

**2374-33**

**Joint ICTP-IAEA School of Nuclear Energy Management**

*5 - 23 November 2012*

**HUMAN RESOURCE DEVELOPMENT IN THE FIELD OF NUCLEAR  
ENERGY**

**PEDDICORD K.L.**

*Nuclear Power Institute at Texas A & M University  
304 Zachary Engineering Center 3475 TAMU  
College Station TX 77843-3473  
U.S.A.*



NUCLEAR  
POWER  
INSTITUTE

# ***HUMAN RESOURCE DEVELOPMENT IN THE FIELD OF NUCLEAR ENERGY***

*IAEA Nuclear Energy Management School  
Trieste, Italy*

K. L. Peddicord, Director  
Nuclear Power Institute  
Texas A&M University  
[www.nuclearpowerinstitute.org](http://www.nuclearpowerinstitute.org)

November 12, 2012



# ***104 Operating Nuclear Power Plants, 30 Potential New Plants Announced to the NRC 4 New Reactors Under Construction***



# ***Nuclear Power in the US Human Resources Needs***



- Anticipated growth in electricity demand
- Continued/growing *key role* for nuclear power
- Anticipated challenges: retirements
- New plants being planned
- Require *significant numbers* of well-prepared new technical staff
- This has created need for *new approaches*



# *Traditional Approaches to Nuclear Engineering Education*



## **Several Strong Academic Programs in the U.S.**

- Berkeley
- Florida
- Georgia Tech
- Idaho State
- Illinois
- Michigan
- Missouri
- MIT
- New Mexico
- NC State
- Ohio State
- Oregon State
- Penn State
- Purdue
- RPI
- Tennessee
- Texas A&M
- Wisconsin

