

2050 Pathways Calculator

An introduction to the UK's 2050 Pathways
Calculator and how you can develop your own

www.decc.gov.uk/2050

The 2050 Calculator

The 2050 Calculator can outline, in minutes, months of work from technical experts. It allows you to answer the fundamental questions of how far you can reduce emissions and meet energy needs. With three different levels of detail it can be used to engage technicians, policy makers and the public on how a country's emissions could change overtime. Bring your energy and emissions data alive. Show the benefits, costs and trade-offs of different versions of the future. Openly challenge long-held beliefs on what is possible.

Easily adapted

The 2050 Calculator can be readily adapted for use by other countries: China, Belgium and South Korea have already tailored the Calculator for their own use. The UK Department of Energy and Climate Change (DECC) would like to invite a small group of

developing countries to join this collaboration and work in partnership with us to develop their own 2050 Calculator.

The 2050 Calculator approach is already gaining momentum, with Calculators so far developed in China, UK, Belgium and South Korea, and we hope to see many more countries join this community of long-term thinkers.

An accessible emissions and energy model

In the 2050 Calculator the UK has developed an interactive simple to communicate tool that allows experts and non-experts alike to develop their own combination of change in different technologies and sectors of the economy to explore different energy and emissions scenarios out to 2050. At its heart is a technical energy balancing model, that has been extensively peer reviewed by experts, which brings together sectoral trajectories in different ways to construct possible pathways to 2050.



"The 2050 Calculator is a ground-breaking tool to help countries better plan their future energy strategy, in a transparent and evidence-based way."

Rt Hon Edward Davey MP,
Secretary of State, UK Department of
Energy and Climate Change



"The 2050 Calculator helps me present a strategic framework to discuss some of the options available and the choices and trade-offs we will have to make over the next 40 years."

Ravi Gurumurthy
Director of Strategy, UK Department of
Energy and Climate Change

"The game is an excellent exercise for anyone interested in the UK's energy future - which we all should be. Importantly, it gives a real sense of some of the difficult choices that must be made"

The Guardian newspaper

"The government of the United Kingdom should.... enhance communication and information to the general public, in particular maximise the use of 2050 pathways as an admirable way of communicating the range of possible choices"

The International Energy Agency

"This excellent pathway model provides critical data on what is possible and what it may cost. Importantly it allows people to explore their own pathway to a low carbon economy."

Friends of the Earth

The 2050 Family

The 2050 Calculator has three levels of complexity



My 2050 simulation – for the public

Visual internet simulation that helps young people to imagine how the energy system will evolve, and the secondary impacts this will have. Users can make decisions about levels of effort in 14 simplified sectors, including both supply and demand, to make decisions about their own version of how their country will meet the energy and emissions challenge by 2050.

