



U.S. Department of Energy
**Energy Efficiency
and Renewable Energy**

Bringing you a prosperous future where energy
is clean, abundant, reliable, and affordable

Industrial Technologies Program

Corporate Strategies for Technology Management: Managing Risk

Industrial Technologies Program

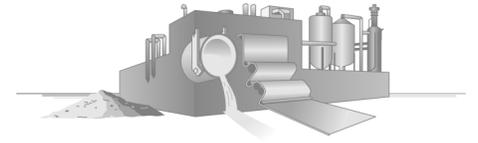
Corporate Peer Review

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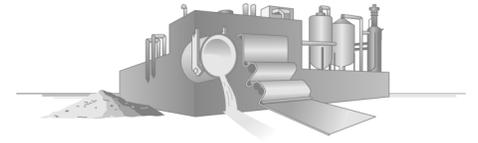
Overview



- ITP's Role in Energy Technology R&D
- Risk and innovation
- Managing risk
- Stage-Gate Innovation Management Process



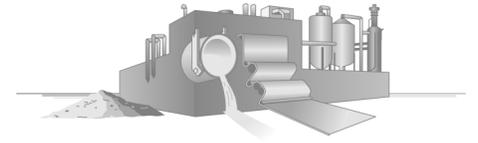
ITP's Mission is Risk Driven



“The Industrial Technologies Program works with U.S. industry to improve industrial energy efficiency and environmental performance. The program invests in high-risk, high-value R&D to reduce industrial energy use while stimulating productivity and growth.”



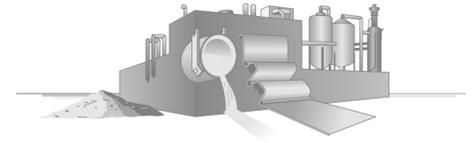
Risks Addressed by ITP



- Risk of manufacturing loss
- Risk of climate change
- Risk of energy price increase
- Risk of technology obsolescence



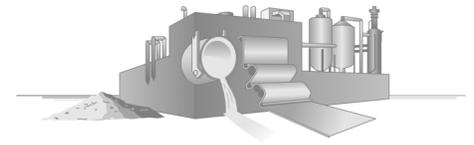
What is Risk?



- Risk is a word that means different things to different people.
 - Possibility of a loss
 - Uncertainty
 - Probability of success
 - Reward



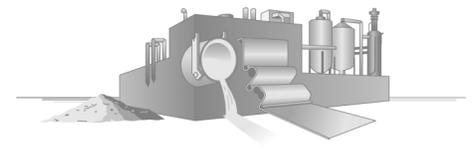
Relationship between Risk and Opportunity



- Balance of Risk and Reward
 - Historically, great accomplishments have always involved taking substantial risks in one form or another
 - Willingness to take significant risk is a common factor among great artists, explorers, and entrepreneurs
 - Opportunities arise from understanding and managing risks.
- Avoiding risk
 - Impossible to completely avoid risk
 - Progress is limited if risk avoidance is dominant



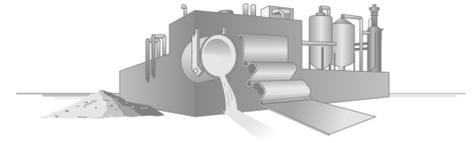
Research, Development, and Commercialization Risks



- Innovation is inherently risky
- Success depends on
 - Having a high tolerance for risk
 - Addressing different types of risk
 - Risk management



