Finding Personnel for the Nuclear Industry
- the role of educational institutions

Lisa Marshall
Director of Outreach Programs
Department of Nuclear Engineering
NC State University
Overview

- Some Key Demand Drivers
- Employee Trends: current & projected
- Educational Pipeline
- NC State’s Nuclear Engineering Initiatives:
  - strategic enrolment management; partnerships
- Questions/Comments
Demand Drivers For Personnel

- License renewals
- New plant designs from Toshiba, Westinghouse, AREVA, GE
  - ABWR, ESBWR, AP1000, EPR
- DOE power initiatives
  - GNEP, Gen IV
- Homeland security
- Attrition figures
Nuclear Industry Workforce v.s. National Workforce

Source: Bottom Graph - Bureau of Labor and Statistics, 2004 Employed Civilian Labor Force; Top Graph - NEI Workforce Survey, 2005
Projected Employee Status

- Median age of US labor force is projected to rise to 41.4 in 2012 (36.6 in 1992)

- Nuclear power generators may expect 40% attrition in next 5 years (23,200)
  - 15,600 look to retire
  - 7,600 will be lost through general attrition

- Key suppliers anticipate 32% of their workers will be eligible to retire by 2009
  - 13% through general attrition

- Demand Drivers ➔ Critical Staffing Concerns

Source: NEI Work Force Survey, 2005
Cumulative Demand for New Employees

NEI Workforce Survey, 2001
Worker Supply Projected To Decrease In Key Areas

% Change In New Worker Supply (2002 - 2011)

-100%  -50%  0%  50%  100%  150%  200%

Computer scientists
Other technical degrees
HP, chem, env, tech
Other non-tech degree
I&C craft/tech
Electrical craft/tech
All others
Welder
Operator
Mechanical craft/tech
Other engineers
Nuclear engineers
Health physicists

NEI Workforce Survey, 2001
Health Physics Professionals

- Shortage of qualified radiation protection professionals
- Present demand is approximately 130% of supply
- Over next 5 years demand will outstrip supply by 160%
- In 10 years, demand will more than double the supply

Source: 2004 HPS Survey
Educational Supply

New engineers
- 1985 = 85,000
- mid-90s = 65,000
- 2004 = 75,000 approx.

Reasons students cite for leaving engineering: curriculum and pedagogy

(W. Wulf, President, National Academy of Engineering, 2004)
Demographics Trends

Figure 2-2
U.S. population ages 20–24 years, by race/ethnicity: Selected years, 1985–2020

Population (millions)


American Indian/Alaska Native
Asian/Pacific Islander
Black
Hispanic
White


Science and Engineering Indicators 2006
Educational Supply

Figure 2-12
Minority share of S&E bachelor’s degrees, by race/ethnicity: 1985–2002
Percent

Figure 2-11
Female share of S&E bachelor’s degrees, by field: 1983–2002
Percent

NOTE: Data not available for 1999.

Science and Engineering Indicators 2006

NOTES: Physical sciences include earth, atmospheric, and ocean sciences. Data not available for 1999.

Science and Engineering Indicators 2006
National Undergraduate Enrolment

Academic Year

Number of students

2000-2001: 668
2001-2002: 855
2002-2003: 1,113
2003-2004: 1,366
2004-2005: 1,520

Legend:
- Other
- Radiological
- Health Physics
- Nuclear Engineering

DOE Survey Results on Enrolments, Graduates and Employment, 2006
National Graduate Enrolment

DOE Survey Results on Enrolments, Graduates and Employment, 2006
National Undergraduate Degrees Conferred

DOE Survey Results on Enrolments, Graduates and Employment, 2006
National Graduate Degrees Conferred

DOE Survey Results on Enrolments, Graduates and Employment, 2006
NCSU Nuclear Engineering
Undergraduate Outreach

Student Focus
School Visits
University & Engineering Open Houses
Young Investigators’ Summer Program
Undeclared Engineering & First Year College activities

Educator Focus
NC Science Teachers’ Association Conference w/ NC HPS
Nuclear Engineering Science Teachers’ Workshop w/ PE
Dept. of Energy’s Harnessed Atom
NCSU Nuclear Engineering Graduate Outreach

