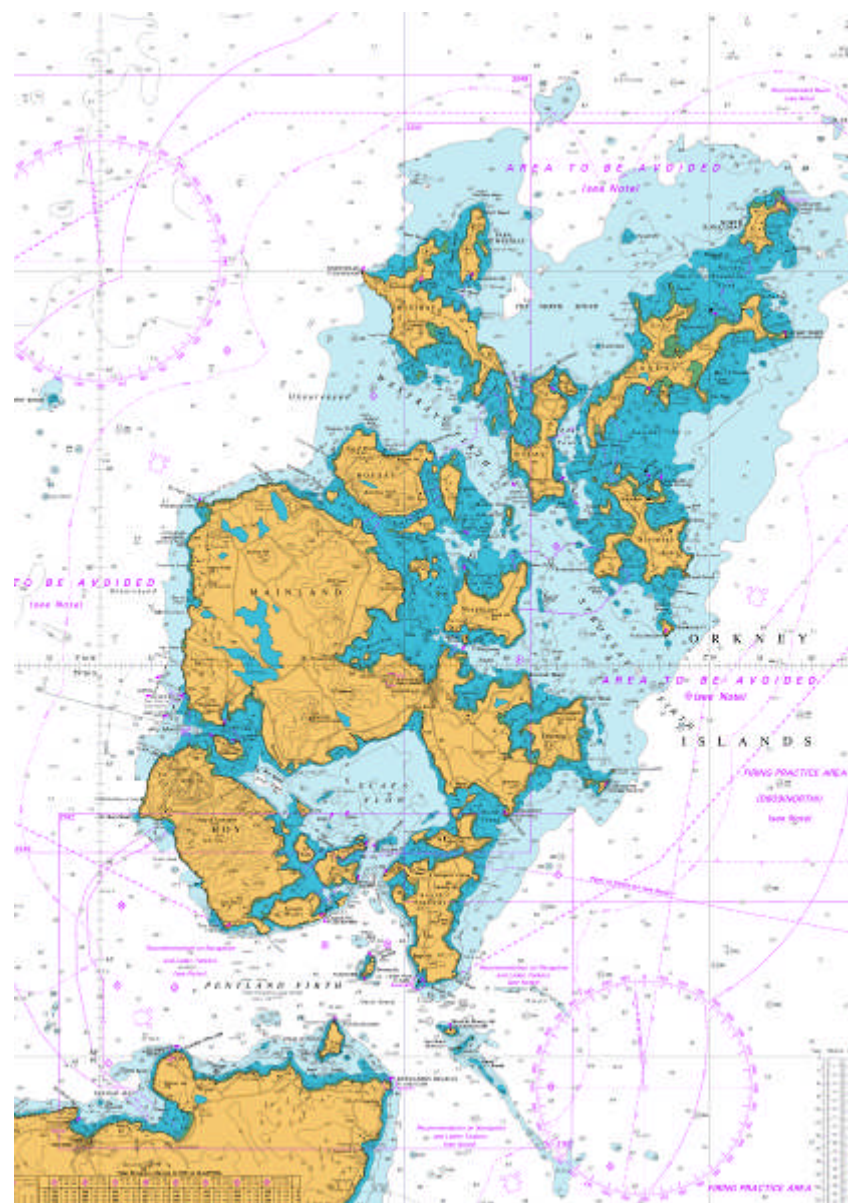
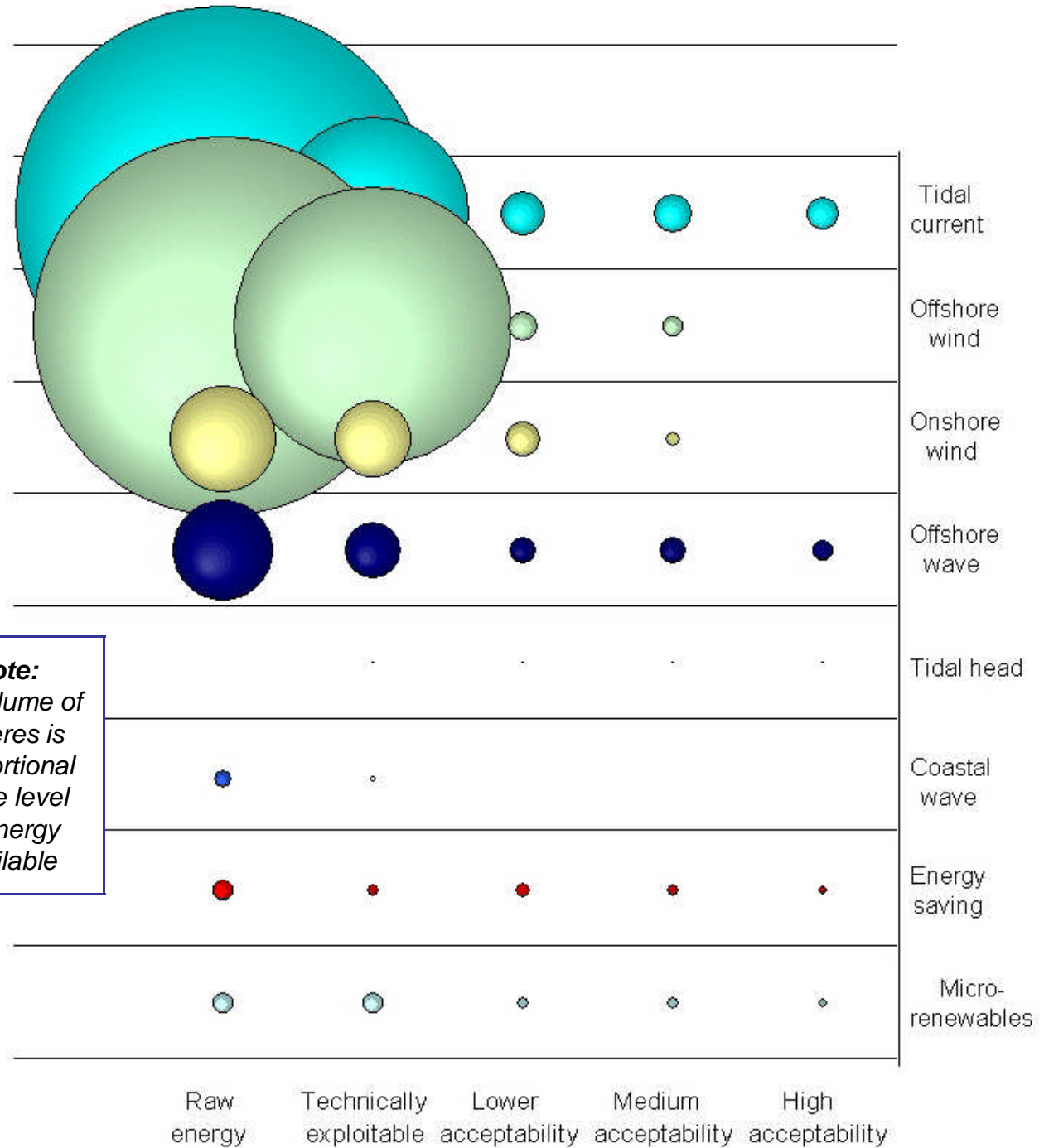


