APPLICATION NOTE
INVESTING IN LONG-LIFE RENEWABLE ENERGY AND ENERGY EFFICIENCY ASSETS

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Disclaimer

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SUMMARY

It is critically important to define the specific objectives prior to investing. Once these are established, any of various investing strategies can then be applied. This paper focuses on long-life asset investments (i.e. those lasting between one and more than twenty-years).

Investing in long-life assets must consider dealing with all types of potential risks. Risk assessment must be one of the foundation stones of every investment decision and needs to follow three important steps:

- Risk identification
- Risk valuation
- Risk hedging decisions depending on the amount and type of risk the investor is willing to take

The best—and often mandatory—tool for risk assessment is Due Diligence (DD). This process identifies and evaluates every potential risk a project can reasonably be expected to face. A number of hedging instrument can then be employed (contracts, insurance, credit enhancement instruments, revenue support policies and direct concessional agreements) to mitigate risk.

Renewable Energy (RES) and Energy Efficiency (EE) projects can be considered Long-term (LT) investments as they both present certain intrinsic characteristics that can attract investors who look to invest on a long-term basis:

- Low technological risk
- Long and predictable cash flows

INTRODUCTION

An investment is defined as a commitment of money or capital in order to obtain a financial return. The rate of this return will often be linked to the investor's appetite for or aversion to risk. The assessment of investment opportunities can be summarized in a single question. Is the risk an investor is willing to take worth the profit they can potentially realize?

Project risk is affected by two main factors:

- The investment horizon: This is the first factor to define before considering any type of investment. How long will it be before the investment is returned (payback period)? The investment horizon can be most simply divided into Short-term (ST) and Long-term (LT) investments. Long-term investments require a deep analysis prior to commitment by the investor and will be the investment horizon analyzed in this paper.

- The type of investment asset: This will have an impact on how to approach potential investments. There are a large number of asset types: infrastructure, energy, real estate, et cetera. This document focuses on Renewable Energy Source (RES) and Energy Efficiency (EE) projects and reviews the salient particularities of these investments.

The investment decision process can be segmented into three phases:

- The project identification phase: Different projects can be identified depending upon investor knowledge, objectives and experience.
- The project assessment phase: The investment assessment is quite similar for every type of project. This phase refers to a deep analysis of potential costs, returns and risks. A Life Cycle Cost (LCC) analysis[1] is recommended in RES and EE projects to properly assess costs. Potential risk assessment through a DD process is the most important phase.
    - The investment decision phase is the result of previous phases. It is at this point that investors take the go or no-go decision.

This paper will develop the risk assessment phase including risk identification and the decision on the best instruments for risk mitigation, with a special focus on RES and EE investments on a long-term basis.

[1] See the Leonardo Energy Application Note 'Life Cycle Costing – The Basics' for more details.

DEFINITION AND CHARACTERISTICS OF LONG-TERM INVESTMENTS

It is necessary to define what constitutes a LT investment. The definition of a LT investment depends upon the sector and on the investor point of view. For example, for an intraday trader, a holding period of 30 days will be considered as a LT position but for infrastructure investments, LT investments usually have a time horizon higher than fifteen to twenty years.

The LT investment definition used in this paper is based on the International Financial Reporting Standards (IFRS) that defines a LT investment as "an account on the asset side of a company's balance sheet that represents the investments that a company intends to hold for more than a year". Focus is on investments greater than a year in duration. However, further segmentation of LT investments is included:

- Medium-term (MT) horizon: One to five years. If longer than one year, it is then considered as a long-term investment in financial statements. A horizon of less than five years will give greater visibility on the entire project's life.
- LT horizon: Five to twenty years. If longer than five years, the visibility of future cash flows is reduced and risk assessment is strongly recommended.
- Very Long-term (VLT) horizon: Longer than twenty years. If longer than twenty years, project cash flows are even harder to predict and therefore risk assessment becomes mandatory.

Time horizon segmentation can be detailed as follows:

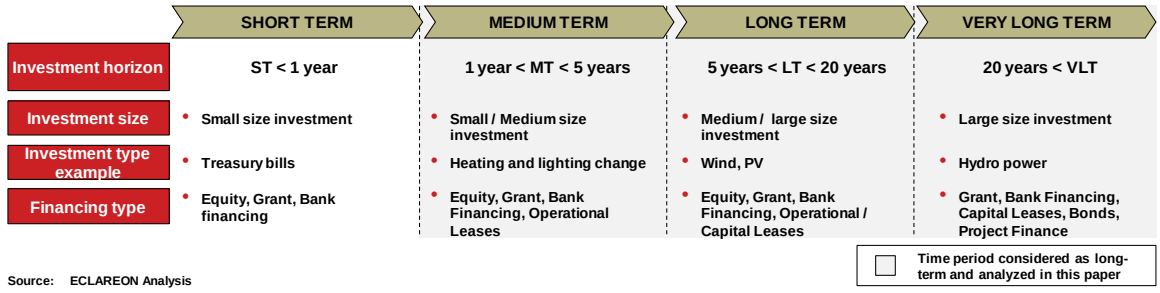


Figure 1 – Definition and characteristics of long-term investments.

