

RENEWABLE ELECTRICITY CAPACITY EXERCISE

The NW aims to contribute to the UK renewable energy target, by generating 30% of its electricity demand from renewable sources by 2020.

Projected Electricity Demand 2020 ¹	34,600 GWh
Renewable Electricity Target 2020	10,380 GWh

Background Data:

Wind Turbines

A 20 turbine wind farm requires approximately 5 sq km and ideally an average wind speed of 12m/sec.

The maximum technical capacity in the NW for large wind turbines, placing them in **every** available location not constrained by proximity to buildings, landscape and nature classifications, air traffic, etc is **23,000 MW** or over 9,200 turbines equivalent to 460 20-turbine wind farms. This includes areas with wind speeds as low as 5m/sec, which is less than the ideal for an economically viable wind farm.

Small Wind Turbines

A small wind turbine requires a minimum wind speed of 5m/s, ideally within 50m of a suitable grid connection point. A typical turbine at a good location would generate 30,000 kWh per year.

The maximum technical capacity for small wind turbines, placing them in every suitable location, is **670MW**, equivalent to 60,000 11kW turbines or 6,700 100kW turbines.

Hydro

There are 900 good sites for hydro schemes, with an average capacity of 40kW. Of these less than 10% will generate more than 100kW.

The maximum technical capacity for small hydro schemes, placing them at all sites except the most highly sensitive, is **77MW**, equivalent to around 750 100kW schemes or 2,500 30kW schemes.

Domestic & Commercial PV

The maximum technical capacity for PV, placing systems on every suitable roof, is **1,100MW**, equivalent to 440,000 domestic systems or 44,000 commercial roof systems or 550 2MW solar farms.

A 1MW generating 1,000 MWh/year solar farm requires approximately 2 hectares.

The average cost of a 2.5kW domestic system is £12,000 with an annual income of £1,000. Commercial systems, at around 10 times as large as domestic systems, typically cost £80,000 and provide an annual income of around £8,000.

¹ Data sourced from "Northwest renewable and low carbon energy capacity & deployment" 2010

Annual output in GWh of different numbers of installations of each technology

Wind farm - 20 x 2.5MW turbines	5	10	20	50	100	200
Output GWh	650	1,300	2,600	6,500	13,000	26,000
Large wind turbine - single	5	10	20	50	100	200
Output GWh	33	65	130	325	650	1,300
Small wind turbine	50	100	200	500	1,000	2,000
Output GWh	2	3	6	15	30	60
Hydro - small	5	10	20	50	100	200
Output GWh	3	6	12	30	60	120
Hydro - very small	50	100	200	500	1,000	2,000
Output GWh	8	15	30	75	150	300
Solar farm	5	10	20	50	100	200
Output GWh	5	10	20	50	100	200
Domestic Solar PV - single system	5,000	10,000	20,000	50,000	100,000	200,000
Output GWh	13	25	50	125	250	500
Commercial Solar PV - single system	500	1,000	2,000	5,000	10,000	20,000
Output GWh	13	25	50	125	250	500

1 GWh = 1,000 MWh = 1,000,000 kWh

1MWh = 1,000 kWh

Note on efficiency

The demand data assumes that efficiency improvements can negate the impact of rising demand, so that the 2020 demand is equal to that of 2008. Although electricity demand has fallen in recent years due to the recession, it rose by 10% from 1997-2007.

Part 1: How many systems of each type you would install to meet the target?

Projected Electricity Demand 2020	34,600	GWh
Renewable Electricity Target 2020	10,380	GWh
Current Renewable Electricity	1,900	GWh
Contribution from other sources e.g. EfW/Biomass	980	GWh

Remaining Target 2020				7,500 GWh
Technologies	Capacity (each) kW	Output (each) MWh	Number of schemes	Total Output GWh
Wind farm - 20 x 2.5MW turbines	50,000	130,000		
Large wind turbine - single	2500	6500		
Small wind turbine	11	30		
Hydro - small	100	600		
Hydro - very small	30	150		
Solar farm	1,000	1,000		
Domestic Solar PV - single roof system	2	2.5		
Commercial Solar PV - single roof system	20	25		

Part 2

- Which technologies are likely to face the biggest barriers in your area and what are these barriers likely to be?
- How can planning assist in the development of renewable technology installations considering these constraints to still meet the 2020 targets?
- What else would need to be in place to support achieving the target?