NORTHLAND PIONEER COLLEGE
POWER PLANT FUNDAMENTALS PROGRAM REVIEW

I. Introduction

A. Methods

The following document presents a comprehensive review of the Power Plant Fundamentals program at Northland Pioneer College (NPC) as of Spring 2007. Because NPC programs are reviewed on a five-year cycle, data was collected back to the 2003-2004 academic year. There is no record of any previous program reviews, because the existing Power Plant Fundamentals degree program did not appear in the NPC catalog until 2003. The document was co-authored by Kenneth L. Keith, Program Chair for the NPC Power Plant Fundamentals program and Betsyann Wilson, an independent consultant.

This section provides the reader with background information for understanding the development and evolution of the program. Part II examines all aspects of the current program with regard to instruction, student services, noteworthy developments and external alliances and supports that have advanced and improved the Power Plant Fundamentals program in the past five years. Parts I-II were developed using information gathered from the Division of Workforce Development, the Office of Records and Registration, the Power Plant Fundamentals Program, and the Division of Student Services. To develop Part III, members of the Power Plant Advisory Board were asked to report on current trends that have ramifications for the program. They were also asked to add any additional salient information that would serve to examine and review the effectiveness of the NPC Power Plant Fundamentals program, as well as provide direction for its future. Part IV provides a summary of the program review document. Parts I-IV were presented to the ITP Program Review Committee on February 15, 2007 and the committee was asked to discuss issues that arose during the research and review process and provide final recommendations, which were then added to the Appendix. At the February 15, 2007 meeting of the Power Plant Advisory Board and also through e-mails, members supplied information and direction discussed in Part V, Committee Recommendations on pp. 15.

B. A Brief History of the Power Plant Fundamentals Program at Northland Pioneer College

For clarification, the Power Plant Fundamentals program is an offshoot of the Industrial Technology Program, which is often referred to as the "ITP" program, because of the course prefix, ITP, that is used in the NPC catalog. The origin of the Power Plant *Operations* (PPO) courses dates back to 1981. At that time, the program was under the direction of Ron Glen. The courses were limited to individuals employed by Coronado Power Plant. There were 12 courses that *only* covered power plant operations.
The origin of the ITP prefix dates back to the 1991-93 when the program was changed from "Power Plant Operations" to "Industrial Technology" and broadened in scope. Jim

Richmond was the Director and Carl Sheperd was the Program Coordinator. The program consisted of 6 classes: ITP 100- Introduction to Industrial Technology, ITP105- Principles of Technology I,ITP 106- Principles of Technology II, ITP110-Unified Technical concepts of Physics, ITP 150 Pneumatics and Hydraulics Control Systems and ITP 200- Systems Critical Thinking and Control.

In 2000, NPC was approached by the CEOs of several power plants that operate within the college service area to provide high-quality education and training to prepare employees to replace a workforce that was aging out at a critical rate. The Division of Business and Industry Training (now Workforce Development) worked throughout the following year with representatives from all power plants to develop curriculum and instructional methods that would meet industry needs. Empowered by a revised Industrial Technology (ITP) curriculum that was driven by innovative online instructional technology, the college had to respond quickly with courses and faculty. Mr. John Darst, Program Chair of the NPC Construction Technology program was asked to serve as a temporary instructor for the power plant project. He taught the newly christened Power Plant Fundamentals in Fall of 2002 and Spring of 2003 for both regular NPC students and Northern Arizona Vocational Institute of Technology (NAVIT) students (see page 7) via online technology.

In the Spring of 2003, Richard Poundstone was hired to coordinate the Power Plant Fundamentals Program, and John Darst was able to focus entirely on the Construction Technology Program, then in Fall 2004, Richard Poundstone abruptly left his position, Darst stepped in again to teach Power Plant Fundamentals courses. In the late Fall of 2004, Joe Young, a retired Power Plant Instrumentation Technician was hired to be the Program Coordinator and Faculty. January 2006 saw the Program Coordinator position change again when Kenny Keith was hired. He had been Adjunct Faculty in Administrative Information Systems/Business (AIS/BUS) and was also teaching a Business 105 class to Salt River Project (SRP) personnel.

KEY ELEMENTS THAT AFFECTED POWER PLANT FUNDAMENTALS FROM 2003 – PRESENT

- Throughout 2000, the Division of Business and Industry Training (now Workforce Development) worked with representatives from all area power plants to create a new, industry-driven Power Plant Fundamentals degree and certificate program.
- In 2000-2001, online courseware from General Physics was adopted for the classroom learning portion of the core skills classes.
- In December 2003, a power plant operations simulator was donated to NPC by Tucson Electric Power (TEP). Currently there is only one Tucson Electric Power Plant employee, who is proficient in its operation, so it has not been utilized as a teaching tool yet.
- In Fall 2004 the online curriculum provider was changed from General Physics to Trinity in response to recommendations from the advisory committee in conjunction with Workforce Development. Trinity includes a hands-on

component that General Physics did not. It was felt that the hands-on component was critical to the student's ability to master competencies and demonstrate proficiency. A 2003 curriculum change incorporated these hands-on labs to existing course descriptions so students could *apply* their classroom learning. Lab classes were taught at power plant facilities and in the NAVIT classroom facility in St. Johns.

