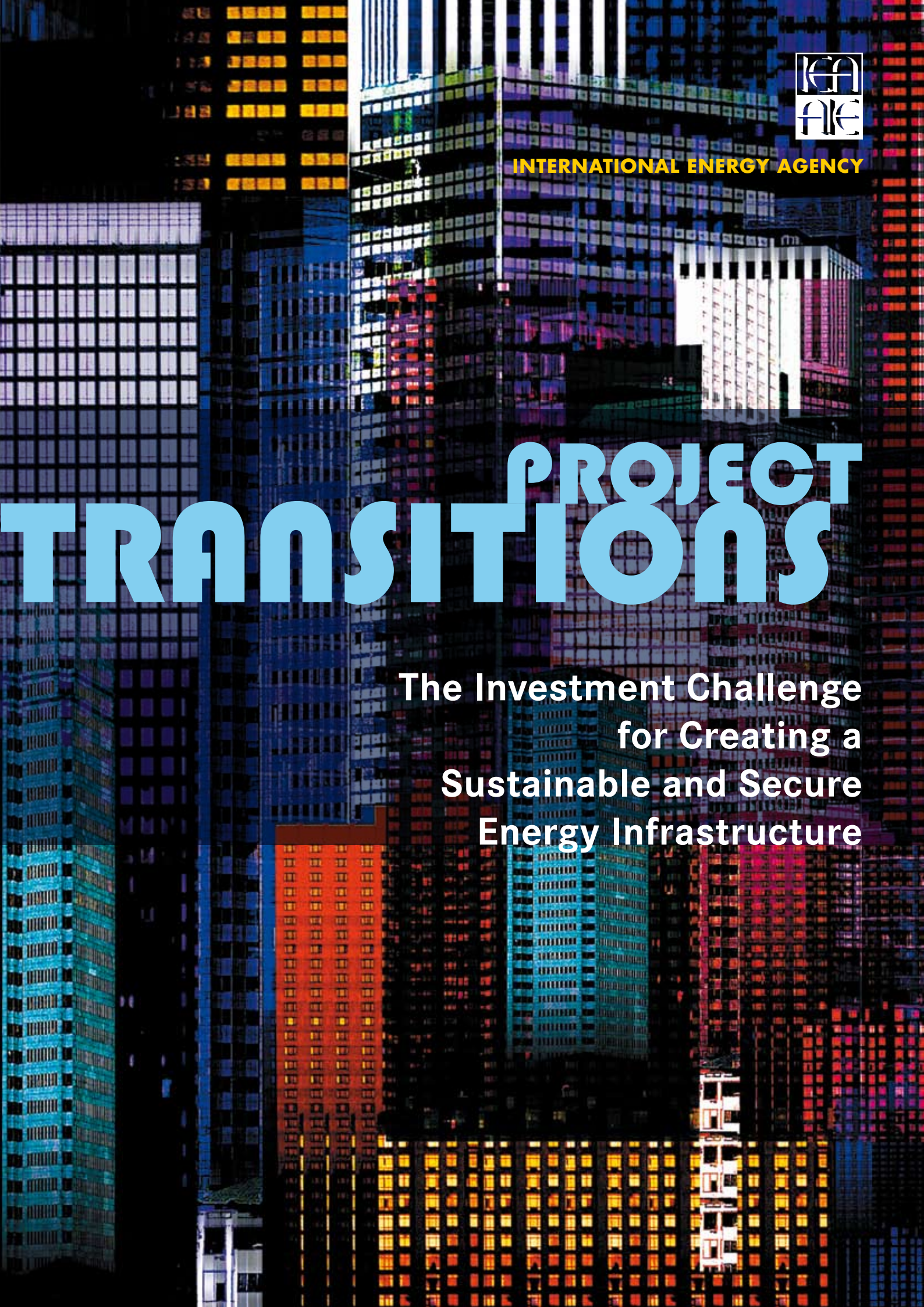
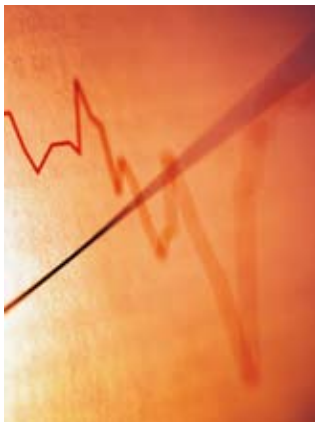


