



DEPARTMENT OF ENERGY TECHNOLOGY
AALBORG UNIVERSITY

IEPE Symposium 2017

- Welcome
By
Project Leader Stig Munk-Nielsen,
Aalborg University



IEPE Symposium - programme

PROGRAMME FOR THE SYMPOSIUM

08:00-08:50 REGISTRATION AND COFFEE

08:50-09:10 WELCOME

BY PROJECT LEADER STIG MUNK-NIELSEN, AALBORG UNIVERSITY, DEPARTMENT OF ENERGY TECHNOLOGY

09:10-09:40 TRENDS IN OFF-SHORE WIND ENERGY

BY BO SVOLDGAARD, HEAD OF ENGINEERING AND CEO, VATTENFALL WIND DENMARK

09:40-10:10 TRENDS IN HIGH POWER MODULES AND AUTOMOTIVE

BY MICHAEL TØNNES, SENIOR DIRECTOR R&D, DANFOSS SILICON POWER, DENMARK

10:10-10:40 OPPORTUNITIES FOR POWER ELECTRONICS BY PACKAGING AND INTEGRATION

PROF. DR.-ING. ECKART HOENE, FRAUNHOFER IZM

10:40-10:55 COFFEE BREAK

10:55-11:15 GaN CONVERTERS FOR PUMP DRIVES

BY NIELS HØGHOLT PETERSEN, CHIEF ENGINEER, GRUNDFOSS, DENMARK

11:15-11:35 NEXT GENERATION OF HIGH FREQUENCY POWER CONVERTERS

BY ZHE ZHANG, ASSOCIATE PROFESSOR, TECHNICAL UNIVERSITY OF DENMARK

11:35-11:55 TAKING ADVANTAGE OF NEW TECHNOLOGIES IN DRIVES

BY MICHAEL TERMANSEN, VP R&D, MANAGER, DANFOSS DRIVES, DENMARK

11:55-12:15 VERY HIGH EFFICIENCY GaN DC/DC CONVERTERS

BY MORTEN NYMAND, ASSOCIATE PROFESSOR, UNIVERSITY OF SOUTHERN DENMARK

12:15-12:35 OPPORTUNITIES OF POWER ELECTRONICS SEEN FROM A RELIABILITY POINT OF VIEW

