PERFORMANCE & INNOVATION UNIT ENERGY POLICY REVIEW

INITIAL RESPONSE BY NATIONAL GRID

INTRODUCTION

1 This Paper sets out the issues related to National Grid's responsibilities as provider of transmission services for England & Wales that we believe are particularly important for the Review. The Paper has been prepared against the background of the PIU Initial Scoping Paper and the presentations at the Stakeholder Workshop held on 20 July 2001. However, it does not take into account the Scoping Note on electricity and gas networks and security of supply published on 24 August and on which we will respond shortly.

2 We have identified two main policy areas in the Review, which have particular relevance for electricity transmission in the future. These are security of supply, and, the role of transmission with a major renewable generation base. These are discussed below under the following headings:

i) Security of Supply

Real-time Balancing

Network Investment for the Long-term

Fuel Diversity

ii) The Role of Transmission with a Major Renewable Generation Base

Requirements for Transmission Capacity

Impact of Cost Reflective Charging

Transmission *I* Distribution Interfaces and Active Distribution

Intermittency

3 We do not examine these policy areas against a specific time frame to 2050. However, the contributing factors identified in the section on Security of Supply are largely known at this point. By contrast, the issues associated with a very much larger renewable generation base are presently less predictable, especially out to 2050, and could yet evolve in a variety of ways, depending on technical developments.

4 Nevertheless, we believe that the requirement for a high voltage transmission system will continue to be an integral part of a sustainable energy policy both now and in the long-term. The transmission system will remain a significant and efficient enabler of both security of supply and of fuel diversity.

5 In addition, major new long-term development in renewable energy is likely to boost the need for an enduring transmission system. First, the transmission system will continue to enable bulk power transfers as much large-scale renewable generation will tend to be sited away from areas of major consumption. Second, there will be a significant need for sophisticated approaches to real-time balancing of the electricity system in the face of a notably more intermittent generation base. Both in the short-term to 2010, and in the medium-to-long-term to 2025 and beyond, we are confident that the England and Wales transmission system can and will meet these challenges.

SECURITY OF SUPPLY

Real Time Balancing

6 One aspect of the security of supply of electricity is the capability to match generation in real time to the level of demand and, indeed, vice-versa. Under NETA, market participants have incentives to achieve this match to a

significant degree, but the task of managing the inevitable residual mismatch in the short-term is one of the responsibilities of National Grid as system operator for England & Wales. The ability to do so at any given time depends on a large number of factors:

- the adequacy of generation capacity in relation to the level of demand;
- the extent to which the level of output of generators can change in real time to meet variations in the level of demand (and vice versa);
- the extent to which prices in the market for electricity can be fully communicated to consumers and generators and the extent to which this information enables an effective demand side response;
- the capabilities of the electricity transmission and distribution systems to enable available generating capacity to meet demand;
- the extent to which the availability of generating plant is dependent on the availability and reliability of the fuel supply systems. In particular:
    - * capability of the gas transmission system both in terms of total capacity and its ability to meet rates of change of demand for gas caused by changes in power station demand;
    - * adequacy of gas supplies reaching the gas transmission system;
    - * adequacy of gas storage;
    - * availability of alternative fuel sources and capability of power stations to switch fuels;
    - * fuel stocking policies of primary fuel sources (eg, coal at coal-fired power stations) or secondary fuel sources (eg, distillate oil at gas-fired stations).

7 Given the complexities of the issues related to balancing electricity demand and supply in the context of real time operation of the system, as well as the need to consider the medium and longer term issues of security of supply (discussed below) it is important that these issues are given separate consideration. We would very much hope that the PIU, in order to give the necessary weight to the real-time as well as the long term issues, considers them in depth but separately.

Network Investment for the Long Term

8 The transmission system provides the link between generators and the distribution systems. As this link effectively pools the security contributions of all generation, it makes a very significant contribution to the security of supply of electricity regardless of whether generation is connected to the distribution or transmission network.

9 The transmission system in England & Wales is currently operated and planned to meet the security standards designated in the Transmission Licence. This provides a transmission system that enables generation regardless of where it is located in England & Wales to meet demand with a relatively low level of constraints, ie, generators are able to operate at their desired levels of output to meet demand for the vast majority of the time and subject to minimal and infrequent restrictions on the levels of output for transmission reasons. This, in turn, facilitates security of supply in that non-availability of generation in a particular locality will not lead to a failure to meet demand in that locality as the transmission system is able to supply energy from other generators. Furthermore, security standards require levels of transmission capability which mean that losses of electricity supply due to the unreliability of the transmission system itself are relatively rare. Energy not supplied to customers as a result of faults on the transmission system last year represented only 0.5 GWh out of total energy transmitted of 280,000 GWh.

