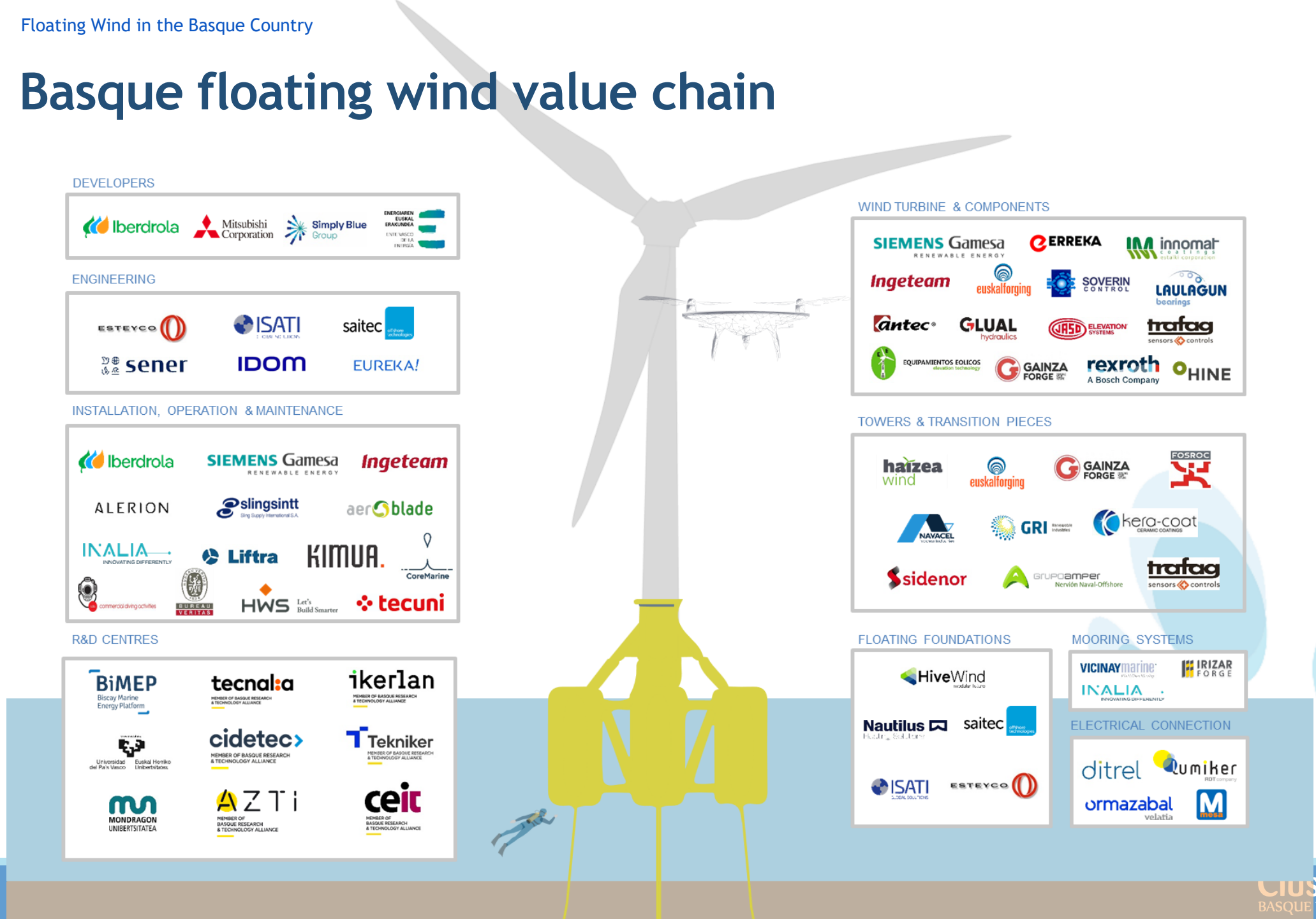
Floating Wind Energy Technology Strategy of the Basque Country

XI Marine Energy Conference, May 2025

Basque floating wind value chain



DEVELOPERS

Iberdrola · Mitsubishi Corporation · Simply Blue Group · Energiaren Euskal Erakundea

ENGINEERING

ESTEYCO · ISATI · saitec offshore technologies · sener · IDOM · EUREKA!

