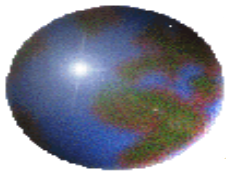
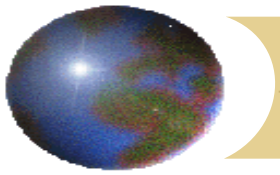


APPLICATIONS OF OPTIMIZATION



Optimization Applications

- 1 • Energy Management and Planning
- 2 • Finance
- 3 • Production Planning and Supply Chain Management
- 4 • Airline Application
- 5 • Resource Management
- 6 • Dealing with Uncertainty



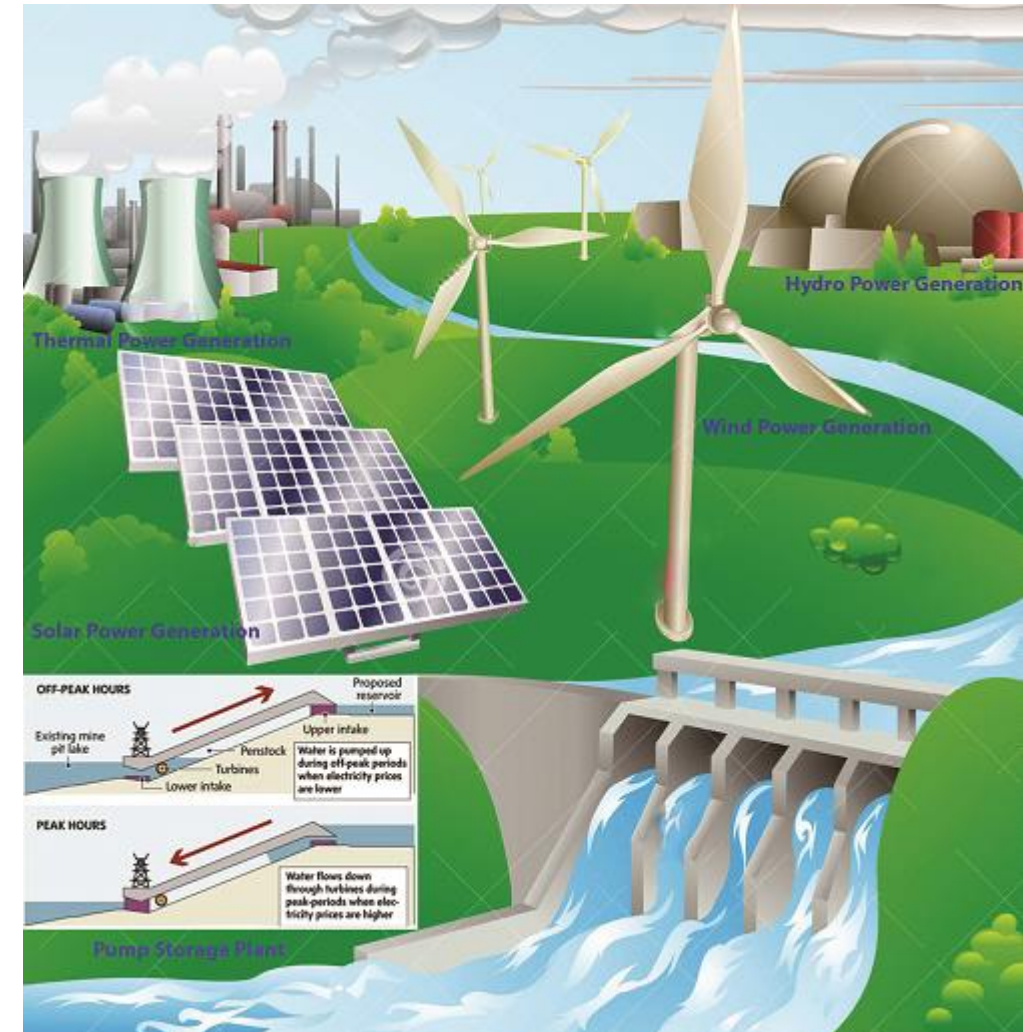
Energy Management and Planning

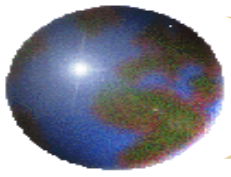
Auction of Electricity Transmission Capacity in a U.S. state:

Maximize the value of awards, subject to not selling more capacity than is available. Interesting feature: a bidder may bid on a combination of lines, e.g., if in series. Dual prices are the clearing prices.