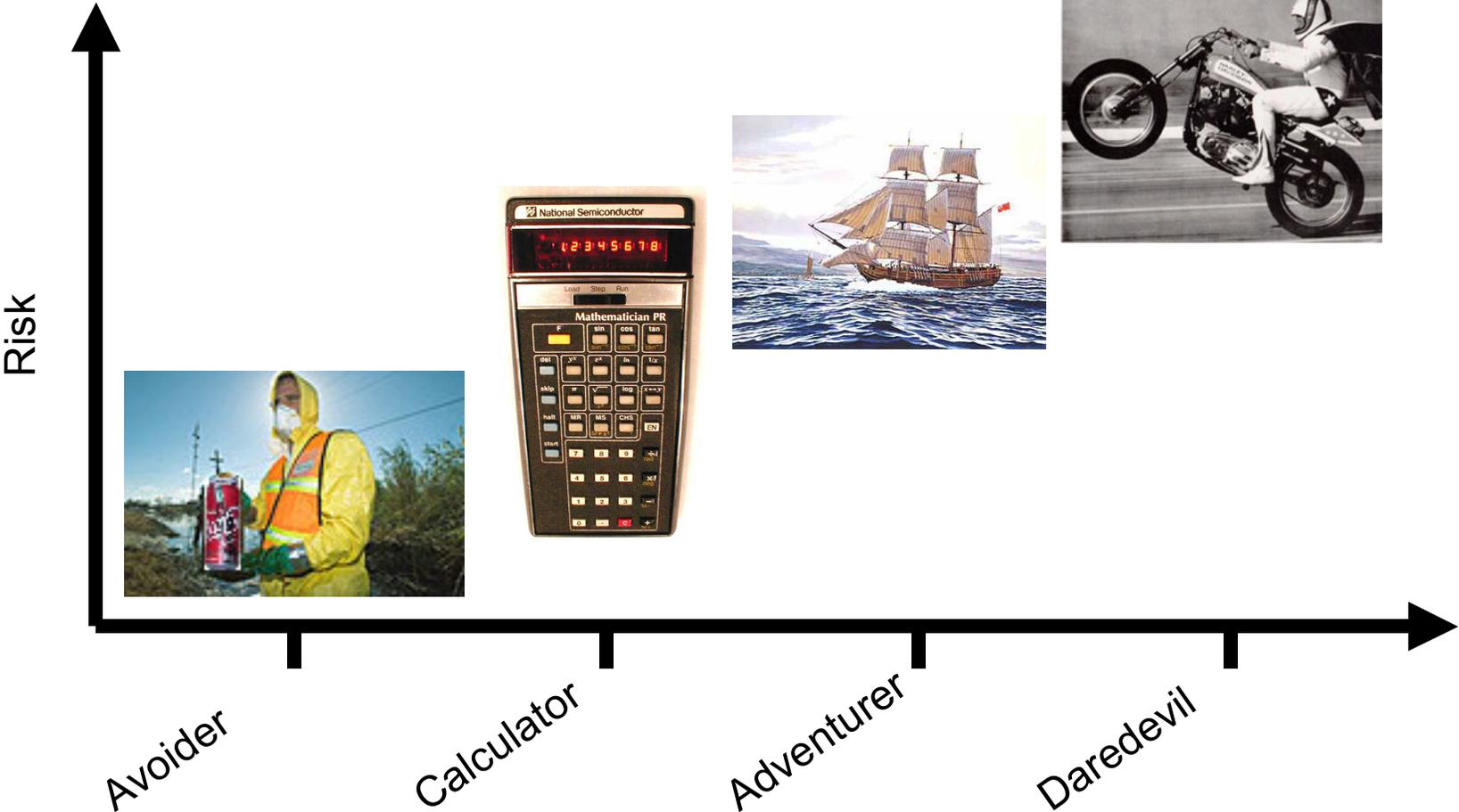
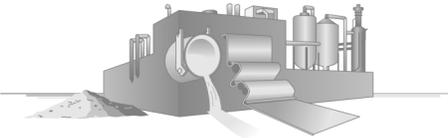
Risk Tolerance



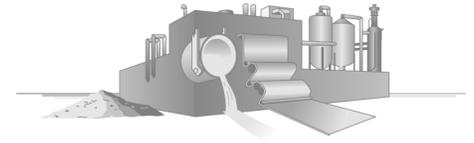
- Risk tolerance is the degree of uncertainty that an organization can handle with respect to a negative change in their finances or some other measure of value.
- Risk tolerance varies according to corporate culture, industry, company age, cash flow requirements, financial goals, etc.
- Companies often have different risk levels for different investment objectives.
- An organization's ability to tolerate risk and the perceptions of risk change over time.



