



# OFFSHORE WIND ENERGY DEVELOPMENT IN THE ADRIATIC SEA: THE P.O.W.E.R.E.D. PROJECT AS PLANNING POLICY

*Università Politecnica delle Marche, Ancona, May 2013*

## PRESENTATION TITLE

**Experience of developing an offshore wind farm  
in Italy.**

**Critical issues and opportunities.**

***Author:***

***Leonardo Perini***

***Organization:***

***wpd Italia offshore s.r.l.***



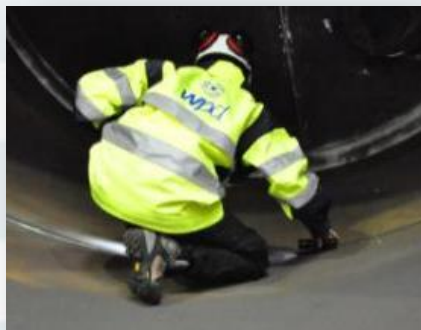
- **THE COMPANY**
- **THE PROJECT**
- **CHALLENGES FROM THE OFFSHORE BUSINESS**
- **CRITICALITIES DURING THE AUTHORIZATION PROCESS**
- **CONCLUSION & SUGGESTIONS**

# THE COMPANY



## The wpd group:

- More than **2,5 GW** of renewable energy power implemented and operated.
- More than **860** experienced workers.
- Various projects in **20 countries**.
- **1500 turbines** installed and operating.
- On going development, an ONSHORE wind projects international portfolio for a total of **6,7 GW**.
- On going development, an OFFSHORE wind projects international portfolio for a total of **10 GW** with more than **3 GW** already authorized.



# THE COMPANY





## wpd offshore GmbH:


### GERMANY


-  Baltic 1 (48,3 MW)\*
-  Baltic 2 (288 MW)\*
-  Hohe See (400 MW)\*
-  He Dreiht (595 MW)\*
-  Butendiek (288 MW)
-  Aiolos (1.182 MW)
-  Kaikas (498MW)
-  Notos (318 MW)


### FRANCE


-  Courseulles (450 MW)\*\*
-  Fécamp (500 MW)\*\*
-  Vendée (504 MW)
-  Somme Gr. Large, Fécamp II, Flamanville (500 + 500 + 360 MW)


 1 project with a capacity of 48.3 MW in operation

 2 project with a capacity of 576 MW under construction

 2 projects with a capacity of ~ 1,000 MW consented and under procurement

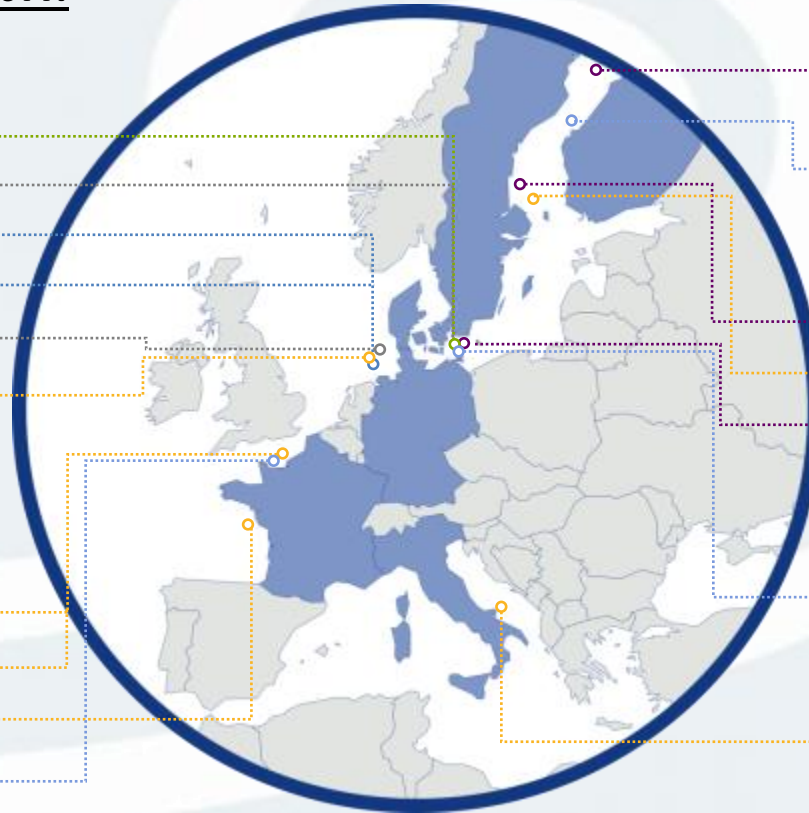
 3 projects with a capacity of ~ 1,500 MW consented

 8 projects with a capacity of ~ 5,300 MW (net) in advanced permission process



 5 projects with a capacity of ~ 2,600 MW (net) in early stage of permission process

\* Sold – wpd was further involved by cooperation agreement




\*\* minority, JV with EdF/ Dong/ Alstom




### FINLAND

-  Suurhiekkä (480 MW)
-  Korsnäs (720 MW)


### SWEDEN

-  Storgrundet (420 MW)
-  Finngrundet (fino a 1.500 MW)
-  Kriegers Flak II (640 MW)\*

### DANEMARK

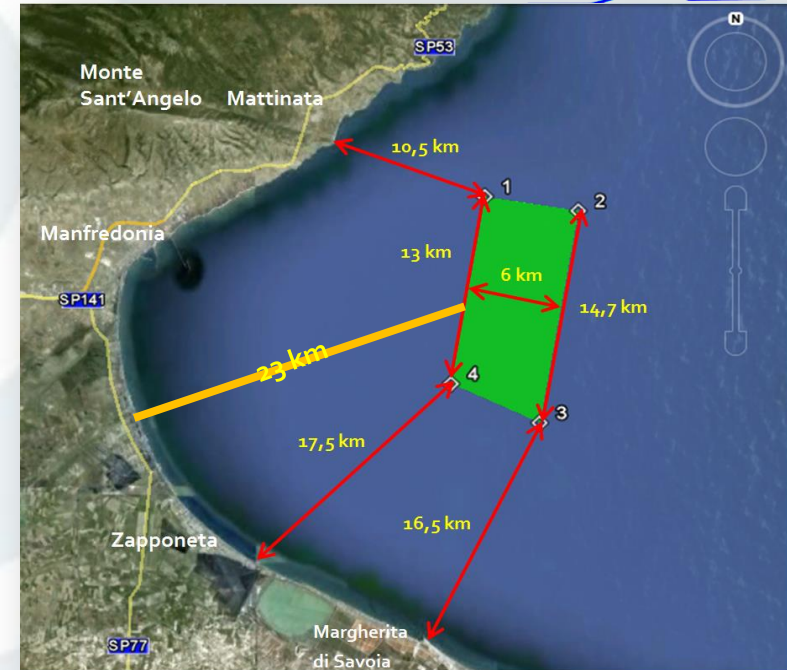
-  Kriegers Flak III (570 MW)

### ITALY

-  Gargano Sud (340 MW)



# THE PROJECT



The project **GARGANO SUD**, is based on **85 wind turbines** of 4 MW each, for a total of **340 MW** installed.

