

# VISIONS FOR LARGE SCALE TRANSFORMATION OF TRANSPORTATION

Innovation Week

30 maj

# ELECTRIC VEHICLES – WHY SLOW EXPANSION?

- Electric vehicles are more expensive and they provide shorter range
  - 100.000 SEK more expensive – lower prices in sight, promised by for example Volvo
  - 130 km range – Tesla more, but at a higher price
- Uncertain choice
  - Petrol and diesel may suffice?
  - Hydrogen fuel cells?
  - Vehicle gas? Biological waste is free!
- Knowledge deficit
  - Why hurry?
  - Why so many alternatives? Which ones will survive?

# VISIONS ARE NEEDED!

- Why?
  - "...landing a man on the moon and returning him safely to the earth."  
JFK1961
  - "My employees will be able to buy my cars" H. Ford  
1908
- Visions: The foundation of extraordinary efforts and memorable successes!

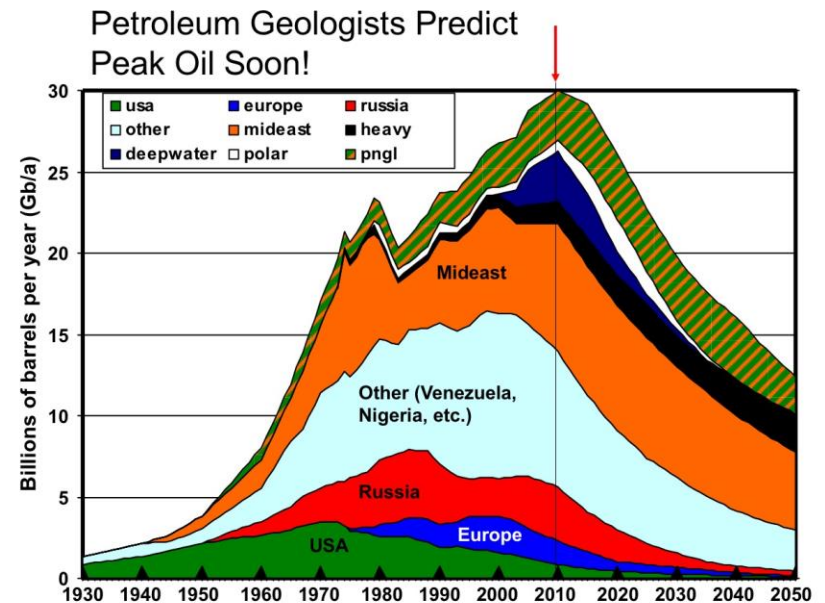


# AN EXTRAORDINARY CHALLENGE

- 1 billion cars (SE 4.3 mn)
- 100 million heavy vehicles (SE 0.5 mn)
- 90 mn barrels of oil per DAY (2 l/person – SE 5.5 l/person)
- Transportation dependence
- Transformation - global context
- Very large investments necessary

# PEAK OIL – OIL VOLUMES IN DECLINE

- International Energy Agency: From 2019
- Dire consequences for the global economy
- Do people realize the impact?



# SYSTEMIC CHALLENGE

- Fuels and fuel production
- Vehicles
- Services
  - Maintenance etc
  - Electronic
- Systems solutions
  - Cars
  - Short distance transportation
  - Long distance transportation

# ALTERNATIVE SYSTEMS

- Electric
  - Power from 5 nuclear reactors to replace oil for cars.
    - Same volume for heavy vehicles
  - Large-scale systems already available
  - "Two holes in the wall." - everywhere



# ALTERNATIVE SYSTEMS

- Hydrogen fuel cells
  - Power from 15 nuclear reactors to replace oil for cars.
    - Same volume for heavy vehicles.
  - No infrastructure
    - Production
    - Distribution
  - Many technical and systems solutions missing





# BIOFUELS

- Biogas + natural gas
  - Small volumes of biological waste
  - Small import of natural gas
  - Limited gas network
- Works for buses and on a limited scale for other purposes



# BIOFUELS

- Fuels from grain
  - Low or negative net energy result
  - If all agricultural products were used for fuel 25% of oil used for transportation would be covered.
  - No volumes left for food.
  - Limited volumes can be used for fuel.



# ALL OTHER FUELS CAN BE USED FOR ELECTRICITY PRODUCTION

- If power is produced from gas, grain, or biological materials, two times the distances can be driven
- As few systems as possible.
- Cannot afford multiple parallel systems.

# MIXING SCALES AND HORIZONS

- Short term horizon
  - Start with available solutions
- Medium term horizon
  - Transfer to better solutions
- Consider Path Dependence!
- What works on a small scale doesn't necessarily work on a global scale!

# VISIONS NEEDED!

- Realistic!
  - Choice of technology
  - Financing
  - Human Resources
  - Speed of change
- Bold!
  - Large scale
  - Too little time!
  - Need to make decisions!