# Full Scope Academic Offerings

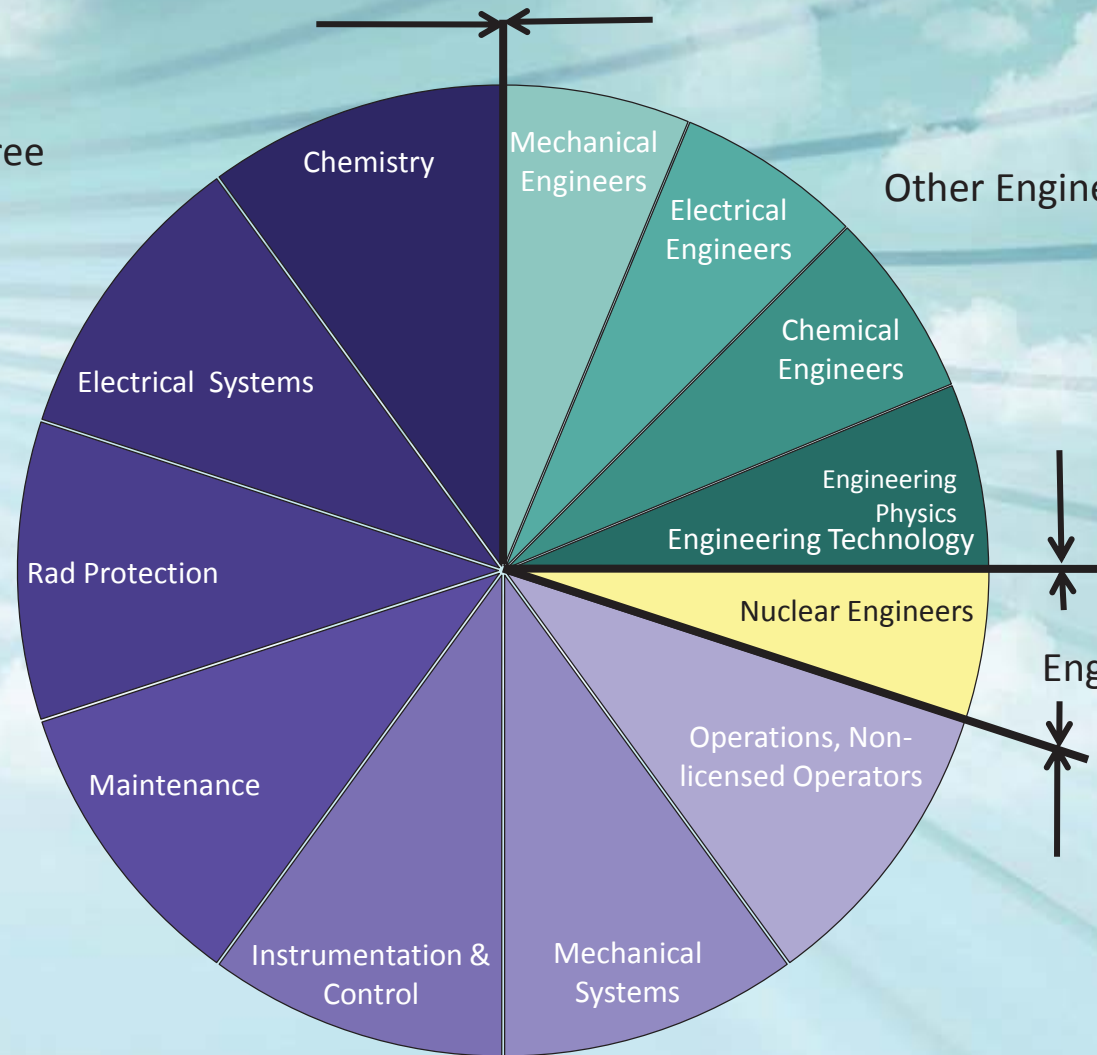


- Academic degree programs leading to the B.S., Master's of Science and Ph.D. in Nuclear Engineering
- Strong research programs
- Ties with industry and government agencies and laboratories
- Graduating students going into industry, national labs, academia, government and the military
- However *industry needs go beyond programs in nuclear engineering*

