

PHSEN: Exemplar For Technology Refreshment

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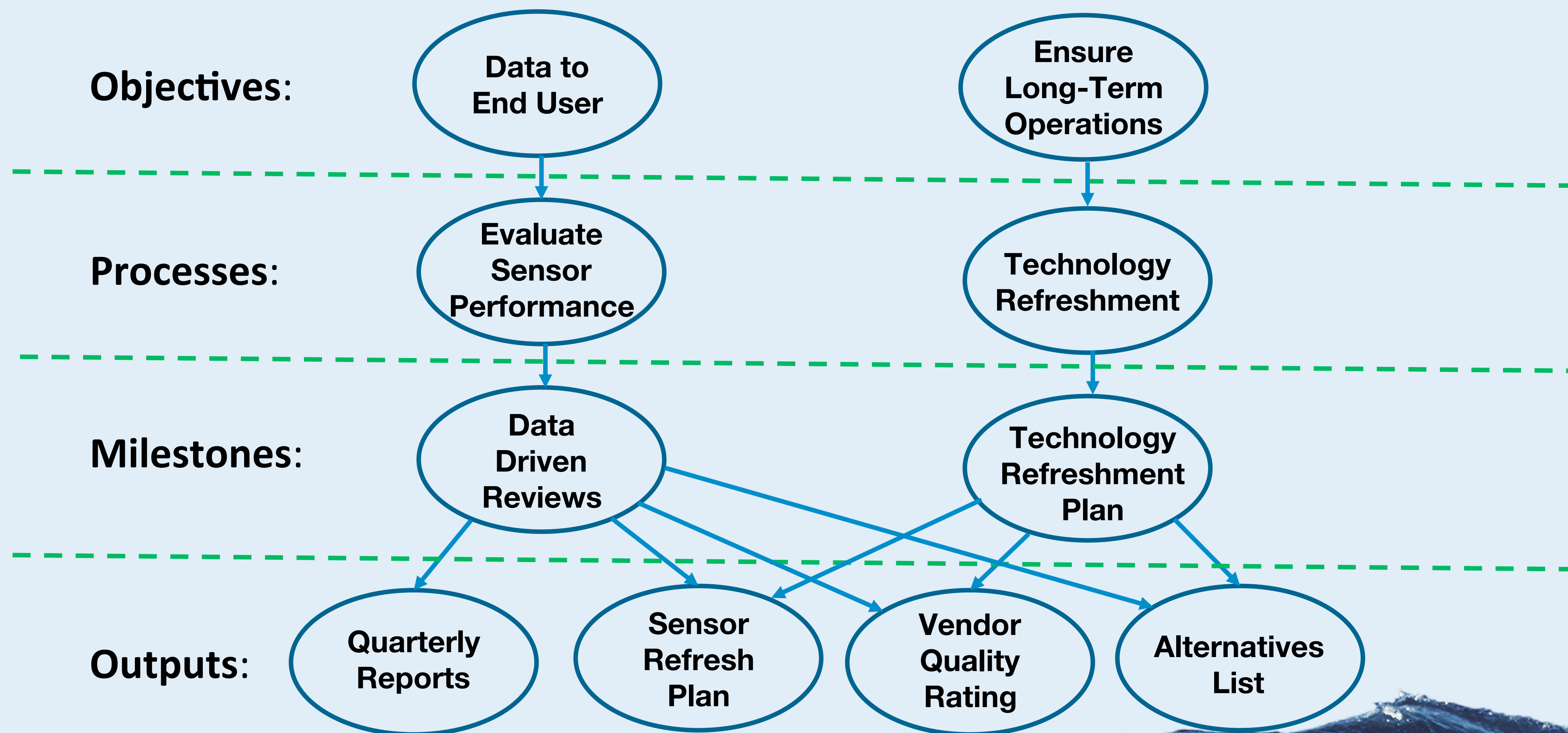
MIO Instrument & Data Teams

14 October 2020



OOI 2.0 Continuous Improvement Process

Program Engineer Scope: Marine Infrastructure:





OOI 2.0 Sensor Technology Refreshment

First Quarterly Data Driven Review: December 2019

Focus: Sensor Technology Refreshment

- Review Inputs:
 - Cross-MIO Instrument Working Group
 - Identified Sensor Qualitative Ratings
- Review Outputs:
 - Quantitative Analysis Techniques
 - Requirements and Specifications Documents to Update
 - Technology Refreshment Procedure Outline
 - Process Identified PHSEN as Highest Priority