Electrical Generator Unit Commitment at GE:

Given forecasted demand over next 24 hours, week, etc., and cost structure of each generator, which generators should be run in which intervals?

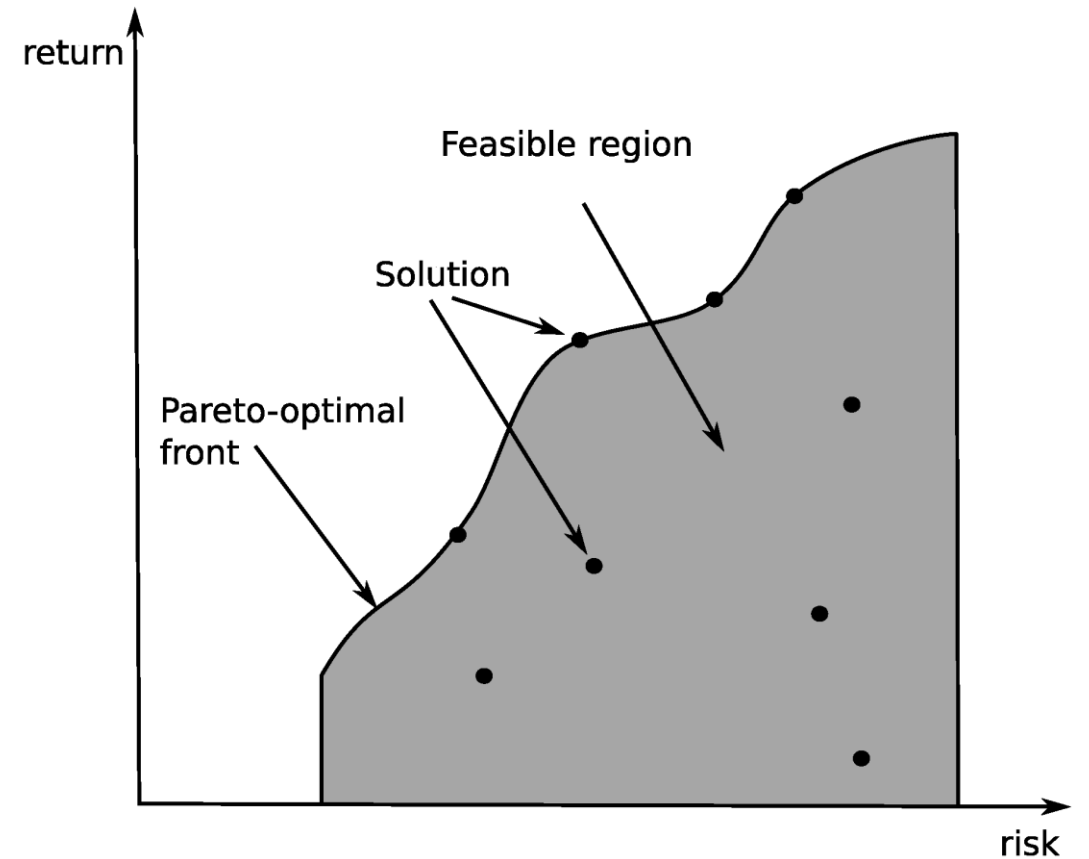


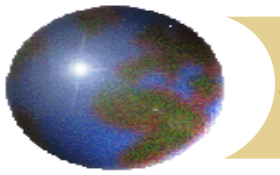


Financial Application

Financial Portfolios:

How much to invest in which assets given expected returns, interactions/correlations among investments at a telecommunications company, mutual fund firm.





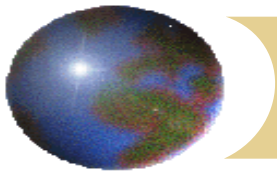
Production Planning and Supply Chain Management

Supply Chain Redesign/DC Location at P&G: After merging in several new product lines and distribution centers, which DC's should be closed? Which DC's should serve which customers?

IBM (\$20 million + \$250 million less inventory, 1990)

- ❏ Integrate a national network of spare parts inventories to improve service support

Tire Production Scheduling at Bridgestone/Firestone: Given daily demand schedule and which combinations of tires can be produced together in which heaters, which tire combinations should be run in which heaters?



