by the grid is a major long-term project, but it is critical that the plans for strategic change are made this year. A clear network vision is needed as well as the establishment of a 'System Architect' to steer complex physical, institutional and regulatory changes on networks before 2020. Failure to do so risks a network crisis for the achievement of a low carbon power system in the next decade.

Further measures

Protect the domestic market

The UK now has more than 650,000 solar homes, which is a world-class achievement. This shows what is possible given a supportive policy framework, close government and industry co-operation, and user-friendly policies that are carefully tailored to investors outside the traditional energy sector.

However, if this progress is to continue, the stability of the domestic solar market must be maintained in DECC's anticipated review of the FITs later this year. In order to stay on the path to zero subsidy, the domestic market size needs to reach capacity triggers to naturally reduce tariffs. The UK market size (only recently above 100,000 installations per annum) is currently too low to reach significant degression triggers, raising the prospect of government intervention. Given this context, while the industry clearly needs to act to stimulate the market, if government is to review FITs, our very strong recommendation would be to address FIT *capacity triggers* (as per this Plan) rather than making changes to tariff levels, which could cause a repeat of the boom/bust cycle of 2012 and risk damaging market confidence.

Our modelling shows how capacity triggers can be adjusted to deliver both increased market growth as well as zero subsidy by 2020. Two hundred and twenty-five thousand more domestic systems would be installed under the Minimum Ambition scenario. It is arguable that regular tariff reductions can actually be helpful in stimulating investment, but sudden reductions do not lead to sustainable

Wind and solar generally produce power at times of the day, and over the year, that complement each other. The number one lesson from Germany's 'Energiewende' is to expand wind and solar in tandem.

Photo: © Westmill Energy Farm

market growth. Instead, we propose carefully structuring annual capacity in order to achieve parity by 2020.

Ensure that solar costs and benefits are accurately reflected in department and regulator modelling and key strategic documents including the 2020–2030 Renewables Roadmap

The speed at which the UK and global solar industries have developed has meant that DECC's modelling data for solar power is often out of date. This was the case for example with analysis on EMR, LCOE and Zero Carbon Homes, with the result that the role of solar and its value for money are often underplayed. Analysis in strategic documents such as the 2011 Carbon Plan, the 2030 Renewable Energy Roadmap and Ofgem's 'Transform Model' can have real impacts on the solar industry, so it is important this analysis reflects the latest solar data. For example, National Grid's UK Future Energy Scenarios anticipates just 7.5GW of solar being deployed by 2020 under its 'gone green' scenario – similar to *current* deployment. Likewise distribution networks anticipate connecting only 6.6GW of solar by 2023 as a result of partly basing projections on the 2011 Carbon Plan. Modelling and documents informing long term planning, particularly by DNOs and National Grid, should anticipate realistic and ideally ambitious levels of solar deployment in the 2020s. A minimum requirement for all such documents should be that they use up-to-date data and projections.

Develop a UK solar industrial strategy

Solar is often perceived to be more 'foreign' than other renewable technologies but evidence shows this is not the case. For example, a recent report by the Centre for Economics and Business Research (Cebr), shows that investment in solar delivers higher UK value than investment in other major sources of low-carbon power[31]. Cebr analysis also shows that solar has led to rapid growth in new business entrants in the UK electricity sector, mostly British owned, diversifying competition in the interests of all consumers.

The Department of Business, Innovation and Skills (BIS) has developed industrial policy strategies for nuclear power and for offshore wind only. Yet solar power provides greater content sourced from the UK than either, as well as greater employment potential. It is very welcome that the Government is taking a proactive approach to attracting UK manufacturing of wind turbines – and this is an approach we would like to see expanded to solar power. With the IEA anticipating that solar could dominate the world's power supply by mid-century, a UK strategy for strengthening its position in a booming international market would deliver significant economic benefits in the coming decades. Successful UK solar firms are already exploiting international opportunities to export their expertise, but stymieing development at home will impact the export pipeline.

Joined up policy-making can optimise UK solar industrial opportunities. For example, introducing a Building Integrated PV (BIPV) Tariff[32] in the FIT scheme should stimulate markets where the UK already has good manufacturing expertise. There is also tremendous potential to integrate solar policies with the roll-out of electric vehicle (EV) charging points. In addition to providing a local daytime load for solar generation, EVs can act as local storage, allowing self-consumption to be maximised. Indeed storage more generally provides huge opportunities to optimise self-consumption and is beginning to show clear signs of mirroring PV's dramatic cost reduction trajectory and its growth potential. UBS predicts that solar, storage and electric vehicles will reshape the electricity market[33] and sees Europe leading this paradigm shift.

Defining good practice in solar farms

The STA has been highly proactive in defining good practice. Our '10 Commitments' are widely followed by responsible companies in the industry. We have contributed to detailed guidance documents published by the BRE National Solar Centre on planning and community engagement, incorporating biodiversity into solar farms, and combining solar farms with agriculture and food production. These guidance documents can be found on the National Solar Centre's website.

Establish a Government-industry working group to prepare for solar parity

When solar reaches grid and socket parity, subsidy will no longer be required. However, until further cost reduction establishes a clear competitive advantage, it will need market design or regulation to incentivise capital investment. At a minimum solar power should not encounter structural barriers from a system historically designed to support large-scale centralised power.