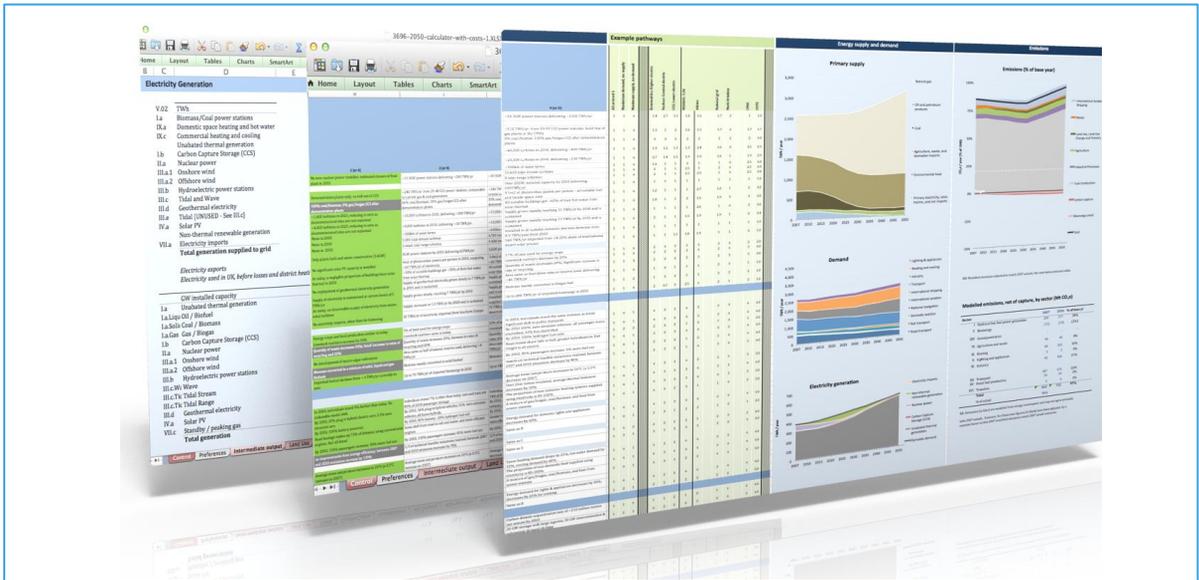
2050 Webtool – for policy makers

Internet based scenarios model. By varying the level of ambition for change in over 44 technologies and behaviours a policy maker is able to get instant results showing information on energy output, demand and emissions out to 2050. It enables a quick comparison of the consequences and trade-offs of different scenarios.

Excel spreadsheets - for technicians

Detailed spreadsheets outlining all the underlying data such as emissions baselines, population and expected economic growth as well as the assumptions used to calculate costs. Freely available to the public and experts online.

Understanding what is possible



Understanding what is possible

Key to the 2050 Calculator is considering the full range of what is possible, not just what we think will happen. It sets out four trajectories for each sector, each describing a different level of change: from the minimum (called 'Level 1') to the physical maximum believed possible (called 'Level 4'). This provides a consistent way of comparing the relative impact of different technologies across the whole economy.

UK Calculator levels

1	No effort (not business as usual)
2	Effort described by most stakeholders as achievable
3	Effort needing significant change – hard but deliverable
4	The maximum possible due to physical/ practical constraints only

All of these assumptions are freely available to any stakeholder or individual interested – in keeping with the transparency of the

Calculator. In developing the model the assumptions were also subjected to an extensive process of peer review from experts, who were able to make their own suggestions on what the level of effort for each technology should be.

2050 Helps answer the fundamental questions

The UK has built a tool that answers key policy questions quickly and transparently – using numbers that have been reviewed by external organisations. Because it is so easy to use it means that it is accessible to senior officials and politicians as well as technical experts. The results are clearly illustrated so that they can be used to present energy and emissions strategies over the coming decades.

This makes the Calculator very useful for long-term strategy planning as it is extremely effective for modelling multiple scenarios . And it acknowledges the uncertainty associated with the energy system. It is not the only tool out there though, and was not designed for some detailed questions such as how to design an individual policy measure, or for studying the impact of energy prices on the rest of the economy.

*Answered by the
2050 Calculator*

How far could renewables satisfy energy demand in the future?	✓
What could be the impact of individual behaviour change?	✓
How much fossil fuels will we need to import in the future?	✓
Which pathways could achieve an x% emissions reduction target?	✓
Can we reduce emissions with high levels of economic growth?	✓
How much will this cost?	✓
How diverse will my energy supply be in 2050?	✓
Will supply meet demand?	✓

What would be the impact of a carbon tax on the economy?	X
What would be the most efficient way of subsidising solar power?	X
What will be the impact on consumers energy bills?	X

Deeper analytics

So the 2050 Calculator will not be able to answer all your climate and energy related questions. But where it can provide an analytically robust answer it combines this with an extremely effective and simple to

use internet-based interface, which provides very engaging visualisations of the data. These are available at the touch of a computer button, providing insight on a range of impacts such as costs, land-use, fossil fuel imports and air quality.



Land use

Energy flows

Electricity breakdown

Emissions and energy

2050 can be tailored to your country's needs

The Department of Energy and Climate Change (DECC) developed the 2050 Calculator to model the UK. However what we have created is a very flexible structure that can be modified to take into account structural differences between the UK and other economies. This has meant that we have already been able to support teams in China, Belgium and South Korea to adapt the methodology to fit their reality.

