ArcGIS as a tool for renewable energy site design

Emma Hall & Mike Hayward
Design and Technical Team
So who are Ecotricity?

- World’s first green electricity company – now ‘green energy’ company
- We generate and supply green energy to 180,000 customers across UK
- Radical ‘Bills into Mills’ model - ‘not for dividend’
- Mission is to bring about a Greener World
- Not just about energy – and transport too
The Design & Technical Team

- Renewable energy project design & planning
- Produce technical assessments & visualisations
- A range of recipients (EIA, FEI, Appeals, professional & public consultation)
- ...and that is where ESRI’s ArcGIS for Desktop comes in
3D and Spatial Analyst
3D and Spatial Analyst
ZTVs for complex layouts
ZTVs for complex layouts

Infrastructure Footprint Points for ZTV

Height (in m)
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
ZTVs for complex layouts
Model builder Automation

Legend
- Site Location
- 5km Distance Bands
- Cumulative Wind Turbine Locations:
  - Operational
  - Consented
  - Planning
  - Masts, Scoping, Refused & Withdrawn
Model builder Automation

**Output/Input**
- Geodatabase Input
  - Turbine location Point shapefiles

**Input**
- Height Data

**Tool**
- Iterator
  - instructs subsequent tools to repeat for all files

**Tool**
- Visibility (ZTV)

**Defunct Output**
- Tool
  - Raster to Vector (shapefile)

**Derived Data**
- Parameter to distinguish the derived pieces of data

**Output**
- Tool
  - Raster to Polygon
  - ZTV raster

- Tool
  - ZTV shapefile
Model builder Automation

Legend
- Viewpoint locations
- 5km Distance Bands
- Turbine Locations
  - Inch Moor (126.5m Tip Height)
- Bareground Zone of Theoretical Visibility (ZTV) to Blade-Tip Height (Viewer Height 2m)
- One or more Cumulative Projects
- One or more Cumulative Projects & Inch Moor
- Inch Moor Only

ecotricity
Model builder Automation

Legend
- 1km Distance Bands
- 5km Distance Bands

Turbine Locations
- Inch Moor
- Black Hill (76m TH)
- Weetburn House (54m TH)
- Fatfield Rig (125m TH)
- Fatfield Rig Ext (126m TH)
- Quikwood (106m TH)
- Crydale Rig 1 (100m TH)
- Crydale Rig 2 (107m TH)
- Alkengall (119m TH)
- Alkengall 2 & 3 (117m TH)
- Buck Dudley (78m TH)
- Black Rig (119m TH)
- Rumblethorn (120m TH)
- Westbeak Soar (115m TH)

Lines showing direction to site if theoretically visible (Bareground) to
- Inch Moor
- Black Hill
- Weetburn House
- Fatfield Rig & Ext
- Quikwood
- Crydale Rig & Alkengall
- Brockholes

Table: Number of Turbines Theoretically Visible or Partially Visible to Blade Tip from 500m spaced assessment points

<table>
<thead>
<tr>
<th>Distance from West End (km)</th>
<th>0</th>
<th>0.5</th>
<th>1</th>
<th>1.5</th>
<th>2</th>
<th>2.5</th>
<th>3</th>
<th>3.5</th>
<th>4</th>
<th>4.5</th>
<th>5</th>
<th>5.5</th>
<th>6</th>
<th>6.5</th>
<th>7</th>
<th>7.5</th>
<th>8</th>
<th>8.5</th>
<th>9</th>
<th>9.5</th>
<th>10</th>
<th>10.5</th>
<th>11</th>
<th>11.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackhill</td>
<td></td>
<td>1</td>
<td></td>
<td>4</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Weetburn</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fatfield &amp; Ext</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td>3</td>
<td></td>
<td>3</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Quikwood</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>Crystal Rig &amp; Alkengall</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Brockholes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black Rig</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Rumblethornig</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Weeffoot Soar</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Inch Moor</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

G6485 - Westbeak to Christmas Theoretical Visibility to Wind Projects (Bareground)
- Inch Moor Cruise
- Inch Moor and at least one other project
- One or more other projects
- Non-Project
Overcoming issues

Visualising data which is:
- Spatially dense
- Updated regularly

Solution:
- Choose a dynamic symbology style
- Update the data source
Overcoming issues
Overcoming issues

Visualising data which:
- Has same geographical coordinates
- Is complex

Choose symbology style:
- Represent true location
- Maintain good visual aid
Overcoming issues
Thank you

Any Questions?