We recommend that the Government establishes a formal working group with industry to prepare for a post subsidy world. This would need to include topics such as grid, storage and market integration as well as considering innovative financial solutions. The complex interaction of solar in the power market also needs to be better understood and supported to realise the full cost-saving benefits for consumers going forwards. Such a working group would also lay the foundations for preparing for other renewable technologies to also reach parity.

Support good quality large-scale solar

There is concern in the industry about the diminishing size of the market for large-scale solar over the next two years, yet it is this market that has been key to driving major cost reductions internationally and in the UK. Stable markets are needed in order for costs to continue coming down. Current policies leave a major gap in the large-scale market in the next few years, risking the momentum towards lower costs, and making industry contraction a real possibility. Policies also fail to take advantage of emerging patterns in the UK industry that see solar developers promoting biodiversity conservation and working with farmers to ensure that stocking density of livestock is maintained (which evidence shows it can be). At a time when farming is facing dwindling returns, and many biodiversity indicators are heading in the wrong direction, we believe the government should promote and work constructively with companies that have a proven ability to produce electricity while safeguarding nature and maintaining farm output.

We believe there is currently a bias towards large companies in the Contracts for Difference policy framework, which could consolidate, rather than expand, the generation market. The CfD mechanism as it stands is much better suited to larger companies that can shoulder high levels of risk and which have the capacity to pursue complex bidding strategies.

Furthermore, the open competition that CfDs present, not only across technologies but across all delivery years, prioritises later projects over near term schemes. This is particularly a problem for solar power, which has relatively rapid annual deployment cycles and which depends on a relatively consistent annual market volume to drive future cost reductions. The small size of the CfD budget, together with the removal of RO support two years early for 5MW+ projects, is tilting the playing field away from solar. The STA is also concerned that the sole focus of CfDs on costs risks undermining substantial industry work to define and promote best practice. Good quality schemes are essential for retaining public support, and quality has cost implications.

Grow the commercial and industrial rooftop market

The commercial and industrial rooftop solar market dominates across much of Europe. Analysis by EPIA suggests that this sub-market will be first to reach parity with grid electricity prices[34]. As recognised in DECC's Solar PV Strategy, there is huge potential for installing solar on big rooftops around the UK. This is also a critical scale for local community-led solar projects. Yet to date, this sector is not performing to its full potential in the UK. Large solar roofs are cheaper than many forms of centralised low-carbon power generation, so it matches the government's goals to encourage community and commercial developments at this scale. Our plan includes a new tariff band of 8.0p/kWh for projects between 250kW and 1MW, which will help to bridge the gap between the higher 9.54p and lower 6.16p[35] bands.

Whilst DECC has made positive steps towards unlocking some of the barriers to larger rooftop schemes, significant market growth can not be supported within the constraints imposed by the current FIT scheme. There are other barriers too, such as removing unworkable energy efficiency performance requirements (EPC D), which need to be addressed and can be afforded under our proposed changes to policy. The review of the FIT this year presents an opportunity to deliver much more ambitious deployment on larger roofs, which is very cost-effective. Politicians and the public have expressed extremely strong support for larger rooftops schemes, so it is now essential that this sub-market be supported in the policy framework.

Securing free trade in solar modules

Since December 2013, duties have been applied in Europe on crystalline silicon modules and cells from China. A Minimum Import Price (MIP) and volume quota was imposed by the EU. These trade restrictions are due to expire in December 2015, again allowing the UK industry access to competitive world pricing for PV modules. However, a further partial interim review has recently been launched by the European Commission and this could last for 15 months, with the potential for a full review in September. It is important for the Solar Independence Plan that the UK Government opposes any delays to the scheduled removal of trade restrictions. A return to a level playing field for international trade at the end of 2015 will help solar power to grow across Europe and enable consumers to buy quality products at the best prices.

Photo: © Phil Clarke-Hill and Dulas

Conclusion

The solar power industry has achieved spectacular growth and delivered unprecedented cost reductions over the last five years. The technology has huge potential in the UK and looks to be the first renewable able to compete with conventional energy without subsidy. However the increase in solar deployment resulting from the rapid cost reductions has led to a number of disruptive changes to solar subsidy schemes and dented industry's trust in government policy. Progress towards cost reduction and subsidy removal requires stable and predictable policy – the Solar Trade Association wants to work constructively with the new Government to achieve such a framework.


Photo: © Solarcentury

We believe that our Solar Independence Plan does just that by showing how the Government can act within the existing policy framework to achieve higher solar deployment with more cost-effective use of public subsidy. Our analysis shows that within current resource constraints, the existing support schemes can deliver increased solar capacity across the country, delivering secure, low-carbon power and providing better public value for money.

The STA has calculated that under our Minimum Ambition scenario, based on the latest data available to us, just 17% of the 2020 LCF budget would provide a glide path to grid and socket parity while delivering 20GW of solar power, or 5.6% of UK electricity demand. This expenditure is less than a fifth of the total low-carbon power budget in 2020, leaving 83% of funds available for other technologies. This seems a modest allocation of resources for the UK's most popular, and soon to be cheapest, major low-carbon power source.

