What is Claimed is:

1. A process of mixing natural gas with a hydrocarbon solvent to yield a liquid medium suited for storage and transport at greater storage densities than compressed natural gas at the same storage conditions, comprising:

combining natural gas with a liquid hydrocarbon solvent into a single phase liquid medium comprising the natural gas absorbed in the hydrocarbon solvent, wherein combining natural gas with the liquid hydrocarbon solvent into a single phase liquid medium includes optimizing a ratio of the liquid hydrocarbon solvent to the natural gas to optimize the storage densities of the natural gas of the single phase liquid medium for pressures and temperatures at which the single phase liquid medium is set to be stored in the storage vessel,

cooling the single phase liquid medium to a storage temperature in a range between -80 F and -120 F, and compressing the single phase liquid medium to a storage pressure in a range between 500 psig and 900 psig, and

storing the single phase liquid medium in a storage vessel at a storage temperature of less than -80 F to about -120 F and a storage pressure between 500 psig and 900 psig, wherein the natural gas of the single phase liquid medium is stored at storage densities that exceed storage densities of compressed natural gas for the same pressure and temperatures.

2. The process of claim 1 ~~further comprising the steps of cooling the single phase liquid medium to a storage temperature of less than -80 F to about -120 F, and compressing the single phase liquid medium to a storage pressure between 500 psig and 900 psig~~ wherein the step of optimizing the ratio of the liquid hydrocarbon solvent to the natural gas includes monitoring the composition of the natural gas and adjusting the mol percentage of the liquid hydrocarbon solvent to be combined with the natural gas.

3. The process of claim 1 wherein the hydrocarbon solvent is ethane, propane or butane, or a combination of two or more of ethane, propane and butane constituents.

4. The process of claim 1 wherein the natural gas is methane.

5. The process of claim 1 further comprising the step of recovering the natural gas unaltered from the single phase liquid medium of natural gas absorbed in the hydrocarbon solvent.

6. The process of claim 1 further comprising the steps of
reducing the pressure of the single phase liquid medium of natural gas absorbed in the hydrocarbon solvent to separate the natural gas and hydrocarbon solvent, and

14. The process of claim 1, wherein the hydrocarbon solvent is a natural gas liquid (NGL) solvent with a propane bias of 75% C3 to 25% C4 and the volumetric ratio of the natural gas component of the single phase liquid medium being in a range of about 187 to about 423.

15. The process of claim 14, wherein the concentration of the ethane hydrocarbon solvent is in a range of about 7 to 30 percent mol, the volumetric ratio of the natural gas component of the single phase liquid medium being in a range of about 274 to about 388.

16. The process of claim 1, wherein the hydrocarbon solvent is a natural gas liquid (NGL) solvent with a butane bias of 75% C4 to 25% C3 and the volumetric ratio of the natural gas component of the single phase liquid medium being in a range of about 167 to about 423.

17. The process of claim 16, wherein the concentration of the ethane hydrocarbon solvent is in a range of about 9 to 26 percent mol, the volumetric ratio of the natural gas component of the single phase liquid medium being in a range of about 297 to about 373.

~~18. The process of claim 1, wherein the step of combining natural gas with a liquid hydrocarbon solvent into a single phase liquid medium comprising the natural gas absorbed in the hydrocarbon solvent includes the step of optimizing a ratio of the liquid hydrocarbon solvent to the natural gas to optimize the storage densities of the natural gas of the single phase liquid medium for pressures and temperatures at which the single phase liquid medium is stored in the storage vessel.~~

~~19. The process of claim 18, wherein the step of optimizing the ratio of the liquid hydrocarbon solvent to the natural gas includes monitoring the composition of the~~

~~natural gas and adjusting the mol percentage of the liquid hydrocarbon solvent to be combined with the natural gas.~~

~~20. A single phase liquid medium comprising a natural gas component absorbed in a liquid hydrocarbon solvent, wherein the natural gas component within the single phase liquid medium (CGL) is compressible to storage densities that exceed storage densities of compressed natural gas (CNG) for the same storage pressure and temperatures, and wherein the hydrocarbon solvent is ethane (C2) and the volumetric ratio of the natural gas component being in a range of about 270 to about 414 at storage pressures and temperatures in a range of 500 psig to about 900 psig and less than -80 F to about -120 F.~~

~~21. The single phase liquid medium of claim 20 wherein the concentration of the ethane hydrocarbon solvent is in a range of about 9 to 23 percent mol, the volumetric ratio of the natural gas component being in a range of about 297 to about 388.~~

