



HVAC - Energy Conservation and Demand-shifting Opportunities
18 December 2009

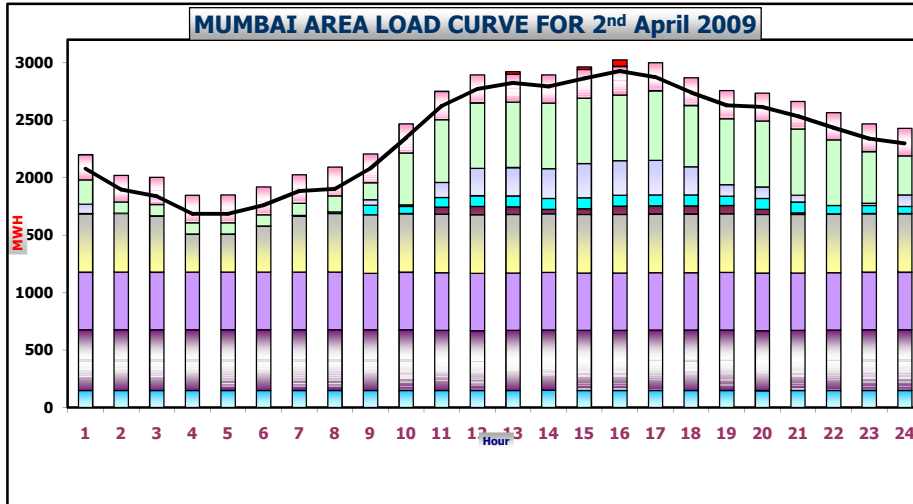
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Outline

- ▶ Demand-side management drivers in Maharashtra
- ▶ Program drivers for HVAC systems
- ▶ Components of HVAC systems
- ▶ HVAC improvement opportunities
- ▶ HVAC DSM program typology
- ▶ Session profile

Mumbai system peaked at 2927 MW in April 2009 (summer peak)

