(ii) Energy Consumption

The components that consumes huge amount of energy in sensor nodes are,

1. Micro controller
2. Radio
3. Memory
4. Sensors.

Hence, to avoid such consumption, the sensor node in the network should be tightly controlled. In order to reduce the power consumption from the above components a low-power chip that can provides efficient energy for sensor node should be designed.

The major disadvantage of this design is that it squandered when devices are not operated properly.

Since, nodes in wireless sensor network are free most of the time, the other important contribution that can made to reduce power consumption is to turn off the sensor node when they are free and wake them up when,

(i) External stimuli occur

(ii) Depending on time consideration.

The disadvantage of this technique is that complete turning off of node is not always possible. Similarly the other core technique adapted for providing efficient energy consumption is to make use of those state that represents multiple operations simultaneously.

ACPI (Advanced Configuration and Power Interface) is one such technique in which a single state is used for representing fully operational machine where as other four states are used for representing power consumption and wake-up time etc.

Therefore, different operation modes are introduced on various components of sensor nodes. So that different number of sleep state with distinct characteristics act on different model. Thus, for this reason states like idle, active and sleep has been defined for microcontroller sleep state of microcontroller keep the sensor nodes in sleep mode. Thereby reducing the power consumptional then required. This energy saving strategy can be explained with the help of the following figure,

$$E_{overhead} = \tau_{up}(P_{active} + P_{sleep})/2,$$

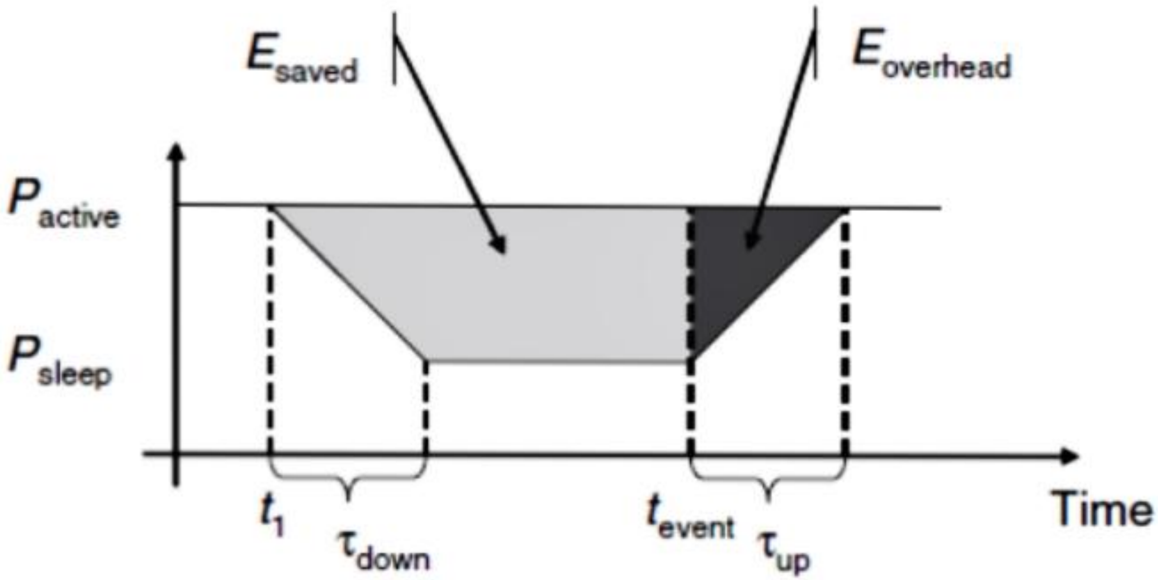

Figure 2.5 Energy savings and overheads for sleep modes

Let us consider,

1) 't_1' as a decision, which helps in deciding whether a sensor node should be put into sleep mode so as to reduce the power consumed from P_{active} to P_{sleep}.

2) 't_{event}' as the time by next event to occur if controller is in active state.

3) '$t_{active} = P_{active}(t_{event} - t_1)$' as the total energy sent by nodes for being idle.

4) τ_{down} as the total time taken to keep the component in sleep mode.

5) $(P_{active} + P_{sleep})/2$ as average power consumption.

∴ The total energy required to keep node in sleep state is given as $\tau_{down}\left(\frac{P_{active} + P_{sleep}}{2}\right)$

$$+ (t_{event} - t_1 - \tau_{down}) P_{sleep}.$$

τ_{sleep}

The total energy saving is given as,

$$E_{saved} = (t_{event} - t_1) P_{active} - \left[\tau_{down} \frac{(P_{active} + P_{sleep})}{2} + (t_{event} - t_1 - \tau_{down}) P_{sleep} \right]$$

The additional overhead,

$$E_{overhead} = \tau_{up} \frac{(P_{active} + P_{sleep})}{2}$$