# The "U.S. Model": Distribution of Disciplines for the Nuclear Workforce, The "Other than Nuclear" Challenge



2-year Associate Degree  
Backgrounds

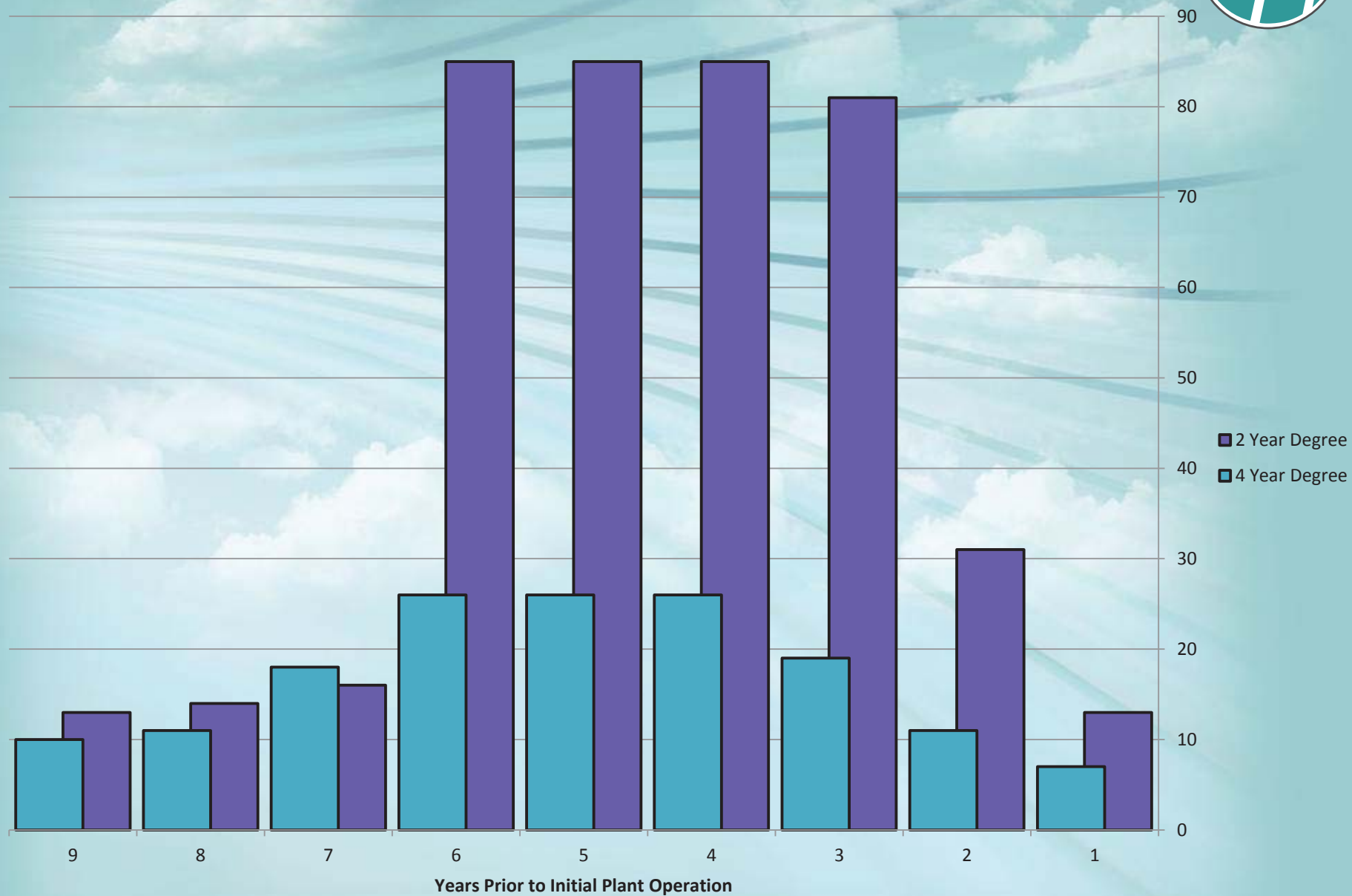


4-year Degrees  
Other Engineering Disciplines

Nuclear  
Engineering Degree

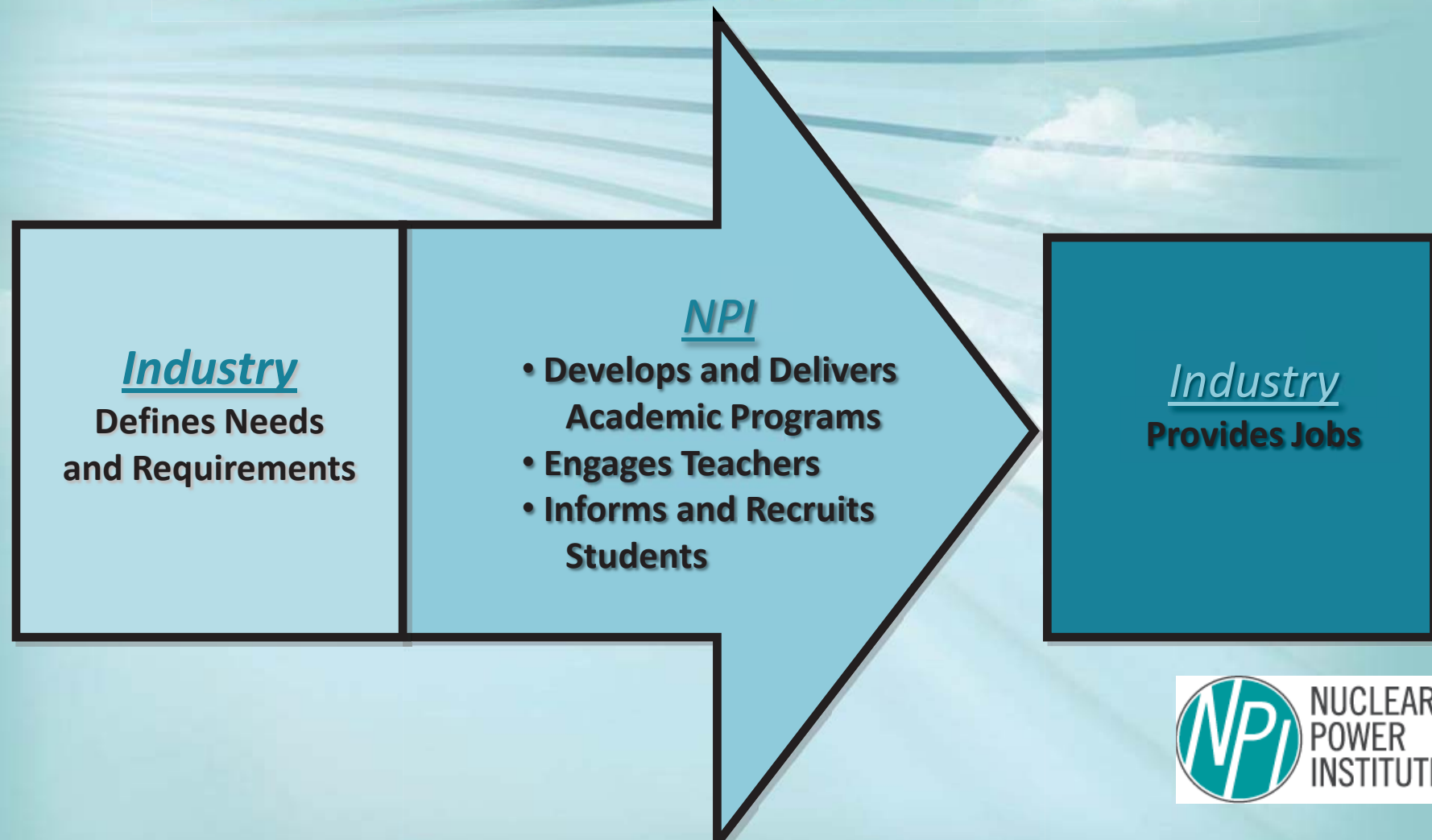


## Timing of Workforce Employment Before Plant Operation





# *An “Integrated Approach”: Collaboration Between Industry and the Nuclear Power Institute*



# ***Establish New Approaches***



- Create *new programs* at the baccalaureate level for *engineers in other fields*
- Establish *new degrees at two-year community and technical colleges* to prepare graduates to become *nuclear power plant technicians*
- *Reach out to inform students and teachers* of career opportunities in nuclear energy
- *Engage with communities and stakeholders* to develop understanding of the role of nuclear as a source of electricity