- The Power Plant Fundamentals program appeared in the 2003-2005 NPC catalog.
- In Fall 2006 Carl Perkins grant funds purchased 13 new computers and three printers for the APS Cholla Power Plant classroom used by NPC students.
- In January 2005, ITP changed to a four-semester Power Plant Fundamentals program with Maintenance and Operations offered separately, giving students the option of emphasizing a specialty in Maintenance or Operation, or taking both simultaneously. These program changes were aimed at providing students a better chance of completing courses. It should be noted that the power plants want to see students cross-trained in Maintenance and Operations.
- In Spring 2005, NAVIT began offering Power Plant Fundamentals – Maintenance only. NAVIT does not pay for its students to take the Operations component of Power Plant Fundamentals because there is no NCCER curriculum (see page 4) aligned with Operations. As of Fall 2006, some NAVIT students are taking Maintenance and Operations concurrently, simply by virtue of the fact that there are common elements of both programs in the Maintenance coursework.

II. The Current Status of the Power Plant Fundamentals Program

A. Faculty and Classes

The Power Plant Fundamentals program currently employs 1 full-time coordinator/ faculty, Kenny Keith who coordinates the program and carries a teaching load of twelve credits per semester. He administers the on-line courses, and is currently teaching Northern Arizona Vocational Institute of Technology (NAVIT – see page 7) students at Arizona Public Service's (APS's) Cholla Power Plant in Joseph City. These students come from the high schools at Joseph City and Holbrook. Core Power Plant Fundamentals courses are still offered through web-based and hands-on exercises. The hands-on labs are taught by two current Arizona Public Service employees and one retired SRP employee. They are Don Softley, who is an Operator and Machinist at APS Cholla Power Plant, Robert Martineau, an electrician and Electrical and Instrumentation Technician, and Don Bradburn, a Power Plant Operator. Each of these gentlemen has over 25 years of experience in his field. The labs are presented at the APS Cholla Power Plant at Joseph City and at the NAVIT building in St. Johns. In April or May 2007, the Salt River Project Coronado Generating Plant will be the host of future labs.

B. Evidence of Need for Program Growth and Expansion

Navajo and Apache Counties are home to three of the nation's largest coal-fired generating plants: Cholla Power Plant at Joseph City operated by Arizona Public Service (APS); Coronado Generating Station at St. Johns operated by Salt River Project (SRP); and Springerville Generating Station at Springerville, jointly operated by SRP and

Tucson Electric Power (TEP). In addition, Navopache Electric Cooperative in Lakeside supplies electricity to over 10,000 square miles of eastern Arizona and western New Mexico, and Abitibi Consolidated, a recycled-paper products mill, runs its own internal generating plant. All five employers provide lucrative career opportunities across an area marked by poverty and unemployment. Still, all are experiencing rapid growth and concomitant growing pains, and all face the challenge of advancing their workforces in an increasingly technological industry, while preparing to replace a large percentage of retirees.

Together, the five corporations provide nearly 600 jobs in the power generation industry in Navajo and Apache Counties. Given the low socioeconomic status of the two-county area, this is significant, because theirs is the highest-wage industry in Apache County with an hourly mean of $20.97[1]. Entry level power plant jobs across the two-county region average $18.00 per hour, while journeyman level averages $32.00 per hour[2]. With Apache County's average Per Capita Personal Income (PCPI) at only $16,476 and Navajo County's even less at $16,421 a power plant career is extremely desirable.

According to APS, an estimated $231 million in environmental upgrades at Cholla Power Plant will result in 30 permanent full-time jobs and $15 million more in payroll over the next four years.[3] Also, per a May 10, 2006 joint press release from SRP and TEP, construction is approved for a 400-megawatt, coal fired generating facility in Springerville, to be sited at TEPs existing Springerville Generating Station, and scheduled to be operational in late 2009, employing an additional 55-70 skilled workers. Explosive growth in the White Mountain Area in southern Navajo and Apache Counties means greater demand for skilled workers at Navopache Electric Cooperative, which has seen growth in its customer base of nearly 5% *per year* for the past five years. The need for workers due to growth is compounded by the need to replace a workforce that is "aging out" at a rate of 5%-10% per year, and magnified by difficulty in attracting highly-skilled employees to such a rural and remote region. The latter caused all five power partner with NPC in 2001 to advance the "grow your own workforce" concept.

NPC has been instrumental in assisting with preparation of entry-level employees through the current ITP program, which began with a partnership between the college and all five power plants. Still, all five have identified two critical unmet education and training needs. (1) There is a marked gap between employees at the entry level and journeyman level, and incoming workers do not have the skills to replace those who are "aging out" of the industry. (2) To circumvent the need for costly travel by their employees, plants currently conduct their own mandatory continuing education *in-house,* which compromises power production, and plant efficiency and safety. NPC is the only full-service, accredited community college in the region, and NPC tuition is the lowest of any community college in Arizona. Still, capacity challenges keep the college from being able to respond to the needs of the local power-generating industry:

[1] *Arizona Workforce Informer*: www.workforce.az.gov/cgi/databrowsing/localAreaProfileQSResults…8/01/2006.
[2] EMPower Advisory Committee Power Plant Representatives
[3] *Holbrook Tribune News-Silver Creek Herald*, July 14, 2006.