10 The contribution of the transmission system to security of supply is not merely a matter of establishing sufficient transmission capacity to meet the required

flows on the system but also involves appropriate levels of maintenance and timely asset replacement and development. As a measure of the effectiveness and efficiency of National Grid maintenance policies, average annual availability of the transmission system has increased from 91% in 1991/92 to almost 96% in 2000/01.

11 This level of system performance has been achieved against the background of sharply reducing RPI-X revenue through the 1990s. These revenue reductions have been possible because of substantial reductions made in the costs of operating the transmission system. However, there are limits to further reductions in these costs and it is likely that the emphasis of regulation will need to shift from squeezing of operating costs to the encouragement of necessary investment. Although Ofgem has tilted the focus of regulation towards rewarding system 'outputs' (eg, the Information and Incentives Project for distribution), there is a need for greater consistency between such initiatives and the setting of the main price controls for the energy network operators.

Fuel Diversity

12 The importance of diversity of energy supply both in terms of sources of an individual energy power form (eg, gas) or, in terms of a mix of energy forms (eg, balance between gas, coal, nuclear, renewables) is an issue that the PIU has indicated it will wish to consider. In terms of diversity of energy forms for electricity generation, the role of the transmission system will continue to be important. On the basis of a continued mix of generating plant (coal, gas, oil, nuclear and increasingly renewables) the ability to substitute one form of generation for another in order to take advantage of the diversity of fuel supply sources to power stations depends fundamentally on the existence of a transmission system that is capable of enabling power stations wherever located to meet demand securely. Over the past decade, we have facilitated a major shift in fuel types for power generation connecting over 20 GW of mainly gas-fired plant, which offers clear evidence of our capability to facilitate diversity both now and for the future.

13 A related issue arises in respect of interconnectors between the National Grid

transmission system and those of other countries. Clearly, an increase in interconnections with other countries will increase the diversity of electricity supplies available to meet demand in this country. However, economies of scale on submarine cables will mean that for interconnectors to be economic they will tend to be of significant size — 500 MW plus. Interconnectors of this size will require connection to the high voltage transmission system.

THE ROLE OF TRANSMISSION WITH A MAJOR RENEWABLE GENERATION BASE

14 The Royal Commission on Environmental Pollution's June 2000 Report considered a number of scenarios that would be consistent with a 60% reduction in carbon emissions by 2050. These scenarios involved large-scale developments of renewable energy, combined heat and power and other energy efficiency technologies of a variety of forms. The Government currently has targets consistent with the Kyoto Agreement to increase substantially the contributions from renewable energy and from CHP by 2010.

15 Such developments are likely to have an impact on the transmission system, which will need to be developed to meet these challenges. The following sections identify a number of issues that will need to be considered, particularly if significant increases in renewable energy's contribution beyond those envisaged for 2010 are to be achieved.

Requirements for Transmission Capacity

16 Many renewable energy sources for electricity generation and CHP developments which are likely to become more widespread will, because of their small scale, find it more economic to connect to the low voltage distribution systems rather than to the transmission system. It is often taken as axiomatic that such a trend will lead to a reduction in the need for transmission capacity but, in general, this does not follow.

17 Future requirements for transmission capacity in a world where renewable

energy plays an increasingly important role in the generation of electricity depends on their location rather than on the voltage of connection of such technologies. Increasing development of on-shore and off-shore wind and wave power will tend to lead to a need for increased transmission capacity as the resource base for many of these developments is likely to be the north and west of England & Wales (and, indeed, in Scotland) while demand is likely to continue to be concentrated in the south and the east. It follows that, regardless of voltage of connections, such developments will tend to add to the flows on the transmission system.

18 Other renewable or energy efficient systems such as micro-CHP, photovoltaic generation and fuel-cells could be more evenly distributed and therefore their development may tend to reduce the need for transmission capacity. However, as many of these technologies may not or cannot be operated continuously, the ability of the transmission system to deliver power efficiently from other sources as necessary due to the intermittent nature of these sources will be important.

19 While it is generally the case that renewable developments will tend to connect to distribution systems, this is not universally true. Off-shore wind and wave developments may well be of a size to make it more economic to connect at transmission voltages, once ashore, rather than to distribution networks, and such tidal schemes as the Severn Barrage are, clearly, of such a scale to necessitate transmission connection. As recognised in the Royal Commission's scenarios, it is unlikely that all traditional electricity generation capacity can be replaced and new/replacement generation of this type will also require transmission development.

