



# **Green Jobs for a Green Economy**

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# Defining the “Green” Economy

*“A rapidly growing billion-dollar sector that includes renewable energy sources, organic produce and products, green buildings, alternative fuel vehicles, and more.”*

# Defining a “Green” Business

*“Businesses that develop new technology that spans a broad range of products, services, and processes that lower performance costs, reduce or eliminate negative ecological impact, and improve the productive and responsible use of natural resources.”*

# Defining a “Green” Business

*Includes “related business activities that either support the wide-spread application of new technologies such as solar system installations or apply new technologies as service providers for instance in emissions monitoring.”*

# Defining “Green” Jobs

*"Green jobs are family-supporting, middle-skill jobs in the primary sectors of a clean-energy economy - efficiency, renewables, and alternative transportation and fuels."*



# **Working for a Sustainable Future**

**America's growing green economy  
faces a looming labor shortage in  
sectors like manufacturing,  
construction, and utilities.**

# **Working for a Sustainable Future**

**For example in the energy sector about 55% of the workforce, nationwide, is over the age of 45. Many of these workers will either retire or prepare to retire within the next 10 years.**

# **Working for a Sustainable Future**

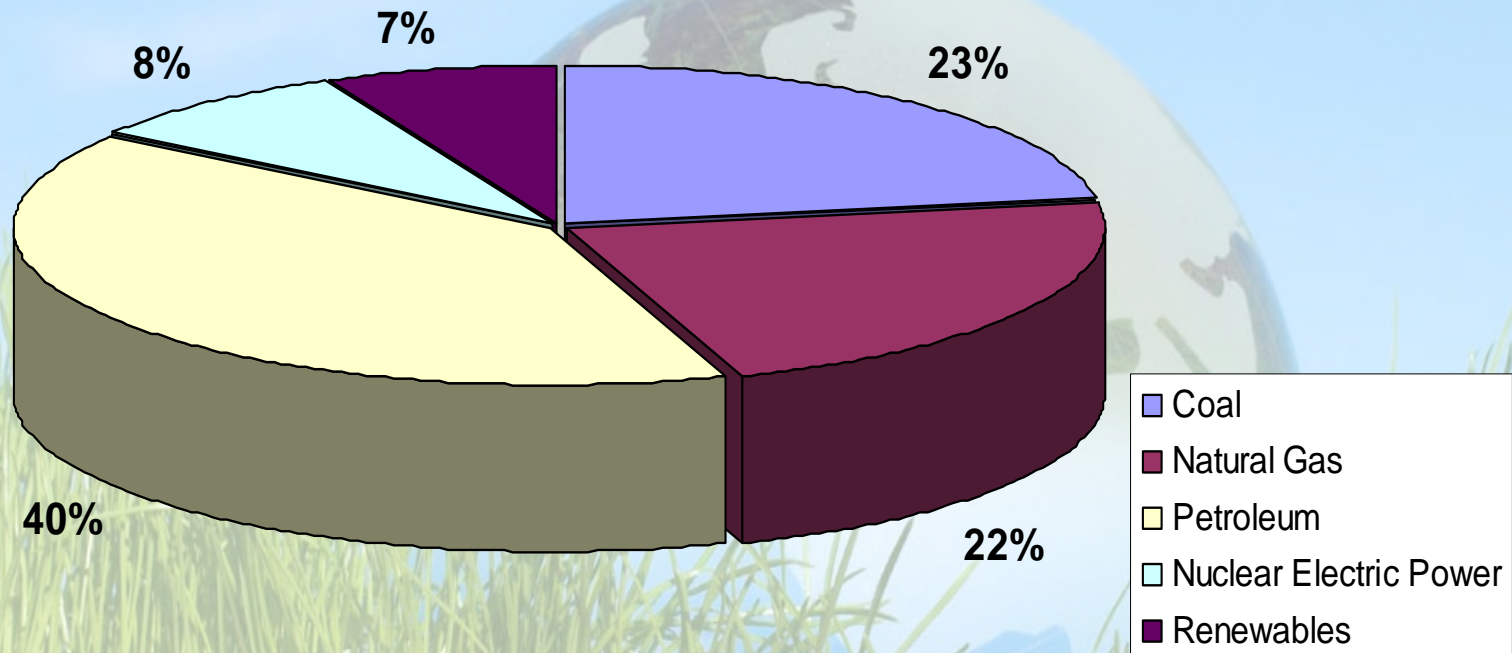
**In Los Angeles, employment stability will also result from the retirement of much of the energy industry's workforce. It is estimated that nearly 8,000 trades-related jobs will need to be filled in the next 5 years due to retirements.**

# Infrastructure Employment Five Yr Job Growth - Traditional Occupations

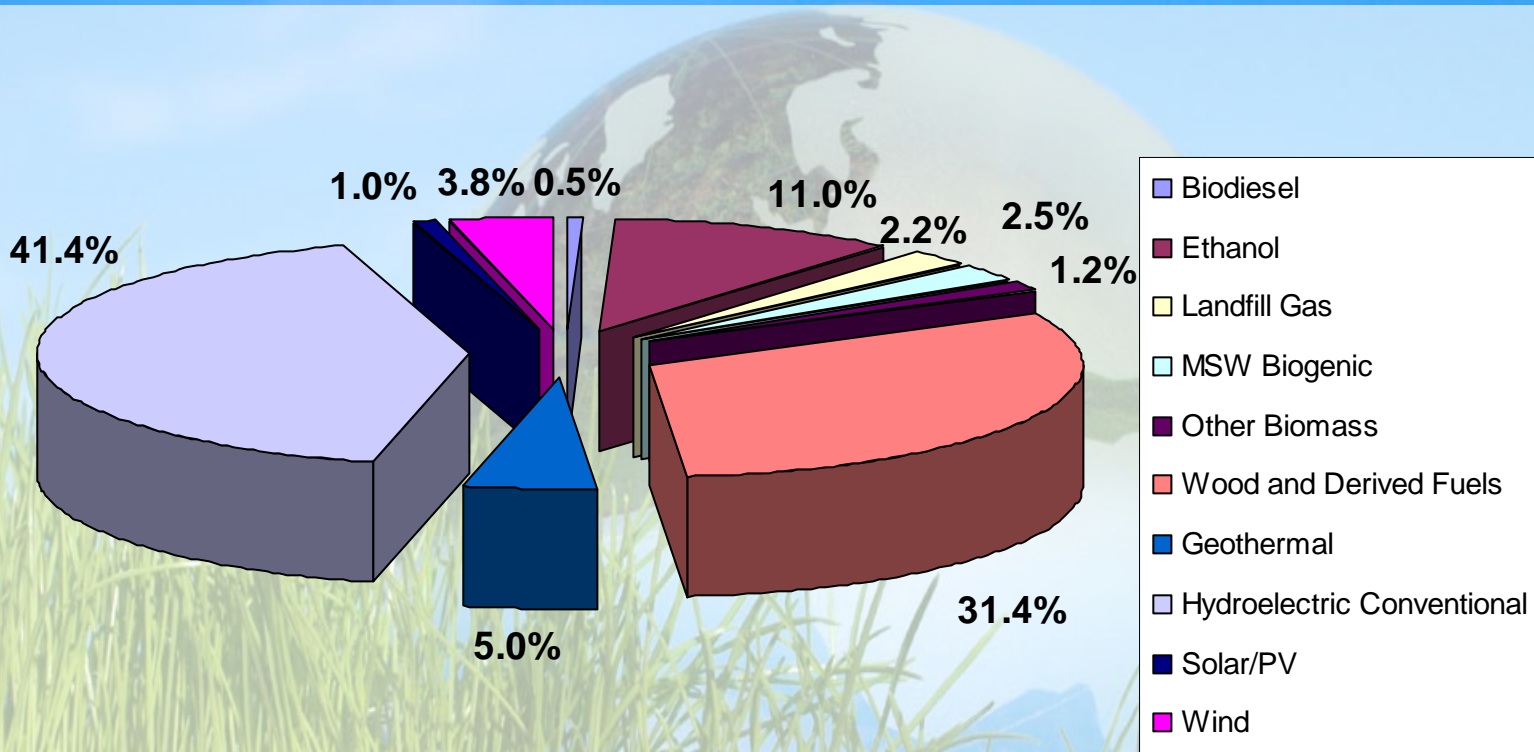
| INFRASTRUCTURE, ENERGY, POWER |        |     |
|-------------------------------|--------|-----|
| Manufacturing & Design        | 500    | 3%  |
| Maintenance                   | 1,100  | 6%  |
| Construction                  | 6,500  | 34% |
| Installation                  | 3,800  | 20% |
| Energy/Power                  | 3,500  | 18% |
| Engineering                   | 4,000  | 21% |
| <b>TRANSPORTATION</b>         |        |     |
| Distribution                  | 14,700 |     |
| Automotive                    | 6,400  |     |
| <b>ENVIRONMENTAL SCIENCE</b>  |        |     |
| Environmental Scientists      | 800    |     |
| Environmental Engineers       | 200    |     |
| Surveying and Mapping         | 400    |     |

