TotalControl

Advanced integrated supervisory and wind turbine control for optimal operation of large Wind Power Plants

Title: Project master plan including full transparency of resources, schedule and cost/performance.
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EXECUTIVE SUMMARY

This deliverable is produced as part of the Total Control work package 6, Management and Coordination. The deliverable provides an overview of the project master plan in terms of procedures, templates and other tools developed for project reporting and planning as well as budget. The focus of the overview lies with the communicative tools, both internally (SharePoint) and externally (www.totalcontrolproject.eu). Furthermore, the report will give an overview of the budget and its distribution among partners and work packages.

INTRODUCTION

The purpose of this report is to give a brief description of the developed TotalControl information tools as well as the selected *financial* and *scientific* reporting procedures. The information tools make up for a framework, which splits into two disjoint parts - one dedicated external project communication reaching out to the 'world', and another designed for internal communication among consortium partners. The information framework is in place and as the project progresses, specific information will be added/organized within this framework.

The report is structured as follows: First the external information 'channel' setup will be briefly described. Then follows a description of the internal communication setup and administrative guidelines. Finally, the distribution of the project budget will be accounted for.

COMMUNICATION

EXTERNAL COMMUNICATION

The external communication hub is a project home page (http://www.totalcontrolproject.eu/), through which general non-confidential information will be distributed to the public broadly and to the wind energy community in particular. The preliminary layout and structure of the home page is illustrated in Figure 1 below.

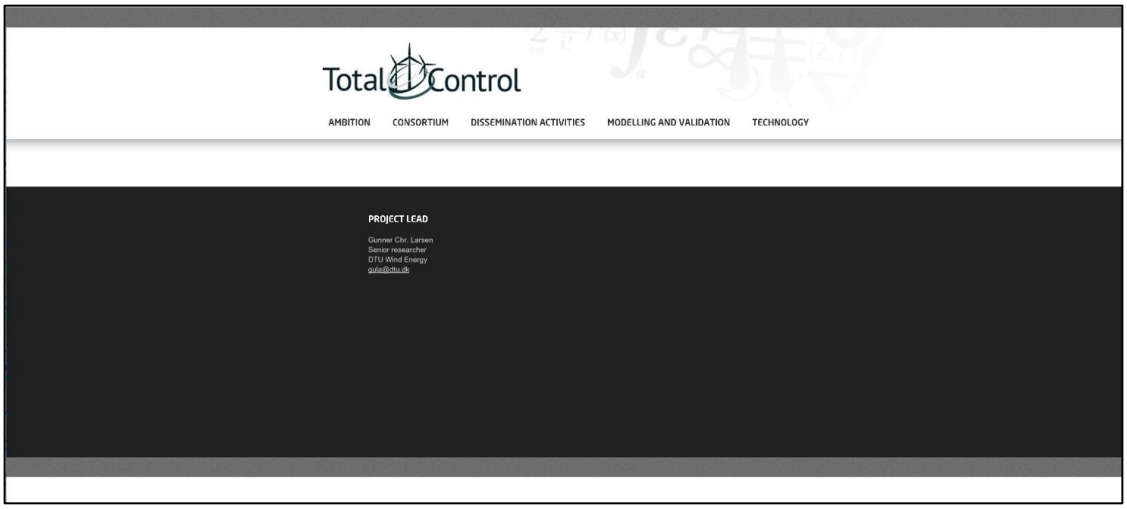


Figure 1: Home page structure.

The home page is structured with information on project *ambition*, project *consortium*, various *dissemination activities*, the *modelling and validation* approach, and the expected *technology* lift on Wind Power Plant (WPP) control emerging from TotalControl.
Project *ambition* will contain a summary description of TotalControl (*project at a glance*); a more detailed description of the project *main objectives* as well as the individual project *work packages* (WP's); and finally a description of the *expected impacts* of the project on future optimal WPP control strategies.
Project *consortium* contains a description of each of the eight consortium partners.