# Orkney waters & Pentland Firth energy context

- Energy Resources
- Energy people
- Marine technology pathway
- Infrastructure needs
- Roles & responsibilities



# Huge resources



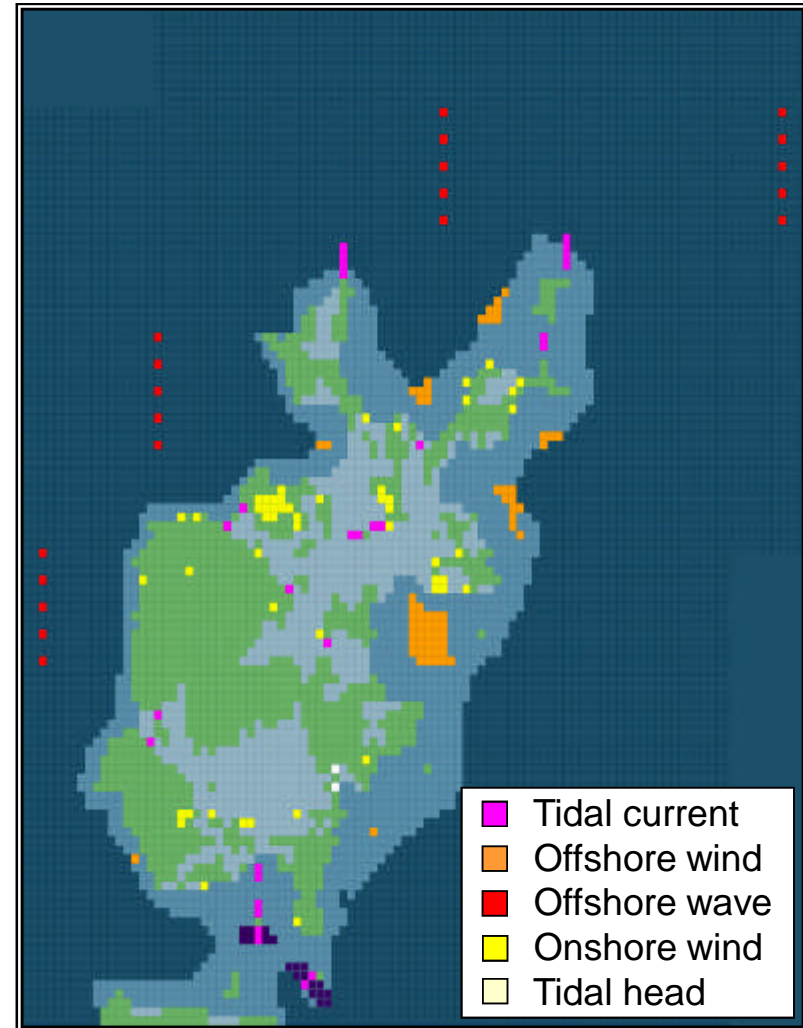
**Note:**  
3D volume of spheres is proportional to the level of energy available