Substituting data

The Excel base of the model means that it is very easy to substitute data, or to add sectors or technologies if these are deemed necessary to accurately map the structure of a country's economy. Our experience of working with other countries has shown that there are two broad approaches to adapting the 2050 Calculator:

- **Replace UK data:** The simplest way of creating your own version of the 2050 Calculator is to replace the UK data in the original version of the model with your country's numbers. This was the approach used by teams in South Korea and Belgium. It works well where a

country has a similarly structured economy to the UK, and has the advantage of being very easy to do with no additional model design being required.

- **Replace UK data and restructure:** In countries where the economy is significantly different to the UK, some restructuring of the model will be needed if it is to present an accurate picture. China has significantly restructured the model to take into account differences in energy and transport demand between rural and urban areas, and the significant temperature variations between the north and south of the country. China has also added additional industry sectors that more accurately reflect its economy . .

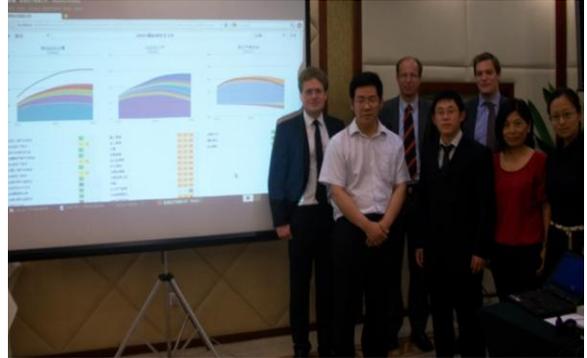


Dedicated support team

DECC has a dedicated team based in London here to help you build your own version of the model. The team were responsible for the development of the UK 2050 Calculator, and have worked with China, Belgium and South Korea to create their own calculators. We'd like to share our experience and expertise with you to work in partnership in developing your Calculator. Every country will be different, but examples of the support that we can provide include:

- **Training workshops:** DECC staff can travel to your country to lead a series of technical workshops with your team which explain how the Excel structure of the Calculator works, what data you will

need to collect and how to go about building the different trajectories. This is an effective way of commencing your project and can be completed in one week.



- **Continued technical advice:** If you'd like to work with us we'll assign you a dedicated modelling expert, who will be able to answer all of your questions on how to adapt your version of the Calculator. You'll be able to contact them by email, telephone and Skype. We anticipate holding regular technically focused Skype sessions with your modelling team over the course of the project to break down the work into manageable pieces.
- **Quality assurance:** Once you've built your own Calculator we'll be happy to provide some quality assurance of the initial results, before you make them public. We've lots of experience from the UK launch process, and can act as a critical friend to help you make your analysis as credible as possible.
- **Building your webtool:** Building your Calculator in Excel is the first step, but it is the internet based webtool that really brings your analysis alive and enables you to share it with the widest possible audience. The webtool uses computer coding to link your Excel spreadsheets with an interactive webpage. We would invite a member of your team to come to our offices in London to adapt the code

for your work, creating your own version of the webtool.

- **Project planning support:** As well as providing you with an expert modelling contact we'll also assign you a project manager who will help you organise the work, set deadlines and offer advice on how to structure your team, based on our experience. We will act as your day to day contact point on the project to make sure it stays on track.
- **Stakeholder engagement plans:** One of the real benefits to the UK of the 2050 Calculator has been how it has helped us to engage more effectively with stakeholders. We strongly recommend engaging stakeholders from an early stage, not just so that they understand the project but also so they can help you with the data and scenario setting. If managed sensitively the Calculator can be used as a useful consensus-building tool and getting stakeholders involved at an early stage is vital to this. We'll share with you the UK's experience of doing this, including facilitation methods and

tools, and can also provide financial support for events you may wish to hold to ensure wide participation.

