National Grid operational metering data and renewables

Introduction

This article provides an overview of National Grid's publically available half-hourly electricity generation data, and outlines how it can be used to examine shorter term trends in electricity generation than those covered by DECC's monthly and quarterly Energy Trends statistics. It also describes the limitations of using the data (particularly with regard to renewables) since it is in examining these more intermittent sources of generation where the National Grid data can be of most value.

Data source

National Grid uses half-hourly operational metering of generation units (including imports via interconnectors) in order to assist in balancing the Great Britain transmission network. The metering data are aggregated by fuel type, with the sum of each providing the total Transmission System Demand (TSD, i.e. the demand met by the Great Britain transmission system, including demand from the generation units themselves, pumping and exports).

The real-time data can be found on the "NETA" website at:
www.bmreports.com/bsp/bsp_home.htm[1].

Data coverage

National Grid is the transmission network operator for Great Britain. Therefore, generation units connected to the transmission network in Northern Ireland (which is integrated with the Republic of Ireland network as part of a single electricity market for Ireland as a whole) are not included. However, imports, via the Northern Ireland-Scotland interconnector, are included.

Operationally metered sites are typically larger sites, connected directly to the high voltage (HV) transmission system. With the exception of some key larger sites, generation units connected to the low voltage distribution system ("embedded" generation) are excluded from operational metering. For some fuel types, where sites are typically large and directly connected to the HV network, operational metering will have almost full or full coverage of generation capacity in Great Britain. This is the case for nuclear (100 per cent coverage), and coal and gas (around 90 per cent, with the main exclusions being smaller 'auto-generators', i.e. businesses who generate electricity primarily for their own consumption). However, for renewables, which are often on a smaller scale and embedded, far less of total generation capacity is covered by operational metering.

A list of the units covered by operational metering, by fuel type, can be found on the NETA website under: *'Generation by fuel type (table)' -> BMU fuel type EXCEL spreadsheet.* However, for wind, there are several sites listed that are not yet included under operational metering – a definitive list of the current sites (and capacity) covered can be found on the website under:
'Peak Wind Generation Forecast' –>Power Park Modules EXCEL spreadsheet.

Coverage of renewables

When using operational metering data for examining the contribution of fuels, and particularly renewables, to UK generation, the limited coverage of renewable generation should be taken into account. Table 1 compares the coverage of UK electricity generation (in 2011) from renewables, as reported in DECC's quarterly and monthly Energy Trends statistics, with that obtained from National Grid's operational metering.

[1] Generation data can be downloaded from 'Generation by fuel type (graph)' -> current/historic.

Table 1: Comparisons of UK renewables coverage (based on *generation* in 2011) – DECC quarterly and monthly data, and National Grid operational metering data

	Energy Trends Quarterly - 2011 (tables 5.1 & 6.1) [2]	Energy Trends Monthly (Major Power Producers only) – 2011 (table 5.4)		Operational metering data - 2011
Onshore wind	100%	73%	80%	63%
Offshore wind	100%	100%		
Hydro	100%	81%		65%
Bio-energy	100%	35%		0%
Solar Photovoltaics, Wave & Tidal	100%	0%		0%
TOTAL	100%	63%		39%

Unlike in DECC's statistics, operational metering does not distinguish between onshore and offshore wind generation (although the capacity can be separated by using the Power Park Modules spreadsheet). Prior to 2012, operational metering did not include any generation from bio-energy, as the majority of this is embedded. Since early 2012, two dedicated plant biomass stations have been included: Tilbury B (which has been converted to biomass from a chiefly coal-fired station) and Steven's Croft. Generation from co-firing, however, is included within the fuel with which it is co-fired (usually coal). No generation from landfill gas, sewage gas, anaerobic digestion, animal biomass or energy from waste is included in operational metering, as these sites are entirely embedded. The same applies to wave, tidal and solar photovoltaics (and the majority of installations on the GB Feed in Tariff scheme).

Using operational metering data for examining wind generation's contribution to the fuel mix

Operational metering data can be used for estimating the half-hourly contribution of fuel types to the overall electricity fuel mix. This can provide a more up to date picture of the contribution of renewables, as well as demonstrating the variability of the contribution of intermittent technologies, such as wind, where generation levels can vary considerably from one hour to the next. However, the results should be used with caution.