Project *dissemination activities* will contain (breaking) news as well as information on *publications* emerging from TotalControl activities and derived achievements, on the *TotalControl toolbox*, on *training activities* and on *videos* and *webinars*.
Project *modelling and validation* will contain information of the various TotalControl modelling approaches ranging from high-fidelity (and CPU demanding) to more simplified and fast (i.e. less CPU demanding) modelling platforms. Moreover, the dedicated project full-scale and laboratory-scale experiments will be described along with their use for model validation.
Project *technology* will give an overview over the expected technology lift from today's standard to an optimal coordinated wind turbine (WT) and wind farm (WF) control approach for the operation of large WPPs.
The status as of February 2018 is that the home page structure as well as the consortium description is in place. Further description of the project website will be given in a separate deliverable (D5.1).

Internal Communication

The internal project communication is managed by establishing *administrative guidelines* for scientific and financial reporting as well as by setting up a *communication hub* for exchange of general and scientific information within the project consortium. In the following sections, these will be described separately.

Internal Project Communication

The internal project *communication-hub* is a project Share Point site (share.dtu.dk), through which all kinds of (confidential) project relevant information can be distributed among the project partners. The layout of the project Share Point site is illustrated in Figure 2 below.

Figure 2: Layout of the TotalControl SharePoint site.

The SharePoint is organized with a wide range of relevant project information. A close-up of the left hand menu-bar is shown in Figure 3.

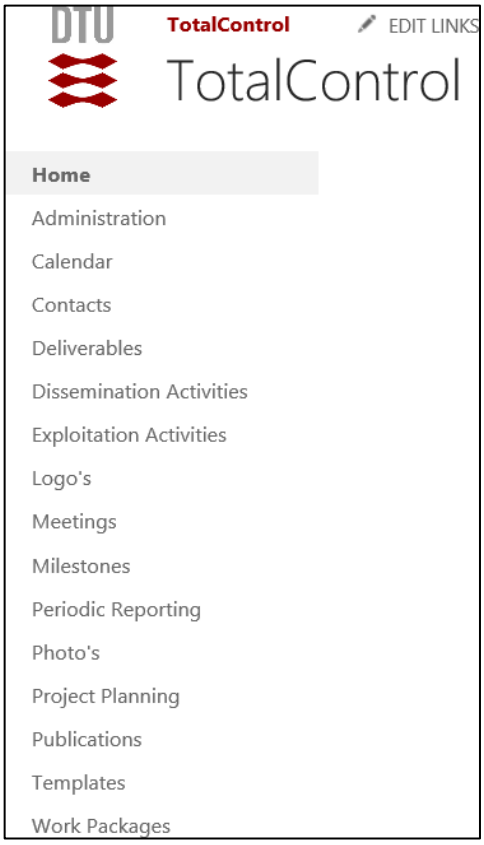


Figure 3: TotalControl SharePoint menu.

To give an impression of the use of the SharePoint site, a few illustrative examples are given in Figures 4-7 below.

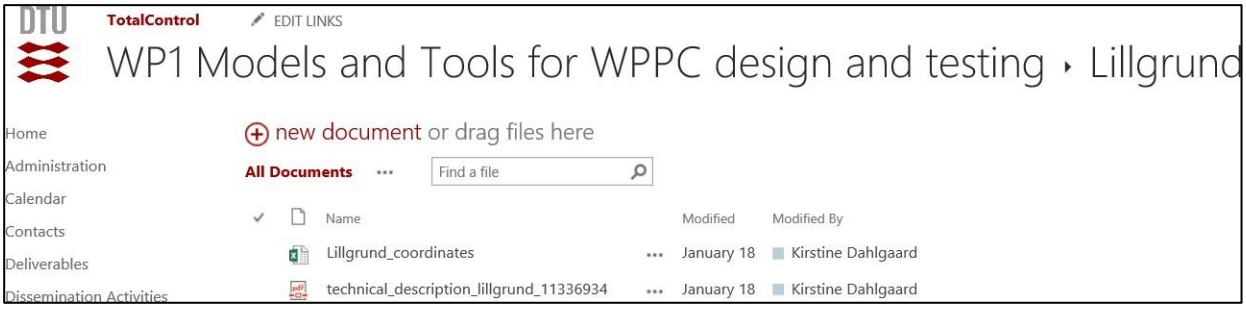


Figure 4: WP1-information on the Lillgrund case study.