71%

# US Energy Consumption by Energy Source



# US Energy Consumption – Renewable Energy Sources



# US Green Economy

In 2006, renewable energy and energy efficiency technologies (RE&EE) industries generated:

- 8.5 million new jobs
- \$970 billion in revenue
- \$100 billion in industry profits
- \$150 billion in increased tax revenue

# US Green Economy

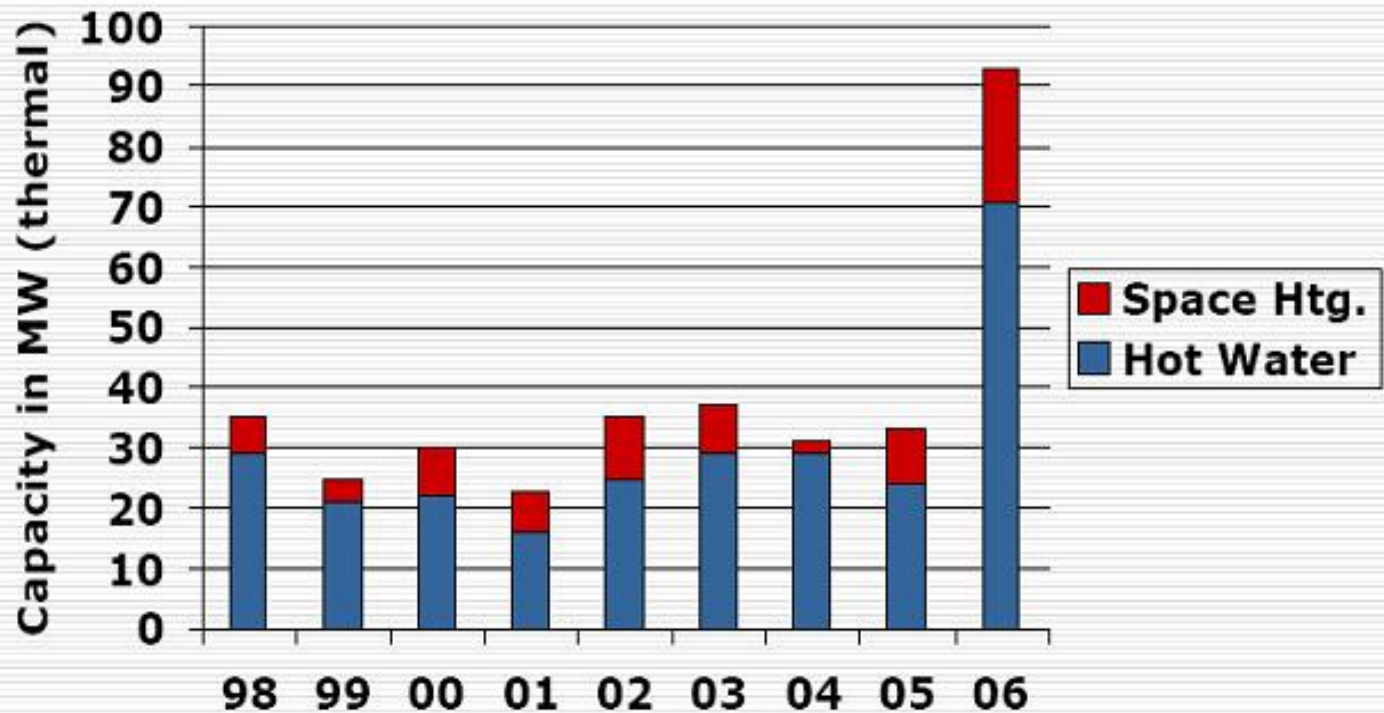
To put this in perspective, RE&EE sales outpaced the combined sales of the three largest U.S. corporations

- Wal-Mart
- Exxon-Mobil
- General Motors

# US Green Economy

## Renewable Energy Technologies

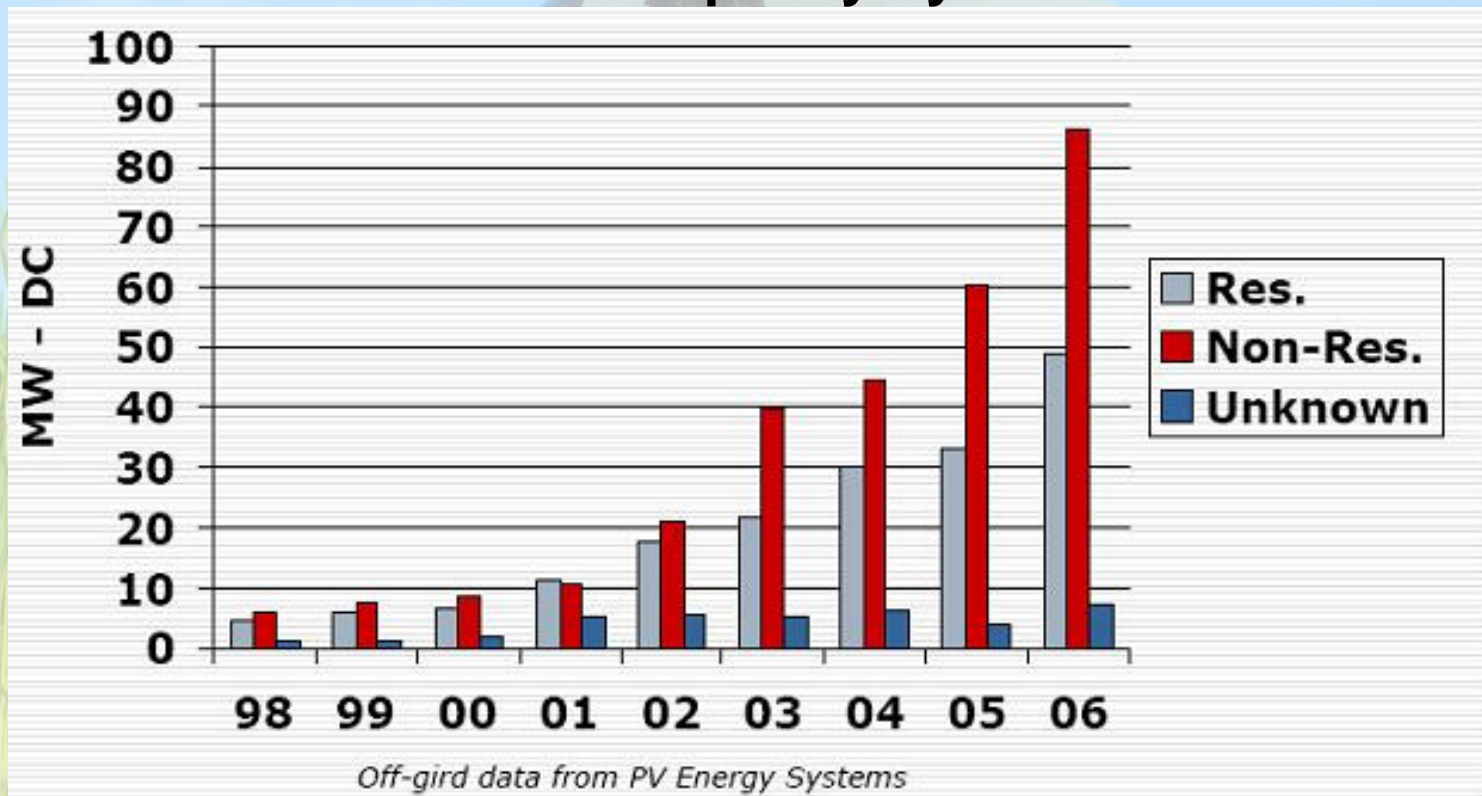
### Solar Hot Water and Space Heating Installations