Airline Application

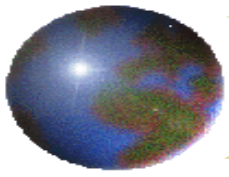
Delta Airlines (\$100 million, 1994)

✚ Maximize the profit from assigning airplane types to over 2,500 domestic flight

United Airlines (\$6 million, 1986)

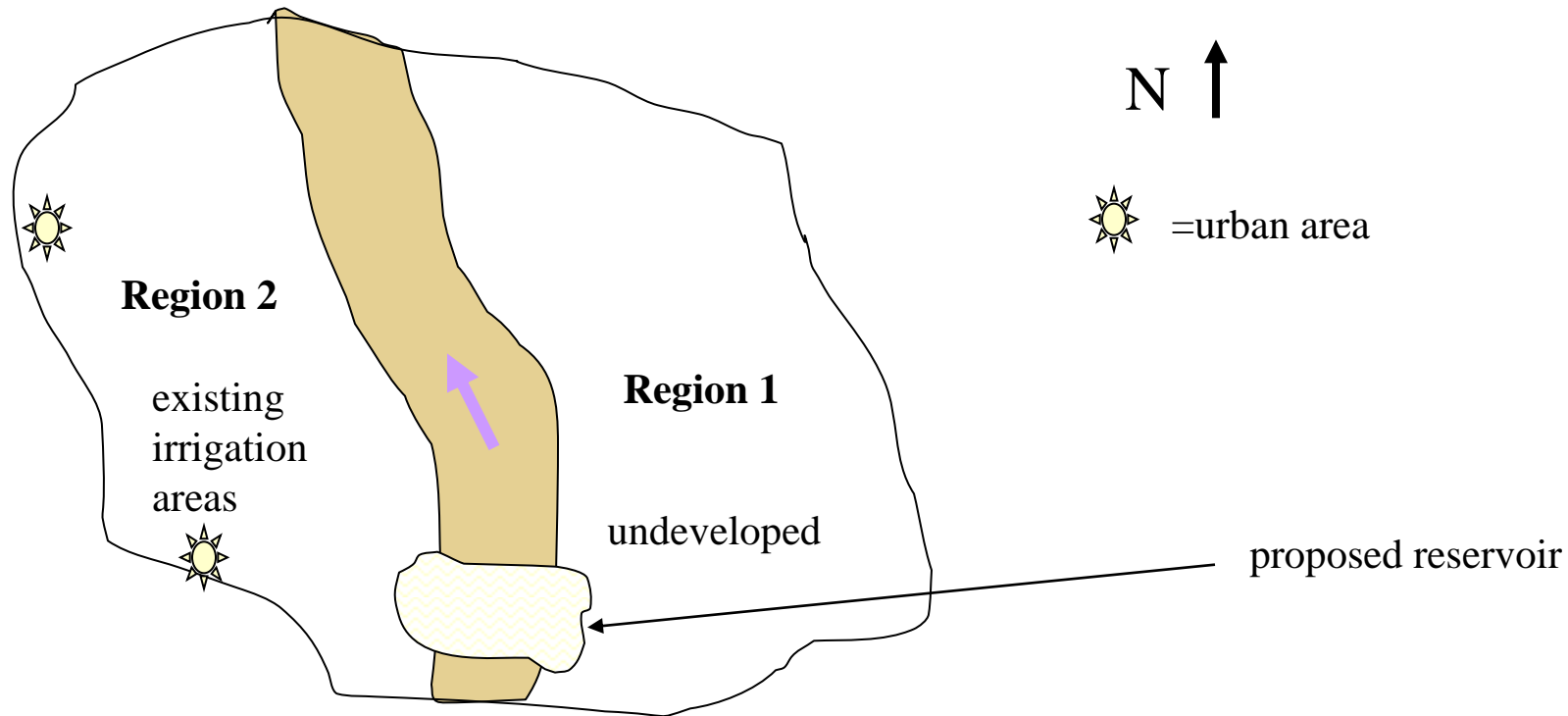
Schedule shift work at reservation offices and airports to meet customer needs with minimum