C. NCCER Curriculum

The National Center for Construction Education and Research (NCCER) was formed in 1995 as a non-profit foundation to help address the critical workforce shortage facing the vocational/technical industries and to develop industry-driven standardized craft training programs with portable credentials. In addition to developing curriculum for many vocational disciplines, NCCER maintains a national registry of companies that recognize this curriculum and its attendant certification. The NCCER certification program for Power Plant Fundamentals is used in NPC coursework. The performance testing used by Trinity is closely related to that of NCCER. *NCCER tests are given as a supplement* and added way of testing the student's knowledge. The NPC goal is for all students who complete the ITP 230 series, which constitutes the core requirement for the Maintenance Fundamentals Area of Specialization, to receive a level one and two NCCER certification. The power plants acknowledge that NCCER certification verifies that students have demonstrated proficiency in a given set of competencies. Still, the power plants do not, as a group, recognize NCCER certification as being a benchmark for employment or salary grade. Chester Crandell, Superintendent of NAVIT advocates for adopting NCCER curriculum in all vocational areas, but it should be noted that there is no NCCER curriculum that aligns with the Power Plant Fundamentals Operations speciality.

D. Requirements for certificates and degrees, including prerequisites

1. Prerequisites

Accommodated testing is offered to all students with disabilities who are registered with the Northland Pioneer College's Disability Resources and Access (DRA) Office. Students with disabilities provide the DRA with current documentation of their disability which qualifies them for in class and testing accommodations. Accommodations are approved according to the students limitations associated with his/her disability. Possible testing accommodations include the ASSET test on tape and in Braille; the use of calculators for students with Specific Learning Disabilities in the Math area; the Asset test untimed; and a scribe to mark the answer sheet on the ASSET test for students with hand mobility impairments.

Placement testing is required for students who wish to enroll in academic courses. Therefore, any student attempting the Associate of Applied Science (AAS) degree or Certificate of Applied Science (CAS) in Construction Technology would be required to show appropriate scores in writing skills, reading skills and math skills on the ASSET, the COMPASS or the ACT prior to enrolling in the required general education classes. Minimum scores are as follows:

Subject	ASSET	COMPASS	ACT
Reading Skills	42	82	18
Writing Skills	42	71	18
Math Skills	42	46	18

For each skill area, a Decision Zone exists. This is a score that falls below the minimum allowed, but permits the student to enroll in the course if he or she signs a waiver acknowledging the placement score and agreeing not to request a refund of tuition if he or she fails the course. Complete information about the college's placement policies and procedures can be found in the NPC Placement Handbook available through the Division of Student Services.

2. Associate of Applied Science

The **Power Plant Fundamentals Program** prepares students to be technicians and operators capable of understanding the entire system with which they work. Core courses cover the complex related mechanical, pneumatic, hydraulic, electrical, thermal and sensory control systems used in modern industry. To complete the AAS in **Power Plant Fundamentals**, a student must complete 17 credits of general education. This includes 6 credits from Communications: ENL 101 (College Composition I – 3 credits) and ENL 102 (College Composition II – 3 credits) or SPT 120 (Public Speaking – 3 credits). Three credits of Mathematics are required: MAT 101 (Basic Technical Math). Six credits of Computer Science, CIS 100 (Introduction to Computer Science – 3 credits) and CIS 106 (Computer Literacy – 3 credits) are required, as are two credits of Business: BUS 103 (Success on Your Job). In addition to these general education requirements, the student must complete 24 credits in an Area of Specialization: Power Fundamentals or Maintenance Fundamentals. Students must take 15 credits from the List of Required Electives: BUS 105 (Techniques of Supervision – 3 credits); CIS 120 (Introduction to Databases – 3 credits); CIS 230 (Introduction to Microsoft Office – 3 credits); CIS 235 (Advanced Microsoft Office – 3 credits); ENL 109 (Technical Writing – 3 credits); and any unduplicated ITP course, 100 level or higher. To complete the AAS, eight credits of unrestricted electives are required. They may be any college course, 100 level or higher.

The **Industrial Technology Program** prepares students to be technicians and operators capable of understanding the entire system with which they work. Core courses cover the complex related mechanical, pneumatic, hydraulic, electrical, thermal and sensory/control systems used in modern industry. To complete the Associate of Applied Science degree in **Industrial Technology**, a student must complete 16-17 credits of general education. This includes 6 credits from Communications: ENL 101 (College Composition I – 3 credits) and ENL 102 (College Composition II – 3 credits) *or* ENL 109 (Technical Writing – 3 credits) *or* SPT 120 (Public Speaking – 3 credits). Three credits of Mathematics: MAT 112 (Algebra II: Intermediate – 3 credits) or MAT 121 (Intermediate Algebra – 3 credits) are accepted for the AAS in Industrial Technology. An additional 7 credits must be selected from at least *two* disciplines on the AAS Discipline Studies list: Physical and Biological Sciences, Arts and Humanities, and Social

and Behavioral Sciences. The candidate for the AAS in Industrial Tech must also take 39 credits of core requirements and 9 elective credits.