The solar industry has much to contribute to the UK economy in terms of jobs, energy security and GDP – but it needs a coherent and stable policy framework, not least to minimise costs. More than any other technology, solar challenges deeply held assumptions about our electricity system and the relationship between consumers and suppliers. Government support is urgently needed to create space for such transformative technologies. The STA advocates informed and evidence based decision-making based on a transparent framework for evaluating all technologies. This includes using the most current cost information to inform policy choices and consideration of the many benefits relating to energy security, community involvement, job creation and emissions reduction. We hope that our Solar Independence Plan can help to underpin that framework.

Over the last five years there has been international recognition, including by Deutsche Bank, UBS and the International Energy Agency, that solar is likely to dominate the world's power supply by the middle of this century. Major economies such as India, the USA and China now have huge ambitions for solar.

Photo: © 10:10

Residents of Balcombe in Sussex celebrate the first stage of their plan to power their community entirely with solar.

The new Government has a unique opportunity to embrace this solar revolution and strengthen the UK's position in the booming global market. For this reason and many others – including delivering grid compatibility with wind and maximising value for money – we recommend our 'Higher Ambition' scenario to the new Government. This will deliver more than 2 million solar homes, 24,000 commercial and community schemes and 2,000 solar farms by 2020, as well as cost parity. The cost to households would be just £13.35 in 2020 – a small price to pay for the solar transition and an investment in a secure, low-carbon future.

We invite all political parties, the devolved administrations, and relevant government departments (HMT, DECC, DCLG, Defra and BIS) to examine our Solar Independence Plan in the light of both current science on climate change and analyses confirming the spectacular progress and huge potential of solar power. We urge the new Government to embrace the opportunities that solar provides and we invite MPs from all parties to endorse our push for solar independence. If government gets this policy right, the prize is solar competitiveness with fossil fuels by the end of this Parliament, and a significant stake in a tremendous global industry.

This would be a milestone achievement in the fight against climate change, for British competitiveness and for our national security.

Annex 1: Technical Methodology of the Solar Independence Plan Model

The Solar Independence Plan is backed up by a robust economic budget model. This section describes the background, assumptions and methodology of this model.

The STA model behind the Solar Independence Plan has been independently verified by experts from Imperial College, London. Estimates of jobs figures for the scenarios presented in the Plan were kindly provided to the STA by the Centre for Economics and Business Research based on their methodology set out in their 2014 report *Solar Powered Growth in the UK*.

Background

Experts from the STA together with members with many years of experience in the global solar PV market have pooled expertise to develop a framework for optimising economic benefits and to deliver a greater proportion of power from solar.

We recognise a diversity of views among STA members and this model is not intended to present a definitive option. It *is* intended to provide an alternative to the Government's current proposals and illustrate the affordability of a solar revolution.

Methodology

The model uses assumptions in deployment to calculate generation and therefore subsidy costs through the FIT, RO and CfD schemes from 2014 to 2021, along with the static legacy costs associated with FITs.

Deployment

Deployment assumptions are based on three scenarios: Solar Strategy, Minimum Ambition and Higher Ambition.

- Solar Strategy: this scenario is the STA's interpretation of the 10–12GW de facto "target" from the DECC Solar Strategy. This scenario has 12GW in 2020, with a particular focus on commercial rooftop and domestic solar, with an active curtailment of solar farms.
- Minimum Ambition: this is the central STA scenario, representing a possible outcome for the industry with stable policy support, with a balance of growth over all markets, and 20GW in 2020 split between domestic, commercial and solar farms.
- Higher Ambition: this scenario intends to show what the industry could deliver with stable and supportive policy. It provides 25GW in 2020.

For FITs, "legacy" deployment and cost is considered to be before 2Q14. Deployment from 2Q14 to 1Q15 is known through DECC's degression statistics[36] and therefore the values are fixed for all scenarios. Deployment from 1Q15 to 1Q16 is manually modelled for each scenario, and beyond that a yearly percentage growth is applied to each band per scenario.

For the RO, the yearly deployment is estimated for each scenario for both rooftop and ground mount based on discussions with members, as well as sources such as DECC's planning database[37] and additional assumptions such as having security of the <5MW RO allowing growth.

For CfDs, the yearly deployment is estimated for each scenario based on discussions with members, as well as sources such as DECC's planning database[38]. This deployment also depends on the removal of barriers allowing the solar industry to enter and compete the auction process.

Deployment Tables – DECC Solar Strategy

Total deployment by scheme – DECC Solar Strategy

Solar Strategy	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	Cumulative
FIT's deployment (MW)		2,010	680	720	810	890	950	1,000	1,060	8,120
RO ground deployment (MW)	750	1,350	1,000	100	200	0	0	0	0	3,400
RO rooftop deployment (MW)	0	20	40	80	150	0	0	0	0	290
CfD deployment (MW)	0	0	0	0	0	50	100	100	100	350
Total	**750**	**3,380**	**1,720**	**900**	**1,160**	**940**	**1,050**	**1,100**	**1,160**	**12,160**

Feed-in Tariff Deployment by band – DECC Solar Strategy

Projected Deployment	Legacy	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	Cumulative Total
0–10kW	1,390	400	460	520	540	570	600	630	5,100
10–50kW	290	110	100	100	110	110	120	130	1,070
50–250kW	70	80	110	140	160	180	190	220	1,150
250kW–5MW	80	10	10	30	50	60	60	60	370
Stand-alone	180	70	40	20	20	20	20	20	410

Note: This is based on our interpretation of DECC's 10–12GW scenario in the UK Solar PV Strategy.

