Title: METHOD FOR STARTUP AND MANAGEMENT OF A COMBINED CYCLE HEATING SYSTEM FOR THE PRODUCTION OF POWER, AND THE RELATIVE SYSTEM INVOLVED

Abstract: A method for startup and management of a combined cycle heating system for the production of power includes the execution of several functional units according to a predefined sequence.
Title: "Method for startup and management of a combined cycle heating system for the production of power, and the relative system involved."

This invention refers to a method for startup and management of a combined cycle heating system for the production of electric power in accordance with the preamble presented in claim 1. In the scope of this invention, "functional unit" and other similar expressions are used to indicate a clearly predefined sequence of sequential operations executed automatically and linked to one another; in short, these expressions are used to indicate a macro instruction composed of several minor instructions linked to one another from a standpoint of time and function. Furthermore, in the scope of this invention, the term "bottling" in reference to a heat recovery steam generator is used to indicate the total of a series of activities designed to isolate the same steam generator and the peak heating cycle from the external environment and other components of the system as much as possible, in order to retain all of the accumulated heat within the generator as long as possible. The bottling operation is executed by implementing opportune actions on the system's insulation systems (valves, dampers, etc.).

The electric power production systems described above, also noted as combined cycle systems in relation to the fact that these systems require a recovered heat steam cycle subordinate to a preliminary cycle to generate electric power through the implementation of one or more gas turbine and generator units, are quite common at present due to their extreme flexibility of use which allows variations in the quantity of produced power within an extended range of percentages in reasonable time limits, while maintaining good overall yield when the system reaches the fully operational phase. Moreover, the combined cycle heating system for the production of electric power can also be stopped and restarted within reduced time intervals. For combined cycle heating systems for the production of electric power, the transitory phase, which comprises the stages in which the system changes...
functioning modes, is very critical. Examples of possible transitory stages in the functioning of the system are as follows:

- during the startup phase from a stopped system through startup of a single gas turbine and generator unit and subsequent ground running and loading of the steam turbine (TV);
- during the startup phase of the second gas turbine and generator unit with the first gas turbine and generator unit already running, as well as the steam turbine;
- during the complete stopping of the system starting from an initial condition in which only one gas turbine and generator unit is operating or
- during the stopping of a gas turbine and generator unit from an initial condition in which two gas turbine and generator units are operating.

It is almost superfluous to explain how the aforementioned transitory stages of system operations are critical from the following points of view:

1) from the structural stress that the various system components are subjected to (for example, due to the heavy-duty operating conditions or the temperature fluctuations in the range of several hundreds of degrees absorbed within only a few hours) and

2) the decisional randomness and discretionality left to the operator when startup is carried out as a sequence of manual operations as opposed to automated operations

In addition, the transitory stages are penalized from the standpoint of comprehensive efficiency of the system, in particular as pertains to the startup phases.

Furthermore, it is also evident that during the transitory stages of the system startup from an initial condition with the system completely stopped there is an increase in polluting atmospheric emissions.

As described above, it is evidently necessary to operate the system through startup sequences and stopping procedures which:
- are as optimized as possible, in order to reduce the mechanical and thermal stress on the components,
- allow reduction to a minimum of the duration of the transitory stages without excessively penalizing the comprehensive yield of the system and
- allow reduction to a minimum of potential errors, limiting the discreational component of the operator as much as possible.

Since for each system component, such as, for example, the gas turbine and generator unit, the steam generator or the steam turbine must follow a specific functional unit, and it should be noted that a clearly determined sequence of subsequent operations, from startup to stopping, provided by the manufacturer of the same component in order to address the aforementioned requirement, creates the problem of how to correctly link the functional units of the various components of the system to obtain a harmonious startup and stopping procedure that takes the system from an initial condition of, for example, a stopped system, to a secondary condition of, for example, a running system. Currently, the aforementioned harmonious procedure for executing the correct sequence of functional units is the responsibility of the plant technicians, who start from a written sequence of the functional units specifically arranged for the system and follow the procedure. In this regard, it is appropriate to highlight the fact that even though this is correct from a chaining standpoint, the sequence of the functional units is executed according to timing on a case-by-case basis established by the plant technician, who based on personal gained experience evaluates the specific physical and functional parameters of the system, and decides based on personal experience which operations to carry out for commissioning the various components required for startup.

This procedural method is not satisfactory because it constantly requires the presence of plant technicians who have acquired long-term experience with the specific plant to start/stop the equipment, which inevitably leads to
conflict due to the fact that different technicians will implement different startup times, and even though they may be correct, this does not permit constant optimization of the procedure while at the same time satisfying this requirement.