~~22. A single phase liquid medium comprising a natural gas component absorbed in a liquid hydrocarbon solvent, wherein the natural gas component within the single phase liquid medium (CGL) is compressible to storage densities that exceed storage densities of compressed natural gas (CNG) for the same storage pressure and temperatures, and wherein the hydrocarbon solvent is propane (C3) and the volumetric ratio of the natural gas component being in a range of about 196 to about 423 at storage pressures and temperatures in a range of 500 psig to about 900 psig and less than -80 F to about -120 F.~~

~~23. The single phase liquid medium of claim 22 wherein the concentration of the ethane hydrocarbon solvent is in a range of about 9 to 21 percent mol, the volumetric ratio of the natural gas component being in a range of about 326 to about 392.~~

~~24. A single phase liquid medium comprising a natural gas component absorbed in a liquid hydrocarbon solvent, wherein the natural gas component within the single phase liquid medium (CGL) is compressible to storage densities that exceed storage densities of compressed natural gas (CNG) for the same storage pressure and temperatures, and wherein the hydrocarbon solvent is butane (C4) and the volumetric ratio of the natural gas component being in a range of about 158 to about 423 at storage pressures and temperatures in a range of 500 psig to about 900 psig and less than -80 F to about -120 F.~~

~~25. The single phase liquid medium of claim 24 wherein the concentration of the ethane hydrocarbon solvent is in a range of about 6 to 28 percent mol, the volumetric ratio of the natural gas component being in a range of about 284 to about 376.~~

~~26. A single phase liquid medium comprising a natural gas component absorbed in a liquid hydrocarbon solvent, wherein the natural gas component within the single phase liquid medium is compressible to storage densities that exceed storage densities of compressed natural gas (CNG) for the same storage pressure and temperatures, and wherein the hydrocarbon solvent is a natural gas liquid (NGL) solvent with a propane bias of 75% C3 to 25% C4 and the volumetric ratio of the natural gas component being in a range of about 187 to about 423 at storage pressures and temperatures in a range of 500 psig to about 900 psig and less than -80 F to about -120 F.~~

~~27. The single phase liquid medium of claim 26 wherein the concentration of the ethane hydrocarbon solvent is in a range of about 7 to 30 percent mol, the volumetric ratio of the natural gas component being in a range of about 274 to about 388.~~

~~28. A single phase liquid medium comprising a natural gas component absorbed in a liquid hydrocarbon solvent, wherein the natural gas component within the single~~

~~phase liquid medium (CGL) is compressible to storage densities that exceed storage densities of compressed natural gas (CNG) for the same storage pressure and temperatures, and wherein the hydrocarbon solvent is a natural gas liquid (NGL) solvent with a butane bias of 75% C4 to 25% C3 and the volumetric ratio of the natural gas component being in a range of about 167 to about 423 at storage pressures and temperatures in a range of 500 psig to about 900 psig and less than -80 F to about -120 F.~~

~~29. The single phase liquid medium of claim 28 wherein the concentration of the ethane hydrocarbon solvent is in a range of about 9 to 26 percent mol, the volumetric ratio of the natural gas component being in a range of about 297 to about 373.~~

18~~30~~. A gas transport vessel comprising

a cargo hold, and

a containment system located in the cargo hold and adapted to store a single phase liquid medium comprising natural gas absorbed in a hydrocarbon gas solvent at storage pressures and temperatures associated with storage densities for the natural gas in the single phase liquid medium that exceeds the storage densities of compressed natural gas (CNG) for the same storage pressures and temperatures, wherein the containment system is adapted to store the single phase liquid medium at temperatures in a range of ~~less than~~ -80 F to ~~about~~ -120 F and at pressures in a range of 500 psig to 900 psig.

19~~31~~. The vessel of claim 3~~0~~18, wherein the containment system includes a looped pipeline system.

20~~32~~. The vessel of claim 19 ~~31~~ wherein the looped pipeline system adapted to store the single phase liquid medium at pressures in a range from 300 psig to 900 psig.

2133. The vessel of claim 19 ~~31~~ wherein the looped pipeline system includes recirculation facilities adapted to control temperature and pressure.

2234. The vessel of claim 19 ~~31~~ wherein the looped pipeline system is configured for serpentine fluid flow pattern between adjacent pipes.

2335. The vessel of claim 21 ~~33~~ further comprising a loading and mixing system adapted to mix natural gas with the liquid hydrocarbon solvent to form the single phase liquid medium.

2436. The vessel of claim 23 ~~35~~ further comprising a separation, fractionation and offloading system for separating the natural gas from the single phase liquid medium.

2537. The vessel of claim 24 ~~38~~ wherein the offloading system includes a displacement means for displacing the single phase liquid medium from the containment system.

2638. The vessel of claim 25 ~~37~~ wherein the displacement means further comprises a means for purging of a displacement fluid using an inert gas.

