To help ensure that buildings are being designed and constructed according to current codes using the best tools, TP&D staff teach workshops to those involved in the building industry.

ers and large buyer groups and developing a web site for ordering.

One of the key services we provide is training for building officials, contractors, architects, and engineers on energy codes and code compliance tools. We make the best use of our training programs by also collecting feedback on products and services in order to continually improve our services. These training sessions and other interactions with user groups allow us to produce off-the-shelf training programs and support materials that can be used by a wide set of users.

Our training extends to DOE's National Workshop on State Building Energy Codes, which we manage and facilitate annually. Attended by over 1100 individuals over the past 9 years, the conference brings together officials involved in energy code programs to learn about the latest program approaches and efficient technologies.

We also provide training for the Facility Energy Decision System (FEDS) software, which identifies energy-efficiency measures, selecting minimum life-cycle cost technologies, determining payback, and enabling users to prioritize retrofit options and compare alternative financing options (site funding, leases, loans, etc.). TP&D teaches introductory and advanced classes to help FEDS users learn both the basics and the intricacies of this software. In the last 4 years, we have trained more than 350 federal, local, and private-sector facilities managers in FEDS and have conducted other courses such as water resources management, operations, and maintenance.

TP&D staff helped develop the residential and commercial code compliance software RES*check*™ and COM*check-EZ*™ and markets them to help building officials, builders, architects, engineers, and others demonstrate compliance with energy codes. Detailed input on user needs and software enhancements is gathered through training sessions, a web site, email surveys, and trade conferences. Over 130,000 copies of the software have been downloaded or mailed since 1996.

*TP&D staff helped develop RES*check*™ and COM*check-EZ*™, two code compliance software tools for DOE's Building Standards and Guidelines Program. Users can download these tools from the program's web site, and we offer training courses and videos, user manuals, software customization, and technical assistance.*

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Science.

Technology.

Innovation.

We are seeking professional staff with education and experience in the fields of economics, engineering, marketing, business administration, psychology, and policy analysis. Individuals must be proactive and able to work on several smaller projects with diverse customers or support one large project and one customer. Individuals also must be able to work effectively on teams made up of staff from multiple disciplines and backgrounds.

PNNL, with about 3,400 staff members in a variety of disciplines and support functions, offers outstanding facilities and equipment, excellent benefits, and competitive salaries. PNNL is an Affirmative Action/Equal Opportunity Employer and values diversity in the workplace.

Pacific Northwest National Laboratory

Operated by Battelle for the U.S. Department of Energy

Technology Planning and Deployment

The Technology Planning and Deployment (TP&D) Group is part of Pacific Northwest National Laboratory's (PNNL's) Energy and Engineering Division. Over 30 TP&D professionals offer customers a unique combination of diverse capabilities in economics, engineering, marketing, business administration, psychology, and policy analysis.

TP&D's vision is to apply our expertise to help customers anticipate the social context of technology in order to make sound decisions about energy technologies, environmental stewardship, and natural resource management. TP&D provides the innovative tools, professional analysis, and in-depth technical expertise that enable innovative and effective technology solutions.

We help customers by providing the following types of services:

- Evaluating, designing, and managing programs that focus on energy and environmental issues
- Developing commercialization strategies
- Analyzing life-cycle energy costs and consumption, economic options, and environmental impacts of new and emerging technologies
- Modeling and assessing economic impacts to society from developing and consuming energy and from deploying technologies
- Analyzing technology investment, financial, and contracting decisions
- Developing strategic policies and plans
- Obtaining and using stakeholder input to resolve issues and barriers to deploying new technologies.

Our products include technical reports, journal articles and papers, environmental impact statements, customer marketing materials, web sites, industry newsletters, workshops, software, and databases. Our customers for these products and services include U.S. government agencies, industrial and commercial companies, and international customers as well as other PNNL organizations.