INSTALLATION, OPERATION & MAINTENANCE

Iberdrola · SIEMENS Gamesa RENEWABLE ENERGY · Ingeteam · ALERION · slingsintt · aeroblade · INALIA INNOVATING DIFFERENTLY · Liftra · KIMUA. · CoreMarine · commercial diving activities · BUREAU VERITAS · HWS Let's Build Smarter · tecuni

R&D CENTRES

BiMEP Biscay Marine Energy Platform · tecnalia MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE · ikerlan MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE · Universidad del País Vasco · Euskal Herriko Unibertsitatea · cidetec MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE · Tekniker MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE · MONDRAGON UNIBERTSITATEA · AZTI MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE · ceit MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE

WIND TURBINE & COMPONENTS

SIEMENS Gamesa RENEWABLE ENERGY · ERREKA · innomat coatings · Ingeteam · euskalforging · SOVERIN CONTROL · LAULAGUN bearings · antec · GLUAL hydraulics · JASO ELEVATION SYSTEMS · trafag sensors & controls · EQUIPAMIENTOS EOLICOS elevation technology · GAINZA FORGE · rexroth A Bosch Company · HINE

TOWERS & TRANSITION PIECES

haizea wind · euskalforging · GAINZA FORGE · FOSROC · NAVACEL · GRI · kera-coat CERAMIC COATINGS · sidenor · GRUPOAMPER Nervión Naval-Offshore · trafag sensors & controls

FLOATING FOUNDATIONS

HiveWind · Nautilus · saitec offshore technologies · ISATI · ESTEYCO

MOORING SYSTEMS

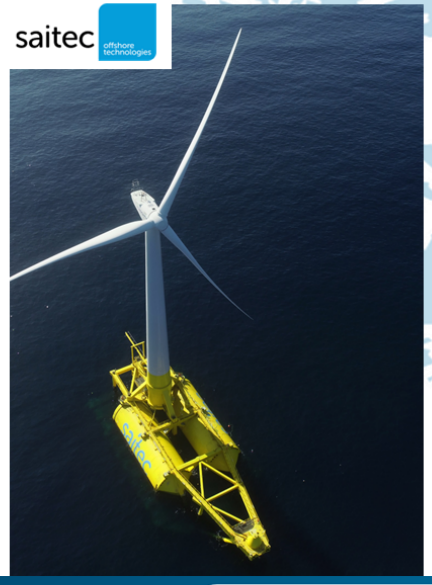
VICINAY marine · IRIZAR FORGE · INALIA INNOVATING DIFFERENTLY

ELECTRICAL CONNECTION

ditrel · Qumiker RDT company · ormazabal velatia · M mesa

References in almost all FOW projects in the world

DemoSATH, 2 MW (2023)



Kincardine, 50 MW (2020)

Basque companies:
EUSKAL FORGING, NERVION INDUSTRIES, SENER, VICINAY

Hywind Scotland, 30 MW (2017)

Basque companies:
EUSKAL FORGING, NAVACEL, NERVION INDUSTRIES, SIEMENS GAMESA, VICINAY

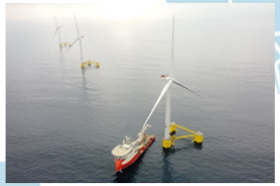
Hywind Tampen, 88 MW (2023)

Basque companies:
EUSKAL FORGING, HAIZEA WIND, SIEMENS GAMESA, VICINAY

Kitakyushu/Hibiki, 3 MW (2019)

Basque companies:
VICINAY

Windfloat, 25 MW (2020)



Basque companies:
EUSKAL FORGING, NAVACEL, NERVION INDUSTRIES, VICINAY

Provence Grand Large, 24MW (2023)

Basque companies:
SIEMENS GAMESA, VICINAY

Context

- Development of a specific technological strategy for floating wind power in the Basque Country
- July 2023 – February 2024
- Benefits:
  - Identification of common challenges of interest to companies
  - Development of a logical framework to facilitate the identification and implementation of collaborative projects both in the Basque Country and internationally
  - Visibility of the Basque Country's technological capabilities in this field
- Involvement:
  - General outline, global sections and coordination from Basque Energy Cluster
  - Supervision of areas by platform developers (Nautilus, Saitec and Sener)
  - Details of technological lines by interested entities

Participants

COORDINATORS OF STRATEGIC AREAS

Nautilus Floating Solutions
saitec offshore technologies
sener
Cluster Energía BASQUE ENERGY CLUSTER

