



**STUDY COMMITTEE A1**

**ROTATING ELECTRICAL MACHINES**

**PANEL SESSION**

**43 BIENNIAL SESSION**

**PARIS, AUGUST 26th, 2010**

**COORDINATION OF THE PANEL:  
Erli Figueiredo (BR) and Oscar Martinez (SP)**

**COORDINATION OF THE DEBATES:  
Sameh Salem (US)**



**CONSIDERATIONS ABOUT THE PANEL AND OVERVIEW ABOUT  
THE GROWTH OF WIND GENERATION IN THE WORLD**

**PRESENTED BY: Erli Figueiredo (BR)**



## STUDY COMMITTEE A1

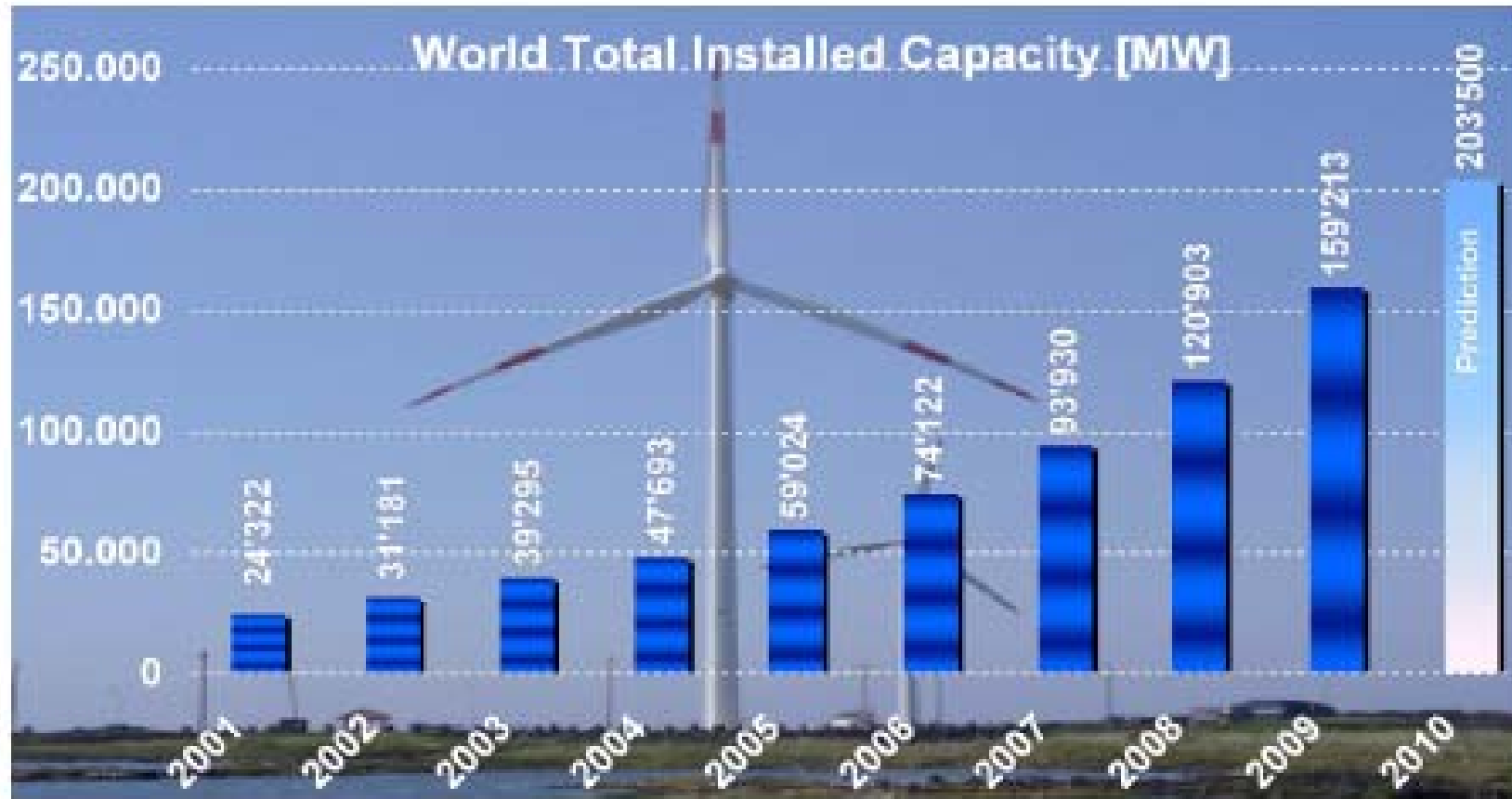
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### PANEL THEME:

- **RECENT DEVELOPMENTS IN WIND POWER GENERATION INVOLVING DESIGN, CONTROL AND IMPACT OF GRID CONSTRAINTS ON MACHINE PERFORMANCE.**
  
  - **OBJECTIVE: TO DISCUSS WIND GENERATION OF DIFFERENT DESIGNS, WHICH ARE PRESENTING A FAST GROWTH IN SEVERAL COUNTRIES, AS THE MOST PROMISSING ALTERNATIVE TO HYDRO-GENERATION AMONG THE OTHER SOURCES OF RENEWABLE ENERGY.**
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## SOME CONSIDERATIONS ABOUT WIND GENERATION



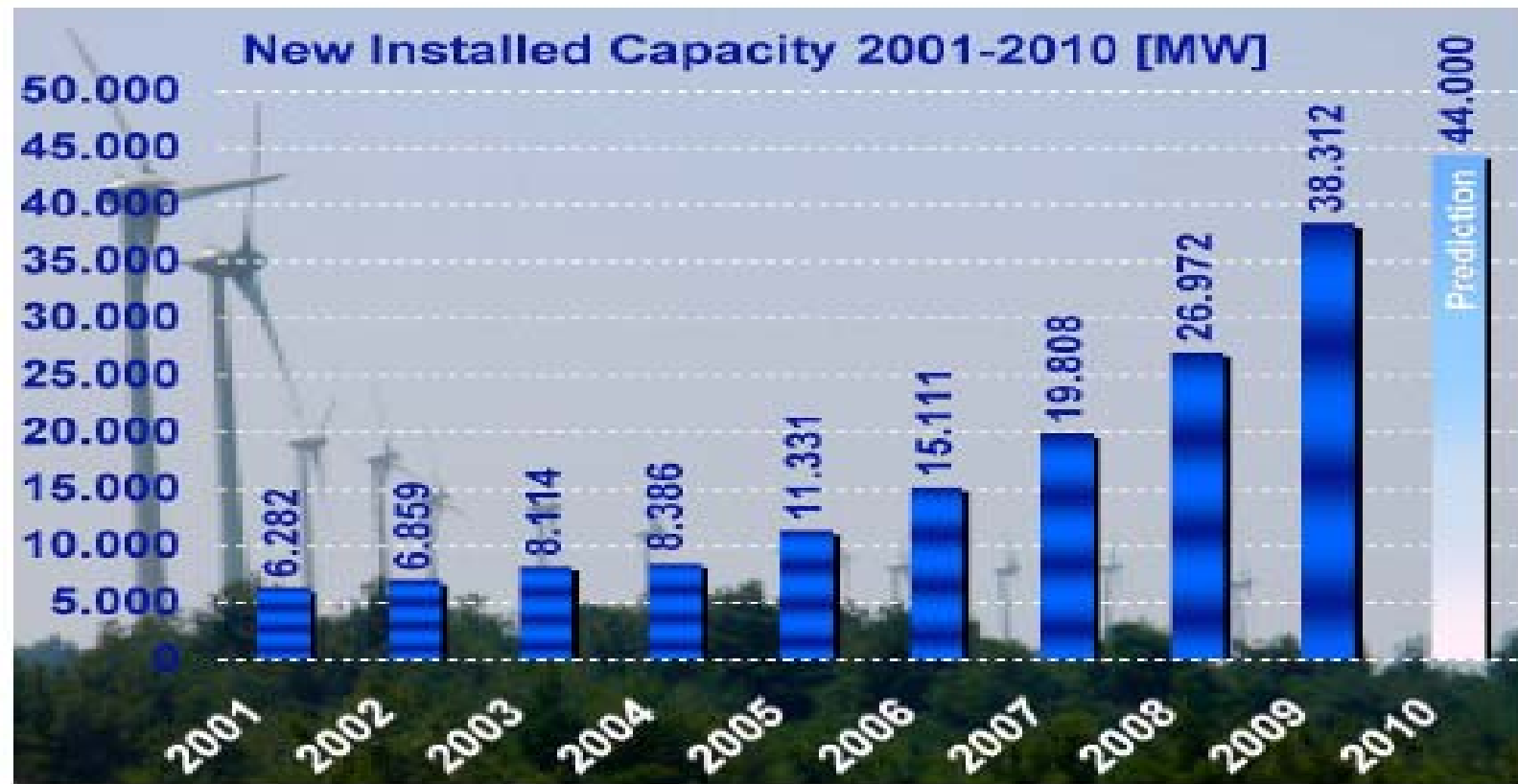
**1. WORLDWIDE CAPACITY REACHED 159'213 MW, OUT OF WHICH 38'312 MW WERE ADDED in 2009, I.E., A 31,7 % INCREASE OVER 2008, THE HIGHEST RATE SINCE 2001.**

