ENERGY SYSTEMS TOOLKIT

Developing a Project Idea Module

RICARDO
Ricardo Energy & Environment
LOCAL ENERGY SCOTLAND
HIE
Highlands and Islands Enterprise
Iomairt na Gàidhealtachd 's nan Eilean

BACKGROUND

The Energy Systems Toolkit (the 'Toolkit') is aimed at organisations, community groups or businesses, at different stages in the project development process, whether exploring ideas to develop into a project or additional options to include in a current project. The Toolkit aims to provide further information to organisations on energy systems topics that will help determining whether a project idea is viable or highlight alternative options that should be considered. The Toolkit also provides support through the development process to construction, highlighting any support available to them. This could include:

- Signposting businesses or communities to additional support (technical or financial) in developing their project, to potential project partners or to potential sources of funding;
- Provide detail on key considerations and barriers across different technology projects; or
- Highlight different technology projects and themes that have been developed successfully across Scotland.

For each of the topics, the guidance provided will be informative and will indicate the actions to be taken and the next steps the organisations should take to progress.

The Toolkit links to other relevant guidance documents, such as the CARES Toolkit, which can be used in parallel.

INTRODUCTION TO DEVELOPING A PROJECT CONCEPT MODULE

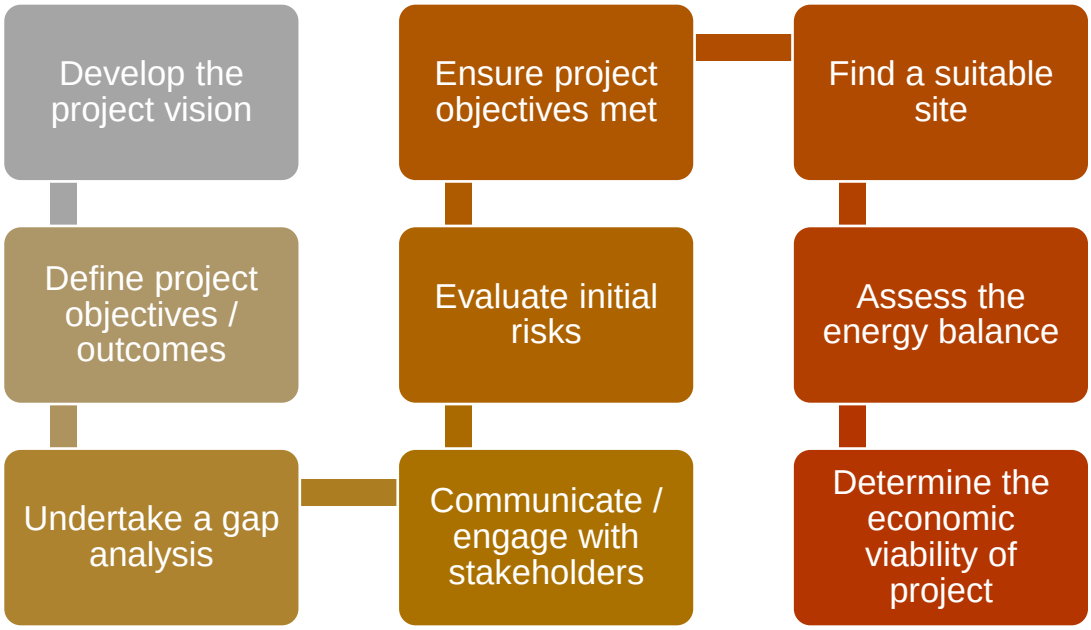
This module will aim to provide a framework to help develop a project concept. A number of key steps and information is supplied to enable the user to navigate from an initial project idea to a more robust feasibility study. The module provides guidance on aspects that should be considered in order to develop a successful project.

A series of stages to the development of a project concept are outlined below, with examples and pointers where relevant. As there is considerable difference between energy systems projects, the guidance provided is generic where possible so that it can be applied across multiple project areas.

