



SeaGen, Strangford Lough – an adaptive management approach to environmental management, monitoring and mitigation



ROYAL HASKONING

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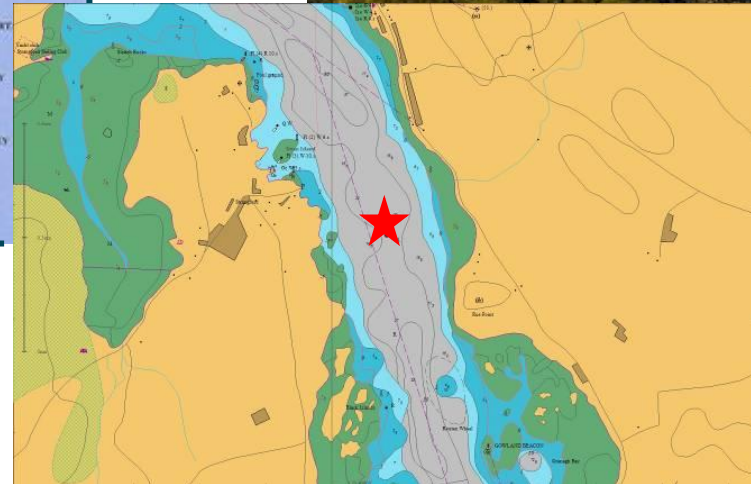
May 2012

Background



- Frank Fortune
- Technical Director – Royal Haskoning, Edinburgh
- Working in marine renewable energy – with heavy focus on wave and tidal energy since 2004, when I started work on SeaGen project
- Involved in various aspects of the project including:
 - Baseline surveys;
 - EIA and addendum;
 - Environmental monitoring and mitigation measures
 - EMP and adaptive approach

Location of SeaGen and Strangford Lough



Why choose Strangford Lough?



Significant tidal resource;

- Easy access;
- Grid connection;
- QUB marine station; and
- Local skills base for assembly and O&M.

However, the site is within a European Marine Site and hosts European Protected species.



EIA and consenting issues can pose a serious project risk

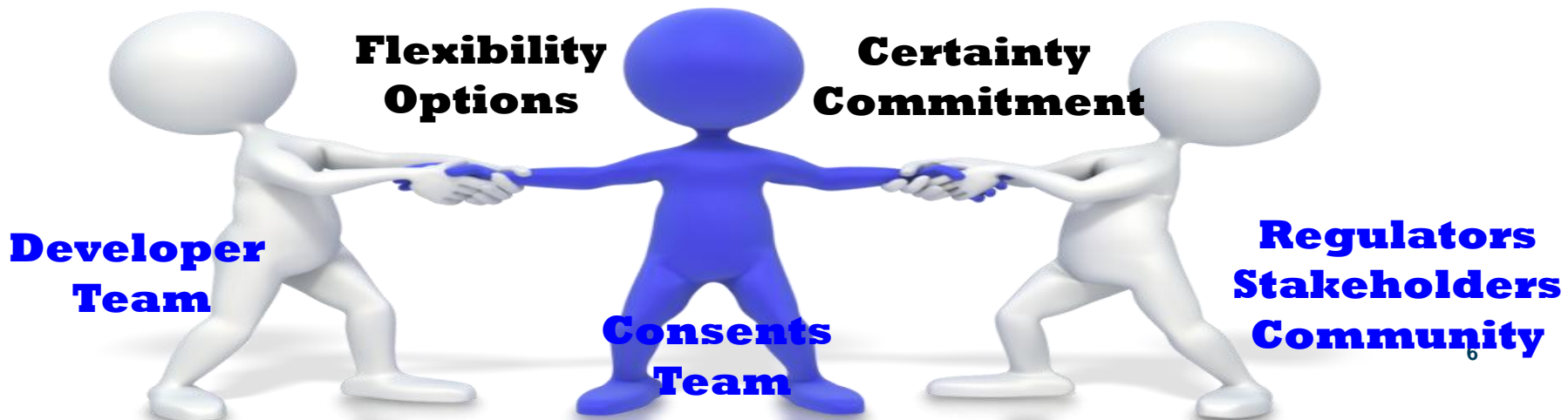
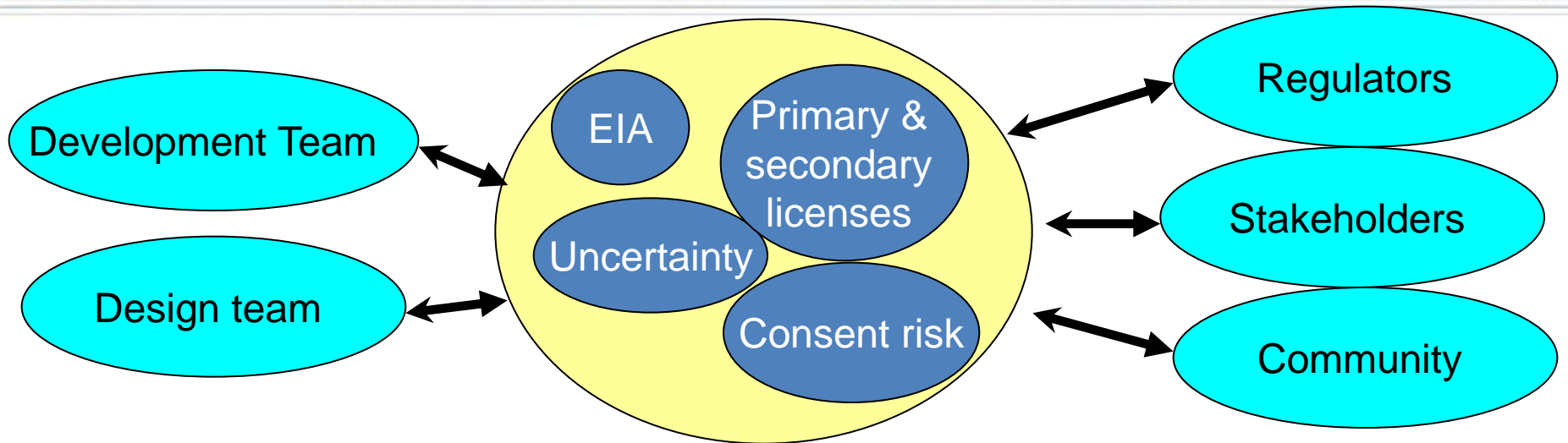
Broadmeadows wind farm seven-year saga extended.

