Rationale for a Mobile Wireless MAN Standard:
Meeting the Five Criteria

1. Broad Market Potential

A standard project authorized by IEEE 802 shall have a broad market potential.
Specifically, it shall have the potential for:

a) Broad sets of applicability

The mobility enhancement will target the consumer and enterprise markets, allowing fast access to mobile IP applications, multi-media messaging, mobile videoconferencing, etc. Possible tariffed services include: games, video clips, virtual sightseeing, emergency services, location based services, financial services, telematics, telemedicine, etc. The user will have access to these services at data rates similar to those provided by the 802.16/802.16a standard, while stationary, walking, or mobile. For example, in a 6 MHz channel, the maximum data rate per user can be beyond 20Mbit/s.

The resulting standard will have a very broad applicability set because it will converge fixed and mobile services, allowing connectivity for high-speed data in both stationary and mobile situations using the same set of base stations. Large demand exists for such systems. For example, see "WCA Letter of Support for 802.16e" (C802.16sgm-02/26), from the trade association of the wireless broadband industry, the Wireless Communications Association International (WCA). The letter says:

-"WCA member companies (many of whom are service providers) have a great interest in this very topic. In particular, the U.S. spectrum known as the 'MDS' bands has historically been allocated for fixed use. Recent regulatory changes by the FCC in response to WCA efforts provide the opportunity to use the spectrum for combination of fixed and mobile purposes. Our members see great opportunities here."

-"We understand that IEEE 802 is, very appropriately, concerned that standardization projects be based in market requirements. So, we assure you that many of WCA's members are looking forward with keen interest to deploying fixed/mobile broadband wireless metropolitan area networks, and would be very interested in the future output of the IEEE 802.16e project."

b) Multiple vendors and numerous users

The possibility of multiple vendors introducing this equipment is indicated by the fact that the standard is to be developed by the IEEE 802.16 Working Group on Broadband Wireless Access, which has operated for nearly four years with the participation of hundreds of people from many companies from many countries. The standard will be based on standards that have been completed, or nearly completed, by the Working Group.

The possibility of multiple users is indicated by the letter of interest from the WCA (see (1a)). Many companies throughout the world have been granted rights to licensed spectrum for deployment of fixed broadband wireless access. As noted in (1a), recent regulatory changes by the FCC provide the opportunity to use MMDS spectrum for fixed and mobile purposes. The many holders of MMDS spectrum will certainly be interested in fixed/mobile deployments, if standardized equipment is available. The initiation of standardization efforts on this topic is also expected to influence regulatory regimes to liberalize their fixed wireless access rules to encompass mobility.

c) Balanced costs (LAN versus attached stations)

Portable 802.16a radio interfaces are expected to be similar in production cost to cellular air interfaces. The cost of adding such an interface to a mobile computer is expected to be much less than the cost of the computer.

2) Compatibility

IEEE 802 defines a family of standards. All Standards shall be in conformance with the IEEE 802.1 Architecture, Management and Interworking documents as follows: 802 Overview and Architecture, 802.1D, 802.1Q and parts of 802.1f. If any variances in conformance emerge, they shall be thoroughly disclosed and reviewed with 802.

Each standard in the IEEE 802 family of standards shall include a definition of managed objects which are compatible with systems management standards.

The proposed standard will conform to IEEE Standard 802 and the other cited documents, with the possible exception of the Hamming distance.

3. Distinct Identity

Each 802 standard shall have a distinct identity. To achieve this, each authorized project shall be:

a) Substantially different from other IEEE 802 standards.

IEEE 802.16 is the only IEEE 802 standard designed for metropolitan area networks (MANs). Other 802 wireless standards and projects that support mobile use do not offer the full set of key defining features of 802.16, including
*design for long-range MAN-sized macrocells
*high data rate
*scheduled MAC for full Quality of Service support
*specification for licensed bands
For these (and other) reasons, the 802.16 standard will be unlike any other standard or current project in 802.