# US Green Economy

## Renewable Energy Technologies

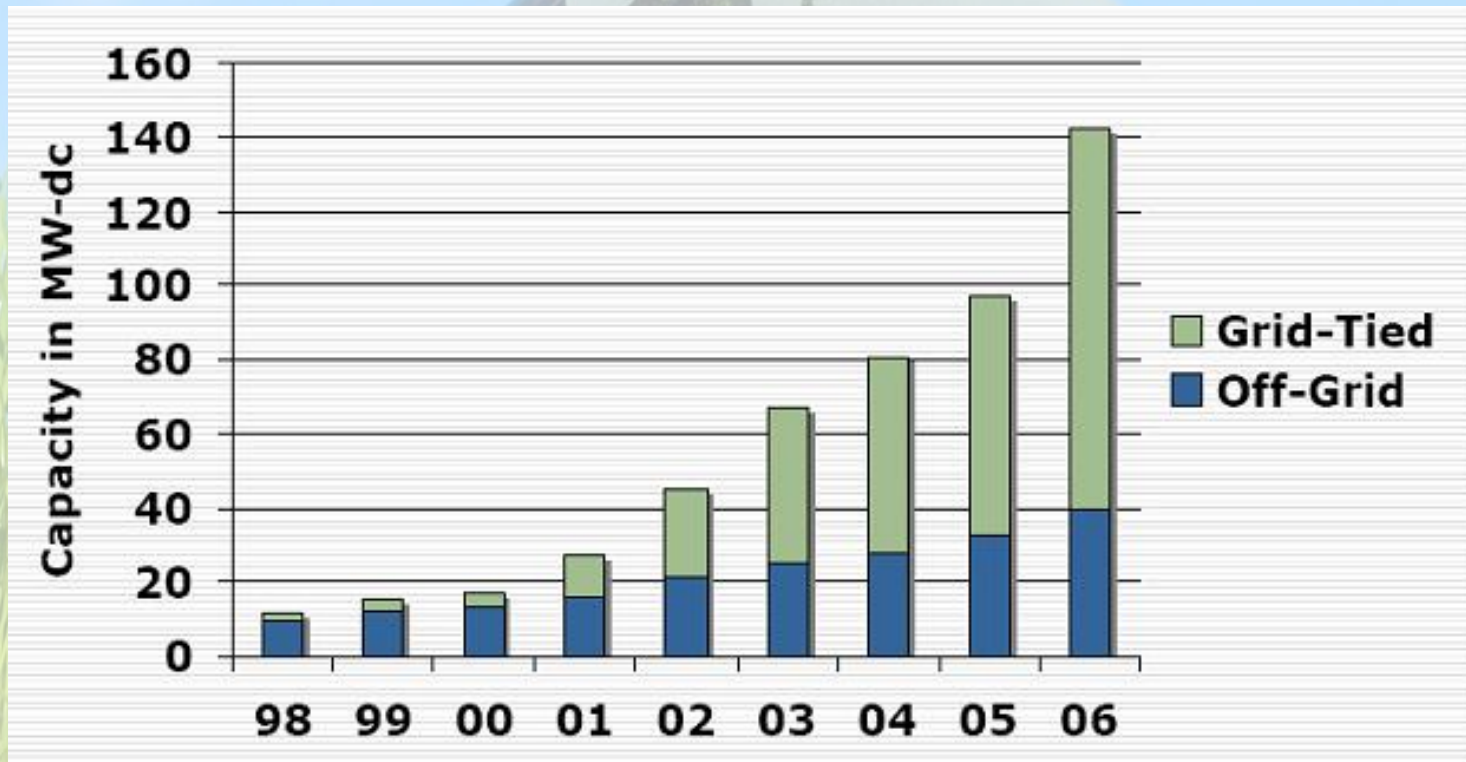
### Installed PV Capacity by End Use



# US Green Economy

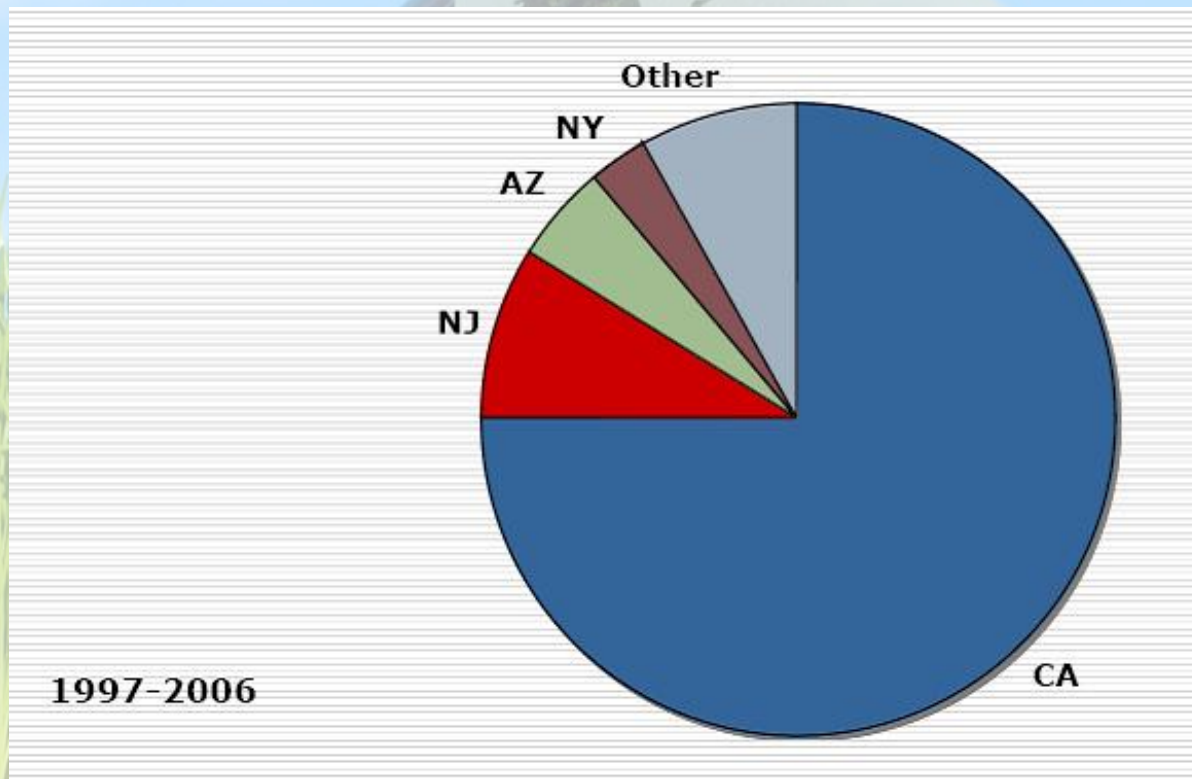
## Renewable Energy Technologies

### US PV Installations



# US Green Economy Renewable Energy Technologies

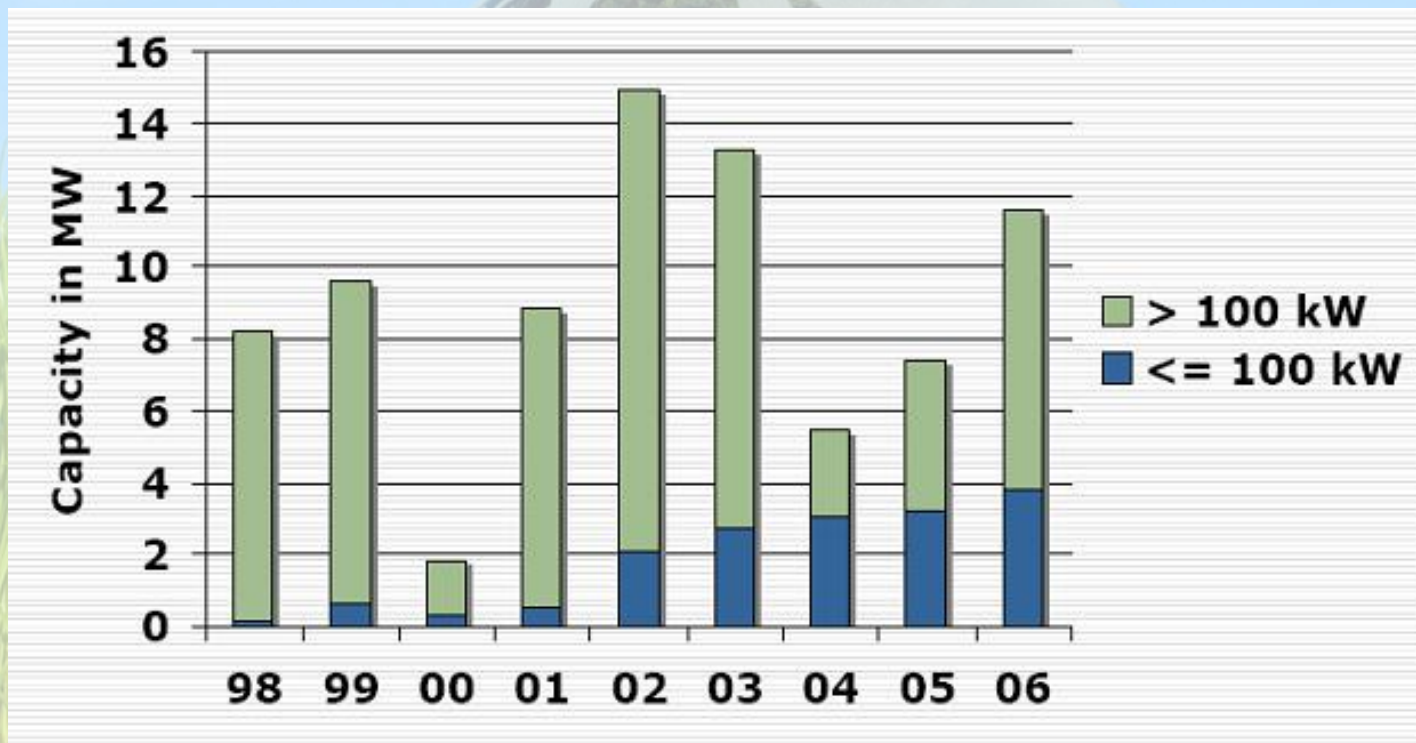
## Grid Tied PV Installations by State



# US Green Economy

## Renewable Energy Technologies

### Grid-Connected Wind Turbine Installations



# US Green Economy

The renewable energy and energy efficiency industry could...

- generate \$4.5 trillion in revenue and
  - create 40 million new jobs
- ...by the year 2030

These 40 million jobs would represent nearly one out of every four jobs in 2030.

# CA Green Economy

| California Venture<br>Capital Investment in<br>Clean Technology | Millions, 2006 Inflation<br>Adjusted Dollars |      |                        |
|---|--|------|------------------------|
|   | 2005   | 2007 | %<br>Change<br>2005-07 |
| Energy Generation   | 109  | 960  | +783%                  |
| Transportation  | 23   | 308  | +1218%                 |
| Energy Efficiency   | 15   | 108  | +608%                  |
| Energy Storage  | -  | 89   | -                      |
| Materials   | 90   | 80   | -11%                   |
| Energy Infrastructure   | 74   | 65   | -13%                   |
| Recycling & Waste   | -  | 63   |                        |
| Agriculture   | 42   | 62   | +48%                   |
| Water & Waste Water   | 15   | 31   | +103%                  |
| Manufacturing/Industrial  | 35   | 13   | -62%                   |
| Air & Environment   | 71   | 6    | -92%                   |
|   | 474  | 1785 | +276%                  |

Source: Henton, D. Melville, J. Grose, T., & Maor, G. (2008). Clean Technology and the Green Economy.

# CA Green Economy

California's green industry is primarily in energy generation and energy efficiency.

- Solar makes up 53% of employment and 64% of employers
- The Bay Area Region and Southern California Region are major hubs of activity