2739. The vessel of claim 24 ~~36~~ wherein the offloading system comprises a means for adjusting a gross heat content of an offloaded gas.

2840. A system for processing, storing and transporting natural gas from supply source to market, comprising

a production vessel comprising processing equipment modules configured to produce a single phase liquid medium comprising natural gas absorbed in a liquid hydrocarbon solvent by combining natural gas with a liquid hydrocarbon solvent into a single phase liquid medium comprising the natural gas absorbed in the hydrocarbon solvent while optimizing a ratio of the liquid hydrocarbon solvent to the natural gas to optimize the storage densities of the natural gas of the single phase liquid medium for pressures and temperatures at which the single phase liquid medium is set to be stored in the storage vessel, wherein the production vessel is moveable between natural gas supply locations,

a marine transport vessel comprising a containment system configured to store the single phase liquid medium at storage pressures and temperatures associated with storage densities for the natural gas that exceeds the storage

densities of compressed natural gas (CNG) for the same storage pressures and temperatures, wherein the marine transport vessel is configured to receive single phase liquid medium from the production vessel and load into the containment system, wherein the containment system is configured to store the single phase liquid medium at storage temperatures and pressures in the ranges of ~~less than~~ -80 F to ~~about~~ -120 F and ~~about~~ 500 psig to ~~about~~ 900 psig, and

an offloading vessel comprising separation, fractionation and offloading equipment modules for separating the single phase liquid medium into its natural gas and solvent constituents and offloading natural gas to storage or pipeline facilities, wherein the offloading vessel is configured to receive single phase liquid medium from the marine transport vessel and wherein the offloading vessel is moveable between natural gas market offloading locations.

2941. In a system for processing, storing and transporting natural gas from supply source to market, the system comprising

a production vessel comprising processing equipment modules configured to produce a single phase liquid medium comprising natural gas absorbed in a liquid hydrocarbon solvent by combining natural gas with a liquid hydrocarbon solvent into a single phase liquid medium comprising the natural gas absorbed in the hydrocarbon solvent while optimizing a ratio of the liquid hydrocarbon solvent to the natural gas to optimize the storage densities of the natural gas of the single phase liquid medium for pressures and temperatures at which the single phase liquid medium is set to be stored in the storage vessel, wherein the production vessel is moveable between natural gas supply locations, and

a marine transport vessel comprising a containment system configured to store the single phase liquid medium at storage pressures and temperatures associated with storage densities for the natural gas that exceeds the storage densities of compressed natural gas (CNG) for the same storage pressures and temperatures, wherein the marine transport vessel is configured to receive single phase liquid medium from the production vessel and load into the containment system, wherein the containment system is configured to store the single phase

liquid medium at storage temperatures and pressures in the ranges of ~~less than~~ -80 F to ~~about~~ -120 F and ~~about~~ 500 psig to ~~about~~ 900 psig.

30~~42~~. In a system for processing natural gas from supply source and producing, storing and transporting a single phase liquid medium comprising natural gas absorbed in a liquid hydrocarbon solvent to deliver natural gas to market, the system comprising

a marine transport vessel comprising a containment system configured to store the single phase liquid medium at storage pressures and temperatures associated with storage densities for the natural gas that exceeds the storage densities of compressed natural gas (CNG) for the same storage pressures and temperatures, wherein the marine transport vessel is configured to receive single phase liquid medium from the production vessel and load into the containment system, wherein the containment system is configured to store the single phase liquid medium at storage temperatures and pressures in the ranges of ~~less than~~ -80 F to ~~about~~ -120 F and ~~about~~ 500 psig to ~~about~~ 900 psig, and

an offloading vessel comprising separation, fractionation and offloading equipment modules for separating the single phase liquid medium into its natural gas and solvent constituents and offloading natural gas to storage or pipeline facilities, wherein the offloading vessel is configured to receive single phase liquid medium from the marine transport vessel and wherein the offloading vessel is moveable between natural gas market offloading locations.

31~~43~~. The system of claims 28~~40~~, 29 ~~41~~ or 30 ~~42~~ wherein the containment system comprises a looped pipeline containment system with recirculation facilities to maintain temperatures and pressures at selected points in the ranges of ~~less than~~ -80 F to ~~about~~ -120 F and about 500 psig to ~~about~~ 900 psig.

3244. The system of claim 31 43 wherein the looped pipeline system is configured for serpentine fluid flow pattern between adjacent pipes.

3345. The system of claims 2840, 29 41 or 30 42 wherein the containment system includes a displacement fluid loading and unloading system for loading the single phase liquid medium under pressure into the containment system and fully displacing the single phase liquid medium from the containment system.