Defining objectives

Whether the idea is based on a demand by the community or business, or a simple observation of an available resource, the first stage is to take the embryo of the idea for a project and explore it further. The steps to developing that idea further to see if it is worth investing a significant amount of time and money are:

- **Develop the vision** – have a clear idea of what the project will be and pull together a skills matrix
- **Seek wisdom from others** – consider previous case studies or similar projects nearby
- **Communicate** – engage with relevant stakeholders
- **Find a site** – ensure that suitable resource / energy supply or energy demand is available and there are no major development barriers (land ownership, distance from grid connection point, etc.)
- **Initial viability** – conduct an energy assessment to get an idea of the size of the project and consider the project financials

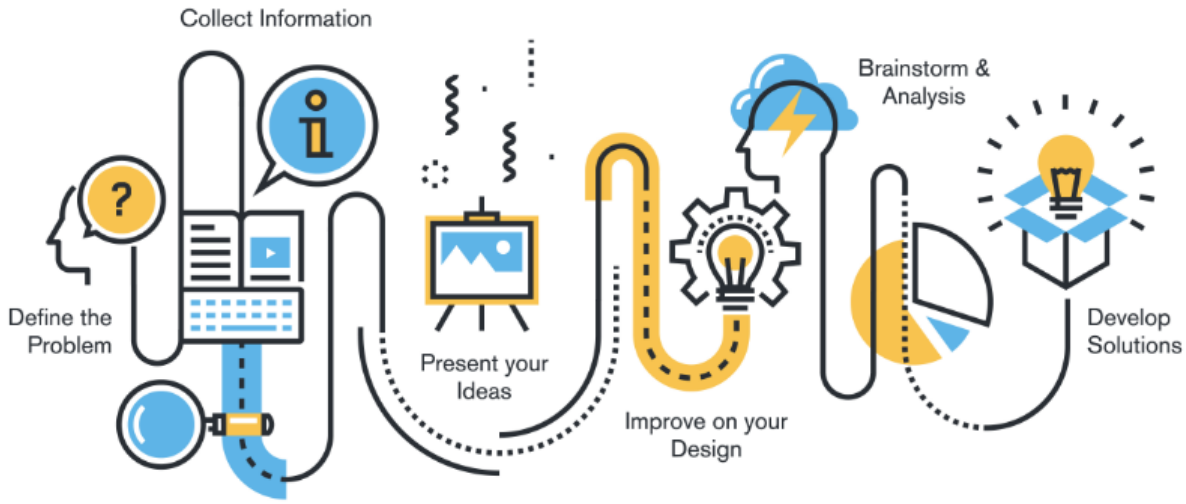


These steps will be developed further below. Be sure to allow enough time for a thorough analysis and planning phase to ensure you get the most out of the project. In order to ensure that the project is a success, you need to make sure that the project:

- Addresses a real issue (i.e. the project is a solution to a problem);
- Has realistic objectives and activities;
- The risks to the project can be sufficiently evaluated and mitigated (see specific section in this guide);
- You have sufficient capacity to manage and implement the project; and
- It leads to long-term or sustainable outcome.

Developing the project vision

A brain-storming session with the team and possibly other important stakeholders is a good way to collect these initial thoughts and problems relevant to the idea. There are many different tools and methodologies available for running brain-storming sessions. Potential project ideas can be discussed as well as potential individuals or organisations which might be interested and might become project partners.



Define the project objectives and outcomes

In brainstorming, ask yourselves the following questions to clarify your project idea. Your initial thoughts will form the basis of a more in-depth analysis on all of these points:

- Why is the project being carried out (i.e. in answer to what need/problem)?
- How would the ideal situation look like and what is the project expected to achieve (i.e. what are its objectives and expected immaterial results and outputs in terms of services/goods)?
- How is the project going to achieve it (i.e. which activities, which methodologies are used)?
- Which external factors are crucial for its success (i.e. which assumptions do we have, what are the preconditions for our activities)?
- Where to find the information required assessing the success of the project (i.e. ways to measure the results)?
- Which means are required (in terms of human and other resources)?
- How much will the project cost and how you will finance it? (i.e. what is the budget)?

Rules of thumb to bear in mind

- For an energy project, ensure that you have a suitable and reliable resource and end user
- Try to accommodate any demand that is physically close, whether on the electricity grid or geographically, to the resource (i.e. near an energy intensive local business)
- Check for current cost of existing energy sources, especially for heating or transportation, any change of supply will need to be cost effective
- Ensure that there is local infrastructure
- It is always best if there are supportive local partners

Undertake a gap analysis

Seek advice from other projects in the area to understand what the needs and barriers are of the project and if there are any lessons learnt that can be applied to your project. In doing so, consider undertaking a gap analysis of your organisation against the project aims and objectives and the learnings from other projects. This should help identify areas where there is a gap in your organisations' knowledge or capability which could be filled by collaborating with a partner or by bringing in additional resource. Refer to the Identifying Partners Module for further information.

