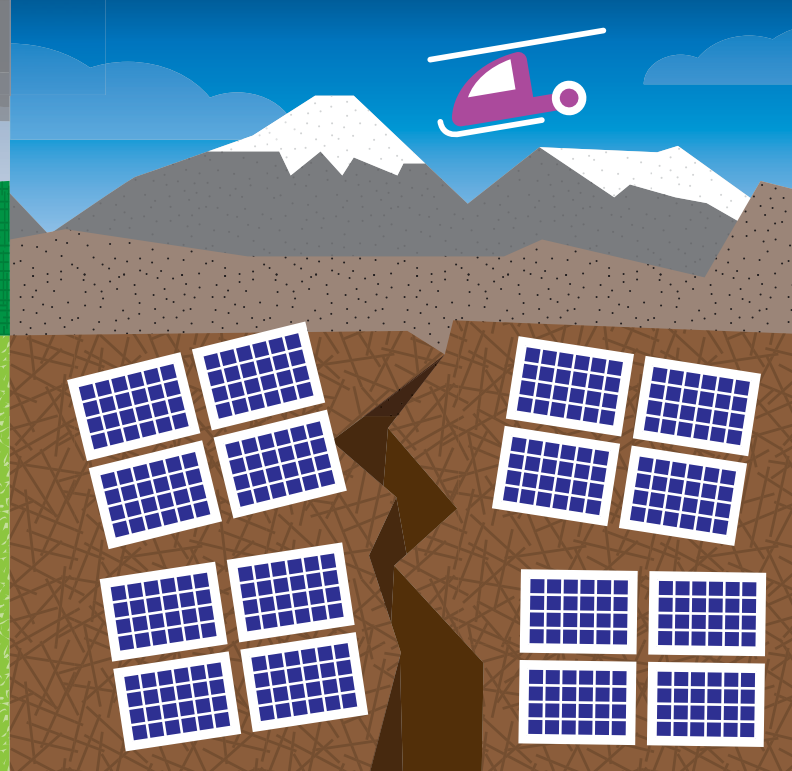
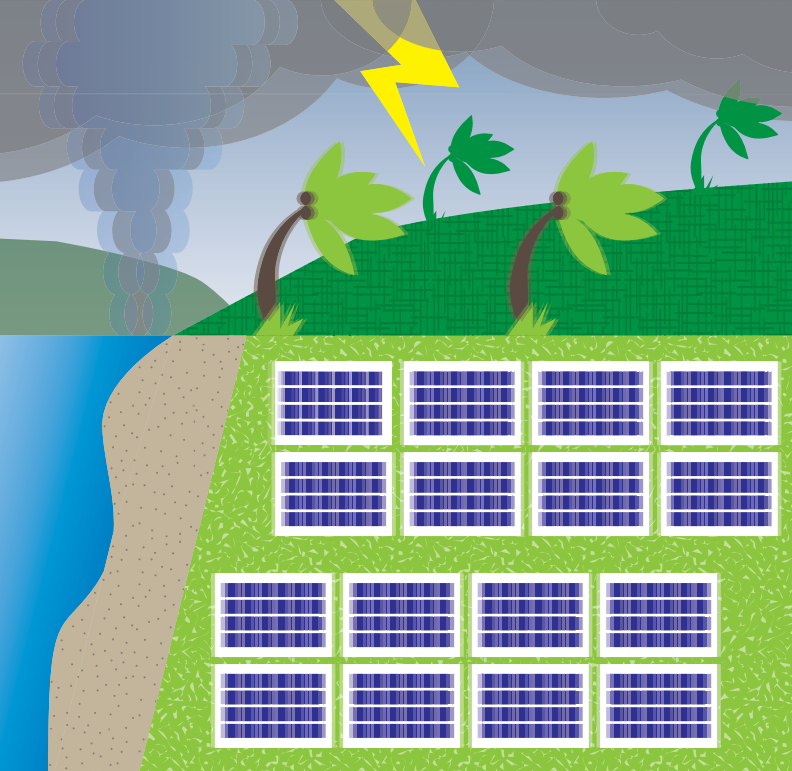
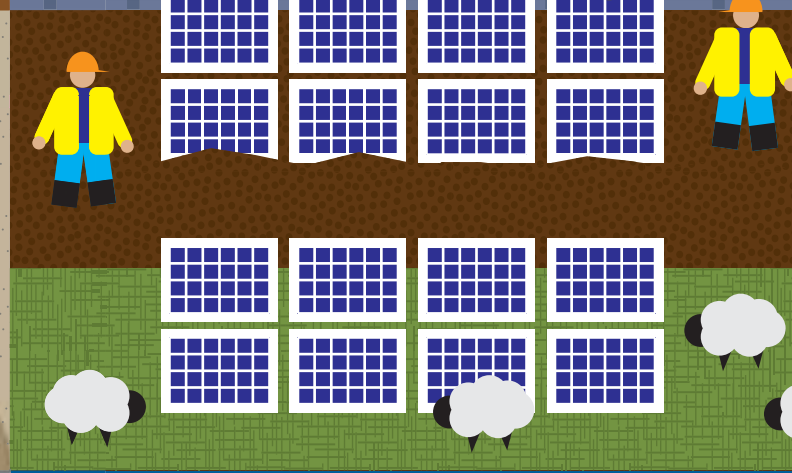
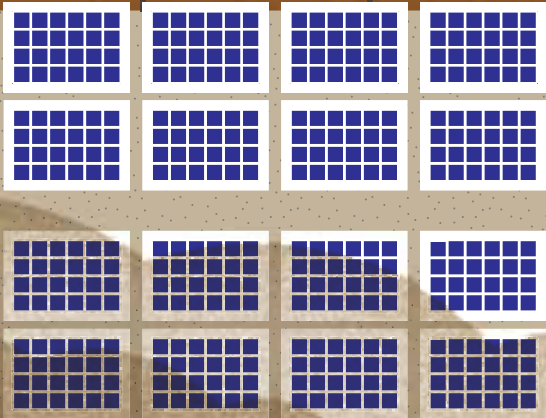