# Large exploitable capacity (2003/4)

Energy category	Acceptability scenario		
	High	Medium	Low
	Installed generation capacity (MW)		
Current energy use	201	201	201
R & D	8	11	17
Existing/approved wind	23	23	23

<b>Tidal current</b>	<b>1462</b>	<b>2443</b>	<b>3571</b>
<b>Offshore wind</b>	<b>0</b>	<b>385</b>	<b>986</b>
<b>Offshore wave</b>	<b>101</b>	<b>226</b>	<b>226</b>
<b>Onshore wind (1 MW units)</b>	<b>0</b>	<b>46</b>	<b>256</b>
<b>Tidal head</b>	<b>1</b>	<b>6</b>	<b>7</b>
<b>Coastal wave</b>	<b>0</b>	<b>0</b>	<b>0</b>
Energy efficiency	19	33	47
Micro-renewables	16	29	47
Biomass crops	3	7	14
Biomass harvest	2	3	3
Bio-digestion	0.1	0.4	0.7
Energy from waste	0	0	0
<b>Total installed capacity (MW)</b>	<b>1603</b>	<b>3177</b>	<b>5158</b>

<b>Annual power production (GWh)</b>	<b>5580.1</b>	<b>11057.6</b>	<b>17951.3</b>
<b>Energy income (£M@1.2p/kWh)</b>	<b>67.0</b>	<b>132.7</b>	<b>215.4</b>
<b>ROC income (£M@4.6p/kWh)</b>	<b>256.7</b>	<b>508.6</b>	<b>825.8</b>



