The Ocean Observatories Initiative (OOI) UNOLS Fleet Improvement Committee Meeting Update

October 10, 2007

Susan Banahan
Associate Director
Status

- NSF/MREFC Capital Investment: $331M over five years
- Operation Funding: Ramping to $50M annually
- Design lifetime: 25 years
- Successful Conceptual Design Review in August of 2006
- Included in FY 2007 Presidential Budget
- Included in FY 2008 Request
- Preliminary Design Review scheduled December 2007
- National Science Board review in spring of 2008
- Projected July 2008 start.
Status

• NEPA Programmatic Environmental Assessment is being performed by JOI on behalf of NSF.
• Team is in place:
  – JOI (Consortium for Ocean Leadership, soon): System Integrator
  – NSF Advisors
  – University of Washington: Regional-Scale IO
  – UC San Diego: Cyberinfrastructure (CI) Implementing Organization (IO)
  – Woods Hole Oceanographic Institution (with OSU and Scripps): Coastal and Global-Scale IO
NSF Projected Funding for OOI
(FY2008 Budget Request to Congress)

<table>
<thead>
<tr>
<th>Category</th>
<th>Funding</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional-scale nodes</td>
<td>$169M</td>
<td>51%</td>
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<tr>
<td>Coastal and Global-scales</td>
<td>96</td>
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<tr>
<td>Cyberinfrastructure</td>
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<td>9%</td>
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<td>Integration, management, education</td>
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<tr>
<td>Management Reserve</td>
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<td>3%</td>
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</table>
4 Global scale nodes in Southern Ocean, Station Papa, Irminger Sea, Mid-Atlantic

5 Regional-scale nodes in NE Pacific, cabled plate-scale observatory

Coastal-scale assets in Mid-Atlantic Bight shelf-break and NE Pacific continental margin.

Each scale incorporates mobile assets.

Cyberinfrastructure to allow adaptive sampling, collaborative experimentation and analyses.
US Stage II

- June 2006 to March 2007, from 6 to 4 primary nodes
- No Connection to Stage I
- From 4 to 3 expansion/branching units
- Two Coastal Endurance Lines
- Desk-top study of cable routing.
Regional-scale Cabled Nodes – Star Design
5 primary nodes; 3 expansion nodes; 1 or 2 Endurance lines
Advantages to Star Design

• Less Cable (albeit more armoring)
• Higher bandwidth per node
• Higher power per node
• Simpler node design
• Three repeater-less segments; one segment with regenerator at bonus Mid-plate Node
• Higher availability during maintenance and repairs
Advantages to Two Landing Stations

- Less Cable
- Fewer Cable Crossings (36 eliminated -- ring configuration with one landing)
- Avoid crowded landing at Nedonna Beach with space not fitted out
- Move into existing space with modest refurbishment
- Availability of existing backhaul, power systems
Endurance Array – Oregon Line

- Along Newport Line
- Surface moorings at 3 sites
- Subsurface profiler moorings at all sites
- 3 sites connected to RSN extension cable
- 50 m site not shown
• Central WA; Grays Harbor
• Surface mooring at 80 m
• Subsurface profiler moorings at 80 and 25 m
• Contingent on costs

Endurance Array – Washington Line
4 Global scale nodes in Southern Ocean, Station Papa, Irminger Sea, Mid-Atlantic

5 Regional-scale nodes in NE Pacific, cabled plate-scale observatory

Coastal-scale assets in Mid-Atlantic Bight shelf-break and NE Pacific continental margin.

Each scale incorporates mobile assets.

Cyberinfrastructure to allow adaptive sampling, collaborative experimentation and analyses.
Global Site -- High Latitude Location

- Surface mooring provides platform for meteorology and air-sea flux sampling, power generation, and satellite communications; 8-9 m long and 2.8 m diameter
- Subsurface mooring with surface-piercing upper profiler, inductively linked lower profiler, acoustic modem
- Cable and seafloor junction box can be added
- Flanking moorings with fixed sensors; gliders are planned
- Launched, maintained, recovered by UNOLS vessels
Global Site: Extended Draft Platform

• Initial Location: Mid-Atlantic
• $8M industry contribution
• Stable platform with deck space 10 m above sea surface, 10 kW diesel generation, EO cable delivers > 500 W to seafloor experiments
• Testbed site for power generation, VSAT communications, sensor technologies
• Offshore supply vessel and small tug to transport/install; UNOLS vessel for instrumentation
Details of Pioneer Array

• 4 EM / sub-surface profiling mooring pairs plus 4 sub-surface profiling moorings.
• 3 AUVs (2 docking stations) to enable autonomous, adaptive sampling at scales up to tens of km.
• At least 6-12 gliders for sampling far-field variability.
• Near-real time communications & wind/solar/wave power.
Pioneer Array Moorings
3 Marine Components
- Coastal 3 sites
- Regional 5 sites
- Global 4 sites

Cyberinfrastructure
- Integrated Resource Network
- Service Oriented Architecture
- Peer to Peer Resource Connectivity

Integrated Management
- Distributed Management
- Shared 24x7 Operations
- Policy based Governance
- Connection & Message Level Security

Extendable Research Facilities
- Virtual Teams & Laboratories
- Incorporation of Local Resources
- Semantic based Knowledge Management
- Machine to Machine Interaction Protocols
## Cyberinfrastructure

<table>
<thead>
<tr>
<th>R-1</th>
<th>Data Mgmt, Dist and Control</th>
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<tbody>
<tr>
<td>R-2</td>
<td>Managed Data Acquisition</td>
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<td>R-3</td>
<td>Integrated Data Analytics</td>
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<td>R-4</td>
<td>Integrated Modeling Network</td>
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<td>R-5</td>
<td>Interactive Observatory Sys</td>
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</table>

### Cyberinfrastructure Activities

- **Fiscal Year 2008 (FY 2008)**: Q1 - Q4 projects focused on the development and implementation of cyberinfrastructure tools.

### Coastal Scale Observatory

- **Development CSN**: Detail Design & Systems Eng - Endurance Array, Central Oregon Line; Detail Design & Systems Eng - Pioneer Array, Middle Atlantic Bight.

### Regional Scale Observatory

- **Development RSN**: Backbone Cables, Warrenton Shore Sta, Pacific City Shore Sta.

### Global Scale Observatory

- **Development GSN**: Mid Atlantic, Southern Ocean 55° S, Station Papa, Irminger Sea.

### Legend

- Design/Development
- Build/Manufacture
- Implementation
- Test/Deploy/Commission

A Division of Consortium for Ocean Leadership
### OOI Estimated Days at Sea

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<thead>
<tr>
<th>Infrastructure</th>
<th>Vessel Class</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
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**Estimated UNOLS DAS**