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Reducing risk in the secondary solar market

O&M due diligence | Emanuele Tacchino of Alectris outlines the lessons learned from the major solar secondary markets for helping investors utilise due diligence phase operations and maintenance (O&M) expertise to hedge risk and increase long-term profitability of their asset acquisitions

Following the grid connection rush, several countries now have an extensive base of installed PV capacity. Investors in these markets are currently turning their interests to solar PV acquisitions and portfolio consolidation. It is within these vibrant markets that the financial benefits of exploiting operations and maintenance (O&M) counsel during acquisition due diligence are being realised by investors. The strategy outlined in this paper, which draws on experience in Italy (one of the world's major PV markets), is applicable to any global region in which the solar PV secondary market is robust and where investors are looking for ways to hedge risk and increase the long-term profitability of their acquired assets.

Consolidation in the solar PV secondary markets

The Italian solar secondary market

represents an ideal case study. The solar PV landscape in Italy continues to be dominated by a large number of mid-size grid-connected plants, with the majority of them having been in operation for more than two years (Fig. 1). According to reports from Italian company Gestore dei Servizi Energetici (GSE) [1], there are more than 5,000 PV plants smaller than 3MWp in operation and approximately 2,000 larger ones, delivering a total capacity of approximately 7GWp. The top five solar PV portfolio companies own approximately 3.8% of the total installed capacity in Italy, with the total for the top ten players amounting to 1GWp. The market is therefore highly fragmented.

In comparison, the other EU countries, with the 'young' UK PV market on top, show completely different values in terms of relevance of the top PV portfolios (Fig. 2). A clear consolidation trend in these

"The financial benefits of exploiting O&M counsel during acquisition due diligence are being realised by investors"

markets follows the level of maturity of each respective country. For example, the UK market started from the very beginning as a 'PV learned' market, with various big funds involved, which have played a significant role in the development of the more mature markets (Germany, Spain, Italy). The results point to solid conditions and potential for the development and growth of a similar consolidation in the Italian solar PV secondary market, which is currently taking place.