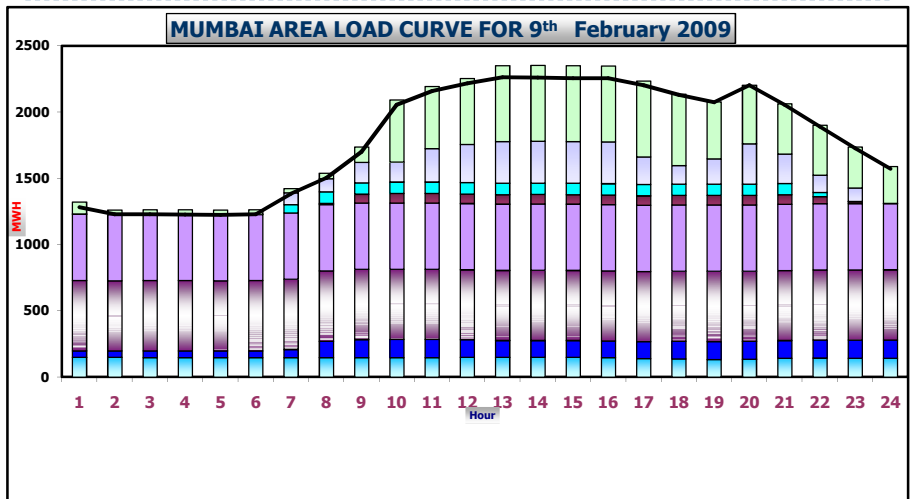


Source: Data from Mumbai utilities

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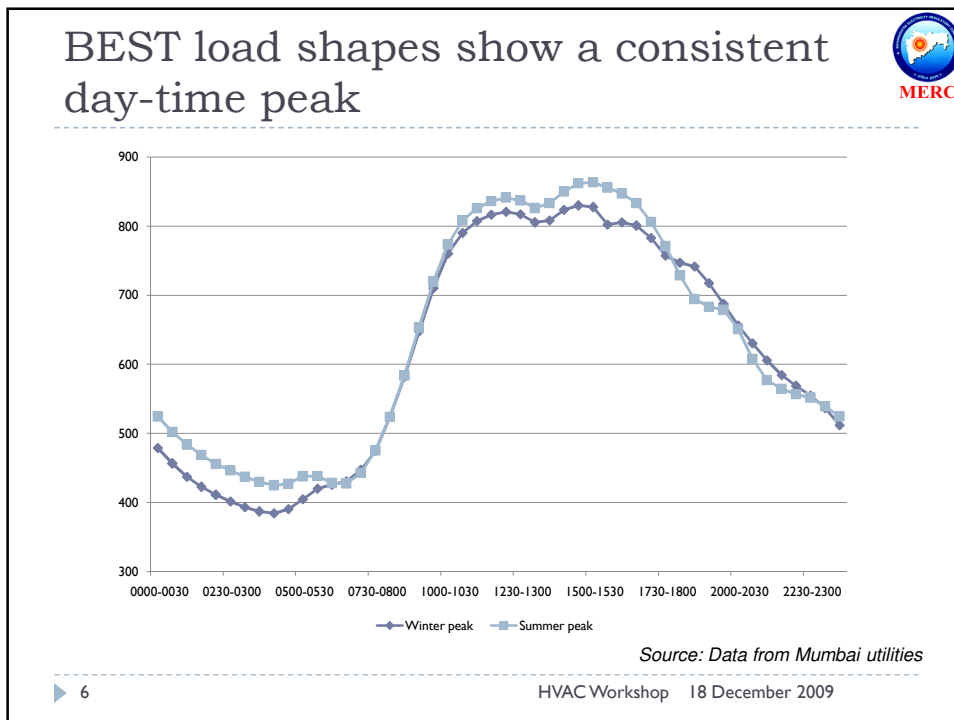
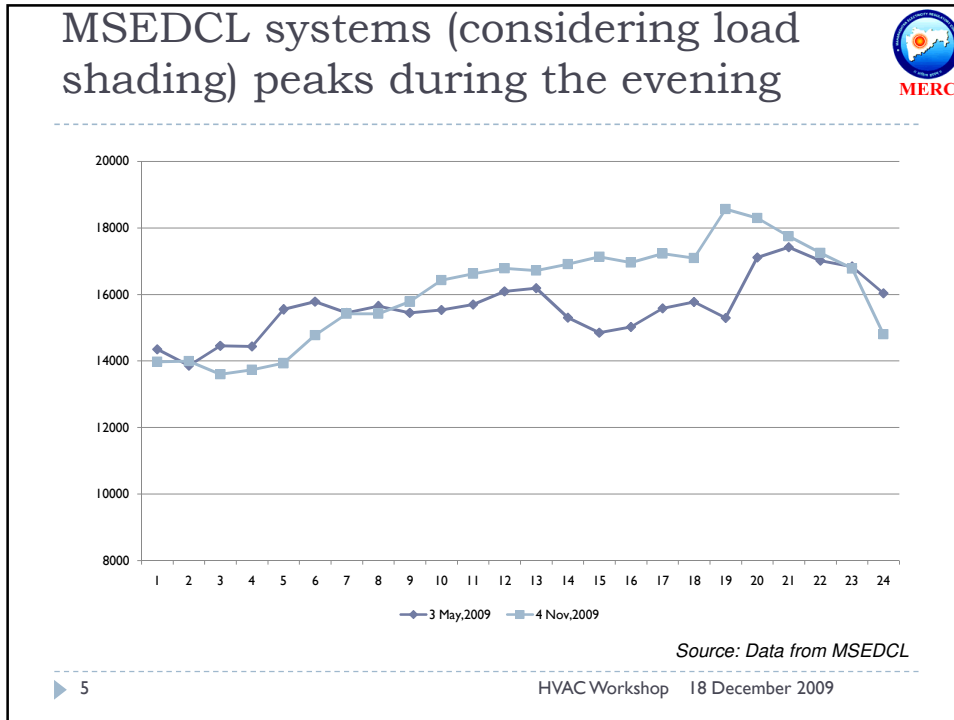
Mumbai system recorded 2256 MW as a winter peak in February 2009

