Visual Representation of Windfarms

Technical Session 1:
Getting the pictures into the camera

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Choice of Camera
‘Full frame’ sensor = the same size as 35mm film
Limited choices

Canon: 3 models

Nikon: 5 models

Sony Alpha 7: 3 models

Sony Alpha 99: 1 model
Anatomy of an SLR
Sony Alpha 7

Not an SLR
# Megapixels
(How many can I get?)

<table>
<thead>
<tr>
<th>Camera</th>
<th>Model</th>
<th>Megapixels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canon</td>
<td>EOS 1D X</td>
<td>18.1</td>
</tr>
<tr>
<td></td>
<td>EOS 5D Mark III</td>
<td>22.1</td>
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<tr>
<td></td>
<td>EOS 6D</td>
<td>20</td>
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<tr>
<td>Nikon</td>
<td>Df</td>
<td>16.2</td>
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<tr>
<td></td>
<td>D4S</td>
<td>16.2</td>
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<tr>
<td></td>
<td>D610</td>
<td>24.3</td>
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<tr>
<td></td>
<td>D750</td>
<td>24.3</td>
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<tr>
<td></td>
<td>D810</td>
<td>36.3</td>
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<tr>
<td>Sony</td>
<td>Alpha 99</td>
<td>24.3</td>
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<tr>
<td></td>
<td>Alpha 7S</td>
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<tr>
<td></td>
<td>Alpha 7</td>
<td>24.3</td>
</tr>
<tr>
<td></td>
<td>Alpha 7R</td>
<td>36.4</td>
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</tbody>
</table>
Megapixels
(How many do I want?)

More for:

- Resolution
- Image robustness

Fewer for:

- Dynamic range
- ISO range
- Pixel charge capacity
- Noise
Choice of Lens
Choice of Lens

- Fixed focal length lens
- Prime lens
- NOT a zoom lens
Focal Length

Focal length
Focal Length

Nodal point

Focal length

f
Horizontal Field of View (HFOV)
HFOV depends on sensor size

\[ f = 50 \text{ mm} \]

- 39.6° for 36 mm Full frame sensor
- 27° for 24 mm APS-C sensor
Equivalent Focal Length
Please avoid using this term!

A 33.3mm focal length lens on a camera with an APS-C size sensor would have an ‘Equivalent Focal Length’ of 50mm.
Vertical Field of View (VFOV)

$VFOV = 27^\circ$ in centre of frame
Vertical Field of View (VFOV)

VFOV = 25.4° at edges of frame
## Available (edge) VFOV

<table>
<thead>
<tr>
<th>Lens</th>
<th>Available VFOV</th>
</tr>
</thead>
<tbody>
<tr>
<td>50mm Landscape</td>
<td>25.4°</td>
</tr>
<tr>
<td>50mm Portrait</td>
<td>38.6°</td>
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<tr>
<td>35mm Landscape</td>
<td>33.9°</td>
</tr>
<tr>
<td>35mm Portrait</td>
<td>51.9°</td>
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<tr>
<td>28mm Landscape</td>
<td>39.6°</td>
</tr>
<tr>
<td>28mm Portrait</td>
<td>61.2°</td>
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</tbody>
</table>
Distortion

Pincushion distortion
Distortion

Barrel distortion
Anatomy of an SLR (again)
Retrofocus Wide-Angle Lens
Field Setup
Panoramic Tripod Head

Landscape or portrait orientation

Indexed rotation

Position camera over axis of rotation
Finding the Nodal Point

Approximate nodal point position

50 mm

Focal plane marker
Levelling
Location

• Good quality GPS
• EGNOS (WAAS) improves resolution
• Some models offer GLONASS as well as GPS
• Galileo will be operational by 2019
Focussing
Focussing

- Always use manual focus
- Always focus on infinity
Autofocus woes...
Focus Affects Scale

Focussing closer moves the lens forward
Wrong focus... and size
Exposure
Shutter Speed

- Fast enough to freeze movement in vegetation and water
- Slow enough not to force very wide apertures
1 second
Aperture

- Small aperture (higher f numbers) if you need lots of depth of field
- Wide aperture (lower f numbers) if the light is poor and shutter speeds might be too slow
- f/5.6 or f/8 is sharpest for most lenses
Sensitivity (ISO)

- High ISO numbers introduce image noise
- Degree of noise varies between cameras and sensors
- Acceptable level of noise depends on subject matter
White Balance

- Set it to ‘Daylight’
- Switch off automatic balance
Auto white balance woes...
...oops
Exposure

• Will vary from viewpoint to viewpoint
• It’s a compromise (shutter speed/aperture/ISO)
• Windfarm work usually requires best exposure on sky
• Underexposure is easier to fix afterwards than overexposure
Trends in Photography

- Increasing in-camera image processing
- Sensitivity to image content (not always helpful)
- Image stabilisation
- Image stacking (combining multiple exposures)
£200 point-and-click camera, full zoom, hand held...