As shown in the figure above, projects with an extended life horizon usually imply high upfront investments and specific financing. Depending upon the investment size and horizon, different financing options are available. However, there are three financing options that can be used in all cases: equity financing, grants and bank financing. (Financing Alternatives for Investing in LT Investments will be discussed in the final section of this paper).

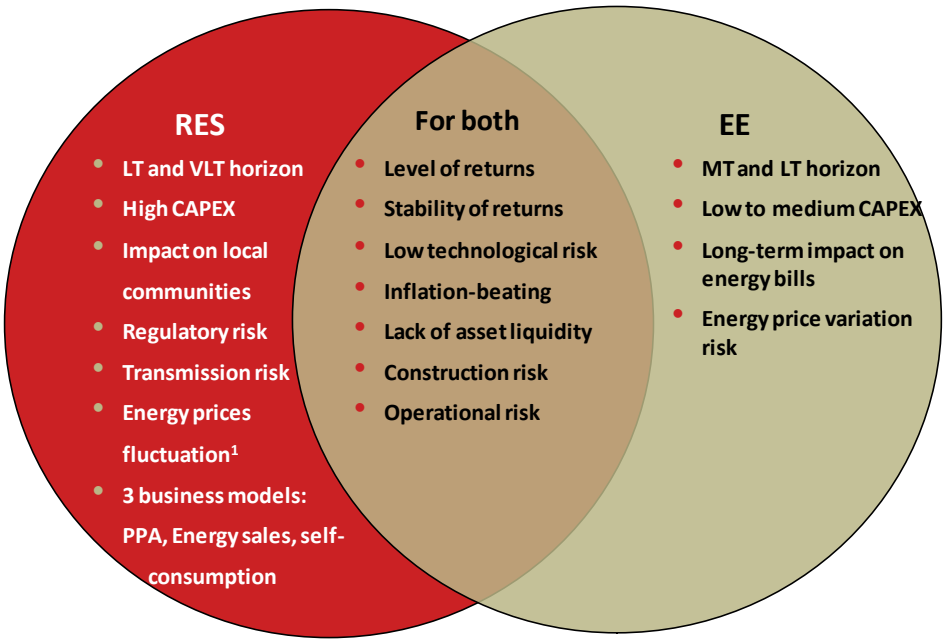
Choosing an investment horizon is a strategic matter that needs to be defined by the investor and will have a major impact on the investment approach.

RENEWABLE ENERGY AND ENERGY EFFICIENCY INVESTMENTS

Investing in RES and EE projects require a different approach as they do not usually have a similar investment size and horizon:

- RES projects (for example wind, solar, hydroelectric, and biomass) are usually considered as LT or VLT investments.
- EE projects (examples include lighting, heating and insulation improvement) are usually considered as MT or LT investment.

Since both RES and EE projects belong to the so-called "clean tech" sector, it is normal that they have several characteristics in common. The principal particularities and common points of these projects are listed in the diagram below:



Note: Depending on the type of installation it can refer to spot prices or retail electricity prices
Source: ECLAREON Analysis

Figure 2 – Main characteristics of RES and EE investments.

As shown on Figure 2, it is important to note the main differences in the risk profile of RES and EE projects:

- In RES projects, regulatory risk is the principal risk, especially for RES receiving governmental subsidies. Depending upon the location, some technologies require incentives to be profitable (e.g. wind power, PV and biomass). Another risk to consider is the curtailment risk for RES that do not self-consume 100% of their production. An excess of electricity injected into the grid may at times provoke blackouts or damage the entire system if not controlled. Therefore, grid operators often opt to curtail injection from non-manageable energy source such as RES.
- In EE projects, energy price fluctuations are one of the main risk factors. For example, if someone wants to implement an EE installation in their residence, they should consider forecasts of retail electricity prices. If these prices plummet below expectations for a considerable period, the return on the investment will be severely affected and may result in a write-off of the investment.

RES projects usually work under three types of business models, which involve different risks in each case. For example:

- With a Power Purchase Agreement (PPA) and depending upon the PPA type, prices can be indexed on pool prices resulting in a market risk or on inflation, in which case there is an inflation risk.
- Energy sales through Feed-in-Tariff (FiT) or governmental incentives involve regulatory risk.
- Self-consumption involves a degree of demand (commercial) risk since RES are not manageable and consequently can generate electricity when it is not needed.

A mix of the business models noted above can be used to mitigate risks. The choice of a particular model depends on the investor's profile and on the project location.