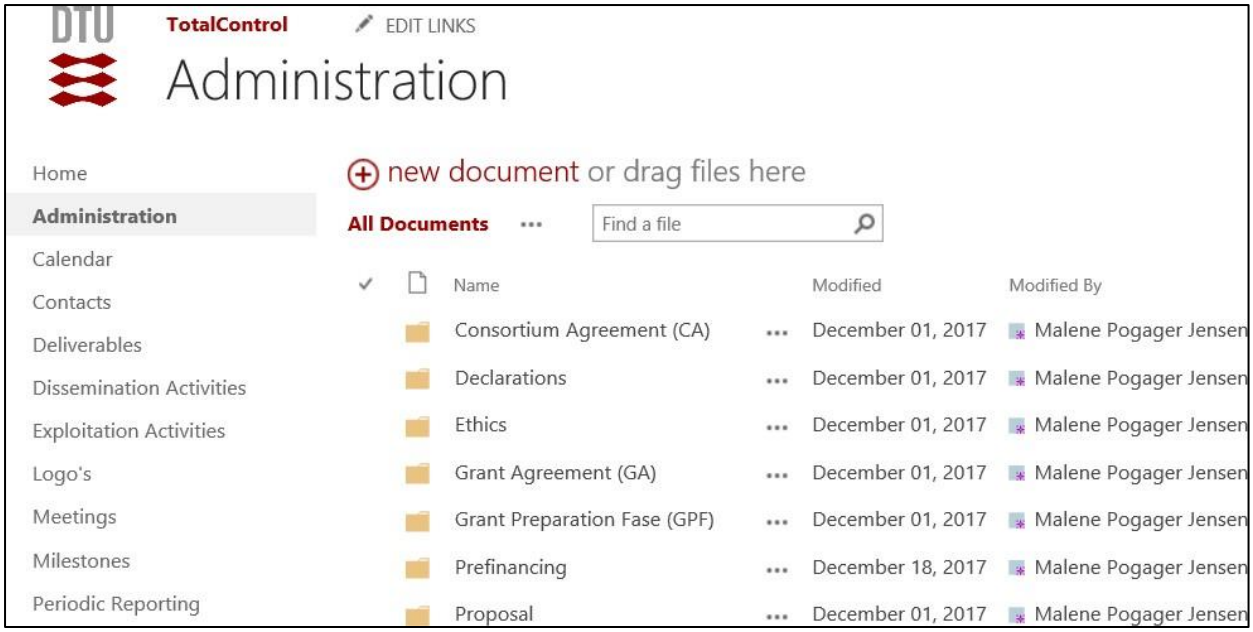


Figure 5: General administrative information/agreement.

Figure 6: Extract of contact information on all project participants.