The basic problem at the core of this invention is how to engineer and fine-tune a method that allows optimization of the startup and/or stopping sequences, partially or totally, for combined cycle heating systems for the production of electric power once the functional units are specified, or, rather, optimization of the specific operations to be carried out to startup or stop the specific components of the system.

This problem is resolved by a method for startup and management of a combined cycle heating system for the production of electric power in accordance with claim 1.

Secondarily, this problem is also resolved by a combined cycle heating system for the production of electric energy in accordance with claim 7, in which it is possible to implement the aforementioned method.

Further characteristics and advantages of the method according to the invention and the system based on the invention are described as follows with preferred implementation, by way of non-limiting examples, with reference to figure 1, which represents a diagram view of a combine cycle heating system for the production of electric power with implementation of the method according to the invention.

In accordance with the illustrations, the heating system for the production of electric power is composed of:

- a first gas turbine and generator unit TGI;
- a first heat recovery steam generator GRV1 to recover the latent heat in the exhaust from the first gas turbine and generator TGI;
- a second gas turbine and generator unit TG2;
- a second heat recovery steam generator GRV2 to recover the latent heat in the exhaust from the first gas turbine and generator unit TG2;
- a steam turbine (TV) with high pressure stages, medium pressure stages and low pressure stages in fluid communication with the first GRV1 steam generator through the high pressure steam lines, the medium pressure steam lines and, respectively, the low pressure steam lines;

- a high pressure steam collector (CAP), a medium pressure steam collector (CMP), and a low pressure steam collector (CBP) to create steam parallelism at high pressure, medium pressure and, respectively, low pressure between the first steam generator (GRV1) and the second steam generator (GRV2), the high pressure steam collector (CAP), the medium pressure steam collector (CMP), and the low pressure steam collector (CBP), respectively, in fluid communication with the high pressure steam lines, the medium pressure steam lines and the low pressure steam lines through which the different steam turbine (TV) stages are powered and

- a generator coupled with the steam turbine.

The system, according to the invention, also includes valves and similar devices which can be opened and closed to adjust system operation. These valves are not represented in the figure diagram and are not described in detail since they are components with which the specialized technician is already familiar.

Furthermore, the system according to the invention includes detection and control devices to detect and monitor several parameters correlated with correct functioning and/or malfunctioning of the system, in particular the first and second gas turbine and generator units TGI and TG2, the first and second steam generators GRV1 and GRV2 and the steam turbine TV.

Favorably, the system according to the invention includes a control and DCS processing unit (not demonstrated in the figure to render the representation as simple as possible) which memorizes:

- the single sequences of the functional units necessary for startup/stopping of the various parts of the system starting from
stopping and/or functioning conditions, total or partial, of the system and
- the different system conditions that must be detected using detection and control devices to consent to the execution of the functional units still to be implemented.

Favorably, the control and processing unit is connected to the aforementioned detection and control devices to:
- acquire and process information relative to the functioning and/or malfunctioning status of the various system components;
- following a request for a specific startup/stopping sequence from the memorized startup/stopping sequences, automatically and in sequence start the functional units of the specifically requested sequence, subordinate to detection by the detection devices of the necessary different system conditions, which must be verified to allow startup of each functional unit, checking the correct completion of each functional unit which is started.

As described above, the control and processing unit memorizes the single functional units, as well as the sequences of the functional units; in other words, several functional units linked to one another according to a preset and optimized sequence, corresponding to the various different startup and stopping procedures, total or partial, for the system according to the invention. At the same time, the aforementioned control and processing unit also memorizes the specific and different local conditions in the various system components and in the remaining parts of the system, which must be identified to consent execution of the functional units still to be executed. This takes place thanks to the fact that the control and processing unit continuously detects the specific and different local conditions in the various system components and in the remaining parts of the system and compares these with the reference values (the suitable values for providing consent), and if the values correspond it allows automatic startup of the
subsequent functional units in the required specific startup/stopping sequence.

In short, the system's control and processing unit permits automatic chained execution of the various functional units required for the sequence composed thanks to systematic automatic verification designed to provide consent for execution of a specific functional unit as soon as the detected values communicated to the control and processing unit satisfy the requirements memorized in the control and processing unit for execution of the functional units which still must be executed.

