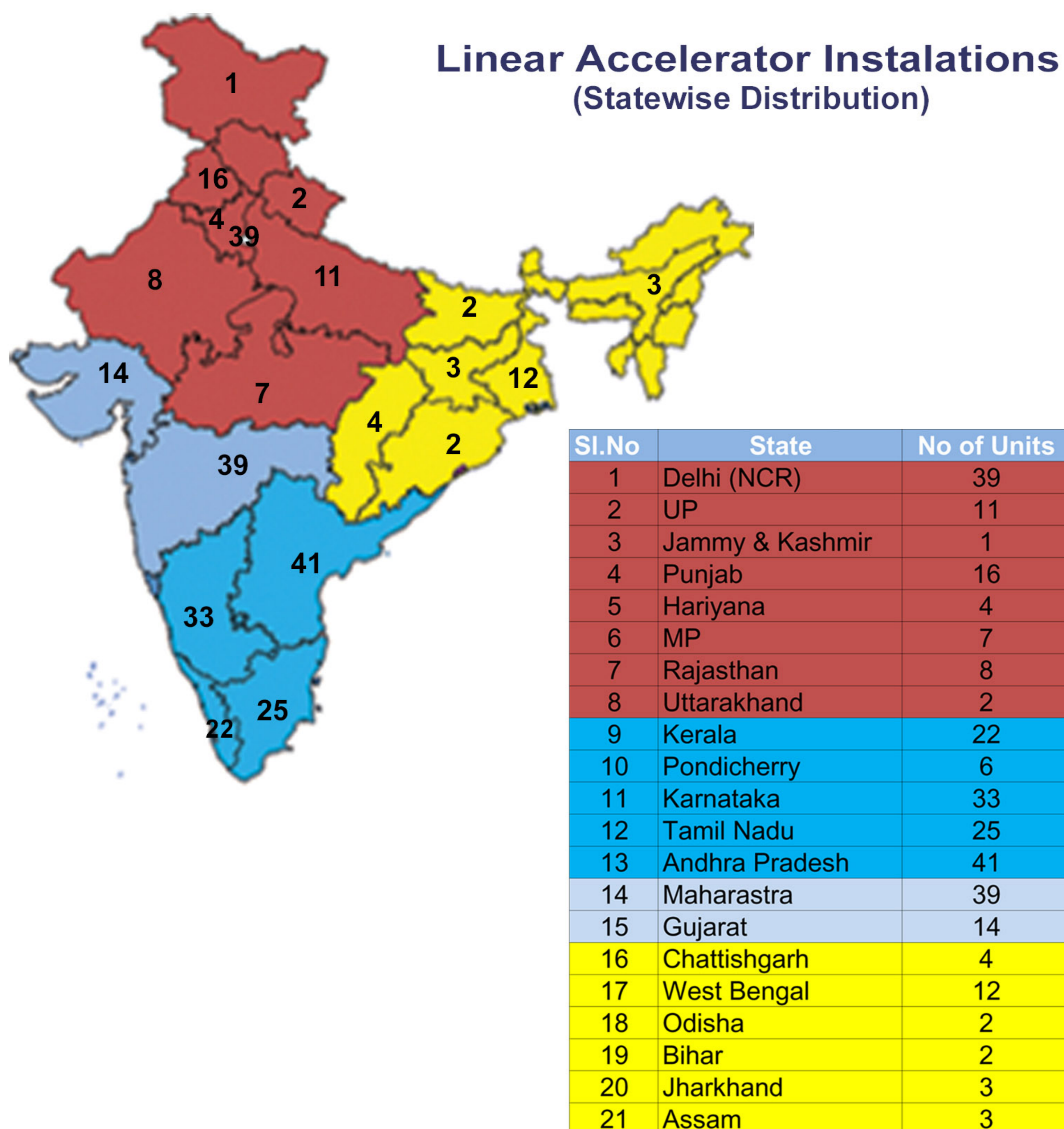


# PARTICLE THERAPY IN INDIA: A FEASIBILITY STUDY

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## Purpose/Objective

India, the 2nd most populated country and one of the top five GDPs of World today is yet to have its particle therapy facility including protons. The present study is aimed to evaluate the current status of radiotherapy technology in India and ascertain the feasibility of particle therapy in India.



## Materials and Methods

India had its first linear accelerator in 1982 but till the end of last century the number of Linear accelerator installations remained in single digits. In sync with the series of economic reforms that the country witnessed Radiotherapy Technology improved drastically in the new millennium. In the last decade there has been more than 1000% growth in numbers and the state of the units with capabilities for IGRT and SBRT Technologies have been installed in many parts of the country. The geographical distributions however show significant disparity. Most of the high tech centres are concentrated in a few Metro Cities. The cost of the treatment also vary drastically from Government run Institutes to the Corporate hospitals. Where the cost of the treatment is practically negligible in state run hospitals, the cost of treatment in corporate hospitals varies from USD 2000 for 3D Conformal Radiotherapy to USD 8000 for SBRT with Cyberknife.