3446. The system of claims 28 40 or 30 42 wherein the offloading system comprises a means for adjusting a gross heat content of an offloaded gas.

3547. A method for processing, storing and transporting natural gas from supply source to market, comprising

receiving natural gas on a production vessel comprising processing equipment modules configured to produce a single phase liquid medium comprising natural gas absorbed in a liquid hydrocarbon solvent, wherein the production vessel is moveable between gas supply locations,

producing a supply of single phase liquid medium for storage and transport by combining natural gas with a liquid hydrocarbon solvent into a single phase liquid medium comprising the natural gas absorbed in the hydrocarbon solvent while optimizing a ratio of the liquid hydrocarbon solvent to the natural gas to optimize the storage densities of the natural gas of the single phase liquid medium for pressures and temperatures at which the single phase liquid medium is set to be stored in the storage vessel,

cooling the single phase liquid medium to a storage temperature in a range between -80 F and -120 F, and compressing the single phase liquid medium to a storage pressure in a range between 500 psig and 900 psig,

loading the single phase liquid medium from the production vessel onto a marine transport vessel comprising a containment system configured to store the single phase liquid medium at storage pressures and temperatures associated with storage densities for the natural gas that exceeds the storage densities of compressed natural gas (CNG) for the same storage pressures and temperatures,

storing the single phase liquid medium in the containment system at storage temperatures and pressures in the ranges of less than -80 F to about -120 F and about 500 psig to about 900 psig,

unloading the single phase liquid medium from the containment system on the marine transport vessel to an offloading vessel comprising separation, fractionation

and offloading equipment modules for separating the single phase liquid medium into its natural gas and solvent constituents and offloading natural gas to storage or pipeline facilities, wherein the offloading vessel is moveable between gas market offloading locations,

separating the single phase liquid medium into its natural gas and solvent constituents, and

offloading the natural gas from the offloading vessel to storage or pipeline facilities.

3648. A method for processing, storing and transporting natural gas from supply source to market, comprising

receiving natural gas on a production vessel comprising processing equipment modules configured to produce a single phase liquid medium comprising natural gas absorbed in a liquid hydrocarbon solvent, wherein the production vessel is moveable between gas supply locations,

producing a supply of single phase liquid medium for storage and transport by combining natural gas with a liquid hydrocarbon solvent into a single phase liquid medium comprising the natural gas absorbed in the hydrocarbon solvent while optimizing a ratio of the liquid hydrocarbon solvent to the natural gas to optimize the storage densities of the natural gas of the single phase liquid medium for pressures and temperatures at which the single phase liquid medium is set to be stored in the storage vessel,

cooling the single phase liquid medium to a storage temperature in a range between -80 F and -120 F, and compressing the single phase liquid medium to a storage pressure in a range between 500 psig and 900 psig,

loading the single phase liquid medium from the production vessel onto a marine transport vessel comprising a containment system configured to store the single phase liquid medium at storage pressures and temperatures associated with storage densities for the natural gas that exceeds the storage densities of compressed natural gas (CNG) for the same storage pressures and temperatures, and

storing the single phase liquid medium in the containment system at storage temperatures and pressures in the ranges of ~~less than~~ -80 F to ~~about~~ -120 F and ~~about~~ 500 psig to ~~about~~ 900 psig.

3749. A method for processing natural gas from supply source and producing, storing and transporting a single phase liquid medium comprising natural gas absorbed in a liquid hydrocarbon solvent to deliver natural gas to market, comprising

storing a single phase liquid medium on a marine transport vessel comprising a containment system configured to store the single phase liquid medium at storage pressures and temperatures associated with storage densities for the natural gas that exceeds the storage densities of compressed natural gas (CNG) for the same storage pressures and temperatures, wherein the single phase liquid medium is stored at storage temperatures and pressures in the ranges of ~~less than~~ -80 F to ~~about~~ -120 F and ~~about~~ 500 psig to ~~about~~ 900 psig, and

unloading the single phase liquid medium from the containment system on the marine transport vessel to an offloading vessel comprising separation, fractionation and offloading equipment modules for separating the single phase liquid medium into its natural gas and solvent constituents and offloading natural gas to storage or pipeline facilities, wherein the offloading vessel is moveable between gas market offloading locations,

separating the single phase liquid medium into its natural gas and solvent constituents, and

offloading the natural gas from the offloading vessel to storage or pipeline facilities.

3850. The method of claims 3547, 36 ~~48~~ or 37 ~~49~~ further comprising the step of recirculating the stored single phase liquid medium to maintain its storage temperatures and pressures at selected points in the ranges of ~~less than~~ -80 F to ~~about~~ -120 F and ~~about~~ 500 psig to ~~about~~ 900 psig.