INTERNATIONAL ENERGY AGENCY

PROJECT TRANSITIONS

The Investment Challenge for Creating a Sustainable and Secure Energy Infrastructure

The long useful life of energy infrastructure and the infrastructure's related greenhouse gas (GHG) emissions complicate efforts to mitigate climate change and increase energy security. The International Energy Agency (IEA) launched PROJECT TRANSITIONS, a multi-stakeholder, multi-output research programme, to determine effective policy responses to this issue through micro-scale analysis from an investor's perspective.



Urgent Call for Energy Investments

Investment in the energy system of tomorrow requires substantial resources and informed policy making to achieve energy-security, economic and environmental objectives. The International Energy Agency (IEA) estimates 26 trillion USD in investments will be needed in the energy sector by 2030 to sustain current energy trends. Energy business-as-usual, however, and the resulting environmental impacts, are not sustainable as they result in energy insecurity and climate damages.

More infrastructure investment is needed, but how can governments ensure it comes in a form that enhances social welfare? Will policy incentives take into account the realities of an energy system characterised by slow capital turnover, and great infrastructure variability among nations and within national borders? What are the policies that meet security, economic and environmental objectives in light of energy-sector inertia? How can governments empower investors to make investment and technology choices in the near term that most cost effectively meet energy and environmental objectives in the long term? These are the questions that motivate **PROJECT TRANSITIONS**.

