



ETIPOCEAN

European Technology & Innovation Platform for Ocean Energy

Metrics and stage-gate development programmes

6 April 2017 – ETIP Ocean

Agenda

Moderator: Jacopo Moccia, Policy Director, Ocean Energy Europe

Presentation: Jonathan Hodges, Wave Energy Scotland, Senior innovation Engineer

Q&A session with the audience

Measuring success – Ocean Energy Metrics

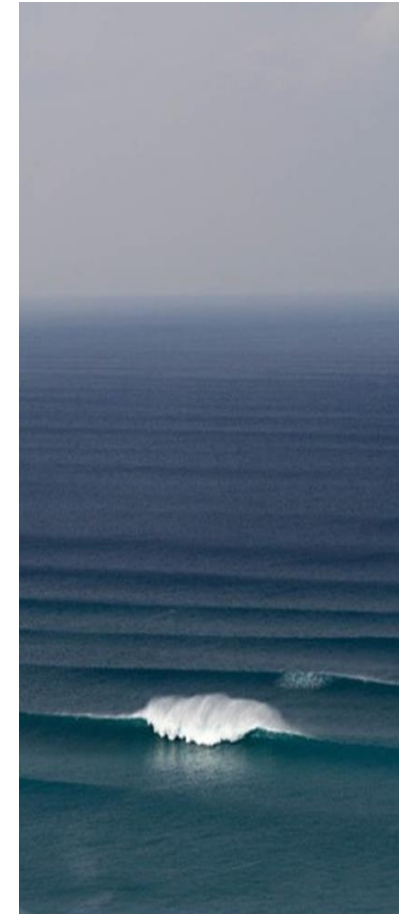
Jonathan Hodges

ETIP Webinar – Stage Gate Metrics

6th April 2017

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- ❑ Why metrics?
- ❑ WES programme
 - Introduction
 - Stage Gated process
 - Metrics and WES
- ❑ Developing Stage Gate metrics
 - International collaboration
 - Workshops
 - Topic areas
 - Metric development
 - Future plans



Why metrics?

- ❑ Measure success
- ❑ Manage competitive innovation calls
- ❑ Allocate funding appropriately
- ❑ Demonstrate progress
- ❑ Gain confidence of investors and stakeholders
- ❑ Cross funder comparisons

- ❑ *Increase number of successful projects*



WES Introduction

□ A Research, Development and Innovation Programme

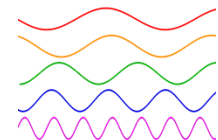
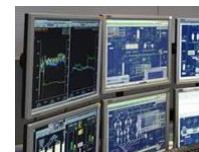
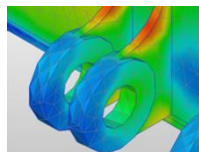
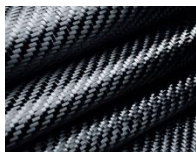
□ Innovation Calls

- Power Take-Off systems
- Novel Wave Energy Converters
- Structural Materials and Manufacturing Processes
- Control Systems – *launched yesterday*