PHSEN Tech Refresh – Task List and Status

Summary	OOI Tracking Number	Status	Description	Start Date	Target Completion Date	Completion Date
OOI PY2 Sensor Technology Refresh Review	PEW-1	Done	Identify and Prioritize Sensor Tech Refresh Process. Create a prototype process with specifics for the PHSEN.	10/24/2020	12/20/2019	12/20/2019
PHSEN Replacement Plan	PEW-77 ECR-442	Done	Define the specific workflow for PHSEN replacement. Use as prototype of infrastructure Technology Refreshment Process	10/31/2019	8/29/2020	9/16/2020
PHSEN Analysis of Alternatives	PEW-2 PEW-3 ECR-441	Done	Analysis of Alternatives will be part of the updated RFI process. See: PEW-3 PHSEN Request for Information	12/20/2019	12/20/2019	1/31/2020
Common Sensor Specifications	PEW-4	Done	Review and update controlled Document: 1336-00000_Common_Sensor_Spec_OOI	10/31/2019	5/8/2020	5/8/2020
Sensor Refresh Table	PEW-5	Done	Define metrics to be applied to a prioritized sensor replacement list.	10/31/2019	7/21/2020	5/21/2020
PHSEN Performance Summary	PEW-6	Done	Analyze PHSEN data using the metrics defined in the PEW-5 Sensor Refresh Table	10/31/2019	7/24/2020	9/1/2020
PHSEN Specifications	PEW-69 ECR-436	In Progress	Review and update controlled Document: 1336-00013_SPEC_PHSEN_OOI using the results of PEW-6 PHSEN Performance Summary	10/31/2019	TBD: Review PHSEN Performance Summary	
PHSEN Request for Information (RFI)	PEW-3 ECR-441	Done	Review and update RFI in support of a competitive bid process.	12/20/2019	8/29/2020	8/28/2020



PHSEN Specifications and General Information

Specifications	
Range:	7.3 - 8.5
Accuracy:	±0.01
Precision:	0.005
Annual Drift:	< 0.001

PHSEN	Sunburst Sensors SAMI-pH		Cost
Quantities:	Total:	Deployed:	Initial
CGSN	45	12	\$ 1,545,250
EA	20	10	
RCA	18	8	\$ 204,750





PHSEN Quantitative Analysis Results

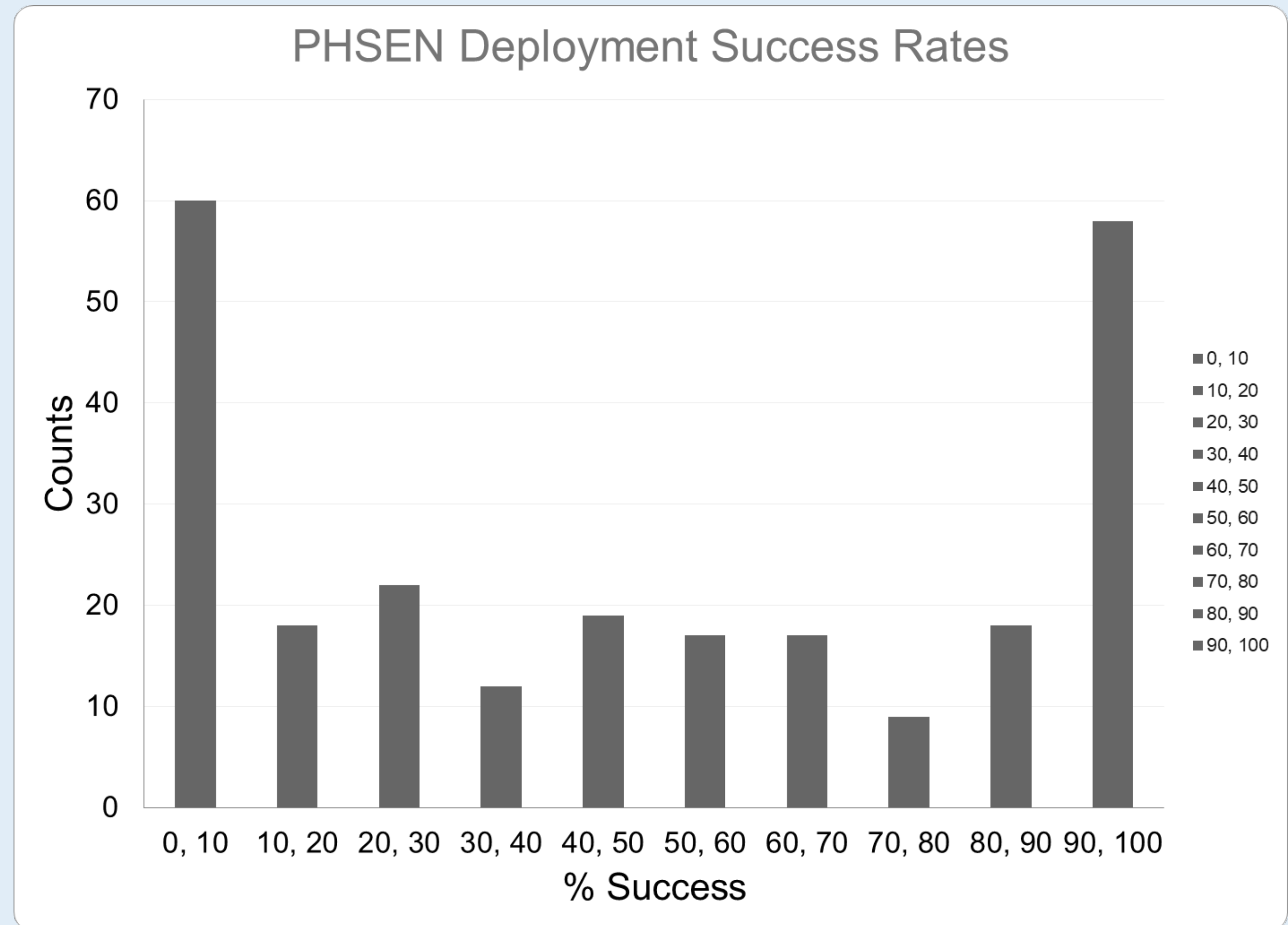
Sub-Set of QARTOD Tests:

- Percent Uptime: Gap Test
- “Days Good Data”:
 - Flat Line
 - Gross Range
 - Gap Test
 - Threshold test

Calendar Year	"Days Good Data" (Days)	Expected Days	Percent of Expected
2013	149	859	17%
2014	2,060	4,937	42%
2015	5,488	14,683	37%
2016	7,023	14,500	48%
2017	4,804	9,066	53%
2018	4,880	11,273	43%
2019	1,313	2,818	47%

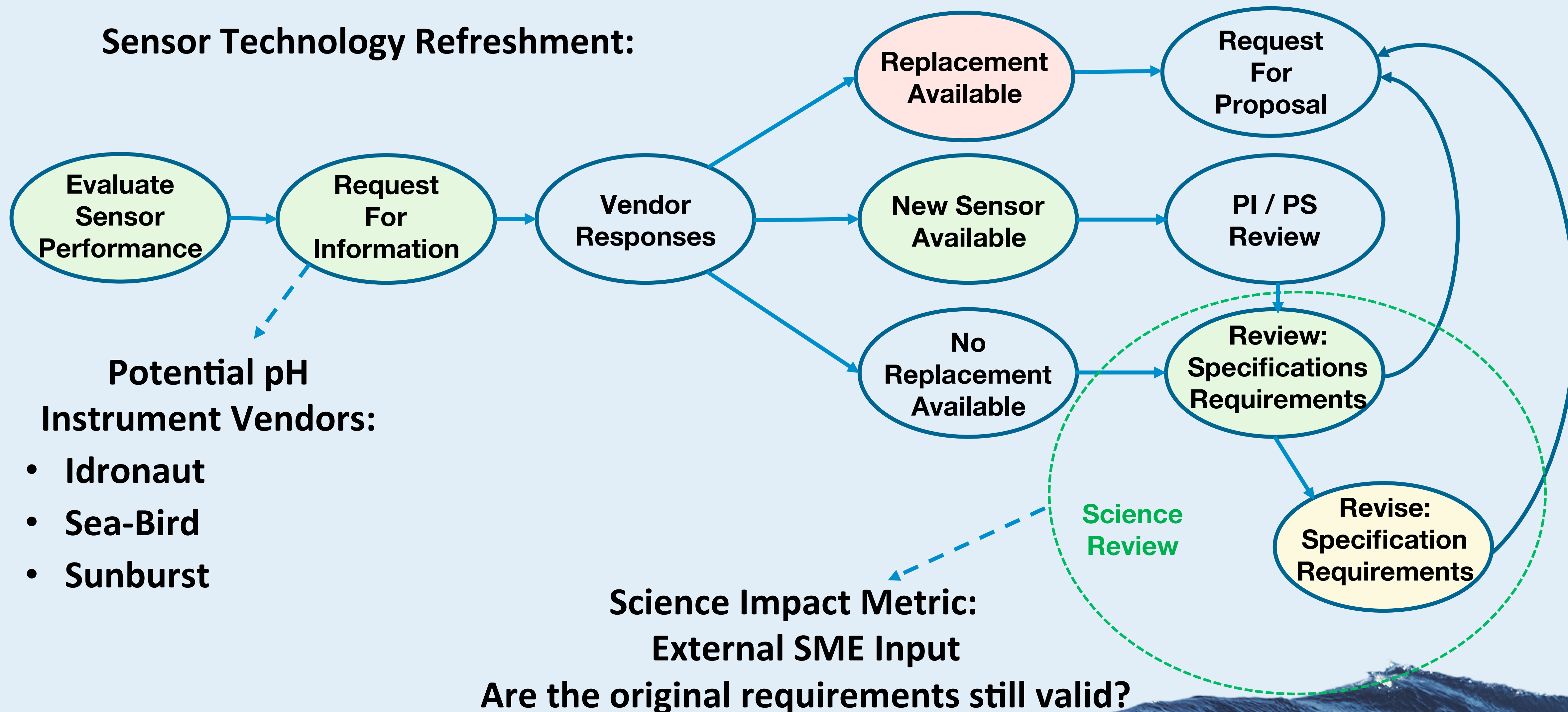
PHSEN Failure Modes and Distribution

