

discussed below, including barriers to initial R&D, barriers to market entry and penetration, and barriers related to regulatory and legal issues.

1.4.1 Barriers to Research and Development

The buildings industry supports very little R&D. Manufacturers of building components and equipment conduct some proprietary research but they usually focus on down-stream issues of product performance and not on basic research leading to the development of new product lines (Moavenzadeh, 1985; Brown et al., 1986). This disinterest in R&D activity is often attributable to a situation in which innovations can be copied by competitors for less cost and risk than is paid by the developer. In addition, product line economics often make investments in energy-related R&D unattractive. While an innovation may represent a major breakthrough in performance or energy efficiency, it may also reduce the profitability of an existing product line. Companies offering the more profitable products that might be displaced will not invest in developing the innovation. They also may oppose the efforts of other companies to introduce the innovation. The solid-state ballast and radiant barrier (Section 4.2 and 5.3) illustrate⁵ this type of problem.

The ability of the buildings industry to conduct R&D is also inhibited by its fragmentation and decentralization. Decentralized industries are characterized by low rates of R&D spending and strong resistance to technological change (Nelson and Winter, 1977). The buildings industry is fragmented along many dimensions, inhibiting the flow of information among its members and reducing its ability to conduct research (Achenbach, 1982; Moavenzadeh, 1985; Brown et al., 1986). The industry's fragmentation is indicated by:

- the large number of small- and medium-sized firms (i.e., low concentration ratios);