Degrees of Risk Tolerance



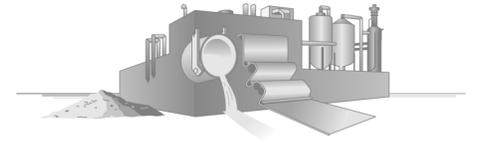
Risk Tolerance of Innovators



- Innovators are adventurers
 - Enjoy taking risks
 - Have ability to visualize the future
 - Plan and strategize before committing to a new endeavor
- Results of survey of ITP commercialization partners
 - Entrepreneurial, small business constitute the majority of commercialization partners
 - Small business value the credibility and access to the market provided by the relationship with ITP
 - Larger businesses with a lower tolerance for risk collaborate with ITP to undertake projects that they would like to do, but which are outside their current risk profile



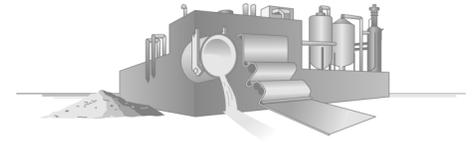
Types of R&D Risks



- Technology
 - Feasibility
 - Safety
 - Manufacturability
- Business
 - People
 - Processes and equipment
 - Intellectual property, legal, regulatory
- Market
 - Customers
 - Competition
 - Economy



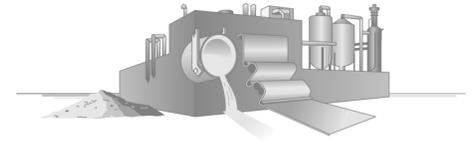
Risk Management



- Objective of risk management is to reduce risk to an acceptable level.
 - Prioritize risks
 - Address the most crucial risks
 - Use most cost effective risk reduction techniques.
 - Diversification
 - Collaboration
 - Information



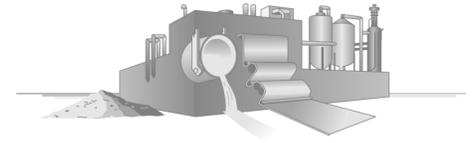
Diversification



- Types of diversification
 - Additional investments
 - Different mix of investments
 - Size
 - Risk
 - Market
 - Timing
- ITP Technology Managers as portfolio managers
 - Select projects
 - Allocate funds



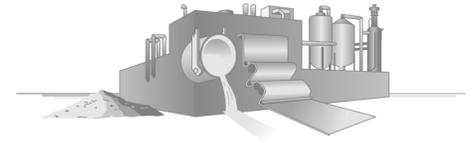
Collaboration



- Partnerships reduce an individual's risk
- Shared Investment
 - Cost sharing
 - Options for future investments
- Information sharing
 - Intellectual property
 - Knowledge of markets



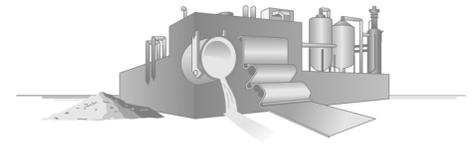
Information



- Meaningful risk management is proactive, and involves using relevant and timely information to make decisions.
- Information reduces the level of uncertainty associated with risk.
- ITP has developed and is implementing a Stage-Gate Innovation Management Process to guide decision-making and information gathering
 - Better manage risks
 - Accelerate the introduction of new energy technologies to industrial energy users.



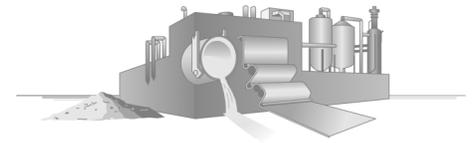
ITP's Innovation Management Process



- ITP's Stage-Gate Innovation Management Process is a flexible, five-stage method that guides research, development and commercialization of new products for U.S. industry.
- It is a process of logical thought, communication, decision-making, and information gathering.
- ITP's Stage-Gate process is based on best practices from EERE and general industry.