3. Certificate of Applied Science

To earn a Certificate of Applied Science degree in Power of Maintenance Fundamentals, a student must complete the core requirements in an Area of Specialization, and ENL 101 or SPT 120, and MAT 101.

To earn a Certificate of Applied Science in Industrial Technology, a student must complete ENL 101 and either MAT 112 or MAT 121, as well as 9 courses (27 credits) prescribed in the catalog.

4. Certificate of Proficiency

No Certificates of Proficiency have been developed for Power Plant Fundamentals.

Certificates of Proficiency in ITP are awarded for completion of the core set of classes only (no general education requirements) in the following areas: Electrical Maintenance (24 credits); Industrial Plant Operations (24 credits); Instrumentation and Controls (24 credits); Mechanical Maintenance (24 credits); Wastewater Collection and Treatment (18 credits) or Water Supply Treatment (18 credits).

E. Course offerings and Special Programs

1. In-House Training

Salt River Project has in the past contracted with NPC to use the Trinity on-line libraries for their training. The on-line courses are administrated by SRP personnel. Students do not get NPC credit for this in-house Computer Based Training (CBT), but they do receive pay raises based upon the CBT modules they complete. Program Coordinator Kenny Keith is currently discussing with SRP the possibility of students receiving college credit.

2. Dual Enrollment

Dual Enrollment is a program that allows high school students to receive credit for certain classes toward both college programs and high school graduation. Dual Enrollment agreements exist between NPC and 20 high schools in its service area and cover a variety of both academic and vocational courses. While no high school offers courses in Power Plant Fundamentals per se, high school students who desire an AAS or CAS may take general education courses and some electives toward their degree/certificate requirements through the dual enrollment program. High school teachers are required to maintain certification as NPC Associate Faculty, and to use the college's approved course outlines and materials.

Depending upon the nature of their school's dual enrollment agreement with NPC (there are three options), students pay full tuition, reduced tuition, or no tuition for taking courses for dual enrollment credit.

3. Northern Arizona Vocational Institute of Technology

The Northern Arizona Vocational Institute of Technology (NAVIT) is a Joint Technological Education District (JTED) formed in 1999 to assist high school juniors and seniors in completing community college technical education classes. NAVIT serves 11 school districts in Navajo, Apache and Gila Counties. Students enrolled in NAVIT can get a jump-start on the Associate of Applied Science degree by taking community college classes beginning in the junior year of high school. NAVIT assists these students with tuition, books and fees, and NAVIT students take classes at the community college from community college instructors for part of their high school day. Power Plant Fundamentals offerings in conjunction with NAVIT include all requirements for the specialization in Power Plant Fundamentals – Maintenance. Of the 51 students enrolled in the Power Plant Fundamentals program from Fall 2003 through Spring 2006, 21 (43%) were NAVIT students. NAVIT enrollment accounted for an average of 40.54% of total program FTSE for that period.

F. Occupations and transfer programs for which the program prepares students

Students in Power Plant Fundamentals can prepare for entry-level occupations in the power plant and maintenance trades. These include O & M Classifications, mechanics and electricians.

It should be noted that completion of a certificate or degree program in Power Plant Fundamentals, in the absence of any additional practical experience, prepares the student for *entry-level* employment in the aforementioned fields. Power Plants are seeking to hire people who have the skills, experience and education necessary to pass entry level exams, and employees who have on-the-job experience, rather than a college degree or certificate. While NCCER certification is recognized by some unions with partial credit toward satisfying requirements for journeyman status, in the State of Arizona, only labor unions issue journeyman cards or certificates. California is the only state in the union that allows individuals to test for journeyman certification in a trade without the endorsement of a labor union.

G. Enrollment

Enrollment from Fall 2003 – Spring 2006 can be summarized as follows:

1. **Regular Students:** Enrollment in NPC Power Plant Fundamentals classes that are scheduled during the spring and fall semesters as part of the regular calendar accounts for 97.4% of all Power Plant Fundamentals FTSE (Full-Time Status Enrollment). Short-term FTSE accounts for 2.6% Annualized FTSE for these classes averaged 30.02 from Fall 2003 through Spring 2006,

with the highest total FTSE coming in Fall 2003 (36.50) and the lowest in Fall 2005 (20.40).