Plans for wind farm unveiled after 8 years

Beauly Denny power line; 6 years in planning; 11 month in PI costs £10m.

Aim of MCT and Royal Haskoning was to minimise that risk through and open, science based approach

Pressures on the project team



SeaGen timeline

- ES submitted and FEPA license first awarded December 2005
- ES Addendum and installation in 2008
- EMP and EASMP implemented
- EMP concluded 2012



Uncertainty identified by EIA process

- The EIA process identified various levels of uncertainty surrounding potential impacts on key marine species, for example.
- Common seals *Phoca vitulina*
- 1) Are the patterns of usage of the Narrows by seals altered by the turbine installation and operation?
- 2) Are seals (or other large marine animals) being struck by the turbine rotors?
- Reef (rocky and biogenic)
- 1) Does the installation and operation of the turbine significantly effect the extent, quality or composition of seabed communities?



Commissioning and operation



Commissioning commenced in July 2008, culminating in full 1.2MW power generation to the grid in December 2008.

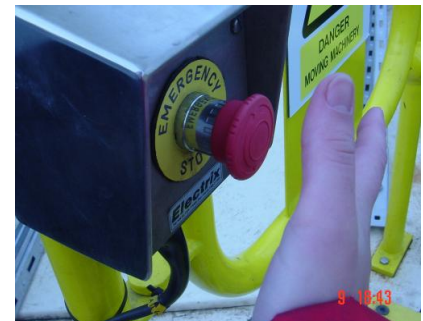
Because of the site's sensitivity and the uncertainties identified - operation is within the constraints of FEPA license conditions with the environmental monitoring and mitigation results contributing to an adaptive management strategy.

FEPA license conditions




Led to requirement for a number of tiers of mitigation :

- MMO presence on pile with ability to shutdown SeaGen;
- Daylight operation, initially;
- Active sonar development as further tier of mitigation.
- Environmental Monitoring Programme in parallel to mitigation and informing need for and nature of that mitigation.



	Date	Species	SeaGen operational activity (twin/ single rotor)	Distance from turbine (m)	Behaviour	State of tide	E-stop initiated by?
1	08/07/2008	Common seal	Single	130	Drifting	Flood	MMO
2	06/10/2008	Common seal	Single	50	Drifting	Flood	MMO
3	07/10/2008	Unidentified target	Single	60	Travelling	Flood	ASO
4	15/10/2008	Common seal	Single	80	Drifting	HW Slack + 1 hr	MMO
5	15/12/2008	Common seal	Twin	50	Travelling	HW Slack + 1 hr	MMO
6	13/05/2009	Common seal	Single	40	Drifting	Flood ¹	MMO
7	27/05/2009	Common seal	Twin	40	Travelling	Flood ²	MMO
8	27/05/2009	Common seal	Twin	80	Milling	Flood ²	MMO
9	27/05/2009	Common seal	Twin	70	Travelling	Flood ⁴	ASO
10	08/06/2009	Common seal	Twin	40	Travelling	Ebb	ASO
11	10/06/2009	Common seal	Twin	80	Drifting	HW Slack + 1 hr	MMO
12	22/06/2009	Common seal	Twin	38	Travelling	LW Slack + 1 hr	ASO
13	02/07/2009	Common seal	Twin	20	Travelling	Ebb	MMO
14	02/07/2009	Unidentified target	Twin	44	Travelling	Ebb	ASO
15	06/07/2009	Common seal	Twin	40	Travelling	Flood	MMO

Adaptive management approach



An iterative process where uncertainty regarding environmental effects is progressively reduced, through managed; science led monitoring of agreed indicators.