WHO IS INTERESTED IN INVESTING IN RES AND EE AND WHY

RES and EE projects have certain characteristics that a long term investor looks for, including predictable and stable cash flows combined with low technological risk. A significant number of well-known LT investors have already invested in the sector. A non-exhaustive list includes the following:

- Hedge Fund/Pension Fund/Private Equity Fund (e.g. Berkshire Hathaway[2], Blackrock, et cetera)
- Industrial electricity consumer (e.g. Google, Microsoft, Apple, et cetera)
- Real estate owner or operator

The following table summarizes the main advantages and disadvantages of RES and EE projects for investors:

	ADVANTAGES	DISADVANTAGES
RES	• Predictable Cash flows • High investment size per project (small managing cost) • No correlation with financial market	• Regulatory risk
EE	• Predictable Cash flows • Short Discounted Pay Back Time (DPBT) • No correlation with financial market	• Uncertainty surrounding energy prices for energy consumers • Small / medium investment size per project (high managing cost)

Source: ECLAREON Analysis

Table 1 – Main RES and EE advantages and disadvantages from an investor point of view.

It appears that even if EE projects are more attractive due to their short DBPT, RES projects seem better adapted to the investment needs of professional funds since their structure is simple (one technology involved) and the size of investments is larger. Due to the existence of fixed costs, it is generally cheaper to analyze and manage one large project than a high number of smaller projects. From the perspective of investment strategies, RES and EE projects can be an interesting match for investors such as pension funds, using Asset Liability Matching (ALM) techniques. The ALM attempts to time future asset sales and income streams to match expected future outflows. This makes RES and EE highly suitable due to the predictability of their Capital Expenditure (CAPEX), Operational Expenses (OPEX) and output values over the lifetime of the project. For example, given the predictability of monthly revenues from a PV plant, an investor such as a pension fund can match predicted monthly cash inflows (from the PV plant) against expected monthly cash outflows (payments to retirees) to reduce cash flow risks. It is also important to note that investing in RES and EE projects contributes to a green and eco-friendly image of the investors. This is yet another reason why these types of projects attract capital.

Nevertheless, even if such projects can attract capital, investors have to approach these investments differently as their risk exposure differs from other investment types.

[2] Warren Buffet's famous quote: "*Our favorite holding period is forever*" may explain his appetite for renewable energies.

RISK ASSESSMENT IN LT INVESTMENTS

The risk assessment phase has to determine if the risk/profitability ratio is acceptable. If not, investors have to try to reduce risks. They may, for instance, use hedging instruments or adopt an appropriate investment approach, in order to reach the target risk/profitability level. In LT investments, risk impact increases with the investment horizon: the longer the investment horizon the greater the uncertainties and risks.

The risk assessment process helps investors in making decisions to mitigate risks. The use of these instruments will in general add extra costs to the project. Logically, the risk assessment process will differ depending upon the project size, investment horizon and resources invested in the project. Risk assessment requires a rigorous process following the path illustrated below:

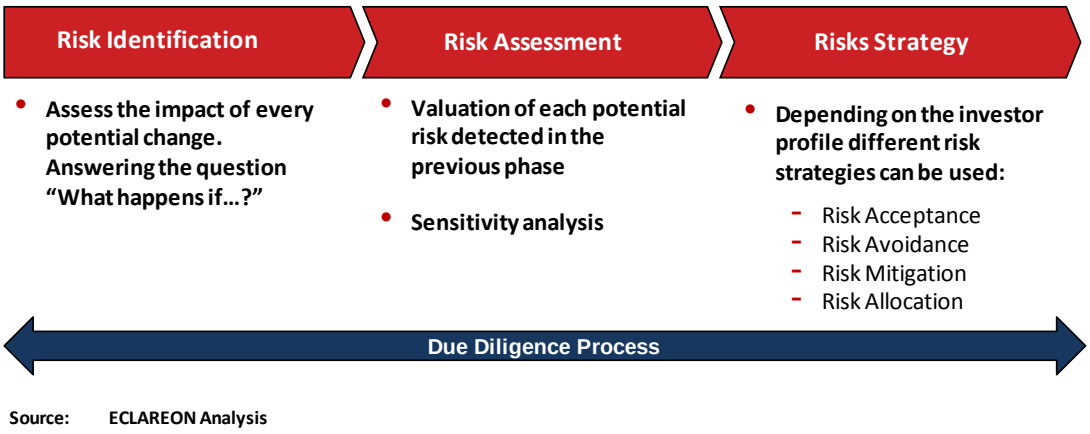


Figure 3 – Risk Assessment process

This process is necessarily performed before the investment decision. It enables the investor to gain a global view of the investment. With this information in hand, each investor can adopt a strategy to fit their unique risk profile.

DUE DILIGENCE PROCESS

The Due Diligence (DD) process is the risk assessment process used to identify and evaluate investment risks.

Which cases require DD?

A DD process is recommended for any type of investment. However, it is essential for projects that require external financing and is highly recommended for investments that take place in foreign countries or unfamiliar environments. Financial institutions and private investors mandate a specialized consulting firm to perform a DD process.

