CLAIMS

1. A method for producing liquefied natural gas (LNG) from a natural gas stream having a nitrogen concentration of greater than 1 mol%, where the method comprises:

at an LNG liquefaction facility, receiving a first liquefied nitrogen (LIN) stream and a second LIN stream, the first and second LIN streams being produced at a different geographical location than the LNG liquefaction facility;

liquefying the natural gas stream by indirect heat exchange with a nitrogen vent stream and the second liquefied nitrogen stream to form a pressurized LNG stream, where the pressurized LNG stream has a nitrogen concentration of greater than 1 mol%;

directing the pressurized LNG stream to a jet pump, and using the pressurized LNG stream as a motive fluid for the jet pump;

mixing the pressurized LNG stream and a lower pressure natural gas stream in the jet pump to produce a two-phase LNG stream, wherein the lower pressure natural gas stream has a pressure that is lower than a pressure of the pressurized LNG stream;

separating the two-phase LNG stream into an LNG vapor stream and an LNG liquid stream;

directing the LNG liquid stream to one or more stages of a column;

directing the LNG vapor stream to one or more lower stages of the column;

directing the first liquefied nitrogen stream to one or more upper stages of the column; and

producing an LNG stream and the nitrogen vent stream from the column.

2. The method of claim 1, wherein the column is one of a fractionation column, a distillation column, or an absorption column.

3. The method of claim 1 or claim 2, wherein the lower pressure natural gas stream comprises boil-off gas extracted from LNG storage tanks.

4. The method of claim 1 or claim 2, wherein the lower pressure natural gas stream comprises boil-off gas extracted from LNG during storage or unloading operations from an

LNG carrier ship.

5. The method of any one of claims 1 to 4, further comprising compressing the lower pressure natural gas stream prior to being directed to the column.

6. The method of any one of claims 1 to 5, further comprising:

indirectly exchanging heat between the nitrogen vent stream and the natural gas stream to form a warmed nitrogen vent stream.

7. The method of any one of claims 1 to 6, wherein the LNG stream has a nitrogen molar concentration of less than 1 mol%.

8. The method of any one of claims 1 to 7, wherein the nitrogen vent stream has a methane molar concentration of less than 0.1 mol%.

9. A method for producing liquefied natural gas (LNG) from a natural gas stream having a nitrogen concentration of greater than 1 mol%, where the method comprises:

at an LNG liquefaction facility, receiving one or more liquefied nitrogen (LIN) streams, the one or more LIN streams being produced at a different geographical location than the LNG liquefaction facility;

at least partially liquefying the natural gas stream by indirect heat exchange with a nitrogen vent stream to form a pressurized LNG stream, where the pressurized LNG stream has a nitrogen concentration of greater than 1 mol%;

directing the pressurized LNG stream to a separation vessel to produce an LNG vapor stream and an LNG liquid stream;

directing the LNG vapor stream to a jet pump, and using the LNG vapor stream as a motive fluid for the jet pump;

mixing the LNG vapor stream and a first lower pressure natural gas stream in the jet pump to produce a second lower pressure gas stream, wherein each of the first and second lower pressure natural gas streams have a pressure that is lower than a pressure of the pressurized LNG stream;

directing the LNG liquid stream to one or more stages of a column;

directing the second lower pressure natural gas stream to one or more lower stages of the column;

directing the one or more LIN streams to one or more upper stages of the column; and producing an LNG stream and the nitrogen vent stream from the column.

10. The method of claim 9, wherein the LNG stream has a nitrogen molar concentration of less than 1 mol%.

11. The method of claim 9 or claim 10, wherein the nitrogen vent stream has a methane molar concentration of less than 0.1 mol%.

12. The method of any one of claims 9 to 11, wherein the column is one of a fractionation column, a distillation column, or an absorption column.

13. The method of any one of claims 9 to 12, wherein the lower pressure natural gas stream comprises boil-off gas extracted from LNG storage tanks.

14. The method of any one of claims 9 to 13, wherein the lower pressure natural gas stream comprises boil-off gas extracted from LNG during storage or unloading operations from an LNG carrier ship.