Therefore, in the system according to the invention, the linking of the various functional units necessary for system startup or stopping sequence, total or partial, no longer relies on the experience and discretion of the system operator, but is instead guaranteed to be optimum and repeatable through the system control and processing unit.

The following section describes some examples of implementation of the method according to the invention relative to some sequences of functional units necessary for a first operative configuration and a second operative configuration.

A) **Startup of a first gas turbine and generator unit TGI and steam turbine TV from stopped condition**

The startup phases of a first gas turbine and generator unit TGI and the steam turbine TV of the system include the following sequence of functional units:

- **GF1A:** Prepare startup of the aforementioned first gas turbine and generator unit TGI;
- **GF2A:** Startup of the aforementioned first gas turbine and generator unit TGI and pressurization of first steam generator GRV1;
- **GF3A:** Ground running and loading of the aforementioned steam turbine TV after startup of the first gas turbine and generator unit TGI with suction at condenser present.
In the system according to the invention, this startup sequence is characterized by the fact that it is composed of the following phases in order:

- through the use of the aforementioned detection and control means, verification of the effective completion of functional unit GF1A (preparation of the first gas turbine and generator TGI for startup) and, subordinate to verification of this condition, determination of automatic startup of the sequence for the aforementioned functional unit GF2A, which determines startup of the first gas turbine and generator unit TGI and the pressurization of the first steam generator GRV1, as well as

- through the use of the aforementioned detection and control means, verification of the effective completion of functional unit GF2A (startup of first gas turbine and generator unit TGI and pressurization of the first steam generator GRV1) and, subordinate to verification of this condition, determination of automatic startup of the functional unit GF3A, which determines ground running and loading of the steam turbine TV.

**B) Startup of a second gas turbine and generator unit TG2 with first gas turbine and generator TGI and steam turbine TV already running**

The startup phases for a second gas turbine and generator unit TG2 while the first gas turbine and generator unit TGI and the steam turbine TV are already running include the following sequence of functional units in order:

GF4A: Prepare the aforementioned second gas turbine and generator unit TG2 for startup;

GF5A: Startup of the aforementioned second gas turbine and generator unit TG2 and pressurization of the aforementioned steam generator GRV2 and
GF6A: Parallel insertion of steam between the aforementioned second steam generator GRV2 and the aforementioned first steam generator GRV1 through high pressure steam collectors CAP, medium pressure steam collectors CMP, and low pressure steam collectors CBP that supply, respectively, the high pressure stages, medium pressure stages and low pressure stages of the aforementioned steam turbine TV.

In the system according to the invention, this startup sequence is characterized by the fact that it is composed of the following phases in order:

- through the use of the aforementioned detection and control means, verification of the effective obtainment of the system conditions obtained following the correct execution of the functional unit GF1A (preparation of the aforementioned first gas turbine and generator unit TGI for startup) and, subordinate to verification of this condition, determination of automatic startup of the functional unit GF4A, which prepares the second gas turbine and generator unit TG2 for startup;

- through the use of the aforementioned detection and control means, verification of effective obtainment of the system conditions obtained following the correct execution of the aforementioned functional unit GF3A (ground running and loading of the steam turbine TV following startup of the first gas turbine and generator unit TGI) and, subordinate to verification of this condition, determination of automatic startup of the functional unit GF5A, which determines startup of the second gas turbine and generator unit TG2 and pressurization of the second steam generator GRV2, as well as

- through the use of the aforementioned detection and control means, verification of the effective obtainment of the system conditions obtained following the correct execution of the functional
unit GF5A (startup of the second gas turbine and generator unit TG2 and pressurization of second steam generator GRV2) and, subordinate to verification of this condition, determination of automatic startup of the sequence for the aforementioned functional unit GF6A, which establishes parallel steam between the second steam generator (GRV2) and the first steam generator (GRV1).

C) **Stopping the second gas turbine and generator unit (TG2) with the first gas turbine and generator unit (TGI) and steam turbine (TV) running**

The stopping phases of the second gas turbine and generator unit TG2 and the second steam turbine GRV2 while the first gas turbine and generator unit TGI and steam turbine TV are running include the following sequence of functional units in order:

GF4B: Interruption of the parallel steam between the second steam generator GRV2 and the steam from the first steam generator GRV1 and

GF3B: Stopping of the second gas turbine and generator unit TG2.

In the system according to the invention, this stopping sequence is characterized by the fact that it is composed of the following phases in order:

- through the use of the aforementioned detection and control means, verification of the effective obtainment of the system conditions obtained following the correct execution of the functional unit GF4B (interruption of parallel steam between the second steam generator (GRV2) and the first steam generator (GRV1) and, subordinate to verification of this condition, determination of automatic startup of the stopping sequence for the aforementioned functional unit GF3B to stop the second gas turbine and generator unit TG2.