BY FREDE BLAABJERG, PROFESSOR, AALBORG UNIVERSITY, DENMARK

12:35-12:55 FUTURE HIGH POWER TECHNOLOGY

BY PHILIP CARNE KJÆR, CHIEF SPECIALIST, VESTAS WIND SYSTEMS AND ADJOINT PROFESSOR, AALBORG UNIVERSITY, DENMARK

12:55-13:15 OPENING OF THE PACKAGING LABORATORY

13:15-13:45 LUNCH

ROOM: PONTOPPIDANSTRÆDE 111, 1.030 AND 1.031

13:45-17:00 THREE PARALLELED ACTIVITIES

1. IEPE EXHIBITION - SHOWING SPIN-OFF COMPANIES AND DEMONSTRATOR ACTIVITIES
ROOM: PONTOPPIDANSTRÆDE 111, 1.030 AND 1.031

COFFEE BREAK

- NORDIC POWER CONVERTER
- POWERCON
- KK WIND SOLUTIONS
- AAU
- SDU
- DTU
- GRUNDFOSS
- DANFOSS
- VESTAS

2. POSTER SESSION

3. GUIDED LABORATORY TOURS (EVERY HALF HOUR)

CONVERTER MONITORING ON 1.25MW BACK-TO-BACK CON. WITH INSTALLED CMU SYSTEM

PACKAGE LABORATORIES FOR 10kV AND 15kV SiC POWER MODULER

MV LABORATORY 3kV TO 24kV TAPED TRANSFORMER

RELIABILITY LABORATORIES

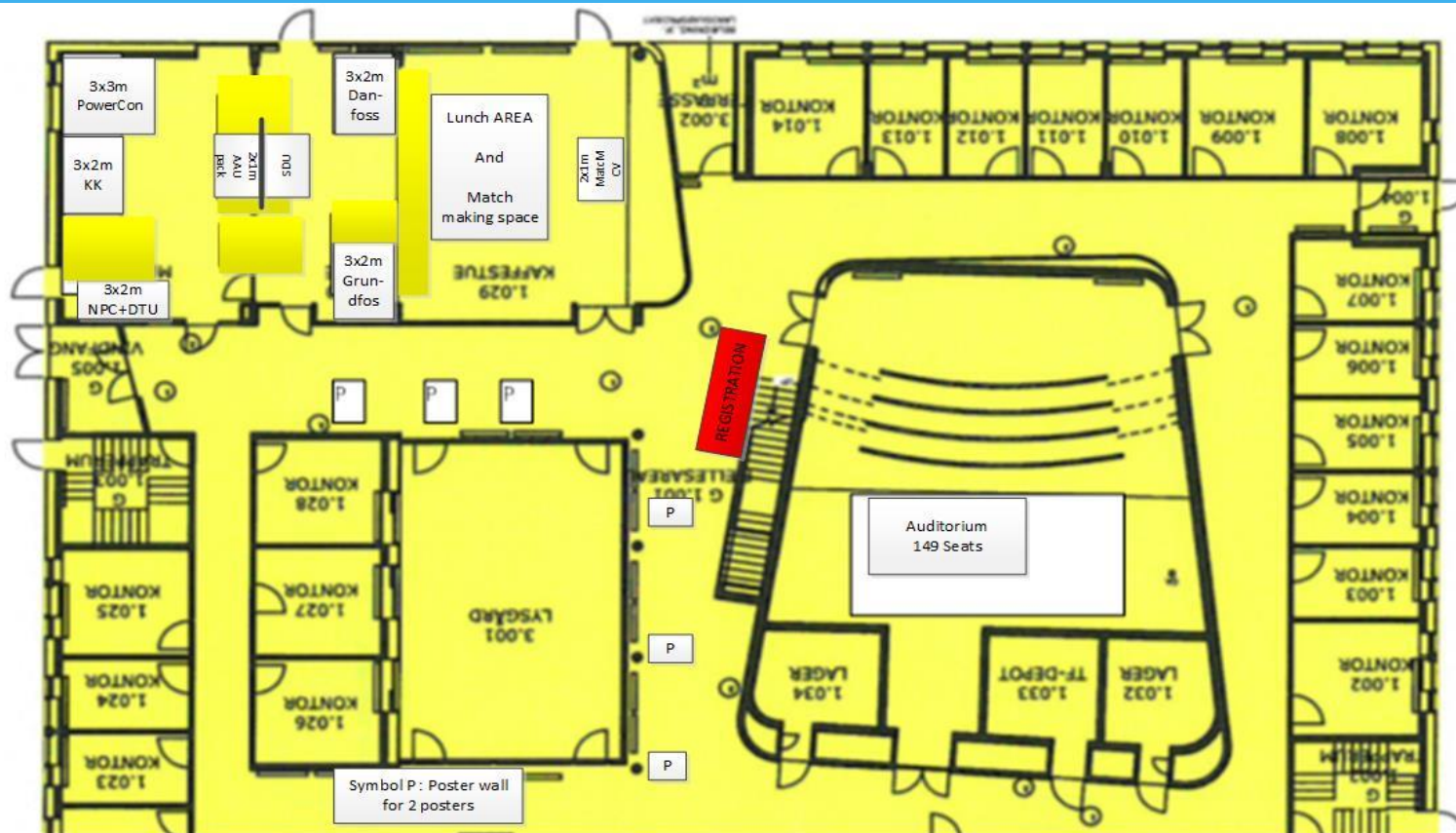


Guided Laboratory tours:

Time: 13:45, 14:45, 15:45 at Registration Desk

- **Converter Monitoring and 1.25MW Back-to-Back converter**
(Bjørn Rannestad et al.)
- **Package laboratories for 10kV and 15kV SiC power modules**
(Christian Uhrenfeldt et al.)
- **MV laboratory 3kV to 20kV taped transformer**
(Catalin Gabriel Dincan)
- **Reliability Laboratories**
(Uimin Choi et al.)