OTHER PARTICIPATING COMPANIES

aerblade
rexroth A Bosch Company
CoreMarine
ditrel
EQUIPAMIENTOS EOLICOS elevation technology
EUREKA!
HINE
INALIA INNOVATING DIFFERENTLY
innomat coatings
JASO ELEVATION SYSTEMS
kera-coat CERAMIC COATINGS
nabla wind hub
Simply Blue Group
VICINAY marine World Class Mooring

ORGANISATIONS OF THE BASQUE SCIENCE, TECHNOLOGY AND INNOVATION NETWORK

AZTI MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE
ceit MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE
Tekniker MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE
ikerlan MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE
tecnalia MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE
MONDRAGON UNIBERTSITATEA
Universidad del País Vasco Euskal Herriko Unibertsitatea

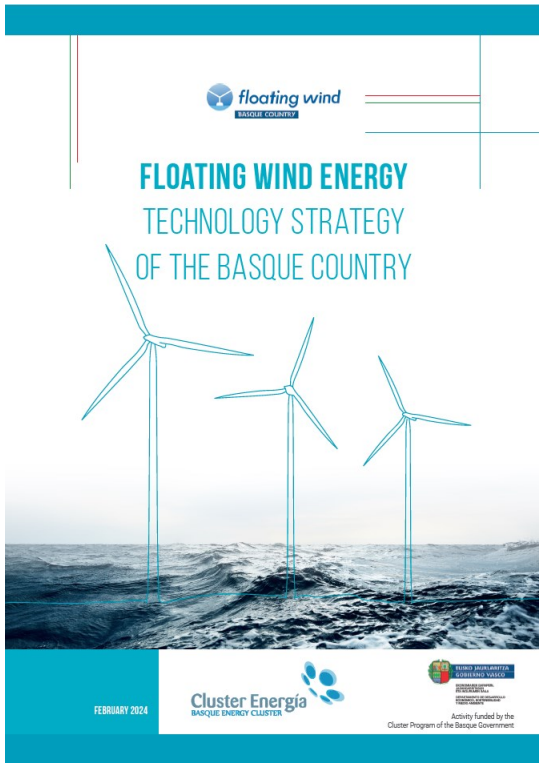
ACTIVITY FUNDED BY THE
CLUSTER PROGRAM OF THE BASQUE GOVERNMENT

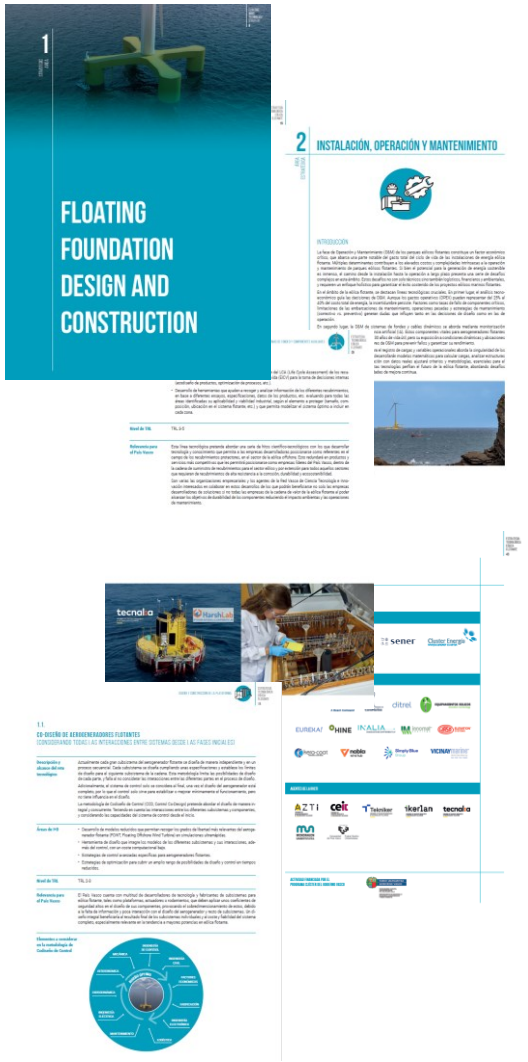
EUSKO JAURLARITZA GOBIERNO VASCO
EKONOMIAREN GARAPEN, JASANGARRITASUN ETA INGURUMEN SAILA
DEPARTAMENTO DE DESARROLLO ECONÓMICO, SOSTENIBILIDAD Y MEDIO AMBIENTE