Even after the recent legal and incentive changes (Spalma Incentivi, among others) affecting solar PV plant internal rate of return (IRR), as well as the patience levels of plant owners and the subsequent operating cost restructuring involving primary stakeholders (O&M servicer, asset managers), the acquisition of an operating PV plant in Italy at the right conditions still affords strong financial returns for investors.

In addition, the country's renewed political stability has allowed Italy to become more appealing for foreign investments: according to the 2015 A.T. Kearney Foreign Direct Investment Confidence Index [2], Italy has jumped from 20th place in 2014 to 12th place in 2015 (Fig. 3). The A.T. Kearney Index highlights, among the first 12 positions (the major PV markets of the world), the most appealing countries for investment. These markets create conditions for the maximum benefits of PV market development and portfolio consolidation.

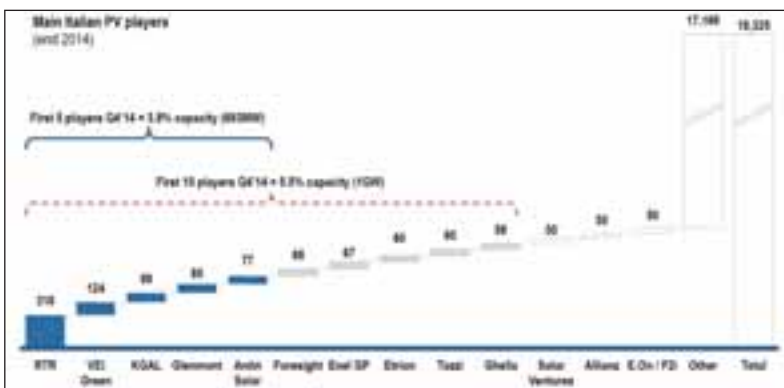


Figure 1. The main Italian PV players (end 2014), showing how much the PV landscape is fragmented.

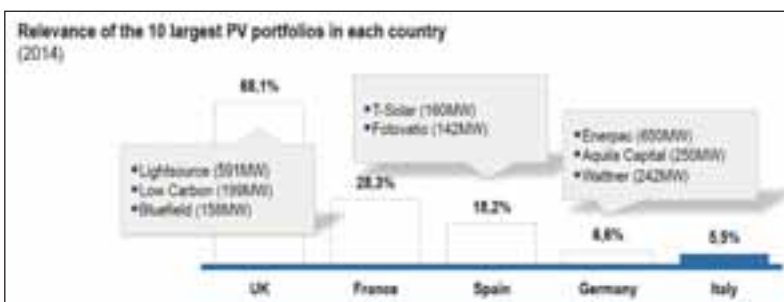


Figure 2. Consolidation in the new 'learned' PV markets: relevance of the top-ten PV portfolios in each country.

Source: eLeMeNS market research.

Source: eLeMeNS.

Source: 2015 A.T. Kearney Foreign Direct Investment Confidence Index [2].