ENERGY INVESTMENTS

PROJECT TRANSITIONS

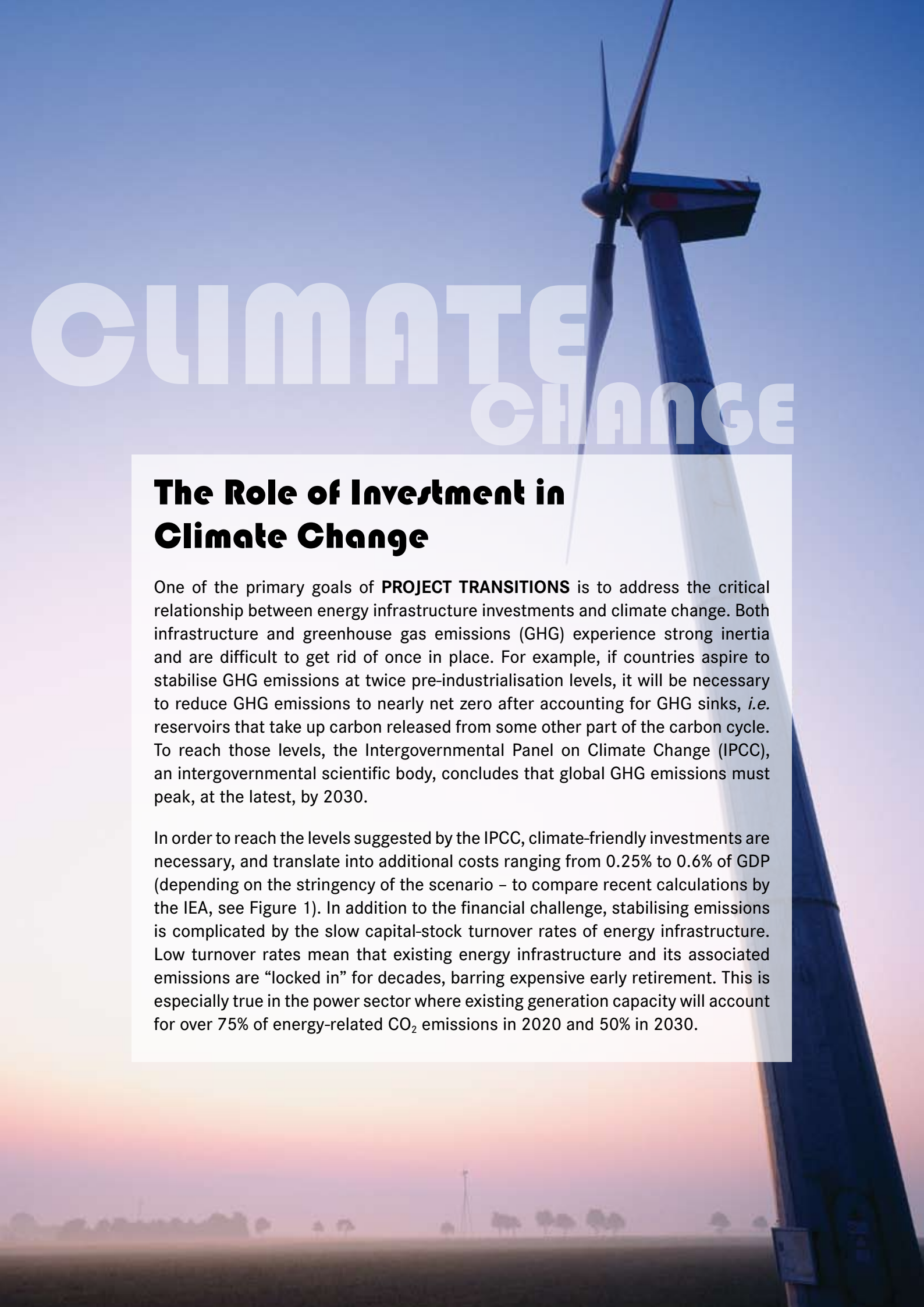
To address infrastructure investment challenges, the IEA engages in extensive macro-scale analysis of the relationship between investment, capital-stock turnover, technology, and climate uncertainty. The IEA publications *World Energy Outlook* (*WEO*) and *Energy Technology Perspectives* (*ETP*) use different modelling structures to provide important insights into the investment challenge.

Most governments invest in technology research and development and in traditional diffusion incentives. Such measures are important, but more analysis is needed that takes into account systematically investor perspectives – including investment drivers, uncertainty about policy commitment and structure, and technology performance characteristics – and the inertia of the energy capital structure.

PROJECT TRANSITIONS targets precisely these issues by considering sustainable energy policy development from the perspective of an investor. It also complements and supplements the traditional IEA macro-scale analysis with a multi-year, multi-deliverable programme to expand micro-scale analysis of uncertainty, inertia and technology choice.

In particular, **PROJECT TRANSITIONS** seeks to answer:

- how energy security and climate change concerns complicate and increase the urgency of the investment challenge;
- how capital-stock turnover, technology performance, timing, and climate uncertainty impact investment choices across different sectors (power, buildings, industry) and geographic areas;
- what are the most important near-term energy infrastructure decisions that should be made; and
- how policies can influence various investment drivers to encourage climate-responsive ventures in new builds and refurbishments.



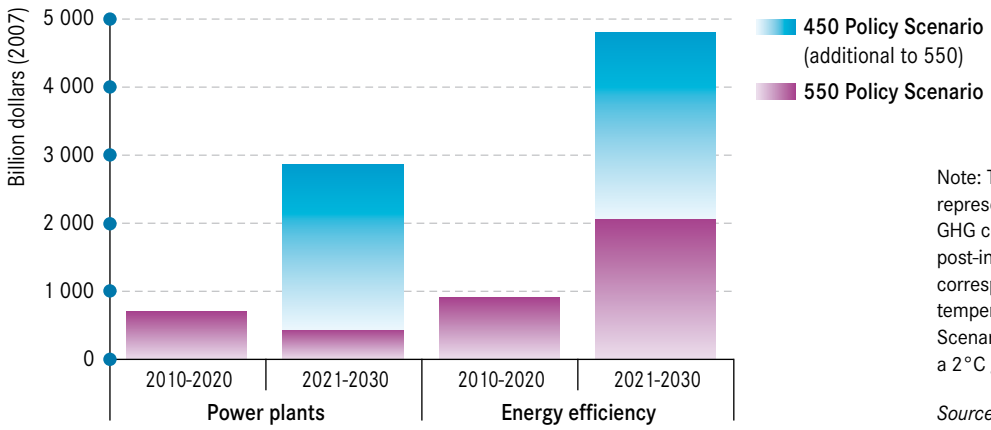
The Role of Investment in Climate Change