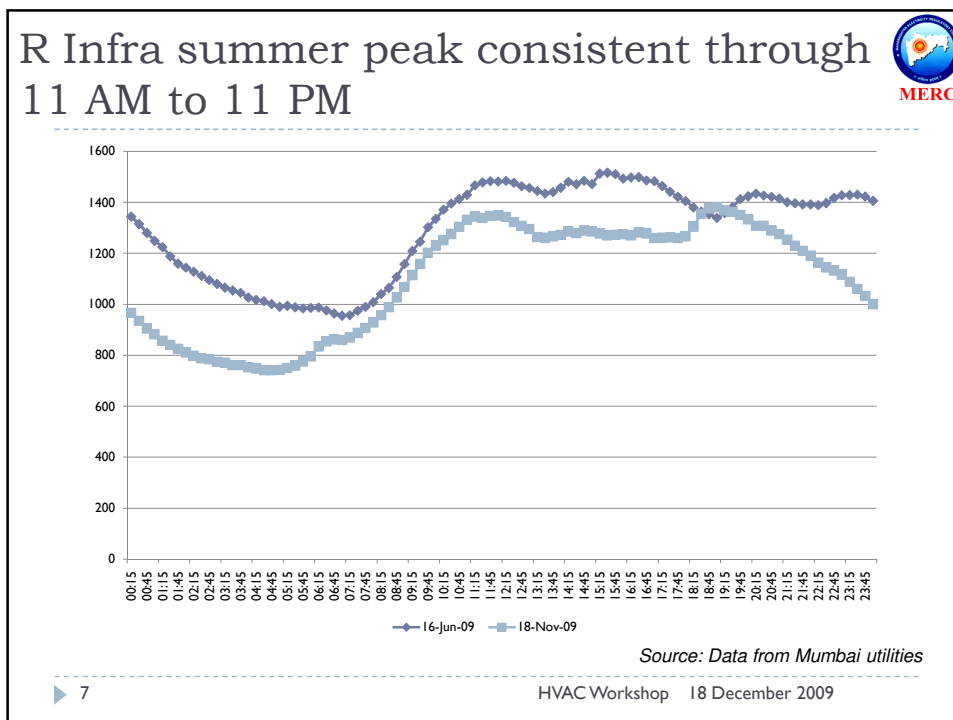


Source: Data from Mumbai utilities

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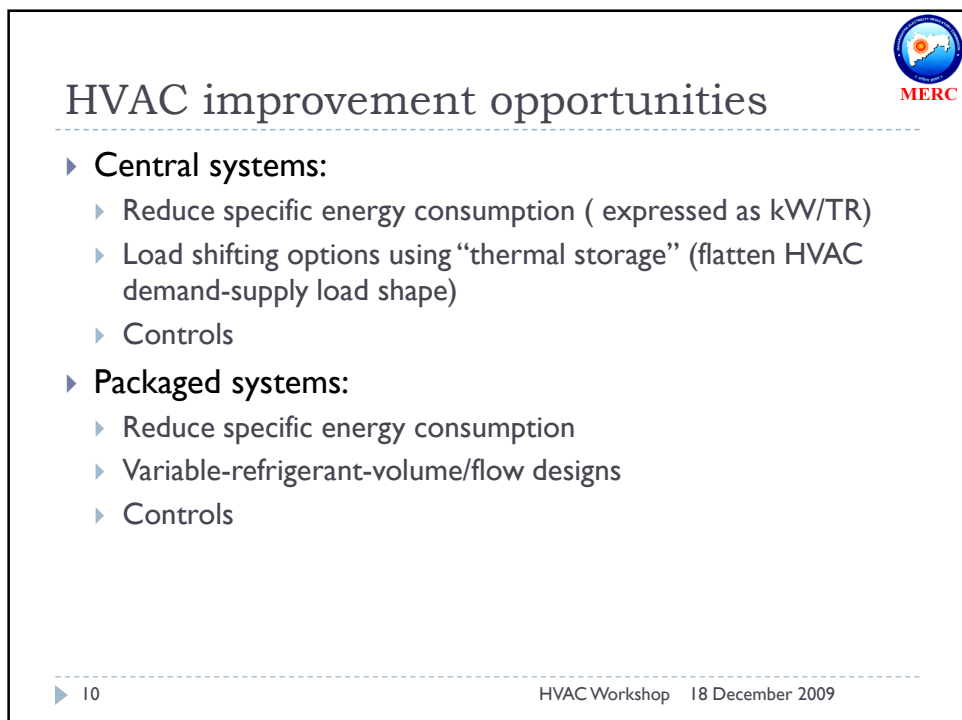
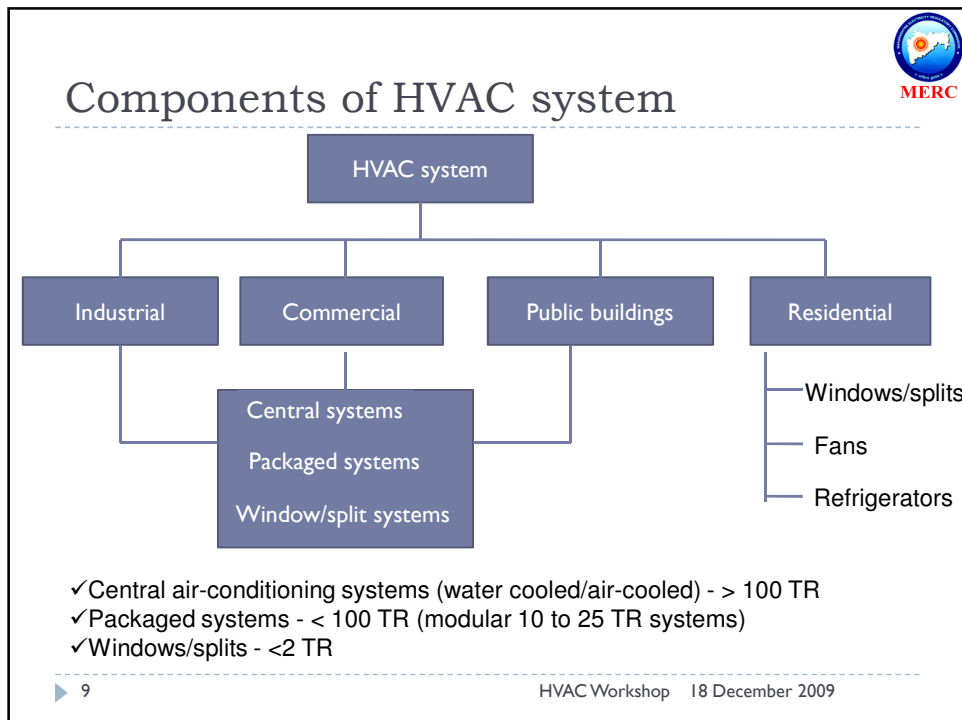