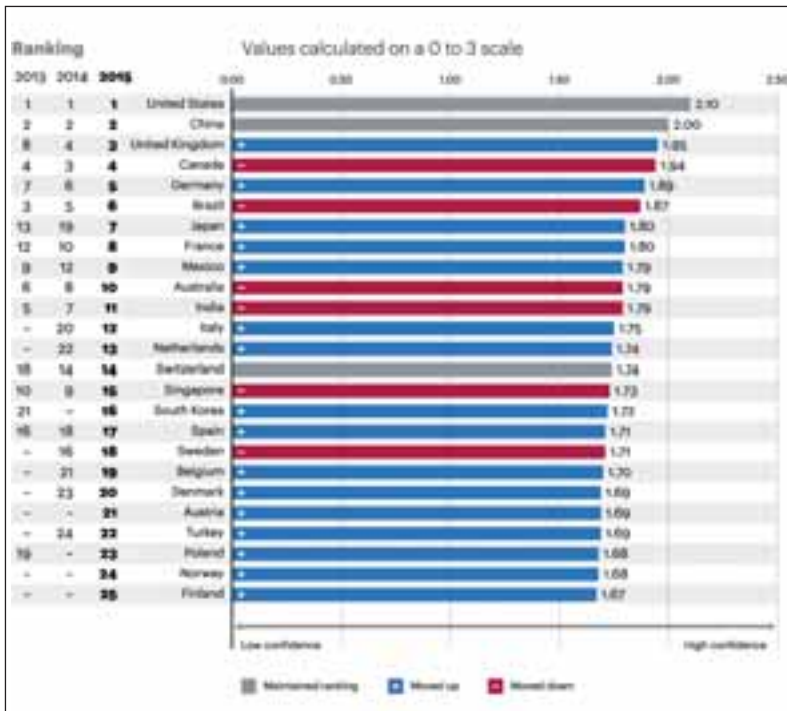


Figure 3. Appeal of investment in the top global PV markets.

encourage adoption of guidelines by industry.

- Create a quality benchmark of service provision for the benefit of the PV industry.
- Encourage debate among high-level experts.
- Facilitate networking between stakeholders.

As SolarPower Europe CEO James Watson has said [4]: “Best practices to support solar PV are critically important to PV solar becoming a serious energy generator here in the EU and globally. Initiatives are emerging in the US and other markets to aggregate industry knowledge into standardised recommendations. SolarPower Europe is leading efforts to ensure those practices are available to our sector.”

It is also worth mentioning the work of the DNV GL solar project certification initiative [5] in this direction. Such certification can represent a robust means of providing, through independent verification, evidence to all the solar stakeholders (owners, buyers, lenders, off-takers, insurers, governmental and non-governmental organisations) that a set of requirements laid down in standards has been followed; in addition, it indicates that a satisfactory performance has been shown during design and installation, and maintained during the operation of a PV power plant.

Due diligence cost-reduction strategy for solar secondary market acquisition

A solar PV plant secondary market acquisition is significantly different from acquiring a PV plant in development. With an extensive knowledge of the right partners during due diligence, investors in an operating PV plant acquisition can be guaranteed strong returns.

The due diligence process and allocation of risks

Investors face a range of risk and performance scenarios in any secondary market solar acquisition. The investment decision, however, can be assisted by experts and advisors in that domain: their competence in analysing risks, and in drafting and completing the contractual structure to allow the implementation of the risk allocation and to ensure, whenever possible, the reliability and the assumptions of the financial model, can

Consolidation of solar PV best practices

Globally the major solar industry players and stakeholders are developing best-practice guidelines and standards; these standards will support homogeneous worldwide development of PV. One result will be a more robust secondary market, impacting investors and off-takers, and indeed the whole financial community.

The development of best practices is evident in nearly every realm of solar PV throughout the world. These efforts include:

- A standardised tendering for investors and EPC constructors.
- Activities to improve the investment rating of PV plants and projects.
- Asset care, including O&M and asset management.
- An emerging discipline to standardise bankability criteria and requirements.

All of these efforts contribute to the market sophistication and maturity, but PV plant owners will continue to look to maximise the value of their project portfolios.

A combination of increased PV capacity worldwide, ageing fleets and the need to maximise the revenue from plants has indeed created a boom in the worldwide O&M business. Solar players should follow, from the greenfield phase to the operational phase of their PV assets, the following rules (Fig. 4):

- Engineer solar profits and performance from the beginning.
 - Build solar PV assets with a foundation for achieving strong solar profits, utilizing quality control.
 - Protect the profit performance of acquired solar assets with the help of technical expertise of professional partners.
 - Follow one standard holistic approach to maintaining and managing a global solar portfolio.
- SolarPower Europe (formerly EPIA), together with its members, has created

“With an extensive knowledge of the right partners during due diligence, investors in an operating PV plant acquisition can be guaranteed strong returns”

initiatives to develop best-practice guidelines for the European solar sector in the above-mentioned fields of solar tendering, bankability and O&M [3]. The main objectives of these SolarPower Europe initiatives are:

- Identify best practices and draft industry-led guidelines.
- Promote these guidelines across Europe.
- Increase awareness and consensus, and



Figure 4. PV plant lifecycle and processes under standardisation.

make the difference between a profitable investment and one that falls short of projections.