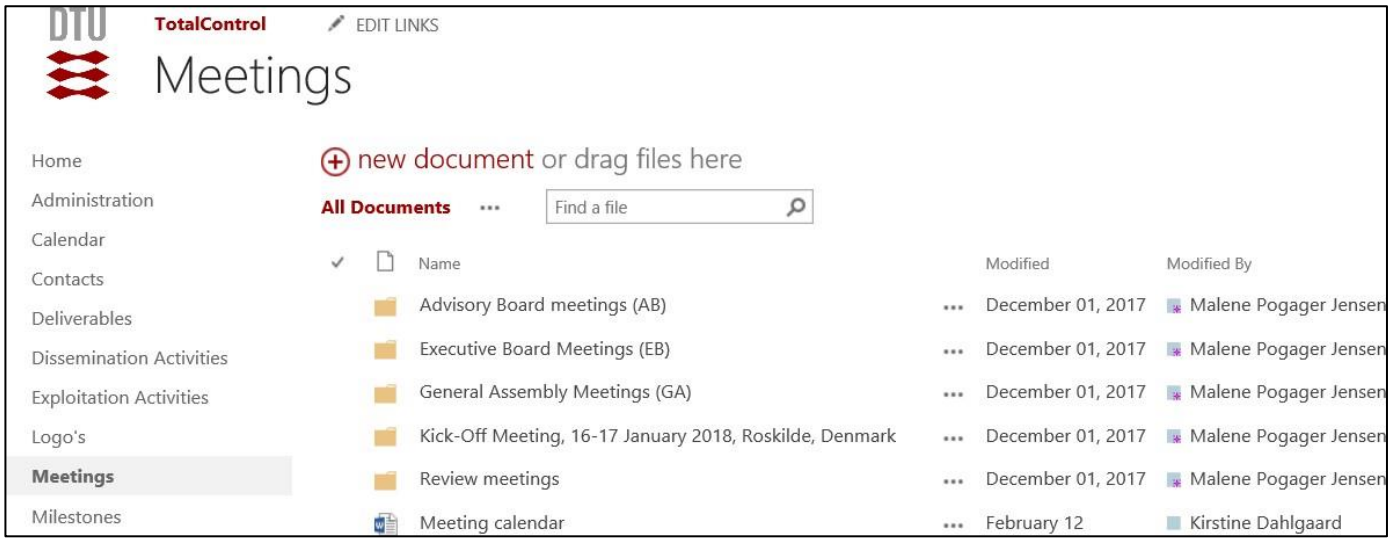


Figure 7: List of planned and finalized meetings categorized according to type of meeting.

In addition to the above examples, it should be mentioned that various templates for project reporting and project presentations have been designed. These are also available from the SharePoint site. Regarding deliverables due within 2018, the consortium has agreed to maintain a particular focus on deliverables that could potentially delay other project activities if delayed. These appear from Table 1, where the timing of deliverables marked in bold are considered particularly important.

WP n°	N°	Lead Beneficiary	Title	Project month
6	1	DTU	Detailed Project Management Plan	2
1	**3**	**SINTEF**	**Reference Wind Power Plant**	**3**
3	**1**	**ORE**	**7MW turbine model and reference loadset**	**3**
5	1	DTU	Setup of the website	3
6	2	DTU	Project master plan including full transparency of resources, schedule and cost/performance	3
1	10	DNV	Machine learning approaches to wind farm control	4
1	9	DNV	Simple dynamic wind farm model	8
3	**2**	**DNV**	**Controller adaptation for varying conditions and ancillary services**	**9**
1	6	DTU	Upgrade of DWM	10
1	5	SINTEF	Electro-mechanical model of reference wind power plant	12
2	**1**	**SINTEF**	**Cost model for fatigue degradation and O&M**	**12**
3	**6**	**DTU**	**Wind field measurements using LiDAR**	**12**
5	2	DTU	First project video	12
5	6	DTU	Dissemination and communication plan and annual reports on the dissemination and communication activities, 1	12

Table 1: Overview of deliverables in the first project year

Status for the TotalControl SharePoint site as of February 2018 is that the framework is fully established and operational, and along with the project progressing the site will gradually be more and more 'populated' with relevant project information.

ADMINISTRATION AND REPORTING

In this section, the administrative project procedures are briefly accounted for. This includes information regarding: 1) Submission procedures for deliverables; 2) Layout for presentations; 3) Various reporting; and 4) Planning.

DELIVERABLES – SUBMISSION PROCEDURE

- Deliverables must be written in the *reporting template* available from the project SharePoint site (see annex 1);
- The coordinator administration team will send out a pre-reminder to the overall responsible partner as well as to the relevant WP leader *2 months* before the due date;
- The deliverable should be *reviewed* and approved by the WP leader before handed in to the coordinator;
- The deliverable should be submitted in the template (word) format to the coordinator *2 weeks* before the due date;
- Postponement of deadlines must be justified and *approved* by the coordinator beforehand;
- The coordinator will assess the deliverable, submit it to the EC and upload it to the SharePoint site.

PRESENTATIONS

Whenever presentations are given in connection to the TotalControl project, partners are requested to use the PowerPoint template, which like all other project documents can be found at the SharePoint site for TotalControl. The front page of this template is depicted as Figure 8 below.