# ***NPI University***

## ***Certificate Program***

### ***A Unique and Innovative Approach***



#### ***NPI Nuclear***

#### ***Power Certificate***

#### ***Partner Universities***

(ME, EE, ChE, Engr Tech,  
Engr Physics)

- PVAMU
- Tarleton State
- A&M
- TAMU-Kingsville
- TAMU-Corpus Christi
- UNT



- Fundamentals
- Systems-  
BWR/PWR
- Operations
- Human  
Performance



#### ***Outcome***

Graduates with  
***Academic  
Backgrounds,  
Credentials  
and  
Hiring Advantages***  
for Jobs at  
Nuclear Power Plants

***Approach:*** Distance delivery of courses based on industry input and needs to five campuses across Texas.



# *Certificate of Completion*

This award is presented to

*John Calvin Martinez*

For successfully completing all required coursework for

*Nuclear Power Plant Technology*

On the 16<sup>th</sup> of December, 2011



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\_\_\_\_\_  
K. L. Peddicord, Director

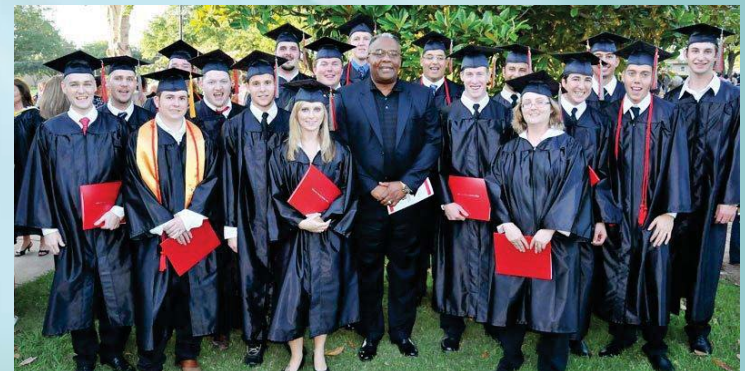
\_\_\_\_\_  
Galina V. Tsvetkova, Instructor