One of the primary goals of **PROJECT TRANSITIONS** is to address the critical relationship between energy infrastructure investments and climate change. Both infrastructure and greenhouse gas emissions (GHG) experience strong inertia and are difficult to get rid of once in place. For example, if countries aspire to stabilise GHG emissions at twice pre-industrialisation levels, it will be necessary to reduce GHG emissions to nearly net zero after accounting for GHG sinks, *i.e.* reservoirs that take up carbon released from some other part of the carbon cycle. To reach those levels, the Intergovernmental Panel on Climate Change (IPCC), an intergovernmental scientific body, concludes that global GHG emissions must peak, at the latest, by 2030.

In order to reach the levels suggested by the IPCC, climate-friendly investments are necessary, and translate into additional costs ranging from 0.25% to 0.6% of GDP (depending on the stringency of the scenario – to compare recent calculations by the IEA, see Figure 1). In addition to the financial challenge, stabilising emissions is complicated by the slow capital-stock turnover rates of energy infrastructure. Low turnover rates mean that existing energy infrastructure and its associated emissions are “locked in” for decades, barring expensive early retirement. This is especially true in the power sector where existing generation capacity will account for over 75% of energy-related CO_2 emissions in 2020 and 50% in 2030.

Figure 1

The Investment Challenge in the Energy Sector



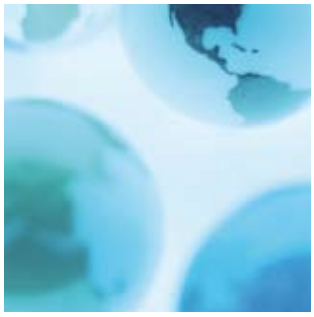
Note: The 550 Policy Scenario represents the stabilisation of GHG concentrations at twice post-industrialised levels and corresponds to a 3°C global temperature rise. The 450 Policy Scenario corresponds to a 2°C global temperature rise.

Source: IEA 2008

Creating effective policies to address the role of both capital-stock turnover in investment decisions and climate change mitigation is essential. This will only be possible, however, if investors inform climate change negotiations, and detail the realities of investment decisions and the implications of policy design. Instead of mandating early retirement, for example, refurbishing existing electricity-generation capacity can introduce more efficient technologies or fuels and minimise expensive delays and legal fees associated with new plant permitting and siting.