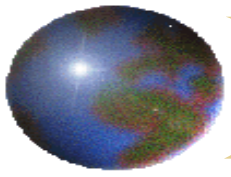




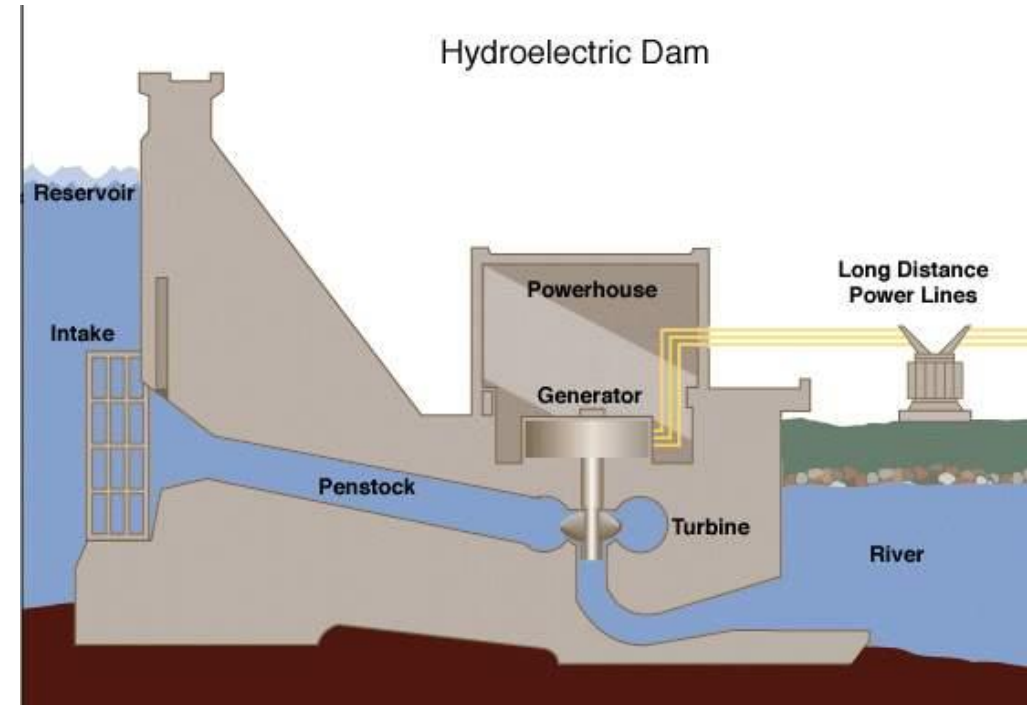
Resources Allocation Problem

Two regions separated by a river share the water of that river (shown in blue below)
Region 1 to the east is undeveloped, region 2 has 2 urban areas and existing irrigation areas
A reservoir has been proposed to increase the hydroelectric capacity for the 2 regions as well as irrigate the land in the 2 regions

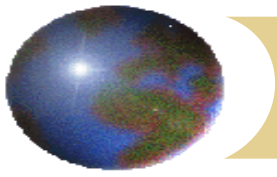




Hydroelectricity Example



Could consider the total benefits to the region
Hydroelectricity
Irrigated land



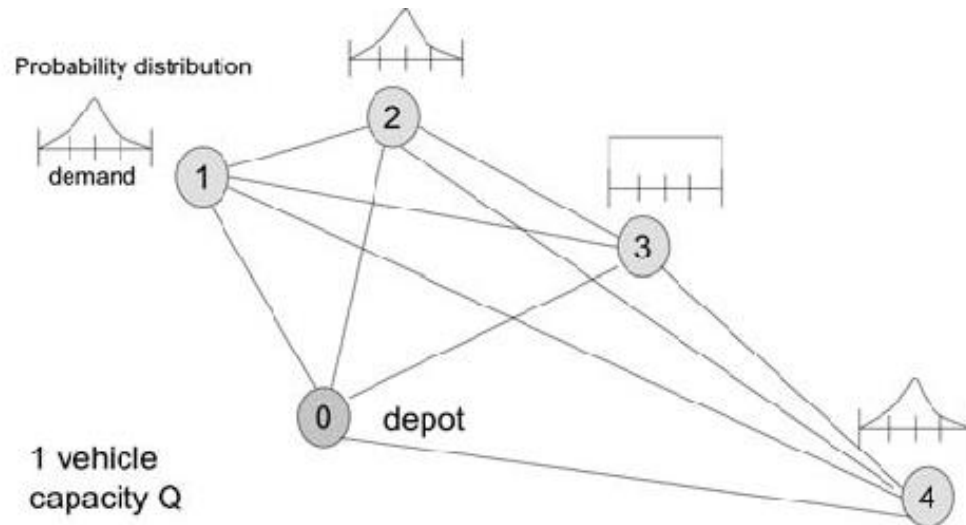
Dealing with Uncertainty

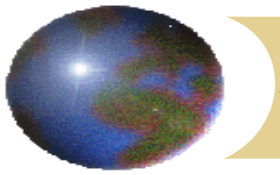
Plant Configuration Under Uncertainty at GM:

Which plants to close, which to re-focus, given demand scenarios and their probabilities. Used three scenarios/year over a five year planning horizon.

Gas contract selection under uncertainty at Peoples Gas:

which gas contracts to buy when, how much gas to store, when to draw it out, in the face of uncertainty (represented by about a various scenarios of possible weather and spot prices).





THANK YOU