Economics of LNG Cold Energy Utilization by Generation of Electricity

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Abstract

Liquefied natural gas (LNG) is stored as liquid at -162°C. It must be gasified by heating before it is transported as natural gas to consumers in a pipeline. Approximately 220 kWh/Mt of heat energy is required to regasify LNG into natural gas. This heat is traditionally supplied by cooling seawater in an open rack vaporizer (ORV) or by the combustion of natural gas in a submerged combustion vaporizer (SCV).

It has long been recognized that this “cold energy” is a valuable energy resource and its utilization can improve the economics of an LNG regasification terminal. At present, the utilization of this cold energy is done to a significant extent only in Japan. However, in recent times, there is a growing interest in the recovery and utilization of this cold energy, as evidenced by the increasing number of publications on this subject [1].

In this review, IHS Markit PEP examines one such process—the production of electricity using LNG cold energy in an organic Rankine cycle (ORC). The base case considered is an LNG regasification terminal with a processing capacity of 4 MMtpa of LNG using open rack and submerged combustion vaporizers.

This review addresses the technology and economics of the generation of electricity using the cold energy of LNG regasification in an ORC using propane or ethane as the motive fluid. It includes the process flow diagram, material balance, major equipment sizes, and specifications. Cost data, including battery limits and offsites costs, variable costs, capex, opex, and the overall production costs are provided. This review will be beneficial for planners, producers, and designers who are looking for independent data of LNG cold recovery using propane/ethane ORC. An interactive iPEP Navigator module of the process is included, which provides a snapshot of the process economics and allows the user to select the units and the global regions of interest.
Contents

1 Introduction 5
2 Summary 6
3 Industry status 8
   Natural gas 8
   LNG import-export 8
   LNG—largest importing and exporting markets 9
   LNG regasification terminals—existing and under construction 10
   LNG regasification terminals—currently using cold energy for electricity generation 20
4 Technology review 22
   Cold energy of LNG 22
   Methods to utilize cold energy of LNG 22
      Water desalination (cryo-desalination) 22
      Air liquefaction and cryogenic air separation 22
      Power generation 23
      CO₂ liquefaction or solidification 23
      Turbine inlet air cooling 23
      Space cooling 23
   Factors to consider for utilizing cold energy of LNG 23
      Reliability of availability of the “cold energy” receiver 23
      Demand matching 23
   Organic Rankine cycle 23
      Principle 23
      Steam Rankine cycle 24
      Organic Rankine cycle (propane) 25
      Organic Rankine cycle (ethane) 26
5 Process review 27
   Basis of design 27
   Base case 27
   Alternate case 1 28
   Alternate case 2 29
   Process description 29
      Section 100—Jetty, unloading arms 30
      Section 200—LNG storage 31
      Section 300—BOG handling system, metering 31
      Section 400—Vaporization (propane, ORC, SCV) 31
      Offsites and general service facilities 32
   Cost estimates 34
      Fixed capital costs 35
      Production costs 35
Appendix A—Design and cost basis 40
Appendix B—Cited references 45
Appendix C—Process flow diagrams 47
Tables

Table 2.1 Pros and cons of the two considered alternate cases over the base case 6
Table 2.2 Unit costs/consumptions 7
Table 2.3 Carbon and water footprint[1] 7
Table 3.1 Existing LNG regasification terminals 2020—excluding decommissioned and mothballed [6] 11
Table 3.2 LNG regasification terminals under construction in 2021—region-wise 17
Table 3.3 LNG regasification terminals under construction in 2021—project-wise [6] 18
Table 3.4 Cryogenic power plants in Japan [8] 20
Table 5.1 Basis of design 27
Table 5.1(a) Basis of design of vaporizers—base case 27
Table 5.1(b) Basis of design of vaporizers—alternate 1 (propane ORC) 28
Table 5.1(c) Basis of design of vaporizers—alternate 2 (ethane ORC) 29
Table 5.2 Stream flows 33
Table 5.3 Major equipment 34
Table 5.4 Utility summary 34
Table 5.5 Total capital investment 36
Table 5.6 Capital investment by section 37
Table 5.7 Production costs 38

Figures

Figure 3.1 Primary energy demand by fuel 8
Figure 3.2 Natural gas transportation cost 9
Figure 3.3 Existing regasification capacity—end-2020 [7] 10
Figure 3.4 Regasification capacity under construction by market—February 2021 [7] 16
Figure 3.5 Number of publications per year related to cold energy recovery from LNG regasification 21
Figure 4.1 Heat input to gasify LNG 22
Figure 4.2 Basic steam Rankine cycle 24
Figure 4.3 Power plant steam Rankine cycle 25
Figure 4.4 Propane ORC for LNG regasification 26
Figure 5.1 Propane ORC for LNG regasification 28
Figure 5.2 Ethane ORC for LNG regasification 29

Appendix C Figures

Figure 5.1(a) Process flow diagram—LNG regasification termination with propane ORC for electricity generation 48
Figure 5.1(b) Process flow diagram—propane ORC (organic cycle) package 49