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The Road to Collaborative Research & Technology Development

Petroleum Technology Alliance Canada

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Prepared with the support of the Vice Presidents Breakfast Club
by the Collaborative Technology Initiative Steering Committee
in association with consultants
Todd Resources and Pallister Management

Contents

Executive Summary	1
1. Destination	5
2. Vehicle	7
3. How it Works	11
4. Hitting the Road	15
Appendix	23

Terminology

Canadian petroleum industry means the spectrum of private sector organizations that operate and provide services in exploration through to transportation of oil and natural gas and by-products.

Conventional oil means oil other than in oil sands deposits.

Oil and gas companies are the companies which are directly engaged in the discovery, production and transportation of oil and natural gas.

Stakeholders are all those public and private institutions organizations and individuals which stand to benefit from the continued prosperity of the upstream petroleum industry. (Drafts of this report have been circulated to some 180 stakeholders. Their comments and revisions have been incorporated.)

Stakeholder Groups are the professional and trade associations and other aggregations of stakeholders who have common interests.

For copies of this report, please contact:

PTAC
3rd Floor, Monenco Place
801 6th Avenue S.W., Calgary, Alberta, Canada T2P 3W2
Phone: (403) 297-4384 Fax: (403) 297-3638
Internet Website: <http://www.ptac.org>
E-mail: lloyde@cadvision.com

Executive Summary

1. Background

The initiative for this project was taken by the Vice Presidents Breakfast Club, an informal organization of senior conventional oil production executives from 25 Canadian oil companies. This group of executives recognized that there had been a dramatic decrease in resources applied to research and development in the petroleum industry as a result of changing industry demographics, down-sizing, and tight budgets.

In the past, much of this industry's technology has been developed through proprietary research carried out by large international oil companies, supplemented with university and government sponsored programs. This model is no longer delivering the level of research and technology development required to keep Canada's maturing oil and gas fields competitive with other worldwide sources.

The executives concluded that a new model for developing technology was required. They visualized a model based on increased collaboration among all industry stakeholders. The stakeholders could collectively identify problems, combine scarce intellectual and financial resources and apply them to solutions. These combined resources would be concentrated on research and technology development that would yield the most useable results with a minimum of duplication.

The VP Breakfast Club commissioned a study in the fall of 1994 to determine if its views were more widely shared. The study was focused on conventional oil, recognizing that the technological needs for oilsands were unique and were already being addressed through the new research organization CONRAD.

The study was done by Murray Todd, a retired executive with many years experience in petroleum production and research operations. It concluded that the concern about the low level of research in this industry was wide spread and there was support within all stakeholder groups for increased communication and collaboration. Virtually all expressed the view that more research was required and that research should be focused on solving

industry problems. The study also concluded that there were adequate facilities and capable people in Canada to do the job.

The Todd Report led to a day-long workshop which brought together over 100 people representing all stakeholder groups - producers, pipeline companies, service and supply companies, research providers, learning institutions, and government. Through panel presentations, break-out discussion groups, and subsequent debriefings, a clear consensus emerged. Workshop participants agreed that the level of spending on research was too low and that future technology development would be greatly enhanced through collaboration. Also, they concluded that research and technology development should be highly focused; the process be user driven; and that all stakeholders be involved in both identifying and solving needs, opportunities and problems.

Participants recommended that a new model for research and technology development be explored and that it be done under the direction of a steering committee with representatives from all stakeholder groups.

A larger Steering Committee was formed with 15 members. All stakeholder groups were represented, with the exception of the pipeline companies who continued to be interested but did not have anyone available to assign to the project.

The new Steering Committee engaged two industry consultants, Todd Resources and Pallister Management to assist with the development of a new collaboration model, referred to here as Petroleum Technology Alliance Canada (PTAC).

The Todd report, the Workshop Report, and this document provide a detailed account of the results and status of the VP Breakfast Club initiative.

2. Methodology - The Road Map

The "Road Map Process" was used as an aid to developing the detailed implementation plan for the new model. In this process the Steering Committee

members started by identifying the vision and purpose for the organization, and systematically worked their way through the enunciation of the founding beliefs, principles, and goals. With the addition of strategies and tactics, the Committee arrived at a detailed implementation plan and schedule.

The process was divided into four tasks using the analogy of a journey to a desired destination. The first task was to describe where the organization wanted to go. Chapter 1 "Destination" describes the vision, purpose, beliefs, principles, and goals that will provide clear guidance to future PTAC members, directors, managers, employees, suppliers and customers.

The second task was to design a method to take the group to its destination. Chapter 2 "Vehicle" describes the organization, its strategies and tactics, and its membership.

The third task was to describe how the vehicle would function. Chapter 3 "How It Works" includes an articulation of roles and responsibilities for each part of the organization. It sets out a financial plan and a method to identify industry problems and encourage collaboration on research and technology development projects.

The fourth task was to identify all the steps that are necessary to get PTAC up and running. Chapter 4 "Hitting the Road" addresses the legal and administrative requirements; staffing and office facilities; a funding formula a financial forecast; a marketing plan; and a six month start-up workplan.

The Steering Committee held several half-day meetings. At the first meeting the consultants presented a draft of "Destination" for discussion. At the next meeting there was a review of the second draft of Destination and a presentation and discussion of "Vehicle". This iterative process continued in subsequent meetings as the road map continued through presentations and discussions of "How it Works" and "Hitting the Road". This feedback process was supplemented with input solicited from 180 people who had attended the workshop or had expressed interest in the initiative. They were furnished second drafts of each chapter as the work progressed. The name "Petroleum Technology Alliance Canada" - PTAC, was conceived late in the process.

3. The Plan

3.1 Beliefs

Petroleum Technology Alliance Canada is founded on the belief that the application of new and better technology will improve oil and gas recovery, lower costs, make operations safer and reduce the impact on the environment. It has been created in the firm belief that this improvement will be best achieved when all industry stakeholder groups work together in a structured way to identify industry problems and define research projects to deal with those problems.