Signature Capabilities

TP&D has focused our services and products in three signature capabilities:

- ***Technology, energy, environment, and economic impact (T3E) assessment***
- ***Technology procurement***
- ***Market definition and outreach.***

Looking at Problems from All Sides...

We offer creative new approaches to solving customers' challenges, especially those that appear to be intractable or not well defined. We help customers consider all aspects of the decisions they're facing by examining problems systematically, holistically, and from different perspectives.

Strategic Perspective: We take a long-term view of customers' goals, objectives, opportunities, and constraints and then develop strategies that will achieve the best results with the best use of resources.

Systems Perspective: We look at the "big" picture to ensure that our customers receive the most effective and long-lasting solutions. We use the most appropriate tools and procedures to explore improvements while examining technology, cost, regulations, human behavior, safety, feasibility, and societal impacts.

Integrated Perspective: We identify opportunities to match processes, eliminate redundancies and inefficiencies, and focus efforts where they will produce the greatest benefit.

T3E Assessment

National and international agencies turn to TP&D and the tools we've developed for analyzing complex socioeconomic and environmental issues on regional, national, and global scales. Our staff conduct both macro- and micro-economic analysis and forecasting.

Over the last 20 years, our staff have conducted hundreds of energy, environmental, and economic impact assessments. These assessments provide government and industrial customers with data and analyses on the costs, benefits, and environmental and economic impacts of major technology adoption and land-use decisions ranging from local to international levels.

For example, we developed the Jaccard/Roop Industrial Energy Model (also known as the Industrial Technology Energy Modeling System–ITEMS) for the U.S. Department of Energy (DOE). ITEMS is the only comprehensive economic-engineering model of U.S. manufacturing industries and the only model that can evaluate individual technology alternatives in individual industries.

We operate the National Energy Modeling System (NEMS), DOE's official forecasting tool for evaluating new technologies and programs to enhance U.S. residential and commercial energy efficiency. We also track the commercial technologies funded by DOE and their benefits, energy savings, gaseous emissions, and number of installations to determine the impacts of various DOE programs. We work with commercial technology developers in DOE's financial assistance programs to help them commercialize their concepts.

In response to an Internal Revenue Service request to estimate excise tax revenues based on economic indicators, TP&D staff built an economic model that forecasts fuel use. Then, based on information about tax rates for each of the separate fuels, staff can estimate excise tax revenues. The TP&D model is complete for gasoline, and the modeling team is adding other fuels subject to excise tax.

TP&D researchers often lead and contribute their expertise to national or international panels or activities, such as the Intergovernmental Panel on Climate Change (IPCC) 1995 Second Assessment Report, the 2001 IPCC Third Assessment Report, and the IPCC Special Report, *The Regional Impacts of Climate Change*.

For economic impact analyses of domestic energy and technology developments, we developed the Life Cycle Plus™ and ImBuild models and adapted the IMPLAN model. For international analyses of the adoption and consequences of energy technologies, we helped develop the MiniCAM and Second Generation Model of the world energy markets. The capabilities encoded in these models are in the vanguard for international policy analysis of the benefits and costs of energy efficiency, technology development, and carbon sequestration, representing some of the most advanced thinking in the world on technologies to mitigate global warming and carbon emissions.

Technology Procurement

TP&D's technology procurement expertise is highly regarded within DOE. DOE refers to our technology procurement methods as being among the most effective and successful technology commercialization tools at its disposal. We have developed and implemented more technology procurement projects for energy-efficient products than any other organization in the United States.

Using technology procurement – a method that harnesses the buying power of large volume buyers to speed early commercialization of new technologies – we have transformed markets for several appliance and energy end-use products. Cooperating with key market players such as manufacturers, builders, engineering firms, utilities, nonprofit organizations, retailers, wholesalers, housing agencies, federal and state agencies, and other private-sector businesses, we have spearheaded projects leading to the successful creation, commercialization, and large volume sales of several new energy-efficient products.

