CLAIMS

What is claimed is:

1. A subsea production system, comprising:

a subsea tree comprising:

a first valve configured to control a flow of reservoir fluid through the subsea tree; and

a second valve configured to control the flow of the reservoir fluid through the subsea tree; and

a bus system comprising:

a plurality of control modules configured to generate control signals to operate the first valve and the second valve;

a first electric bus configured to provide the control signals from a first control module of the plurality of control modules to the first valve;

a second electric bus configured to provide the control signals from a second control module of the plurality of control modules to the second valve;

a third electric bus configured to provide the control signals from a third control module of the plurality of control modules to the first valve and the second valve; and

a single cable comprising the first electric bus, the second electric bus, and the third electric bus, wherein the single cable couples the plurality of control modules to the first valve, from the first valve to the second valve, and from the second valve back to the plurality of control modules in a daisy chain.

2. The subsea production system of claim 1, wherein the first electric bus is configured to provide the control signals from a fourth control module of the plurality of control modules to the first valve.

3. The subsea production system of claim 2, wherein the first control module is a primary control module, and wherein the first electric bus is configured to provide the control signals from

the fourth control module to the first valve based on a loss of communication between the primary control module and the first valve.

4. The subsea production system of claim 2, wherein the first electric bus comprises wiring from the first control module to the first valve, from the first valve to a third valve, and from the third valve to the fourth control module.

5. The subsea production system of claim 1, wherein the second control module is not configured to operate the first valve.

6. The subsea production system of claim 5, wherein the first valve comprises a production master valve of the subsea tree and the second valve comprises a production wing valve of the subsea tree.

7. The subsea production system of claim 1, further comprising:

a second subsea tree comprising one or more valves;

a second bus system comprising a second plurality of control modules; and

a central controller comprising the plurality of control modules and the second plurality of control modules.

8. The subsea production system of claim 1, wherein the first valve comprises an electric actuator configured to operate the first valve based on the control signals.

9. The subsea production system of claim 1, wherein, in response to a fault condition, the first valve is configured to bridge the first electric bus and the third electric bus to couple the second valve to the first control module via the third electric bus and the first electric bus.

10. An electric bus system comprising:

a plurality of control modules configured to generate control signals to operate a plurality of valves, wherein each valve of the plurality of valves is operated via an electric actuator;

a first electric bus configured to provide the control signals from a first control module or a second control module of the plurality of control modules to a first electric actuator, wherein first wiring of the first electric bus couples the first control module to the first electric actuator and the second control module; and

a second electric bus configured to provide the control signals to the first electric actuator and a second electric actuator from a third control module or a fourth control module of the plurality of control modules, wherein second wiring of the second electric bus couples the third control module to the first electric actuator and the fourth control module.

11. The electric bus system of claim 10, further comprising a third electric bus configured to provide the control signals to the second electric actuator from a fifth control module of the plurality of control modules.

12. The electric bus system of claim 10, wherein the first electric actuator is configured to bridge the first electric bus and the second electric bus.

13. The electric bus system of claim 10, wherein a single cable comprises the first wiring and the second wiring.

14. The electric bus system of claim 10, wherein the second electric actuator does not communicate with the first control module via the first electric bus.

15. A method comprising:

providing, via a first bus, communication between a primary subsea control module and two or more electric actuators configured to operate respective production flowline valves of a subsea tree; and

in response to determining a fault in the communication between the primary subsea control module and the two or more electric actuators, providing, via the first bus, the communication to the two or more electric actuators via a secondary subsea control module, wherein the first bus is configured to couple the primary subsea control module and the secondary subsea control module with the two or more electric actuators, and wherein the two or more electric

actuators are daisy chained between the primary subsea control module and the secondary subsea control module.

16. The method of claim 15, further comprising, in response to determining a second fault in the communication to the two or more electric actuators via the secondary subsea control module, providing, via a second bus, the communication to the two or more electric actuators via a third subsea control module.

17. The method of claim 16, further comprising:

in response to determining a third fault in the communication to the two or more electric actuators via the third subsea control module, enabling, via a separate electric actuator, a bridge from a third bus to the second bus; and

providing, via the third bus and the second bus, the communication to the two or more electric actuators via a fourth subsea control module.

18. The method of claim 15, further comprising, in response to an electric actuator of the two or more electric actuators determining a loss of the communication, actuating the electric actuator to a default state.