Beyond solving current problems, PTAC will provide a means by which industry stakeholders will identify broad bodies of knowledge which must be advanced in order for the industry to meet future requirements. This is to assure that sufficient resources are applied to basic research and other research gaps that will not be addressed by problem-solving research alone.

3.2 Vision, Purpose, Principles, and Goals

Relating the need for the energy industry in Canada to compete on a worldwide basis with the importance of using the most advanced technology has led to the following Vision:

"The initiators of the Petroleum Technology Alliance of Canada visualize a prosperous Canadian conventional petroleum industry successfully competing in the energy business by applying leading-edge technology developed through the collaboration of all stakeholders."

PTAC will play an important role in achieving that Vision:

"The Purpose of PTAC is to provide a structure that will bring stakeholders together to identify industry problems and define research projects to deal with them. The objective is to leverage intellectual and financial resources, apply them to solving industry problems and improve industry performance."

The Principles which will govern and guide PTAC include:

- a focus on conventional oil and gas
- involvement and active participation of all stakeholder groups.
- leveraging of financial and intellectual resources
- elimination of unnecessary redundancy

- a focus on user problems and specific research projects to solve those problems
- recognition of the value of proprietary technology to its owners
- no new bricks and mortar
- an organization to facilitate and encourage collaboration, not conduct nor direct research
- projects to be financed by those who participate in those projects
- minimum permanent staff
- low administrative costs

The Goals of PTAC in the near-term are to recruit a sizable membership, create a mechanism to identify the most important needs of the industry, facilitate several new collaborative projects, and see an increase in the level of research and technology development expenditures. In the medium-term, the goals are to assist stakeholders in their delivery of cost-effective solutions to technical problems. In the long-term PTAC goals are to demonstrate that the organization has contributed to improved industry performance.

3.3 Organization

All stakeholder groups - oil and gas producers, pipeline companies, service and supply companies, research providers, learning institutions, and government - have an opportunity to belong to PTAC and be represented on the Board of Directors. The board structure will be similar to other industry not-for-profit organizations.

The key committee of PTAC will be the Technology Development Policy Committee with its several technical subcommittees. This committee will establish a policy framework for the collaborative process. It has the responsibility of identifying "bodies of knowledge" which must be advanced in order for the industry to be successful in the long run. Each Subcommittee, comprised of interested stakeholders, will deal with a particular body of knowledge. Their role is to identify specific industry problems, and react to prospective research projects that will deal with those problems. (A Natural Gas Production and Processing Subcommittee is an example).

The first assignment of the technical subcommittees is to identify what research is currently being done and

how it is being supported. Early wins can be delivered through PTAC by ensuring that these existing projects are not overlapping nor redundant, and that those projects that can really make a difference are widely advertised and supported.

The success of PTAC is dependent on members actively participating in the technical subcommittees.

3.4 How It Works

The PTAC Board of Directors will function in the usual corporate manner. Staff will consist of a president and administrative support. PTAC will contract additional services and expertise as required. The role of the staff is to provide support to the board and its committees. The staff would initially be challenged in attracting members to PTAC, developing work processes, and getting the technical subcommittees running. The medium-term measure of performance will be reflected in the number of participants in PTAC, the number of research projects, the number of participants in projects, and the dollar commitment to research. In the longer-term the principal measure of performance will be demonstrated improvement in industry performance.

The technical subcommittees are the heart of the system. Within these several committees industry problems and opportunities are identified and discussed, not only among the end-users but with the research providers, service and supply companies, learning institutions, and government agencies.

In general the role of users is to identify problems; the role of research providers is to suggest and formulate research and technology development projects that will lead to solutions. Once a project is identified the PTAC staff ensures that the project gets to the "request for proposal (RFP)" stage. Thereafter it is a matter of selecting either one of the participants or a third party to manage the project. Other PTAC members will be invited to become participants.

In the start-up phase PTAC will be able to play a role with projects that are already under way as a result of the initiative of a producer or research provider. In these cases PTAC will play a role in attracting additional participants. PTAC will also be able to provide advice to governments in identifying research gaps and industry needs so that government research dollars complement those spent by industry.

3.5 Financing

The membership fee schedule is based on the sector of the industry, and the size of the member organization. The fees are structured so that they would not discourage an interested party in becoming a member. These fees are dedicated to the cost of running PTAC. Research will be funded separately on a project by project basis by members who elect to participate.

The expenses of PTAC are estimated to be about \$270,000 per year. If membership revenues exceed expenses the surplus will be used for: 1. working capital 2. reimbursement of VP Breakfast Club members who provided initial financing and 3. reducing membership fees.

PTAC Membership Categories

Producers

1995 BOE/day	Fee (\$)
> 100,000	11,000
75,000 - 100,000	10,000
50,000 - 75,000	9,000
40,000 - 50,000	8,000
30,000 - 40,000	7,000
20,000 - 30,000	6,000
10,000 - 20,000	5,000
5,000 - 10,000	4,000
2,000 - 5,000	3,000
1,000 - 2,000	2,000
<1,000	1,000

Transporters

Large	11,000
Other	5,000

Service & Supply / Research Providers / Learning Institutions

Large	5,000
Medium	3,000
Small	500

Other

Individuals	100
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Governments

As per producer fee schedule and government royalty production

Notes to the table PTAC Fee Structure

1. The formula used to calculate the membership cost for producers, pipeliners, and service sector are similar to those used in the industry associations.
2. "Large" organizations are those with more than 100 employees, "medium" is between 20 and 100 employees and "small" is fewer than 20 members.
3. Governments as royalty owners are offered membership for the same fee as large producers. Government-owned research providers will participate like any other provider and be subject to the same fee. The Alberta Government is expected to contribute \$100,000 of in-kind support during the first three years.
4. With prior consent, members may offset a portion of their membership fee by providing in-kind support.
5. Members will commit to PTAC for a 3-year period to ensure its financial viability and continuity.