20 Further capital investment to enhance the transmission system may well be a requirement of increased reliance on new forms of energy and to make energy use as efficient as possible

21 It also leads on to the need to simplify and speed-up the process by which consents for transmission reinforcements required to access remote renewable energy developments can be achieved. One issue that the PIU review study will

need to consider is the process by which renewable energy sources gain consent for their developments, if renewables are to make a major and accelerating contribution. Any such review will need to encompass issues of associated transmission and distribution system reinforcements and not just the planning consent process for the renewable generation developments themselves.

Impact of Cost Reflective Charging

22 The current approach to charging by National Grid for connection to and use of the transmission system, charges generators for the costs incurred by National Grid in connecting that generation to the system. The costs of system reinforcements required as a result of increased generation at a particular location is recovered via geographic tariffs with significant differentials between charges in the north of the country and the south, reflecting the predominant flow on the system and therefore the requirements for reinforcement.

23 This approach to charging is reflective of those costs incurred by National Grid in meeting the requirements of generation. The approach adopted by distribution companies to charging generators connecting to their system is to identify all reinforcement costs on the distribution system required as a consequence and charge such costs to the connectees.

24 Both approaches can be considered as cost-reflective and are likely to involve relatively high charges to generators whose developments are remote from high densities of load and where significant reinforcements are caused by the developments.

25 It is therefore important that the Review takes into account when assessing the costs of renewable developments and the potential support needed for them, the possible costs of the reinforcements to the transmission and/or distribution system consequent on their connection. While the extent to which these costs are visited on the generation development itself may currently differ between the approaches to charging adopted by the distribution companies and National

Grid, the investment in system reinforcement will have to be remunerated one way or another and, indeed, will have to be funded.

Transmission/Distribution Interfaces and Active Distribution

26 As indicated, renewable energy sources and CHP plants are generally more likely to connect to distribution systems. As a consequence, distribution systems may need to become "active," as against the current passive role of taking energy from the transmission system and distributing it to final customers. This active role may involve both technical operation of the distribution system, and, commercial and market issues. We are currently considering the issues that might arise and will submit a further note later in the Review process.

Intermittency of Renewable Sources

27 Intermittency in operation is an inherent characteristic of some (but not all) renewable energy sources. While existing generators are not available 100% of the time, requiring outages for both routine maintenance and breakdown, the availability of some renewable generators, eg, wind, will, inevitably, be weather dependent. Our current modelling data indicates that the availability of wind generators at times of system peak is about half that of CCGT stations and a wind generator is likely to be available in a typical year for about a third of the time. Intermittency will also mean that while, with conventional power stations, the timing of their coming on and off the system will be determined largely by commercial factors, ie, whether or not they have a contract or whether their services have been purchased in the balancing mechanism, the ability of wind generators to come on and off the system will also be weather related.

28 This gives rise to two issues. The first (lower operating availabilities) means that the plant margin (ie, the difference between installed capacity and system peak demand) is likely to look very different with respect to operating security in the longer term. The second issue means that consideration has to be given

to the effect on management of the system of an increasing proportion of energy sources where availability is determined by the weather as well as by technical and commercial considerations. We have no concerns in respect of being able to continue to balance the electricity system securely at the levels of intermittent renewable energy envisaged in the Government's current targets for 2010. However, developments more in line with those put forward in some of the Royal Commission on Environmental Pollution scenarios, would most likely give rise to the need to develop new market approaches to system balancing, but do not present insoluble issues relating to transmission operation and intermittency. We are undertaking further analysis and will make a further submission to the Review this autumn.

Summary

29 This note has set out some of the major issues that we believe the Review may wish to consider. In particular, we have concentrated on electricity transmission-related issues.

Security of Supply

- Transmission will remain an integral part of a long-term sustainable energy policy. Transmission has an important enabling role in ensuring security of supply and fuel diversity for the future.

- Regulatory stability and appropriate incentives are needed to ensure adequate network investment for the long-term.

- It is important for the Review to draw a clear distinction between real-time issues relating to balancing the electricity system and delivering minute-by-minute security of supply, and, a range of longer-term resource-related issues. We strongly support this distinction being made in the PIU analysis.

Renewables

- In terms of significant new development of renewable energy sources there will be a continued major role for transmission - both in facilitating bulk power transfers and in ensuring real-time operational security of supply.

- Cost reflective charging for connection and use of system will, in many cases, bear particularly heavily on renewable generators because of their relative remoteness from demand centres. In assessing the future costs of renewable developments and potential levels of support for them, it is important that this factor is taken into account.

- Particular issues arise for National Grid from the likely development of active distribution systems and from the intermittency of some renewable energy sources. We will make further detailed submissions on these issues.

National Grid
30 August, 2001