Some of the key barriers affecting projects are:

- Insufficient understanding of the energy balance
- High capital costs/finances
- Restrictions on siting and construction (e.g. planning or environmental consents)
- Grid connection deferral due to capacity constraints
- Lack of technical/commercial skills
- Subsidy deadlines and changes in regulations (e.g. FITs)
- Community or individual rejection

Rules of thumb to bear in mind

- Look within and beyond your community to build a coalition
- Getting specialist support particularly with project management, technical studies and financial analysis will derisk your project
- Speak to other communities

Some of the barriers identified above can be overcome by partnering with an organisation that has specific knowledge or expertise in the field, or could provide financial backing. However, in most instances, the barriers should be identified and suitably addressed during the initial brainstorming of the project idea.

Communicate and engage with stakeholders

An important step to a successful project is to have open communication channels with the local community and stakeholders. One effective way to do this is to hold information sharing events, backed up by an online presence with a point of contact for questions. The relevant stakeholders to take into account could be the local residents and businesses, land owners (e.g. the Forestry Commission, Community Organisations, etc.), utilities (electricity, water, gas), investors and technology experts.

Another benefit of this approach is the potential to form partnerships. Partnerships can share risk and increase a project's access to equity. In the early stages of a project, a newly formed group may look for partners to gain expertise, development capital, or equity. The complexity and novelty of renewable energy projects requires careful consideration before a partnership is established. Ideally, the two partners should be relatively equal in access to capital, and this equality should be reflected in structure and decision-making.

Refer to the **Identifying Partners Module**[1] which will help organisations understand how partnership and collaboration could benefit them. It will suggest potential sources of inward investment, options for identifying innovation partners, key actors in the energy systems sector in Scotland and links to other financial, technical or other collaboration resources.

Grant funding is available from CARES to complete stakeholder consultations[2].

[1] Energy Systems Toolkit: Identifying Partners

[2] http://www.localenergyscotland.org/funding-resources/funding/applying-to-cares/start-up-grant/

Evaluate initial risks

A key step for the development of the project is to set up a risk register or project risk assessment. This is done to help understand the likely threats to the successful completion of the project. In the context of this guide, by risk we mean risk to one of the project baselines, that is technical, cost or schedule. It should not be confused with health and safety risks, though these should be considered to the extent that they impact the risk to the project baselines.

It is best practice to consider all possible risks to the project: it has to be a realistic project and even if you fail to identify certain risks, lenders may spot them and question your credibility. Ask yourselves the following questions in order to obtain an overview of the likely risks:

- Which external factors are likely to influence your project's ability to achieve the expected outcomes within the expected timeframe?
- Which impact would they have on project progress and success?
- What is the likelihood that this risk will materialise? High, medium, low?
- Which risk management strategies do we have?
- Whose responsibility is it to address these risks?

To help this process, it is beneficial to develop a table with the risks identified and the risk mitigation strategy that you would put in place. An example template is set out in the table below.

Risk category	Risk description	Potential impact	Risk level	Mitigation strategy
e.g. Cost	e.g. Reduction of government subsidy	e.g. Lower revenue to the project / community from lower tariff	e.g. Medium / 2	e.g. Ensure pre-accreditation deadline met to secure higher tariff
…	…	…	…	…
…	…	…	…	…

The key elements of this table should encompass:

- Risk category – categorise risks to help group similar risks. The category could be project scope, timeline, cost, resource, environmental issues, etc.;
- Risk description – provide a description of the potential risk;
- Potential impact – lay out the impact that the risk would have on the successful completion of the project;
- Risk level – provide a risk level based on the impact that the risk would have on the project. This could be numeric (1 – 5, where 1 is low and 5 is high) or qualitative (low, medium, high); and
- Mitigation strategy – outlines the steps to take to reduce the risk or minimise the impact of the risk.

You should also consider adding in a timeline and an owner for particular risks to aid with accountability, especially in the case that the project has multiple partners. This risk register should be set up at the start of the project and kept up to date as the project progresses through the various stages identified earlier in this guide.