1.3.6 Start-Up and Marketing

The administrative and legal requirements for start-up have been identified and preparation of documents is in progress. An interim president has been engaged and is active in detailed planning and implementation.

The marketing plan includes:

- identification of potential stakeholders
- communication with industry associations, learning institutions, research providers and government
- preparation of a marketing document
- commencement of a publicity and communications plan

1.3.7 The Schedule

Key actions include the hiring of a permanent president, finalizing arrangements for office space, registering the corporation, publicizing the organization, and signing up members. A six month workplan has been prepared (see pages 21-22 of this report).

Chapter 1. Destination

1. Vision

The founding sponsors visualize a prosperous Canadian conventional petroleum industry successfully competing in the energy business by applying leading-edge technology developed through collaboration among all stakeholders. A new organization, referred to as "Petroleum Technology Alliance Canada" or "PTAC", shall be established.

2. Purpose

The Purpose of PTAC is to provide a structure that will bring stakeholders together to identify industry problems and define research projects to deal with them. The objective is to leverage intellectual and financial resources, apply them to solving industry problems and improve industry performance."

3. Beliefs

We believe that:

- the Canadian petroleum industry must compete within the international energy industry.
- the application of new technologies can make the Canadian petroleum industry more competitive by reducing finding and development costs, reducing operating costs, increasing rates of production, increasing recovery from existing reserves and improving the safety and environmental performance of the industry.
- collaboration results in faster problem-solving, better identification of opportunities, improved quality of new technologies, and leverage of financial and intellectual resources
- technology development resources must be focused on problems and opportunities that will have a meaningful impact on industry performance.
- all stakeholder groups, including oil and gas producers, pipeliners, research providers, learning institutions, and resource owners will benefit from an industry that is financially sound and technically on the leading edge.
- the benefits of new technology will be the greatest when new technology is rapidly and widely dispersed.
- stakeholders must identify areas where entire bodies of knowledge should be moved forward.
- spending on technology development should be increased by combining resources of all stakeholder groups.
- the old model of delivering research will no longer be effective because of changed industry demographics, down-sizing, and a realignment of priorities in industry, government and learning institutions.
- individual oil and gas companies benefit primarily through the application of technology, not the ownership of it.
- PTAC recognizes the value of proprietary technology to stakeholders.
- PTAC should facilitate collaboration, but not be a performer of research.
- the primary responsibility for identifying industry problems resides with the oil and gas companies and other users. All stakeholders should be involved in describing research and technology development projects that will address these problems.
- spending should not be on bricks and mortar; administration costs should be minimal.
- the cadre of research providers in Canada collectively have the facilities, people and expertise to deal with most of the petroleum industry opportunities and problems.
- world-class organizations with the ability to conduct research, develop new technologies and deliver well-trained people exist in Canada.

4. Principles

Consistent with these beliefs the governance, organization, structure, financing, policies, and work processes of PTAC shall be based on the following principles:

1. The activities of PTAC shall be focused on the upstream conventional oil industry.

2. All stakeholders and stakeholder groups shall have the opportunity to be involved; through voluntary participation in the board, committees, subcommittees or projects
3. It is desirable to have diversity in the membership, so that a broad spectrum of experience, ideas, talent, and opinion is brought to bear on problems, solutions, and opportunities.
4. The structure, policies, and practices shall not discourage stakeholders from being members and participating in projects.
5. The focus of PTAC shall be on promoting collaboration among stakeholders, identifying industry problems, describing research projects that address them, and facilitating the conduct of joint research projects.
6. PTAC shall play an active role in identifying the combination of applied research and basic research required to continuously advance bodies of knowledge in areas critical to the petroleum industry.
7. PTAC shall encourage stakeholders to conduct the research which is necessary to advance critical bodies of knowledge, but is not being addressed through problem-solving research and technology development.
8. The organization, policies, and work processes will promote collaboration and alliances among research providers.
9. PTAC will facilitate collaboration; it will not be a performer of research.
10. Research projects conducted under the umbrella of PTAC shall be financed by those members who elect to participate in individual projects.
11. PTAC will encourage rapid and broad transfer of technology. However, the owners of technology and those funding projects will decide on the use and distribution of new technology on a project-by-project basis.
12. Policies and work processes will promote research being done in a timely and effective manner at the most effective institution worldwide, recognizing that it is preferable to have facilities and core competencies in Canada.
13. PTAC will encourage the elimination of unnecessary duplication by being aware of ongoing projects and making both research providers and sponsors aware of redundant projects.

5. Goals

The measurements:

- short-term success shall be measured by the number of members, number of collaborative projects, total investment in research, ability to identify needs, and number of participants in projects.
- medium-term success shall be measured by the effectiveness in delivering cost-effective solutions to technical problems and seizing new opportunities within a reasonable time-frame.
- long-term success shall be measured by the improvement in the competitiveness of the industry brought about by the application of new and better technology.

Short term goals include:

- make PTAC operational, with 25 user members and all other stakeholder groups represented by June 30, 1996.
- have 40 producers, 10 Canadian research providers and 20 service and supply companies as members by September 30, 1996.
- have 4 collaborative research and technology development projects underway by Dec. 31, 1996.
- identify on-going research projects with the objective of identifying and dealing with redundancy, and attracting additional participants to highly worthwhile projects.

Medium term goals are achieved through the application of new and better technology. By December 31, 1999:

- decrease the finding and on-stream costs per BOE by a significant percentage.
- decrease the cost of lifting, processing, and transporting oil and natural gas by a significant percentage.
- decrease the frequency and severity of accidents and near misses.
- decrease the incidence of oil and gas pollution and the amount of net emissions discharged into the atmosphere.
- increase the ultimate recovery by a significant percentage.

Precise percentage goals will be set by the PTAC Board of Directors.