# ***NPI Community College Partners***



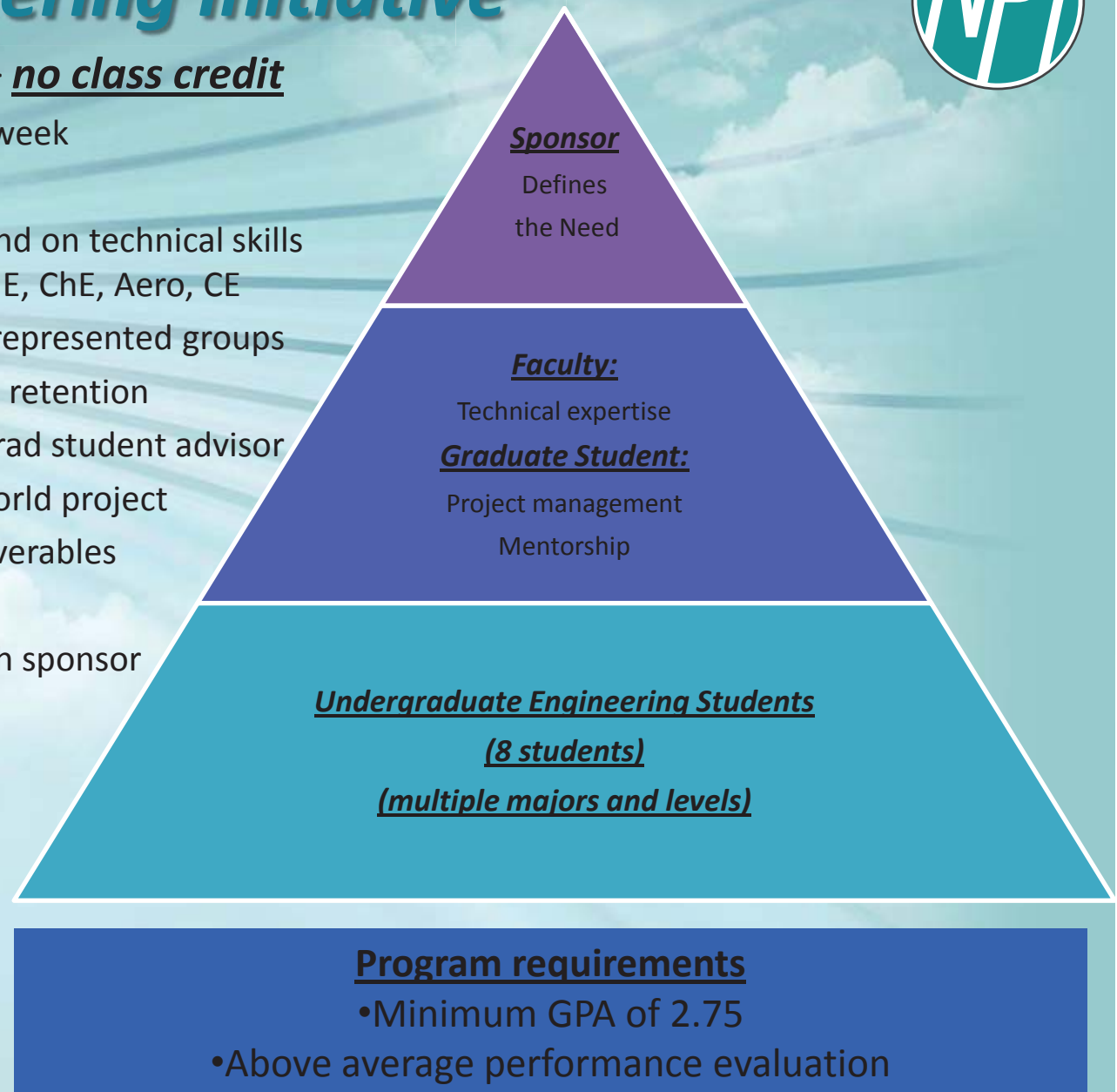
- Associate of Science degree in Nuclear Power Technology
- Advance Certificate in Nuclear Power Technology
- Electrical and Electronic Systems
- Digital Instrumentation and Control
- Radiation Protection
- Brazosport College
- Texas State Technical College
- Wharton County Junior College
- National Uniform Curriculum Project-in 39 community colleges in the U.S.



# System Engineering Initiative



- **Part-time internships – no class credit**
- Students work 10 hours per week
- Hourly pay \$8-10 per hour
- Mix of students majors depend on technical skills needed for project-ME, EE, NE, ChE, Aero, CE
- Targets students from underrepresented groups
- Improve engineering student retention
- Freshmen through seniors, grad student advisor
- Handle problem like a real world project
  - Semester plan with deliverables
  - Weekly team meetings
  - Regular interactions with sponsor
  - Technical presentations
  - Industry mentor
- Performance evaluation
  - Quality of work
  - Initiative
  - Teamwork