IEPE Symposium – map of Pon.



IEPE Symposium – companies



Highest Performance, Highest Reliability GaN



IEPE Symposium 2017 - participants



Internal External

Innovation Fund Denmark

Platform project:

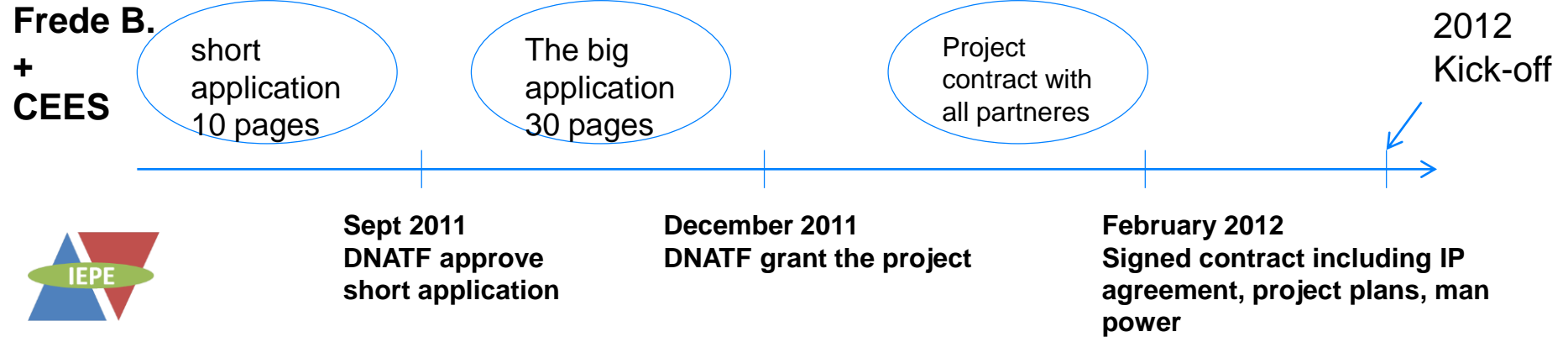
Intelligent and Efficient Power Electronics, IEPE

Duration: 5 years (2012-2017)

Budget: 14.4 Mill. Euro (108 mio. dkk)

Investment: 7.2 Mill. Euro (54 mio. dkk)

History:



IEPE Platform project participants

The 3 Universities, 4 Companies and 1 network organisation

Organisation

Technical University of Denmark



Steering Group:
Partners + IF
Denmark

**Project manager
role:** AAU

**Outreach
activities:** CEES

**Project leaders
and participants:**
All partners



Steering Group

1. John K. Pedersen, Aalborg University (AAU)
2. Kristian Gadgaard, KK-Group (KK)
3. Thorkild Kvisgaard, Grundfos Holding A/S (Grundfos)
4. Niels Gade, Danfoss Power Electronics A/S (Danfoss)
5. Philip C. Kjær, Vestas Wind Systems A/S (Vestas)
6. Michael A.E. Andersen, DTU Electrical Engineering (DTU)
7. Morten Nymand, SDU- Institute of Technology and Innovation (SDU)
8. Klaus Moth, CEES E/F (CEES)
9. Niels Langvad, Innovation Fund Denmark

Project Management

- Ann Louise Henriksen, Economy etc.
- Casper Jørgensen, Web etc.
- Stig Munk-Nielsen, Project leader

Work package Leaders

WP1: MW Technology (3 phd/post)

Remus Teodorescu, AAU

WP5 : MW Power Converter

KK, VESTAS **Bjørn Rannestad, KK**

WP2: KW three phase Technology (3 phd/post)