The bathymetry range is between 14-23m

# THE PROJECT



## ALTERNATIVA 1

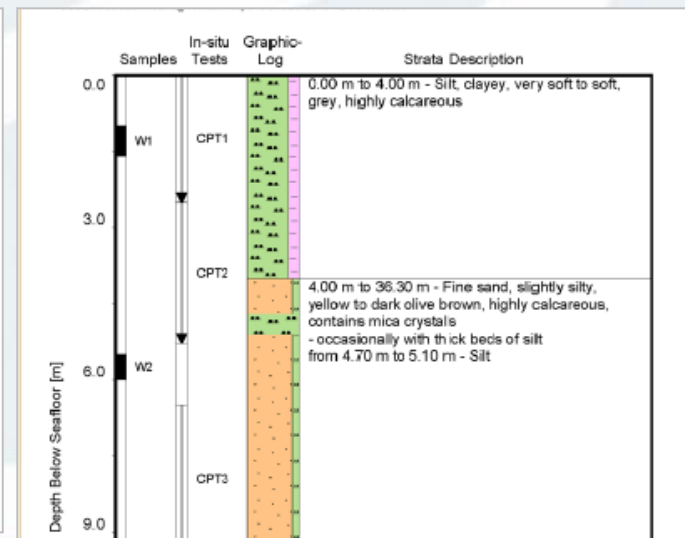
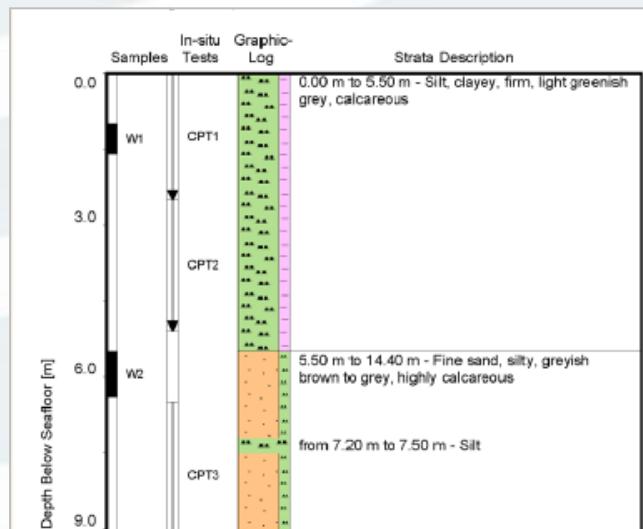
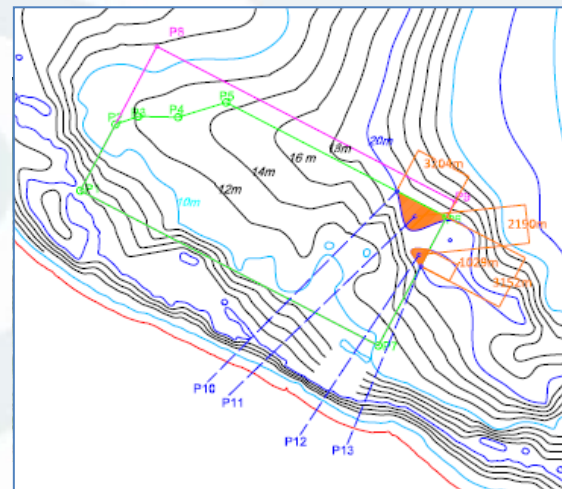
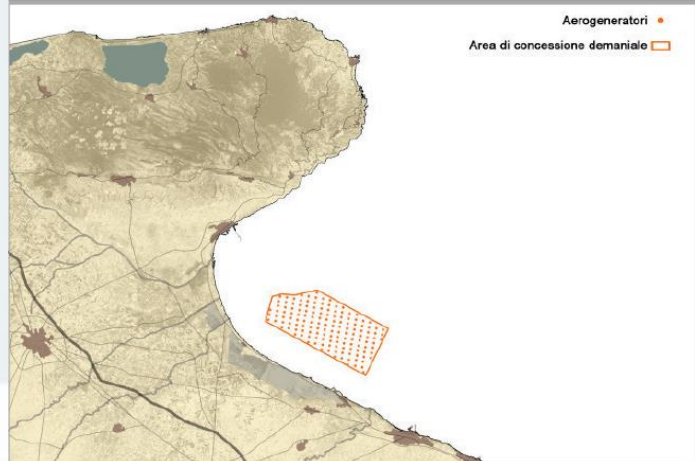
Layout composto da 167 aerogeneratori modello REpower 5M, con potenza nominale di 5 MW, diametro di rotore di 126 m ed altezza al mozzo di 100 m; distanza dalla costa di 5 km.

## ALTERNATIVA 2

Riduzione del numero degli aerogeneratori (da 167 a 146) e cambiamento del modello di turbina con la

## ALTERNATIVA 3

Riduzione dell'area occupata dal progetto e del numero di aerogeneratori (da 146 a 126); distanza dalla costa di 5 km.



# THE PROJECT



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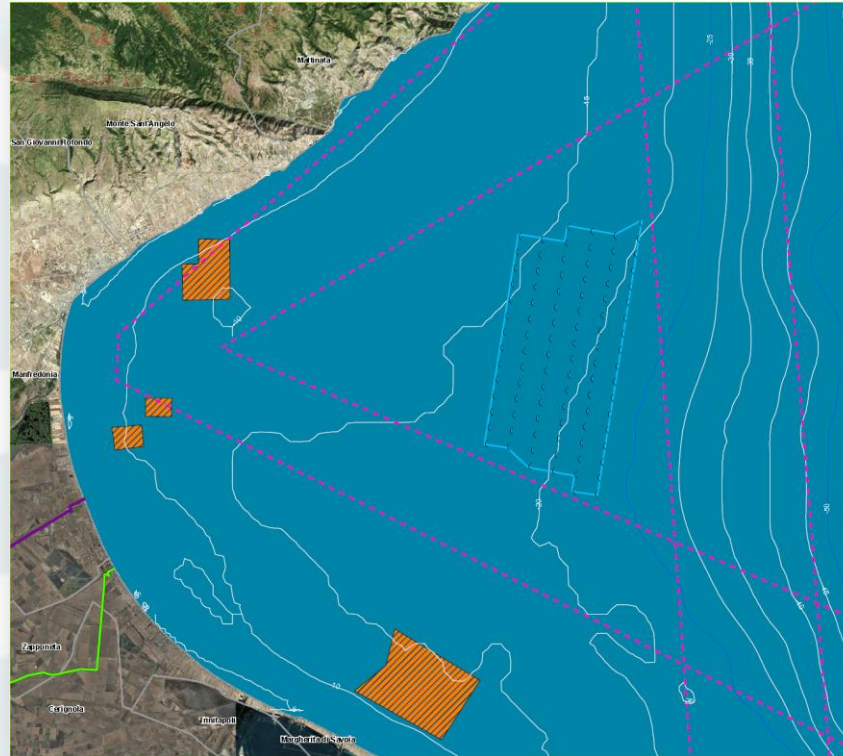
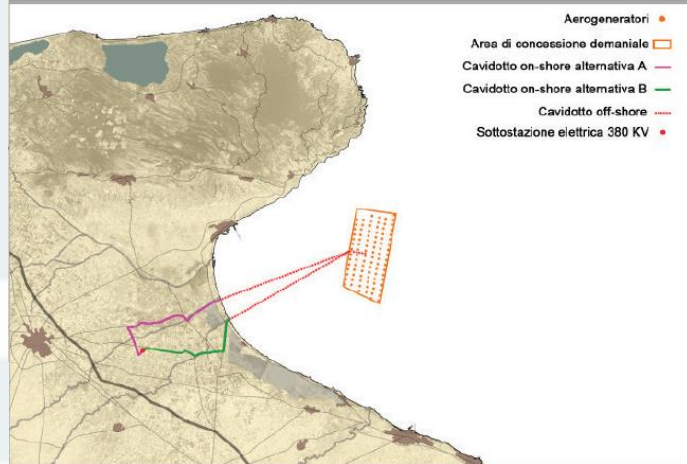
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## ALTERNATIVA 3

Riduzione dell'area occupata dal progetto e del numero di aerogeneratori (da 146 a 126); distanza dalla costa di 5 km.

## ALTERNATIVA 4

Spostamento dell'area di intervento più a largo di circa 10 km rispetto alle precedenti; riduzione della stessa; riduzione del numero di aerogeneratori da 126 a 95; distanza dalla costa di circa 10,5 km.





# THE PROJECT



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Layout composto da 167 aerogeneratori modello REpower 5M, con potenza nominale di 5 MW, diametro di rotore di 126 m ed altezza al mozzo di 100 m; distanza dalla costa di 5 km.