Chapter 2. Vehicle

1. Organization

1.1 Strategies

- PTAC will have a board of directors who will provide broad direction, ensure that PTAC is working to meet its purpose within the beliefs and principles that have been established, and is working to achieve its goals.
- Committees of the board will be structured to deal with the wide range of opportunities and problem areas in the industry, the large number of prospective participants, and the diversity of the stakeholders.
- Board committees will have volunteer chairpersons from their membership, and will have direct links to their subcommittees.
- All member stakeholder groups will have a voice in the PTAC operation.
- Roles and responsibilities and authorities for each level in the organization will be defined.
- Oil and gas companies, transporters, and other prospective users will have primary responsibility for identifying petroleum industry needs and funding specific projects.
- All stakeholder groups will be involved in identifying bodies of knowledge that will be advanced, and in determining what needs to be done to make them advance.
- Individuals serving on the board will be in a position to speak for stakeholder groups.
- The term of service of board members will be sufficiently long to provide for a period of learning, and subsequent year-to-year continuity.
- The board will have members-at-large in addition to members who are representative of stakeholder groups.
- Although PTAC will be largely dependent upon volunteers, it will be organized so as to recognize the limited time availability of board, committee and subcommittee members.

1.2 Tactics

- Board members could be recommended or appointed by industry associations and government agencies, as they are in the Petroleum Industry Training Service.
- Where a single representative may not be in a position properly to represent all interests in a stakeholder group, it may be appropriate to have additional board members to ensure that all interests are represented. Example: a service company representative may not be able to adequately represent the manufacturing sector, even though both come from the service and supply sector.
- Stakeholder groups not having associations should develop their own mechanisms for nominating board members and providing input. The committee structure could include a Research Provider Committee and a Learning Institutions Committee. These committees could also foster cooperation among their constituents.
- There could be more than one board member from learning institutions.
- Government representation could be through cross membership in the Alberta Energy Research Council or by a member-at-large. There could be a permanent board position for a representative from the Alberta Energy and Utilities Board.
- The board should have several committees so that major roles are delegated to smaller groups.
- A Technology Development Policy Committee should be formed with overall responsibility for identifying bodies of knowledge that need to be advanced. Subcommittees should be formed to deal with specific areas of the business. These subcommittees should develop a plan to ensure that bodies of knowledge are advanced.
- There should be processes which make it easy for any member to provide input, even though the member may not have representation on the board.

- Board members should be appointed for three-year terms, with the initial terms staggered to provide for partial board replacement each year.

A detailed design of the organization follows.

2. Board of Directors

2.1 Roles and Responsibilities

- to make policy and ensure conformance
- to hire, direct, and evaluate the chief executive officer
- to establish the organizational structure and governance procedures
- to ensure that PTAC is responsive to its members
- to ensure that appropriate bodies of knowledge are identified and plans are in place to advance them
- to ensure that the subject of technology is adequately addressed
- to provide government and learning institutions advice on conventional oil and gas research and technology development priorities and the role that they might play in advancing bodies of knowledge.

2.2 Structure

PTAC shall be governed by a board of directors. The board shall include representatives from all stakeholder groups, namely:

- ◆ oil and gas producers
- ◆ pipeline and transportation companies
- ◆ manufacturing, service and supply firms
- ◆ research organizations
- ◆ government agencies
- ◆ learning institutions.
- the board chairman shall be elected by the directors.
- the terms of board members shall be three years, with the terms staggered so as to have an annual turnover of one third of the board.
- the board shall meet monthly, or as required. The expectation would be that frequent meetings would be required during start-up, and less frequent after a few years of satisfactory operations.

3. Committees of the Board

3.1 Membership and Nominations - Roles and Responsibilities

- to identify potential members, and attract them to join the organization
- to ensure members' needs are properly served
- to develop processes for communicating with members
- to ensure PTAC is performing in compliance with its vision, purpose, principles and beliefs

3.2 Finance and Audit Committee: Roles and Responsibilities

- to ensure processes are in place to determine the administrative funding needs and to manage these funds
- to manage the treasury function
- to develop formulas and mechanisms which users may use for sharing the cost for research projects
- to be aware of other sources of funds (such as various government grants) which may reduce the costs for research projects.
- to ensure research users are aware of tax benefits for research spending
- to manage financial and business processes, and the audit function
- to study and develop alternate mechanisms for funding basic research

3.3 Technology Development Policy Committee

This committee should include representatives from the technology users, service and supply companies, research providers, and learning institutions. Roles and responsibilities are:

- to identify broad business needs and how technological improvements can address them
- to identify bodies of knowledge that should be advanced and establish subcommittees to deal with each of them
- to coordinate processes and projects among the technology development subcommittees
- to encourage technology transfer

3.4 Legal Committee: Roles and Responsibilities

- to provide general corporate advice
- to provide standard project agreements
- to provide advise on intellectual property

3.5 Compensation Committee: Roles and Responsibilities

- to manage the employee compensation function

4. Technology Development Policy Committee - Subcommittees

Subcommittees are required to divide the areas of research into logical groups, or technology development areas. These are bodies of knowledge where the application of new and better technology will reduce costs, improve oil and gas discovery, production and recovery, improve safety, or reduce environmental impact. They are technological areas in which the petroleum industry will benefit significantly when the overall body of knowledge is advanced.

It is envisioned that these areas will be most effectively advanced when problem-solving research is supplemented with the basic research that is required to ensure continuity and general advancement of the body of knowledge. Problem-solving research and technology development will readily be sponsored by the petroleum industry. Governments should participate in PTAC problem-solving projects and also contribute to the supplemental basic research. These subcommittees can be formed progressively as priority needs and champions are identified.

4.1 Roles and Responsibilities

- to bring the research providers, including the learning institutions, together and encourage coordination among them
- to provide forums in which the research providers and learning institutions can discuss potential projects that will address technology needs of oil and gas companies
- to initiate collaborative projects
- to communicate or meet as required to identify problems and opportunities
- to ensure that research providers are aware of industry needs and problems
- to discuss proposals for research

- to actively involve research providers
- to work with research providers, learning institutions, and government agencies to define the body of knowledge that exists in their particular area
- to define steps that need to be taken to advance the body of knowledge
- to review progress from time-to-time in advancing the body of knowledge
- to identify gaps in the research continuum that are not being addressed through problem-solving research and describe methods to ensure that research continuity and direction is maintained
- to issue requests for proposals to research providers
- to review, prioritize and seek funding for unsolicited research and technology development projects from research providers, industry members and inventors
- to become aware of existing research projects and work to eliminate duplication and redundancy.