Application of Best Practices at ITP

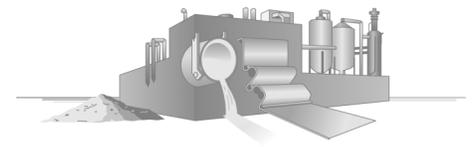


- Staged project management processes have withstood the test of time since 1950's .
 - NASA successfully used its Phased Review Process in the 1960s.
 - Stage-Gate new product development process was introduced by Robert Cooper in the 1970's
- Approximately 50% of Fortune 500 companies now utilize versions of Stage-Gate processes
- Innovation processes continue to evolve to address the speed of the market and the reach of global customers

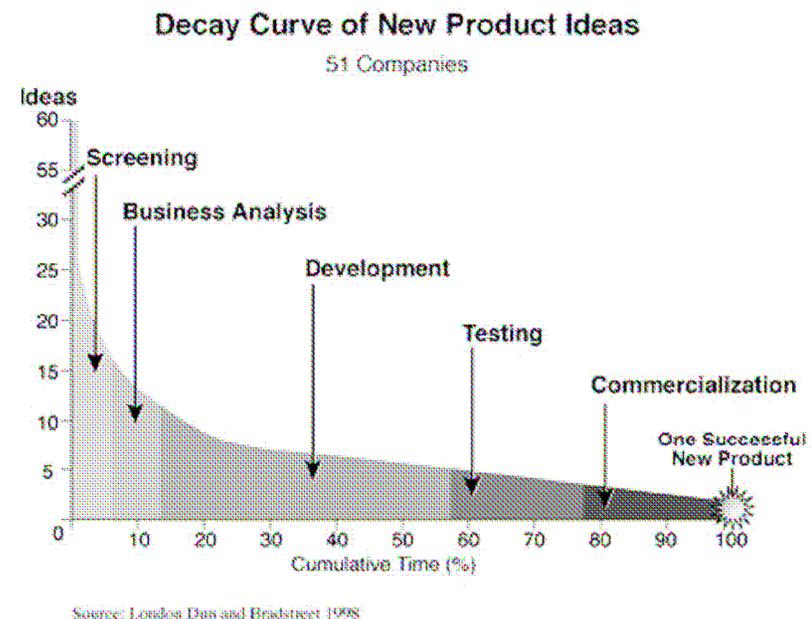
ITP Stage-Gate Innovation Management Guidelines are based on Stage Gate® (a registered trademark of the Product Development Institute) principles (Cooper 2002, Cooper 1998, GRI 1995).



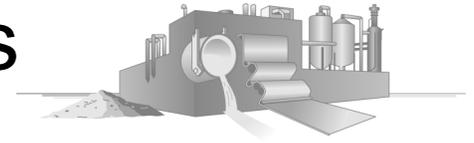
Stage-Gate Processes Exist Because of the Risk of Commercial Failure



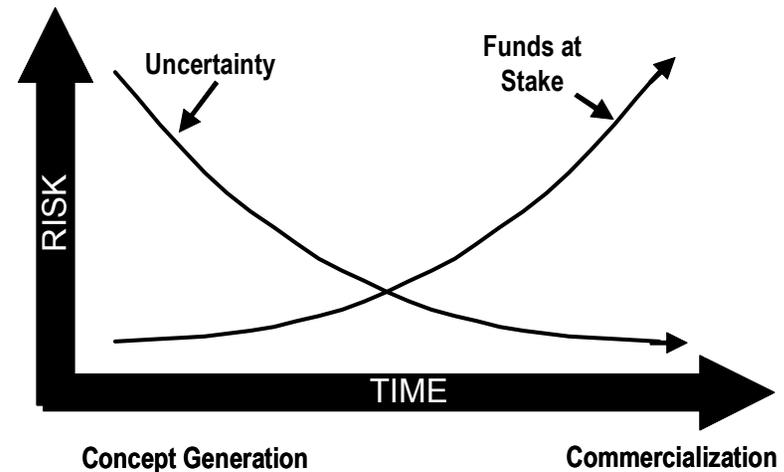
- Innovation is a creative activity and inherently difficult to control.
- Only one out of sixty new product ideas result in a successful product
- Structured processes weed out low potential projects early
 - “Fail Fast”
 - Learning from failure



