QUANTUM VALLEY: SCIENCE & TECHNOLOGY

NEWS: Andhra Pradesh Government approves Amaravati Quantum Valley Declaration

WHAT'S IN THE NEWS?

The Andhra Pradesh government launched the Amaravati Quantum Valley Declaration (AQVD) to establish India's first global quantum technology hub, aligned with the National Quantum Mission. It aims to create an innovation ecosystem in quantum computing, sensing, and communication through massive investments and industry-academia partnerships.

Context and Announcement

- The Government of Andhra Pradesh has officially approved the Amaravati Quantum Valley Declaration (AQVD) in 2025.
- It aims to transform Amaravati into India's first **Quantum Valley** and position it as a **global hub for quantum technologies**.

Amaravati Quantum Valley Declaration (AQVD)

- AQVD is aligned with the goals of India's **National Quantum Mission (NQM)**.
- The declaration reflects a **multi-stakeholder collaboration** involving:
    - Andhra Pradesh state government
    - Global tech giants like **IBM**, **TCS**, **L&T**
    - Leading academic institutions
    - Quantum technology startups
- The plan includes the creation of **QChipIN**: India's largest open **quantum testbed**, where quantum computers and tools will be accessible for research and innovation.
- Investment targets:
    - **$500 million by 2027**
    - **$1 billion by January 2029**

Key Objectives

- Create a **quantum innovation ecosystem** that fosters R&D, skilling, and tech entrepreneurship.
- Develop core technologies in:
    - Quantum computing
    - Quantum communication
    - Quantum sensing

    - Quantum chip design and fabrication
- Make Amaravati the **deep-tech capital** of India.
- Promote **public–private partnerships** in emerging technologies.

Strategic Significance

- Enhances **India's self-reliance in quantum technology** to safeguard national interest and economic data.
- Reduces dependence on foreign quantum infrastructure, thus **ensuring data sovereignty**.
- Strengthens India's position in the **global quantum race**, with strategic implications for defense, cybersecurity, pharma, and logistics.

Quantum Computing: Core Concepts

- **Qubit**: The basic unit of quantum information; unlike binary bits, a qubit can be in **superposition** (0 and 1 simultaneously).
- **Superposition**: A quantum state enabling qubits to perform multiple calculations at once.
- **Entanglement**: A quantum property allowing qubits to be interlinked so that the state of one affects another, regardless of distance.
- **Quantum Gates**: Logical operations on qubits similar to classical logic gates, forming the basis of quantum algorithms.

Key Initiatives in India

- **National Quantum Mission (NQM)**:
    - Launched in 2023 with a budget of ₹6,003 crore.
    - Aims to develop quantum computers with **50–1000 qubits** by 2031.
- **QpiAI-Indus**:
    - India's first indigenous full-stack **quantum computer with 25 superconducting qubits**.
    - Built by Bengaluru-based firm QpiAI and launched in 2025.
- **Quantum Communication Projects**:
    - ISRO and SAC are developing **Quantum Key Distribution (QKD)** systems using satellites for ultra-secure data links.
- **Quantum Materials Research**:
    - Focused on superconductors and topological materials for stable and scalable quantum devices.

Challenges to Quantum Advancement

- **Error Correction**: Quantum systems are highly sensitive to noise and require robust error correction algorithms.
- **Scalability**: Building scalable systems with thousands of reliable qubits is a major technological hurdle.
- **Cost & Infrastructure**:
    - Quantum systems need **cryogenic environments** (~millikelvin temperatures).
    - High complexity and maintenance costs.
- **Talent Shortage**: A limited pool of experts and researchers in quantum computing, requiring urgent investment in education and skill development.

Conclusion and Future Outlook

- AQVD represents a transformative step in India's ambition to lead the **quantum revolution**.
- Through strong infrastructure, international collaboration, and a focus on R&D, Amaravati can become a **global nucleus** for quantum breakthroughs.
- Coupled with National Quantum Mission, it can make India a **key player in shaping future digital economies** and national security architectures.

Source: **https://www.thehindu.com/news/national/andhra-pradesh/andhra-pradesh-government-approves-amaravati-quantum-valley-declaration/article69782492.ece**