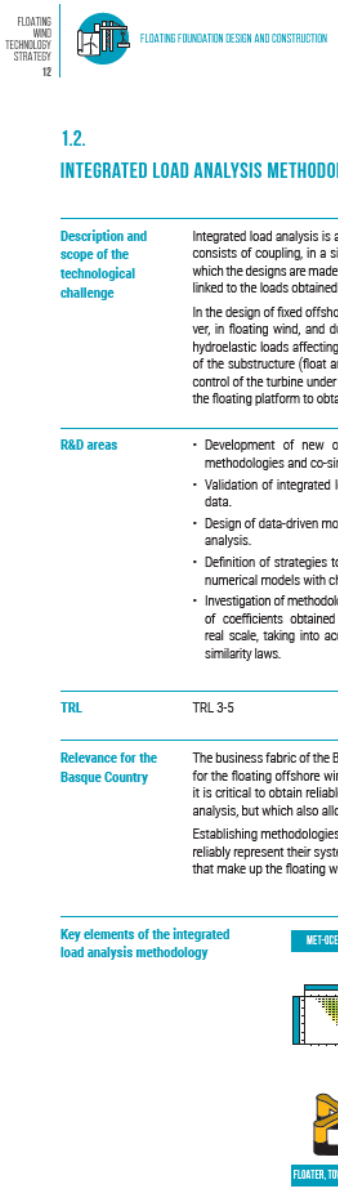
4 strategic areas & 20 technology lines

		Aeroblade	Bosch Rexroth	Core Marine	Ditrel	Equipamientos Eólicos	Eureka!	Hine	Inalia	Innomat Coatings	Jaso	Keracoat	Nabla Wind Hub	Nautilus FS	Saitec Offshore	Sener	Simply Blue	Vicinay Marine	Azti	Ceit	Ikerlan	MU	Tecnalia	Tekniker	UPV/EHU	TRL
STRATEGIC AREA 1: FLOATING FOUNDATION DESIGN AND CONSTRUCTION																										
1.1	Co-design of floating wind turbines	x		x			x							x							x		x			2-3
1.2	Integral load analysis methodologies	x		x			x							x									x			3-5
1.3	Structural integrity calculation methodologies	x		x			x							x									x			3-5
1.4	Design for manufacturing and assembly			x										x									x			5-7
STRATEGIC AREA 2: INSTALLATION, OPERATION AND MAINTENANCE																										
2.1	O&M of mooring systems and dynamic cables			x	x		x		x					x	x					x	x	x	x			3-5
2.2	Techno-economic analysis for O&M decisions	x		x						x			x	x	x		x				x	x	x	x		3-5
2.3	Instrumentation for recording in-service loads and operational variables	x		x										x	x						x		x			5-7
STRATEGIC AREA 3: TURBINE, MOORING SYSTEMS AND AUXILIARY COMPONENTS																										
3.1	Subsea power cables and accessories							x	x		x		x	x									x				4-5
3.2	Development of optimised mooring lines for floating wind turbines							x			x		x	x									x	x	x		2-6
3.3	Development of a lift specifically for floating wind turbines									x						x							x				3-4
3.4	Development of new anti-corrosion coatings with reduced thickness and environmental impact								x					x		x											3-5
3.5	Multiphysics models of high-power turbines: mimicry and new developments										x	x											x				3
3.6	Anchoring for adverse site conditions													x									x	x	x		2-5
3.7	Dismantling and recycling of floating wind turbine components											x		x									x				3-5
3.8	Actuation systems for floating wind turbines and control strategies		x								x	x											x				2-4
3.9	Development of thermal management systems for floating wind turbines											x															2-4
STRATEGIC AREA 4: RESOURCE AND IMPACT ANALYSIS AND STUDIES																										
4.1	Wave and wind resource characterisation and forecasting	x		x																			x				2-5
4.2	Maritime Spatial Planning: tools to identify suitable areas for offshore wind development			x																			x			x	2-6
4.3	Environmental impact of floating wind turbines in the marine environment													x									x				1-7
4.4	Technical and economic analysis of offshore green hydrogen production plants																						x				2-5