Figure 8: PowerPoint template for TotalControl presentations

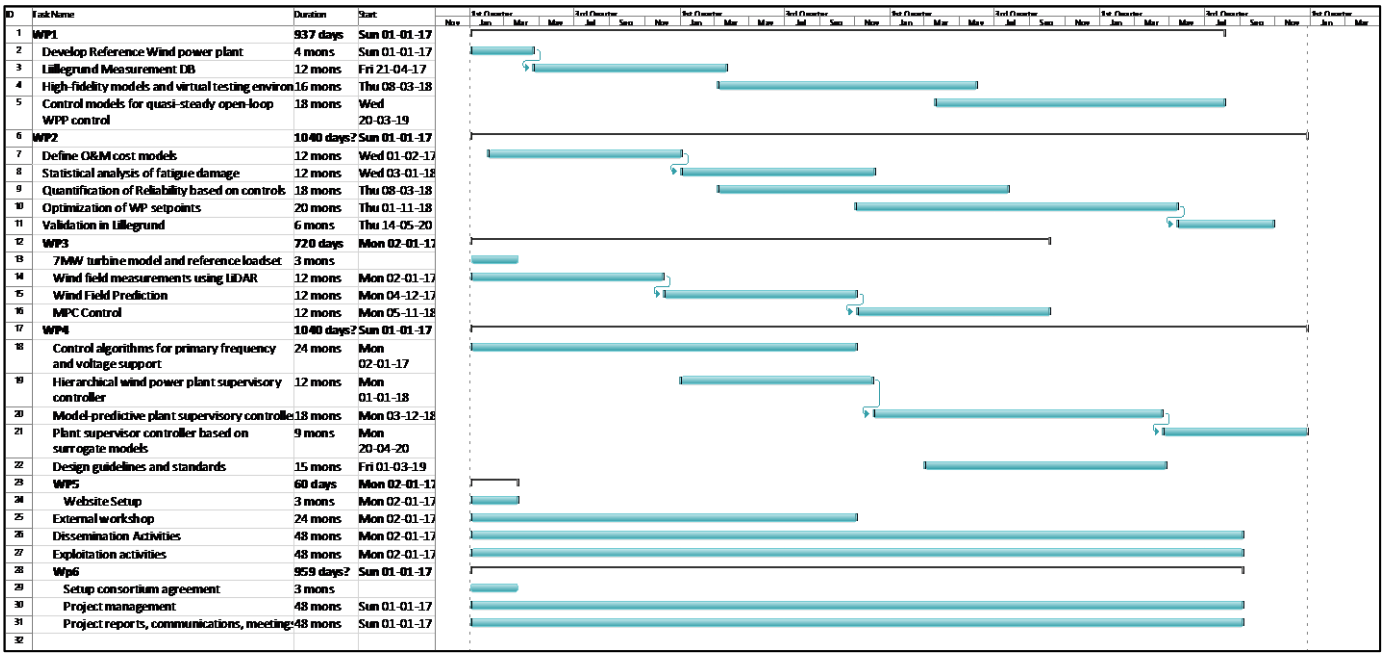
VARIOUS REPORTING

In addition to the already developed templates for deliverables and project presentations, respectively, there will throughout the project be developed other templates whenever needed for various reporting. An example of such is for the periodic reports, for which a template will be created in order to receive structured inputs from all the partners on both scientific work progress and financial spendings. Specific procedures for various kinds of reporting throughout the project are furthermore to be developed later on.

PLANNING

As a means to ensure that all project activities/tasks will be carried out in a timely manner according to the project plan, a Gantt chart has been created for the project. This chart, which can be seen below, shows the expected progress for each task throughout the project period. In each yearly periodic reporting and the related review report, the project plan as explained in the Grant Agreement, Annex 1 (Discription of Action) and visualised in the Gantt chart will be evaluated and moderated if needed.

The main responsibility for timely progress of the overall project lies with the coordinator (DTU) but for the actual work progress, the responsibility lies with each work package leader, of whom paying close attention to the given administrative guidelines is expected.



ID	Task Name	Duration	Start
1	WP1	937 days	Sun 01-01-17
2	Develop Reference Wind power plant	4 mons	Sun 01-01-17
3	Lillegrund Measurement DB	12 mons	Fri 21-04-17
4	High-fidelity models and virtual testing environ	16 mons	Thu 08-03-18
5	Control models for quasi-steady open-loop WPP control	18 mons	Wed 20-03-19
6	WP2	1040 days?	Sun 01-01-17
7	Define O&M cost models	12 mons	Wed 01-02-17
8	Statistical analysis of fatigue damage	12 mons	Wed 03-01-18
9	Quantification of Reliability based on controls	18 mons	Thu 08-03-18
10	Optimization of WP setpoints	20 mons	Thu 01-11-18
11	Validation in Lillegrund	6 mons	Thu 14-05-20
12	WP3	720 days	Mon 02-01-17
13	7MW turbine model and reference loadset	3 mons	
14	Wind field measurements using LiDAR	12 mons	Mon 02-01-17
15	Wind Field Prediction	12 mons	Mon 04-12-17
16	MPC Control	12 mons	Mon 05-11-18
17	WP4	1040 days?	Sun 01-01-17
18	Control algorithms for primary frequency and voltage support	24 mons	Mon 02-01-17
19	Hierarchical wind power plant supervisory controller	12 mons	Mon 01-01-18
20	Model-predictive plant supervisory controlle	18 mons	Mon 03-12-18
21	Plant supervisor controller based on surrogate models	9 mons	Mon 20-04-20
22	Design guidelines and standards	15 mons	Fri 01-03-19
23	WP5	60 days	Mon 02-01-17
24	Website Setup	3 mons	Mon 02-01-17
25	External workshop	24 mons	Mon 02-01-17
26	Dissemination Activities	48 mons	Mon 02-01-17
27	Exploitation activities	48 mons	Mon 02-01-17
28	Wp6	959 days?	Sun 01-01-17
29	Setup consortium agreement	3 mons	
30	Project management	48 mons	Sun 01-01-17
31	Project reports, communications, meeting	48 mons	Sun 01-01-17
32			