DSM drivers in Mumbai .. some take-ways from load-shapes

- ▶ During winter, Mumbai system recorded a high of 2256 MW (12 noon to 4 PM) and a low of 1228 MW (2 to 6 AM) on 9 February 2009 (difference of ~ 1000 MW)
- ▶ During summer, Mumbai system recorded a high of 2927 MW (12 noon to 4 PM) and a low of 1684 MW (4 to 5 AM) on 2 April 2009 (difference of ~ 1300 MW)
- ▶ Enough evidence of day-time peak contribution due to commercial activities in Mumbai
- ▶ HVAC contributes to 50% of demand and energy use in small and large commercial offices
- ▶ Residential sector shows peak due to cooling/lighting peak demand

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HVAC improvement opportunities

- ▶ **Windows/split systems:**
 - ▶ Transit from non-labeled to BEE star-labeled products for new purchase
- ▶ **Fans:**
 - ▶ Promote BEE star-labeled fans
 - ▶ Typical payback for residential sector < 2 years (cost of fans: INR 1400, daily use: 8 hours; difference in old and new ratings: 40 Watts)
- ▶ **Refrigerators:**
 - ▶ 5-star rated refrigerators to replace old refrigerators of >8 years vintage

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DSM Program Design Typologies

- ▶ **Tariff signals:**
 - ▶ Higher TOU difference? (currently INR 1.85/kWh between day peak and night-tariff)
 - ▶ Higher demand-charges for energy-intensive users? (current demand charges of INR 150/kVA/month)
- ▶ **Market-transformation:**
 - ▶ Promote phase-out of non-star air-conditioners in Maharashtra
 - ▶ One-time subsidy to high-efficiency fans, air-conditioners, refrigerators (utility-driven and state-VAT reductions?)
 - ▶ Early retirement of old appliances with involvement of suppliers?

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DSM Typology - opportunities through BEE - ECBC



- ▶ **Fast-track promotion of Energy Conservation Building Codes (ECBC)**
 - ▶ Most of the current commercial buildings have an energy performance index (EPI) of 200 to 400 kWh/sq m/year
 - ▶ Best performing commercial designs result in EPI of 100 to 150 kWh/sq m/year (combination of envelop, lighting and HVAC optimization)
- ▶ **Utility options:**
 - ▶ Offer one-time subsidy and contract-demand charges for new construction?
 - ▶ Promote retrofits through design support?

Source: BEE ECBC presentation

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Purpose of the workshop



- ▶ Deliberate on efficiency opportunities in central, discrete and home-based systems
- ▶ Understand technological innovations
- ▶ Discuss implementation options
- ▶ Session I: Energy efficiency in central systems
- ▶ Session II: Thermal storage – solutions to shift demand
- ▶ Session III: Energy efficient home systems
- ▶ Session IV: Innovations (Solar-AC) and VRV/VRF
- ▶ Session V: Typology of Utility-driven programs
- ▶ Panel discussion

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▶ Thank you

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