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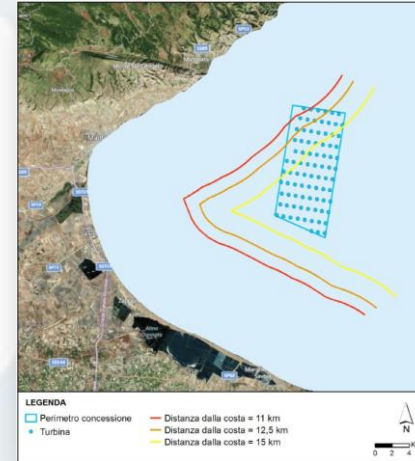
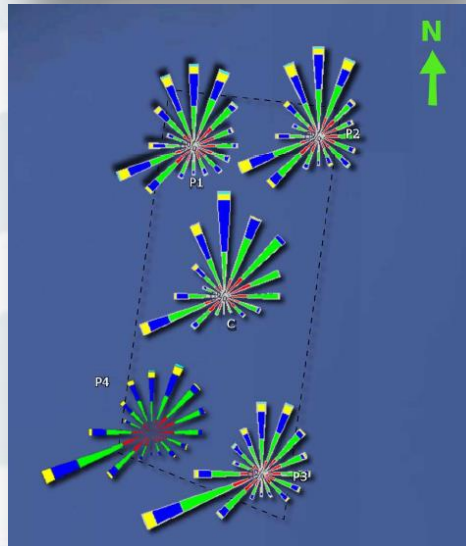
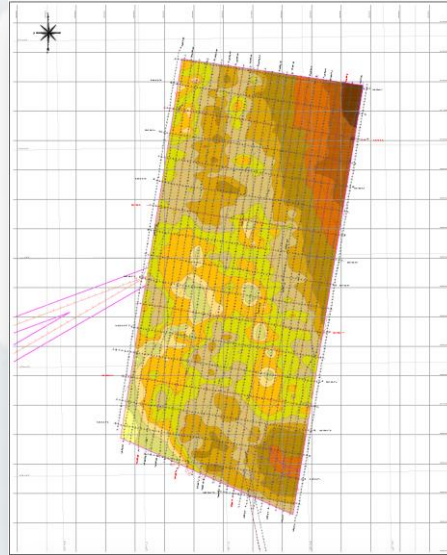
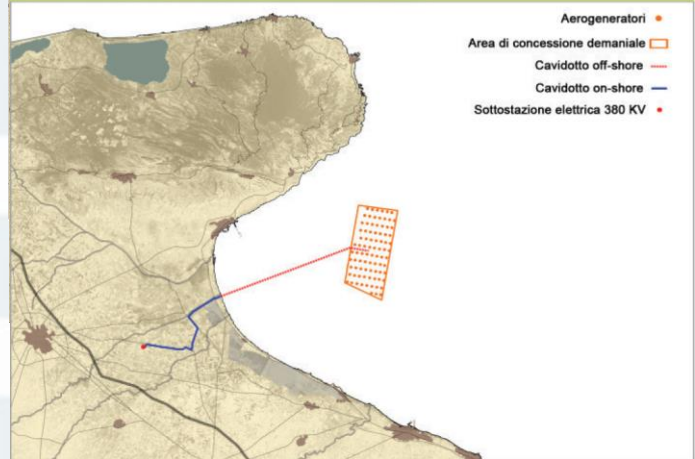
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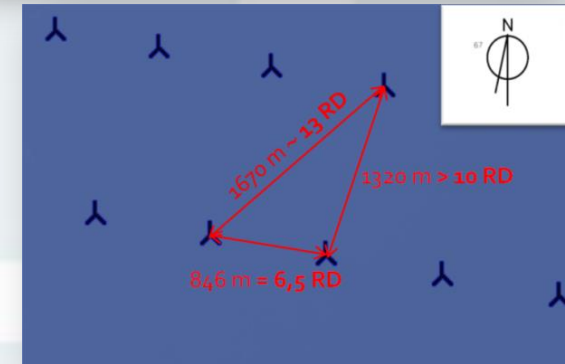
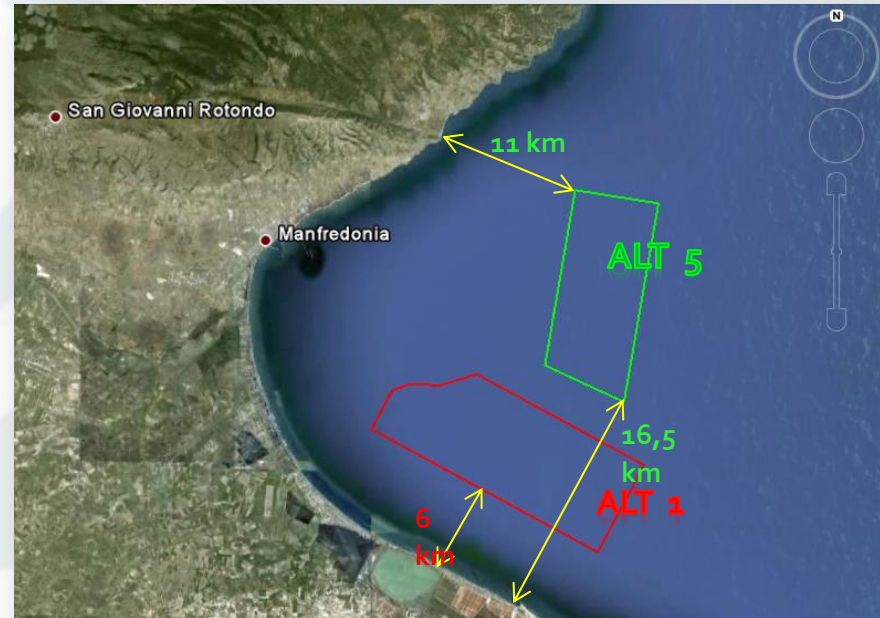
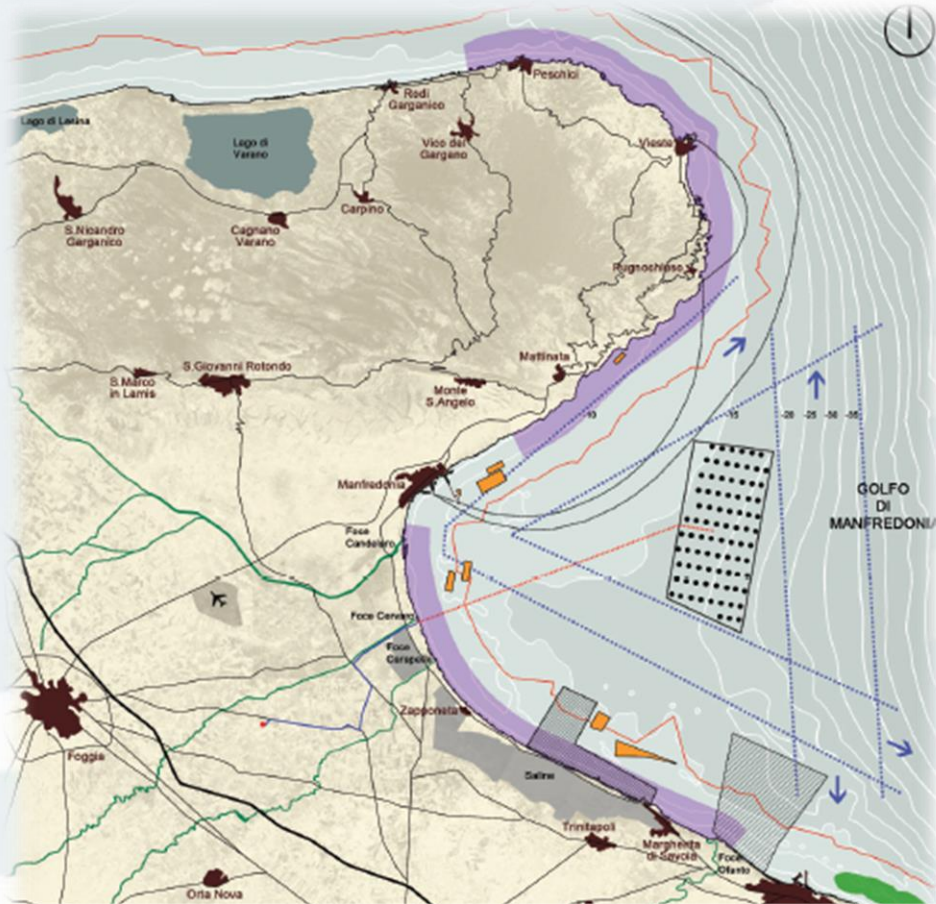
## ALTERNATIVA 5

Riduzione del numero di aerogeneratori (da 95 a 85) e cambiamento del modello di turbina con la Siemens SWT-4.0-130, con potenza nominale di 4 MW. Ridefinizione del layout delle turbine, all'interno dello stesso specchio acqueo richiesto precedentemente in concessione, al fine di ottimizzare la produzione energetico e di ridurre ulteriormente l'impatto visivo.





