Auroville’s sustainable energy solutions

24th February 2018
Auroville Energy Vision

Auroville Energy Vision (draft December 2009)

In Auroville energy will be consumed as a means to achieve a higher level of collective consciousness rather than for the fulfillment of personal desires and comforts.

Auroville will be a township that consumes energy only from sustainable energy sources.

To the extent that Auroville uses energy from non-sustainable sources for the building of the town, surplus sustainable energy shall be produced to compensate for such consumption.

A change of consciousness and the transformation of matter are essential to achieve ultimate integral sustainability.
The Energy Pyramid

Define the Need (vs. Greed)
Do we need it? For eg. light during the day

Energy Conservation
What is the least energy consuming design? Using natural light instead of artificial light (saving 100 units)

Energy Efficiency
What is the most efficient technology for it? Using CFLs or LEDs instead of incandescent light (saving 75 units)

Renewable Energy
What is the most sustainable production? Using renewable energy

Fossil Fuel
What is the last option? Use fossil fuel as final resource only

Source: Sustainable Urban Energy: A Sourcebook for Asia
Energy Saving

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Renewable Energy Grid Penetration and the Smart Grid...
Renewable Energy Grid Penetration and the Smart Grid...
Grid-Connected Rooftop Solar
Energy Storage
A key issue to be addressed

- The energy in fossil fuels is stored solar energy
- We need to replace that fossil fuel “battery” with a sustainable energy storage solution
- With local energy storage the electricity grid gets a new role to play.
Renewable energy generation during 2015-16

<table>
<thead>
<tr>
<th>Source</th>
<th>Generation (kWh)</th>
<th>% of Grid Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>From stand-alone solar PV systems (400 kW, CUF of 14% assumed)</td>
<td>490,560</td>
<td>10.16%</td>
</tr>
<tr>
<td>From grid-connected solar PV systems (150 kW, CUF of 17% assumed)</td>
<td>223,380</td>
<td>4.63%</td>
</tr>
<tr>
<td>From wind turbines of Varuna - Auroville</td>
<td>2,534,821</td>
<td>52.50%</td>
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<tr>
<td>From wind turbines of Varuna Pvt. Ltd.</td>
<td>4,591,560</td>
<td>95.09%</td>
</tr>
<tr>
<td>Total (kWh)</td>
<td>7,840,321</td>
<td>162.37%</td>
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The (electrical) infrastructure as it was developing.

- Unplanned ("organically grown") infrastructure;
- Unsafe, not sustainable, difficult to maintain, expensive.
- The basic principle of laying underground infrastructure within permanent right-of-ways is / was not being followed.
- Infrastructure often an after-thought and seen as a financial burden;
- Very low density development makes infrastructure cost per capita very expensive;
- TNEB lines crisscrossing the Auroville Master Plan area with private parties getting connected thereby making these lines permanent features of the Auroville landscape.
TNEB Lines in Auroville
Electrical Infrastructure after Thane
The HT ring feeder – lay-out
11 KV Town Feeders (example)
Auroville Internal electrical distribution

- Ring mains 11 KV along the Crown connected at 2 or more points to the state grid at 11KV or 22KV /33KV (interim)
- Final interconnection with the state grid at 110 KV
- 11 KV spur lines from 11KV ring mains connected through Ring Main Units (RMUs)
- Indoor 11/0.433 kV distribution transformers and switch gear;
- LT underground cables;
- Feeder pillars integrated into buildings as much as possible;
Auroville Internal electrical distribution

- Energy efficient system (low voltage drops, low I^2R losses).
- Grid is fed from Auroville grid-connected renewable energy systems. Surplus exported to grid, shortfall imported from grid (but compensated with grid-connected wind turbines): Distributed generation.
- Buildings and facilities within Auroville export renewable energy to each other and import renewable energy from each other
- Local energy storage solutions
Auroville Internal electrical distribution

- Energy metering with remote monitoring (Auroville’s Wattmon) over internet;

- True four quadrant metering with imported and exported active, reactive and apparent energy measurements in each quadrant.
Auroville Internal electrical distribution

- Energy metering audits;
- Energy consumption feedback loops;
- Remote monitoring through Aurinoco optical fiber network
Auroville mobility

- Transition to fossil-fuel free mobility
- First and last mile connectivity
- E-cycles for Auroville residents and visitors
- First 50+ e-cycles in the field
- E mini busses and e-rickshaws to follow
Thank you

Q&A