**2. IF THE TREND THAT WIND CAPACITY DOUBLES EVERY THREE YEARS CONTINUES THE PREDICTION OF A GLOBAL CAPACITY OF 1'900'000 MEGAWATT IS POSSIBLE BY THE YEAR 2020.**

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## SOME CONSIDERATIONS ABOUT WIND GENERATION

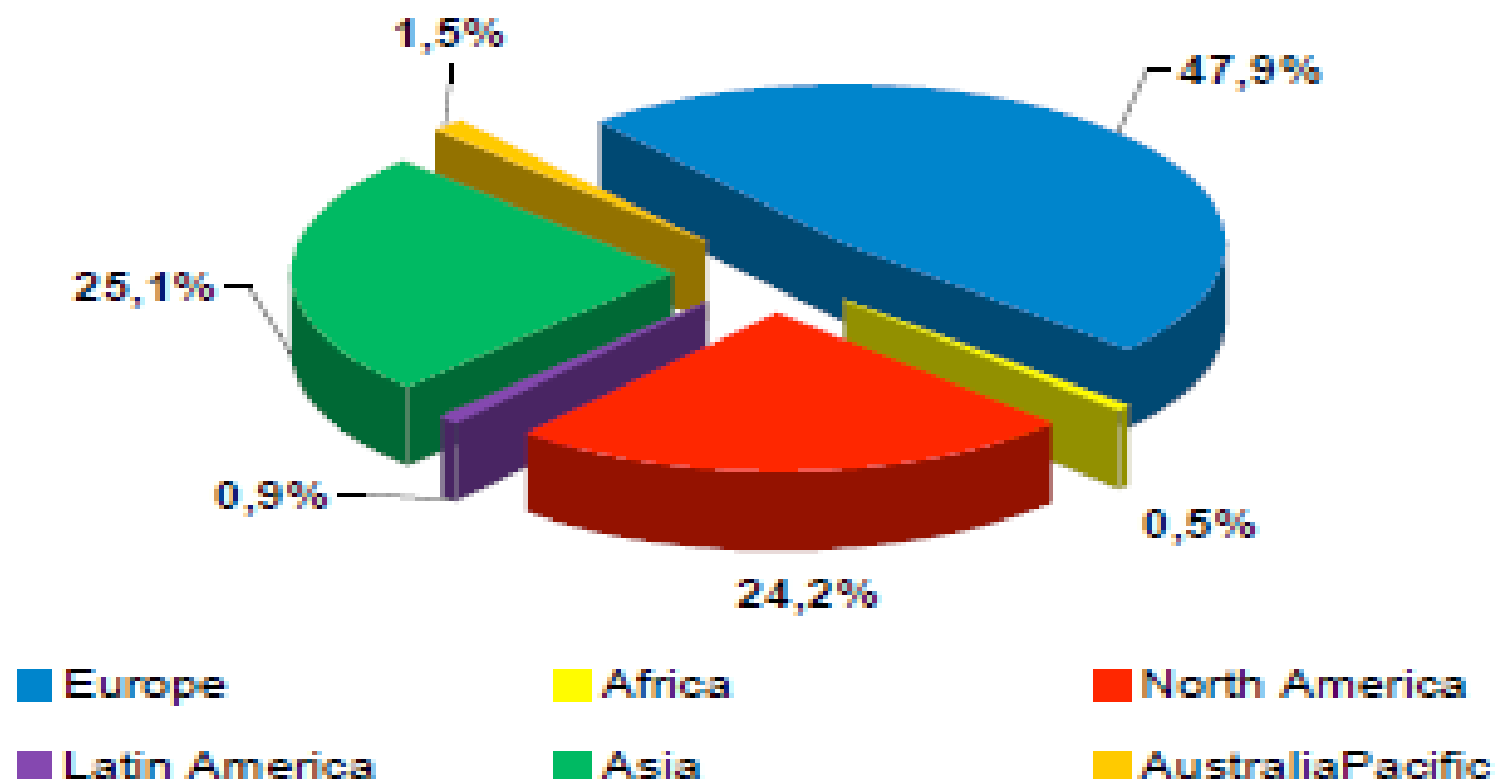


1. IN 2009 THE INSTALLATION OF NEW WIND TURBINES SHOWED A 42,1 % INCREASE WITH