WE CLAIM:

1. A process for separating and recovering ethane (C2) up to 99% and heavier hydrocarbons from LNG compositions including a range of mol 1% C2 to mol 52% C2 comprising the steps of:

a. providing an undivided feedstock stream containing Rich LNG wherein the Rich LNG is in liquid form from a storage tank or other source, the Rich LNG comprising C1 and C2+ hydrocarbons including a range of C2 content from mol 1% to mol 52%, the Rich LNG having an ambient storage temperature and pressure and an upstream pump or other motive power system providing a source pressure to pump the Rich LNG;

b. providing a heat exchanger having one cool side and one hot side; providing the upstream pump upstream of the heat exchanger cool side for pressurizing the feedstock Rich LNG; providing a first downstream pressure regulation valve downstream of the heat exchanger cool side for regulating the pressure in the heat exchanger cool side; and providing a combination of items downstream to provide variability of the pressure on the exchanger condensing hot side;

c. pumping the feedstock Rich LNG into the cool side of a heat exchanger, the heat exchanger having a cool side and a hot side;

d. heating the feedstock Rich LNG within the heat exchanger while utilizing a combination of the upstream pump and pressure regulation from the first downstream pressure regulation valve to maintain the feedstock Rich LNG below its bubble point to avoid or otherwise manage vaporization while heating against the heat exchanger hot side;

e. directing the undivided, non-vaporized, feedstock Rich LNG from the heat exchanger through the first downstream pressure regulation valve to a column arrangement, the column arrangement comprising a degasser, a processing column and a reboiler arrangement, the processing column being capable of receiving the feedstock Rich LNG directly from the first downstream pressure regulation valve in a first mode of column arrangement operation, the degasser being capable of receiving the feedstock Rich LNG directly from the first downstream pressure regulation valve in a second mode of column arrangement operation;

f. in the first mode of column arrangement operation, directing the feedstock Rich LNG feed stream from the heat exchanger through the pressure regulation valve and then into to a processing column, the column comprising one or more entry ports along the height of the column to permit directing the stream into the column at one or more entry locations along the height of the column, the column capable of operating in either an ethane rejection mode of operation or an ethane recovery mode of operation, the column further capable of operating at any particular pressure up to, and beyond if required, any process mixture thermodynamic critical pressure as required for operation of the column;

g. in the second mode of column arrangement operation, directing the feedstock Rich LNG from the heat exchanger through the pressure regulation valve and then into a degasser, the degasser comprising a first inlet for receiving the feedstock Rich LNG, a second inlet for receiving a recycled stream from a downstream process, and a first outlet for discharging any gas phase that may be present and a second outlet for discharging a degasser liquid stream;

h. while still in the second mode of column arrangement operation, directing the degasser first outlet discharge directly to the processing column and directing the degasser second outlet liquid stream, via its own pressure or via an additional pump, directly to the processing column;

i. in either of the first or second modes of column arrangement operation, separating in the column an overhead gas stream comprising lighter hydrocarbon products and a column bottoms liquid stream comprising heavier hydrocarbon products of compositions varied by operation of the column in modes of operation such as the ethane recovery mode or the ethane rejection mode;

j. in either of the first or second modes of column arrangement operation, directing the overhead gas stream from the column to the hot side of the heat exchanger;

k. in either of the first or second modes of column arrangement operation, cooling and condensing the overhead gas stream against the Rich LNG feedstock in the heat exchanger to form a condensed stream comprising condensed Lean LNG liquid, wherein the condensation process is capable of fully condensing the overhead gas stream;

l. in either of the first or second modes of column arrangement operation, directing the Lean LNG liquid from the hot side of the heat exchanger to a receiving vessel;

m. in either of the first or second modes of column arrangement operation, pumping the Lean LNG liquid from the receiving vessel at a desired pressure to storage or to another location for end use;

n. in either of the first or second modes of column arrangement operation, directing some of the column bottoms liquid stream from the column to one or more reboiler arrangements;

o. in either of the first or second modes of column arrangement operation, heating the some of the column bottoms liquid stream present in the one or more reboiler arrangements creating a heated reboiler stream and a heated reboiler product liquid stream;

p. in either of the first or second modes of column arrangement operation, returning at least a portion of the heated reboiler stream to the column, the column being further outfitted with one or more heated bottoms stream entry ports along the height of the column to permit directing the heated reboiler stream into the column flexibly at one or more heated reboiler stream entry locations along the height of the column;

q. in either of the first or second modes of column arrangement operation, discharging the column bottoms liquid stream from the column via the one or more reboiler arrangements to one or more a desired end use locations;

r. in the second mode of column arrangement operation, optionally recycling some of the heated reboiler product liquid stream, to the degasser to permit the recycled reboiler product liquid stream to mix with the feedstock Rich LNG or optionally recycling some of the column bottoms liquid stream, to the degasser to permit the recycled column bottoms liquid stream to mix with the feedstock Rich LNG, or optionally recycling some of the column bottoms liquid stream to the column;

s. in either of the first or second modes of column arrangement operation, discharging the some of the column reboiler product liquid stream, from the one or more reboilers to a desired location; and

t. transferring any gas in the receiving vessel to a desired location,

wherein the combination of step d. and step k. involving the heat exchange process are effectively managed by use of the pressure regulation on the heat exchanger cool side and the variability of the pressure on the heat exchanger hot side to permit the capability of achieving full condensation of the column overhead gas stream in the heat exchanger while preventing any temperature crosses or temperature pinch problems in the heat exchanger.