- **Resourcing your team:** As the next section shows, building a Calculator does take time and resource. We believe that you are in the best position to take judgements on the data and scenarios that should be included in your calculator, but realise that your team may be under resourced to undertake certain aspects of the work. At the start of your project we'll help you identify what you need to build a team with the right skills, and can help provide additional financial support to contract a member of staff where needed. We will also provide finance for the travel of your team to the UK if this is needed.
- **Communications support:** Once you've got a robust version of the Calculator the scope for engaging stakeholders, the media and the public is huge. We have experiences to share having already done this in the UK –ranging from a simplified version of the model that can be used



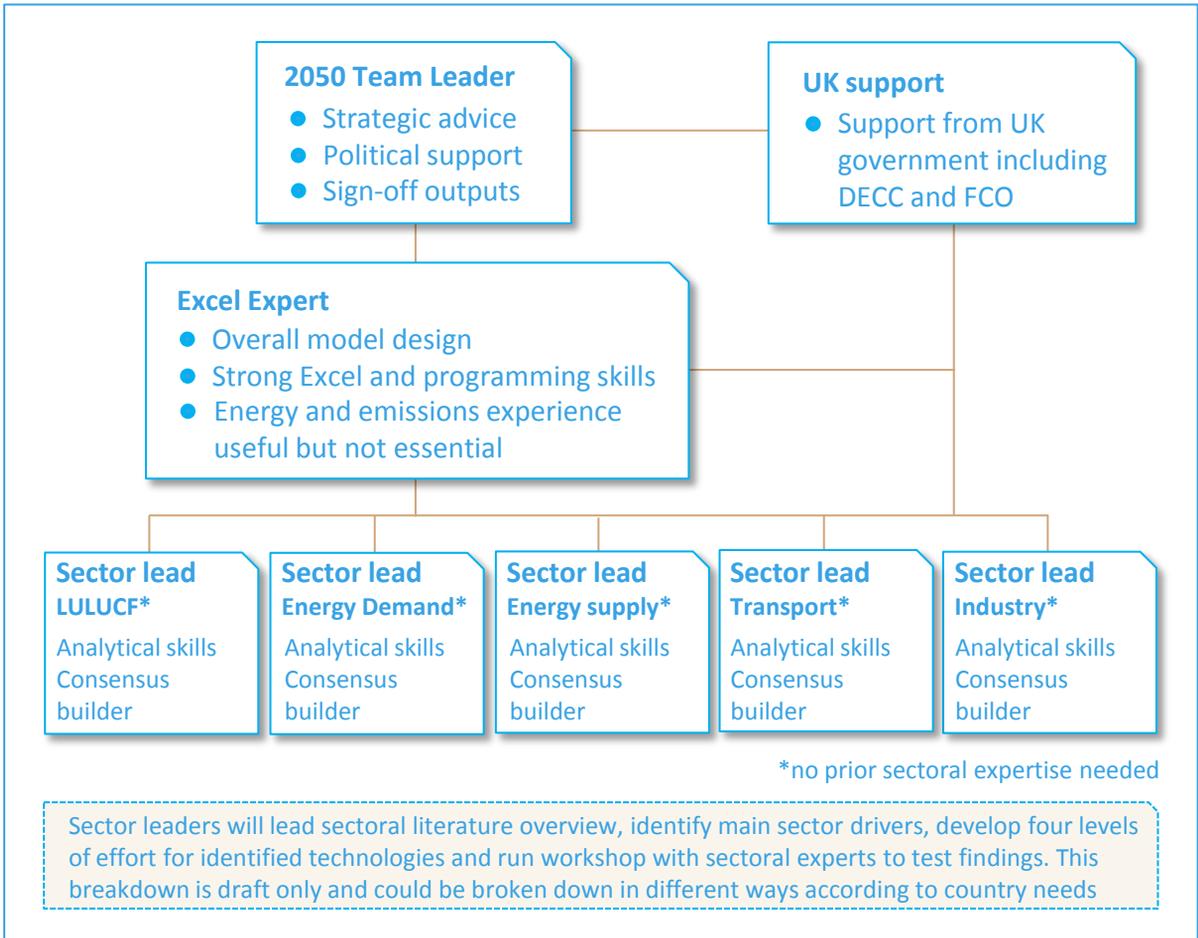
with schoolchildren to using the tool to facilitate mass participation events. We can provide finance for activities tailored to what would be most useful for your country, including developing your own version of the My2050 game.

What you need to build a 2050 Calculator

Based on our experience of building the UK Calculator and working with China and other countries, the three main things required for building a 2050 Calculator are senior-level enthusiasm, capable staff and enough time. We believe that building a robust version of the Calculator requires a team of four to seven people, and will take around one year from the start date to having a version that is ready for a full public launch.