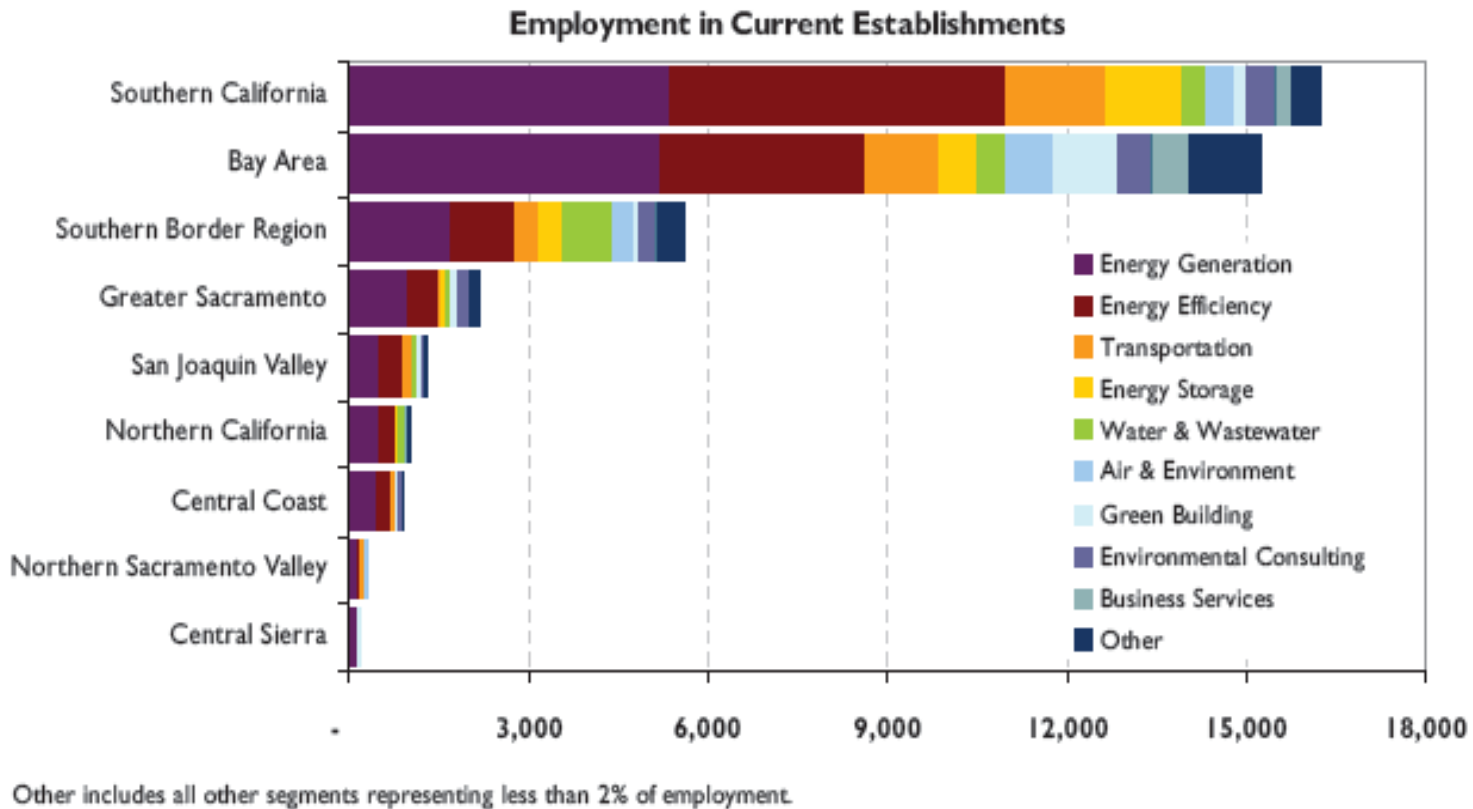
# CA Green Economy

- **Green building is more concentrated in the Bay Area Region**
- **Energy storage and efficiency are more concentrated in the Southern California Region**
- **Manufacturing accounts for 41% of employment and 15% of employers**

# CA Green Economy

- **Professional, Scientific, & Technical Services accounts for 28% of employment and 36% of employers**
- **Construction accounts for 10% of employment and 19% of employers**

# CA Green Economy



Source: Henton, D. Melville, J. Grose, T., & Maor, G. (2008). Clean Technology and the Green Economy.

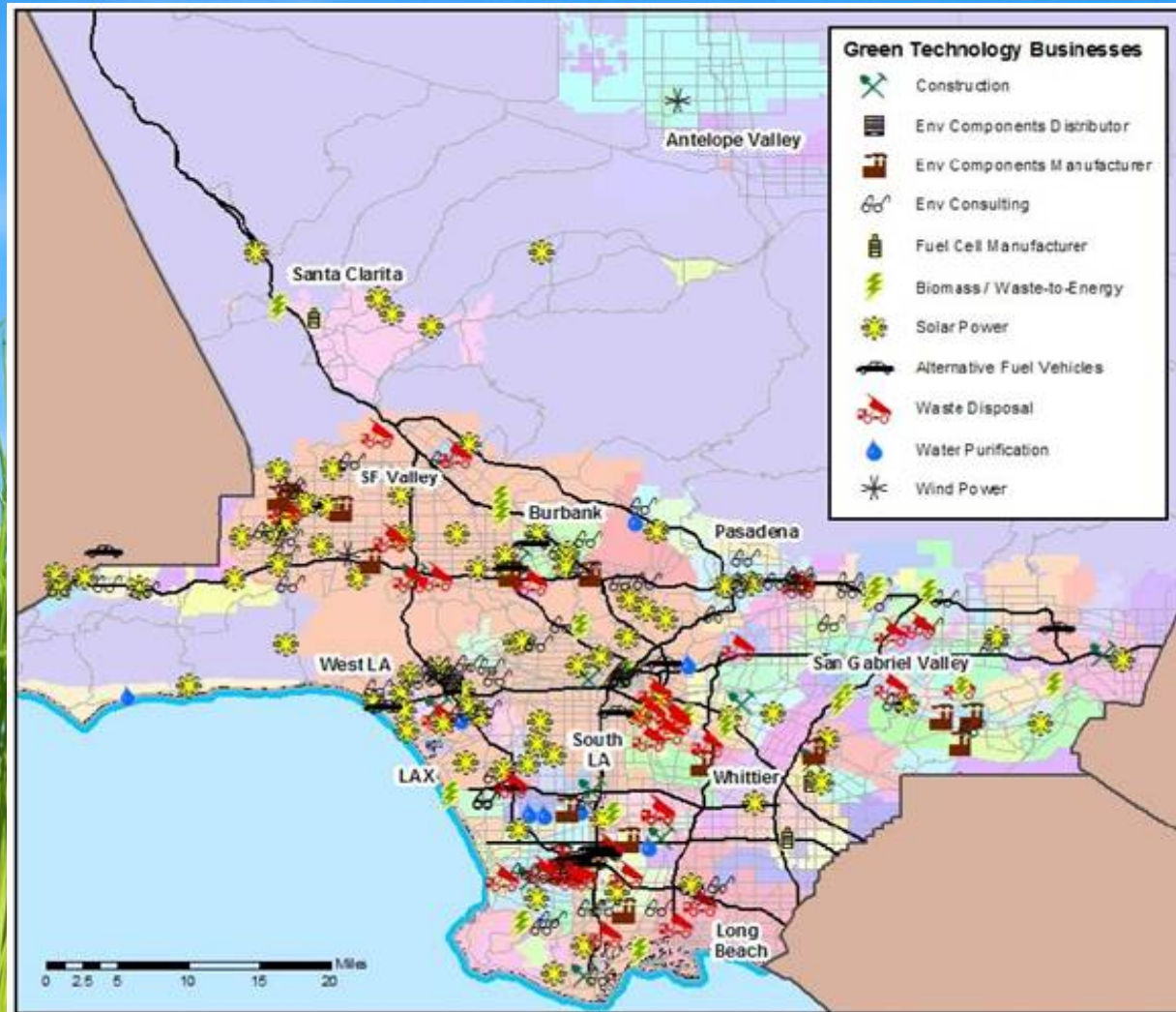
# LA Green Economy

## *Green LA Action Plan Goals*

|                                |  |
|--------------------------------|--|
| <b>Energy</b>                  | <ul style="list-style-type: none"> <li>• Increase renewable energy from solar, wind, biomass, and geothermal sources to 20% by 2010</li> <li>• Increase use of renewable energy to 35% by 2020</li> <li>• Complete energy efficiency retrofits of all city-owned buildings to meet a 20% or more reduction in energy consumption</li> <li>• Install the equivalent of 50 “cool roofs” per year by 2010 on new or remodeled city buildings</li> <li>• Become a worldwide leader in green buildings (* see LA Green Building Program below)</li> </ul> |
| <b>Water</b>                   | <ul style="list-style-type: none"> <li>• Reduce per capita water consumption by 20%</li> </ul>   |
| <b>Transportation</b>          | <ul style="list-style-type: none"> <li>• Require 85% of city fleet to be powered by alternative fuels</li> <li>• Convert 100% of city refuse collection trucks and street sweepers to alternative fuels</li> <li>• Convert 100% of MTA buses to alternative fuels</li> </ul>   |
| <b>Waste</b>                   | <ul style="list-style-type: none"> <li>• Recycle 70% of trash by 2015</li> </ul>   |
| <b>Port of Los Angeles</b>     | <ul style="list-style-type: none"> <li>• Fully implement the San Pedro Bay Ports Clean Air Action Plan</li> </ul>  |
| <b>Airport</b>                 | <ul style="list-style-type: none"> <li>• Develop and implement comprehensive policies to green Los Angeles’ airports to meet green building specification, improve recycling, use alternate fuel sources, use recycled water, employ water conservation methods, reduce energy requirements and reduce green house gas emissions.</li> </ul>   |
| <b>Open Space and Greening</b> | <ul style="list-style-type: none"> <li>• Create 35 new parks by 2010</li> <li>• Plant 1 million trees</li> </ul>   |

Source: Regional Economic Development Institute, Los Angeles Trade-Technical College (April, 2008 Draft). The strategic opportunity to build a green workforce in Los Angeles.