Jacob Lykke Pedersen, SDU

WP6: Three Phase Converters

Danfoss

Aupke Andreas, Danfoss

WP3: KW Single phase Technology (4 phd/post)

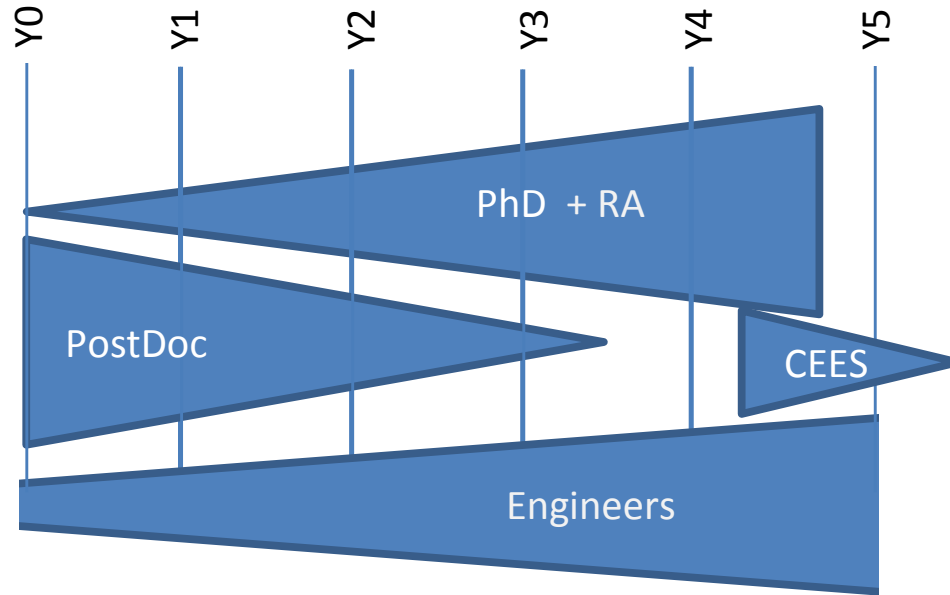
Zhe Zhang, DTU

WP7: Single Phase Converters

Grundfos

Niels H. Petersen, Grundfos

People and Activities



IEPE Researchers etc. (PostDoc)

The project hero's (human infrastructure)

Ionut Trintis
Angel Ruiz de Vega
RamKrishan Maheshwari
Carsten Karup Nielsen

Szymon Beczkowski
Christian Uhrenfeldt
Hanne Benggaard

Frerk Haase
Marian Lungeanu
Marco Zuccherato
Søren Jørgensen

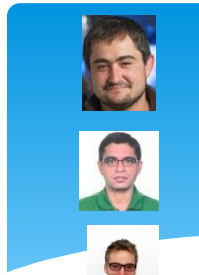
Arnold Knott
Lars P. Petersen
Henriette Wolff

Wulf-Toke Franke
Radu Laser
Brian Bech Christensen
Mogens Lau
Henrik Møller

Christian Wolf
Bjarne Henriksen

Tune Pedersen
Thomas L. Andersen

Paul B. Thøgersen
Henrik Simonsen
And many more



	Name	Affiliation, Sup.	Today?
1	Lorand Bede	AAU, Tamas T.	Power Electronics Engineer at DFT
2	Ghanshyamsinh Gohil	AAU, Remus T.	Postdoc at North Carolina State University
3	Alexander Anthon	DTU, Michael A.	Postdoc at DTU
4	Andres Revilla/Helong Li (CSC)	AAU, Stig M.	Finalizing PhD/Dynex
5	Juan Carlos Hernández Botella	DTU, Michael A.	Development Engineer - Grundfos
6	Mickey Madsen	DTU, Michael A.	Start-up - Nordic Power Converters
7	Alireza Kouchaki	SDU, Morten N.	Research Fellow SDU
8	Rakesh Ramachandran	SDU, Morten N.	Research Fellow SDU
9	Kristian Lindberg-Poulsen	DTU, Michael A.	Start-up - www.senserna.com
10	Emanuel-Petre Eni	AAU, Remus T.	Testing Engineer at Infineon Technologies
11	Casper Vadstrup	AAU, Frede B.	Development Engineer at EWII Mobility A/S