RESPECT TO 2008 AND REACHED AN OVERALL SIZE OF 38'312 MW.. TEM YEARS AGO, THE TOTAL AMOUNT OF WIND TURBINES WAS 4 GIGAWATT, ONLY ONE TENTH OF THE SIZE OF 2009.
  2. BY END OF 2009, 17 COUNTRIES HAD INSTALLATIONS OF MORE THAN 1'000 MEGAWATT.
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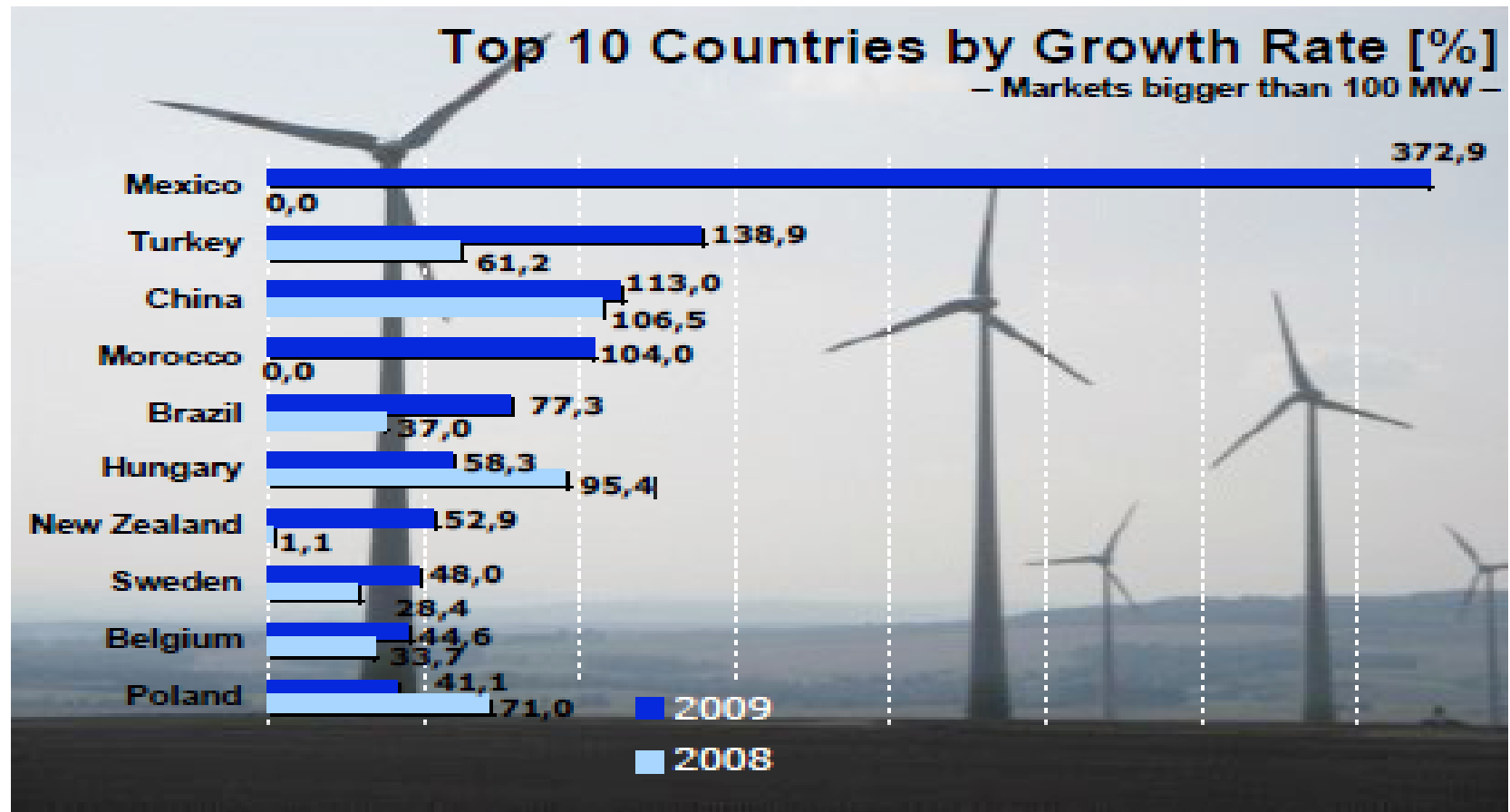
## SOME CONSIDERATIONS ABOUT WIND GENERATION