2. **NAVIT:** Enrollment through the Northern Arizona Vocational Institute of Technology has produced significant FTSE for the Power Plant Fundamentals program from Fall 2003-Spring 2006. It averaged 12.17 FTSE per semester during that period, with Fall '03 and Fall '04 having the highest total FTSE (15.20 each) and Spring '04 having the lowest (8.8).
3. **Students with Disabilities:** During 2003 to 2007 there have them five students asking for assistance

H. Number of students completing program

Only 3 students have completed degree programs in Power Plant Fundamentals since its inception in 2003. Still, there have been many course completers. Course numbers and the number of completers are as follows (ITP 210,211,212, and 213) comprise the Operations area of specialization; ITP 230, 231, 232, and 233 – 233 comprise the Maintenance component):

ITP 210 – Power Principals I – 42
ITP 211 – Power Principals II – 27
ITP 212 – Power Principals III – 8
ITP 213 – Power Principals IV – 7
ITP 230 – Mechanical Maintenance I – 42
ITP 231 – Mechanical Maintenance II – 36
ITP 232 – Mechanical Maintenance III – 25
ITP 233 – Mechanical Maintenance IV - 17

It should be noted that, while there are 51 degree plans on file since 2003, not all students are degree seeking. Some only wish to complete an Operations or Maintenance specialization to become employed or advance in employment. In fact, Program Coordinator Keith reports that nine students (non-NAVIT) have taken the specialization core for Maintenance or Operations and become employed at APS Cholla Power Plant. Two NAVIT students completed courses and served internships last year, then became employed by Tucson Electric Power and APS, entering in-house O & M Classifications and apprenticeship programs to advance further in their careers.

Keith also attests to the value of the Power Plant Fundamentals program in helping employees advance through in-house training programs. For example, APS has an in-house Computer Based Training (CBT) program to allow employees to develop and refresh skills. As they complete CBT modules, they advance up the pay scale. APS supervisors report that those employees who have completed courses through the NPC Power Plant Fundamentals program advance through their in-house CBT modules much more quickly than those who have not. Ostensibly this is because they are familiar with the computer-based learning format and testing protocol and because some of the material covered in the in-house CBTs reinforces the NPC course content.

Finally, APS reports that they use the NPC Power Plant Fundamentals program as a screening tool. They prefer to hire candidates who have taken courses in the Power Plant Fundamentals program over those who have not because they find that the NPC students have a better understanding of entry-level competencies.

I. Salary ranges in occupational field

As with most vocational programs, wages are paid on an hourly basis, and depend almost entirely upon experience. Entry-level workers such as laborers and helpers for the various trades possess limited skills and earn lower wages. Apprentices are in the process of developing their skills, and their wage level reflects their degree of knowledge and experience. Journeymen are at the apex of the pay scale for tradespeople. For a comparative picture of salary ranges, locally, for the Prescott area, the Phoenix metro area, statewide and nationwide please see the charts on Pages 16-19 of the Appendices.

Program cost per FTSE

Given that the NPC Power Plant Fundamentals program includes regular college enrollment and NAVIT enrollment, it is almost impossible to ascertain with any accuracy a cost per FTSE. While data exists for enrollment in each of these areas, budgetary information is unclear and appears to come from multiple sources, including NAVIT. To simply apply the 2005-2006 budget figure to the total FTSE for that year would not provide a valid figure of the cost to the college.

J. Integration of Academic and Vocational Education

While Power Plant Fundamentals falls under Vocational Education, all students completing the Associate of Applied Science degree in Power Plant Fundamentals are required to complete seventeen credits of general education courses, ensuring a well-rounded complement of general education studies. All students completing a Certificate of Applied Science in Industrial Technology are required to take six general education credits.

K. Special Populations

Services to special populations are the responsibility of the Coordinator of Disability Resources and Access (DRA), under the Division of Student Services. The DRA Coordinator ensures equitable access for any NPC student who self-identifies as having a disability by providing classroom accommodations and various support services under the guidelines of the Americans with Disabilities Act (ADA). These include, but are not limited to the following: assisting with registration; coordinating services with other local, state, and federal agencies and programs; and assisting the Vice President for Administrative Services with monitoring of facilities to make sure they meet ADA access guidelines. In addition, the DRA Coordinator provides training to faculty and staff on

issues related to the ADA and oversees ADA issues that may arise with regard to staff and faculty. Extra time on tests, notetakers, tape records to record lectures, sign language interpreters, assistive software for the blind, assistive software for students with Learning Disabilities, readers, scribes, and ergonomic chairs and tables and computer peripherals for those with orthopedic impairments or who use wheelchairs.

L. Equipment

Items on hand in Spring 2006 when current chairman Kenny Keith began include all the hand tools and tools boxes necessary to complete the lab assignments.

M. Business-Industry Partnerships

1. Power Plant Advisory Board

To facilitate dialogue with industry, and respond efficiently and effectively to industry needs, Keith has continued to work with an advisory committee consisting of the following individuals: The Advisory meets quarterly.

- Jeff Comer, Human Resources Manager, Abitibi Consolidated
- Chester Crandall, Superintendent, NAVIT
- Mike Evans, Supervisor, Navopache Electric
- Roxanne Gomez, F&SS Manager, SRP
- David Hansen, NPC Business and Industry Training Coordinator
- Rose Lee Jaquez, Human Resources Supervisor, APS
- Kenny Keith, ITP Coordinator, NPC
- Dan Nicholaus, Apprenticeship Coordaintor, APS
- Jeff Lefevre, Operations Trainer, TEP
- Ernie Tomlinson, Training Analyst, SRP
- Matt Weber, Asst. Superintendent, NAVIT
- Todd White, Training and Development Director, TEP

2. Facilities and Services that Support the Program

The Power Plant Fundamentals Program is set up to allow students to practice and apply what has been learned taking the Trinity Computer Based Training (CBT) modules for both Power Plant Operations and Power Plant Mechanics. All the power plants have allowed NPC students to practice hands-on components on site, and these hands-on components are taught by plant employees. In addition, the NAVIT facility in St. Johns serves as a classroom and laboratory for Power Plant Fundamentals. All power plants are represented on the NPC Power Plant Fundamentals Advisory Committee as described on the previous page, and as such they guide the development of curriculum and keep the program current regarding trends in the industry.

