CLAIMS

1. A method for loading liquefied nitrogen (LIN) into a cryogenic storage tank initially containing liquid natural gas (LNG) and a vapor space above the LNG, the method comprising:

providing a first nitrogen gas stream and a second nitrogen gas stream, where the first nitrogen stream has a temperature lower than a temperature of the second nitrogen gas stream;

offloading the LNG from the cryogenic storage tank while injecting the first nitrogen gas stream into the vapor space;

purging the cryogenic storage tank by injecting the second nitrogen gas stream into the cryogenic storage tank, to thereby reduce a methane content of the vapor space to less than 5 mol%; and

after purging the cryogenic storage tank, loading the cryogenic storage tank with LIN.

2. The method of claim 1, wherein the temperature of the first nitrogen gas stream is within 5 °C of a normal boiling point of the first nitrogen gas stream.

3. The method of claim 1 or claim 2, wherein the temperature of the second nitrogen gas stream is within 5 °C of a temperature of the LNG.

4. The method of any one of claims 1-3, wherein the first nitrogen gas stream and the second nitrogen gas stream are slip streams from a nitrogen liquefaction process.

5. The method of claim 4, further comprising using available cold from regasification of the LNG to liquefy the nitrogen in the nitrogen liquefaction process.

6. The method of claim 4, further comprising expanding a pressurized liquefied nitrogen gas stream in the nitrogen liquefaction process to produce LIN and a boil-off nitrogen gas stream, wherein a portion of the boil-off nitrogen gas stream is the first nitrogen gas stream.

7. The method of claim 6, further comprising, prior to expanding the pressurized liquefied nitrogen gas stream, cooling the pressurized liquefied nitrogen gas stream using the

boil-off nitrogen gas stream to produce a warm boil-off nitrogen gas stream, wherein a portion of the warm boil-off nitrogen gas stream is the second nitrogen gas stream.

8. The method of claim 4, wherein a gas stream ejected from the cryogenic storage tank during LIN loading is mixed with a nitrogen gas stream within the nitrogen liquefaction process.

9. The method of claim 8, wherein the nitrogen gas stream within the nitrogen liquefaction process comprises the second nitrogen gas stream.

10. The method of any one of claims 1-9, wherein a gas stream ejected from the cryogenic storage tank during LIN loading is mixed with a boil-off natural gas stream.

11. The method of any one of claims 1-10, wherein a gas stream ejected from the cryogenic storage tank from the purging of the cryogenic storage tank is mixed with an LNG boil-off gas stream.

12. The method of any one of claims 1-11, wherein a methane content of a gas in the vapor space prior to injecting the second nitrogen gas stream is less than 20 mol%.

13. The method of any one of claims 1-12, wherein a methane content of a gas in the vapor space prior to loading the LIN into the cryogenic storage tank is less than 2 mol%.

14. The method of any one of claims 1-13, wherein a methane content of the LIN after being loaded in the cryogenic storage tank is less than 100 ppm.

15. The method of any one of claims 1-14, wherein the first nitrogen gas stream and the second nitrogen gas stream have an oxygen concentration of less than 1 mol%.

16. The method of any one of claims 1-15, wherein a gas stream ejected from the cryogenic storage tank during LIN loading is mixed with a natural gas stream created by regasification of the LNG.

17. A method of purging a cryogenic storage tank initially containing liquid natural gas (LNG) and a vapor space above the LNG, the method comprising:

providing a first nitrogen gas stream with a temperature within 20 °C of a normal boiling point of the first nitrogen gas stream;

providing a second nitrogen gas stream with a temperature within 20 °C of a temperature of the LNG;

wherein the first nitrogen gas stream and the second nitrogen gas stream are slip streams from a nitrogen liquefaction process;

offloading the LNG from the cryogenic storage tank while injecting the first nitrogen gas stream into the vapor space;

injecting the second nitrogen gas stream into the cryogenic storage tank, to thereby reduce a methane content of the vapor space to less than 5 mol%; and

after injecting the second nitrogen gas stream into the cryogenic storage tank, loading the cryogenic storage tank with liquid nitrogen (LIN).

18. A dual-use cryogenic storage tank for alternately storing liquefied natural gas (LNG) and liquid nitrogen (LIN) according to the method of any one of the preceding claims, comprising:

a liquid outlet disposed at a low spot in the cryogenic storage tank and configured to permit liquids to be removed from the cryogenic storage tank;

one or more nitrogen gas inlet ports disposed at or near a top of the cryogenic storage tank, the one or more gas inlet ports configured to introduce nitrogen gas into the cryogenic storage tank as LNG is removed from the cryogenic storage tank through the liquid outlet;

one or more additional nitrogen gas inlet ports disposed near the bottom of the cryogenic storage tank and configured to permit additional nitrogen gas to be introduced into the cryogenic storage tank;

one or more gas outlet ports configured to permit removal of gas from the cryogenic storage tank as the additional nitrogen gas is introduced into the cryogenic storage tank; and

one or more liquid inlet ports configured to permit a cryogenic liquid such as LIN to be introduced into the cryogenic storage tank while the additional nitrogen gas is removed from the cryogenic storage tank through the one or more gas outlet ports.