Typically, the legal, political and commercial risks are allocated to the sellers, with appropriate contractual structures and a set of warranties and responsibilities. These often evolve into specific criteria or formulas for price adjustments in the case of unexpected retroactive changes to any granted feed-in tariffs (FiTs) or power purchase agreements (PPAs). Several risks associated with the operation of the PV asset can, of course, also be properly insured; however, the main stakeholder to whom the risk of underperformance of the PV asset acquired will be allocated is the O&M contractor.

In order to identify the risks associated with the PV plant, various types of due diligence have to be performed, including:

- **Technical due diligence:** assessment of the technology, integration and technical aspects of permits and contracts; construction and operation assessment and monitoring.
- **Legal due diligence:** assessment of permits and contracts (EPC, O&M, land acquisition, financing, etc.), highlighting project legal risks.
- **Tax and accounting diligence:** assessment of the tax and accounting risks, issues arising from a transaction, and implications deriving from the proposed structuring of the transaction itself; checks that the financial model and the accounting and tax input are consistent with the assumptions and the appropriate accounting standards.
- **Insurance diligence:** assessment of the insurance policies' adequacies, to ensure that the insurance package matches the project requirements, from construction up to decommissioning.

All the outcomes of the due diligence process will impact the deal negotiations, the contract drafting, the conditions preceding the signing, and the relevant execution and eventual earn-out. Each selected risk mitigation instrument associated with the relevant risk has to be duly represented in each corresponding contract; to list just a few examples:

- Volatility on the energy price or unbalancing risks has to be regulated in the PPA with the appropriate energy off-taker.
- Higher costs related to land taxation impact the deal with the plant seller and can be managed with the partial purchase price retention until the end of the eligibility period for a cadastral review.
- Lower production than expected, resulting in lower revenues, gives rise to the application of guaranteed performance penalties under the O&M agreement.
- Defects or deficiencies resulting from the technical due diligence could lead to a price reduction or to a punch list of issues to be fixed at the seller's expense before the transaction is executed.

Technical due diligence performed by professional O&M providers

Due diligence technical service providers should apply a 'deep dive' (comprehensive review) process to the solar PV plant targeted by the investor. Services to ensure future energy generation should go beyond simply verifying documents and performing basic visual inspections; the basic services performed by typical technical consultants may overlook key details that professional O&M service providers could identify in the plant's construction and performance history. If investors want to be assured of future performance, they should contract a reputable solar O&M firm to provide a high-level and detailed assessment of the targeted PV plants.

If investors adopted a strategy of allowing the O&M provider to carry out the technical due diligence, in combination with a guarantee of performance after acquisition, the result could be substantial cost savings. For example, if due diligence is conducted by a third party, and a second O&M provider is appointed after acquisition, the latter provider will have to conduct another

technical analysis in order to secure their risk. In other words, a technical due diligence will need to be done twice, therefore incurring double the cost.

A qualified solar O&M provider should provide the following due diligence services for investors of operating solar PV plants:

- Verify the status and functioning of all the equipment in place at the targeted plant. Conduct verification in the field.
- Identify the plant's defects or performance weaknesses.
- Suggest cost-effective corrective or improvement actions.
- Highlight the relevant technical upsides/downsides of the plant to the investors, for a better negotiation with the seller.
- Properly serve the plant as an O&M service provider after the acquisition.
- Grant the relevant typical plant key performance indicator (KPI) guarantees during operation.

It is clear that such a partner, the professional O&M service provider, will agree to a completely different commitment on the basis of the assessment and

"Investor risk can be minimised by following critical due diligence evaluation steps in the field"

the relevant findings of their in-depth analysis, since they will also be required to provide performance guarantees (typically performance ratio and availability) in the case where they are appointed as the O&M service provider to the inspected plants after their acquisition is certain.

For the majority of solar assets, high-level technical and legal due diligence has been conducted during several phases of the asset's life cycle. The investor's risk in the secondary market is heightened unless detailed equipment reviews are performed. This process is fundamental to the security of the investment:

- Operating PV plants, particularly older assets (more than five years old), have already been assessed by other legal or

technical advisors during the financing stage at the time of construction and/or during refinancing.

