E3 REFRAC, LLC is a company dedicated to the development and commercialization of clean water technologies with a focus on the Energy Industry and Desalination opportunities. Our flagship process is a new technology based on a Low Pressure Pervaporation (LPV) system that incorporates a specially designed and manufactured membrane filter to flash evaporate clean water vapor from highly contaminated feed water sources such as produced and frac flow-back water from the Oil & Gas industry. The system is a low-pressure, vacuum assisted process and thus is unlike traditional nano-filtration and reverse osmosis systems that rely upon high pressure for operation.

Produced water in the oil and gas industry contains high concentrations of total dissolved solids ("TDS") (for example, up to about 25% or about 250,000 mg/L of TDS), resulting from organic compounds and inorganic salts. In addition to the natural constituents, the use of fracturing agents and the mix of fracturing backflow into the produced water make it even more challenging to treat. Meanwhile, the total water consumption among energy companies may be expected to almost quadruple to as much as about 15 billion gallons a day by 2035 from about 4.3 billion in 1995. Technologies, such as E3 REFRAC's LPV system, that can cost-effectively treat this water and be in compliance of environmental regulations are highly warranted to both industries and general public.

Conventional technologies are not typically effective nor even economical for produced water containing higher TDS concentrations. This would include produced water and frac flow-back water from certain shale gas producing areas. Currently, there are no cost-effective solutions in place, either stand-alone or treatment facilities, for treatment of super high TDS produced and frac water from oil and gas operations such as shale gas production. Thus, there is an imminent need for a new and cost-effective treatment technology.

E3 REFRAC, LLC's LPV system is a non-pressure driven membrane process that relies on differences in vapor pressure to drive mass transport across a semi-permeable membrane. The LPV system has a high sorption capacity for pure water, while maintaining a high salt rejection (e.g., greater than 99%). The rejection efficiency arises from a phase change that occurs within the membrane material (liquid to vapor), which means that all non-volatile materials may be rejected by the LPV system. Because the LPV process relies on differences in vapor pressure, rather than overcoming an osmotic pressure of a brine solution, it is capable of desalting waters (over 80% recovery rate) having high total dissolved solids concentrations (e.g., TDS greater than about 150,000 mg/L). Note that traditional reverse osmosis ("RO") may be limited to raw water TDS concentrations of up to approximately 36,000 mg/L at about a 50% recovery rate. Furthermore, because the LPV process does not require high pressure pumping systems, it has dramatically lower O&M costs with specific emphasis on lower power costs. The E3 REFRAC system and LPV process is a low cost but highly efficient treatment approach for oil and gas produced waters as well as frac flow-back water.

E3 REFRAC, LLC manufactures its system in a mobile unit specifically designed to treat highly contaminated water in the field. With the ability to remove dissolved solids such as **SALT** from a water source, this mobile plant offers a revolutionary new means of providing potable water to the public and environmental improvement to the ecosystem. Capable of operation under mobile - generator power, this unit can be mobilized to anywhere in the world, set up and placed into operation on very short notice and done so in a manner that can treat virtually any volume of water, based upon the number of units placed into operation.

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