Deployment Tables – STA Minimum Ambition

Total deployment by scheme – STA Minimum Ambition

Minimum Ambition	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	Cumulative
FIT's deployment (MW)		2,010	700	990	1,310	1,470	1,530	1,530	1,520	11,060
RO ground deployment (MW)	750	1,350	2,000	400	600	0	0	0	0	5,100
RO rooftop deployment (MW)	0	20	50	130	250	0	0	0	0	450
CfD deployment (MW)	0	0	0	0	200	500	750	1,000	1,250	3,700
Total	**750**	**3,380**	**2,750**	**1,520**	**2,360**	**1,970**	**2,280**	**2,530**	**2,770**	**20,310**

Feed-in Tariff Deployment by band – STA Minimum Ambition

Projected Deployment	Legacy	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	Cumulative Total
0–10kW	1,390	410	500	650	740	760	730	700	5,890
10–50kW	290	110	140	150	160	180	190	190	1,400
50–250kW	70	80	150	200	220	240	250	260	1,470
250kW–5MW	80	20	70	110	140	150	160	170	890
Stand-alone	180	70	140	200	200	200	200	200	1,400

Deployment Tables – STA Higher Ambition

Total deployment by scheme – STA Higher Ambition

Higher Ambition	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	Cumulative
FIT's deployment (MW)		2,010	710	1,050	1,400	1,730	1,960	2,130	2,320	13,310
RO ground deployment (MW)	750	1,350	2,500	650	750	0	0	0	0	6,000
RO rooftop deployment (MW)	0	20	100	180	250	0	0	0	0	550
CfD deployment (MW)	0	0	0	0	500	1,000	1,000	1,250	1,750	5,500
Total	**750**	**3,380**	**3,310**	**1,880**	**2,900**	**2,730**	**2,960**	**3,380**	**4,070**	**25,360**

Feed-in Tariff Deployment by band – STA Higher Ambition

Projected Deployment	Legacy	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	Cumulative Total
0–10kW	1,390	420	520	670	770	810	850	900	6,330
10–50kW	290	110	160	170	190	210	230	250	1,600
50–250kW	70	90	170	230	280	330	410	490	2,070
250kW–5MW	80	20	70	120	270	380	400	420	1,770
Stand-alone	**180**	**70**	**140**	**210**	**220**	**230**	**240**	**250**	**1,540**

Subsidy Scheme Calculations

Feed-in Tariff

For FITs, the model accurately replicates the degression mechanism, as well as handling alternative degression limits and banding structures. This enabled a comparison of the existing banding structures to our new proposed structures (described in Annex 2) directly. By tweaking the FITs scheme through the model, the savings gained by making sensible long-term policy changes can be evaluated.

The cost of deployment from 2Q14 is considered in detail, and the cost of solar under the FIT for before this time is considered "legacy". The Feed-in Tariff "legacy" point was chosen to be 31st March 2014. This is simply so that the Feed-in Tariff model can calculate degression based on recent reported values to check against actual results. The choice of when is considered legacy does not impact the costs in any case, as the deployment and tariff values up to 1Q15 are obtained from the DECC Monthly MCS and ROO-FIT Statistics report[39].

FIT Legacy costs

The Feed-in Tariff legacy costs are calculated from the Ofgem Feed-in Tariff Installation Report from 31 March 2014[40]. In this report, there are deployment values in kW of each tariff code, corresponding to a particular band at a particular time (i.e. at a particular rate). Using this data, the legacy cost for FITs in 2020/2021 is

$$C_{\text{FiT Legacy}} = \sum_{c} (D_c \times Y_{FL}) \times \frac{T_c}{100} \times (1 - d_a)^7$$

Symbol	Meaning	Source
$C_{\text{FiT Legacy}}$	The cost to the LCF of the FITs legacy to 31st March 2014	Calculated
c	A tariff code, i.e. a tariff band at a particular time	Ofgem[29]
D_c	deployment for a particular tariff code	Ofgem[29]
Y_{FL}	Annual yield (FITs legacy)	STA
$\frac{T_c}{100}$	Tariff for that code in p/kWh converted to £/kWh	Ofgem (REF)
d_a	Annual degradation factor	STA
$(1-d_a)^7$	Degradation of generation (and therefore cost) from 2013/14 to 2020/2021 – 7 years	N/A


Photo: © Viridian Solar

FIT non-legacy costs

The deployment and cost under the Feed-in Tariff from 2Q14 are considered as "non-legacy" or "new deployment". The cost of new deployment to the LCF is calculated as the amount of generation per quarter multiplied by the tariff rate received, with some additional factors such as degradation and first quarter reduction factor.

For any particular quarter q, the deployment in that quarter has a different cost to the LCF for the first two quarters than the following quarters. There are therefore three equations required:

- Costs for the first quarter
- Costs for the second quarter
- Costs for all following quarters

The costs for the first quarter – i.e. the quarter in which the deployment was made – is calculated as

$$Q_1^q = \sum_{\text{bands}} D_b \times \frac{Y_s}{4} \times RF_q \times T_b \times 10$$

Symbol	Meaning	Source
Q_1^q	Cost in the first quarter of that quarter's deployment	Calculated
b	Deployment band (e.g. 0–4kW, 4–10kW)	N/A
D_b	Deployment within that band	If before 1Q15, DECC[28], otherwise STA modelling
$\frac{Y_s}{4}$	Annual yield (small scale), converted to quarterly	STA
RF_q	First quarter reduction factor	STA
T_b	Tariff for that band in p/kWh	If before 1Q15, DECC[28], otherwise STA modelling

The 10 multiplier is a unit conversion factor arising from the deployment being in MW and the tariff being in p/kWh, converted to £/kWh.

