U.S. Department of Energy's Power Electronics and Drives Needs

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Government R&D Programs

- **Power Electronics & Motors Pervade Almost All Government R&D Programs**
- **Developments Are Synergistic and Useful to All**
- **Each Application Has Specific Requirements**

PNGV Technical Performance Objectives

Parameter	1997	1999	2000	2004
Electric Motor / Generator:				
Specific Power at Peak Load (kW/kg)	1.2	1.5	1.5	1.6
Volumetric Power Density (kW/l)	3.5	4	4	5
Cost ($/kW)	10	10	6	**4**
Efficiency (10% to 100% speed, 20% rated torque)	90	88	92	96
Power Electronics (Inverter/Controller):				
Specific Power at Peak Load (kW/kg)	2	5	4	5
Volumetric Power Density (kW/l)	8	9	10	12
Cost ($/kW)	25	15	10	**7**
Efficiency (10% to 100% speed, FTP drive cycle)	93	95	95	97-98

DOE's Power Electronics Needs

- Transportation
  - Hybrid electric vehicles
  - Fuel cell power management
  - Heavy hybrids
  - Off-road heavy equipment
- Transmission and distribution
  - DC-AC conversion
  - Interties
  - Power quality
- Distributed energy resources
  - Power management
  - Microgrids

DOE's Power Electronics Needs

- **New Technologies or Improvements Needed**
  - Wide band gap materials
  - Passives (high temperature)
  - Energy storage
  - Inexpensive, but rugged & small automotive
  - Extended constant power speed ratio
  - Thermal management
  - Dc-dc/ac power management
  - Inexpensive, efficient, reliable converters for renewables
  - Sensors

DOE's Power Electronics Needs

- **Skills of Graduates**
  - **Planning, organizing, and implementation**
    - **-- Good, old fashioned work skills**
  - **Hands-on skills from the laboratory**
  - **Experience in writing papers and presenting**
  - **Familiarity with industry trends and costs**
  - **US Citizens**