# *Outreach Programs*



*Nuclear  
Power  
Institute*



*Teacher Programs*

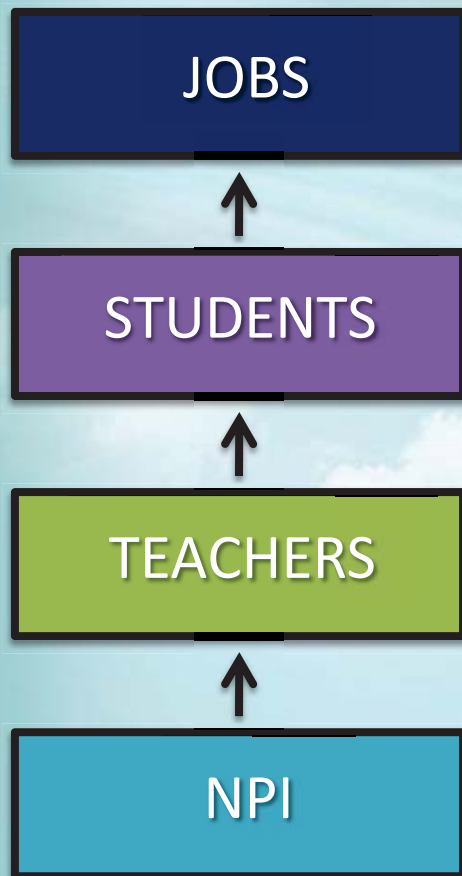


*Student Programs*



*Communities and  
Leaders*

# NPI Educator Programs



## Progression of Programs

International Teacher Exchange

Counselors Making Occupational  
Readiness Exciting (C-MORE)

Teacher Research Academy  
(TRA)

Science on Saturday (SOS)

Enrichment Experiences in Engineering  
(E<sup>3</sup>)

Teacher Summit

Teacher Workshops

Conference for the Advancement  
of Science Teachers (CAST)



# *Enrichment Experiences in Engineering*



*Develop curriculum and experiments for the classroom*



*Enhance lab skills & techniques*

$E^3$

$E^3$

$E^3$



*Experiences with the latest in engineering research*



*Practical experience at the nuclear power plant.*

# POWER SET



*Powerful Opportunities for Women Eager and Ready for Science Engineering and Technology*

- High school/secondary school girls selected to apply for membership
- Educational tools and support to pursue STEM studies and careers
- 3.5 GPA, demonstrate strong aptitude for math and/or science
- 8 high schools, 160 participants



- *Mentoring by WIN members and other professionals*
- *Professional development days*
- *Job Interview Skills, resume writing skills*
- *Tours of industry sites to explore career options*
- *College and employment application assistance*
- *Community service*
- *Advice on selection of university or college*



# WIT

## Workforce Industry Training



### Components and Activities

- mentoring by industry professionals
- site visits to local industry partners
- professional development activities
- educational visits to universities and community colleges
- community service events
- scholarship opportunities
- 8 high schools, 180 participants



# ***POWER GRID***

## ***Girls Responding to Industry Demands***



- Extension of POWER SET
- Focus on junior high school girls
- Encourage their participation in math and science through high school
- 6 schools
- 130 participants
- Grant from Phillips-66





***BRT***

# ***Boys Resourcing Technology***



- Extension of WIT
- Focus on elementary and junior high boys
- Engage in academic activities
- Stay focused on STEM path

# *NPI Student Programs— Linking Together*



**High School Programs**

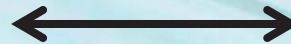
**Junior High/Elementary  
Programs**

## ***POWER SET***

*Powerful Opportunities for  
Women Eager and Ready for  
Science, Engineering and  
Technology*

## ***Power GRID***

*Girls Responding To Industry  
Demands*



## ***WIT***

*Workforce Industry Training*

## ***BRT***

*Boys Resourcing Technology*



# High School Students Visit Colleges/Universities





# *Students Outreach to Students*



**High school students outreach to younger students**



**University students outreach to high school students**





# Science on Saturday—Reaching Families and the Community



- *Presentation of experiments geared towards junior high and high school students and families*
- *A program developed by NPI and presented by high school teachers and college students interested in promoting STEM*
- *SOS stimulates scientific inquiry and piques student interest*
- *Includes students, teachers, parents, and community members welcomed*
- *Planned for 100, over 200 attended*

