In view of the growing need for energy, the risk of exhaustion of fossil fuel and the problem of global warming, the nuclear energy is receiving added attention as a realistic and viable advanced solution. International collaborations on Generation IV (Gen-IV) fission reactors and on ITER and DEMO fusion reactors are developing. This is particularly the case in the sector of materials, where they hold the key to success of these systems.

The international community has recognized and planned its materials R&D work for Fusion and Gen-IV reactors with the following considerations:

1- The time allotted to materials R&D is short and may not allow development of totally new materials.
2- Activities required, to cover existing materials variations and service conditions necessary for reactor design, are very time consuming.
3- The work to be done must build upon the existing knowledge of materials and avoid duplications.

Although ITER for fusion and Generation four International Forum (GIF) for Gen-IV are important international collaborative programs, they are insufficient to meet all the national energy policies of the participating countries.

This paper provides an overview of the materials R&D carried out for fusion and Gen-IV reactors at international and national levels.

Materials programs discussed include both cross-cutting and reactor specific actions, where major tasks can be defined as:

- **Cross-cutting materials tasks:**
  - materials for high temperature service
  - materials with neutron damage tolerance
  - materials behavior analysis and modeling
  - high temperature design methodology

- **Reactor specific materials tasks:**
  - very high temperature alloys
  - carbon, high temperature ceramics and their composites
  - materials compatibilities

Starting with a brief introduction of materials R&D strategies, ITER and Broader Approach (BA), overall activities for fusion and GIF for Gen-IV will be reviewed. Domestic program overviews will be also provided with the emphasis on cross-cutting materials tasks.