In our first technology procurement project, we worked with three partners to develop a new energy-efficient refrigerator for multifamily housing. Over a 2-year period, more than 100,000 of these refrigerators were sold to targeted public housing authorities, including the New York City Housing Authority. The units are now sold throughout the United States.

Building on that success and others, we are now developing several technology procurement projects in cooperation with dozens of organizations and utilities, including the U.S. Defense Logistics Agency, the New York State Energy Research and Development Authority, the Consortium for Energy Efficiency, the Northwest Energy Efficiency Alliance, the Sacramento Municipal Utility District, and Northeast Utilities. We have enjoyed several significant project successes in this area. The technology procurement approach encourages late-stage technology development and product refinement before products are introduced in the market.

Our laboratory and field testing of products is often a key part of technology procurement. For example, we worked closely with two manufacturers who were proposing new-to-the-market recessed downlights. Our testing revealed critical product weaknesses that manufacturers then addressed. The modified units are now undergoing additional laboratory and field testing before they are introduced to the market.

Partners have enthusiastically offered their financial and staff assistance because of our past technology procurement successes and the notorious inefficiency of the current generation of recessed downlight technology.

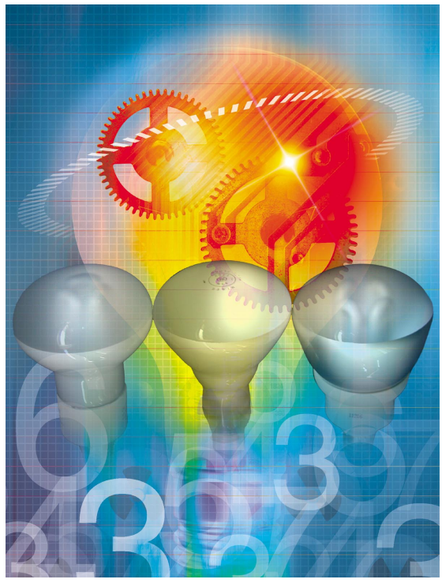
TP&D was instrumental in DOE's subcompact fluorescent lamp (sub-CFL) program. In this project, we identified the market need and performance requirements for the technology, supervised a testing program, and developed a volume purchase program, which resulted in 16 new sub-CFL models being commercialized and over 3.5 million lamps being sold. These sub-CFLs use 75% less energy than the incandescent bulbs they replace, last 8 to 10 times longer, and fit most fixtures. Sub-CFLs have now entered the commercial marketplace at competitive prices.

In another project, we proposed that air conditioner manufacturers bring more competitively priced energy-efficient rooftop air conditioners to market. Small footprint, rooftop air conditioner units are used to cool two-thirds of all U.S. commercial space including stores, restaurants, offices, motels, barracks, and warehouses. We are partnering with large-volume consumers such as the Defense Logistics Agency, McDonald's, and Wal-Mart to promote sales of the energy-efficient models.

Market Definition and Outreach

Market definition and outreach activities are critical to the technology procurement programs that TP&D manages for DOE, utilities, and others. With access to the latest market research tools and approaches and opportunities to design and deliver marketing programs, we are uniquely qualified to identify, analyze, and address market issues to determine how a particular technology, product, or service might be designed or refined and delivered to the market. We have developed and trained many groups on software and procedures to facilitate technology deployment–to help answer critical cost and performance questions.

Our ongoing work introducing new technologies and programs for customers has given us an in-depth understanding of energy technologies such as building systems, appliances, and lighting and the markets they serve. Our experience has shown that the best way to design, manage, and continually improve all aspects of the programs we manage is to become strategically involved in the market with the product and service users.



TP&D was instrumental in matching manufacturers of subcompact fluorescent lamps with high-volume purchasers to offer a significantly improved product at a greatly reduced prices. Over 3.5 million lamps have been sold.

For example, market outreach was critical in identifying DOE's sub-CFLs as a product category that had high potential for a technology procurement based on our market investigations. Our outreach efforts involved coordinating with lighting manufactur-