- To the investor, the risks related to legal due diligence (critical issues or red flags), to technical documentation and the 'as built' of the existing plant, or to the compliance with applicable law and regulations, are quite limited (excluding full-equity plants, which have not yet been assessed by any technical consultants). The associated issues are typically remedied without incurring dramatic additional cost.

While the legal or high-level technical risk is thus quite limited, or in some way 'controlled', the analysis of plant equipment is critical. Given the value of the investment, it becomes imperative to reduce any kind of operational surprise and future corrective costs after plant acquisition. Knowledge of the weaknesses of the targeted plants before acquisition will allow the investor to save money on the acquisition itself. The value of this approach for an investor very much depends on the ability of a professional partner to:

- act in a speedy, accurate and complete manner in their assessment of a solar PV plant in the field;
- add fundamental understanding related to the real value of the plant that is being evaluated for acquisition;
- provide quick and comprehensive answers to questions which are normally out of their scope.

Technical in-field due diligence details

Investor risk can be minimised by following critical due diligence evaluation steps in the field; this evaluative process provides a complete plant assessment, executed in phases of increasing accuracy. This approach also minimises investor expense. It is assumed that the O&M due diligence runs in parallel to the reviews of legal, tax and accounting aspects. The recommended solar PV O&M due diligence scope of work includes two phases.

Phase one

- **As-built vs. detailed engineering and EPC contract analysis**
 - o PV plant layout, flash tests, wiring

plans, electrical drawings, design documentation

- **Compliance of the plant with safety regulations and applicable norms**
- **Complete plant equipment checks on site**
 - o PV modules (string connections, string boxes, broken/defective modules)
 - o Inverters (operation and state, existence/operation of DC/AC surge arresters)
 - o DC cables (state, sufficient current-carrying capacity)
 - o Mounting system (tilt position, state)
 - o Transformers/MV part (MV UPS, LV UPS, LV mainboard)
 - o Trackers (position–orientation and operation, stability and static efficiency)
 - o Security system (cameras, beams, magnetic contacts, DVR, motion detectors, optic fibre, etc.)
 - o Monitoring system (weather station, pyranometers, GSE meters)
 - o Communication (equipment, quality of internet connection)
- **In-depth thermography**
 - o Thermographic check of all modules, inverters and string boxes

Phase two

This phase should be activated if and when the plant acquisition is probable, after it has achieved clean legal due diligence, with no major red flags:

- **Additional in-depth measurements and checks**
 - o Junction boxes (string DC fuses, measurements of V_{oc} , I_{sc} or I_{mpp} , $I-V$ curves)
 - o Inverters (parameters/limits, AC/DC conversion)
 - o AC/DC cables (measurement of insulation level)
 - o Trackers (efficiency and state of motors, encoders)
 - o MV part (MV switch, MV UPS, transformer)
 - o Pyranometers (verification of consistency of measured values)
 - o Communication (data transfer, connection stability)

Each phase's investigative report should summarise the data and findings and provide a complete overview of the opera-

tional status of the installation. Specific qualitative and quantitative factors need to be analysed:

- Inverter dimensioning
- Cabling dimensioning
- Transformer dimensioning
- Shadowing effect
- Sorting of modules
- Performance ratio (PR) of the plant (for last year, as well as monthly values)
- Availability of the plant and reliability of the tracking system
- Energy deviation between real values and base case scenario
- Irradiation deviation between real values and base case scenario
- Security system

Upon the completion of this range of work, the entire plant operation and performance will have been evaluated and will provide investor confidence to move forward with the plant acquisition. By tying the initial solar O&M provider services to the same firm as the one supplying the long-term care of the asset, the investor can gain additional value from this process in the form of securing long-term profitability. ■

Author

Emanuele Tacchino is a business development manager in the Western Europe and Middle East division of Alectris. He has over a decade of experience in solar PV project management, dealing with PV projects or plant transactions and involving the development, construction and operation of PV plants.



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