# Energy people

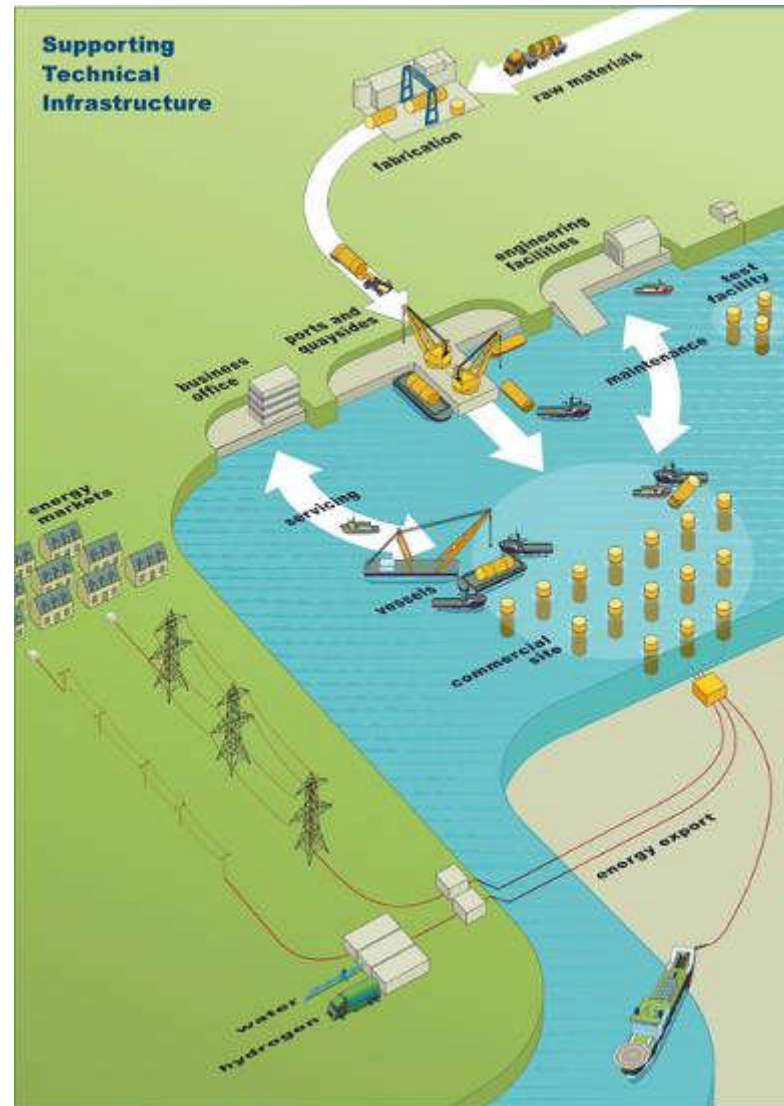
- Orcadians are passionate about energy
  - We are surrounded by it (wind, wave, tide, oil)
  - We need a lot of it (harsh weather, old houses)
  - We pay a lot for it (21% to 40% fuel poverty)
  - We know the benefits energy can bring in terms of jobs, 500 energy jobs, 200 renewables jobs!
- We have worked hard for over 20 years to get where we are today!



# What infrastructure will be required?

What will this region need to deliver 1 GW of marine renewables capacity:

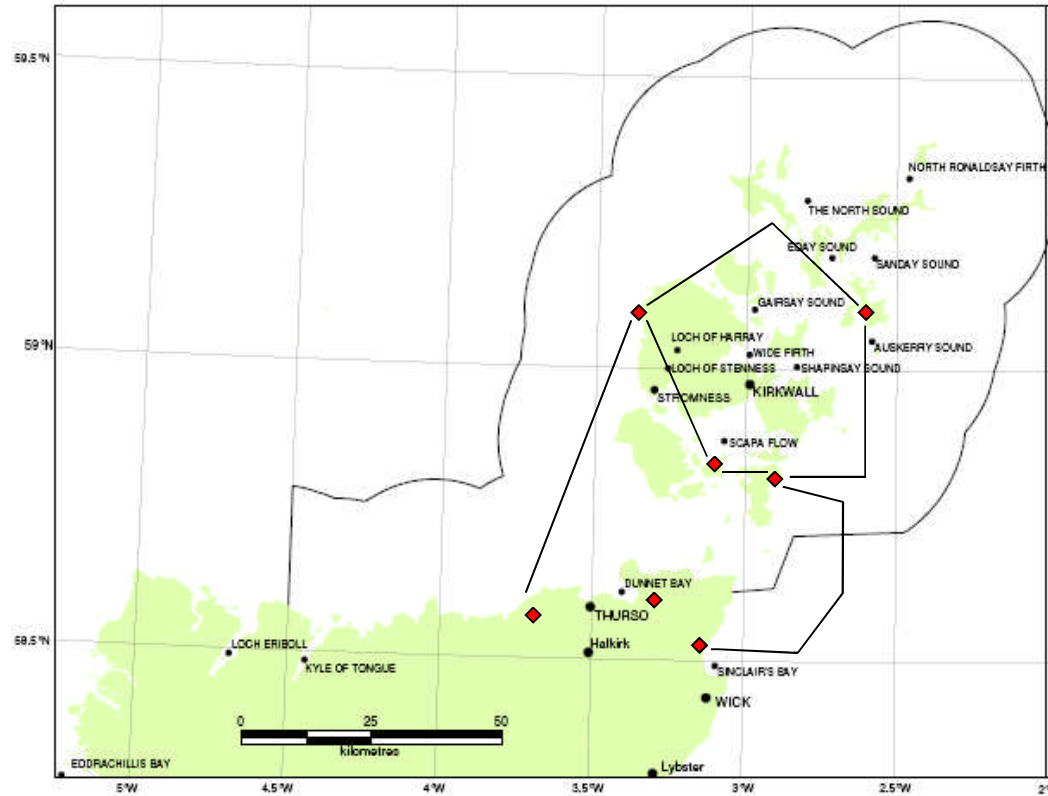
- Energy converters 1100-1200
- Connecting cables 1000/6000km
- Sub stations 10
- New 132kv connections 10
- Converter stations 1-2
- GW grid connection 1
- Co-gen/storage scheme 1-2
- Large purpose built vessels 10
- Emergency tugs 1-2
- Work boats 20-30
- Expanded/new ports 3-4
- Assembly/maintenance yards 2-3
- Local workforce 500-1500
- Expanded and new offices 50
- New houses 300-1000
- Operations control centre 1



