Designing onshore and offshore energy projects in seismic areas

Prodromos Psarropoulos[1 *]

[1] Structural & Geotechnical Engineer, BEng, MEng, MSc, PhD
School of Rural & Surveying Engineering,
National Technical University of Athens, Greece
* prod@central.ntua.gr

Abstract

Since society demands increasing availability and reliability of energy supply, together with improved environmental standards, the structural design of any onshore or offshore energy project (including its foundation) may be very demanding, depending on the circumstances. It is evident that in the case of long energy projects that traverse remote regions with extreme terrains and/or seabeds, such as a gas pipeline or a cable, the design may be more challenging due to the variety of geotechnical conditions and the potential geohazards along the routing. Nevertheless, in areas that are characterized by moderate or high seismicity the design of energy projects may be more complicated due to the various types of seismic loading. The seismic loading may be either dynamic due to the inertial forces developed on the mass of the structure(s) and/or quasi-static due to the permanent ground deformations (PGDs) caused by various earthquake-related geohazards, such as active-fault ruptures, slope instabilities, and soil liquefaction phenomena. The current paper tries through case studies to shed some light on these interesting issues of geotechnical earthquake engineering from a structural and a geotechnical perspective. The first part of the current paper focuses on the impact of local site conditions (i.e. soil stratigraphy, bedrock geomorphology, and/or surface topography) on the ground surface motion that will dominate the dynamic structural response. In the second part emphasis in given on the quantitative assessment of the earthquake-related geohazards and the realistic estimation of the PGDs that will actually determine the soil-structure interaction and the structural response / distress.