### Continental Share in Total Capacity 2009





## SOME CONSIDERATIONS ABOUT WIND GENERATION



1. THE GROWTH RATE IS THE RELATION BETWEEN THE NEW INSTALLED WIND POWER CAPACITY AND THE INSTALLED CAPACITY OF THE PREVIOUS YEAR.
  2. IT IS ENCOURAGING TO SEE THAT THREE OF THESE FOUR OF THE MOST DYNAMIC MARKETS CAN BE FOUND IN AFRICA AND IN LATIN AMERICA WERE THE AMOUNT OF WIND POWER IS STILL SMALL IN RELATION TO OTHER CONTINENTS.
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**PANEL SESSION**  
**“RECENT DEVELOPMENTS IN WIND POWER GENERATION”**

*Thursday, 26th August 2010. Palais des Congres de Paris  
 CIGRE 2010, Paris*

## AGENDA

<u>TIME</u>	<u>MANUFACTURER</u>	<u>TITLE OF PRESENTATION</u>	<u>SPEAKER</u>
13:45	OPENING & WELCOME CHAIRMAN SC A1 – ERLI FIGUEIREDO		
14:00	<b>GE ENERGY</b>	“WIND PLANT FUNCTIONALITY AND EMERGING GRID CODES”	NICHOLAS MILLER
14:20	<b>ACCIONA</b>	“ACCIONA WINDPOWER: GRID INTEGRATION EXPERIENCE ”	ÓSCAR ALONSO
14:40	<b>VESTAS</b>	“WIND POWER PLANT ELECTRICAL PERFORMANCE COMPLIANT WITH GRIDS & CONNECTION CODES”	PHILIP C. KJAER
15:00	<b>GOLDWIND</b>	“GRID-CONNECTED EXPERIENCES OF GOLDWIND MW DIRECT DRIVE PMSG WIND TURBINE”	YUAN QIAO
15:20	<b>HITACHI</b>	“IMPROVING COOLING OF A WIND TURBINE GENERATOR BY UNIFORM COOLING AIR”	TETSUO FUJIGAKI
15:40	COFFEE BREAK		
16:00	<b>GAMESA</b>	“DEVELOPMENT OF ELECTRICAL MACHINES IN WIND TURBINE POWER GENERATOR (WTG) ”	FRANCISCO JAVIER GARDE
16:20	<b>HYUNDAI</b>	“WIND TURBINE GENERATOR DEVELOPMENT AT HYUNDAI HEAVY INDUSTRIES”	JANOS GAL
16:40	<b>SIEMENS</b>	“PAST AND FUTURE WIND TURBINE TECHNOLOGY”	SOREN O. LIND
17:00 -18:00	<b>DEBATE</b> SAM SALEM ( A1 CONVENER OF NEW TECHNOLOGIES )		



## **DEBATE: KEY QUESTIONS TO OEMS:**

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**IN ORDER TO STIMULATE THE DEBATE THE FOLLOWING KEY QUESTIONS WILL BE PRESENTED TO THE OEMS FOR ANSWERING:**

- **WHAT ARE THE KEY CHALLENGES FACING BY WIND TURBINE MANUFACTURERS WITH REGARDS TO COMPLIANCE WITH GRID CODES, AND HOW ARE THESE CHALLENGES IMPACTING THE GENERATOR DESIGN, LOCALLY AND GLOBALLY?**
  - **PERMANENT MAGNET SYNCHRONOUS GENERATOR VERSUS DOUBLY FED INDUCTION GENERATOR: WHAT ARE THE BENEFITS AND LIMITATIONS OF EACH DESIGN FOR WIND APPLICATIONS. WHAT ARE THE TRENDS OF USING THESE DESIGNS FOR BUILDING BIGGER GENERATORS IN THE FUTURE?**
  - **HOW ARE THE NEW GENERATOR DESIGNS HELPING TO REDUCE WIND GENERATION COST PER K W?**
  - **HOW ARE THE NEW WIND GENERATOR DESIGN TOOLS, NEW MATERIAL, AND NEW TECHNOLOGY ENABLING BUILDING BIGGER WIND TURBINE GENERATORS?**
  - **HOW SUPERCONDUCTOR TECHNOLOGY COULD HELP CHANGING THE WIND GENERATION GAME?**
  - **WHAT ARE THE WIND GENERATOR DESIGN IMPROVEMENTS BEING MADE TO INCREASE WIND TURBINE SYSTEM RELIABILITY AND REDUCE DOWNTIME?**
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**Thank you for your attention**

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