Who is in charge of the DD?

A DD can be conducted by internal and/or external consultants. In the case of bank financing, a DD will be obligatory. The bank will hire their own independent consultants who will review all of the risks and inputs. This DD will be used in preparing the projections that will make up the Bank Case.

What about DD costs?

It is a costly process integrated in the upfront costs:

- DD costs range from 0.5% to 1% of project Capital Expenditure (CAPEX)

- The biggest part of DD expenses is allocated to legal fees (depending upon the investment location, contracts have to be more or less exhaustive, e.g. common law)
- DD costs are added to the project's CAPEX
- DD costs will be amortized and considered in the balance sheet as an asset and is amortized

How long does it take to perform the entire DD process?

It usually takes less than 60 days to perform the entire DD process. However, depending upon the project, it can take up to 90 days or more.

A due diligence aims to review all aspects shown below:

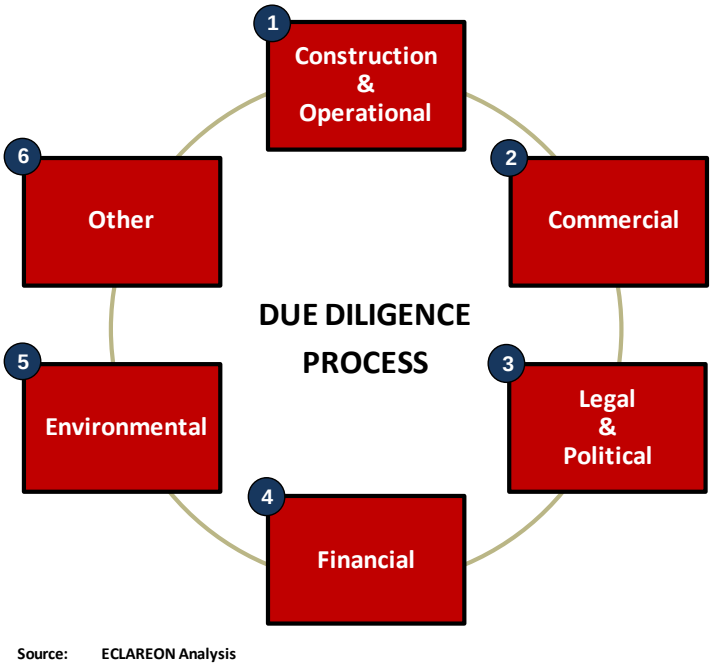


Figure 4 – Main categories reviewed during a Due Diligence

Depending on the project type, the DD has to focus primarily on specific areas that have a major impact on the project viability and profitability.

For RES projects, the environmental impact assessment is particularly important to the project since it may have a direct effect on the surrounding environment. This applies primarily to wind, PV and hydroelectric plants. Operational considerations generally hold a lower risk since it does not require complex Operation and Maintenance (O&M) and the electricity output can be easily predicted.

Role of Independent Consultants

In general, it is strongly recommended that DD be performed by independent auditors to avoid conflicts of interest and to guarantee the integrity of the auditing process. Likewise, external consultants are also mandatory when external financing is needed. Different types of advisors are used based on the expertise required:

1 Construction and Operational Risks along with 2 Commercial Risks

- Technical advisor: Usually an experienced and well-known firm in the sector. They are responsible for two main tasks:

        - Construction process assessment: Deadlines, budgets, Database Administration (DBA), O&M
        - Monitoring of development and certifications
    - Insurance advisor: An insurance broker is usually responsible for designing the insurance package and ensuring that it matches project requirements. Insurance is used to cover risks during the entire life of the investment (from construction to decommissioning).

3. Legal and political risks
    - Legal advisors: Can be local and/or international in nature. Their role is to audit project legal risks, actual or anticipated legislative activities, documentation and contracts. They also assist financial institution with financial documents.
4. Financial Risks
    - Financial advisor: Structures the financial modeling and advises on financing options. This is usually a financial institution or a specialized financial advisor.
    - Financial model auditor: Usually performed by one of the so-called "Big Four" auditing firms (PWC, Deloitte, E&Y and KPMG), or by a specialized consultant. They check the financial model and inputs used in order to confirm that they are consistent with DD reports and that the financial model meets appropriate accounting standards (IFRS or Generally Accepted Accounting Principles (GAAP)).
    - Accounting and tax consultant: Again usually performed by a Big Four auditor. They check and audit accounting and tax assumptions of the financial model and frequently advise on accounting and tax decisions.
5. Environmental risks
    - Environmental Impact Audit: Consists of performing the Environmental Impact Assessment (EIA). This is a preventive study that intends to assess and predict the environmental impact of the investment. It is usually accompanied by mitigation proposals.

Each project area needs to be exhaustively reviewed to assess all potential risks to the project.