3. Articulation and Collaboration

a. Dual Enrollment

Many area high schools offer dual enrollment classes to their students through an agreement with NPC. Dual enrollment classes allow students to earn college credits for certain classes offered at the high school before they graduate from high school. Students get a head start on college through dual enrollment. Occupational classes are accepted for credit at all state community colleges. Academic courses are accepted for credit by all state community colleges as well as state universities. Many general education courses that are required for a certificate or degree in Power Plant Fundamentals are offered for dual enrollment at high schools throughout the NPC service area. However, no courses specific to the Power Plant Fundamentals core are offered for dual enrollment credit.

b. NAVIT

The Northern Arizona Vocational Institute of Technology (NAVIT) is a Joint Technological Education District (JTED) formed in 1999 to assist high school juniors and seniors in completing community college technical education classes. NAVIT serves 11 school districts in Navajo, Apache and Gila Counties. Students enrolled in NAVIT can get a jump-start on the Associate of Applied Science degree by taking community college classes beginning in the junior year of high school. NAVIT assists these students with tuition, books and fees, and NAVIT students take classes at the community college from community college instructors for part of their high school day. As aforementioned, NAVIT enrollment accounts for a significant portion of all Power Plant Fundamentals enrollment.

c. Marketing Plan

According to the Office of Marketing and Public Relations, there has never been a formal marketing plan for Power Plant Fundamentals. Course offerings appear in the college catalog and course schedule, and on the NPC web site. In years past, there have been occasional news releases about happenings in the program, but there is no official brochure or other printed material produced by Marketing and Public Relations.

III. The Future of the Power Plant Fundamentals Program at NPC: Trends

- There is a continued need for adjunct faculty as more night labs are being added, and to cover the daily NAVIT program. The maximum capacity for labs is 15 students. The program has had to offer more night labs and NAVIT labs to meet enrollment demands, so faculty must be added to accommodate the larger numbers of students in the labs. Program Coordinator Kenny Keith reports that in the Fall 2006 semester, students were turned away from enrolling due to lack of faculty.
- APS Cholla Power Plant has expressed a desire to have NPC administer and facilitate their Electronics and Instrumentation (E & I) program.

- The advisory committee would like to devise a means to cross train students, because industry desires a person who is proficient with both maintenance and operations.
- Prior to 2005 when Trinity was adopted for computer based training, NAVIT students were given the opportunity to take both operation and maintenance classes. They were getting 12 credits per semester versus the present 6 credits for taking the maintenance courses. Still, these students are going to class for three hours per day, five days per week, but still receiving only 6 credits for maintenance. Because of the amount of contact time and because they are mastering some competencies common to both Maintenance and Operations, students feel they should be earning more credits. Some have reported a decline in interest in the NAVIT Power Plant Fundamentals program related to the lack of credits from the contact time.
- There is a need to expand NAVIT program offerings to high school students in ShowLow, Whiteriver, and Blue Ridge High Schools
- Job Shadowing could be implemented to give NAVIT students a great chance to observe and practice what they have learned.
- The advisory committee would like to see summer internship opportunities at all power plants as partial requirement for degrees.

IV. Summary of Program Review Findings

If the Power Plant Fundamentals program is to live up to its potential, several factors must be addressed:

1. The program must have specific, industry-driven, time-oriented guiding goals, objectives, strategies and outcome measures.
2. Adequate numbers of faculty must be employed to support enrollment. In addition, power plants can promote to their employees the opportunity to become guest instructors for specific content areas. For example, a specialist in hydraulics might instruct the hydraulics portion of a course, rather than one instructor covering all areas;
3. There must be a marketing plan, complete with specific and time-oriented objectives, strategies and outcome measures to advance the program to all potential enrollees;
4. While the power plants are unquestionably valuable partners in the Power Plant Fundamentals program, their relationship to the program with regard to their roles and contributions has not been formalized. It may be in the best interests of both the college and the power plants to formalize the role the plants play in providing their facilities for hands-on labs and allowing their employees to serve as adjunct faculty.
5. There does not appear to be a Certificate of Proficiency for students who wish to complete only a core area of specialization without general education. This should be addressed. The addition of certificate programs would increase educational opportunities for those students with Learning Disabilities. Often these students will avoid programs with General education requirements.
6. The advisory committee might discuss how in-house apprentices can receive NPC credits so they can apply apprenticeship learning toward an associate's degree.
7. The advisory committee might explore ways to standardize educational outcomes. For example, an NPC Certificate of Proficiency in Power Plant Maintenance = NCCER Level I and Level II Certification = X entry-level position in any power plant.