**Internal Students**
- Accelerated master’s programs
- Internal pipeline to MS, MNE, PhD degrees

**External Students**
- On-campus, national, & international pipelines
- Graduate school fairs
- Professional conferences
- Faculty recommendations
NCSU Nuclear Engineering Retention Initiatives

- Nuclear Engineering Student Research Programs
- NC State (Under)graduate Research Symposia
- Professional Development Opportunities
  - e.g. ANS Mark Mills Awards
- Student Reactor Program
- Career Development Series
- Graduate Research Seminar Series
- Distinguished Lecture Series
NCSU Nuclear Engineering Retention Initiatives

- Scholarships: national & departmental
- Summer Internships
- Co-operative Education
- Graduate Traineeships & Fellowships
- Full time positions
Federal Support

University Reactor Infrastructure and Education Assistance Program – FY 2005

- Total $23.5 Million
- INIE: 39%
- Reactor Upgrades: 4%
- Education Outreach: 2%
- Reactor Sharing: 3%
- Fuel: 13%
- Other: 4%
- NEER: 20%
- Radiochemistry: 1%
- Matching Grants: 4%
- Fellows & Scholars: 9%
- HP Fellows & Scholars: 1%
NCSU Undergraduate Student Enrollment

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Freshman Students</th>
<th>Sophomore Students</th>
<th>Junior Students</th>
<th>Senior Students</th>
<th>Undergraduate - total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002-03</td>
<td>20</td>
<td>25</td>
<td>11</td>
<td>17</td>
<td>73</td>
</tr>
<tr>
<td>2003-04</td>
<td>27</td>
<td>27</td>
<td>27</td>
<td>14</td>
<td>95</td>
</tr>
<tr>
<td>2004-05</td>
<td>24</td>
<td>30</td>
<td>29</td>
<td>102</td>
<td>102</td>
</tr>
<tr>
<td>2005-06</td>
<td>26</td>
<td>33</td>
<td>42</td>
<td>121</td>
<td>121</td>
</tr>
<tr>
<td>2006-07</td>
<td>31</td>
<td>25</td>
<td>33</td>
<td>44</td>
<td>133</td>
</tr>
</tbody>
</table>
NCSU Graduate Student Enrollment

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>New Master Students</th>
<th>New Doctoral Students</th>
<th>New Graduate Students - total</th>
<th>Masters' Student Body - total</th>
<th>Graduate Program - total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002-03</td>
<td>9</td>
<td>6</td>
<td>15</td>
<td>15</td>
<td>37</td>
</tr>
<tr>
<td>2003-04</td>
<td>12</td>
<td>16</td>
<td>22</td>
<td>22</td>
<td>37</td>
</tr>
<tr>
<td>2004-05</td>
<td>12</td>
<td>5</td>
<td>20</td>
<td>17</td>
<td>41</td>
</tr>
<tr>
<td>2005-06</td>
<td>12</td>
<td>3</td>
<td>22</td>
<td>15</td>
<td>51</td>
</tr>
<tr>
<td>2006-07</td>
<td>11</td>
<td>4</td>
<td>17</td>
<td>16</td>
<td>52</td>
</tr>
</tbody>
</table>
NCSU Degrees Conferred

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>B.S. in Nuclear Engineering</th>
<th>B.S. in Engineering, Nuclear Power concentration (last class in Dec 2005)</th>
<th>Graduates - M.S. in Nuclear Engineering</th>
<th>Graduates - Masters total</th>
<th>Graduates - Ph.D.</th>
<th>Total Graduate Degrees Conferred</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002-03</td>
<td>8</td>
<td>3</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>2003-04</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>2004-05</td>
<td>3</td>
<td>5</td>
<td>7</td>
<td>4</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>2005-06</td>
<td>3</td>
<td>6</td>
<td>7</td>
<td>4</td>
<td>11</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>11</td>
<td>27</td>
</tr>
</tbody>
</table>

Legend:
- B.S. in Nuclear Engineering
- Total Undergraduate Degrees Conferred
- Graduates - Master of Nuclear Engineering
- Graduates - Ph.D.
- B.S. in Engineering, Nuclear Power concentration (last class in Dec 2005)
- Graduates - M.S. in Nuclear Engineering
- Graduates - Masters total
- Total Graduate Degrees Conferred
Comments, Questions ??

Lisa Marshall
Director of Outreach Programs
NC State’s Nuclear Engineering Program
919.515.5876
lisa.marshall@ncsu.edu