



ADOrED

Accelerating the Deployment of Offshore wind using DC
technology

Grant Agreement number : 101073554

ADOrED report template

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November 7, 2023

Name Here

| | |
|------------------------|-----------------|
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| Dissemination level | Public |
| Project period | xxxxxx |
| Due date | xxxxxx |
| Actual submission date | xxxxxx |

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Abstract

1 Introduction

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2 Development

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Figure 1: ADORED Logo

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2.1 Helpful Information

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Table 1: ADOrED Candidates starting date

| Fellow nr | Institution | Name | Starting date - approximately |
|-----------|-------------|-------------------------|---------------------------------|
| 1 | UPC | Kriti Agrawal | 1st of September |
| 2 | UPC | Bernardo Castro Valerio | 19th of June |
| 3 | UPC | Luis Angel Garcia-Reyes | 1st of July |
| 4 | UPORTO | Re-advertisement | ? (not possible before October) |
| 5 | UPORTO | Waseem Haider | 1st of September |
| 6 | Clille | Anup Joshi | 1st of September |
| 7 | KULeuven | Manika Khadka | 1st of September |
| 8 | YUSO | Re-advertisement | ? Contact them |
| 9 | DTU | Alexander Novikov | 1st of September |
| 10 | DTU | Nicolae Darii | 1st of July |
| 11 | DTU | Germano Mugambe | 1st of September |
| 12 | DTU | Zhengua Xu (Joshua) | 1st of September |
| 13 | UPC | Mario Useche Arteaga | 1st of July |
| 14 | KULeuven | Hanwei Li | 1st of September |
| 15 | UPORTO | Ahmar Farooque | 1st of September |
| 16 | Cardiff | Muhammad Fawad | 1st of August |
| 17 | Cardiff | Qingyuan Gong | 1st of August |
| 18 | Cardiff | Junaid Khalid | 1st of August |
| 19 | Cardiff | Muhammad Helal Uddin | 1st of August |

Table 2: Work Package List

| WP No. | WP Title | Lead (Short Name) | Start | End | Activity | Reasearchers |
|--------|------------------------------------|-------------------|-------|-----|----------------------|------------------------|
| 1 | Offshore Wind | CU | 6 | 48 | Research | 3, 10, 11, 12, 17, 19 |
| 2 | HVDC | UPC | 6 | 48 | Research | 1, 2, 6, 7, 14, 16 |
| 3 | AC/DC interaction | KULeuven | 6 | 48 | Research | 4, 5, 8, 9, 13, 15, 18 |
| 4 | Training | DTU | 6 | 48 | Training Activity | all |
| 5 | Communication and Dissemination | UPC | 6 | 48 | Dissemination | all |
| 6 | Management | DTU | 1 | 48+ | Management | |



Table 3: ADORed projects

| Fellow nr | Project title |
|-----------|--|
| 1 | Autonomous operation of modern power systems including HVDC grids |
| 2 | Tools for the design and sizing of offshore transmission systems using HVDC systems and grids |
| 3 | Tools development for stability and interaction assessment of large modern power electronics dominated power systems. |
| 4 | Hydrogen storage on offshore wind power plants |
| 5 | Digitalization of the offshore power substation secondary equipment in an AC/DC context |
| 6 | Stability of an islanded power system with a grid-forming VSC-HVDC link, an LCC-HVDC link and non-synchronous generation |
| 7 | HVDC Cable Analytics: Using monitored data from contingency analysis to determine cable and accessory lifetime |
| 8 | Risk-based operational models for hybrid offshore interconnectors for ancillary service provision |
| 9 | Wind turbine and wind power plant protection in a converter-based power system |
| 10 | Electrical Compatibility Study of a Converter based Offshore Energy System constituting diverse Control Strategies. |
| 11 | Dynamic stability of multi-vendor large (offshore) wind power clusters |
| 12 | Ancillary services from offshore wind power plants in HVDC grids |
| 13 | Tools development for stability and interaction assessment of large modern power electronics dominated power systems |
| 14 | Protection schemes for HVDC cable systems in multi-vendor HVDC grids |
| 15 | Renewable Hydrogen on offshore wind power plants |
| 16 | Assessment and operation of DC technology based multi-purpose interconnectors (MPIs) |
| 17 | Design and control of offshore wind farms with hybrid ac and dc technologies |
| 18 | Modelling and control of large wind turbines for fault ride-through and grid support |
| 19 | Reliability-based design optimisation of large offshore wind turbine |

2.2 How to add Lists

You can make lists with automatic numbering ...

1. Like this,
2. and like this.

... or bullet points ...

- Like this,
- and like this.

2.3 How to write Mathematics

L^AT_EX is great at typesetting mathematics. Let X_1, X_2, \dots, X_n be a sequence of independent and identically distributed random variables with $E[X_i] = \mu$ and $\text{Var}[X_i] = \sigma^2 < \infty$, and let

$$S_n = \frac{X_1 + X_2 + \dots + X_n}{n} = \frac{1}{n} \sum_i^n X_i \quad (1)$$

denote their mean. Then as n approaches infinity, the random variables $\sqrt{n}(S_n - \mu)$ converge in distribution to a normal $\mathcal{N}(0, \sigma^2)$.

2.4 Python program example

```

1 def create_Ybus(self):
2     # off diagonal elements
3     for k in range(self.nl):
4         line = self.lines[k]
5         fromNode = line.fromNode.nodeNumber
6         toNode = line.toNode.nodeNumber
7

```




```
8         self.Ybus[fromNode, toNode] -= 1/line.Z
9         self.Ybus[toNode, fromNode] = self.Ybus[fromNode, toNode]
10
11        self.AdmitanceVec[fromNode] += line.Y/2
12        self.AdmitanceVec[toNode] += line.Y/2
```

2.5 Matlab program example

```
1 function [Y_bus]= Ybus(Line_data_table_pu ,total_nodes)
2
3 Y_bus=zeros(total_nodes);
4
5 admittance_vector=zeros(total_nodes ,1);
6
7 for i=1:total_nodes-1
8
9     Y_bus(k,m)=-1/(R+1j*X);
10    Y_bus(m,k)=Y_bus(k,m);
11
12    admittance_vector(k)=admittance_vector(k)+1j*B/2;
13    admittance_vector(m)=admittance_vector(m)+1j*B/2;
14 end
15
16 for m=1:total_nodes
17    sum_pa=-sum(Y_bus(:,m));
18    Y_bus(m,m)=sum_pa+admittance_vector(m);
19 end
20
21 end
```



3 Referencing

To add references download the bibtex citation style, and copy and paste it to sources.bib such as:

```
@article{ShortName,  
title=The Article,  
author=Shall Not be Named,  
journal=The Journal,  
volume=56,  
number=1,  
pages=99–111,  
year=3662,  
publisher=ADored Publisher  
}
```

The 'ShortName' is a personal tag for each citation. To cite on the text use command "`\cite{ShortName}`"[1]



Conclusion

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References

- [1] Shall Not be Named. “The Article”. In: *The Journal* 56.1 (3662), pp. 99–111.



Annex