IEPE Publications 2013-2016

Including newest publications and submissions: 139



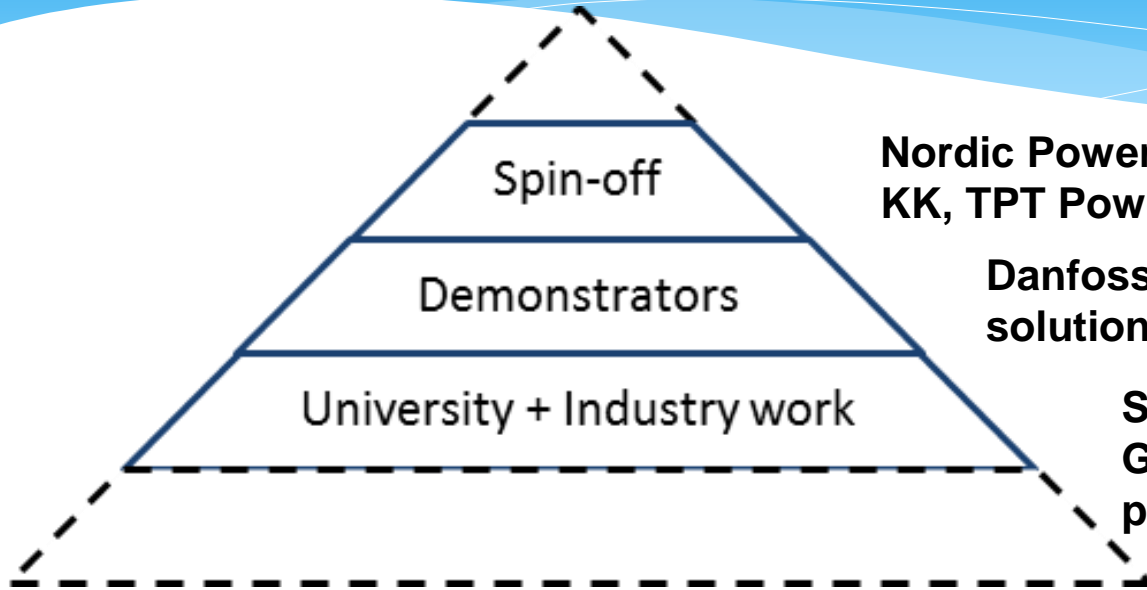
The success of the IEPE platform is quantified in the following (ok/fail): Self assessment:

1. Synergy resulting from joint technology development (**ok**)
2. Reduced cost by at least 20%, min. 20% less weight, volume and improved efficiency (**fail/ok**)
3. To demonstrate the usability of new technologies in future products (**ok**) (PCB embedded inductors, DC/AC GaN, SiC converters, high current PCB, hybrid magnet, +10 MHz converters, high power integrated inductor, low inductance design, 10 kV SiC devices, DC/DC GaN converter, reliability tests, IGBT characterization)

The success of the IEPE platform is quantified in the following (pass/fail):

4. Technology platform for new intelligent power electronic concepts (**ok**) (On chip temperature monitoring, harmonic reduction, optimized PCB layout, interleaving strategies, de-rating strategies, filter design)
5. Tools that can be used for future power electronic equipment design (**ok**)
6. Attract and facilitate new companies exploiting platform knowledge (**ok**)
7. Fast and flexible incorporation of ideas for potential exploitation (**ok**) (TPT, CMU, NPC VHF converter)

‘Technology Readiness Level’



**Nordic Power Converters (DTU) , CMU
KK, TPT PowerCon**

**Danfoss, Grundfos, Vestas, KK Wind
solutions, SDU, AAU,DTU**

**SDU,DTU, AAU, Vestas, Danfoss,
Grundfos, KK Wind solutions (139
papers)**