Preferably, the aforementioned functional unit GF3B (stopping of the second gas turbine and generator unit TG2) also includes
simultaneous bottling of the second steam generator GRV2 in order to maintain the temperature pressure of the steam within the generator as long as possible.

D) **Complete stopping of the system starting from a condition with only the first gas turbine and generator unit (TGI) and the steam turbine (TV) running**

The phases for complete stopping of the system starting from a condition with only the first gas turbine and generator unit (TGI) and the steam turbine (TV) running include the following sequence of functional units in order:

- GF2B: Reduction of load in the first gas turbine and generator unit TGI and blocking of the steam turbine TV and
- GF1B: Stopping of the first gas turbine and generator unit TGI.

In the system according to the invention, this stopping sequence is characterized by the fact that it is composed of the following phases in order:

- through the use of the aforementioned detection and control means, verification of the effective completion of the aforementioned functional unit GF2B (reduction of load in the first gas turbine and generator unit TGI and blocking of the steam generator TV) and, subordinate to verification of this condition, determination of automatic startup of the stopping sequence for the aforementioned functional unit GF1B to stop the first gas turbine and generator unit TGI.

Preferably, the aforementioned functional unit GF1B (stopping of the first gas turbine and generator unit TGI) also includes simultaneous bottling of the first steam generator GRV1 in order to maintain the temperature pressure of the steam within the generator as long as possible.

As evident in the descriptions, the method according to the invention, as well as the system according to the invention, satisfy the
aforementioned requirement of simultaneously resolving the problems presented in the introduction of the description with reference to the technician. In fact, as described above, the linkage of the various functional units necessary to compose a startup or stopping sequence, partial or total, of the system, no longer relies on the experience and discretion of the system operator, but is instead guaranteed to be optimum and repeatable through the system control and processing unit. Obviously, a specialized technician, for the purpose of satisfying specific requirements, may implement numerous modifications and variations to the system and method described above, all of which are covered in the scope of protection of the invention as defined in the following claims.
Claims

1. Method for startup and management of a combined cycle heating system for the production of power including a first gas turbine and generator unit (TGI), a first steam generator (GRVI), a multi-stage steam turbine (TV) and a generator associated with the aforementioned steam turbine (TV), in which:

- the aforementioned first steam generator (GRVI) is a heat recovery steam generator to recover latent heat in the exhaust from the first gas turbine and generator unit (TGI);
- the aforementioned steam generator (GRVI) is in fluid communication through high pressure steam lines, medium pressure steam lines and low pressure steam lines with corresponding high pressure, medium pressure and low pressure stages of the aforementioned steam turbine (TV) and
- the aforementioned generator is cinematically coupled with the steam turbine to power rotational drive.

The aforementioned system includes detection and control devices to detect and monitor a range of parameters correlated to proper functioning and/or malfunctioning of the first gas turbine and generator unit (TGI), the first steam generator (GRVI), and the steam turbine (TV), with the system startup phases initiated from a stopped system condition with the following functional units in order:

GF1A: Preparation of the aforementioned first gas turbine and generator unit (TGI) for startup;
GF2A: Startup of the first gas turbine and generator unit (TGI) and pressurization of the aforementioned first steam generator (GRVI);
GF3A: Ground running and loading of the aforementioned steam turbine (TV) after startup of the first gas turbine and generator unit (TGI) with suction at condenser present.

This startup sequence is characterized by the fact that it is composed of the following phases in order:
through the use of the aforementioned detection and control means, verification of the effective completion of functional unit GF1A in preparation of the first gas turbine and generator (TGI) and, subordinate to verification of this condition, determination of automatic startup of the sequence for the aforementioned functional unit GF2A, which determines startup of the first gas turbine and generator unit (TGI) and the pressurization of the first steam generator (GRV1), and

-through the use of the aforementioned detection and control means, verification of the effective completion of functional unit GF2A and startup of the first gas turbine and generator unit (TGI) and pressurization of the first steam generator (GRV1) and, subordinate to verification of this condition, determination of automatic startup of the functional unit GF3A, which determines ground running and loading of the steam turbine (TV).

This sequence executes the entire system startup sequence in automatic mode.