Main Types of Risk

The notion of risk can be defined as a measure of uncertainty surrounding the outcome of a factor that affects the economic outcome of an investment. Risks can have positive or negative effects on an investment. In order to prevent or limit the possibility of negative outcomes or, more generally, uncertainty itself, risks need to be adequately identified and defined. The main risks involved in a RES or EE project can be grouped into one of six categories as shown below:

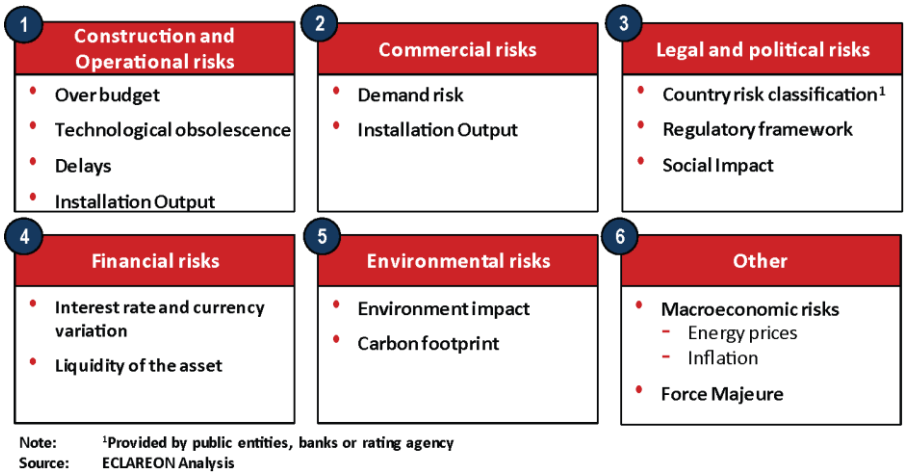


Table 2 – Main investment risks by category.

All risks can have a significant impact on project profitability and therefore need to be properly assessed and in some cases hedged. Some risks can be hedged naturally due to the investment type. Investing in RES and EE projects has an advantage in that the technological obsolescence risk is very low. In RES investment, this business model is either based on the sale of its energy production through PPA/FiT contracts, which secure revenues for a period of fifteen to twenty-five years, or are based on a self-consumption model. In the latter case, the investor is the energy consumer and investment obsolescence risk will be low. In the case of EE projects, since the business model is based on the creation of savings, even if the technology is obsolete it will continue saving energy. For these reasons, the risk of obsolescence can be considered low in both RES and EE investments. Nevertheless, technologies that are more efficient can become available on the market in a near future. In this case, a project analysis will have to be carried out to determine if the retrofitting of existing technology is profitable.

Even if RES and EE investments have advantages compared to others, they require a stable regulatory framework. Nowadays, many RES technologies no longer require economic incentives but they do need a stable regulatory framework to provide predictable returns over time. This is important for LT investments such as RES or EE investments because they require predictable cash flows in order to have access to financing. A changing or uncertain regulatory environment may result in investors going somewhere else or investing in other sectors, thereby damaging the future of these technologies as viable investments.

Risk Mitigation Strategies

The risk strategy of the investor can be applied after completing the risk assessment phase. In all investment cases, there are four risk strategies which can be used. Each strategy is defined in following:

- Risk Acceptance: It does not reduce any effects but is nevertheless considered a strategy as long as it is conscientiously adopted. This strategy is a common option when the cost of other risk management options, such as avoidance or limitation, outweighs the cost of the risk itself. A company that does not want to or cannot spend a significant amount of money on avoiding risks that do not have a high probability of occurring will use the risk acceptance strategy.
- Risk Avoidance: This is the opposite of risk acceptance. It is the action that avoids any exposure to risks. Risk avoidance is usually the most expensive of all risk strategy options.
- Risk Mitigation: This is the most common risk management strategy used by investors. This strategy limits a company's exposure by taking some sort of action. It is a strategy employing a bit of risk acceptance along with a bit of risk avoidance or an average of both. An example of risk mitigation would be a PV park owner accepting that an inverter may fail and not signing a lifetime warranty but avoiding excessive risk by securing an inventory of spare parts or signing O&M management contracts.
- Risk Allocation: This involves handing risk off to a third party that willingly accepts it. For example, numerous companies outsource certain operations such as O&M, and the risk of fluctuating energy prices. It can be beneficial for an investor to transfer a risk that is not associated with one of its core competencies.

In others words, risk avoidance, risk mitigation and risk allocation are strategies that can be executed using specialized instruments. However, before using hedging instruments, a sensitivity analysis is a necessary step to forecast and quantify potential risks. A sensitivity analysis is a quantitative impact assessment of a factor in a main parameter. Assessment of factors that can potentially vary significantly at any time during the asset lifecycle is especially recommended for LT investments. A non-exhaustive list of factors and percentage variations usually used during sensitivity analyses can be found in the table below:

	Interest rate	Inflation	Revenues	CAPEX	OPEX
Variation used	**-300 bps/+300 bps**	**-1%/+1%**	**-10%/+10%**	**-10%/+10%**	**-10%/+10%**

Table 3 – Sensitivity Analysis Variables and the variations usually employed.

