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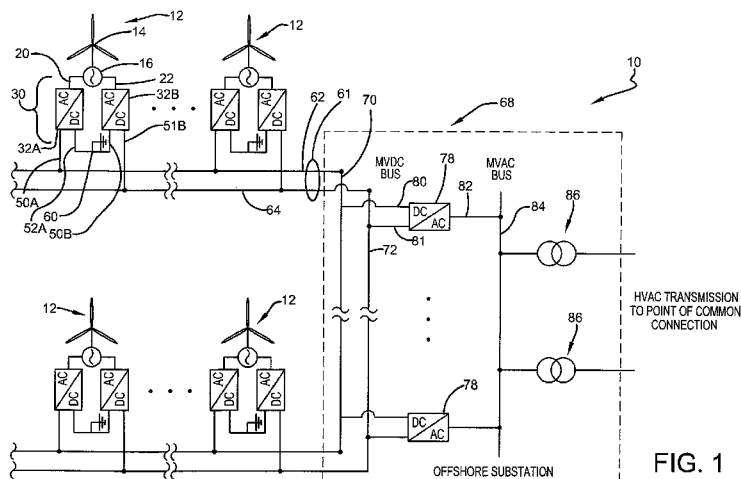


FIG. 1

(57) Abstract: A power generation system (10) includes at least one generator (16) having at least two sets of stator windings, an active rectifier (12) comprising power cell based modular converters associated with each set of generator windings. Each set of windings is connected to an AC voltage side of the associated active rectifier (32), with each active rectifier (32) having a positive DC voltage output (50A) and a negative DC voltage output (52B). The DC voltage outputs of active rectifiers are connected to each other in series. A medium voltage DC (MVDC) collection network comprises positive pole cables (62) and negative pole cables (64), wherein each positive pole cable (62) is connected to the positive DC voltage output (50B) of a first active rectifier (32) and each negative pole cable (64) is connected to the negative DC voltage output of a last active rectifier (32). A substation (68) receives the negative and positive pole cables of the MVDC collection network for further transformation and transmission.

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# INTERNATIONAL SEARCH REPORT

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**A. CLASSIFICATION OF SUBJECT MATTER**  
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According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
 H02J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
 EPO-Internal, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 2 341 594 A1 (CONVERTEAM TECHNOLOGY LTD [GB]) 6 July 2011 (2011-07-06) abstract; figures 1,7 -----	1-12
A	US 2010/133816 A1 (ABOLHASSANI MEHDI [US] ET AL) 3 June 2010 (2010-06-03) abstract; figures 2,5 -----	1-12

Further documents are listed in the continuation of Box C.
  See patent family annex.

\* Special categories of cited documents :

<p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&amp;" document member of the same patent family</p>
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Date of the actual completion of the international search	Date of mailing of the international search report
15 April 2014	25/04/2014

Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer  <p style="text-align: center;">Poth, Hartwig</p>
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# INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2341594	A1	06-07-2011	NONE
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US 2010133816	A1	03-06-2010	CN 102171449 A 31-08-2011
		DE 112010002781 T5	11-10-2012
		US 2010133816 A1	03-06-2010
		US 2010327666 A1	30-12-2010
		US 2011012364 A1	20-01-2011
		WO 2011008466 A2	20-01-2011
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