In the face of uncertainty, regulators will tend to favour a conservative approach, even when the objective of a project is broadly supported. Adaptive management allows risks and project needs to be balanced with , within an agreed framework.

In areas of particular environmental sensitivity, it may be necessary to put in place a number of short term precautionary mitigation measures, to reduce potential for effects to a level considered acceptable to regulators and stakeholders.

Science Group

- Independent chairman – Dr David Erwin
- Environmental Regulator – NIEA
- JNCC
- Royal Haskoning, QUB, SMRU
- Dissemination of information
- Forum for open discussion and advice for regulator and MCT in confidential forum
- Agreement of mitigation and adaptive management

Liaison Group

- Shares independent chairman
- Open to Science Group members
- Open to wider public and other interested bodies
- Dissemination of information
- Gain views of wider public

Monitoring

Marine mammal studies (SMRU / SMRU Ltd)

Benthic Ecology Monitoring (RH and QUB)

ADCP surveys (QUB)

Carcass surveys, reporting system and independent autopsy

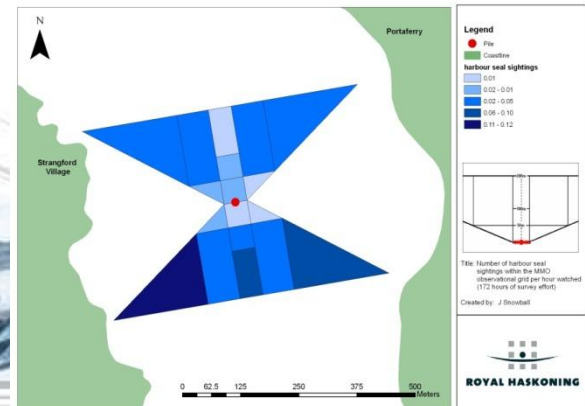
Focus on answering carefully stated monitoring questions,

Mitigation

Active Sonar (SMRU)

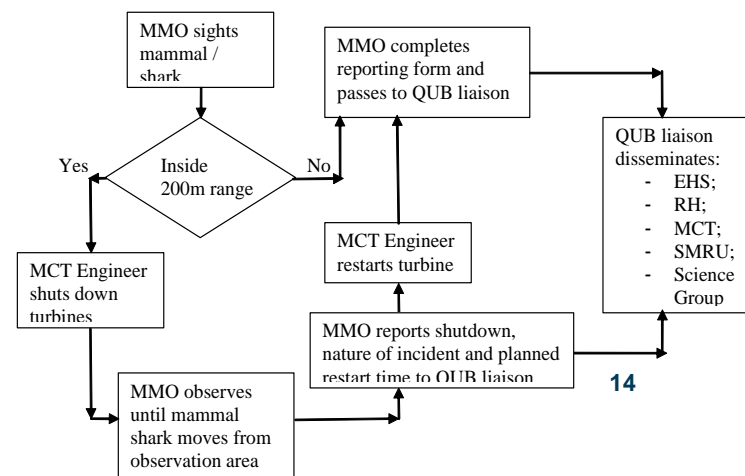
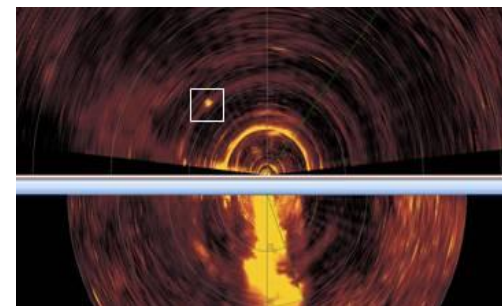
Pile-based Marine Mammal Observation (RH)

MMOs, Active sonar & shutdown distances



ACTIVE SONAR Common seal ~ 20m

- Mitigation allowed operation and adaptive management
- Progressive decrease in shutdown distance via science group, based on evidence;
- Initially MMO in parallel with active sonar operator;
- Compare sonar with MMOs and remove MMOs;
- Continue to reduce shutdown distance and start 24hr operation / generation;
- Further reduction in shutdown distance
- Present evidence for removal of shutdown with on-going surveillance



- **Twice yearly reporting to science group of results of monitoring and mitigation measures.**
- **Reporting framed in the context of series of monitoring questions developed by the Science Group.**
- **Key outcomes transmitted more widely via liaison group and website.**
- **Final report available online since January 2012.**

So what has happened?

- MCT has been able to install and operate for over 3 years justifying confidence in the technology and supporting future projects
- We have learned a lot about the effect of SeaGen on the marine environment and key receptors
- The regulator has had the comfort of a mitigation back stop
- Science Group has provided structure for review of results of monitoring and success of mitigation.
- Mitigation measures have been progressively removed.
- Decision regarding removal of shutdown protocol soon.



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THANK YOU

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