# THE PROJECT

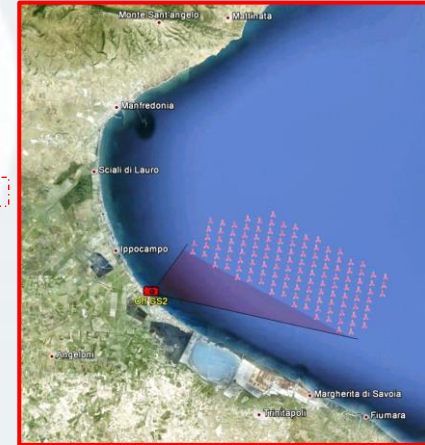
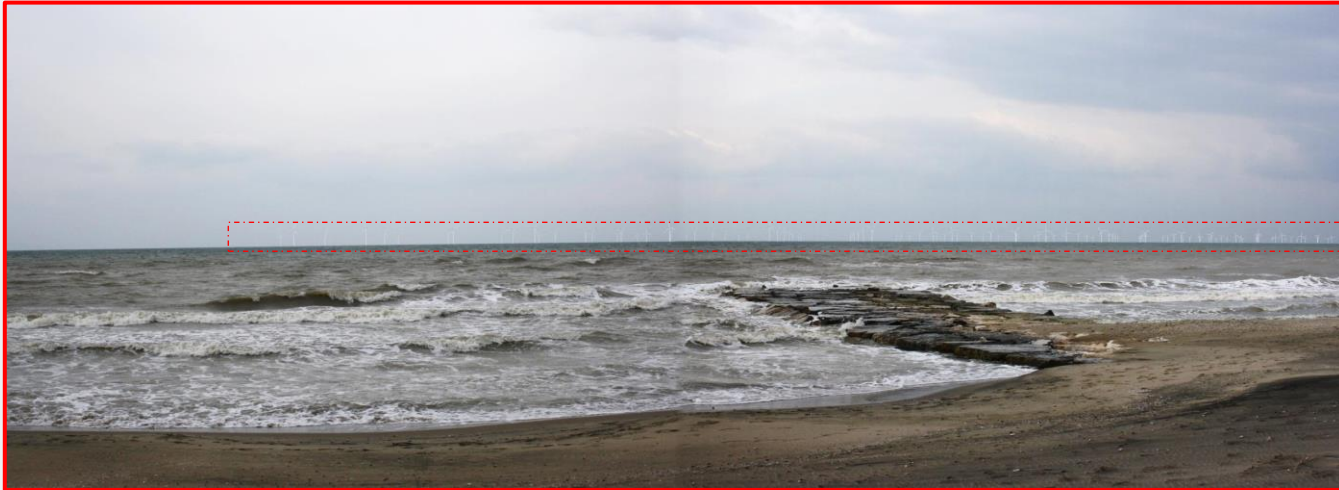


	Nr.wtg	total Power	Area occupied [km <sup>2</sup> ]	Wtg model	GROSS Annual Energy Yield [GWh/y]	Annual Energy yeild /per km <sup>2</sup> [(GWh/y)/km <sup>2</sup> ]	Minimum distance from shoreline [km]
<b>ALTERNATIVE 2</b>	126	630	126,8	Siemens SWT-3,6-120	1.298	7,75	6
<b>ALTERNATIVE 5 (definitive)</b>	85	340	72,3	Siemens SWT-4.0-130	942	10,14	11

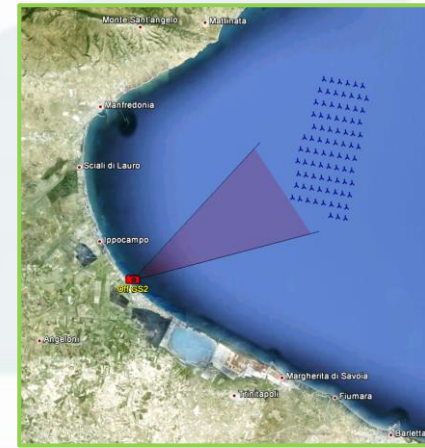
# THE PROJECT



## ALTERNATIVE 1



## ALTERNATIVE 5



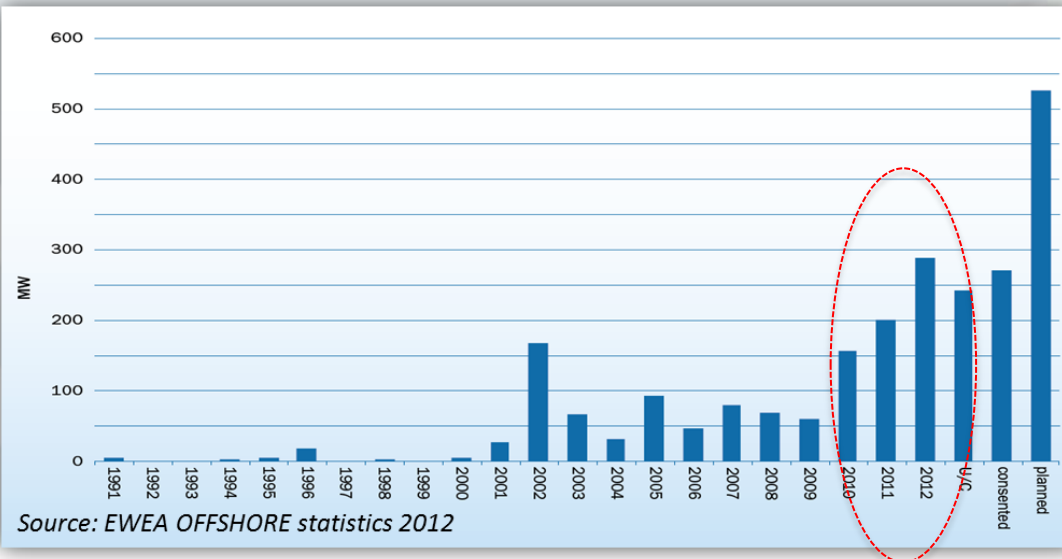


# CHALLENGES OF THE OFFSHORE BUSINESS



## The EVOLUTION of the wind farm SIZE:

Considering **fully commissioned** projects in the last 3 years, as well as the project **under construction**, the **average size** is about **260 MW** based on around **73 wind turbines**.



