



Presentation to  
**BWEA 28**

October 2006

# Introduction

## Contacts

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- What we do and why it's important
- How a Weather Radar works
- Our network
- How wind farms affect us
- The criteria we use to analyse applications
- What you can do to help
- Questions

- Produce real time precipitation data across the UK
- Primary tool in flood forecasting
- Vital component of the Nowcasting system giving forecasts up to 6 hours in advance

Pictures from the Boscastle storm



## 19 Radars:

- 16 in the UK
- 2 in Eire
- 1 in the State of Jersey (Channel Islands)

## Radar hardware:

- Plessey 45C(D)
  - C-Band (5.6 cm wavelength)
  - 7 radars are Doppler capable
- And
- 1 dual polarization radar with Doppler capability

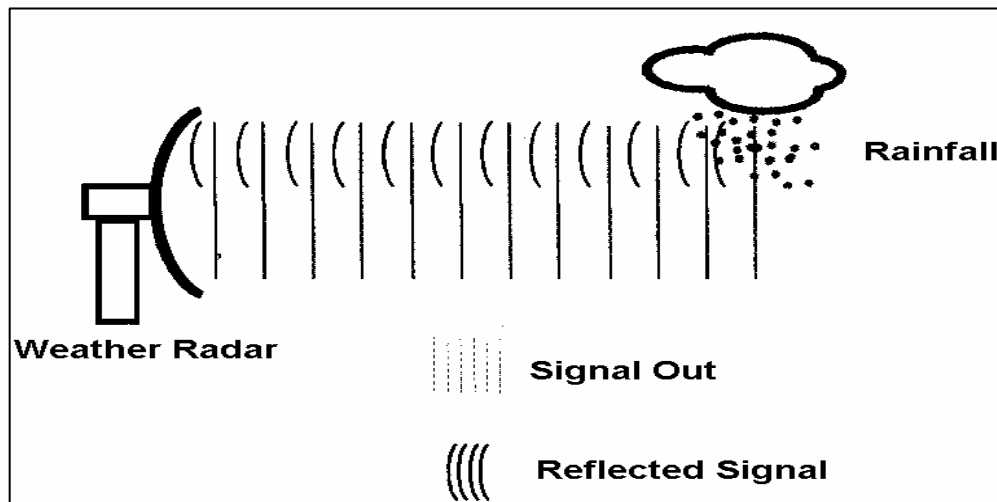


## Radar



- Radar scans horizontally round  $360^\circ$  sending out tiny pulses in a beam of energy.
- The radar scans at 4 or 8 elevations to give a picture of the precipitation through the atmosphere.
- The scans are generally at  $0.5^\circ$ ,  $1.0^\circ$ ,  $1.5^\circ$  and  $2.5^\circ$  elevations and there are two radars that run an 8 elevation scan strategy.

- The pulses of energy are focussed on a  $1^\circ$  beam width so the maximum range for usable data is 255km.
- The energy pulses are then reflected by anything it meets on the way: precipitation, aeroplanes and wind turbines etc.