Technology development subcommittees will include the following:

1. Production and Processing of Natural Gas Subcommittee

Areas of study include:

- compression
- corrosion
- fractionation
- hydrogen sulfide handling and removal
- power optimization/energy conservation
- sulfur recovery
- cryogenics
- dehydration
- plant construction/project management
- gas and product measurement and storage
- safety and environment
- etc.

2. Drilling Subcommittee

Areas of study include:

- horizontal drilling
- tubulars
- drilling strings and bits
- hydraulics and mud
- well control

- safety and environment
- foam/under balanced drilling
- horizontal kickoffs
- MWD/LWT/LWD
- etc.

3. Oil Production Subcommittee

Areas of study include:

- artificial lift
- well bore hydraulics
- water separation, handling, and disposal
- storage and measurement
- automation
- power optimization
- safety and environment
- etc.

4. Well Completion, Stimulation and Workover Subcommittee

Areas of study include:

- wellbore damage
- fracing
- acidizing
- other stimulation techniques
- paraffin/asphaltene management and removal
- etc.

5. Oil and Gas Transportation Subcommittee

(includes flowlines, gathering systems and mainline systems). Areas of study include:

- construction techniques
- gas compression
- power optimization
- internal corrosion
- external corrosion
- measurement
- friction reduction
- SCADA
- etc.

6. Reservoir Recovery Subcommittee

Areas of study include:

- water and gas coning
- gas and water injection
- tertiary recovery/EOR
- well spacing
- depositional problems (like conglomerates over tight sand)
- reservoir numerical modeling

- conformance/sweep improvement

7. Geoscience Subcommittee

Areas of Study include:

- basin stratigraphy
- structural geology
- sedimentology
- seismology
- geophysical data acquisition and processing
- paleontology
- application of 3D seismic to depletion optimization
- etc.

8. Basic Research Subcommittee

Areas of Study include:

- future threats, needs and opportunities
- environmental, safety, information technologies impacts

5. Membership

5.1 Strategies

Membership will include a sufficiently large number of companies and institutions in each of the stakeholder groups so that PTAC is seen as the focus of collaborative research in the Canadian upstream conventional petroleum industry. All stakeholder groups - technology users, research providers, service and supply companies, learning institutions, and government agencies will be members of PTAC.

5.2 Tactics

- Publicize PTAC throughout the industry.
- Establish a fee structure that does not discourage companies or institutions with limited resources to become members.
- Meet with the many industry and professional associations to publicize PTAC and encourage their members to join.
- Meet with universities, ARC, CANMET, and other research providers and encourage them to be part of PTAC.
- Encourage research providers to form some type of association to make it easier for them to form alliances for the purpose of handling broad industry problems.
- Supply lists of potential projects to members and prospective members.

Chapter 3. How it Works

1. Roles of PTAC

PTAC is comprised of members from oil and gas companies, oil and gas transporters, service and supply companies, R&D providers, government agencies and learning institutions. It is supported by a small staff, of a president and administrative support. Additional manpower requirements will be subcontracted as needed. As a management team this staff has technical, networking, and marketing skills. Its role in general is:

1. to bring producers and other technology users together to identify common problems which might be addressed through the application of new and better technology
2. to connect producers and other users with research providers so that research providers are aware of industry problems and have a forum in which to discuss research projects that may address these problems
3. to assist in the preparation of research "requests for proposals (RFP's)"
4. once research projects have been initiated to advertise and solicit participation in these projects by others
5. to identify bodies of knowledge that should be advanced in order to benefit the conventional oil industry
6. to identify what research work beyond problem-solving research and technology development should be done in order to advance specific bodies of knowledge
7. to provide advice to governments on their research spending so that it complements research work sponsored by industry
8. to assist in transferring new technology to industry
9. to ensure that research and technology is properly archived and preserved
10. to provide for the management of specific research projects if requested by participants
11. promote alliances among research providers so they can combine their expertise in dealing with comprehensive problems

2. The Process

The board and its committees function similarly as in other not-for-profit organizations. The technical innovation process resides with the Technical Development Policy Committee and its subcommittees. These are the groups in which most of the responsibilities set out in *Chapter 2 Vehicle*, reside.

The Technical Development Policy Committee has broad oversight responsibilities. It ensures that the technical subcommittees are properly defined and coordinated, and function in accordance with the principles and beliefs of PTAC. In addition it ensures that the research providers are in the loop and in a position to respond to problems raised by producers and other users. The committee also deals with the "bodies of knowledge" issue, ensuring that the bodies of knowledge essential to the continuous improvement of the industry are identified and that a plan is in place to continuously advance them.

2.1 Starting New Projects

New projects are generated in response to industry needs. In forums or through other group interaction the technical subcommittees identify problems which, if solved, would achieve the goals of lower cost, higher efficiency, safer operations, or more recovery. Research providers working with producers brainstorm research projects that address these problems. Eventually one or more projects are described that address the problem.

The staff of PTAC ensure that project concepts reach the RFP stage. PTAC will also encourage unsolicited proposals. It must ensure that the work processes flush out the problems and that prospective solutions are forthcoming. The research proposal may come in the form of a proposal directly from a research provider, or group of research providers. It may also be generated by one more of the users. Once the project is defined by either the research providers or the users, or both, it may be fine-tuned so that it meets the needs of a large number of users.

All projects are conducted by the research provider who can deliver the best product. A project defined and proposed by research providers is likely (but not necessarily) carried out by the proponent. This provides an incentive for research providers to be actively involved with PTAC. A project defined by the producers will result in an RFP that will be sent to a larger spectrum of research providers.