Since these factors will affect the annual cash flows, any change in them will have a significant effect on the project. The potential magnitude of this impact must be assessed. Below is an example of what a sensitivity analysis should look like:

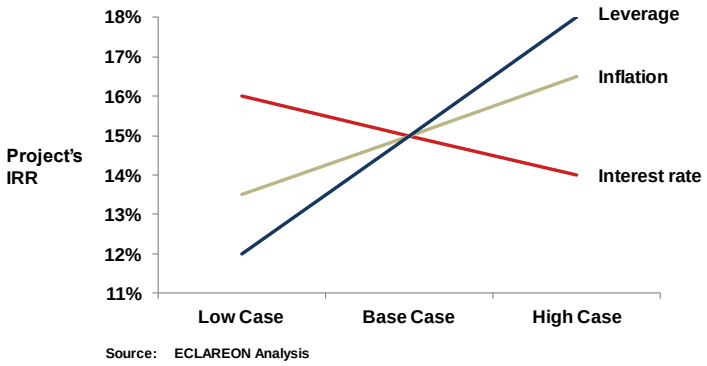


Figure 5 – Example of a Sensitivity Analysis Chart.

A sensitivity analysis provides an investor with an overview of the impact of different factors on key financial indicators. There are three main financial indicators that are usually assessed:

- Internal Rate of Return (IRR)
- Net Present Value (NPV)
- Discounted Payback Time (DPBT)

The analysis of such indicators has been reviewed in the "Life Cycle Costing" paper published by Leonardo Energy.

If it is desired to take a sensitivity analysis further in order to have a more comprehensive global view of all potential scenarios, then it is necessary to integrate statistical analysis in order to reflect the distribution curve of each factor. A Monte Carlo Simulation is used in these cases. It allows investors to deal with risks and uncertainty by building and running a stochastic LCC model (specialized software or an Excel add-in is needed). A good explanation of how to run Monte Carlo simulation is presented in "Stochastic Life Cycle Costing" published by Leonardo Energy.

Sensitivity analysis and Monte Carlo simulations are directly connected to financial risks and commercial risk assessments. Each risk category set out in Table 2 can be mitigated.

1 Construction and Operational Risks

These considerations refer to the construction risk, including among other things, cost overruns, delays and installation changes that can affect the output of a project. Technical risks refer to technological changes that could influence the project or technologies that may not meet expectations.

There is one main type of mitigation instrument for such risks:

- Contracts: These include Engineering, Procurement and Construction (EPC) contracts and O&M contracts. These contracts usually include a set of deadlines, completion guarantees, penalties for

failure to fulfill a contract, penalties for unexpected breakdowns or even Performance Ratio (PER) retro guarantees.

2 COMMERCIAL RISKS

This refers to the lack of demand. This is the risk that the actual consumer demand may not meet the demand forecast (because of overproduction or lack of production).

Those risks can be mitigated by:

- Insurances, for RES, thanks to specifics insurance contracts it is possible to hedge sunlight levels to secure production levels
- Energy output prices can be mitigated through contracts, mainly of two types:
  - PPA is a contract that sets all the contractual terms (prices, payment terms, et cetera) between an energy producer and an energy consumer.
  - FiT is a policy mechanism which offers cost-based compensation (for a fixed period) to the electricity producer

3 LEGAL AND POLITICAL RISKS

Legal and political risks refer to the uncertainty surrounding the regulatory framework and political/governmental stability. The main mitigation strategy for this risk is:

- Involving a public entity in the financing of the project. Public entities can propose advantageous financing through government budgets, bilateral and multilateral development banks, dedicated private equity facilities, and international climate funds such as EBRD, World Bank, MIGA, IDB, et cetera. Since national governments are usually involved in these financial entities (forming part of decision making bodies of these institutions), they can reasonably be expected to take special care of the development of these projects

It is important to note that depending on the investment type, regulatory risks can be critical. Transmission System Operators (TSOs) for example, are generally remunerated through the application of regulated access tariffs approved by the regulator. For every regulatory period, the regulator defines the tariffs to be applied to electricity network users for that specified period. In particular, the regulator decides the allowed revenue to TSOs and the global volume of costs to be passed on to consumers for the regulatory period. It also decides the level of tariff for each service and each category of users (tariff structure). In other words, regulation negatively or positively impacts all aspects of a TSO's business.