# LA Green Economy



Source: Burns, P. & Flaming, D. (January, 2006). Jobs in L.A.'s green technology sector.

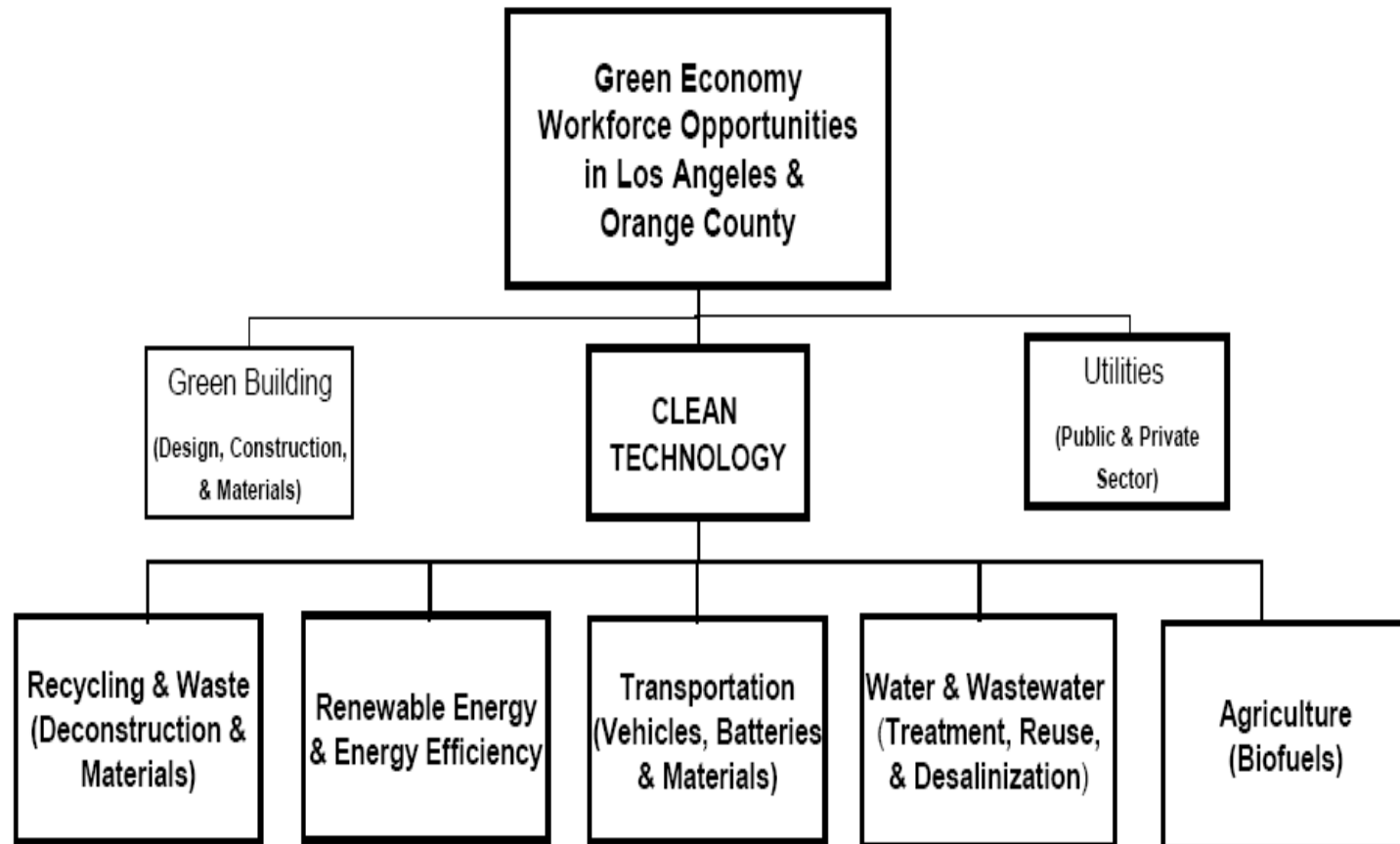
# LA Green Economy

- **Construction and Solar Power - Scattered throughout the county**
- **Waste Disposal / Remediation - Los Angeles, Vernon, Huntington Park, Torrance, and Irwindale**

# LA Green Economy

- **Environmental Consulting - downtown Los Angeles, West Los Angeles, Santa Monica, Western San Fernando Valley, Pasadena, and Torrance**
- **Alternative Fuels - Carson, Gardena and Torrance**

# LA Green Economy



# **Construction Occupations Traditional and Changing Due to Green Construction**

**Construction Managers (7,400 / 200)**

**Cost Estimators (4,500 / 160)**

**Electricians (13,900 / 340)**

**Construction & Building Inspectors (2,800 / 105)**

**First-line Supervisors of Construction Trades  
(13,800/ 340)**

# **Emerging Green Construction Occupations**

**Solar Installer & Technician (electrician  
certification)**

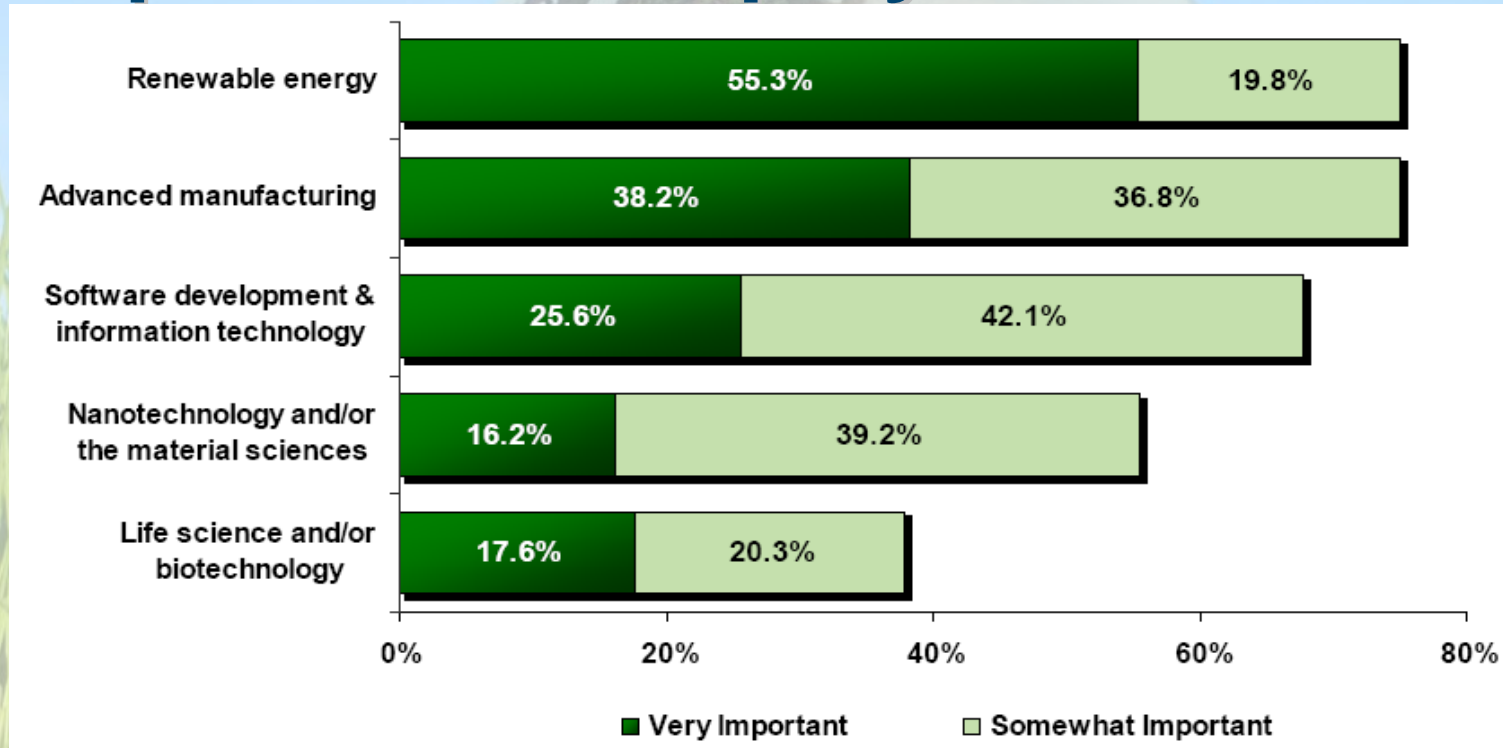
**Energy & Indoor Air Quality Auditor (B.A.)**