2.2 Getting Participants

A project at the RFP stage will likely have several producers who have helped define the problem and the research projects. These are likely the initial participants. A major role of PTAC is to expand this group through actively soliciting participation from others.

2.3 Projects Already Underway

Individual companies, research providers, or consortia may have projects underway that are of interest to PTAC members. The role of PTAC is to identify any on-going projects that address problems raised in the technical development subcommittees to make sure PTAC members are aware of them, and to solicit their participation.

PTAC will also search for projects that may be duplicating other ongoing efforts. Research providers and project sponsors will be made aware of redundancies so that they may take steps to address this problem.

2.4 Project Management

Project management will not come from PTAC staff unless the participants request PTAC to provide that service. It is desirable for project funders or third party firms to play an active role. It is likely that each research project would be managed (operated) by either one of the participants as is done in other joint ventures in the oil industry or an independent project manager. In many cases projects will be suggested by one of the participants and this participant would be the logical operator/manager.

The involvement of participants and other stakeholders on an on-going basis will be decided on a project-by-project basis, recognizing that an integrated team approach adds value to most projects. The project will have an operating agreement that deals with operator responsibilities, distribution of costs

among participants, provisions for late joiners, recovery of costs, billing procedure, ownership of research project results, transfer of technology, and any other necessary terms. PTAC will provide form agreements that simplify this process.

2.5 Transfer of Technology

The project participants have ownership of the technology. They decide how the technology will be used or transferred to others. PTAC is involved to the extent requested by participants. Participants will be made aware that research frequently does not yield the desired result because it is not made available to others who may be able to continuously improve a new product or service, and creatively apply new technology.

2.6 Data Archiving

All research projects will be documented in an appropriate manner. In the longer term there is always the risk that the results of research may be misplaced, particularly if the research did not result in an immediate application. PTAC will provide an archiving service.

2.7 On Going Communication

PTAC, through newsletters, forums, workshops, presentations to industry associations, professional meetings, Internet etc. will keep the membership and the public aware of its activities. The objective of this process is to make sure that on going projects are well publicized.

2.8 Government-Sponsored Research

Governments provide research through government research agencies and by supporting institutions and research providers. Governments are seeking advice on how to spend their research dollars.

PTAC is a logical source for input from the conventional petroleum industry. PTAC will advise government on bodies of knowledge that are critical to the industry and need to be advanced. PTAC will also advise on research beyond problem-solving research that is essential to advance each body of knowledge. This input will provide governments the information they need to allocate their resources to the appropriate disciplines. Together, industry and government should be able to allocate their resources

so that problem-solving research is supplemented with other research that continuously advances essential knowledge.

It will be appropriate to have some individuals serve dually on both government and PTAC boards.

3. Financial Plan

Assumptions

- PTAC will employ a president and administrative support. Other manpower requirements will be seconded or subcontracted as needed.
- Office requirements will be minimal, including space required for three people, suitable space for storage and archiving technical reports, and access to a conference room.
- Staff will require excellent communication and computer facilities.
- Start-up costs might be reduced if PTAC could be co-located with an existing operation (such as CAPP, PSAC, PITS, the University of Calgary or one of the existing research consortia).
- Start-up funding will come from membership fees. Longer-term funding may be a combination of membership fees and a percentage of research projects conducted through PTAC, or some other mechanism.
- Members will make a 3-year commitment, providing this does not present a barrier to obtaining membership. The objective is to secure a long-term commitment to the collaborative process and to secure financing for PTAC during a suitable start-up period.
- Research projects will not be part of the PTAC budget, but will be funded directly by participants.
- Governments will be asked to contribute to PTAC start-up funding and also to become members of PTAC on a long-term basis.
- The fee structure is shown following.

PTAC Membership Categories

Producers

1995 BOE/day	Fee (\$)
> 100,000	11,000
75,000 - 100,000	10,000
50,000 - 75,000	9,000
40,000 - 50,000	8,000
30,000 - 40,000	7,000
20,000 - 30,000	6,000
10,000 - 20,000	5,000
5,000 - 10,000	4,000
2,000 - 5,000	3,000
1,000 - 2,000	2,000
<1,000	1,000

Transporters

Large	11,000
Other	5,000

Service & Supply / Research Providers / Learning Institutions

Large	5,000
Medium	3,000
Small	500

Governments

As per producer fee schedule and government royalty production

Other

Individuals	100
-------------	-----

Notes to the table PTAC Fee Structure

1. The formula used to calculate the membership cost for producers, pipeliners, and service sector are similar to those used in the industry associations.
2. "Large" organizations are those with more than 100 employees, "medium" is between 20 and 100 employees and "small" is fewer than 20 members.
3. Governments as royalty owners are offered membership for the same fee as large producers. Government-owned research providers will participate like any other provider and be subject to the same fee. The Alberta Government is expected to contribute \$100,000 of in-kind support during the first three years.
4. With prior consent, members may offset a portion of their membership fee by providing in-kind support.
5. Members will commit to PTAC for a 3-year period to ensure its financial viability and continuity.

Estimated Annual Startup Operating Expenses

Staff	180,000
Office Rent	22,000
Computer & Office Equipment	30,000
Operating Supplies	23,000
Other	<u>15,000</u>
Total	\$270,000

General: Cash surplus, if any, will be used to maintain adequate working capital, then for compensation to VP Breakfast Club participants for their pre-project contributions, and thereafter to decrease future membership dues. Actual fees and operating budgets will be set by the PTAC Board of Directors.