4 FINANCIAL RISKS

Financial risks include interest rate variations, liquidity of the asset, et cetera There are several mitigation instruments available, such as:

- Credit enhancement Instruments: These aim to improve loans/bonds qualities by hedging the borrower's credit risk and by using total or partial coverage for debt service payment.
- Contracts: Predetermining future date and price for a particular product (financial or material) using derivative contracts such as SWAP, futures, forward, et cetera. Such contracts make it possible to fix the future value of a factor, for example:
  - Currency change/interest rates
  - Energy price
  - Raw material price
  - Other factors

5 ENVIRONMENTAL RISKS

First, an EIA will assess both social and environmental impacts and will identify environmental risks. Those risks refer to the effects that an investment may have on the local, regional or global environment. They can usually be mitigated through:

- Insurance: in the event of involuntary or accidental damage to the environment

6 OTHER

MACRO-ECONOMIC RISKS

This refers to external risks associated with global factors such as inflation, energy prices. The type of mitigation instrument used to hedge this risk is usually:

- Contracts: Such as SWAP, future, forward and other derivatives

FORCE MAJEURE

This refers to the risk that there will be a prolonged interruption of the operations of a project due to fire, flood, storm, or some other factors beyond the control of the project sponsors. This risk can be mitigated primarily with:

- Insurance contracts

SUMMARY OF RISK MITIGATION

Every potential investor has to keep in mind that there is a cost associated with the hedging of a risk and this cost is associated to the chance and potential impact of a given risk. For this reason, the cost of hedging a Force Majeure risk may seem high since there is a low probability of the risk occurring.

It is clear that RES projects are riskier than EE projects given that EE projects do not depend directly on any regulation and that the investor is often also the client (except in ESCO contracts).

Some of the risks that affect a project have a "natural hedge". This means that a factor will have a double impact and that the magnitude of these will tend to cancel each other's out. For example:

- Interest rates on a long-term basis during the life of the project: interest rates will fluctuate up and down and tend to cancel each other out.
- Inflation as it affects both revenue and cost lines: Inflation can also affect interest rates in some cases unless interest rates are hedged at the same time by derivative instruments. This is normally the case.[3]
- Currency exchange, if investors have an international portfolio of investments with revenues nominated in different currencies.

These cases do not require the use of sophisticated financial products.

[3] Moreover, as inflation impacts OPEX and revenues, in some cases, inflation can finance part of the project capital.

FINANCING ALTERNATIVES FOR INVESTING IN LT INVESTMENTS

All financing options available for LT investments have been reviewed in a previous paper (see WP3 Case Studies), and can be summarized in the following figure/table:

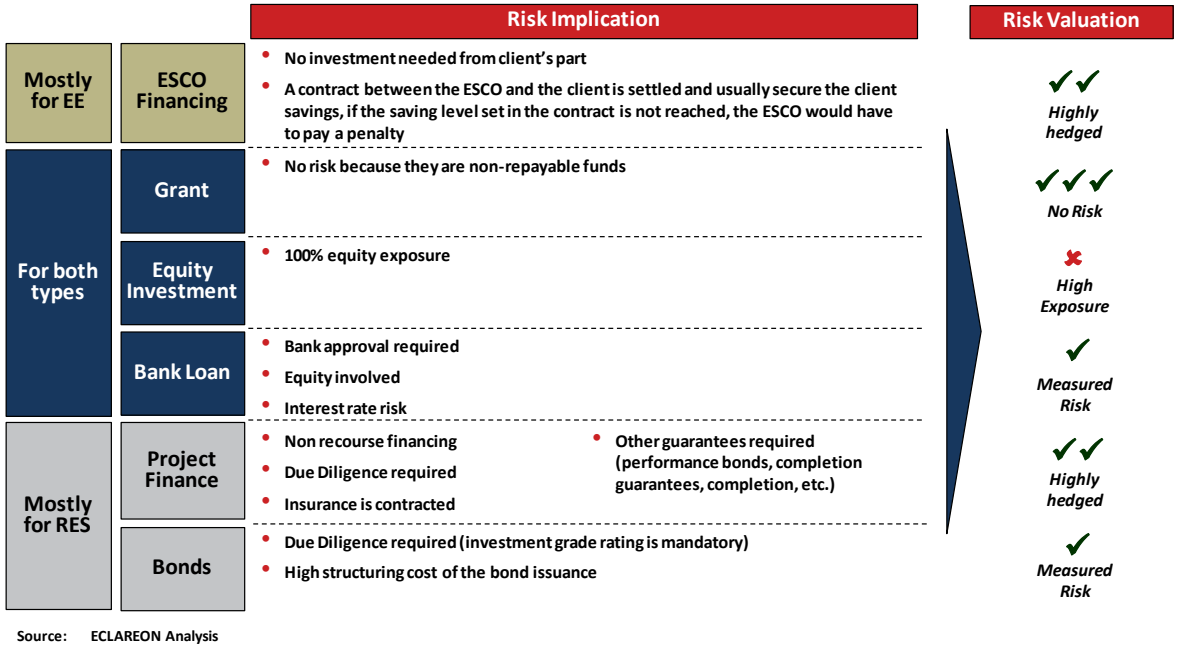
	Financing type	Investment Size	Operational risk
EQUITY	Equity	• Any size	• High exposure
INVETSOR LOAN / SUBORDINATED DEBT	Equity	• Any size	• High exposure
BANK LOAN	Debt	• Any size	• Moderated exposure
MULTILATERAL BANK LOAN	Debt	• Large projects (> 20 MEUR Aprox.)	• Moderated exposure
PROJECT FINANCE	Debt	• Large projects (> 20 MEUR Aprox.)	• Low and mitigated
LEASING / VENDOR FINANCING	Debt	• Mostly small /medium size	• Low exposure
BONDS	Debt	• > 100 MEUR	• Low and mitigated
ESCO/ PERFORMANCE CONTRACTING	Mix model	• Mostly small size (< 1 MEUR)	• Low exposure
GRANT	Grant	• Any size	• High exposure