At this stage you may need technical support to complete the risk assessment from someone with experience of developing projects of a similar nature to your own.

Project plan

It is important to develop a project plan, to ensure that progress can be monitored and managed and so that there is early warning if the project is at risk of problems. It is beneficial to review the project against the objectives and aims, at suitable milestones. The project may have to adapt to certain risks or stakeholder feedback, so it is important to make sure that the project still meets the original objectives that it set out to address. A review process is also a good stage at which to ascertain whether the project is achievable and should go ahead.

A Gantt chart is one way of showing the different steps in a project, with the timelines of each stage. Project management software can be used to develop a plan, but for many uses a spreadsheet is sufficient. An example Gantt chart is shown below:

1		Revision number	4																	
2																				
3				MONTH	Month 1					Month 2				Month 3				Month 4		
4	STEP	ACTIVITY	LEAD PER	WEEK	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
5	1	**Develop the Vision**																				
6	1.1	Outline project vision and objectives																				
7	1.2	Discuss and refine vision and objectives with all stakeholders																				
8	1.3	Stakeholder agreement of vision and objctives																				
9	2	**Seek Advice**																				
10	2.1	Identify previous relevant projects																				
11	2.2	Consult with groups who have undertaken these projects																				
12	3	**Communicate**																				
13	3.1	Plan community communication process for project																				
14	3.2	Ongoing project communication (see below - update based on specific communication plan)																				
15	3.2.1	Committee planning/progress meetings																				
16	3.2.2	Questionnaire to community to test support for plans																				
17	3.2.3	Open community meeting to discuss plans																				
18	3.2.4	Disseminate draft and agreed project plan to community																				
19	3.2.5	Compile evidence on community support for funders																				
20	3.2.6	Provide progress updates to community																				
21	3.2.7	Open day to celebrate project completion																				
22	3.2.8	Periodic feedback on energy performance																				
23	4	**Find a Site**																				
24	4.1	Identify potential sites for development																				
25	4.1	Assess potential sites using steps in guidance																				
26	4.1	Select site(s) for next steps																				
27	5	**Initial Scoping**																				
28	5.1	Utilise tools to provide initial esimates of energy and financial yield																				
29	5.2	Carry out break point 1 (BP1) viability assessment																				
30	BP1 IS THERE A REASON TO DEVELOP?																					
31	6	**Establish An Entity**																				
32	6.1	Set up activities																				

This is taken from the CARES website and a version of the spreadsheet can be downloaded from there[3].

Find suitable site

Sites can be assessed against key factors to identify if there is potential for a project. There a number of key factors to consider when determining the suitability of a particular location for siting the project, some of which will vary depending on whether it is a renewable energy project or a grid project. However, the generic factors to consider are:

- Planning constraints
- Leasing/ownership of land
- Access to the site
- Grid connection
- Renewable energy resource (if applicable)

Rules of thumb to bear in mind

- Engage early with the local network operator and understand the exact nature of the problem (connecting to the electricity grid)
- Before spending any more developing a site, ensure you have some form of agreement in place with the landowner.

Further information on the above factors and for renewable specific projects is provided within the CARES toolkit[4].

[3] http://www.localenergyscotland.org/funding-resources/resources-advice/cares-toolkit/downloadable-tools/project-plan

Assess the energy balance

Traditionally projects have been developed to generate electricity and generate income from the sales of such to pay back the costs and provide dividends. This category encompasses generation from renewables which would get income from the sale of electricity to the grid and the feed-in tariff (FIT) for example.

However, there is an increase in low carbon energy systems projects which consider total energy use and demand as well as generation. Therefore, it is important to assess not only the resource available (for generation), but also the uses of energy locally and how they may interconnect. Energy Masterplanning[5] is one method for doing this. With this in mind, you should also consider whether there is a connection between energy vectors, whether it be electricity for transportation, heat use from renewables or storage of excess renewable generation.

This also means that there will be a range of technologies to accommodate for the wider project scope. Not only will you be only considering what type of generator is suitable for your project idea, but also the electrical equipment required to incorporate demand side management, private wire connections or energy storage for example.

Determine the economic viability of the project

Lastly but important to the success of the project is the economic viability of the project. Here it is worth considering where project finance is going to come from (e.g. private investment, loans, etc.) and therefore the conditions you will need to meet (e.g. loan and investor repayments).