# When - Marine pathway for 1 GW by 2020

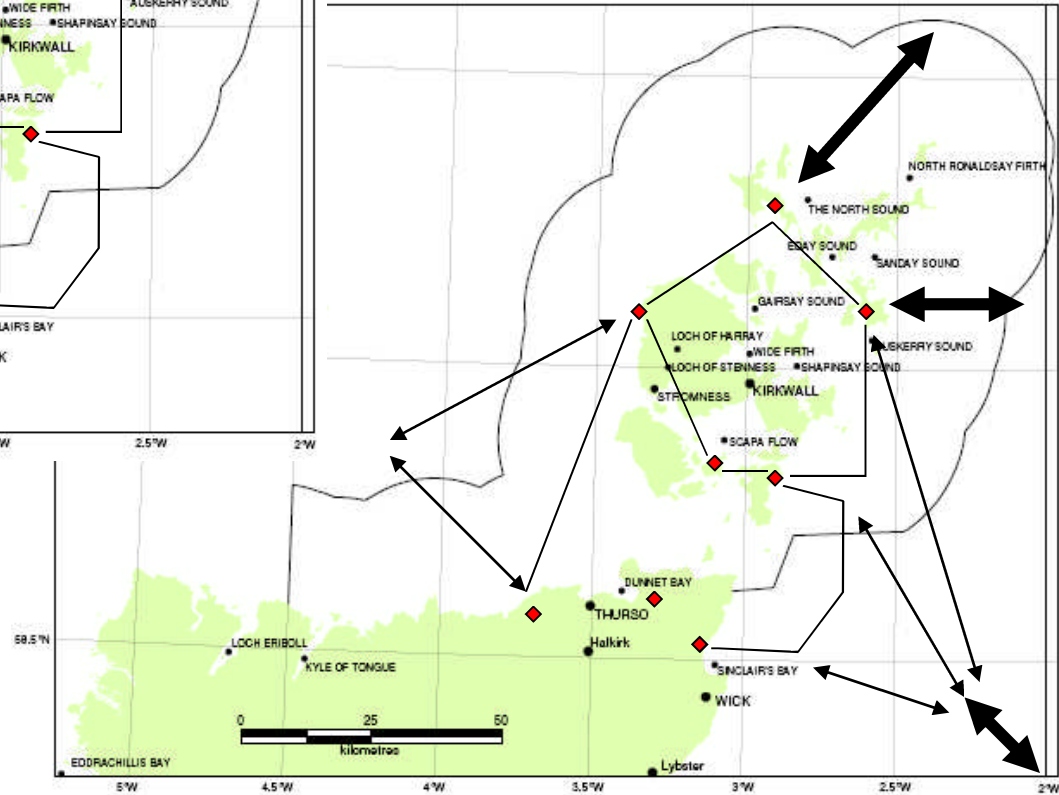
Technology	Assumptions	08	09	10	11	12	13	14	15	16	17	18	19	20
Maintain devices	After 5 years													
Operate devices	Start with 200 yr 1 and add 200 each year													
Commission devices	Same as installation													
Install devices	6 vessels @ 40/yr / 12 vessels @20/yr													
Build devices	200 per technology over 5 years													
Place device orders	6 technologies?													
Prove device arrays	8 technologies?													
Prove technology	10 technologies?													
Infrastructure														
New grid available	Need to be able to connect first devices													
Build new grid	cables, substations, converter station													
New port capacity	Berths needed for boats, yards for devices													
Build port capacity														
New ships available	6-12 large vessels + specialist work boats													
Build 8 new ships														
Design & permitting	Strategic and then site specific planning													
Plan programme	What, where, when & who													

