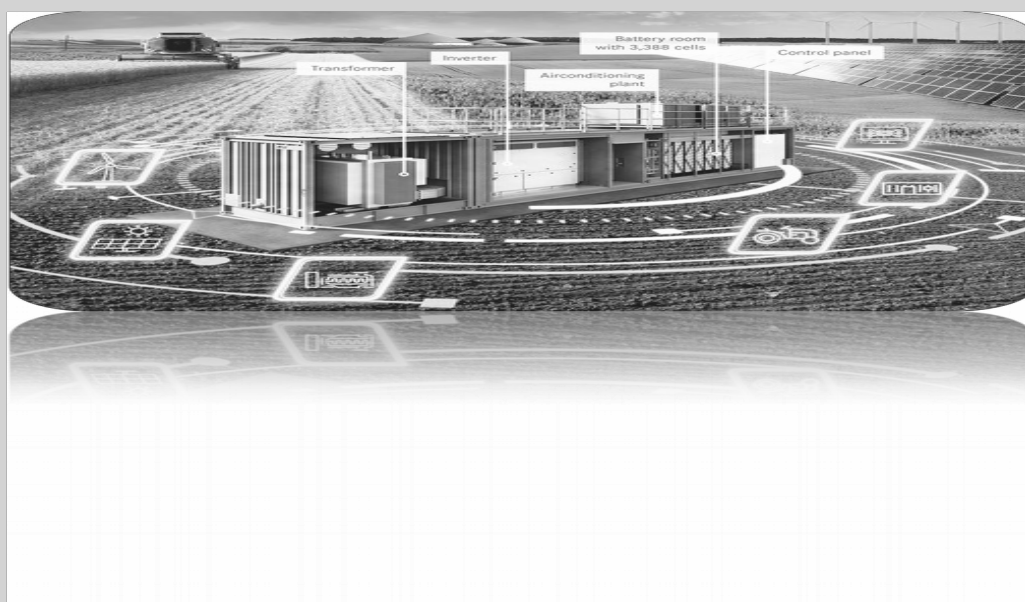


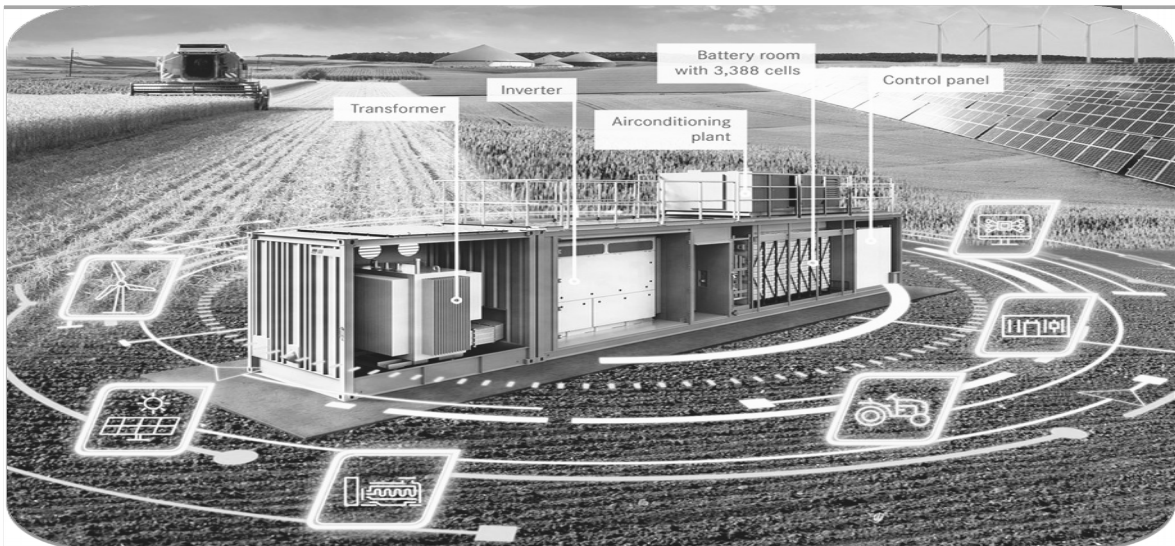
# COMSOL MULTIPHYSICS SOFTWARE ENGINEERING BENACHIR NOUHAILA



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# COMSOL MULTIPHYSICS SOFTWARE ENGINEERING

{Architecture is a wonderful expression of the discovery process. It's like a scientist who doesn't know the answer, but knows the path to it. That's what drives me: the joy of the path, the discovery."}

Glenn Murcutt Architect, winner of the  
2002 Pritzker Architecture Prize

***...A My BENACHIR Nouhaila***



## **Dedication**

I dedicate this modest work to my  
dearest parents, the first ones who  
encouraged and supported me during  
this long way.

**Dedication**



## **Thanks**

"Praise be to GOD, lord and master of the universes".

I would like to express my thanks to a whole world of people who have made this study possible and who have contributed to its elaboration in any form.

I address myself to GOD, the almighty, to thank him  
for having given me the courage, the support, the  
patience to carry out this work.

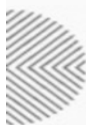


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THÈSE PRÉSENTÉE EN VUE DE L'OBTENTION DU  
DIPLOME DE DOCTORAT EN PHYSIQUE  
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By: Benachir Nouhaila  
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# **Scientific production**

# Publication



## **Publication**

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**Benachir Nouhaila 2022 Paper ID APEN-MIT-2022\_8017 Applied Energy Symposium:Effect of solar ventilation on thermal improvement and energy efficiency of buildings using phase change materials.**

**Benachir Nouhaila Journal of Pharmaceutical Negative Results | Volume 13 | Special Issue 1 | 2022: Role of solar mechanical ventilation and phase change materials on thermal comfort and electrical energy of building envelope.**

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