**WHAT IS CLAIMED IS:**

1. A backup emergency disconnect signal (EDS) transmission system useable in an offshore oil and gas installation, comprising:

a pressure pulse generator located close to a water surface and configured to generate a predetermined pressure variation pattern corresponding to an emergency disconnect signal and including at least one of positive and negative pressure pulses, the signal being propagated downwards in a mud column; and

a pressure pulse receptor connected to a controller of blowout preventers, and configured to measure a pressure in the mud column, at a subsea location.

2. The backup EDS transmission system of claim 1, wherein the pressure pulse receptor is further configured to identify the pressure variation pattern corresponding to the EDS signal based on measured pressure values.

3. The backup EDS transmission system of claim 2, wherein upon identifying the pressure variation pattern, the pulse receptor is configured to forward the EDS to the controller of the blowout preventers.

4. The backup EDS transmission system of claim 1, further comprising:

the controller of the blowout preventers, the controller being configured to receive measured pressure values from the pressure pulse receptor and to identify the pressure variation pattern.

5. The backup EDS transmission system of claim 1, further comprising:

a surface controller connected to the pressure pulse generator and configured to send an EDS transmission trigger signal to the pressure pulse generator, wherein

the pressure pulse generator is further configured to generate the predetermined pressure variation pattern upon receiving an EDS transmission trigger signal from the surface controller.

6. The backup EDS transmission system of claim 5, wherein the surface controller is further configured to send the EDS transmission trigger signal to the pressure pulse generator when an emergency situation is detected or when receiving an operator request.

7. The backup EDS transmission system of claim 5, wherein the surface controller is further configured to send the EDS transmission trigger signal to the pressure pulse generator if a regular signal transmission is interrupted.

8. The backup EDS transmission system of claim 1, wherein the pressure pulse generator includes a valve placed on the mud column, and is further configured to generate the predetermined pressure variation pattern by opening and closing the valve.

9. The backup EDS transmission system of claim 1, wherein the pressure pulse generator includes a vent placed inside the mud column, and is further configured to generate the predetermined pressure variation pattern by venting the fluid in the mud column using the vent.

10. The backup EDS transmission system of claim 1, wherein the pressure pulse generator is configured to generate the predetermined pressure variation pattern at a frequency of few Hz.

11. The backup EDS transmission system of claim 1, wherein the pressure pulse generator is configured to generate the predetermined pressure variation pattern at a frequency selected to avoid frequencies of naturally occurring noise signals.

12. An offshore oil and gas installation, comprising:

a surface drilling platform or vessel;

a lower blowout preventer (BOP) stack attached to a wellhead located on a sea floor, and configured to interrupt a fluid flow from the wellhead;

a lower marine riser package (LMRP) detachably attached to the lower BOP stack;

a fluid pipe configured to allow the fluid flow between the wellhead and the surface drilling platform or vessel through at least one mud column;

a subsea controller attached to the LMRP, and configured to shutdown blowout preventers located in the lower BOP stack and the LMPR upon receiving and an emergency signal (EDS);

an electric line configured to transmit the EDS from the surface drilling platform or vessel to the subsea controller;

a pressure pulse generator located close to a water surface and configured to generate a predetermined pressure variation pattern corresponding to an emergency disconnect signal and including at least one of positive and negative pressure pulses, the signal being propagated downwards through the at least one mud column; and

a pressure pulse receptor connected to the subsea controller and configured to measure a pressure in the at least one mud column, at a subsea location.

13. The offshore oil and gas installation of claim 12, wherein the pulse receptor is further configured to identify the pressure variation pattern corresponding to the EDS based on measured pressure values and to upon identifying the pressure variation pattern, to forward the EDS to the subsea controller.

14. The offshore oil and gas installation of claim 12, wherein the pulse receptor is further configured to forward measured pressure values to the subsea controller, and the subsea controller is further configured to identify the pressure variation pattern.