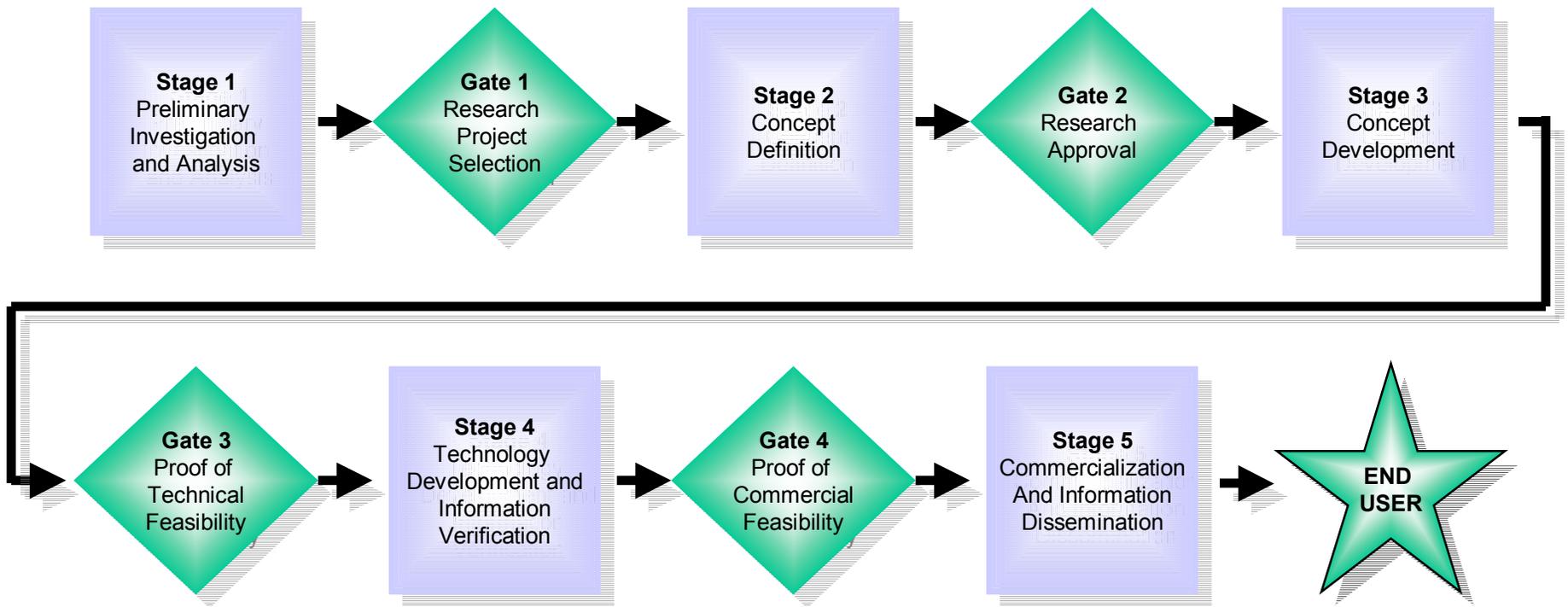
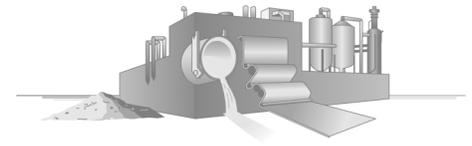
Risk Mitigation with ITP's Process



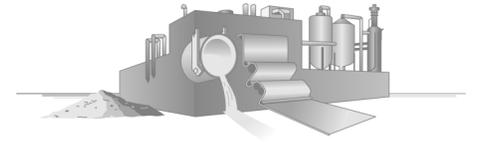
- Each stage of the process is designed to reduce levels of uncertainty and risk.
- As information is assimilated at each stage of research, uncertainty is reduced.
- With sufficient information, the project team can make sound technical and business decisions to control or eliminate risks.



ITP's Stage-Gate Innovation Management Process



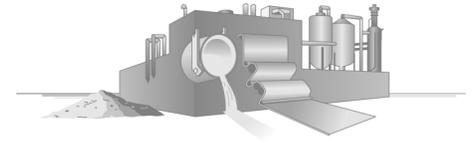
Gates are Decision-Making Points



- Stage-Gate will help screen a broad range of opportunities, accounting for risks and rewards, and ensure that only successful projects reach commercialization.
- Decisions at each gate involve a uniform set of inputs and expected outcomes.
- Gatekeepers make major decisions: “Go-Forward,” “Stop (No-Go),” “Hold” or “Return”



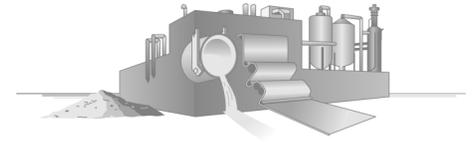
Decision Criteria Control Risks



- Gate decision criteria are related to types of risk:
 - Technology
 - Business
 - Market
 - Budget or schedule
- Criteria will help to answer such questions as:
 - Market Need and Attractiveness
 - Does the concept still have strong potential for becoming a marketable product?
 - Strategic Fit
 - Does the concept still fit with ITP strategies, goals, and objectives?
 - Feasibility
 - Can technical, regulatory, or legal, barriers be resolved?
 - Financial
 - Do financials still meet hurdles?



