Advanced study for the numerical resolution of the Navier-Stokes equations. Application to thermal energy storage systems

Document:

Budget

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TREBALL DE FI D'ESTUDIS

This document presents the budget of the study carried out. This budget is broken down into 4 independent budgets to finally be able to calculate the material execution budget (PEM) and the execution budget by contract (PEC). These 4 independent budgets are:

- Hardware Budget

- Software Budget

- Manpower budget

- Energy budget

In the series of tables, the prices are expressed in work units. Each work unit (u.o.) is independent of each table and is indicated in them. It also indicates the price of each of these work units and the total price of the item. The prices are rounded to euros.

First, table 1 shows the budget of Hardware, in which breaks down the price of each of the components that form the computer that has been used to compute the cases and write all the relevant documents.

Table 1: Hardware budget

Hardware budget					
Concept	**Reference**	**u.o.**	**Units**	**u.o. [€]**	**Price [€]**
Power supply	RM650X 80	Units	1	125,00	125,00
Graphics card	RTX 2070 super	Units	1	600,00	600,00
CPU	AMD Ryzen 7	Units	1	320,00	320,00
Motherboard	ASUS TUF B450	Units	1	103,00	103,00
Hard disk	M.2 NVMe	Units	1	122,00	122,00
RAM	LPX DDR4	Units	1	86,00	86,00
Computer box	Eclipse P400A	Units	1	90,00	90,00
Total					**1446,00**

As for the software, we have tried to use a list of free software, that is, at no additional cost. Only one payment program had to be made, in this case OneDrive, to have 1 TB of data storage in the cloud to be able to treat the data safely and lastingly. Using free software has been able to greatly reduce the budget as seen in table 2.

Table 2: Software budget

Software budget					
Concept	**Reference**	**u.o.**	**Units**	**u.o. [€]**	**Price [€]**
Compiler	Dev C++	Licence	1	0,00	0,00
Text editor	Overleaf	Licence	1	0,00	0,00
Graphic representation	Paraview	Licence	1	0,00	0,00
Graphic representation	Gnuplot	Licence	1	0,00	0,00
Graphic representation	PlotDigitizer	Licence	1	0,00	0,00
Data storage	OneDrive	Licence	1	66,00	66,00
Total					**66,00**

Regarding the manpower, it has been considered that the person who executes the project is a junior engineer, therefore an economic compensation of 20 euros has been applied for each hour of work. In the table 3 breaks down the manpower budget in the different tasks accomplished in this project.

Table 3: Manpower budget

Manpower budget				
Concept	**u.o.**	**Units**	**u.o. [€]**	**Price [€]**
Initial training	hour	20	20,00	400,00
Mathematical comprehension	hour	80	20,00	1600,00
Case programming	hour	230	20,00	4600,00
Post processing	hour	50	20,00	1000,00
Report writing	hour	120	20,00	2400,00
Total				**10000,00**

To end the budget breakdown, the energy cost of the project is exposed in the Table 4. The price in Catalonia of electricity depends on many factors: the supplier electricity company, the amount of renewable energy from which the energy supplied comes, the time of the day of consumption, the contracted power, etc. For this reason, taking into account state taxes, a price of €0.31/kWh has been stipulated.

The computer used for the realisation of the project has a consumption, at full load, of 500 W. This consumption has been taken into account for the calculation of the tasks in which the computer has needed the use of graphic computing as it has been during the writing of the memory or the programming of the cases among other tasks. In the case of case computing, a consumption of 250 W by the computer has been taken into account, since the screen, for example, is disconnected and the computer only uses the computing power of the CPU, which has limited energy use.

Table 4: Energy budget

Energy budget				
Concept	**u.o.**	**Unitats**	**u.o. [€]**	**Price [€]**
Case programming	kWh	230	0,31	71,00
Case computing	kWh	1080	0,31	335,00
report writing	kWh	120	0,31	37,00
Others	kWh	270	0,31	84,00
Total				**527,00**

After the budget breakdown is finished, the material execution budget (PEM) is displayed in the Table 5.

Table 5: Pressupost PEM

Material execution budget (PEM)		
Concept	**Price [€]**	**% total**
Hardware	1446,00	12,01
Software	66,00	0,54
Manpower	10000,00	83,06
Energy	527,00	4,37
Total	**12039,00**	100,00

Finally, in table 6 we can see the execution budget by contract (PEC). The PEC reflects the different types of state tax benefits and mugs that every project must include. These taxes mean that the final budget remains in **17335 €**.

Table 6: Pressupost PEC

Execution budget by contract (PEC)	
Concept	**Price [€]**
PEM	12039,00
General expenses [13%]	1565,00
Industrial profit [6%]	722,00
Total before IVA[€]	14326,00
IVA [21%]	3009,00
Total	**17335,00**