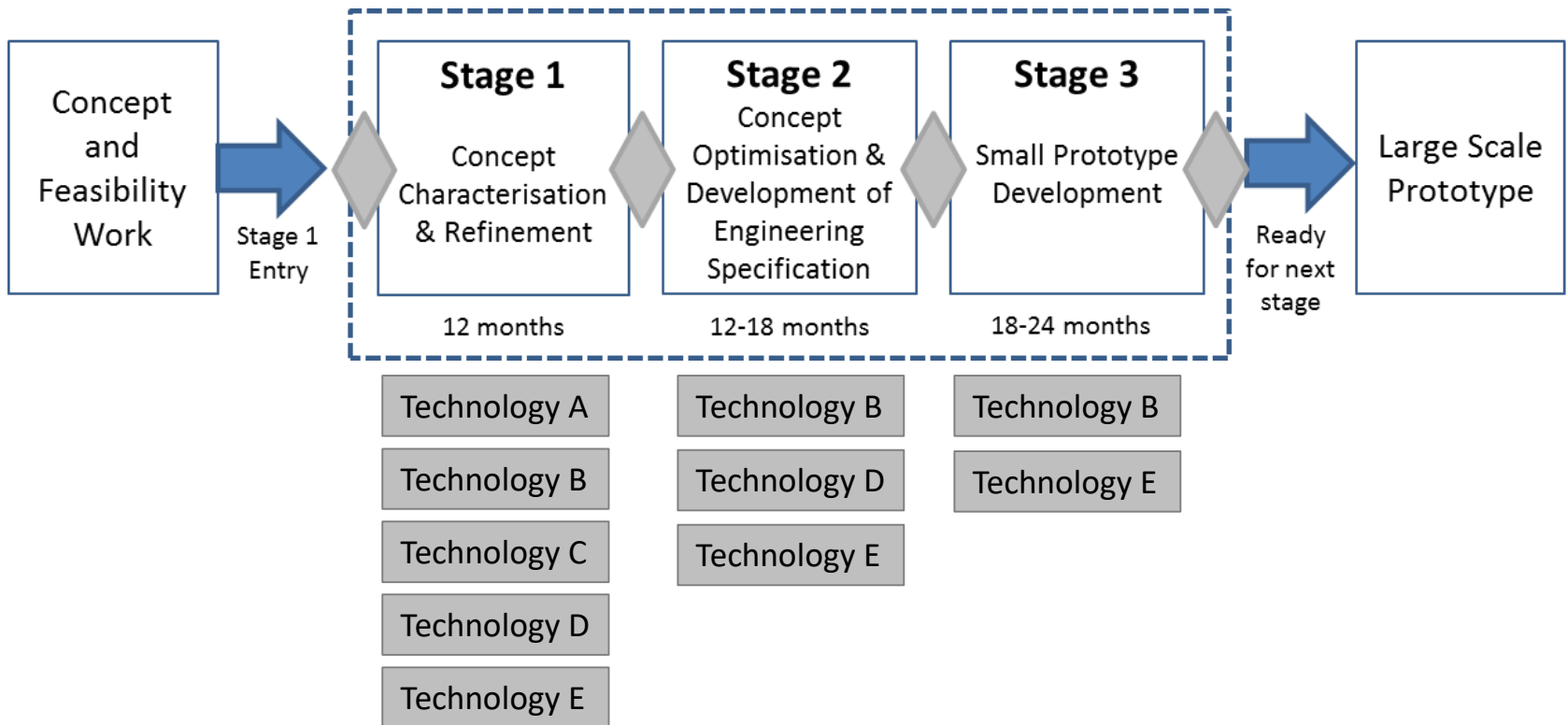
□ Landscaping Studies

- Various – to support call definition and programme participants



WES Stage Gated Process

□ Where do metrics fit in?



At each stage-gate:

- Competitive selection process
- Need to define success/readiness

Metrics and WES

❑ WES Target Outcomes

- Affordability, Performance, Reliability, Survivability.....

❑ Stage Entry Criteria

- Selection of projects

❑ Project-selected metrics

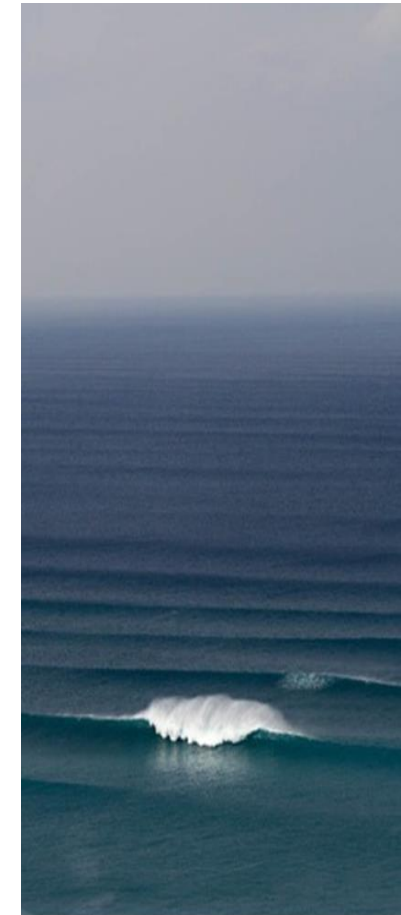
- Project targets and aspirations
- Progress against aspiration from previous stage
- Trajectory towards industry goals

❑ Expected evidence as project progresses

- Early stages – qualitative narrative
- Later stage – quantified

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Engagement with the sector

International Collaboration

- Avoid duplication
- Encourage collaboration
- Foster standardisation



Workshops

- ❑ WEC technology requirement specification and performance metrics – February 2016