The second quarter is calculated as

$$Q_2^q = \frac{Q_1^q}{RF} \times (1 - d_q)$$

Symbol	Meaning	Source
Q_2^q	Cost in the second quarter of that quarter's deployment	Calculated
d_q	Quarterly degradation factor	STA

The costs for the third and every subsequent quarter is calculated

$$Q_n^q = Q_{n-1}^q \times (1 - d_q)$$

The total cost in the financial year 2020 of the FIT scheme is therefore the sum of the costs in that year, including the cost from all previous quarters.

$$C_{FiT} = \sum_{q=2Q14}^{1Q21} \sum_{n=2Q20}^{1Q21} Q_n^q$$

In other words, the cost of solar under FITs in 2020 comes from deployment in that year's deployment, and the cost of deployment in all preceding years.

First Year and Quarter Reduction Factors

The project connection dates within a particular period (quarter or year) are distributed throughout that period. Therefore, it is important to take into account the reduction in generation (and therefore cost) that occurs because of this. For the first quarter reduction factor, the simple assumption is made that the deployment happens 50% through the quarter. For the first year reduction factor, analysis of insolation levels throughout the financial year as well as historic deployment distributions showed that a value of 36% is more reasonable: i.e. all deployment is assumed to be 64% through the year. This was due to both the higher insolation levels during the summer months and the historical tendency for deployment under the RO to be closer to a drop in tariff (i.e. January–April).

Renewables Obligation

For the RO, the model includes both rooftop and ground-mounted deployment with their associated ROC levels. The cost to the LCF in a particular year is the amount of energy generated multiplied by the ROC level, multiplied by the value of a ROC.

The subsidy cost of the RO in 2020 is calculated as follows:

$$C^{R,G} = \sum_{y=2012/13}^{2016/17} \left((D_y^{R,G} \times Y_L) \times (1 - d_a)^{2020/21 - y} \right) \times \left(R_y^{R,G} \times V \right)$$

Where:

Symbol	Meaning	Source
$C^{R,G}$	Cost in 2020 for roof or ground mount	Calculated
y	Financial year	N/A
$D_y^{R,G}$	Deployment in that financial year (roof or ground mount)	STA modelling
Y_L	Yield (large scale)	STA
d_a	Annual degradation factor	STA
2020/21 – y	Number of years between 2020/2021 and that financial year	N/A
$R_y^{R,G}$	ROC level in that year for roof or ground mount	DECC[41]
V	Value of one ROC in £	STA

The above equation is valid for both ground mount and roof mount. The cost of the total is then the sum of them both, i.e.

$$C^{RO} = C^R + C^G$$

Symbol	Meaning	Source
C^{RO}	Total cost of the RO in 2020	Calculated
C^R	Cost of the RO (roof-mounted) in 2020	Calculated (see above)
C^G	Cost of the RO (ground-mounted) in 2020	Calculated (see above)

For the first year, generation is assumed to be 36% of the total generation, to reflect the fact that not all projects will be built on the 1st April that financial year, and therefore will not be generating throughout the year. This does not impact the final 2020 cost, as the RO scheme closes in 2017 and therefore there will be no new RO deployment in 2020.

Contracts for difference

For CfDs, strike prices have been modelled based on a detailed bottom-up cost analysis by STA members and other factors such as PPA's, and these strike prices are compared to the wholesale prices to calculate a difference cost. Then, as with ROC modelling, the deployment is converted to generation and the total cost calculated from the difference cost and the generation. For the first year, generation is assumed to be 36% of the total generation, to reflect the fact that not all projects will be built on the 1st April that financial year, and therefore will not be generating throughout the year.

The subsidy cost of CfDs in 2020 is calculated as follows:

$$C_{CfD} = C_{CfD}^{2020/21} + \sum_{y=2014/15}^{2019/20} \left(D_y \times Y_L \times (1-d_a)^{2020/21-y} \right) \times \left(SP_y - WP_y \right)$$

Where:

Symbol	Meaning	Source
C_{CfD}	Cost of CfDs to the LCF in 2020	Calculated
$C_{CfD}^{2020/21}$	Cost of CfDs built in 2020/2021 to the LCF in 2020	Calculated
y	Financial year	N/A
D_y	Deployment in that financial year	STA modelling
d_a	Annual degradation factor	STA
$2020/21-y$	Number of years between 2020/2021 and that financial year	N/A
Y_L	Yield (large scale)	STA
SP_y	Strike price in that financial year	STA modelling
WP_y	Wholesale price in that financial year	DECC[42]

For the last year (i.e. the 2020/2021 year), the generation is not degraded, but instead a first year reduction factor applies:

$$C_{CfD}^{2020/21} = (Dy \times Y_L) \times RF_y \times (SP_y - WP_y)$$

Symbol	Meaning	Source
RF_y	First year reduction factor	STA

Total costs and household costs

The total cost to the LCF of these three schemes in 2020 is simply the sum of them:

$$C_{Solar} = C_{Fit} + C_{RO} + C_{Cfd}$$

All of the three schemes above are totalled and can be compared to the LCF budget or a household equivalent cost. The household cost does not include any reduction in bills from the self-use of electricity from solar.

