Welcome to Baltimore
Maryland Crabs and Crabcakes
Typical Transportation Entering The 20th Century

- **Stage coach**
  - 6 Passengers
  - 4 Horsepower (quadrupeds)
    - Drive by Line
    - Fare $.06/Mile
- **Bio-Mass Derived Fuel**
  - Minimally processed
    - Fuel infrastructure in place
    - “Stable” Fuel Costs
- **Emissions**
  - Equine methane
  - Agglomeration of macro particles
    - Minimally airborne
    - Recyclable
Evolution of Personal Transport

1902

2012
- All-electric vehicle
- Advanced batteries
- Fast Inductive-charging
- Lightweight materials
- No emissions

**Thermoelectrics**
- TE AC/heater
- TE thermal management of batteries
- TE-cooled collision avoidance system and computers
- TE-cooled/heated beverage holders
- TE-regenerative braking

Entering the 22 Century?
Prototype TEGs Developed in DOE-VTP Programs

- Amerigon TEG’s Developed for Ford and BMW, and GM’s Production Prototype TEG to Provide 5% Improvement in Fuel Economy
- Amerigon TEG Bench Test Peak output was 608 Watts with 620°C inlet air and 20°C cold side temperatures
- TEG tested in a BMW X6 in Munich (in the lobby NOW!)
- A second TEG is being tested in a Ford Lincoln MKT in Dearborn
- GM installed their TEG in Chevy Suburban and is undergoing similar testing
**Energy Requirements (Analytical)**

- **Zonal Concept:** coolest each occupant independently
- **630 Watts** to cool a single occupant
- **Current A/Cs:** 3,500 to 4,500 Watts to cool the entire cabin

Zonal TE units located in dashboard, headliner, A&B pillars and seats/seatbacks
UC-B thermal mannequin and human subjects used to evaluate spot cooling
THERMOELECTRICS:
THE NEW GREEN
AUTOMOTIVE TECHNOLOGY
......AND MORE........