8. The college has a power plant simulator donated by TEP. There should be at least two adjunct faculty at each power plant who are able to use it as a teaching tool. If this were the case, the college could explore a means of mobilizing the simulator, therefore having a Mobile Skills Lab that could travel from plant to plant to facilitate in-house training.
9. There should be a continued emphasis on cross training for Maintenance and Operations. It may be necessary to modify degree programs to reflect this, because the power plants highly value cross-trained candidates for employment.
10. Points for Discussion (see below) should be addressed by the Advisory Committee to clarify program objectives and strategies.

Given the industry expansion, area population growth, and employees reaching retirement age, not only in Navajo and Apache Counties but across the State of Arizona, Power Plant Fundamentals is an exciting and lucrative field with great potential, not only from a standpoint of workforce development, but of overall economic health. With institutional support behind it, the Northland Pioneer College Industrial program can only move onward and upward for the betterment of the communities, employers, and most importantly the *students* who are served by it.

A. Points for Discussion by ITP Advisory Committee at its February 15, 2007 meeting

1. Are current NPC facilities adequate for teaching Power Plant Fundamentals courses? If not, what must be done to rectify the situation?

Facilities will not support program growth, unless they are expanded. The advisory committee recommended:

- Continued strong partnerships with the power plants
- Development of a mobile learning lab (This was an element of the unsuccessful grant proposal.)
- Develop or identify a learning center for students in the southern part of the service area.

2. What goals, objectives and outcome measures would most effectively drive the Power Plant Fundamentals program forward? What strategies must be implemented in order to accomplish those goals?

- Identification of additional facilities
- Addition of adjunct faculty
- Continued analysis of program enrollment and completion trends to determine what works well, and conversely why students withdraw

3. If the program is to grow, what is the capacity for adding faculty? Is it sufficient?

Team members considered the following faculty recruitment strategies:

- Look for adjunct faculty among "currently employed", rather than retired employees
- Develop a pool of adjunct faculty to facilitate more flexibility in scheduling
- Increase salaries to draw more faculty
- Hire more than one additional full-time faculty

4. NCCER – Is adoption of NCCER curriculum right for the college?

Chester Crandell, Superintendent of NAVIT recommended adoption of NCCER testing by the NPC program. He also recommended overall acceptance (and use of) NCCER certification by industry. He would also like to involve NAVIT in securing a training facility for residents in the southern end of the county.

5. Degrees and Certificates – What are the pros and cons of a *degree* in Power Plant Fundamentals? Should degree programs be emphasized and are they indicators of program success?

The advisory committee endorses degrees, because they are important for career advancement. Still, they emphasized the need for on-the-job internships as requirements for degrees. Just because a candidate has a degree does not mean he or she is proficient with competencies required on the job. The completion of areas of specialization is a better indicator of workplace competency.

6. What is the nature of employability of Degree and Certificate Completors locally and statewide?

All the power plants report that they are approaching critical hiring challenges as current employees "age out" and retire. This is not just a local phenomenon, but affects power plants statewide and across the U.S. Employees must also respond to an increasingly technical workplace, so the need for ongoing education and training is critical.

7. What areas could/should be added to Power Plant Fundamentals degree or certificate programs?

The committee recommended that program expansion include training in related areas:

- Electrical and Instrumentation – the group suggested this could be called "Instrument Controls Electrical (ICE)"
- Machinist Mechanics
- Auto Mechanics (including heavy equipment and semi-trucks)

Ernie Tomlinson for SRP recommended enhanced technical components be continued and expanded through use of shared resources. He also noted the hands-on component must be maximized, and the St. Johns power plant simulator needs to be put into operation and use within the current program.

Todd White from TEP emphasized the importance of mechanical elements, and recommended a basic E&I program of 3 to 4 semesters.

Dan Nicholas of APS recommended NPC solidify the operations component of the program and enhance it with E&I.

V. Committee Recommendations

At the February 15 advisory committee meeting, it was noted that the need for adjunct faculty is becoming critical. Enrollment is strong and continues to grow. Program Coordinator Kenny Keith will soon be conducting studies on enrollment increases and program retention. It was suggested that a poll be conducted of students who do not complete program requirements to determine their reasons for withdrawal. As the program stands, labs are full to capacity.

Most notably, the group recommended the program undergo a name change. Power Plant Fundamentals would become "Industrial Maintenance and Operations." It was felt that the latter was a better descriptor of the collective program elements, especially considering incorporation of the program expansion aspects discussed in Part IV A, item 7. "Industrial Technology Program" was discussed, but it was not well accepted.

