Efficient World Scenario: Policy Framework

1 Introduction

The Efficient World Scenario has been developed for the World Energy Outlook 2012 (WEO-2012). It enables to quantify the implications for the economy, the environment and energy security of a major step change in energy efficiency. It is based on the core assumption that all investments capable of improving energy efficiency are made so long as they are economically viable and any market barriers obstructing their realisation are removed. The scale of the opportunity is determined, by sector and region, on the basis of a thorough review of the technical potential to raise energy efficiency, and our judgement of the payback periods that investors will require in order to commit funds to energy efficiency projects.

Several energy efficiency policies are already in place and many are under discussion, which are set to reduce energy intensity of the global energy economy. Existing efficiency policies are integrated into the Current Policies Scenario, while additionally those under discussion are part of the New Policies Scenario. Yet, the energy efficiency potential realised in these scenarios represents only a fraction of the available potential since many barriers still exist to the implementation of fully economic efficiency measures.

2 Method

The central assumption of the Efficient World Scenario is that policies are put in place to allow the market to realise the potential of energy efficiency measures that are economically viable. Two steps were undertaken to calculate the economic potential, which varies by sector and region.

First, the technical potentials were determined, identifying key technologies and measures to improve energy efficiency by sector, in the period through to 2035. This process involved analysis, over a number of sub-sectors and technologies, of a substantial amount of data and information from varied sources (Figure 1). For the industry, power and transport sectors, we undertook detailed surveys of companies, with operations across the world, to ascertain the efficiencies of the best technologies and practices available now and how these are likely to evolve based on the efficiency and costs of technologies that are in the process of being developed and demonstrated. For the buildings sector, we consulted with a large number of companies, experts and research institutions at national and international levels. We also conducted an extensive literature search to catalogue the technologies that are now in use in different parts of the world and judge their probable evolution.

The Efficient World Scenario assumes neither major or unexpected technological breakthroughs, nor more holistic concepts (such as prioritising energy efficiency at all levels of urban planning), nor changes in consumer behaviour (except where induced by lower energy prices). While such measures might well be cost-effective, measuring their cost and impact at global level is speculative, in that they represent a significant departure from current practices and, therefore, data for the quantification of their potential are limited. If adopted at scale, however, they could achieve reductions of energy demand beyond what is achieved in the Efficient World Scenario. The scenario is, rather, based on a bottom-up analysis of currently available technologies and practices, and considers incremental changes to the level of energy efficiency deployed.
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Figure 1 – Representation of energy efficiency by end-use sector* in the World Energy Model as considered in the Efficient World Scenario

* In the power sector, twelve fossil fuel-based efficiency opportunities were considered. For details, see the WEM documentation under www.worldenergyoutlook.org/weomodel/.

Note: PLDV = passenger light-duty vehicles; LCV = light commercial vehicle; ICEV = internal combustion engine vehicle; t = tonnes.
In a second step, we identified those energy efficiency measures which are economically viable. No measure of economic viability is perfect, not least because of data difficulties. The criterion we adopted was the amount of time an investor might be reasonably willing to wait to recover the cost of an energy efficiency investment (or the additional cost, where appropriate) through the value of undiscounted fuel savings. ACCEPTABLE PAYBACK PERIODS WERE CALCULATED AS AVERAGES OVER THE OUTLOOK PERIOD AND TAKE ACCOUNT OF REGIONAL AND SECTOR-SPECIFIC CONSIDERATIONS. THE USE OF RELATIVELY STRAIGHTFORWARD PAYBACK PERIODS IS WIDESPREAD AMONG INVESTORS AND LENDING INSTITUTIONS, AND SO WILL BE A FAMILIAR METHODOLOGY TO THOSE TAKING INVESTMENT DECISIONS IN THE MARKET PLACE TODAY.

The payback periods that result are, in some cases, longer than what is required today by some lending institutions, households or firms; but they are always considerably shorter than the technical lifetime of the individual assets. The periods chosen are in line with prevailing judgements in the literature and have been deemed acceptable under the policy assumptions of the Efficient World Scenario by stakeholders who have been consulted during this study. Moreover, the payback calculation does not take into account the co-benefits to society associated with energy efficiency.

The payback periods adopted do not take into account the transaction costs associated with overcoming the present barriers to investment. The Efficient World Scenario is posited on the basis that these barriers will be overcome by a bundle of targeted policy measures, so eliminating or, at least, minimising, transaction costs. Of course, action of this kind will entail a cost; for example, the cost of enforcement of minimum required standards. Estimating this cost is fraught with difficulties; but it can confidently be stated that it is much less than the economic benefits which will ensue.

Policies in areas other than efficiency are assumed to be the same as in the New Policies Scenario. In countries with carbon pricing, carbon dioxide (CO\textsubscript{2}) prices are lower than in the New Policies Scenario, as energy efficiency measures contribute to targeted emissions reductions. Fossil-fuel subsidies are phased out by 2035 at the latest in all regions except the Middle East, where they are reduced to a maximum rate of 20\% of current levels by 2035.

### 3 The relationship between the 450 and Efficient World Scenarios

The 450 Scenario is designed to illustrate the energy world which results from taking plausible actions, such as an international climate agreement and carbon pricing, to limit the likely global temperature increase to 2 °C. The Efficient World Scenario focuses on exploiting energy efficiency opportunities which justify themselves in economic terms. The average global temperature increase in the Efficient World Scenario is an outcome of the modelling, not a pre-determined target.

In general, measures that decrease CO\textsubscript{2} emissions also save energy. As energy efficiency is often the most economic way to reduce CO\textsubscript{2} emissions, the CO\textsubscript{2} trajectories in the 450 Scenario and the Efficient World Scenario are very similar up to 2020. However, in the 450 Scenario beyond 2020, additional measures are necessary, especially a large increase in the use of renewables and uptake of CCS. Both measures reduce CO\textsubscript{2} emissions, but increase the energy requirements in most cases. Therefore, the Efficient World Scenario includes neither a large increase in the use of biomass nor the deployment of CCS.

The CO\textsubscript{2} savings attributed to energy efficiency are similar in the 450 Scenario and the Efficient World Scenario. However, the policy measures employed are not necessarily the same. The Efficient World Scenario sees a focus on the removal of market barriers, end-user prices consequently fall lower than in New Policies Scenario, as less demand depresses international fossil-fuel prices (albeit with a partial rebound in the demand for energy). In the 450 Scenario, mandatory standards and international sectoral agreements are assumed to be widespread. Electricity prices are high, as the implicit price of CO\textsubscript{2} is passed through to consumers and end-user prices reflect the removal of subsidies; in transport, a tax is applied to compensate for lower international oil prices.