Chapter 4. Hitting the Road

1. Steps to Destination

“Hitting the Road” requires many actions to get the Vehicle up-and-running and moving towards the Destination. These actions are illustrated in a detailed time schedule at the end of this chapter

Important steps include:

- Appoint an interim board of directors to serve until the first general meeting of members; elect an interim chairman; and select interim committees.
- Decide on the mechanisms for engaging a PTAC management team; that is, direct hire, secondment, and outsourcing.
- Assess the feasibility and cost/benefits of co-locating PTAC with another institution or outsourcing, and complete the necessary business arrangements. If one of these options is not selected then arrangements for obtaining dedicated office space will need to be made.
- Enter an agreement with the persons and organization(s) chosen to perform the management functions.
- Develop legal and corporate documents and agreements:
 - Memorandum of Association
 - Articles of Association
 - Bylaws
 - Employment/Out-source
 - Management Agreement
 - Membership Agreement
 - Project Agreement
- Incorporate the institution as a not-for-profit corporation. It could be incorporated as “Petroleum Technology Alliance Canada”, enabling the use of the acronym PTAC.
- Arrange banking
- Develop a marketing plan, and immediately commence recruiting members.
- Develop a networking plan and meet with industry associations.
- Develop an advisory plan and meet with government agencies.
- Elect a board of directors from the membership and elect a chairman and vice-chairman.
- Commence operations in accordance with the Vision, Purpose, Beliefs, Principles and Goals established by the Steering Committee.

2. Incorporation

Documents used and procedures followed by existing multi-sector not-for-profit organizations (CONRAD, C-FER, PITS, PSAC and C-CORE) have been examined so as to minimize the development work. Draft documents for PTAC should be prepared, and fine-tuned by lawyers.

Legal assistance should be solicited as an in-kind support from one of the organizations represented on the Steering Committee. The documentation for PTAC should be much like those of other organizations in which the petroleum industry participates. The governance could be similar to PITS. The operation could be similar to CONRAD. The assessment of dues could be similar to PSAC.

The following headings cover the requirements identified in the preceding chapters.

2.1 Memorandum of Association

Articles of Association:

Definitions
 Head Office and Records Office
 Corporate Seal
 Membership
 Board of Directors
 Officers
 Board Committees
 Meetings of Members
 Indemnification of Directors and Officers
 Financial Arrangements
 Remuneration
 Books and Records
 Notices of Meetings
 Private Company

Not-for-Profit Organization
 Capital
 Shares
 Shareholders
 Accounts and Reserves
 Notices
 Special Provisions

2.2 Bylaws

Meetings of Members
 Proceedings at General Meetings
 Votes of Members
 Directors
 Proceedings of Directors
 Powers of the Board
 Committees
 Officers
 Borrowing
 Audit of Accounts and Auditors
 Income
 Books and Records
 Amendment of Bylaws
 Inspection of Books by Members
 Staff
 Patents
 Trustee
 Accounts
 Voting
 Attendance at Meetings
 Amendment of Bylaws
 Inspection of Books by Members
 Banking
 Investments

2.3 Employment/Outsource Management Agreements

Definitions
 Description of Work
 Responsibilities of PTAC
 Responsibilities of employees or contractor
 Budget, Remuneration and incentive
 Confidentiality
 Termination
 General Conditions

2.4 Membership Agreement

Terms and Conditions
 Interpretation
 Disclosure of Project Information
 Project Applications
 Licensing Policy
 Obligations of Applicant
 Obligations of PTAC
 Amendments to Terms and Conditions
 Termination and Survival of Obligations
 Effective Date
 Purpose
 Organization

Termination
 Amendment

2.5 Project Agreement

Definitions
 Project Information
 Access to Project
 Termination of the Project
 Copyright
 Confidentiality
 Licensing Policy
 Liability
 Indemnity

3. Financing

It will take some time to build the membership in PTAC. Many prospective members may sit back and watch how the organization develops before joining. Start-up funding for PTAC will come from those members who agree to be founders of the organization - probably members of the VP Breakfast Club, and others who will be willing to commit prior to the organization commencing operations. The Alberta Government and other organizations are being approached for start-up funding. The objective is to secure funding and/or commitments to ensure PTAC will be viable for 3 years. This will require approximately \$800,000.

4. Marketing Plan

The marketing plan should have the following components:

1. identification of potential stakeholders
2. a marketing document which includes
3. a presentation that can be made to industry
4. associations and other interested parties
5. a communication plan

4.1 Identification of Potential Members

Potential members include oil and gas producers, pipeline companies, service and supply companies, research providers, inventors, learning institutions, and governments. Most stakeholders were identified by the consultants when the Vice Presidents Breakfast Club solicited participation in the October 1995 Workshop.

To the extent possible PTAC will make direct contact with prospective members. Participants in the workshop provide a starting point. Beyond this, PTAC management should use industry directories,

and make presentations to industry associations. Steering Committee members should be consulted as to the appropriate contacts for research providers and learning institutions.

4.2 Marketing Document

This document should be professionally prepared. Its contents would include:

1. A description of PTAC

- a review of its development
- a summary of the Workshop conclusions
- a statement of its Destination - vision, purpose, principles, beliefs, and goals
- a summary of the Vehicle and How it Works

2. Reasons for becoming a PTAC member

Generic reasons for All Stakeholders to support PTAC include:

- All stakeholders benefit if:
 - the Canadian petroleum industry is healthy and successfully competing in the world oil scene.
 - this industry is seen by the rest of the world as being technically at the leading edge.
 - Canada is seen as a place where a wide spectrum of stakeholders work together to develop resources and make the industry successful.
- A new model is needed to conduct research due to changed industry demographics.
- The level of research spending in the conventional oil industry is too low and fragmented.
- PTAC will provide online access to existing and developing international petroleum technologies to members.
- The leveraging of financial and intellectual resources makes more resources available for research.
- Effective coordination can reduce duplication and improve focus and effectiveness.
- If all stakeholders do their part - contributing in accordance with their needs and capability - everyone benefits and the burden on each is fair and manageable.

- Collaboration in the private sector is likely to attract additional support and to leverage research funds from governments.
- The organization sensitizes more people to the importance of research.