Source: ECLAREON Analysis

Table 4 – Overview of financing options available for LT investment.

The most appropriate financing is not always the most profitable for the project since its impact on risk also has to be considered.

There are fewer financing options available for RES and EE investments. Risk can be lowered or increased depending on the financing option chosen. The following table shows the relationship between financing and risks.



Source: ECLAREON Analysis

Figure 6 – Risk implication and valuation of financing for RES and EE investments.

The choice of financing is extremely important since it has an immediate effect on the investment risk profile. Using a specific financing option can also be used to hedge certain specifics risks.

CONCLUSIONS

Investing in Long-Life Renewable Energy and Energy Efficiency assets is quite attractive for long-term investors since they present a low technical risk and long and predictable cash flows.

The main requirement in securing a predictable cash flow for RES and EE projects is a stable regulatory framework.

In a LT investment, risk is one of the main factors that affect its profitability and viability. The DD is a very powerful instrument for risks assessment, as it enables both the identification of the main risks to a project as well indicating the best hedging and mitigation strategies for securing cash flows and therefore returns for the investor. Predictable cash flow is critical in gaining access to external financing.

The objective of DD processes is to highlight and evaluate potential risks in order to take the appropriate risk strategy decision for the characteristics of the investment and the investor. There are four types of risk strategies:

- Risk acceptance
- Risk avoidance
- Risk mitigation
- Risk allocation

The following figure summarizes the connection between risks and hedging instruments:

		Project phase	Allocation to	Mitigation instruments	RES	EE
1 Construction & Operational risks	Construction over cost	Construction	EPC	• EPC Contracts	✓	✓
	Technological obsolescence	Operation	Project owner/ financing parties	• Suppliers warranties	✓	✓
	Delays	Construction and Operation	Project owner/ financing parties	• EPC Contracts	✓	✓
	Revenues	Operation	EPC	• EPC Contracts with output warranties	✓	✓
2 Commercial risks	Demand risk	Operation	Project owner	• Insurances	✓	✓
3 Legal & Political risks	Political	Operation	Project owner	• N.A	✓	✗
	Social Impact	Operation	Project owner	• Environmental Impact Assessment	✓	✗
4 Environmental risks	Environmental impact	Construction and Operation	Project owner	• Insurances	✓	✓
	Carbon print	Construction and Operation	Project owner	• Carbon Credit, etc.	✓	✓
5 Financial risks	Liquidity of the asset	Operation	Project owner/ financing parties	• N.A	✓	✗
	Interest rate and currency change	Construction and Operation	Financial parties	• SWAPS, Futures, etc • Sensitivity analysis	✓	✗
	Inflation	Operation	Project owner/ financing parties	• Natural hedge	✓	✓
6 Other risks	Force Majeure	Construction and Operation	Project owner/ financing parties	• Insurance contract	✓	✓
	Policy change	Construction and Operation	Project owner	• Authorities engagement • Multilateral institution	✓	✗
	Energy prices	Operation	Project owner	• SWAPS, Collars, Futures, etc.	✓	✓

Source: ECLAREON Analysis

Table 5 – Risk identification and hedging tools.

Investing in risk strategies is therefore an important cost parameter in any LT investment, and the more secure the future cash flows of such investment, the easier the access to financing.

ANNEX: ACRONYMS

Acronym	Meaning
BPS	Basic Points
CAPEX	Capital Expenditure
DBA	Database Administration
DD	Due Diligence
DPBT	Discounted Payback Time
EBRD	European Bank for Reconstruction and Development
EE	Energy Efficiency
EIA	Environmental Impact Assessment
EPC	Engineering, Procurement and Construction
FiT	Feed in Tariff
GAAP	Generally Accepted Accounting Principles
IFRS	International Financial Reporting Standards
IRR	Internal Rate of Return
LCC	Life Cycle Cost
LT	Long-term
MIGA	Multilateral Investment Guarantee Agency
MT	Medium-term
NPV	Net Present Value
O&M	Operation and Maintenance
OPEX	Operational Expenses
PPA	Power Purchase Agreement
PER	Performance Ratio
RES	Renewable Energy
ST	Short-term
TSO	Transmission System Operators
VLT	Very Long-term