

Explaining experience curves for LNG liquefaction costs: Will costs continue to fall?

by Mads Greaker¹ and Erik Lund Sagen

Abstract:

In this article we study the technological, institutional and organizational factors that have influenced the cost of liquefying natural gas for transporting it by ship to users far away from the gas reserve. We limit ourselves to estimating the effects on capital cost, that is, the cost of building a natural gas liquefaction plant.

Today, liquefied natural gas (LNG) is regarded as one of the fastest growing sub-sectors of the energy business. According to the major oil and gas journals, prospects for continued growth are good, partly because, costs are apparently falling. Clearly, potential future cost reductions will be central for the development of the LNG business. In the paper, we therefore look at the following two research questions: What are the factors driving the apparent fall in LNG liquefaction costs?

And, to what extent is the cost of LNG liquefaction likely to fall further?

In order to answer our research questions we have collected a unique data set with price and scale information on nearly all LNG liquefaction plants, the number of LNG technology suppliers at each point in time and an account of the technological advances that have occurred throughout the history of LNG liquefaction. The data are then used to estimate experience curves.

Experience curves are regarded as a powerful tool when it comes to predicting future cost gains. In its basic form, an experience curve explores the causal relationship between accumulated production at time t and average cost of production at time t . With this point of departure, it has been shown in numerous studies that a significant, negative trend can be found between the price of a new technology and accumulated supply of the new technology. However, there are at least three more mechanisms at work behind an experience curve. Firstly, costs may fall due to R&D, and not only accumulated experience. Secondly, there is often the case that the market for a new technology is poorly developed, and hence, potential scale advantages in the production technology cannot be explored. Lastly, we may also have an effect on the price through increased competition. When the market size picks up, more firms enter and start to supply the new technology, and prices fall.

While the two first mechanisms in principle can continue to work together for a long time, the limit of the two latter mechanisms with respect to cost savings is likely reached a lot sooner. In our study we have therefore separated the influence on costs from the different effects. With respect to LNG liquefaction costs, we find that the effect from increased competition among liquefaction technology suppliers is by far the strongest in explaining "the apparent fall in LNG costs". Further, we do not find any significant "experience effect", and only a modest "scale effect". Our preliminary conclusion is therefore that future cost reductions in LNG liquefaction might not look as promising as some seem to suggest.

¹ Statistics Norway, P.O. Box 8131 Dep., 0033 Oslo, Norway.
e-mail: mgr@ssb.no, phone +47 21 09 48 67, fax +47 21 09 49 63.