A high level finance model to determine the financial viability should incorporate the following:

- Project timeline;
- Pre-feasibility and pre-planning costs;
- Capital costs (equipment, etc.);
- Construction costs;
- Operating and maintenance costs;
- Expected income over the project lifetime (from subsidies, sales of heat, etc.)
- Cash flow and balance sheet calculations

There are a number of ways in which the financial performance of a project can be assessed, it comes down to the specific which measure is preferred. The key measures are:

- Simple payback – length of time required to recover the amount invested in the project through the net of the cash outflow generated;

Rules of thumb to bear in mind

- Develop the funding strategy to cover the full life cycle of the project, from inception to de-commissioning.
- Simple payback only provides a high level picture of financial viability. IRR and Debt Service Cover Ratio paint a much more complete picture.
- Simple finance models often do not include the cost of finance in their financial viability assessment.
- A financially healthy renewable project will have an IRR of at least 7-8% and DSCR greater than 1.3.
- The CARES finance model is a free tool that calculates these metrics

[4] The CARES toolkit can be accessed here: http://www.localenergyscotland.org/funding-resources/resources-advice/cares-toolkit/technology/

[5] A tool for Energy Masterplanning can be found here: https://www.scottish-enterprise.com/knowledge-hub/articles/publication/guide-to-energy-masterplanning

- Net present value (NPV) – a measure of the profitability of an undertaking that is calculated by subtracting the present values of cash outflows (including initial cost) from the present values of cash inflows over the duration of the project; and
- Internal rate of return (IRR) – a metric used in capital budgeting measuring the profitability of potential investments. Internal rate of return is a discount rate that makes the net present value (NPV) of all cash flows from a particular project equal to zero.
- Debt Service Coverage Ratio (DSCR) – is the ratio of cash available for debt servicing to interest, principal and lease payments. It is a metric used to determine if a project can finance its' borrowings.

Refer to the CARES toolkit[6] for more detailed information on the project financial viability. As the project develops, a financial adviser may be required to develop a bespoke finance model for your project.

There are also a number of ancillary energy markets to bear in mind in which energy systems projects could potentially operate. These provide opportunities to earn revenues in addition to conventional revenue streams (e.g. the sale of electricity and government incentives). Each market has its own technical requirements and is better suited to some technologies more than others. Aggregator services can help small renewables generators or demands access these markets.

Refer to the **Markets Module** which provides guidance on the key markets and will helps organisations to assess the opportunity to operate in ancillary service markets. The module will also help organisations decide whether they should approach an aggregator or should consider entering the market themselves.

Next steps

Once an idea has been formed and an initial viability of the project has been produced, the next key stages of a renewable project are:

- **Site feasibility** – desktop and/or site studies to determine the suitability of a site and search for any initial barriers to the development. Key aspects to consider are resource availability (wind speed, water source, solar irradiation, etc.), distance to potential grid connection point, accessibility of site, any ecological/historical designations, proximity to residential areas, aviation zones and telecommunications.
- **Site development** – depending on size of project, a number of surveys or an Environmental Impact Assessment (EIA) will need to be undertaken. These will likely encompass bird and ecological surveys, landscape assessments, geological and/or hydrological assessments, grid studies, aviation studies and noise surveys.
- **Planning** – identifying the relevant planning authority and their requirements, preparing a pre-planning advice meeting with the authority, engaging with the local community, conduct a feasibility study and collate relevant planning documentation for submission.
- **Pre-construction works** – discharging of planning conditions (if applicable), further site surveys and procurement of plant and services
- **Construction** – developing a construction method statement and construction Gantt chart, appointing a project manager to see through the process, construction and installation of plant, commissioning of plant and reinstatement works as necessary.

[6] http://www.localenergyscotland.org/media/66401/cares-toolkit-project-finance-module-v5.pdf

- Operation – once operational, a schedule of planned O&M will need to be undertaken and energy produced monitored. This will be ongoing for the duration of the project.
- Decommissioning – at the end of the project life, decommissioning of the plant will have to be carried out as per the planning requirements. This will need to be factored into the project costing.

All of these steps are outlined in more detail in the CARES toolkit[7].

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[7] The CARES Toolkit, http://www.localenergyscotland.org/toolkit