2. Method in accordance with claim 1, in which the combined cycle heating system for the production of electric power also includes:

-a second gas turbine and generator unit (TG2),
-a second heat recovery steam generator (GRV2) to recover latent heat in the exhaust from the aforementioned second gas turbine and generator unit (TG2);

-the aforementioned second steam generator (GRV2) is in fluid communication through a high pressure steam collector (CAP), a medium pressure steam collector (CMP), and a low pressure steam collector (CBP) with the high pressure steam lines, the medium pressure steam lines, and the low pressure steam lines, respectively, of the aforementioned steam generator (GRV1) to power the aforementioned high pressure, medium
pressure and low pressure stages of the steam turbine (TV) through high pressure, medium pressure and low pressure steam parallelism between the first steam generator (GRV1) and the second steam generator (GRV2).

The aforementioned system includes detection and control devices to detect and monitor a range of parameters correlated to proper functioning and/or malfunctioning of the second gas turbine and generator unit (TG2) and the second steam generator (GRV2), with the system startup phases for the second gas turbine and generator unit (TG2) composed of the following functional units in order:

GF4A: Preparation of the aforementioned second gas turbine and generator unit (TG2) for startup;
GF5A: Startup of the aforementioned second gas turbine and generator unit (TG2) and pressurization of the aforementioned steam generator (GRV2) and
GF6A: Parallel insertion of steam between the aforementioned second steam generator (GRV2) and the aforementioned first steam generator (GRV1) through high pressure steam collectors (CAP), medium pressure steam collectors (CMP), and low pressure steam collectors (CBP) that respectively supply the high pressure stages, medium pressure stages, and low pressure stages of the aforementioned steam turbine (TV).

This startup sequence is characterized by the fact that it is composed of the following phases in order:

- through the use of the aforementioned detection and control means, verification of the effective obtainment of the system conditions obtained following the correct execution of the functional unit GF1A in preparation of the aforementioned first gas turbine and generator unit (TGI) for startup and, subordinate to verification of this condition, determination of automatic startup of the functional
unit GF4A, which prepares the second gas turbine and generator unit (TG2) for startup;

- through the use of the aforementioned detection and control means, verification of effective obtainment of the system conditions obtained following the correct execution of the aforementioned functional unit GF3A for ground running and loading of the steam turbine (TV) and subsequent startup of the first gas turbine and generator unit (TGI) with suction present at the condenser, and subordinate to verification of this condition, determination of automatic startup of the functional unit GF5A, which determines startup of the second gas turbine and generator unit (TG2) and pressurization of the second steam generator (GRV2), and

- through the use of the aforementioned detection and control means, verification of the effective obtainment of the system conditions obtained following the correct execution of the functional unit GF5A for startup of the second gas turbine and generator unit (TG2) and pressurization of second steam generator (GRV2) and, subordinate to verification of this condition, determination of automatic startup of the sequence for the aforementioned functional unit GF6A, which establishes parallel steam between the second steam generator (GRV2) and the first steam generator (GRV1).

This sequence executes the entire startup sequence for the aforementioned second gas turbine and generator unit (TG2) in automatic mode.

3. Method in accordance with claim 2, in which the stopping phases of the aforementioned second gas turbine and generator unit (TG2) and the aforementioned second steam generator (GRV2) include the following functional units in order:
GF4B: Interruption of the parallel steam between the second steam generator (GRV2) and the steam from the first steam generator (GRV1) and
GF3B: Stopping of the second gas turbine and generator unit (TG2), characterized by the fact that it is composed of the following phases:

- through the use of the aforementioned detection and control means, verification of the effective obtainment of the system conditions obtained following the correct execution of the functional unit GF4B with interruption of parallel steam between the second steam generator (GRV2) and the first steam generator (GRV1) and, subordinate to verification of this condition, determination of automatic startup of the stopping sequence for the aforementioned functional unit GF3B to stop the second gas turbine and generator unit (TG2), in order to execute the entire stopping sequence for the aforementioned second gas turbine and generator unit (TG2) in automatic mode.

4. Method in accordance with claim 3, in which the aforementioned functional unit GF3B, in order to stop the second gas turbine and generator unit (TG2), includes simultaneous bottling of the aforementioned second steam generator (GRV2) to maintain the pressure temperature of the steam within the generator as long as possible.