THE UNIQUE PREPARATION

The Unique Preparation for PROJECT TRANSITIONS



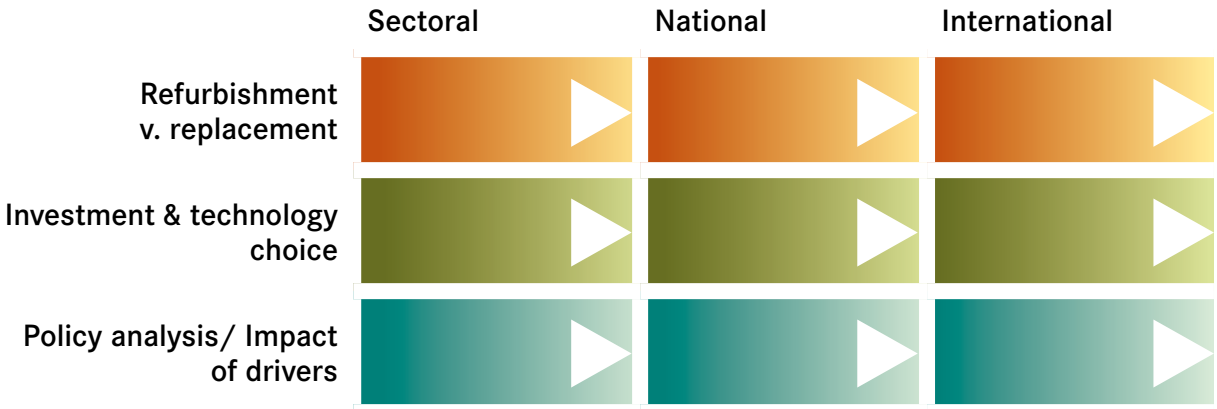
The IEA acts as energy policy advisor to 28 member countries in their effort to ensure reliable, affordable and clean energy for their citizens. Although all member countries are industrialised, their economic and energy structures differ widely. Because of this, and also thanks to its extensive work with non-member emerging economies, the IEA is particularly well placed to conduct **PROJECT TRANSITIONS**.

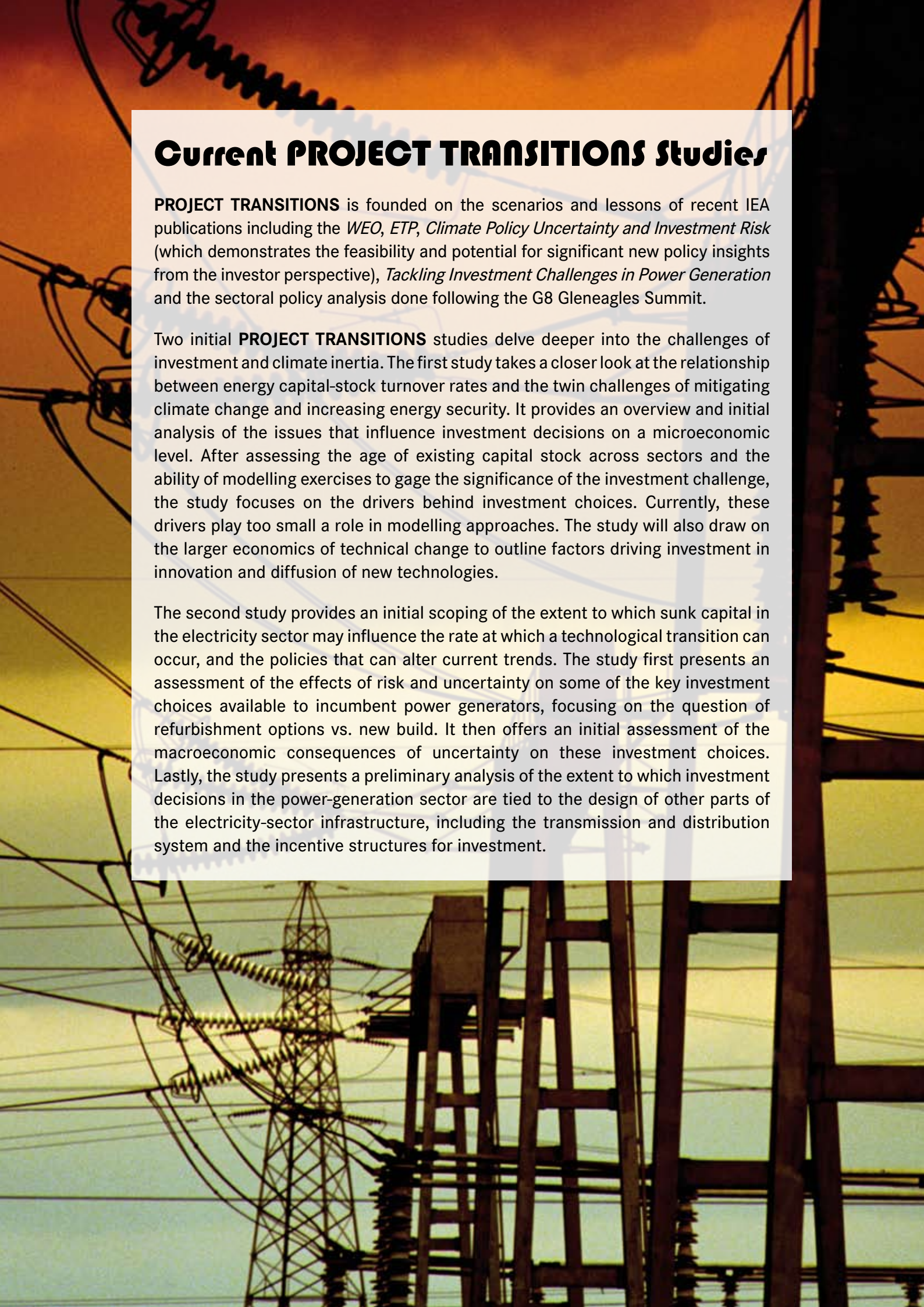
In addition, IEA work benefits from its renowned energy statistics division, macroeconomic environmental and capital-structure models, and research on climate change policy uncertainty. These aspects make the IEA uniquely qualified to conduct **PROJECT TRANSITIONS** and the complex, quantitative analysis at its heart.