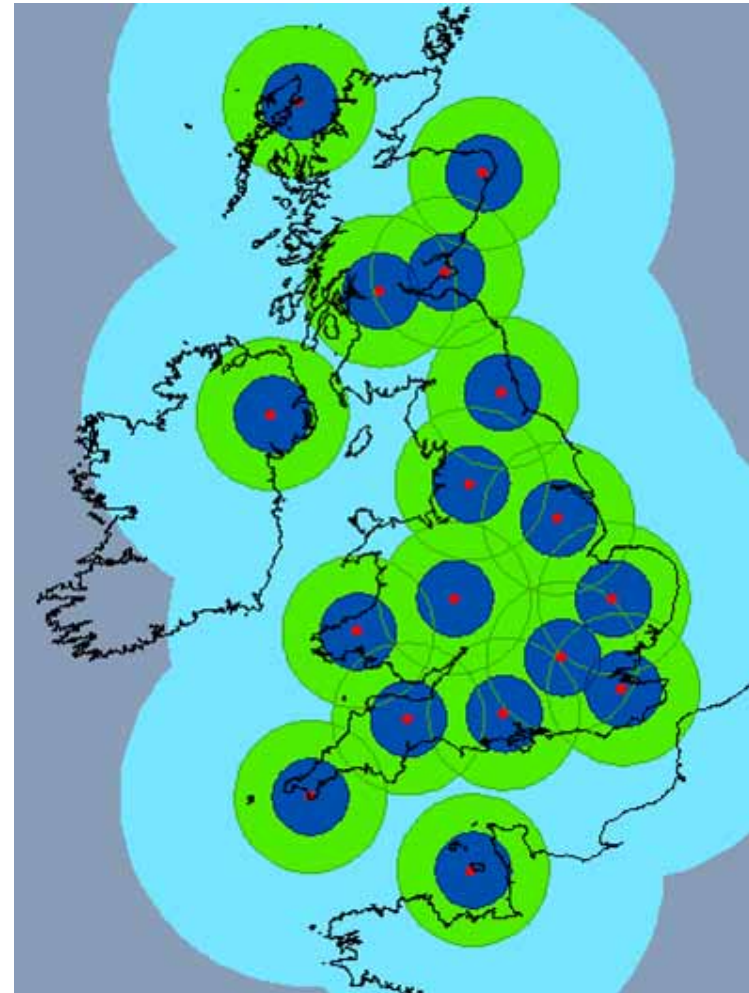
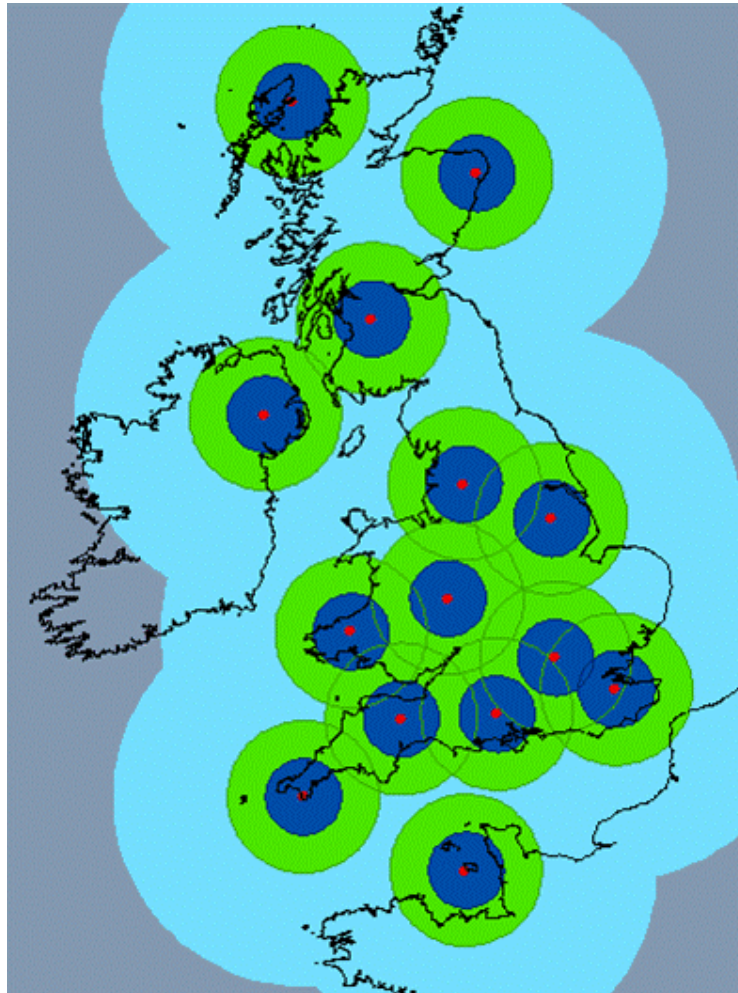
- The radar collects the reflected energy and passes it back to a processing system that interprets the data to produce a rainfall picture.
- Most spurious echoes are removed by sophisticated algorithms but there are some which still cause problems.
- As each radar only has a usable range of 255km we have a network of overlapping radars to give us the vital countrywide coverage that we need to protect all areas.

# Current and future networks

2006



2007/8?



- Weather Radar works by measuring the reflected power from precipitation.
- If the radar beam is intercepted and deflected on its way to or back from the precipitation, the measurement is modified.
- The extent of the modification of a beam by a windmill blade is unpredictable.
- Turbine towers also create blockages in the scan path.
- Resultant measurements are corrupted beyond use for quantitative assessment.

- The numbers of Windfarms and Turbines are increasing.
- Proliferation is a significant problem.
- Allowing a maximum obstruction of 10% of any one degree sector appears to keep the resultant signal degradation down to an acceptable amount.
- Doppler filtering may help with removal of blade effects (but further development work is required).
- A 'sector wide' set of consistent criteria has strengthened our position (to be extended to include North America).
- Exchange of observed and modelled data helps with the defence of Weather Radar Systems against increasing signal degradation.

<b>Turbine Location</b>	<b>Action</b> (agreed by European Met Services and WMO)
Within 60km	Area of interest – USA/ Canada where network density =200km
Within 30km	Area of interest – Europe S-Band
Within 20km	Area of interest – Europe C-Band
10-20km	Assess effects – Possible objection due to cumulative effects
5-10km	Assess effect – Possible objection
Within 5km	Assess effects – Probable objection
Within 2km	Exclusion zone – Objection

- By careful location of the windmills we can position all the blades below the beam.
- We can see if something else is already intercepting the beam in any particular direction. i.e. locate windmills in front of or behind the existing horizon.
- Consider how much partial beam interception is allowable before it becomes critical.
- Talk to us, if we can help we will!

# In the Clutter?



# Questions & Answers