**Deconstruction Worker (entry-level, 2 week  
intensive OJT)**

**Operations & Maintenance Technicians for  
HVAC and PV systems (Associates or  
Certification)**

# LA Green Economy

Clean technologies that are most important to employers:

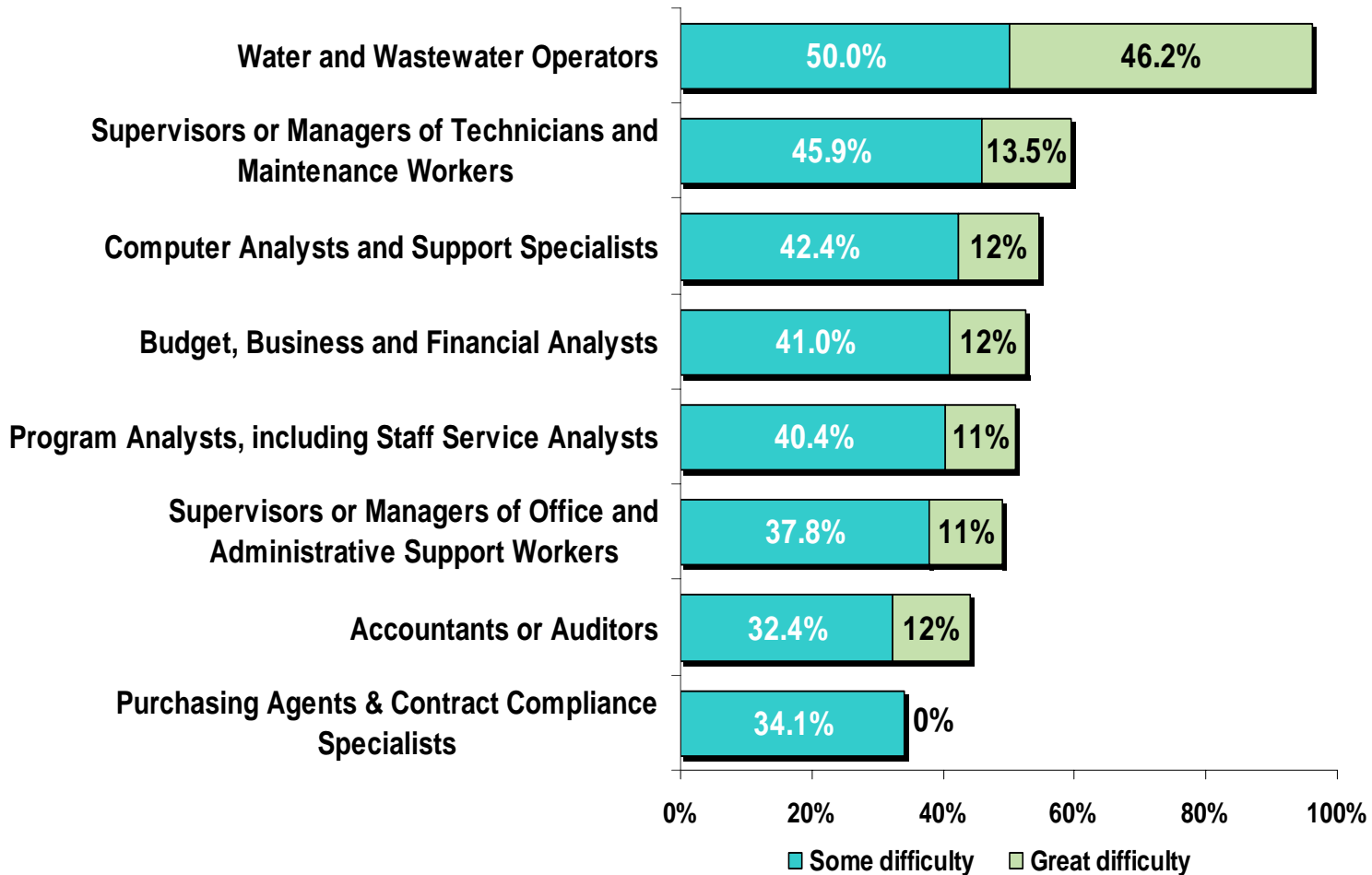


# LA Green Economy

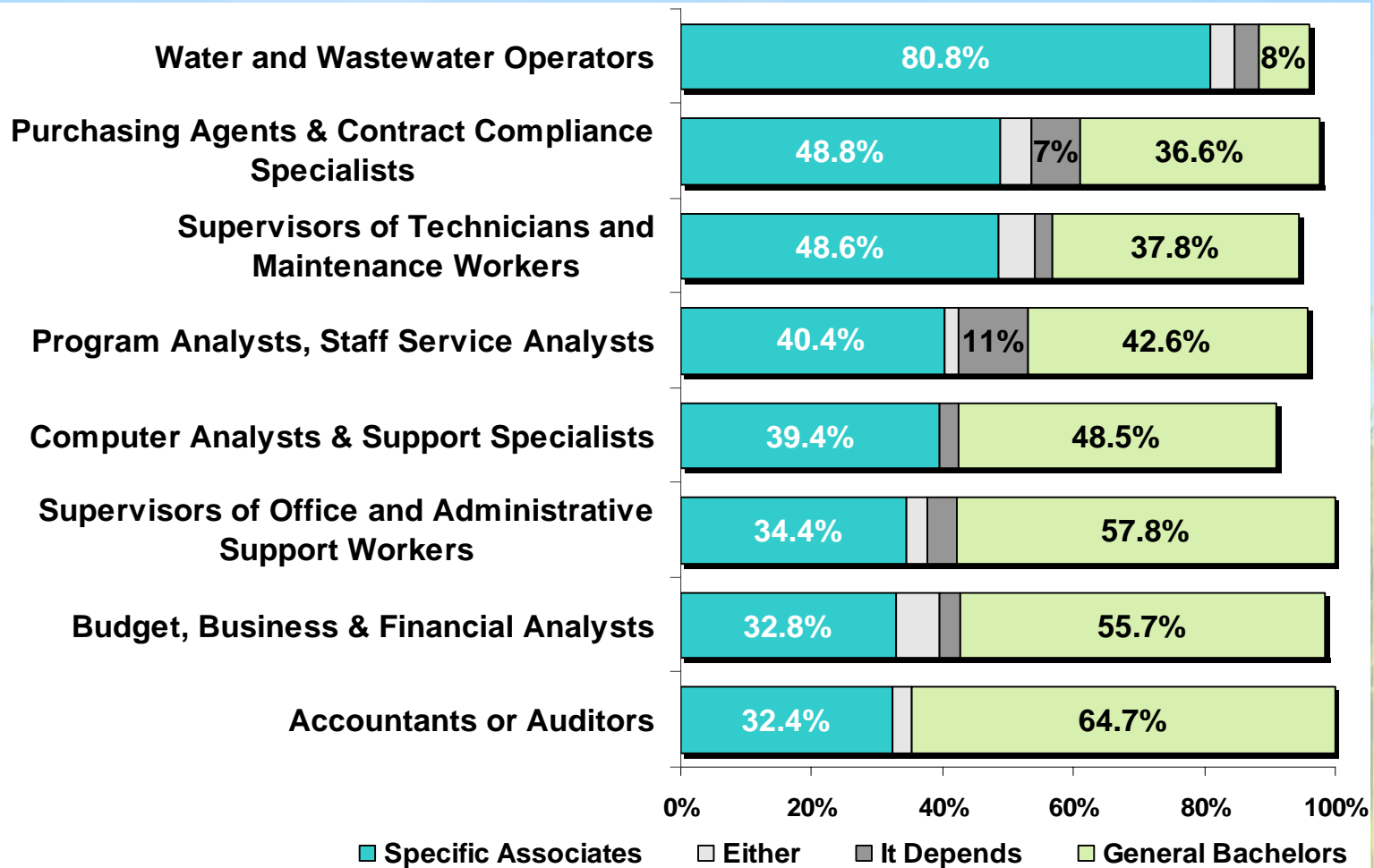
**More than 50% of employers expect to hire for the following occupations in next 12-24 months:**