Example of a technology line







Visibility actions

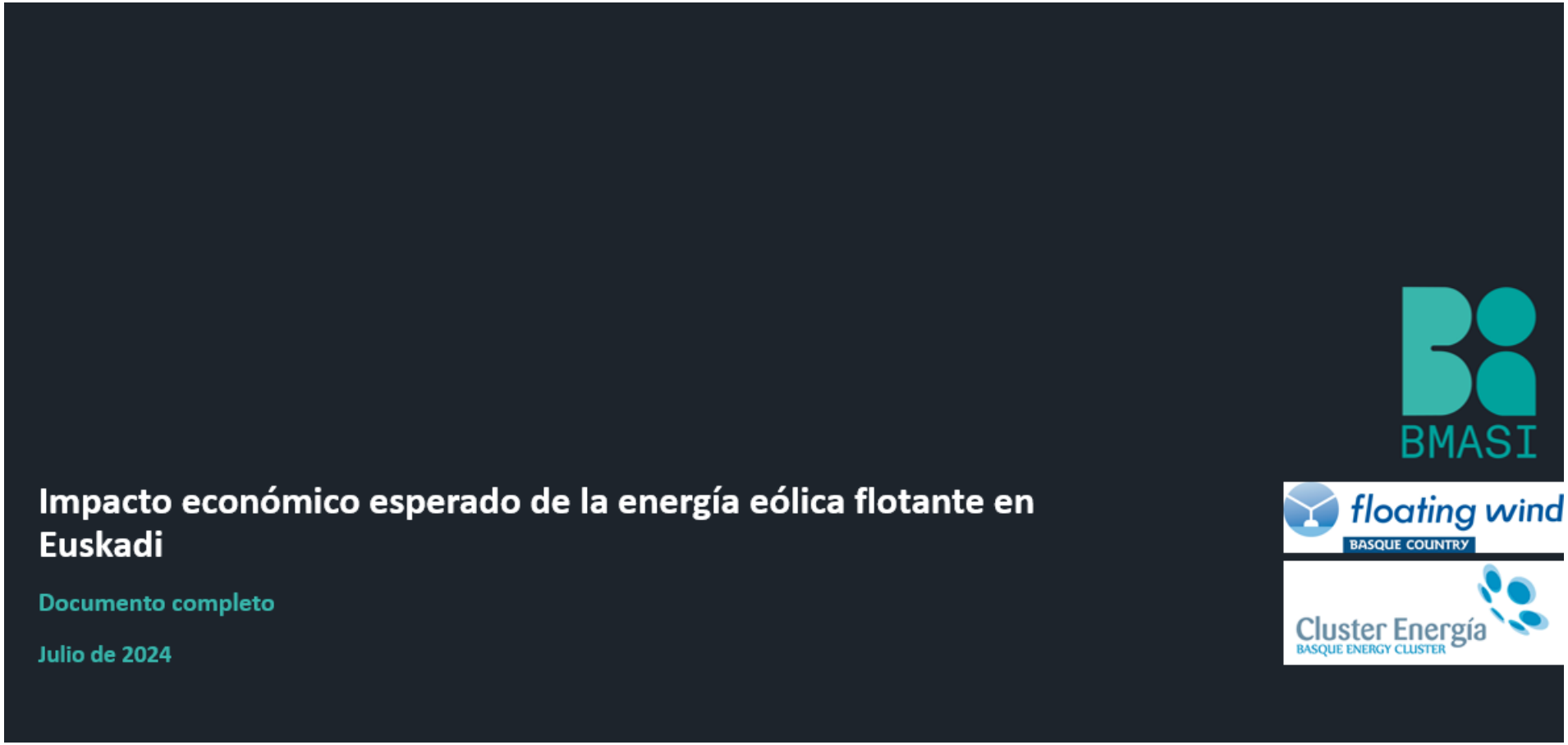
Wind EUROPE ANNUAL EVENT 2024 BILBAO 20-22 MARCH

