CLAIMS

1. A method (8) for operating a train system (T) comprising the steps of:

generating (81) power by a power source (2);

transmitting (82) the power generated by the power source (2) through a drive arrangement (1) including:

an input shaft (3) connected to the power source (2);

an output shaft (5); and

a hybrid gearbox (4) comprising

layshaft gearbox (41), connected to the input shaft (3) and to the output shaft (5), and comprising a star carrier (413) configured to adjust the transmission speed ratio of the layshaft gearbox (41) between the input shaft (3) and the output shaft (5), and

a speed ratio motor-generator unit (42), configured to control the rotation of the star carrier (413);

driving (83) an equipment (L) connected to the output shaft (5);

operating (84) the speed ratio motor-generator unit (42) to adjust the rotation of the star carrier (413) to set the transmission speed ratio of the layshaft gearbox (41) so as to adjust the speed (ω_o) and the torque (C_o) at the output shaft (5) when the power sources (2) is operated at constant speed (ω_i); and

recovering (86) with a power balance motor-generator unit (6), part of the power transmitted to the output shaft (5) and transforming it into electrical energy;

injecting the electrical energy into an electricity grid or battery packs (N) by the power balance motor-generator unit (6),

wherein the power balance motor-generator unit is operable as an electric motor to adjust the speed (ω_o) and the torque (C_o) of the output shaft (5), and

wherein the power balance motor-generator unit is operable as a generator to absorb at least part of the power transmitted to the output shaft (5) and to generate an electric current.

2. The method (8) of claim 1, wherein the power source (2) is a double-shaft gas turbine, or an electric motor or a steam turbine, or a single shaft gas turbine, or a diesel engine or a gas engine

3. The method (8) of claim 2, further comprising the step of gas/electric power balance (87) by using the power balance motor-generator unit (6), connected to a battery system, as a motor for delivering power to the output shaft (5), wherein the battery system builds spinning reserve and covers power surplus or deficit based on ambient conditions.

4. The method (8) of claim 1, further comprising the step of gas/electric power balance (87) by using the power balance motor-generator unit (6) connected to an electric grid, as motor for delivering power to the output shaft (5) to cover power surplus or deficit based on ambient conditions.

5. A computer program, comprising instructions which, when the program is executed by a computer (7), causes the computer (7) to carry out the steps of operating (84) the speed ratio motor-generator unit (42) and the recovering (86) of the method of claim 1.

6. A computer-readable storage medium, comprising the instructions which, when executed by a computer (7), cause the computer to carry out the steps of operating (84) the speed ratio motor-generator unit (42) and the recovering (86) of the method of claim 1.