- ❑ Stage Gate Metrics for Ocean Energy Technology Development – September 2016



Topic Areas

Controllability

Acceptability

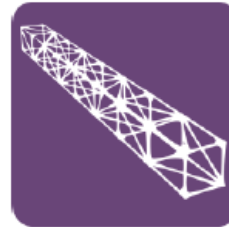
Reliability

Maintainability



Installability

Energy Capture



Manufacturability

Energy
Conversion

Affordability

Survivability

Metric Development

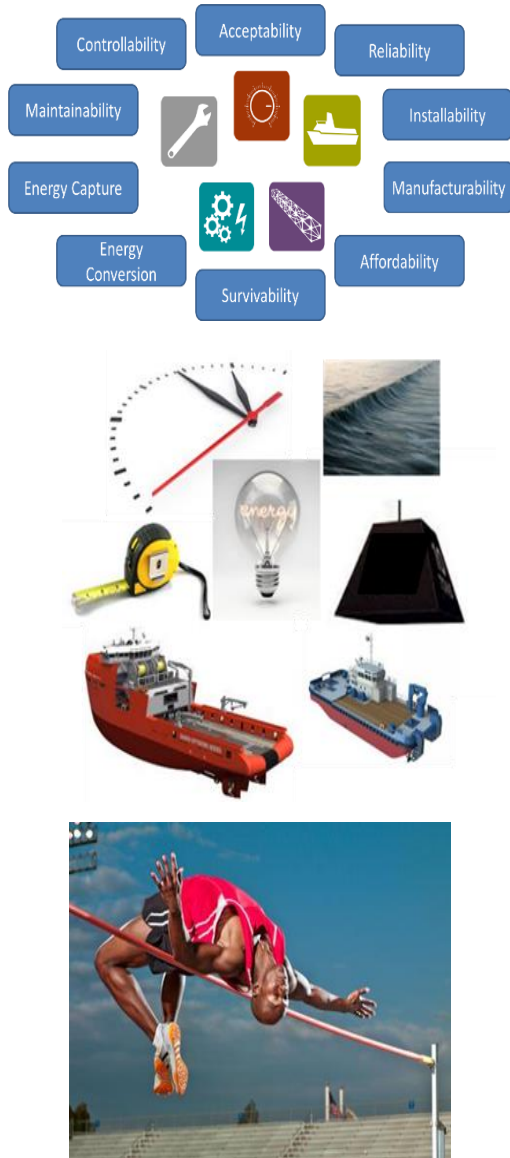


Topic area

Metric

Success threshold

Example metric development



Target
outcome



Metric



Success
threshold

Example

Reliability



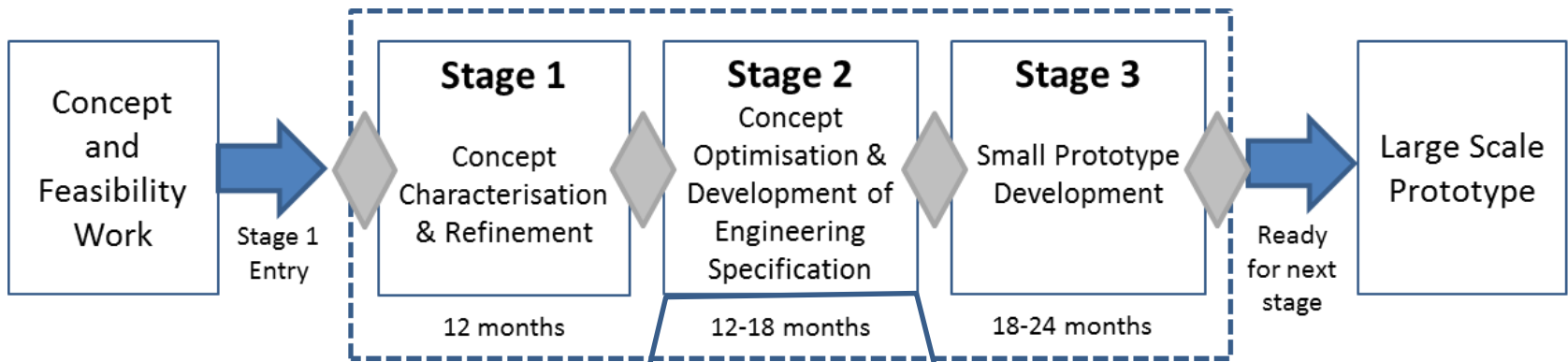
**Mean Time
Between
Failures**



4000 hours

Metrics in the WES Programme

□ Stage Entry Criteria



- Concept development has been demonstrated.....
- Technology has been critically appraised using techniques such as
- Applicant has identified the potential resource and the loading regime
- Applicant has a clear demonstration of the applicability to ... other sub-systems
- Preliminary concept engineering and design has been completed, with a focus on assessing **component size, weight, layout, interfacing, reliability, performance, efficiency, operability, survivability, manufacturability and maintainability**

Project-Selected Metrics

- % performance improvement

- % Availability
- Mean Time Between Failures
- Mean Time to Failure
- # single point failure modes
- Fatigue life

- Mean Time to Repair
- Time to Replace
- # interventions/ year
- Overhaul/refit period



- Cost per install/removal cycle
- Installation/MW

- Capture factor
- Capture width

- Manufacturing Readiness Level (MRL)

- Rated Capacity
- Capacity factor
- Annual Average Yield
- Conversion efficiency
- ACE

- Operational limits
- Survivability limit Hs
- Load shedding capability
- Reliance on control

- LCOE
- CAPEX/MW
- OPEX/MW
- Cost/Device
- Cost per annual MWh

Future plans

- ❑ Develop draft Stage Gate metrics
 - WES projects
 - Structured innovation programme
 - Collaboration

- ❑ Re-consult the sector through workshop
 - Continue to build cross-sector approval

- ❑ Introduce the metrics to the Stage Gate assessments
 - WES programme
 - Other technology development programmes
 - Use common tools where appropriate

Thank you - Questions?

Jonathan Hodges

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