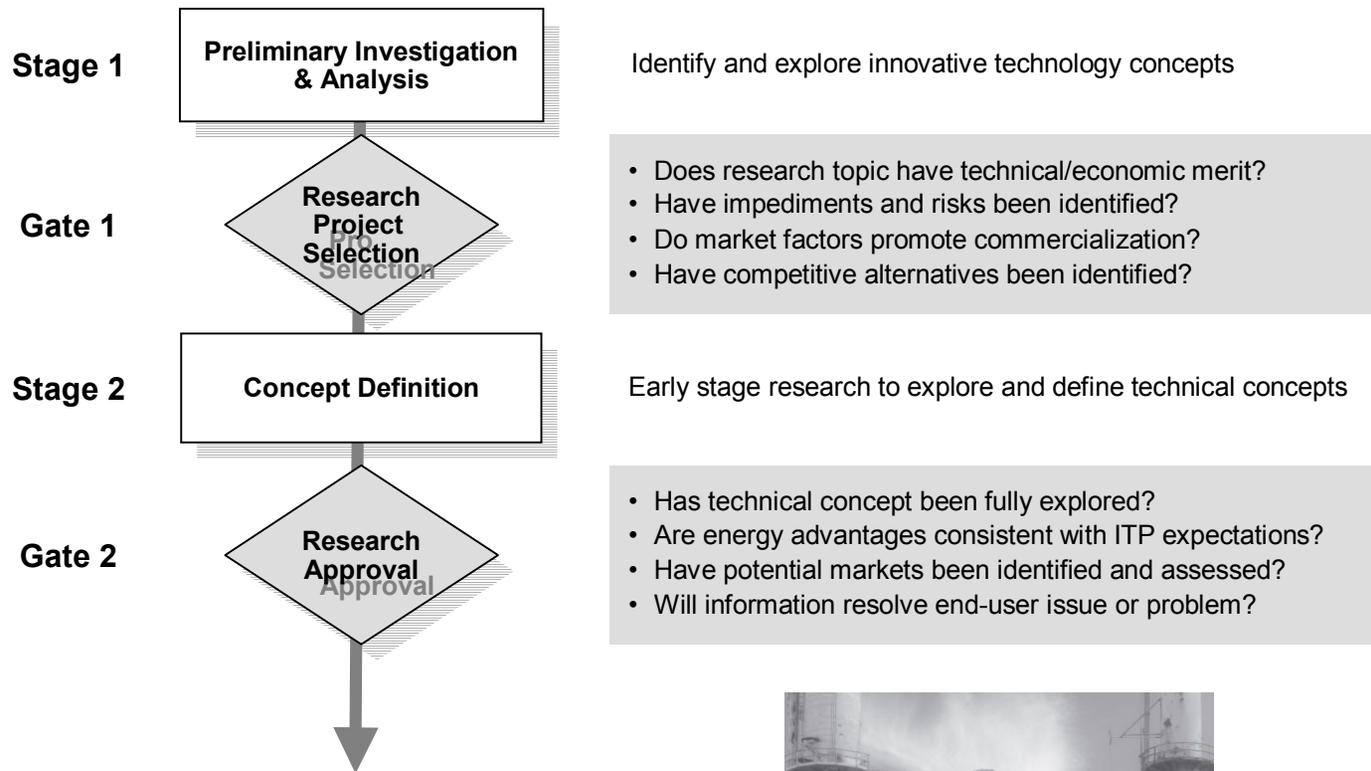
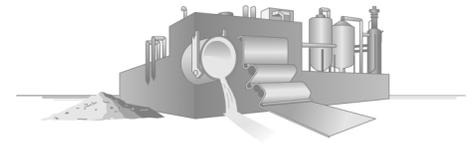
Timely Information Generated during a Stage is Key in Decision-Making



