

## 1A Problem and Constraint Definition

**Our task is to engineer the future of solar electricity.**

Get current PV events at the archives of the National Center for Photovoltaics at:

[http://www.nrel.gov/pv/news\\_hotline.html](http://www.nrel.gov/pv/news_hotline.html)

**due 4-22-10: one paragraph each on Problem and Constraints**

**Team leaders: Student B and Student E**

Consider parallels to the 'Big Dig' example. Engineering began 20 years before completion, and the infrastructure is expected to last for >50years after completion. Problem definition involved projections of traffic and commerce patterns for the next 100 years. Constraint definition involved assessment of technology capability (above, below, beside current road; staging; concurrent transportation during construction) and mediating the needs of residents, ongoing commerce and regional image.

Some issues for problem definition

- Current projected US/world electricity consumption
- Cumulative annual growth rate
- Fraction solar; rate of deployment to reach 50% of total
- Timeline for deployment
- Definition of key terms
- Solar electricity advantages: availability, security, reduced transmission losses, grid independence, grid load leveling
- Greenhouse reduction
- Markets and applications that favor solar electricity
- Roles of Government, Users, Investment, Performance, Sustainability, Economic Climate, Competing Energy Sources

Some issues for constraint definition

- Material resources to achieve target fraction
- Material resources to maintain target fraction for 100 years
- Land resources: factory area; PV surface area
- Design-limiting attributes and specifications
  - Environmental (manufacturing and deployment)
  - Efficiency
  - Infrastructure: mfg, installation, maintenance
  - Return-on-Investment
  - Figures-of-Merit, Estimates, Rules-of Thumb

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