Figure 9: TotalControl Gantt chart

FINANCIAL ASPECTS

TIME AND COSTS SPECIFICATIONS

In order to keep track of spendings within the project, each work package leader is throughout the project responsible for administrating and reporting the hours and costs of the work package to the coordinator (DTU). Time and costs must for each work package be specified as follows:

- *Hours* per person (name and personnel category) within the WP;
- *Travel costs*: name of traveller, from/to dates, destination and purpose (travels outside EU must be approved by the EU project officer before travel - i.e. as part of the travel planning);
- *Equipment*: usage percentage in the project and expected life time in months;
- *Other costs* specified per WP: description and date of purchase.

ELIGIBLE COSTS - REFERRING TO ARTICLE 6 OF THE GENERAL AGREEMENT (GA)

Eligible costs are characterized by being:

- Actual;
- Incurred during the project period;
- Described in the budget in Annex 2;
- In accordance with the beneficiary's usual accounting and management principles and the accounting standards in the country of the beneficiary;
- Recorded in the accounts of beneficiary;
- Used for the sole purpose of achieving the objectives of the TotalControl project.

Non-eligible costs are identifiable indirect taxes including VAT.

CERTIFICATE ON THE FINANCIAL STATEMENT (CFS) – REFERRING TO ANNEX 5 TO GA

- When the total requested financial contribution has passed EUR 325.000 a CFS is required;
- When a consortium partner has made a CFS at the end of a project period, the consortium partner starts from 'zero' in the next period;
- Costs for CFSs should be reported under management costs (i.e. WP6) - all other costs must be reported in the relevant WPs 1-5.

BUDGET

In total, the TotalControl project has received a grant of €4.881.482,5 from the European Commission for its activities. In terms of work packages, the funding is distributed as can be seen in the table below.

	WP1	WP2	WP3	WP4	WP5	WP6	
	Development and testing of wind-farm design and control models	Open-loop quasi-static control schemes	Enhanced WT control schemes	Closed-loop dynamic control schemes	Dissemination	Management and Coordination	Total
Person months (PM)	92,0	62,0	65,0	115,0	18,0	12,0	364,0
Personnel costs	713.983,0	527.922,0	556.770,0	1.040.415,0	149.835,0	96.000,0	3.084.925,0
Travel	76.000,0	31.000,0	44.000,0	43.000,0	29.000,0	32.000,0	255.000,0
Equipment	200.000,0	-	-	-	-	-	200.000,0
Consumables	55.000,0	9.000,0	147.561,0	42.000,0	40.000,0	50.000,0	343.561,0
Audit Costs	-	-	-	-	-	21.700,0	21.700,0
Overhead 25%	261.245,8	141.980,5	187.082,8	281.353,8	54.708,8	49.925,0	976.296,5
Subcontracting	-	-	-	-	-	-	-
Total budget	1.306.228,8	709.902,5	935.413,8	1.406.768,8	273.543,8	249.625,0	4.881.482,5
Total grant	1.306.228,8	709.902,5	935.413,8	1.406.768,8	273.543,8	249.625,0	4.881.482,5

Table 2: Budget per work package (€)

To visualise the distribution above, the percentage of funding for each of the work packages can be seen in the diagram (figure 9) below.