ANALYTICAL FRAMEWORK

PROJECT TRANSITIONS Analytical Framework

The IEA investigation of policies directed at improving energy infrastructure performance, and those intending to encourage replacement of existing capital, will be central to **PROJECT TRANSITIONS**. Analysis will take place on sectoral, national and international levels. It will also identify key drivers of investment choice and provide quantitative insights into investment uncertainty using the IEA Real Options Model (IEA ROM). *Climate Policy Uncertainty and Investment Risk* used this model and was a prototype for **PROJECT TRANSITIONS** publications. Modifying the IEA ROM to accommodate various investment drivers, sectors and industries will be essential to **PROJECT TRANSITIONS**.





Current PROJECT TRANSITIONS Studies

PROJECT TRANSITIONS is founded on the scenarios and lessons of recent IEA publications including the *WEO*, *ETP*, *Climate Policy Uncertainty and Investment Risk* (which demonstrates the feasibility and potential for significant new policy insights from the investor perspective), *Tackling Investment Challenges in Power Generation* and the sectoral policy analysis done following the G8 Gleneagles Summit.

Two initial **PROJECT TRANSITIONS** studies delve deeper into the challenges of investment and climate inertia. The first study takes a closer look at the relationship between energy capital-stock turnover rates and the twin challenges of mitigating climate change and increasing energy security. It provides an overview and initial analysis of the issues that influence investment decisions on a microeconomic level. After assessing the age of existing capital stock across sectors and the ability of modelling exercises to gage the significance of the investment challenge, the study focuses on the drivers behind investment choices. Currently, these drivers play too small a role in modelling approaches. The study will also draw on the larger economics of technical change to outline factors driving investment in innovation and diffusion of new technologies.

The second study provides an initial scoping of the extent to which sunk capital in the electricity sector may influence the rate at which a technological transition can occur, and the policies that can alter current trends. The study first presents an assessment of the effects of risk and uncertainty on some of the key investment choices available to incumbent power generators, focusing on the question of refurbishment options vs. new build. It then offers an initial assessment of the macroeconomic consequences of uncertainty on these investment choices. Lastly, the study presents a preliminary analysis of the extent to which investment decisions in the power-generation sector are tied to the design of other parts of the electricity-sector infrastructure, including the transmission and distribution system and the incentive structures for investment.

PROJECT TRANSITIONS

Partnerships

The IEA intends to carry out **PROJECT TRANSITIONS** in cooperation with government, industry, foundations and international organisations. Partners will be asked to contribute to the studies and, to a varying degree, the overall framework of the project. Stakeholder involvement ensures new data availability and a more accurate understanding and characterisation of investment decisions. Collaboration also contributes to policy relevance, dissemination of results and more rapid policy implementation.

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