PHSEN Failure Modes	
Mode	Percent (%)
Firmware	3
Battery	37
Obstruction	28
Lamp	5
Pump	9
Leak / Flooded	4
Damage	5
Lost	3
Vendor Schedule	3
OOI Schedule	5



New OOI 2.0 Process:

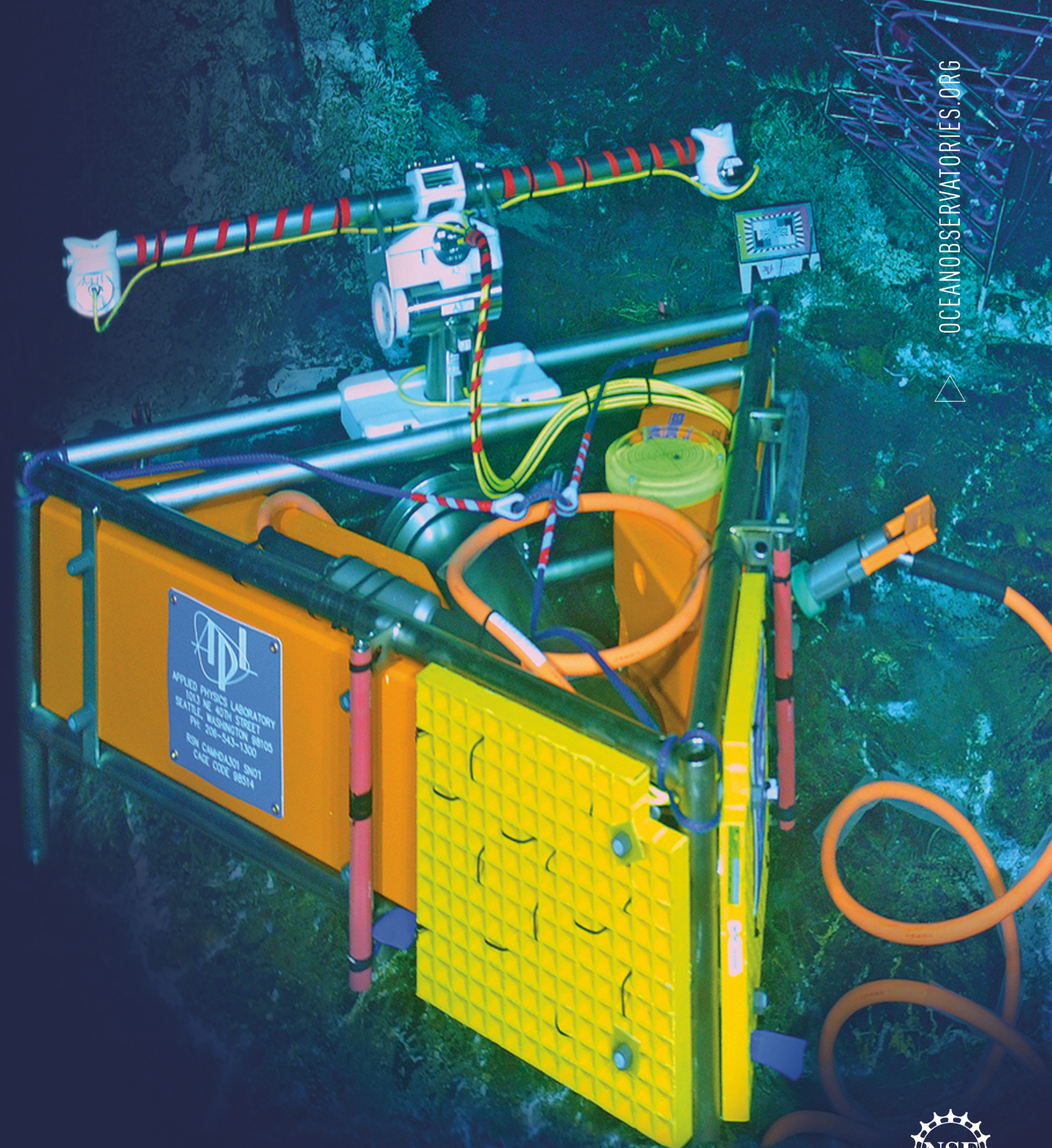
Sensor Technology Refreshment:





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Questions?



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