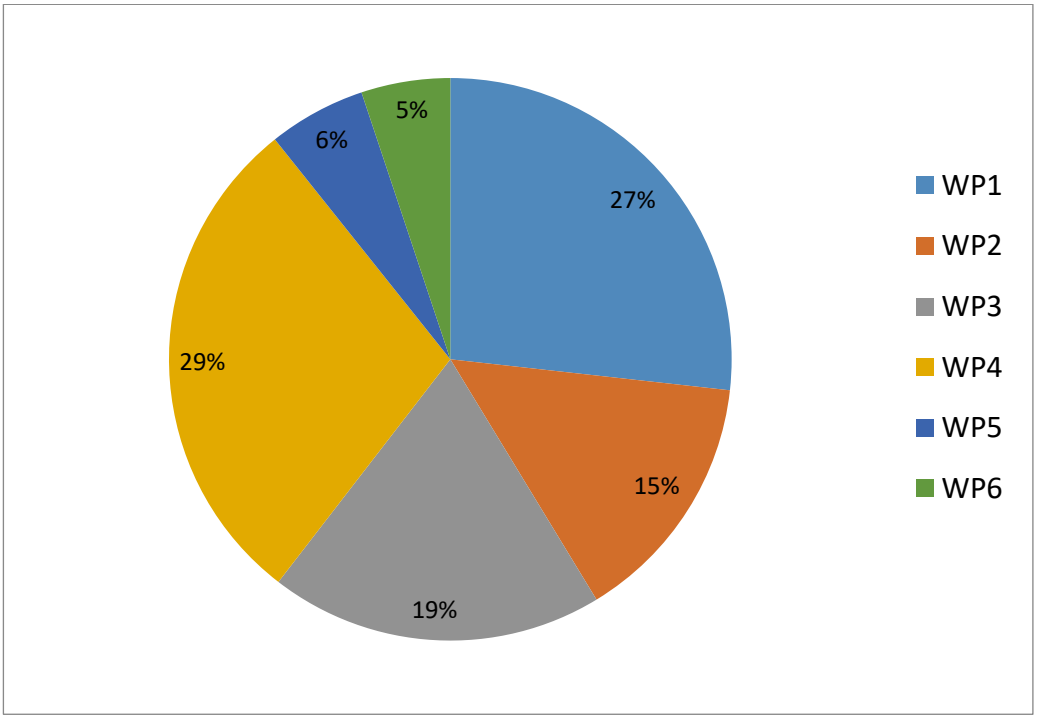


Figure 10: Percentage of financial distribution per work package

Besides the financial distribution per work package, the budget has also been distributed per partner. In the table below, it can be seen how many person months (PM) have been given to each partner in each work package. More detailed tables, including details such as *personnel costs, travel, equipment* etc., have also been created for the budget per individual partner, but these will not be included here.

		WP1	WP2	WP3	WP4	WP5	WP8		
Partner No.	**Partner Name**	**Develop-ment and testing of wind-farm design and control models**	**Open-loop quasi-static control schemes**	**Enhanced WT control schemes**	**Closed-loop dynamic control schemes**	**Disse-mination**	**Manage-ment and Coordina-tion**	**Total PM**	**Grant**
1	**DTU Wind Energy**	20	31	24	18	5	12	110,0	**1.637.500**
2	**Katholieke Universiteit Leuven**	30	10	-	20	5	-	65,0	**626.875**
3	**SINTEF Energi**	9	6	10	45	5	-	75,0	**1.068.156**
4	**DNV-GL**	4	10	11	15	1	-	41,0	**599.250**
5	**Vattenfall AB**	4	2	-	12	-	-	18,0	**202.500**
6	**ORE Catapult**	14	-	20	5	2	-	41,0	**567.201**
7	**Siemens Wind Power A/S**	8	-	-	-	-	-	8,0	**100.000**
8	**Statoil ASA**	3	3	-	-	-	-	6,0	**80.000**
Total		**92**	**62**	**65**	**115**	**18**	**12**	**364**	**4.881.483**

Table 3: Person months per partner/work package

ANNEX 1 – DELIVERABLE TEMPLATE

TotalControl

Advanced integrated supervisory and wind turbine control for optimal operation of large Wind Power Plants

Title (of deliverable):
Deliverable no.:

Delivery date: (dd.mm.yyyy)
Lead beneficiary:
Dissemination level:

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(1, 2, 3 etc.)	dd.mm.yyyy	Name			

Definitions

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