2. The process as claimed in claim 1, further comprising the steps of:

a. directing any gas stream that may be present in the degasser to the column, the column being further outfitted with one or more degasser gas stream entry ports along the height of the column to permit directing the degasser gas stream into the column at one or more desired degasser gas product entry locations along the height of the column.

3. The process as claimed in claim 1, wherein a portion of the column bottoms stream is directed to the degasser to mix and warm the feedstock Rich LNG.

4. The process as claimed in claim 1, wherein the Lean LNG liquid is directed to a storage facility or to further processing to vaporize the Lean LNG liquid.

5. The process as claimed in claim 1, wherein at least some of the Lean LNG liquid is directed to the column, the column being further outfitted with one or more Lean LNG liquid entry ports along the height of the column to permit directing the Lean LNG liquid into the column at one or more Lean LNG liquid entry locations along the height of the column.

6. The process as claimed in claim 1, comprising the additional steps of:

a. preferably pressurizing and directing at least some of the Lean LNG liquid into one or more additional heat exchangers,

b. providing an upstream pump upstream of the one or more additional heat exchangers for pressurizing the Lean LNG liquid,

c. pumping the Lean LNG liquid into the cool side of the one or more heat exchangers, the one or more heat exchangers each having a cool side and a hot side;

d. heating the Lean LNG within the one or more heat exchangers while utilizing a combination of a source pressure, via pump other motive power system, upstream of the one

or more heat exchangers and regulating internal pressure of the heat exchanger via a back pressure controller valve to maintain the Lean LNG liquid at a pressure within the exchanger to suppress as much as possible vaporization while heating,

e. directing the Lean LNG liquid from the one or more heat exchanger through a valve and into a lean LNG degasser or other vessel,

f. directing a liquid product stream from the lean LNG degasser or other vessel for end use, and

g. directing any gas stream in the lean LNG degasser or other vessel for end use.

7. The process as claimed in claim 6, comprising the additional step of directing the liquid product stream from the lean LNG degasser or other vessel into another heat exchanger and repeating the steps of:

a. preferably pressurizing and directing at least some of the Lean LNG liquid into one or more additional heat exchangers,

b. heating the Lean LNG within the one or more heat exchangers while utilizing a combination of a source pressure, via pump other motive power system, upstream of the one or more heat exchangers and regulating internal pressure of the heat exchanger via a back pressure controller valve to maintain the Lean LNG liquid at a pressure within the exchanger to suppress as much as possible vaporization while heating,

c. directing the Lean LNG liquid from the one or more heat exchanger through a valve and into a lean LNG degasser or other vessel,

d. directing a liquid product stream from the lean LNG degasser or other vessel for end use, and

e. directing any gas stream in the lean LNG degasser or other vessel for end use.

8. The process as claimed in claim 1, wherein the Lean LNG liquid is directed to a Rich LNG feedstock storage tank or other source containing the Rich LNG feedstock, the storage tank further comprising one or more Lean LNG liquid inlets located along the height of the storage

tank to permit introduction of the Lean LNG liquid into the storage either above and/or within the level of stored Rich LNG feedstock.

9. The process as claimed in claim 1, wherein the Lean LNG liquid is directed to any stored source of LNG, wherein it is sparged into the stored source of LNG.

10. The process as claimed in claim 1, wherein any gas phase in the receiving vessel is transferred to a compressor wherein the gas phase is compressed and then the compressed gas is directed for end use.

11. The process as claimed in claim 1, wherein the step of cooling and condensing the overhead gas stream against the Rich LNG feedstock condenses up to 100% of the gas.

12. The process as claimed in claim 1, wherein the discharged reboiler product liquid stream or the column bottoms liquid stream comprises up to 99% of the C2 hydrocarbons in the Rich LNG feedstock and up to 100% of the C3+ as a NGL, the discharged reboiler product liquid stream or the column bottoms liquid stream additionally meeting without any further processing a Pipeline Quality Specification of = or < 0.5%v C1.

13. The process as claimed in claim 1, wherein the discharged reboiler product liquid stream or the column bottoms liquid stream comprises an NGL Product with TVP of up to < 400 psig, up to C1 = or <0.5% v.

14. The process as claimed in claim 1, wherein the Rich LNG feedstock comprises between 1% mole C2 to that exceeding 40 to 50 mole % C2.

15. The process as claimed in claim 1, wherein the process runs in a high "ethane recovery" mode to recover 90% to 99% ethane and 99% propane.

16. The process as claimed in claim 1, wherein the column comprises about 10 theoretical trays.

17. The process as claimed in claim 1, wherein the column is selected from the group consisting of distillation columns, extractive distillation columns, reboiled absorption columns, absorption columns, lean oil absorber columns, fractionation columns, stripping columns, refluxed stripping columns, and reboiled stripping columns.

18. The process as claimed in claim 1, wherein a back pressure on the overhead gas in the hot side of the heat exchanger results from operation of equipment downstream of the hot side of the heat exchanger.

19. The process as claimed in claim 18, wherein the back pressure on the overhead gas in the hot side of the heat exchanger results from operation of the receiving vessel.