Table 2 shows how the contribution of wind to the operationally metered fuel mix can differ substantially from the contribution to the UK's fuel mix. Wind's proportion (and renewables as a whole) of the fuel mix will be under-estimated using operational metering due to the lower coverage of these technologies. However, offsetting this slightly will be the denominator, TSD (the sum of operationally metered generation), which is lower than total UK electricity generation.

In addition, the number of existing wind sites included in operational metering has increased over the past few years, which should be considered when comparing contributions from operationally metered wind from one year to the next. Using the 'Power Park Modules' list, Table 3 compares the amount of wind capacity covered by operational metering with that for the UK as a whole.

[2] Quarterly and monthly electricity/renewables Energy Trends tables can be found at: www.decc.gov.uk/en/content/cms/statistics/energy_stats/source/electricity/electricity.aspx and www.decc.gov.uk/en/content/cms/statistics/energy_stats/source/renewables/renewables.aspx

Table 2: Wind generation's contribution to total electricity fuel mix (GWh)

	2010			2011		
	Wind	Total fuel mix	Wind generation share	Wind generation	Total fuel mix	Wind generation share
Operational metering	3,683	334,349	1.1%	9,717	319,848	3.0%
UK generation (ET tables 6.1 / 5.1)	10,181	381,772	2.7%	15,498	367,802	4.2%
Difference % difference	6,498 64%	47,423 12%	1.6 pp	5,781 37%	47,954 13%	1.2 pp

Table 3: Operationally metered wind capacity compared with total UK/GB installed wind capacity (MW) [3]

	End-December 2010			End-June 2012		
	Onshore	Offshore	Total	Onshore	Offshore	Total
Total UK wind capacity (Energy Trends table 6.1)	4,037	1,341	5,378	5,386	2,508	7,894
Total GB wind capacity (Energy Trends table 6.1)	3,715	1,341	5,056	4,937	2,508	7,445
Operationally metered wind capacity	1,930	500	2,430	2,657	2,029	4,686
Operationally metered wind capacity as per cent of total UK wind capacity	47.8%	37.3%	45.2%	49.3%	80.9%	59.4%
Operationally metered wind capacity as per cent of total GB wind capacity	51.9%	37.3%	48.1%	53.8%	80.9%	62.9%
Notable GB wind farms not covered by operational metering [4]	Scout Moor; Little Cheyne; Arecleoch	Kentish Flats; Scroby Sands; Gunfleet Sands; Inner Dowsing; North Hoyle; Rhyl Flats		Fullabrook; Scout Moor; Little Cheyne	Kentish Flats; Scroby Sands	

[3] Operationally metered capacity is measured on a Transmission Entry Capacity (TEC) basis, which is often different (less) than total installed capacity, and is therefore another reason for the difference between the capacity coverage figures.

[4] These sites do not yet have suitable operational metering equipment fitted (but are hoped to have in the future).

Wind generation's contribution to half-hourly Transmission System Demand

Operationally metered data can provide data on the half hours when there was most generation from wind, and when wind's contribution to TSD was highest. Table 4 shows this for 2011 and for 2012 (so far). In 2012, wind's highest share of TSD in a half-hour was 14.1 per cent (occurred on 14 May between 12:30am and 1am) and wind's maximum generation was a half-hour earlier on the same day. Again, when analysing wind's contribution to TSD, consideration should be given to the fact that not all wind generation capacity is included and that the coverage of operationally metered wind may have increased compared with previous years.

Table 4: Operationally metered wind and Transmission System Demand [5]

	Maximum operationally metered wind generation (half-hour ending)			Maximum operationally metered wind *contribution* to Transmission System Demand (half-hour ending)			Maximum Transmission System Demand (half hour ending)			Wind's contribution to maximum Transmission System Demand	
	MW	Date	Time	%	Date	Time	MW	Date	Time	MW	%
2011	3,331	24-Nov	20:00	12.2	28-Dec	05:30	56,108	6-Jan	17:30	534	1.0
2012 (to 23 August)	3,585	14-May	00:30	14.1	14-May	01:00	59,105	8 Feb	18:00	1,581	2.7

Half-hourly wind generation load factors

Operationally metered data, in combination with the capacity listed in the Power Park Modules, can also be used to show variation in wind generation load factors. However, this should be used with extreme caution since not all of the sites listed may have been included in operational metering for each of the half-hourly periods examined.

James Hemingway
Energy Statistics
Tel: 0300 068 5042
E-mail: James.Hemingway@decc.gsi.gov.uk

[5] The maximum demand/wind contribution will differ according to time-period selected, e.g. half-hour, hour or day