Year of Construction or Status	wind farm	Country	MW	N° turbines	turbine size [MW]
2010	Pori	FI	2,3	1	2,3
2010	Gun fleet sands I+II	UK	173	48	3,6
2010	Rødsand 2	DK	207	93	2,3
2010	Horns rev 2	DK	209	91	2,3
2010	Robin Rigg	UK	180	60	3
2010	Thanet	UK	300	100	3
2012	Sheringham shoal	UK	88	88	3,6
2012	Greater Gabbard	UK	504	140	3,6
2012	Belwind Phase I	BE	165	55	3
2012	walney Phase 1	UK	183,6	51	3,6
2012	walney Phase 2	UK	183,6	51	3,6
2012	Egmond aan Zee	NE	108	36	3
2013	TEESIDE	UK	62,1	27	2,3
2013	LONDON ARRAY phase 1	UK	630	175	3,6
under construction	Northwind	UK	216	72	3
under construction	Thorton Banks Phase 2	BE	184,5	30	6,15
under construction	Thorton Banks Phase 3	BE	110,7	18	6,15
under construction	Global teck	DE	400	80	5
under construction	Riffgat	DE	108	30	3,6
under construction	Brokum Phase 1	DE	200	40	5
under construction	Dan Tysk	DE	400	80	5
under construction	Meerwind Ost/Sud	DE	288	80	3,6
under construction	EnBW Baltic 2	DE	288	80	3,6
under construction	Nordsee Ost	DE	295,2	48	6,15
under construction	Dan Tysk	DE	288	80	3,6
under construction	Anholt	DK	399,6	111	3,6
under construction	West of Duddon Sands	UK	389	108	3,6
under construction	Gwynt y mor	UK	576	160	3,6
under construction	Linc	UK	270	75	3,6



# CHALLENGES OF THE OFFSHORE BUSINESS



Current most official cost figures say that :

Split of investment expenditure	k€/MW	%
Wind turbine	1.547	44%
Foundation	559	16%
Electrical Infrastructure	598	17%
Installation	455	13%
Planning & Development & Insurance & Finance	351	10%
<b>Total</b>	<b>3510 k€/MW</b>	<b>100%</b>

Source: The research council of Norway-2010

The purpose is reduce at least down to **3000k€/MW**.

On top of that the **O&M** costs is still at **40-60 €/MWh**.

The high fixed costs inducing high project overall costs require , even more, an investment focused on optimization.

That's one reason why an offshore project tends to be at least **200 MW** or **50 turbines**.

# CHALLENGES OF THE OFFSHORE BUSINESS



- **Large Projects → Higher Investments**
- **High Capex**
- **High OPEX**

It's even more fundamental a **PRECISE WIND RESOURCES ASSESMENT** in order to reduce the investment risks.

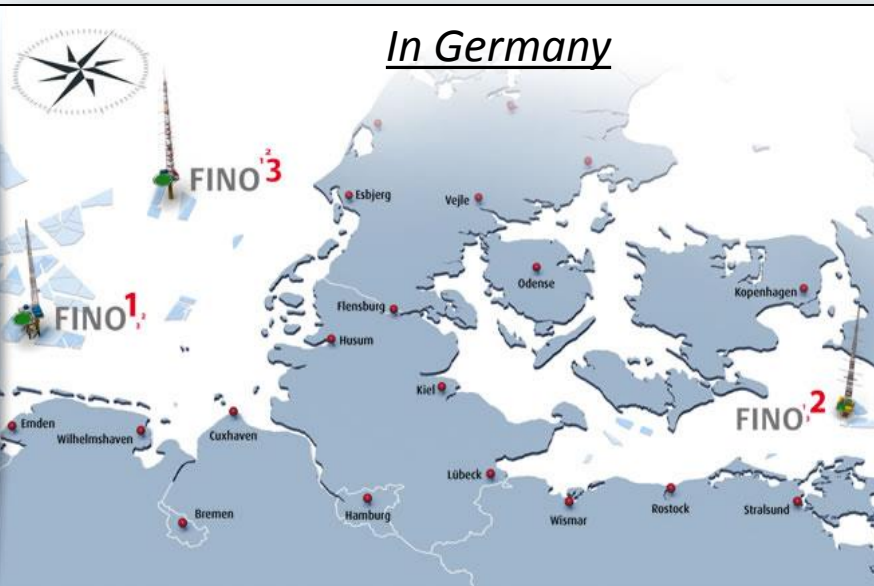
It's even more important considering **the lower wind resources** available and **accessible** along Adriatic and Italian coasts.

The proponent can carry on an assessment starting from onshore measurements and proceeding by **steps investments**, adequate to the permitting process evolution.

In France: Detailed study by **ADEME** to determine the most suitable areas for the **3 GW Tender**.

- **Wind resource**
- *Water depth, current and tide*
- *Protected areas*
- *Landscape and shore distance*
- *Sea activities*
- *Harbor activity & Grid connection*

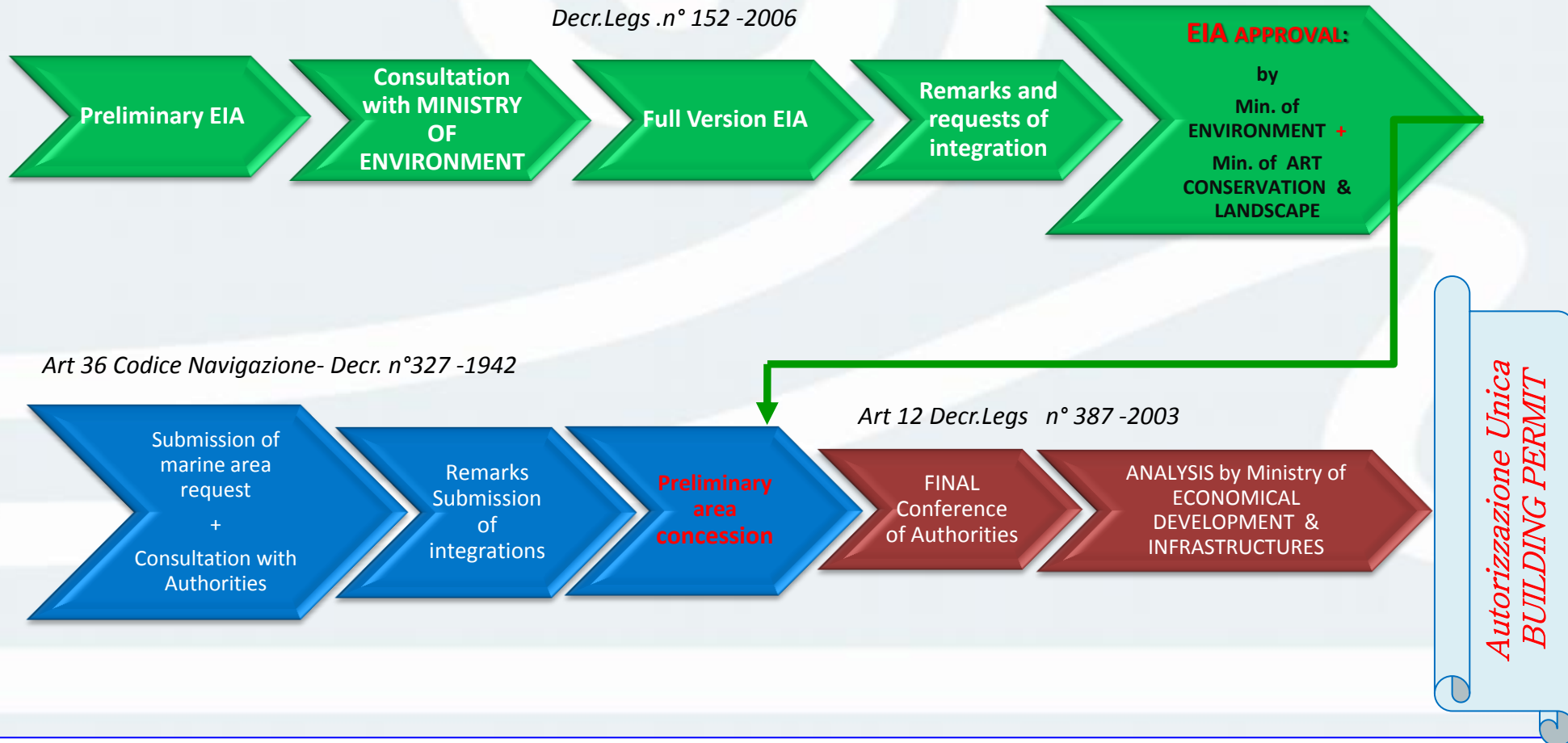
## In Germany



# CRITICALITIES DURING THE AUTHORIZATION PROCESS



The authorization process:

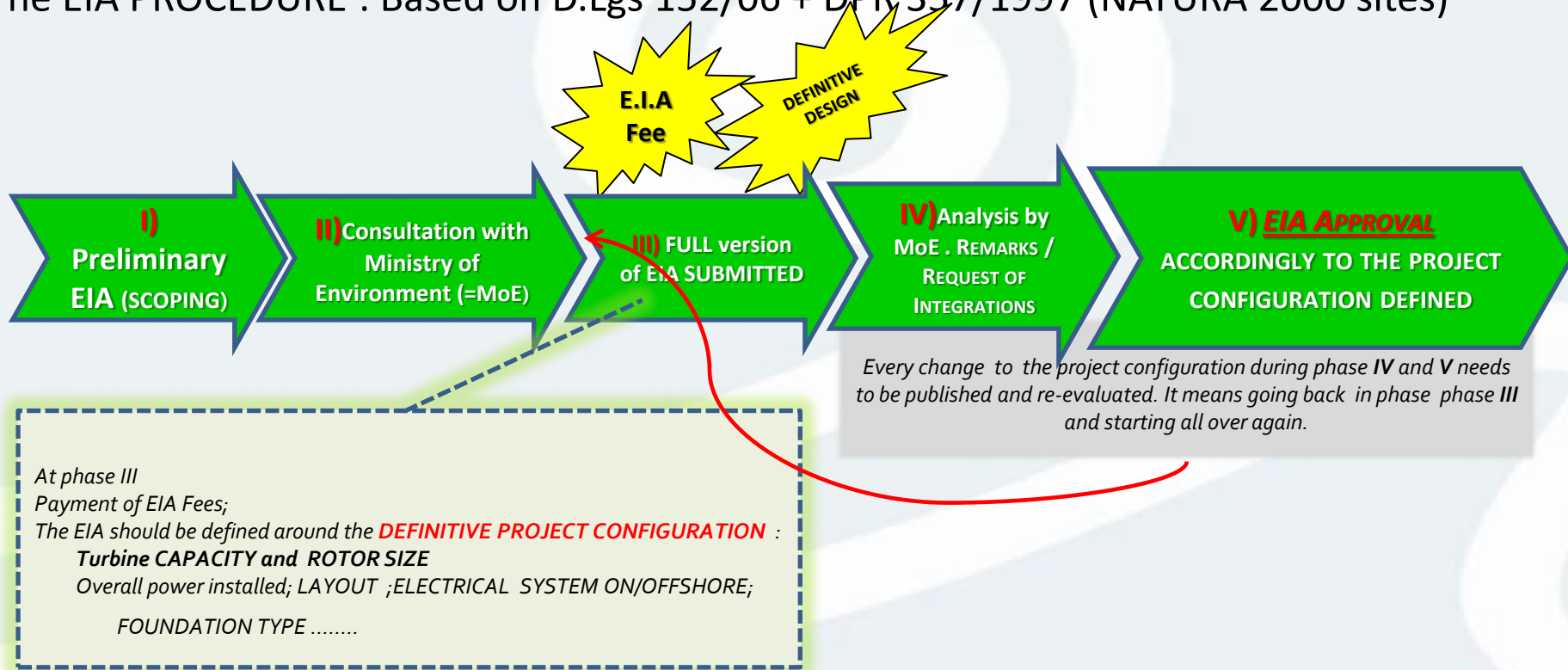




# CRITICALITIES DURING THE AUTHORIZATION PROCESS



The EIA PROCEDURE : Based on D.Lgs 152/06 + DPR 357/1997 (NATURA 2000 sites)



At the EIA submission the proponent is required to pay a fee equivalent to 0,05% of the built **project Value**. → For a European-size project it means at least 180-200 K€ as “entry ticket”.

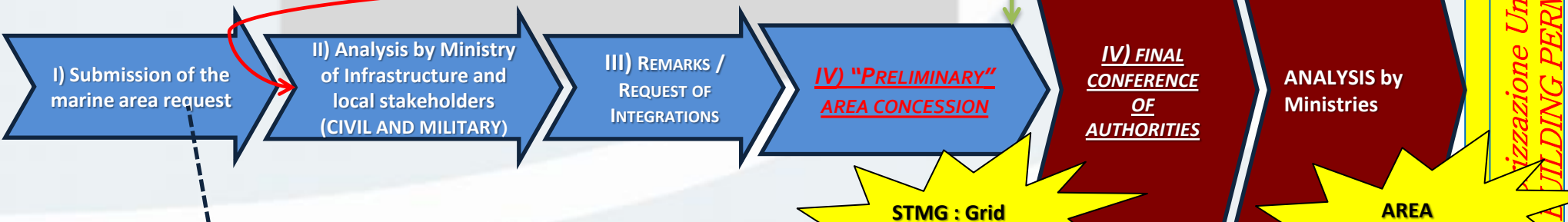
# CRITICALITIES DURING THE AUTHORIZATION PROCESS



The authorization process: THE MARINE AREA CONCESSION → BUILDING PERMIT

Every change to the project AREA LOCATION or CABLING ROUTE OFFSHORE done during phase II, III, needs to be re-evaluated (new submission of the form / remarks acquisition/ publication on newspaper) . It means going back to phase II

FORM APPROVED ACCORDINGLY TO THE PROJECT CONFIGURATION DEFINED



At phase I  
The SUBMISSION should be defined around the **PRELIMINARY** PROJECT CONFIGURATION : **BUT DEFINITIVE**  
AREA LOCATION + OFFSHORE CABLE ROUTE + LANDFALL POINT

**STMG : Grid Connection APPROVED**

**AREA CONCESSION FEES**

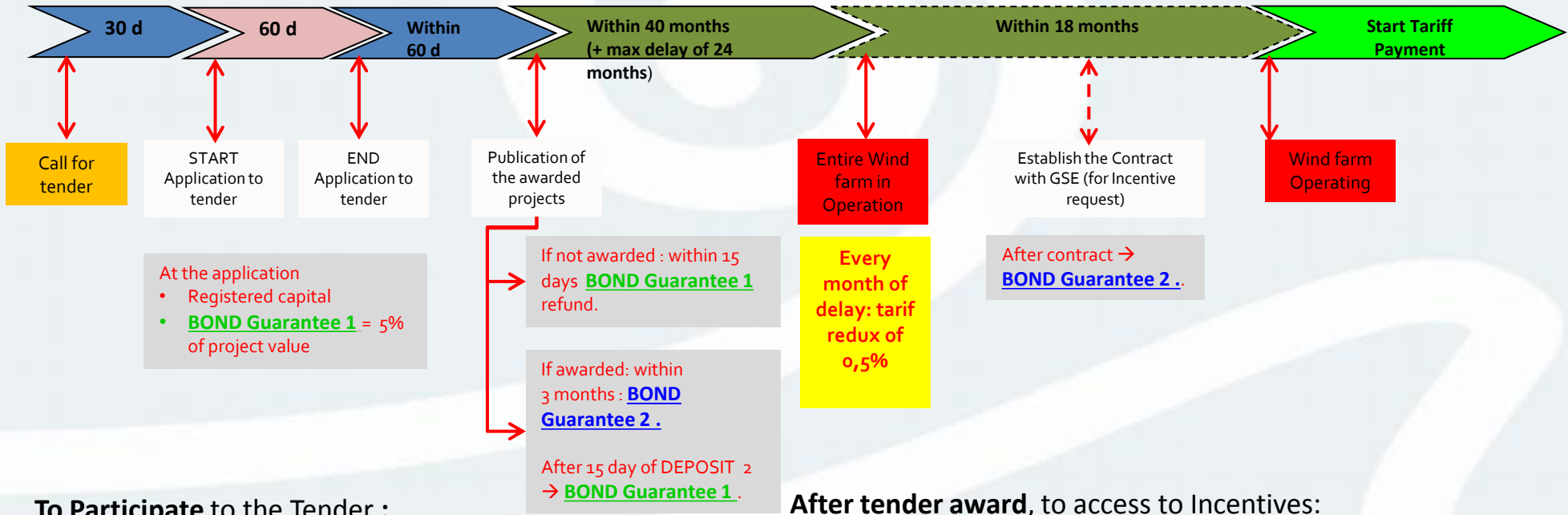
At the STMG acceptance the proponent is required to anticipate the capacity reservation → **For a European size project it means 80-90 K€.**

**For a European-size project it means 2-3 millions € /year.** barely shared with local municipalities

# CRITICALITIES DURING THE AUTHORIZATION PROCESS



The tender procedure & conditions : D.M.6-7-2012



## To Participate to the Tender :

- EIA approved + GRID Capacity reserved and paid +Marine area concession (preliminary).
- COMPANY REGISTRED CAPITAL already deposited = 10% of project value calculated on fixed parameters of 2.500.000€/MW
- **BOND Guarantee 1 as guarantee of the project:** 5% of project value calculated on fixed parameters of 2.500.000€/MW → EU-size P = 25-30 millions € .