## HISTORY OF RADIOTHERAPY IN INDIA

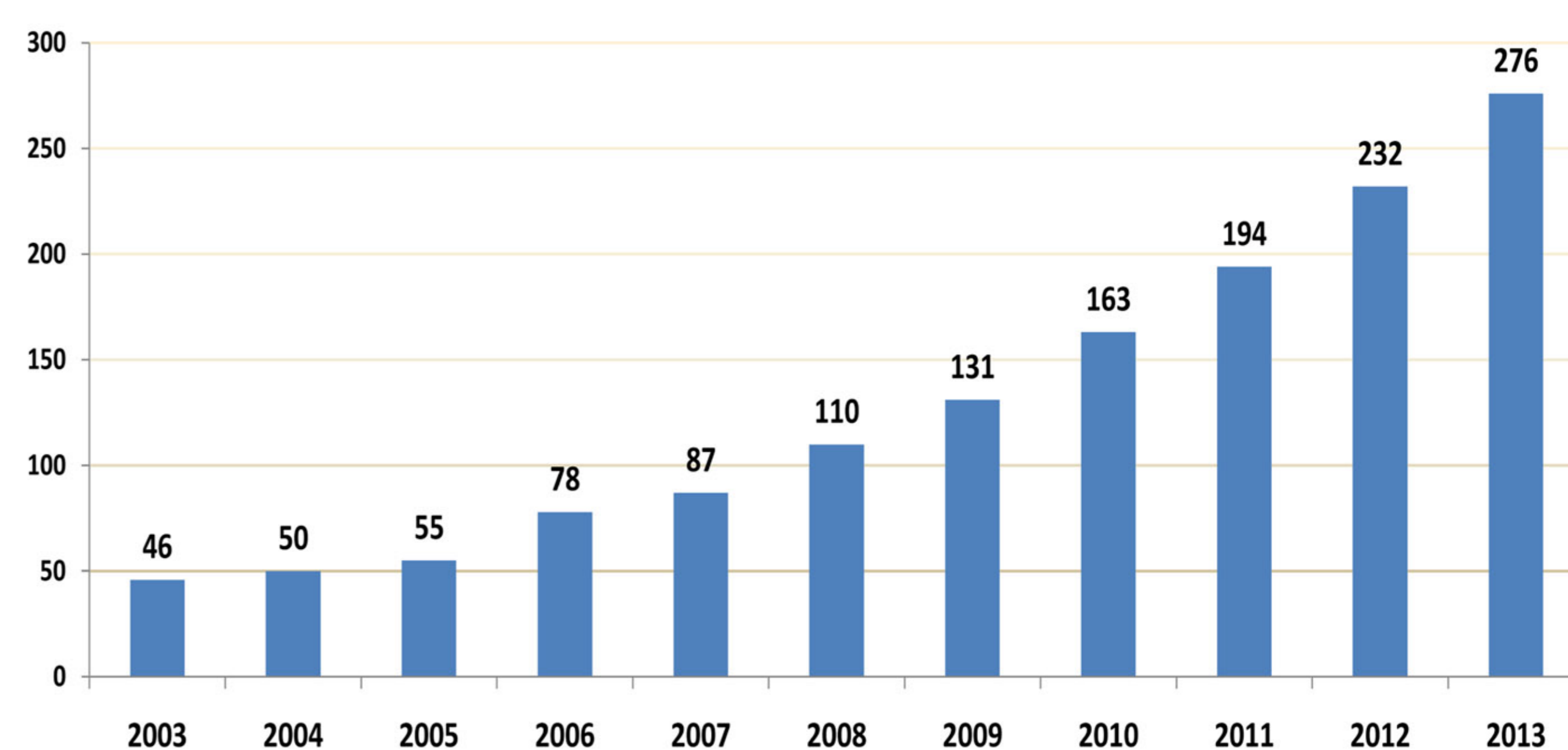
- Had a few centers before independence in 1947
- Got a few Co-60 units under Colombo plan in select cities
- 1st Linear Accelerator in 1982 - AIIMS, New Delhi
- Growth in Radiotherapy was primarily with Co-60 units
- 1st Stereotactic Radiosurgery in 1995
- 1st Linear Accelerator with Multi Leaf Collimator in 1997
- 1st IMRT treatment delivered in 2001

The first Proton Therapy facility has been ordered in January 2013 by the Apollo Hospitals group in Chennai. The first Hardon Therapy facility has been initiated by Tata Memorial Centre, Mumbai under the aegies of Department of Atomic Energy (DAE) in January 2014.