15. The offshore oil and gas installation of claim 12, wherein the pressure pulse receptor is located on the LMRP.

16. The offshore oil and gas installation of claim 12, further comprising:

a surface controller connected to the pressure pulse generator and configured to send an EDS transmission trigger signal to the pressure pulse generator, wherein

the pressure pulse generator is further configured to generate the predetermined pressure variation pattern upon receiving an EDS transmission trigger signal from the surface controller.

17. The offshore oil and gas installation of claim 16, wherein the surface controller is further configured to send the EDS transmission trigger signal to the pressure pulse generator, if the electric or hydraulic communication line is interrupted.

18. The offshore oil and gas installation of claim 12, wherein the pressure pulse generator comprises at least one of a valve and a vent, and is further configured to generate the predetermined pressure pattern by performing at least one of opening and closing the valve, and venting the fluid in the at least one mud column using the vent.

19. The offshore oil and gas installation of claim 12, wherein the pressure pulse generator is configured to generate the predetermined pressure variation pattern at a frequency of few Hz, which is selected to avoid frequencies of naturally occurring noise signals.

20. A method for a backup transmission of an Emergency Disconnect Signal (EDS), the method comprising:

generating a pressure variation pattern corresponding to the EDS signal, at a first location, which is close to a surface end of a mud column;

measuring pressure values in the mud column, at a second location, which is close to blowout preventers;

identifying the pressure variation pattern corresponding to the EDS signal based on the pressure values; and

transmitting the EDS signal to a controller configured to close the blowout preventers.

**What is claimed is:**

1. An offshore drilling assembly, comprising:

a drilling riser containing a fluid column and having an upper end configured for support by a drilling vessel;

a subsea blowout preventer assembly having a blowout preventer (BOP) stack for securing to a subsea wellhead and a lower marine riser package (LMRP) detachably attached to an upper end of the BOP stack, the LMRP being connected to a lower end of the drilling riser;

a subsea controller mounted to the blowout preventer assembly and hydraulically connected with the BOP stack for controlling various functions of the BOP stack, including blocking upward flow through the drilling riser;

an electrical line extending from the subsea controller for connection to the drilling vessel for providing signals to the subsea controller;

a backup system to block upward flow through the drilling riser in the event signals to the subsea controller via the electrical line are interrupted, comprising:

a pressure pulse generator located within the drilling riser close to an upper surface of the fluid column and configured to generate a predetermined pressure variation pattern corresponding to an emergency disconnect signal (EDS) and including at least one of positive and negative pressure pulses, the signal being propagated downwards in the fluid column;

a pressure pulse receptor mounted to the blowout preventer assembly and configured to sense pressure variations in the fluid column at the blowout preventer assembly;

a subsea data processor electrically connected with the receptor for determining whether pressure variations sensed by the pressure pulse receptor comprise the pressure variation pattern propagated by the pulse generator corresponding to the EDS; and

wherein the data processor is electrically connected with the subsea controller to cause the subsea controller to block upward flow through the riser upon determining the pressure variation pattern corresponding to the EDS was detected by the pulse receptor.

2. The offshore drilling assembly of claim 1, wherein the pressure pulse receptor is mounted within a cavity of a blowout preventer of the blowout preventer assembly.

3. The offshore drilling assembly of claim 1, wherein the drilling riser comprises a central conduit for the passage of a drill string and at least one auxiliary conduit alongside and parallel to the central conduit, and wherein the pulse generator propagates the pressure variation, pattern down the central conduit.

4. The offshore drilling assembly of claim 1, further comprising a surface controller adapted to be mounted to the drilling vessel and electrically connected to the pressure pulse generator, the surface controller being configured to send an EDS transmission trigger signal to the pressure pulse generator to cause the pressure pulse generator to generate the pressure variation pattern.

5. The offshore drilling assembly of claim 4, wherein the surface controller has a process monitoring interface that monitors operational conditions of the oil and gas installation and causes the surface controller to send the EDS transmission trigger signal to the pressure pulse generator when operational conditions indicate such is needed.

6. The offshore drilling assembly of claim 1, wherein the pressure pulse generator includes a valve placed in the fluid column, and is further configured to generate the predetermined pressure variation pattern by opening and closing the valve.