## After tender award, to access to Incentives:

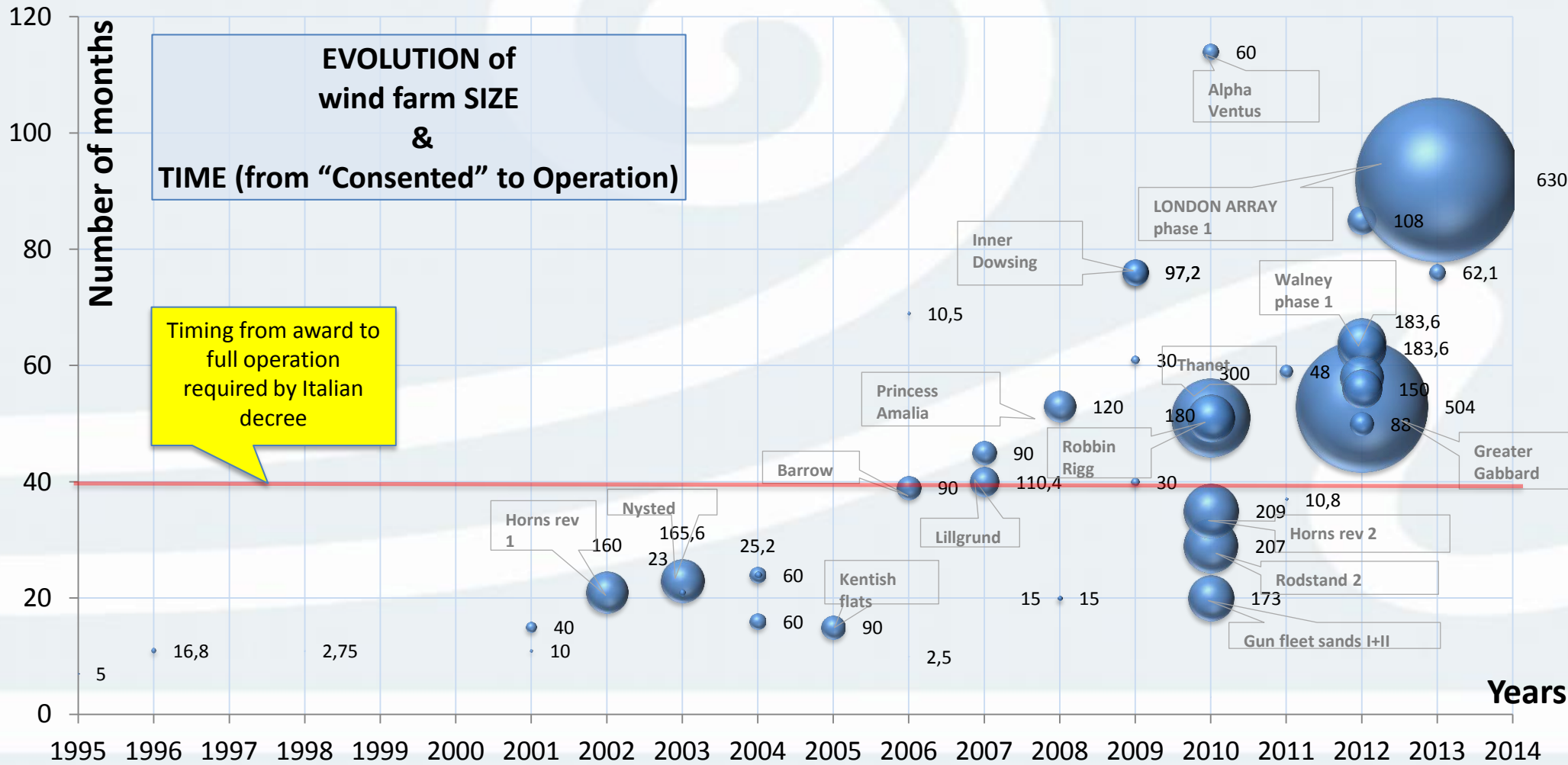
- Building Permit Achieved
- **BOND Guarantee 2 as guarantee for the on time construction:** 5% of project value = EU-size P = 25-30 millions €. It will be refunded after full wind farm operation and contract with GSE for the incentive payment.