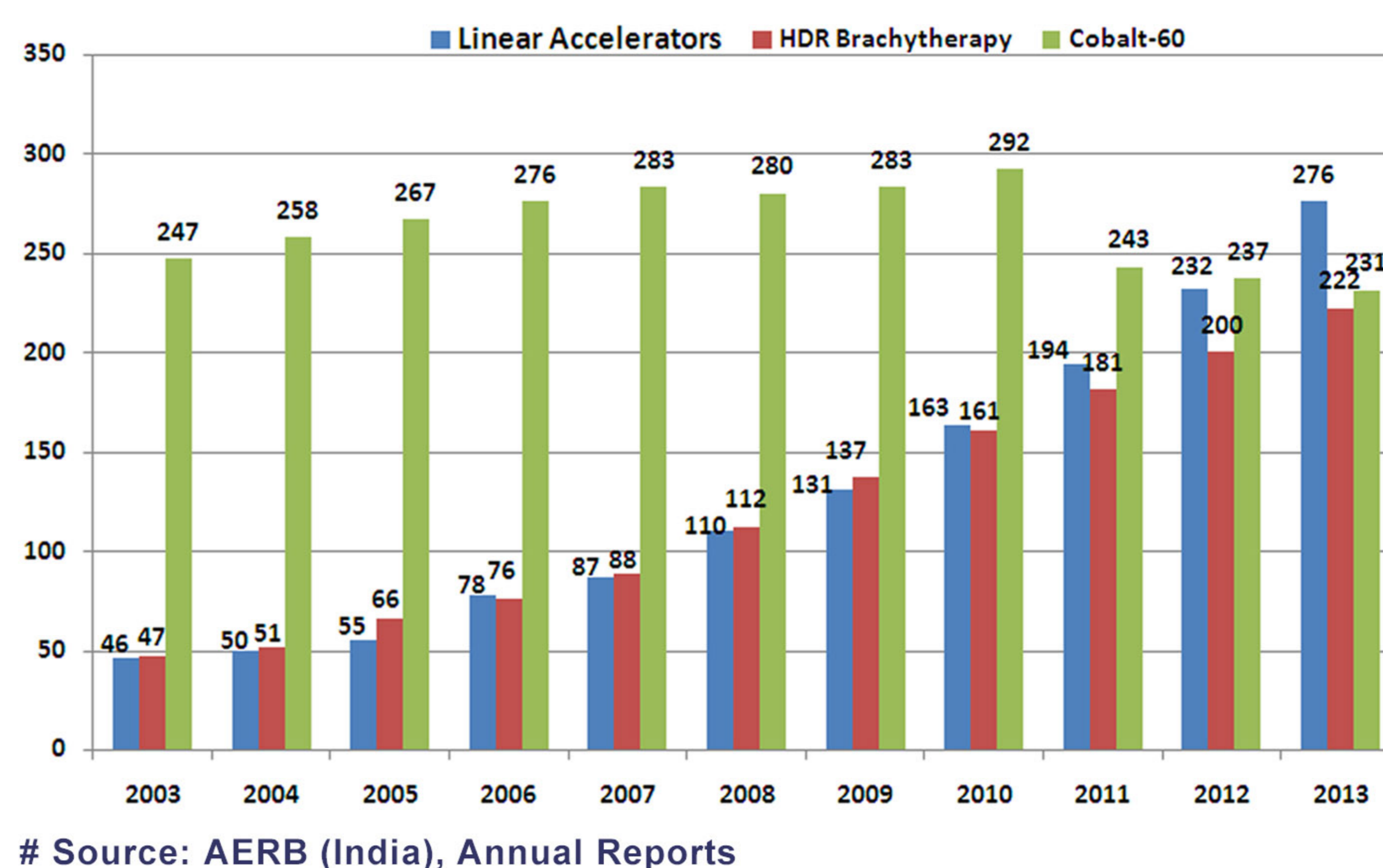
## Results

The number of linear accelerators grew from 46 in 2003 to 276 by June 2013. The HDR Brachytherpay units grew from 47 in 2003 to 222 in June 2013. The cobalt-60 units were 247 in 2003, grew to 283 in 2007 but by June 2013 stood at 231 reflecting the transformation of technology. The first IMRT treatment i the country was delivered in 2001. But post 2006 the country has been catching up with the recent developments in radiotherapy technology. A few state of the art centres with Cyberknife, Tomotherapy, Rapid Arc, VMAT and True Beam facilities that have started almost at the same time as they have been done in the North American and European countries. But these treatments are delivered at significantly lower cost as compared to the western countries. As the cost of proton therapy installations are significantly higher than the photon technologies till date no corporate health care players have ventured into investing in proton therapy. The first Proton Therapy order has been placed but the clinical treatment in this set up is likely to be started by end 2016.

### GROWTH OF LINEAR ACCELERATORS



### TECHNOLOGY TRANSFORMATION



# Source: AERB (India), Annual Reports

## Conclusions

Photon beam radiotherapy technology has penetrated the Indian system at significant pace in the last decade. The financial viability continues to be main deterrent for establishing any particle therapy facility but the potential for setting up such facilities are high due the higher volume of patients that can be selected for treatment with these technologies in a large country like India. As per the current estimates the first patient will be trated with Protons in 2016 and with Hardons in 2017 in India. There are advantages of setting up such high end facilities in India for accumulating data for validating these technologies much faster than in the western countries.