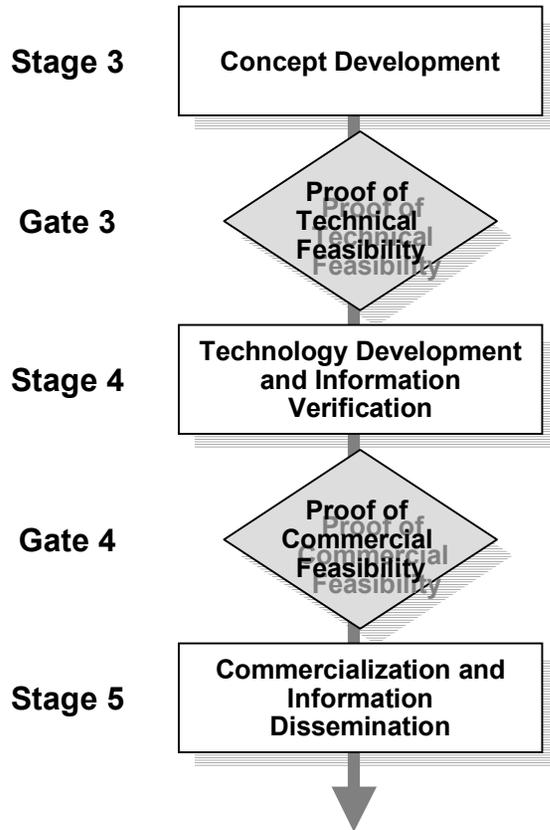
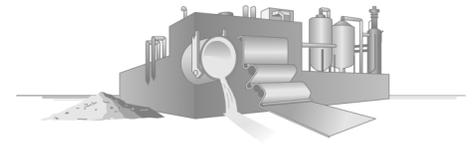
- Overall objective of a stage is to produce the right information to make project-related decisions
- Those contributing to a project are guided by the process and plan accordingly:
 - Research objectives for the individual stage
 - Major technical milestones
 - Commercialization or information dissemination objectives
 - Work breakdown structure and schedule
 - Resource requirements



ITP's Process Provides Structure and Discipline



ITP's Process is Flexible



Develop and test prototype technology or process and evaluate scalability. Generate information addressing specific technical issues or problems

- Has technical feasibility been demonstrated?
- Did prototype meet technical performance criteria?
- Is scale-up feasible?
- Will technology be competitive in the market?
- Has a commercialization partner been identified?

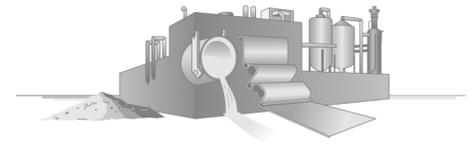
Demonstrate technology performance at pilot scale, and conduct field testing and validation. Verify usability of information.

- Did technology perform satisfactorily in field tests?
- Do field test or information results meet end-user needs?
- Has a license been executed with commercialization partner?
- Have regulatory and other issues been resolved?

Commercialization undertaken by industry. ITP dissemination of technology information and tools to promote use of advanced technology