The total cost of solar as a proportion of the LCF is

$$LCF_{Solar} = \frac{C_{Solar}}{C_{LCF}} \%$$

Symbol	Meaning	Source
LCF_{Solar}	Proportion of the LCF that solar takes	Calculated
C_{Solar}	Total cost of solar under all subsidy schemes in that year	Calculated (see above)
C_{LCF}	Total LCF budget	DECC[43]

The household cost for a particular year is calculated as

$$HC_{Solar} = C_{Solar} \times \frac{E_H}{E_T}$$

Symbol	Meaning	Source
HC_{Solar}	Cost to householders of solar in that year	Calculated
C_{Solar}	Total cost of solar under all subsidy schemes in that year	Calculated (see above)
E_H	Energy consumption by householders in that year	DECC[44]
E_T	Total energy consumption in that year	DECC[33]

This methodology of spreading the costs to households using their proportion of the total electricity demand is used by the CCC[45] and DECC[46], and therefore we believe it to be robust.

The energy consumption data is given in calendar years, rather than financial years. However, as the consumption profiles are relatively static, the calendar year is simply taken to be equivalent to the financial year for this data.

STA numerical assumptions and references

Some variables from the above equations have needed to be assumed. The below table describes which values these take, and a rationale for their selection.

Symbol	Name	Value	Rationale
Y_{FL}	Annual yield (FITs legacy)	876 kWh/kW	Based on 10% load factor
Y_S	Yield (small scale)	850 kWh/kW	Lower than legacy as "low hanging fruit" less likely going forward.
RF_q	First quarter Reduction factor	50%	Deployment happens during the course of the quarter, so this factor corrects the generation in the first quarter to take this into account.
RF_y	First Year Reduction factor	36%	Deployment happens during the course of the year, so this factor corrects the generation in the first year to take this into account.
d_q	Degradation factor per quarter	0.2%	Based on a performance of roughly 80% after 20 years.
d_a	Annual Degradation factor	0.8%	Based on a performance of roughly 80% after 20 years.
Y_L	Yield (large scale)	930 kWh/kW	Higher than small scale as solar farms can optimise direction and minimise shading
V	ROC value	£42 (same for all years)	Based on analysis of previous ROC auction results[47]

Policy Assumptions

The scenarios are based on the following policy assumptions.

Policy	Solar Strategy	Minimum Ambition	Higher Ambition
FITs	No changes to FITs framework	Changes to FITs framework as proposed in Annex 2	Changes to FITs framework as proposed in Annex 2
RO	Current policy	Stability restored to the <5MW RO	Stability restored to the <5MW RO
CfDs	Current policy	CfDs adapted for solar SMEs and some additional budget made available	CfDs adapted for solar SMEs and significant additional budget made available
General	Current policy	Policy stability restored and barriers to deployment removed (Annex 3)	Policy stability restored and barriers to deployment removed (Annex 3)

Photo: © Solarcentury

Annex 2: Proposed Feed-in Tariff Policy Changes

Background

The policy asks for the RO and CfDs are relatively simple: for the RO, provide certainty of the existence of the sub-5MW RO to 2017, and for CfDs provide more money within the auction pot and fix problems for SMEs within the auction framework.

For FITs, however, there are detailed structural asks. These are principally around degression triggers and bands, and are explained in detail in this section. For our Minimum Ambition and Higher Ambition scenarios, these changes are modelled, and for the Solar Strategy the existing policy framework is used.

Proposed changes

Our new band and degression proposals are to recalibrate the 50MW/q on the 50kW to 5MW rooftop and standlone bands in to the following new bands before a 3.5% degression:

- 50kW–250kW to 60MW/q
- 250kW–5MW to 40MW/q
- Stand-alone to 40MW/q

Through our modelling, we are proposing a series of amendments to FITs as part of the 2015 review which will have the effect of stimulating growth, re-allocating underutilised banding capacity to prevent hyper-degression, setting a path for zero subsidy across all rooftop sectors by 2020/21 whilst ensuring that it is 'cost neutral' to the FITs part of the LCF. These are the measures:

- Split the 250kW+ tariff band into 2 bands 250kW–1MW and 1MW–5MW
- Convert 3 degression bands to become 5 (add 250kW and stand-alone)
- Increase the new 250kW–1MW band from 6.38p to ~ 8.00p
- Amend the band limits:
  - **Reduce** 100MW/q 0–10kW to 70MW
  - **Reduce** 50MW/q 10–50kW to 40MW
  - **Increase** 50MW/q 50kW+ to 140MW

These changes are summarised in the below table:

	2014	Existing (2015)	STA	Degression
0–10kW	100	100	70	3.5%
	200	200	140	7%
	250	250	175	14%
	300	300	210	28%
10–50kW	50	50	40	3.5%
	100	100	80	7%
	150	150	100	14%
	200	200	120	28%
50–250kW			60	3.5%
			120	7%
			150	14%
			175	28%
250–5MW	50	32.5	40	3.5%
	100	65	80	7%
	150	97.5	100	14%
	200	130	120	28%
Stand-alone		17.5	40	3.5%
		35	80	7%
		52.5	100	14%
		70	120	28%

Additionally, the rooftop tariff band split of 250kW–5MW into 250kW–1MW and 1MW–5MW can be seen below, along with the proposed 8p/kWh rate for this newly created band:

	Jan–Mar	Apr–Jun	STA proposed new band
0–4kW	13.88	13.39	
4–10kW	12.57	12.13	
10–50kW	11.71	11.71	
50–100kW	10.34	9.98	
100–150kW	10.34	9.98	
150–250kW	9.89	9.54	
250kW–1MW	6.38	6.16	8.00
1MW–5MW			6.16
Stand-alone	6.38	6.16	

Annex 3: Non-financial barriers to rooftop deployment

The barriers to deployment are often not financial, particularly in the commercial rooftop sector, which is an area with a huge amount of potential.