# Short term & long term grid needs



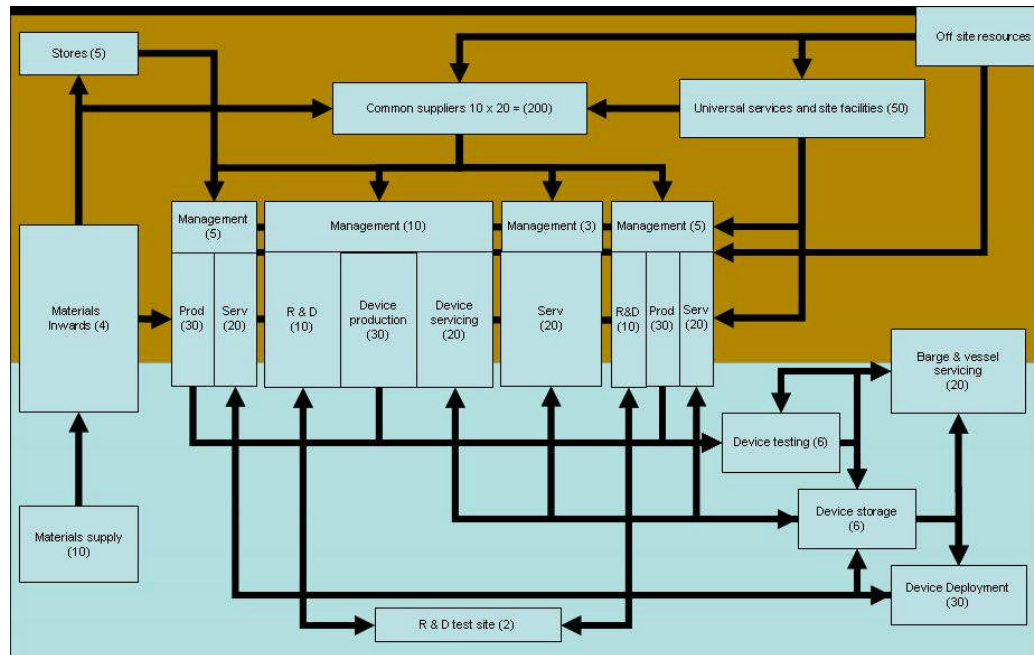
By 2013/14

By 2020/50



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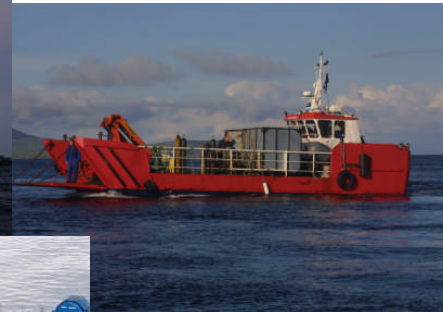
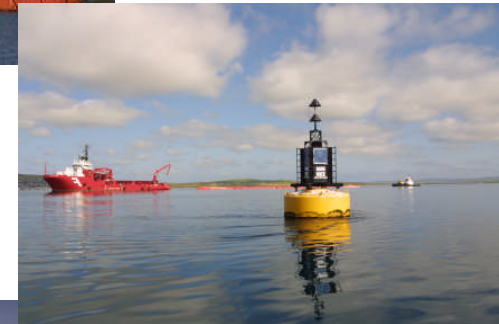
# Lyness supply base developments



Facilities for 600 workers

# Vessel needs

- Delivery vessels
- Construction & diving support vessels
- Jack-up rigs
- Crane barge
- Anchor handlers
- Tugs
- Workboats
- Crew boats
  
- Specialist new builds?



# Controlling crowded seas

- Planned level of activity may involve 30-40 new craft working daily in Orkney waters
- Operations such as:
  - towing, lifting, cable laying, maintenancesqueezed in narrow weather & tidal windows
- Verify positions of equipment
- Control movements during sensitive periods
- Co-ordinate when things go wrong



# Integrated community planning has started!

- Possible grid infrastructure locations
  - Sub sea cables to Dounreay & NE Scotland
  - Converter stations
    - Birsay/Skaill/Marwick
    - Flotta/Newark/Burray
    - Stronsay
  - Numerous substations
  - Overhead wires or cables between substations and converter stations
- Harbour/port expansion
  - Stromness, Kirkwall
- Supply bases
  - Lyness and Hatston
- Office accommodation
  - Stromness, Kirkwall, Hoy?
- Better transport links
  - Within Orkney, with Scotland
- Better and more hotels
  - Stromness, Kirkwall, Hoy, Eday?
- Housing



# Who does what?

It needs:

- everybody,
- working together
- in a co-ordinated way
- with people taking that extra step

to achieve success.