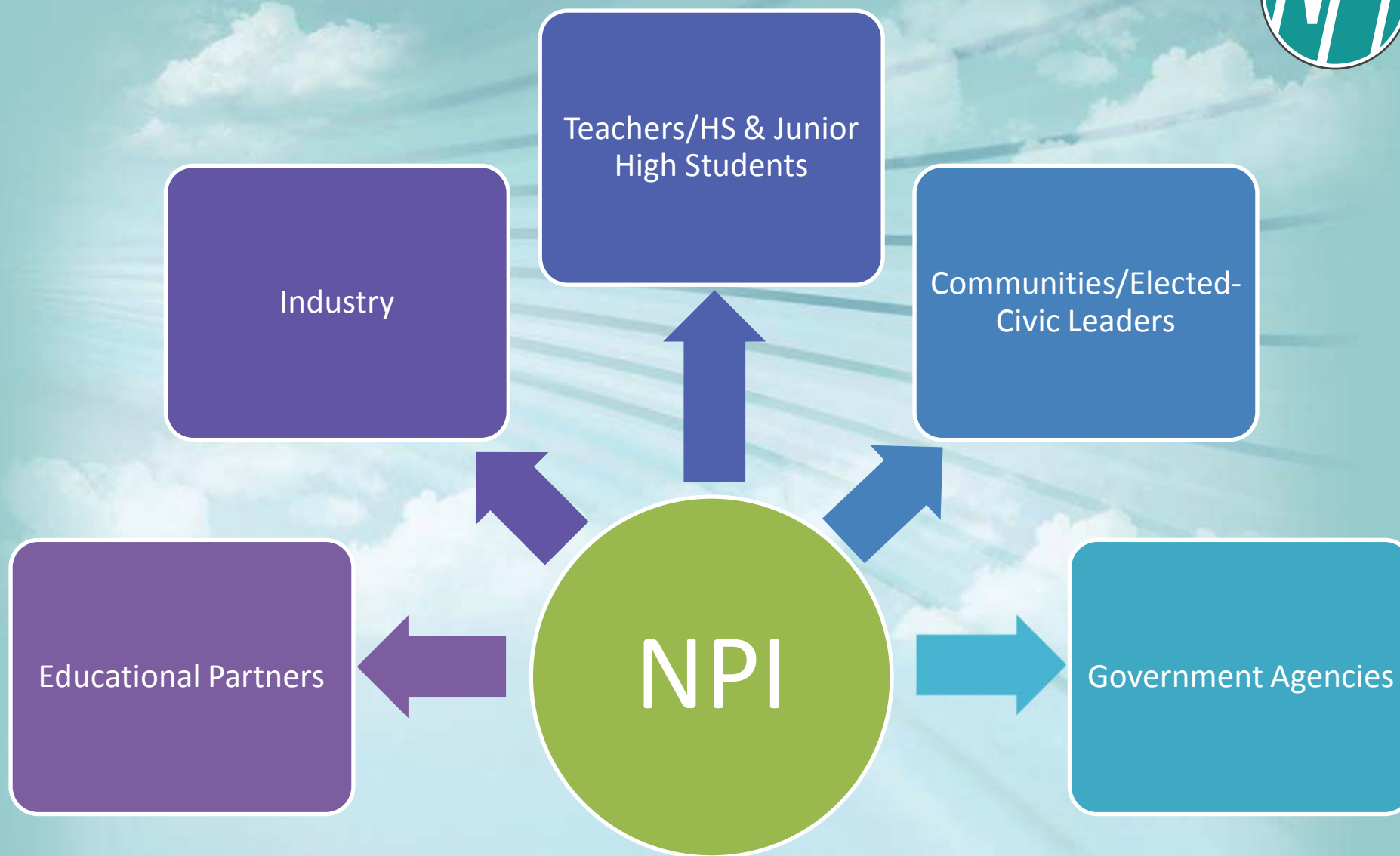


*The Desired Outcome!!*



***This is SUCCESS!!!***





# *International Collaboration*



- Workshop for Kenya
- One month-July 8 to Aug 8
- 29 participants
- Multi-disciplinary group
- Sponsored by IAEA and Kenya
- Visited STP nuclear power plant, had reactor laboratories, “Disaster City” exercise, met elected leaders



A&M Power Plant



A&M Nuclear Science Center



“Disaster City” Emergency Response Exercise



# *NPI – A Vibrant and Robust Partnership*



- *A comprehensive, integrated approach*
- *Working with industry* on needed programs
- Bringing together the *2-year and 4-year institutions*
- Informing and involving *civic and elected leaders, and stakeholders*
- Developing effective *outreach and recruiting* programs with teachers and students
- Working with *other countries* to meet their needs
- Responding to the *key human resource development challenge*
- An “*end-to-end*” program--gaining increasing national and international attention