It should also be noted that this project is tailored towards the addition of mobile service to fixed wireless MANs and does not conflict with mobility efforts ongoing in other Standards Development Organizations.

b) One unique solution per problem (not two solutions to a problem).

By modifying the existing 802.16 air interface, a unique solution will be developed. The mobile extension to the 802.16 standard will inherently provide a single BWA solution for both fixed and mobile applications.

c) Easy for the document reader to select the relevant specification.

It is anticipated that the document will be easily selectable by the user.

4) Technical feasibility

For a project to be authorized, it shall be able to show its technical feasibility. At a minimum, the proposed project shall show:

a) Demonstrated system feasibility

The feasibility of such systems has been demonstrated by proprietary systems that provide some, if not all, of the capabilities envisioned for this standard and are being deployed in many cities worldwide. Additionally, the current Digital Audio Broadcast (DAB) standard (ETSI EN300401) and Digital Video Broadcast – Terrestrial (DVB-T, ETSI EN300744), which support vehicular mobility in the downstream, utilize PHYs similar to the OFDMA PHY in the current 802.16a standard. The current 802.16a standard also does not preclude the incorporation of battery power saving mechanisms. The current 802.16a standard already includes various security features that can be readily extended to mobile operation.

b) Proven technology, reasonable testing

The radio technology proposed has been in existence for decades in both commercial and military environments. Similar proprietary systems currently exist.

In addition, the Worldwide Interoperability Microwave Access (WiMAX) Forum is a corporate consortium that supports the deployment of IEEE 802.16 systems by developing compliance and interoperability testing, both for 10-66 GHz (802.16) and 2-11 GHz (802.16a) systems. WiMAX plans to development an interoperability certification program and is actively engaged in discussions with IEEE-SA regarding such a program. WiMAX has supported the development of drafts that have become the basis of 802.16 standards projects regarding compliance testing. The existence of WiMAX and its earlier output makes the feasibility of developing interoperability tests, and doing so quickly, quite high.

c) Confidence in reliability

Commercial deployment of both point-to-point and point-to-multipoint systems at these frequencies by carriers is evidence of proven reliability. For example, high reliability, carrier class, microwave systems have been deployed for decades. Also, several proprietary systems, which utilize substantially similar PHYs, have been deployed for several years with high link availability.

5) Economic feasibility

a) Known cost factors, reliable data

The economic feasibility of the equipment has already been demonstrated at the level of proprietary systems now going into operation. The willingness of investors to spend large sums to acquire spectrum rights, plus the large additional investment required for hardware in public networks, attests to the economic viability of the wireless access industry as a whole.

b) Reasonable cost for performance.

Utilizing modern radio-modem technologies, defined by 802.16a or ETSI BRAN HIPERMAN, will minimize the subscriber radio cost. As demonstrated in many IEEE 802 standards over the years, the radio shared-media systems effectively serve users whose requirements vary dynamically, within the constraints of the total available rate. The cost of a single base station is amortized over a large number of users; that number may be quite high, since both fixed and mobile users are supported. In addition, due to the different traffic profiles of fixed and mobile users, some users may be able utilize significant bandwidth during periods (such as evening hours) when mobile use may be relatively light, thus providing more efficient use of the available bandwidth.

c) Consideration of installation costs.

The radio interfaces to mobile hand-held devices, such as PDAs and Laptops, can be customer installed or physically incorporated into the device at manufacture.

Base station installation can be costly. However, the cost to install an upgrade to a deployed 802.16a base station should be moderate. Furthermore, the use of 802.16 MANs, particularly of the 10-66 GHz variety, for base station backhaul can minimize the cost of interconnecting the base station to core network and provide flexibility of placement. Furthermore, since one base station may support many (fixed and mobile) users, the costs involved are low on a per-user basis. Where regulations permit, existing physical infrastructure could be utilized for base station installations.