Team structure

Each team will need an in-country project leader – responsible for the strategic aspects of the work and ensuring that it has political support. It will also need a capable modeller to oversee the model development (with support from DECC’s modellers). The sectoral pieces of work can be done by 3-5 sector leaders, who are responsible for developing the four trajectories for each sector. The workstream leaders do not have to be experts in their area, but need to be comfortable conducting literature reviews, coordinating opinions from stakeholders and confidently interpreting competing views. The organogram below gives more detail on what a team might look like – but this is flexible:



Ideally this team would be staffed by existing members of your organisation, but given the size of the task it may be necessary to bring in additional team members on a temporary basis. DECC can provide some financial support to selected countries where there is a clear need for this.

Timings

The project can be broken down into 3 main phases: Initiation, Technical Development and Communication. We anticipate that the **Phase 1** Initiation phase will take around 3 months – although this could be speeded up depending on how long it takes to set-up your team and sign a Memorandum of Understanding with DECC.

Phase 2 of the technical development of the model is expected to take around 6 months. Whilst a fairly quick first version of the 2050 Calculator can be developed in a couple of months, potential changes to the model design to reflect your country's national circumstances, and the need to engage with stakeholders on the data mean that this will be the longest part of the project.

Phase 3 is all about ensuring that the results of your Calculator are communicated to an influential audience in an effective way. This will be the time when you are able to interrogate your results to pick out the key messages that your Calculator has highlighted about different pathways out to 2050.

<i>Task list</i>	<i>Duration</i>
Phase 1 – Initiation	Around 3 months
<ul style="list-style-type: none"> ● Identify resource requirements ● Set-up team ● Agree project timescales ● Sign Memorandum of Understanding with DECC 	
Phase 2 – Technical development	Around 6 months
<ul style="list-style-type: none"> ● DECC visit to provide week long-training session ● Identify potential needs for model restructuring ● Develop 1-4 scenarios for each technology ● Share these scenarios with stakeholders ● Visit to DECCs London offices to build webtool ● Quality checking of work ● Gain internal sign-off 	
Phase 3 – Communication	Around 3 months
<ul style="list-style-type: none"> ● Prepare communications material – including website ● Public launch event ● Potential development of My2050 simulation 	

These timescales are meant as a guideline for how long the project is expected to take. In practice it may be necessary to spend more or less time on any of the three phases, so they are indicative only.

How to take up this opportunity

We hope that over the course of the International 2050 Pathways Conference on 18-21st September 2012 in Beijing you are able to gain a full understanding of the benefits of developing a Calculator, how one can be built and how DECC is able to support you in this endeavour. We hope you are interested in working with us, and would be delighted to speak with you at the event to discuss how to take this forward:

- **Step 1** Download all the materials from our website. See what you think.
- **Step 2** Speak with one of the members of the DECC 2050 Calculator team. Tom Counsell, Ed Hogg, Jan Kiso and Tom Bain are all attending the conference on the 18-21st September and would be delighted to discuss this further with you. The rest of the 2050 team is back in the office and ready to respond to emails and telephone calls.
- **Step 3** Make contact with the British Embassy or Department for International Development (DfID) office in your country. They will be able to facilitate setting up the project, and played a key role in our work with ERI in China.
- **Step 4** Once we've discussed your needs for making this project a success the final step is to sign an Memorandum of Understanding between your organisation and DECC to formalise the cooperation.

We have secured funding to finance this work with some developing countries from the UK government's International Climate Fund (ICF). If your country does not qualify as a developing country then whilst we will not be able to provide you with financial assistance we will be able to offer technical advice on how you can develop your own version of the Calculator.

2050 team member

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Build your own

<http://www.decc.gov.uk/2050>

<http://2050-calculator-tool.decc.gov.uk>

<http://my2050.decc.gov.uk>

<http://2050-calculator-tool-wiki.decc.gov.uk>

<http://www.decc.gov.uk/en/content/cms/tackling/2050/international/international.aspx>

<http://www.decc.gov.uk/en/content/cms/tackling/international/icf/icf.aspx>