7. The offshore drilling assembly of claim 1, wherein the pressure pulse generator includes a vent placed inside the fluid column, and is further configured to generate the predetermined pressure variation pattern by venting the fluid in the fluid

column using the vent.

8. An offshore drilling assembly, comprising: a lower blowout preventer (BOP) stack adapted to be attached to a wellhead located on a sea floor, and configured to interrupt a fluid flow from the wellhead;

a lower marine riser package (LMRP) detachably attached to the lower BOP stack;

a drilling riser connected to the LMRP and extending upward for support by a surface drilling platform or vessel, the drilling riser being filled with a fluid;

a subsea controller attached to the LMRP, and configured to close at least one blowout preventer located in the lower BOP stack upon receiving an emergency disconnect signal (EDS);

an electric line configured to transmit the EDS from the surface drilling platform or vessel to the subsea controller;

a back-up system in the event the EDS is unable to be transmitted via the electric line to the subsea controller, comprising:

a pressure pulse generator located within the drilling riser adjacent an upper end of the drilling riser and configured to generate a predetermined pressure variation pattern corresponding to the EDS and including at least one of positive and negative pressure pulses, the pressure variation pattern being propagated downwards through the fluid in the drilling riser;

a pressure pulse receptor mounted to the LMRP and in fluid communication with the fluid in the drilling riser for detecting pressure variations in the fluid;

a subsea data processing unit that analyzes the pressure variations detected by the pressure pulse receptor to determine whether the pressure variations detected by the pressure pulse receptor comprise the pressure variation pattern corresponding to the EDS; and

wherein the data processing unit is electrically connected to the subsea controller to signal the subsea controller to close the at least one blowout preventer

in the event the pressure variation pattern corresponding to the EDS is received.

9. The offshore drilling assembly of claim 8, wherein the pulse receptor is mounted within a cavity of one of the at least one blowout preventers.

10. The offshore drilling assembly of claim 8, wherein the drilling riser comprises a central conduit for the passage of a drill string and at least one auxiliary conduit extending alongside and parallel to the central conduit, and wherein the pulse generator propagates the pressure variation pattern down the central conduit.

11. The offshore drilling assembly of claim 8, further comprising: a surface controller adapted to be mounted to the surface drilling platform or vessel, the surface controller being electrically connected to the pressure pulse generator and configured to send an EDS transmission trigger signal to the pressure pulse generator to cause the pressure pulse generator to generate the pressure variation pattern.

12. The offshore drilling assembly of claim 11, wherein the surface controller has a process monitoring interface that monitors operational conditions of the oil and gas installation and is further configured to send the EDS transmission trigger signal to the pressure pulse generator in response to the operational conditions monitored.

13. The offshore drilling assembly of claim 8, wherein the pressure pulse generator comprises at least one of a valve and a vent, and is further configured to generate the predetermined pressure pattern by performing at least one of opening and closing the valve, and venting the fluid in the fluid in the riser using the vent.

14. A method for a backup transmission of an Emergency Disconnect Signal (EDS) for an offshore drilling riser assembly comprising:

a drilling riser containing a fluid column and having an upper end configured for support by a drilling vessel;

a subsea blowout preventer assembly having a blowout preventer (BOP) stack for securing to a subsea wellhead and a lower marine riser package (LMRP)

detachably attached to an upper end of the BOP stack, the LMRP being connected to a lower end of the drilling riser;

a subsea controller mounted to the blowout preventer assembly and hydraulically connected with the BOP stack for controlling various functions of the BOP stack, including blocking upward flow through the BOP stack; and

an electrical line extending from the subsea controller for connection to the drilling vessel for providing the EDS to the subsea controller;

the method comprising:

in the event the EDS sent via the electrical line is interrupted, generating a pressure variation pattern corresponding to the EDS in the riser at a point close to an upper end of the fluid column;

with a pressure pulse receptor, detecting pressure variations in the fluid column at the blowout preventer assembly;

with a subsea data processor, identifying whether the pressure variations detected comprise the pressure variation pattern corresponding to the EDS;

and if so, with the data processor, electrically communicating with the subsea controller to cause the BOP stack to block upward flow through the BOP stack.