5. Method in accordance with claim 1, 3, or 4 in which the stopping phases of the aforementioned first gas turbine and generator unit (TGI) and the first steam generator (GRV1) include the following functional units in order:

GF2B: Reduction of load in the first gas turbine and generator unit (TGI) and blocking of the steam turbine (TV) and

GF1B: Stopping of the first gas turbine and generator unit (TGI), characterized by the fact that it is composed of the following phases:

- through the use of the aforementioned detection and control means, verification of the effective completion of the aforementioned functional unit GF2B with reduction of load in the first gas turbine
and generator unit (TGI) and blocking of the steam generator (TV) and, subordinate to verification of this condition, determination of automatic startup of the stopping sequence for the aforementioned functional unit GFIB to stop the first gas turbine and generator unit (TGI),

in order to execute the entire stopping sequence for the first gas turbine and generator unit (TGI) in automatic mode.

6. Method in accordance with claim 5, in which the aforementioned functional unit GFIB for stopping the aforementioned first gas turbine and generator unit (TGI) includes simultaneous bottling of the aforementioned first steam generator (GRV1) to maintain the temperature pressure within the generator for as long as possible.

7. Combined cycle heating system for the production of electric power including:

- a first gas turbine and generator unit (TGI);

- a first heat recovery steam generator (GRV1) to recover latent heat from exhaust from the aforementioned first gas turbine and generator unit (TGI);

- a steam turbine (TV) with high pressure, medium pressure and low pressure stages in fluid communication with the aforementioned first steam generator (GRV1) through high pressure, medium pressure and low pressure steam lines;

- a generator cinematically coupled with the aforementioned steam turbine (TV) to power rotational drive;

- detection and control devices to detect and monitor a range of parameters correlated to proper functioning and/or malfunctioning of the aforementioned system, in particular of the first gas turbine and generator unit (TGI), the first steam generator (GRV1) and the steam turbine (TV),

characterized by the fact that it includes a control and processing unit which memorizes:
-the single sequences of the functional units necessary to achieve startup/stopping of the various parts of the system starting from total or partial system stoppage and/or functioning and -the different system conditions that must be detected by the aforementioned detection and control devices to allow the execution of the functional units which must still be executed, in which this same control and processing unit is connected to the aforementioned detection and control devices in order to:
  - acquire and process the information related to the functioning and/or malfunctioning of the same system;
  -following a request for a specific startup/stopping sequence from the memorized startup/stopping sequences, automatically and in sequence start the functional units of the specifically requested sequence, subordinate to detection of the necessary different system conditions, which must be verified by the aforementioned detection and control devices to allow startup of each functional unit in the requested sequence, checking the correct obtainment of the system conditions obtained following correct execution of the subsequent functional unit according to the requested sequence.

8. System in accordance with claim 7, also including a second gas turbine and generator unit (TG2) and a second heat recovery steam generator (GRV2) to recover latent heat from the exhaust from the aforementioned second gas turbine and generator unit (TG2), in which:
  -the aforementioned second steam generator (GRV2) is in fluid communication through a high pressure steam collector (CAP), a medium pressure steam collector (CMP), and a low pressure steam collector (CBP) with the aforementioned high pressure, medium pressure and low pressure steam lines that power the high pressure, medium pressure and low pressure stages of the
steam turbine (TV) to create steam parallelism at high pressure, medium pressure and low pressure between the first steam generator (GRV1) and the second steam generator (GRV2),

- the aforementioned system includes additional detection and control devices to detect and monitor the correct functioning and/or malfunctioning of the second gas turbine and generator unit (TG2) and the second steam generator (GRV2) and

- the aforementioned control and processing unit is connected to the additional detection and control devices to acquire and process the information related to the functioning and/or malfunctioning status of the second gas turbine and generator unit (TG2) and the second steam generator (GRV2).

9. System in accordance with claim 8, in which the aforementioned first steam generator (GRV1) and the aforementioned second steam generator (GRV2) are generators with horizontal cylindrical bodies with three pressure levels and degasser.
**A. CLASSIFICATION OF SUBJECT MATTER**

INV. F01K23/10

**ADD.**

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)

F01K

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 practical, search terms used)

EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<td>US 4 028 884 A (MARTZ LYLE F ET AL) 14 June 1977 (1977-06-14) column 7, line 5 - column 9, line 7 column 37, line 67 - column 39, line 45 column 42, line 47 - column 45, line 49 column 50, line 17 - column 58, line 31 figures 1,9,14,17,20</td>
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Further documents are listed in the continuation of Box C. See patent family annex.

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**Date of the actual completion of the international search**

27 March 2012

**Date of mailing of the international search report**

16/04/2012

**Name and mailing address of the ISA/**

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**Authorized officer**

Coquau, Stephane
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