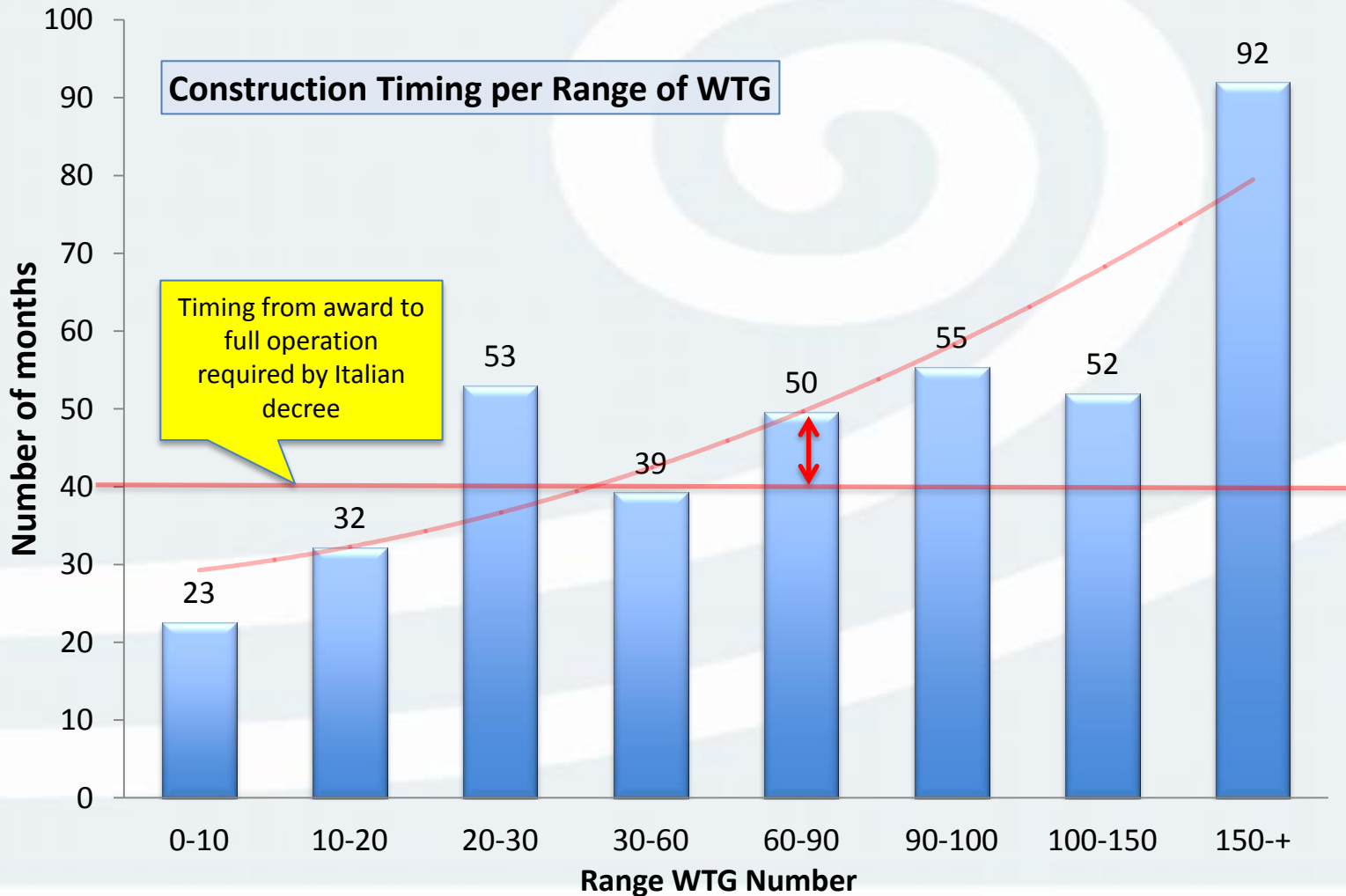
# CRITICALITIES DURING THE AUTHORIZATION PROCESS



The construction time of fully commissioned projects in Europe



# CRITICALITIES DURING THE AUTHORIZATION PROCESS



Nowadays an average size European project (at least 200MW) requires at least 50 months.

This means a most likely reduction of the tariff awarded at **least of 5%** for the entire project life.

# CONCLUSIONS AND SUGGESTIONS :



What **COMPANIES** should do :

- Develop an ENVIRONMENTALLY SUSTAINABLE project: carrying out exhaustive campaigns to identify the environmental implications for the presence of the wind farm presence (i.e. bird monitoring/marine soil investigations).
- Develop a TECHNICALLY FEASIBLE project: verifying since the beginning of the development the feasibility of the project: wind and marine soils conditions → iterative work for **project optimization** in particular considering the continuous evolution of turbines models.
- Propose an ECONOMICALLY SUSTAINABLE project: verify the industrial plan including financial costs → **work on industrial cost reduction.**
- **To avoid the pure «develop to sell» logic, just focused only on selling the «building permit», but consider an offshore project as an INDUSTRIAL PROJECT to be developed by a CONSORTIUM of industrial partners with complementary competencies.**

# CONCLUSIONS AND SUGGESTIONS :



Which **business environment** should be :

## Concerning the EIA procedure:

- To define an authorization process that takes into account the specificities of the wind offshore business: the long authorization process blocks the project on a final configuration (*progetto definitivo*) that can easily become obsolete. It would be enough to approve the most conservative configuration as done in other countries.
- To modify the preliminary EIA fee logic: so that is not proportionate to the power installed, but to the plant productivity.

## Concerning the Marine Area Concession procedure:

- To define concession rules taking into account the specificities of the wind offshore business: i.e. Parameters to evaluate concession requests in competition. Expiring of inactive requests.
- Maritime concession fees must be shared with local stakeholders.



# CONCLUSIONS AND SUGGESTIONS :



Which **business environment** should be :

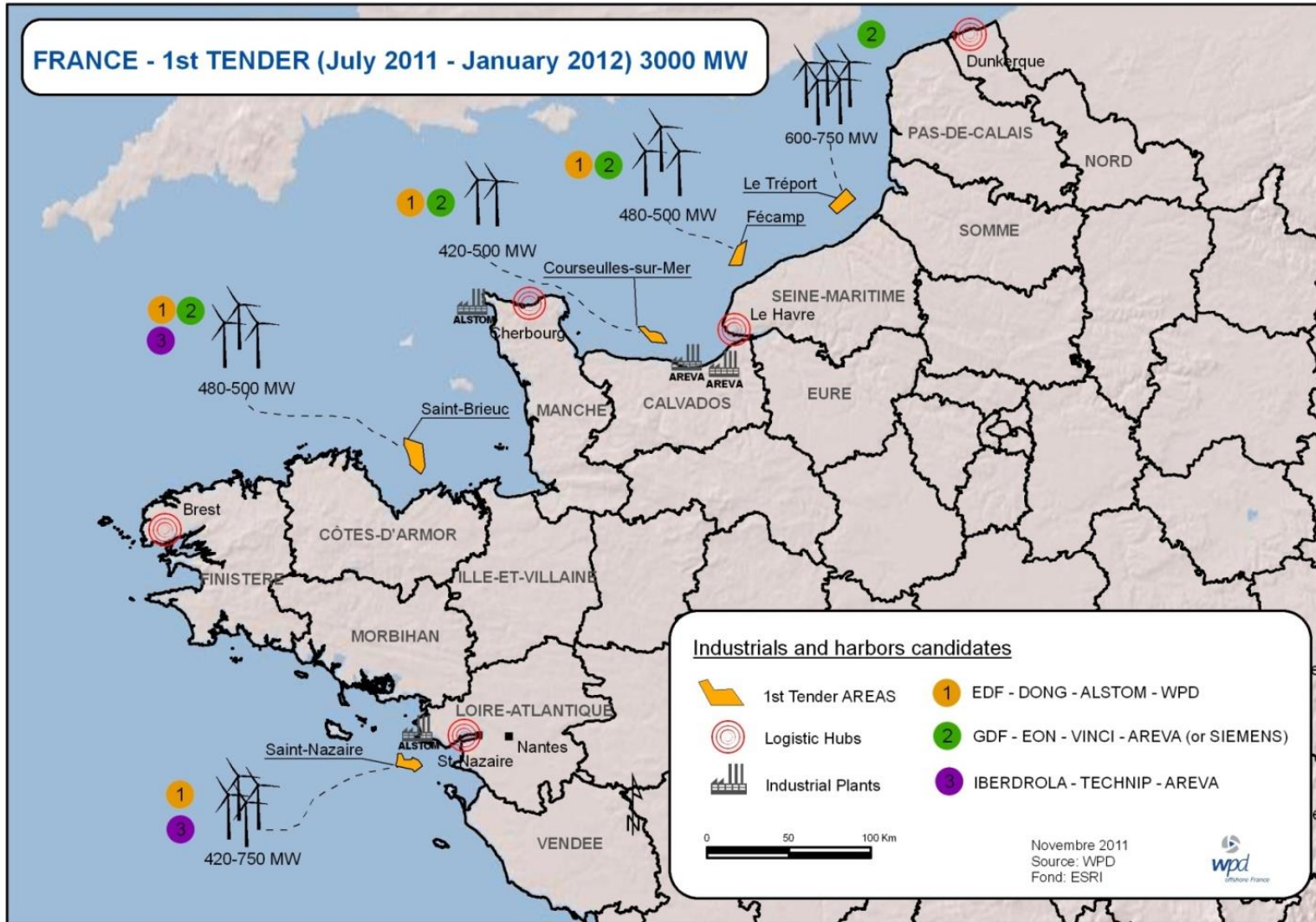
Concerning the Tender :

- Resize warranty to more adequate values
- Remove so stringent timing with something more in line with the current standard

If there is a real objective to develop offshore in Italy, to attract long term investments, it is fundamental to have **stability** in **objectives and procedures**:

- Stated objectives agreed by all authorities involved (MISVE + MIT +MINAMB + MIBAC ...+ Region+ Local Municipalities...) regarding feasibility of offshore wind farm in Italy.  
For example: to be defined a minimum distance beyond which it is possible to propose an offshore project.
- Should be identified **AREAS** and **ZONES** where the development of offshore projects is feasible environmentally / technically / industrially /socially /grid capacity and then should be organized tenders .....

# CONCLUSIONS AND SUGGESTIONS :



## France

*Le premier appel d'offre*

The French Government is seeking to foster the development of a long-term French offshore wind industry, which would create jobs in the local areas near the sites of the projects