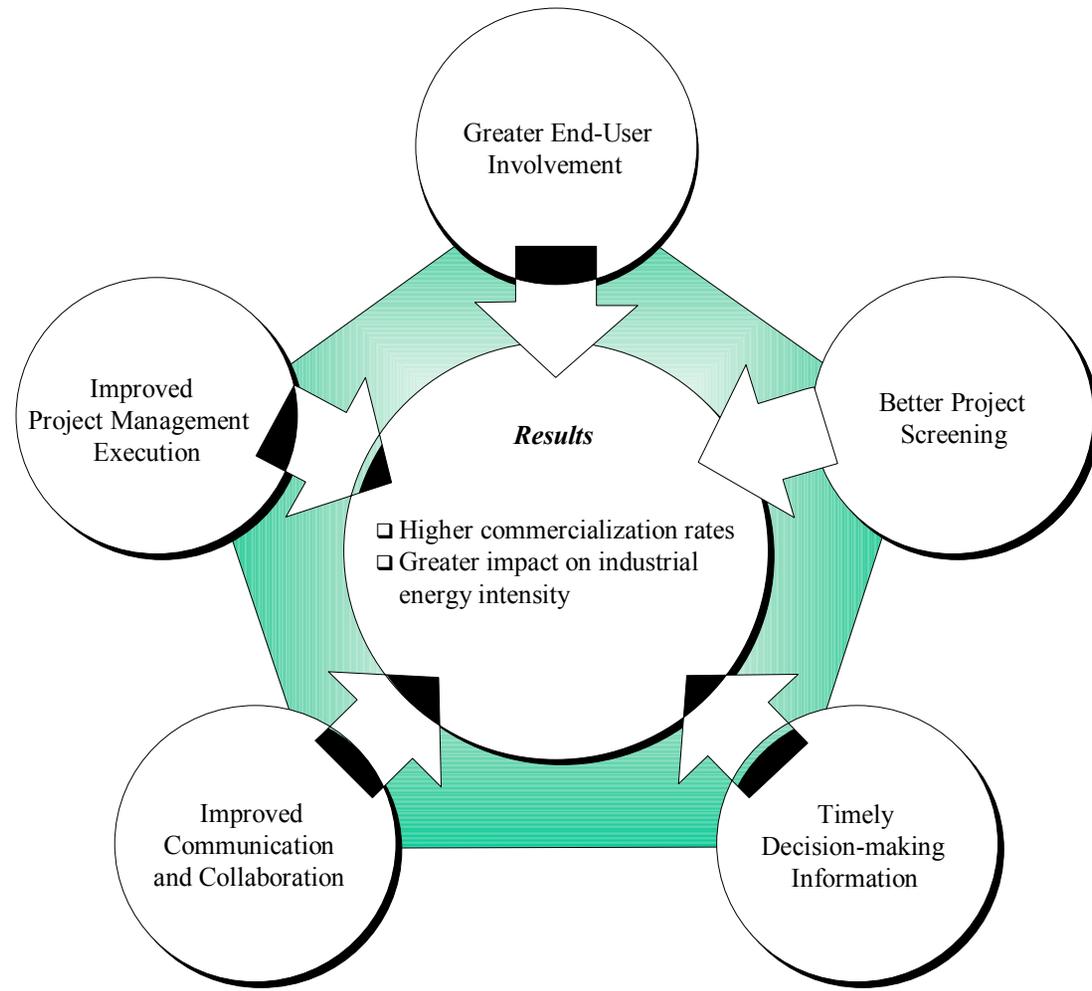
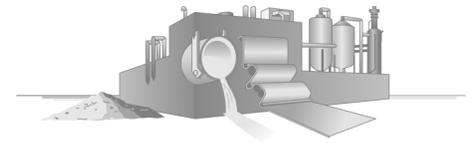
ITP's Role and Responsibilities are Focused on Stages 2 through 4



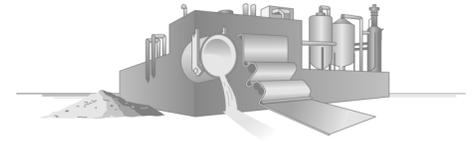
- Roles
 - A key strength of the Stage-Gate process is the application of right kind of expertise at the right stage.
 - Expertise is from a variety of stakeholder organizations.
 - ITP headquarters and field offices
 - National laboratories, contract R&D firms, engineering companies, manufacturers.
 - End-users, industry organizations
- Responsibilities
 - ITP Technology Managers
 - Funding decisions
 - Ensuring proper application of Stage-Gate guidelines.
 - DOE Field Office Project Managers
 - Applying the Stage-Gate guidelines to funded projects.
 - Principal Investigator
 - Project execution and interaction with decision makers.



Stage-Gate: Benefits of ITP's Process



ITP's Stage-Gate Innovation Management Process: A Risk Management Tool



- Process Summary
 - Staged process with periodic checkpoints
 - Provides guidance to the expertise and information required at each stage of R&D.
 - Includes key activities and milestones from initial technology research to ultimate marketplace introduction.
 - Applicable to all types of “products” (i.e. equipment, software, processes, and information)
 - Emphasizes collaboration with external organizations to produce the best results
 - Brings a “product or service to market”; does not only prove a concept