FOWT2024 Floating Offshore Wind Turbines

IPF24 OCEANIC NETWORK INTERNATIONAL PARTNERING FORUM

Cluster Energía BASQUE ENERGY CLUSTER

Expected economic impact of FOW in the Basque Country



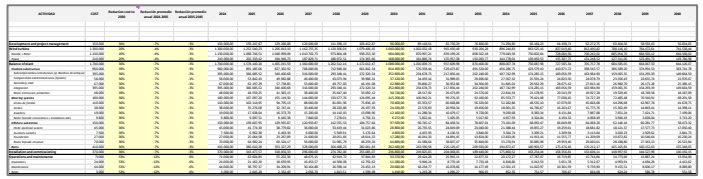
Four major areas of opportunity

Areas	Detail
1. Development & Engineering	• Desarrollo de parques eólicos flotantes • Ingeniería de parques eólicos flotantes • Digitalización y sistemas de control
2. Wind tubine and electrical connection	• Fabricación del aerogenerador y sus componentes • Fabricación de componentes eléctricos de subestaciones
3. Substructures & Mooring System	• Ingeniería vinculada al diseño y desarrollo de subestructuras flotantes • Fabricación de componentes y elementos auxiliares para subestructuras flotantes • Fabricación de sistemas de fondeo de las plataformas flotantes y subestaciones offshore, y elementos accesorios
4. Installation, O&M	• Construcción de SOV – Service Operation Vessels • Fabricación de equipos de elevación y transporte • Mantenimiento de componentes y sistemas fabricados por empresas vascas

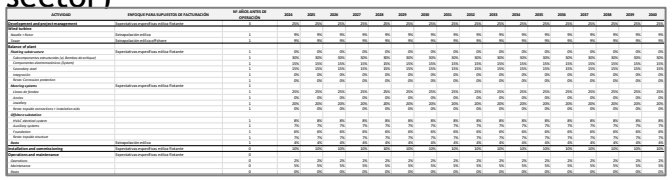
Methodological approach

1. Estimación GW de capacidad instalada acumulada en el Mundo, Europa y España a 2040

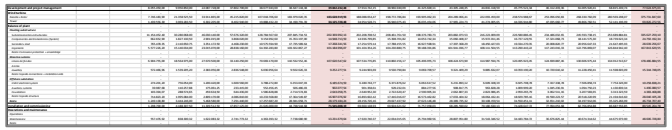
2. Estimación de la evolución de costes por actividad (a partir de fuentes oficiales: estructura de costes BVGA y supuestos de reducción de costes establecidos por NREL)



3. Estimación de cuotas de mercado para las actividades con potencial de desarrollo en Euskadi (en contraste con empresas del sector)

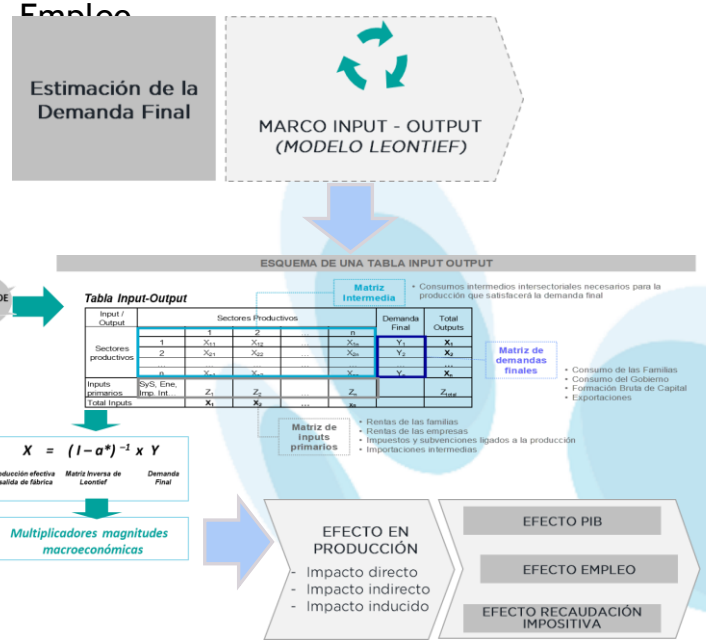


4. Estimación de la facturación (€) por ámbito de oportunidad y actividad



5. Construcción del modelo de impacto económico a partir de las Tablas Input-Output

- Cálculo de los multiplicadores de la economía
- Cuantificación del impacto de la demanda en agregados macroeconómicos: PIB y Empleo



According to estimates, it is expected that the sector:

Genere 6.783 empleos directos en Euskadi a 2040

+ 6.161 empleos indirectos

*Equivalente al **0,7% de la población ocupada en Euskadi en 2022***

Incremente su facturación hasta alcanzar los 1.424 M€ a 2040

con un impacto de 858 M€ de PIB en Euskadi

*Equivalente al **1,0% del PIB de Euskadi en 2022***

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THANK YOU