The STA identified these 14 non-financial barriers in December 2013, and to date two have been consulted on, with responses expected soon. Additional progress has been made on landlord-tenant issues – so often a dealbreaker for large solar installations – with a Ministerial roundtable hosted by Amber Rudd MP. The STA continues to work on breaking down these barriers, and with structural changes to the FIT (see Annex 2) this growth will be enabled rather than causing a boom and bust market.

Headline issues

Number	Description	Current Status	STA next steps
1	Remove EPC D requirement	Currently DECC won't agree due to budget constraints and 'fabric first' policy	Possibility commercial EPC D removal could be negotiated, with Solar Independence Plan changes
2	Change aggregation rule from 90% to 100%	Not enough evidence from industry to justify	Maintain pressure for social housing and commercial properties
3	Allow eligible transfer of commercial installations to alternative location	Transfers to be allowed from 2019	Monitor implementation
4	Remove automatic degression on FIT's for non-deploying mid-scale	Lack of evidence submitted	Proposals on new bandings submitted as part of Solar Independence Plan

Planning related

Number	Description	Current Status	STA next steps
5	Amend permitted development planning rule – 'certificate of lawful development' (>50kW)	Consultation outcome extends permitted development to 1MW	Monitor implementation
6	Amend permitted development planning rule for domestic ground mount to remove the limit of 9.5m^2 (1.3kW)	Not prioritised by DECC	Incorporated request within DCLG consultation response
7	Allow a 9 month pre- registration	Currently all projects > 50kW can pre-register for 6 months	Propose changing this to 9 months
8	Ownership structure "Landlord vs Tenant"	DECC Ministerial round table. Progress	Ensure legal route to ease barriers. Work output from round table
9	New build: planning and energy act/zero carbon homes	Allowable solutions, and planning under consultation	Seek demanding carbon compliance standard in 2016 and maintain 'Merton Rule'

Administrative

Number	Description	Current Status	STA next steps
10	Provide PPA guarantees to allow electricity generated to be sold to the grid should the tenant cease trading.	No further progress	Establish long term impact of barrier
11	Increase the deemed export meter requirement from up to 30kW to 50kW which will encourage larger installations.	No further progress	Need more evidence to push forward
12	Speed up the complex Ofgem, RooFIT and ROC registration process which slows down deployment (process is suitably effective for the < 50kW).	DECC worked with Ofgem to produce 'easy guides' for administering	No evidence that process is easier
13	Update mis-information on EPC assessors default software which states 4kW still costs £16,000.	No further progress	Establish if barrier still exists
14	Undermining political support.	Political opposition to solar farms, despite solar's consistent popularity in DECC polling	Review following general election

Glossary

Capacity Trigger – tariffs degress (decrease) quarterly based on set deployment thresholds known as capacity triggers. For example, national *capacity* of more than 100MW in a quarter may *trigger* a 3.5% degression.

CCGT – Combined Cycle Gas Turbine i.e. a gas fired power station.

CfD – Contracts for Difference. Under this system, renewable energy plants compete purely on price for a 15-year subsidy contract (a CfD) through a sealed auction.

Degression – The reduction of the Feed-in Tariff rate. This is pre-determined according to the extent to which set thresholds for national deployment for bands of system size are exceeded every three months.

DNO – Distribution Network Operator. These are the companies responsible for distributing electricity to homes and businesses in the UK. There are 14 licensed DNOs in Britain.

EMR – Electricity Market Reform. This Government programme introduced Contracts for Difference (CfD), and the Capacity Market.

FiT – Feed-in Tariff. This scheme supports renewable technologies under 5MW in size, including solar PV, wind, hydro, anaerobic digestion and micro CHP.

Grid Parity – Grid parity as opposed to 'socket parity' is the point at which solar power is competitive with wholesale power on the grid. In practice grid parity is complex as, from an investor perspective, it will vary by project and can be affected by the volume of solar in the market.

GVA – Gross Value Added. This defines the value added by particular economic output. It is broadly similar to GDP, but whereas GDP is the measure of the country's economic output, the GVA is a more localised measure of a particular part of the economy.

Hyper-degression – STA term for extreme rates of tariff reduction that the market will not be able to cope with.

LCF – Levy Control Framework. The LCF is the budget available for the government, through levies on energy consumers, to implement Government fuel poverty, energy and climate change policy. It was set by HM Treasury in 2010 up until 2021.

LCOE – Levelised cost of energy/electricity. This measure is the ratio of the total costs of building and running a plant to the total amount of electricity over the plant's lifetime.