- **Assembler (including electronic and electrical)**
- **Customer service representative**
- **Manufacturing technician**
- **Operations and maintenance technician**
- **Research & development asst or tech**
- **Quality control technician**

# Difficulty Finding Workers



# Training/Degree Preference



# **Energy Services Occupational Areas and Technician-Level Titles**

**Generation**

**Transmission and Distribution**

**Energy Assessment**

**Project Engineering and Implementation**

**Sales and Marketing**

**Resource Management**

**Regulatory Affairs**

# Traditional and Emerging Energy Occupations - Generation

- ***Instrument/Control Technician and Process Operator*** - Monitors operation and maintenance of generator for optimization of energy production.
- ***Energy Specialist*** - Performs energy audits and assists in making recommendations for power producer/ generation customers.
- ***Green Power Technician*** - Installs, operates, and maintains green power/ renewable energy systems (i.e., solar, wind, biomass).

# Traditional and Emerging Energy Occupations – Buying and Selling of Energy

- ***Purchasing Agent*** - Analyzes and optimizes energy purchases.
- ***Energy Broker/Power Marketer*** - Buys and sells energy for customers.
- ***Billing Analyst/Rate Analyst*** - Analyzes utility bills and selects optimal rate structures for customers.

# Traditional and Emerging Energy Occupations – Transmission and Distribution

- ***Equipment Operator/ Controls Operator - Operates equipment and process controls.***



# Traditional and Emerging Energy Occupations – Energy Assessment

- **Energy Auditor** - Conducts energy audits (including investment grade audits) of buildings, as well as building and process systems.
- **Energy Analyst** - Analyzes energy and building data, researches energy saving opportunities, and recommends a prioritized list of energy conservation and renewable energy options.
- **Industrial Process Specialist** - Analyzes industrial processes to identify opportunities for reduction of energy consumption and environmental impact.

# Traditional and Emerging Energy Occupations – Engineering and Implementation

- **Systems Technician** - Integrates energy efficiency, energy management, and alternative energies into the operation and maintenance of facilities.
- **Measurement and Verification Technician** - Installs, maintains, and troubleshoots HVAC, electrical, and energy management instrumentation.
- **Testing/Commission Technician** - Ensures proper operation of the energy system by verifying system is working properly and teaching operators how to use the system.

# Traditional and Emerging Energy Occupations – Operations and Maintenance

- **Building Control Operator** - Operates building systems and controls (HVAC, lighting systems, etc.)
- **Building Control Technician** - Installs, maintains, and troubleshoots complex building systems and controls.
- **Building Operator/Building Technician** - Manages all building operations.
- **Resource Conservation/ Efficiency Manager** - Plans, recommends and supervises implementation of resource efficiency and conservation projects.

# Traditional and Emerging Energy Occupations – Operations and Maintenance

- **Maintenance Technician** - Performs preventative and predictive maintenance to keep building running smoothly while reducing energy consumption and environmental impact.
- **Industrial Process Equipment Maintenance and Operations Specialist** - Plans, recommends, and supervises implementation of energy and resource efficiency and conservation projects in an industrial setting.

# Traditional and Emerging Energy Occupations – Resource Management

- **Energy Manager/ Specialist/Consultant** - *Formulates recommendations for energy efficiency, alternative energy improvements, improved cost effectiveness and lower environmental impact by conducting complex analyses of HVAC, lighting, and building systems, energy and environmental data, and rate structures.*
- **Program/Project Coordinator** - *Manages implementation of specific programs and projects.*
- **Energy Cost Analyst** - *Analyzes rate structures and energy purchase possibilities and recommends optimum selection of energy sources.*

# Traditional and Emerging Energy Occupations – Resource Management

- **Resource Conservation/ Efficiency Manager** - Analyzes energy and waste streams in order to identify and implement cost-effective energy conservation measures that could minimize environmental impact.
- **Waste Management Technician** - Evaluates and analyzes processes and waste streams, identifying and implementing opportunities for lowering environmental impact and improving cost effectiveness.

## Traditional and Emerging Energy Occupations – Related Occupations

- ***Building Controls Installer*** - Installs building controls, including computer, control wiring, sensors, and other monitoring equipment.
- ***Maintenance Planner*** - Designs preventative maintenance program for the building owner or for the automated buildings company.
- ***Lineperson*** - Maintains electrical distribution system.
- ***Legislative Research Technician*** - Researches applicable laws and regulations, including current bills and lobbying efforts.

# **Emerging Energy Technology Occupations**

**Systems Technician (Associates or B.A.)**

**Renewable Energy Technicians (Associates or B.A.)**

**Energy Auditor (Associates or B.A.)**

**Compliance Specialist (Associates or B.A.)**

**Resource Conservation/Efficiency Manager (B.A.)**

**Energy Analyst (B.A.)**

# Recommended Educational Background for Traditional and Emerging Energy Occupations

• ***Math/Business*** - Business math, algebra, graphing, geometry, business/finance, economic analysis (e.g., life cycle costing, payback, return on investment)

• ***Computer Skills*** - Word processing, spreadsheets, database, presentation software; energy analysis and management software (e.g., Enerlink), basic understanding of computer programming, such as Visual Basic or Fortran

# Recommended Educational Background for Traditional and Emerging Energy Occupations

• **Science** - Thermodynamics (e.g., basic heat transfer), fluid dynamics, basic biology (e.g., the interactions of ecosystems and pollutants), basic chemistry

• **Building Science** - Basic electrical theory/systems, basic mechanical systems; heating, ventilation, and air conditioning (HVAC) systems; compressed air systems; building controls, lighting motors and motor controls; building envelope (i.e., structure), including energy efficient construction; preventative maintenance; industrial processes; renewable energy design and installation

# Recommended Educational Background for Traditional and Emerging Energy Occupations

• ***Energy Management*** - Codes, standards, and guidelines; deregulation procedures and structure; general rate structures for gas, electric, water utilities; energy production and distribution systems, including alternative and renewable energy technologies; energy audits and analysis, energy management systems, project management

• ***Communications*** - Technical report writing/composition, good oral communication skills/public speaking