TABLE 1

SALARY RANGES IN RELATED OCCUPATIONS – US NATIONWIDE[4]

SOC Code Number[5]	Occupation Title	Number Employed	Median Hourly Wage	Mean Hourly Wage	Mean Annual Wage	Mean RSE[6]
51-8013	Plant Operators	33,650	$25.56	$25.65	$53,350	0.9 %
51-4041		368,380	$16.51	$17.00	$35,350	0.4 %
49-9044		53,080	$21.53	$22.33	$46,450	0.9 %
51-8021	Engineers and Boiler Operators	43,110	$21.44	$21.94	$45,640	0.6 %
51-8031	and Liquid Waste Treatment Plant and System Operators	102,940	$16.79	$17.34	$36,060	0.6 %
49-9041	Machinery Mechanics	234,650	$19.11	$19.74	$41,060	0.3 %
49-9042	and Repair Workers, General	1,307,820	$15.01	$15.70	$32,650	0.2 %
49-9043	Workers, Machinery	83,220	$16.18	$16.96	$35,270	0.6 %

[4] Source: Bureau of Labor Statistics, "May 2005 National Occupational Employment and Wage Estimates: www.bls.gov/oes/current/oes_nat.htm. 15 February, 2007

[5] Bureau of Labor Statistics, "Standard Occupational Classification System", http://www.bls.gov/soc/home.htm. 15 February, 2007

[6] "Relative Standard of Error" – The smaller the RSE, the more precise the estimate.

SALARY RANGES IN RELATED OCCUPATIONS – ARIZONA, STATEWIDE[7]

SOC Code Number[8]	Occupation Title	Number Employed	Median Hourly Wage	Mean Hourly Wage	Mean Annual Wage	Mean RSE[9]
51-8013	Plant Operators	350	$24.18	$23.97	$49,860	4.0 %
51-4041		4,020	$16.60	$17.41	$36,220	3.7 %
49-9044		170	$22.02	$23.49	$48,860	9.4 %
51-8021	Engineers and Boiler Operators	520	$20.34	$20.98	$43,640	4.6 %
51-8031	and Liquid Waste Treatment Plant and System Operators	1,190	$18.68	$18.79	$39,090	2.5 %
49-9041	Machinery Mechanics	2,020	$20.05	$20.46	$42,550	2.9 %
49-9042	and Repair Workers, General	23,980	$13.59	$14.46	$30,080	1.2 %
49-9043	Workers, Machinery	1,170	$19.20	$19.70	$40,980	7.5 %

[7] Source: Bureau of Labor Statistics, "May 2005 National Occupational Employment and Wage Estimates http://www.bls.gov/oes/current/oessrcst.htm 15 February, 2007.
[8] Bureau of Labor Statistics, "Standard Occupational Classification System", http://www.bls.gov/soc/home.htm. 15 February, 2007
[9] "Relative Standard of Error" – The smaller the RSE, the more precise the estimate.

SALARY RANGES IN RELATED OCCUPATIONS – PHOENIX – MESA - SCOTTSDALE[10]

SOC Code Number[11]	Occupation Title	Number Employed	Median Hourly Wage	Mean Hourly Wage	Mean Annual Wage	Mean RSE[12]
51-8013	Plant Operators	No data given.				
51-4041		3,190	$16.46	$17.55	$36,500	4.6 %
49-9044		140	$23.35	$25.85	$53,770	9.9 %
51-8021	Engineers and Boiler Operators	250	$19.11	$20.18	$41,970	6.7 %
51-8031	and Liquid Waste Treatment Plant and System Operators	720	$19.86	$20.02	$41,630	2.5 %
49-9041	Machinery Mechanics	1,080	$20.70	$21.27	$44,230	4.3 %
49-9042	and Repair Workers, General	16,600	$14.06	$14.95	$31,090	1.6 %
49-9043	Workers, Machinery	No data given.				

[10] Source: Bureau of Labor Statistics, "2002 National Occupational Employment and Wage Estimates, Phoenix – Mesa – Scottsdale, AZ", http://www.bls.gov/oes/oes_38060.htm 15 February, 2007.
[11] Bureau of Labor Statistics, "Standard Occupational Classification System", http://www.bls.gov/soc/home.htm. 15 February, 2007
[12] "Relative Standard of Error" – The smaller the RSE, the more precise the estimate.

SALARY RANGES IN RELATED OCCUPATIONS – FLAGSTAFF AREA (COCONINO COUNTY ONLY)[13]

SOC Code Number[14]	Occupation Title	Number Employed	Median Hourly Wage	Mean Hourly Wage	Mean Annual Wage	Mean RSE[15]
51-8013	Plant Operators	No data given.				
51-4041		No data given.				
49-9044		No data given.				
51-8021	Engineers and Boiler Operators	No data given.				
51-8031	and Liquid Waste Treatment Plant and System Operators	No data given.	$15.32	$15.58	$32,400	6.2 %
49-9041	Machinery Mechanics	30	$19.58	$21.15	$44,000	4.6 %
49-9042	and Repair Workers, General	720	$12.70	$13.60	$28,300	6.3 %
49-9043	Workers, Machinery	No data given.				

[13] Source: Bureau of Labor Statistics, "2002 National Occupational Employment and Wage Estimates – Flagstaff, AZ", http://www.bls.gov/oes/current/oes_22380.htm 15 February, 2007.
[14] Bureau of Labor Statistics, "Standard Occupational Classification System", http://www.bls.gov/soc/home.htm. 15 February, 2007.
[15] "Relative Standard of Error" – The smaller the RSE, the more precise the estimate.