PV – Photovoltaic. A technology for the generation of electricity directly from light.

RIIO-ED1 – Revenue = Incentives + Innovation + Outputs. This model set by Ofgem determines how the 14 electricity Distribution Network Operators (DNOs) earn their revenue from 1 April 2015 to 31 March 2023.

RO – Renewables Obligation. This is the main support mechanism for larger-scale renewable electricity generation. It places an obligation on electricity suppliers to source an increasing proportion of electricity from renewables.

SMEs – Small and Medium Enterprises.

Socket Parity – 'Socket parity' refers the point at which solar reaches parity in the built environment where it is competing with the retail price paid for power (socket prices).

Strike Price – The strike price is a guaranteed price that an electricity generator will receive through a CfD.

Zero Carbon Homes – homes which produce no net carbon emissions through the use of high thermal insulation, onsite renewables & design features. The definition has been substantially watered down by Government to exclude appliances and include carbon off-setting.

Endnotes

1. www.iea.org/publications/freepublications/publication/name-51003-en.html.
2. *Deutsche Bank Markets Research*, Solar, Shah, V., 27th February 2015.
3. 6% is based on the most recent published DECC data for 2014. In reality industry intelligence suggests that the current installed capacity figure is more likely to be 7–8GW. The 10% estimate assumes 7.5GW of capacity at average yield.
4. Calculated by STA from DECC and Ofgem data.
5. *Fourth Carbon Budget Review* – technical report, CCC, December 2013. (A 2030 target of 50 gCO2 /kWh is recommended for 2030).
6. Cost Reduction Potential of Large Scale Solar, STA, Nov 2014, www.tinyurl.com/STA-LCOE.
7. *Current and Future Cost of Photovoltaics*, Fraunhofer Institute commissioned by Agora Energiewende, February 2015.
8. www.gov.uk/government/publications/decc-electricity-generation-costs-2013.
9. *Current and Future Costs of Photovoltaics*, Agora Energiewende, February 2015.
10. *Technology Roadmap, Solar Photovoltaic Energy*, IEA, 2014 Edition.
11. 'Socket parity' refers the point at which solar reaches parity in the built environment where it is competing with the retail price paid for power (socket prices).
12. *Solar powered growth in the UK*, Cebr, 2014.
13. *Solar powered growth in the UK*, Cebr, 2014.
14. IPCC AR5 estimates solar requires 18 and 7 times more jobs than nuclear and wind respectively (chapter 7). www.ipcc.ch/report/ar5. This is further supported by our own STA analysis which shows 17 jobs per TWh, in solar compared to 0.8 per TWh for nuclear and 1.1 jobs per TWh for onshore wind based on recent BIS & DECC data.
15. *The Size and Performance of the UK Low Carbon Economy*, BIS, March 2015. www.gov.uk/government/uploads/system/uploads/attachment_data/file/416240/bis-15-206-size-and-performance-of-uk-low-carbon-economy.pdf.
16. Note that the Cebr and BIS employment analyses are based on different methodologies so are not directly comparable. Analyses on UK solar employment can vary significantly – the STA wants to see the ONS routinely monitor employment in the renewables industry to provide robust data on this important sector.
17. *Solar powered growth in the UK*, Cebr, September 2014 (Figure 3, p. 12, based on data from the REA, Innovas, PwC and Cebr analysis).
18. Additional analysis undertaken by Cebr for the STA Solar Independence Plan 20GW scenario, consistent with their methodology in their report *Solar Powered Growth in the UK*, September 2014, Cebr. The figures quoted are for full-time equivalent direct and indirect jobs.
19. *Solar Powered Growth in the UK*, September 2014, Cebr.
20. www.mintel.com/press-centre/social-and-lifestyle/73-of-brits-believe-the-government-should-give-more-support-to-the-renewable-energy-sector.
21. Energy Preferences Briefing, Dods, January 2015 (survey of 100 MPs).
22. The 100MW/q capacity trigger that causes a 3.5% degression is reduced to 70MW/q. See Annex for details of FIT restructure.
23. Please note the STA model considers capacity rather than number of installations, so in order to estimate number of installations, an assumption on average system size needs to be taken. This was 3kW for domestic, 250kW for commercial, 5MW for solar farms and 8MW for shared ownership schemes.
24. Note that for the purposes of the Solar Independence Plan we have defined the 'commercial' sub-market as 50kW–5MW.
25. Available at www.tinyurl.com/STA-LCOE.
26. *Solar Powered Growth in the UK*, Cebr, 2014 estimates this value at £287m by 2030 for 13.3 GW of large-scale solar.
27. Mintel Poll 73% of Brits believe Gov should give more support to the renewable energy sector, published Feb 11th, 2015.
28. 'Code' refers to the 'Code for Sustainable Homes' categorisations.
29. The high levels of growth this year are a result of the Government removing Renewables Obligation support entirely for 5MW+ solar in April.
30. The previous Government raised the prospect of intervening in the sub 5MW RO if deployment is significant.
31. *Solar Powered Growth in the UK*, Cebr, September 2014.
32. Building Integrated PV is incorporated into the roofing fabric itself, e.g. as solar tiles which avoid the need for roof slates. The UK has important manufacturing opportunities in this area.
33. *Global Utilities, Autos and Chemicals: Will solar, batteries and electric cars re-shape the electricity system*, UBS, 2014.
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