Specific reasons for Technology Users to support PTAC include:

- The application of new and better technology can lower operating costs, improve oil and gas recovery, improve safety and mitigate potential environmental problems.
- Participating in the design of technology development programs provides an opportunity for projects to be tailored to an individual user's needs.
- Participation leverages an individual's research and technology expenditure.
- Participation will give the user access to technology that non-participants don't have.
- Prompt application of new technology provides a competitive advantage to users, and may enable them to keep ahead as new technology is further enhanced.
- Users can focus their proprietary research and technology development spending.
- Participation gives the user a say in the overall direction of research in the conventional petroleum industry.
- Participation makes it easy to identify and support research spending for tax accounting.
- Users who have in-house research facilities may be able to do research and technology development for others and hence realize the same benefits as other research providers.

Specific reasons for Research Providers to support PTAC include:

- It provides a forum where they can dialogue with users, find out their needs and collectively describe projects.
- It enables them to plan their resource requirements, identify niches and eliminate unpopular programs.
- It provides a competitive advantage over non-member research providers.

- It encourages alliances from which they may benefit.
- It makes more funds available for research.

Specific reasons for Learning Institutions to support PTAC include:

- As Research Providers they realize the benefits cited above.
- They become aware of industry needs which will be useful in curriculum design.
- More research programs will be beneficial to students in graduate programs.
- Graduates working on research programs designed and supported by industry are provided with an entree into industry.

Specific reasons for Service and Supply Companies to support PTAC include:

- Those who have in-house research facilities may be able to do research for others and hence realize the same benefits as other Research Providers.
- PTAC provides a forum for service and supply companies to dialogue with users enabling them to determine industry needs which may lead to their developing marketable products.
- Collaborating in pre-competitive research will release more funds for their proprietary programs.
- Collaboration may solve specific problems that have been trouble spots for individual service and supply companies.
- They have a say in the broad approach to industry research.

Specific reasons for Governments to support PTAC Include:

- Both industry and government funds are leveraged.
- Governments receive direct input from industry on bodies of knowledge that are critical to the success of the industry.
- Governments, as resource owners, are the largest benefactors of improved recovery that results from lower operating and finding costs, and improved reservoir performance.
- Government agencies are able to focus their research spending to complement the technology

development by industry, so that collectively the appropriate bodies of knowledge are advanced.

3. Fee Schedule

The starting point can be the table included in Chapter 3. Fee levels listed in this table should be discussed with prospective members and industry associations to ensure that they are found to be reasonable.

4. Application Form

A membership application form should be patterned after applications for membership in industry associations. It must contain information that enables the appropriate fee to be assessed, identifies the areas of interest of the member, and names people who may be willing to serve on committees.

4.3 Presentation for Industry Associations and other interested parties

One or more well-designed generic presentations are required. These should include quality 35mm slides, overheads or computer-generated presentations that can be used with a large group, and flip charts or other visual aids that could be used with individuals or small groups. The presentations could be made by a member of the Steering Committee, consultants, and PTAC management.

The latest techniques of making PTAC corporate and technical project information widely available through electronic networks should be employed. Systems such as Internet will reduce the cost, effort and delay of getting information to all members and potential members.

4.4 Communications Plan

Communications are aimed at attracting prospective members and creating interest in PTAC. The communications plan should include:

- industry journal articles, interviews
- industry journal advertising
- direct mailing
- person to person contact
- presentations to industry associations
- Internet home page

5. Staffing the Organization

Permanent staff will consist of a president and administrative support. Additional requirements can be met through contracting out. Options for staffing include direct hiring, secondment, and outsourcing, and a combination of the three. If PTAC is co-located with another organization it may be able to share certain support services. An interim solution may be to out-source initially, and then commit to direct hire or secondment. Pros and cons of these alternatives include:

Direct Hiring

Pros: achieves commitment, likely good are candidates available.

Cons: expensive, especially if head hunter is used, requires long lead time, difficult to retreat if candidate not suitable, requires setting up employee administration and benefit plans.

Secondment

Pros: could be less expensive, doesn't require long term commitment.

Cons: difficult to get full commitment, candidate availability may be limited.

Outsourcing

Pros: immediately available, can fix and control costs, pay as you go, obtain specialized focused expertise, allows board to focus on core work, minimize management responsibilities, offers flexibility, a team approach and allocation of resources only as needed, access to advanced management practices.

Cons: dependence on outsourcing firm, risk to confidentiality, less control over staff.

6. Office Space and Support

Office space requirements will be approximately 1500-2500 square feet. Ideally the space should include conference room space to accommodate committee meetings. The space needs to have good access to downtown Calgary, but need not be first class office space. A realistic alternative is to co-locate PTAC with a companion organization such as CAPP, PSAC, PITS, government agency, or at the University of Calgary. Perhaps one of the producers will provide space.

If PTAC were to be co-located it would be desirable to have the host provide support services and facilities

such as shared secretaries, office furniture and equipment, computers, telephone and switchboard.

7. Interfacing with Industry Associations

Prior to launching PTAC, industry associations should be consulted on all aspects of PTAC. Discussion should take place on:

- reasonableness of PTAC mandate
- likelihood of the association endorsing PTAC
- proposed fee structure
- feasibility of co-location
- possibility of the association providing administrative support

8. Interfacing with Government

The governments of Alberta and Saskatchewan are aware of PTAC progress through attendance at the Workshop and Alberta membership on the Steering Committee. Presentations should be made to the Alberta Energy Research Council; and the Alberta Ministers of Energy; and Science and Research. Presentations should also be made to the governments of Canada, Saskatchewan and British Columbia.

9. Elect a Board of Directors

The PTAC Board of Directors will be elected by the membership. On the premise that the companies and institutions currently serving on the Steering Committee will become PTAC members it would be reasonable for some members of the Steering Committee to form the Interim Board. This board would serve until the PTAC Board is officially elected by the membership.

10. PTAC Workplan - First Six Months

The attached Gantt chart shows a workplan for the first six months of PTAC's operations. This chart, and additional background information has been prepared to answer these questions:

- ◆ what needs to be done?
- ◆ who is responsible to complete the tasks?
- ◆ when must it be done?
- ◆ how much will it cost?
- ◆ what happens if there are delays?

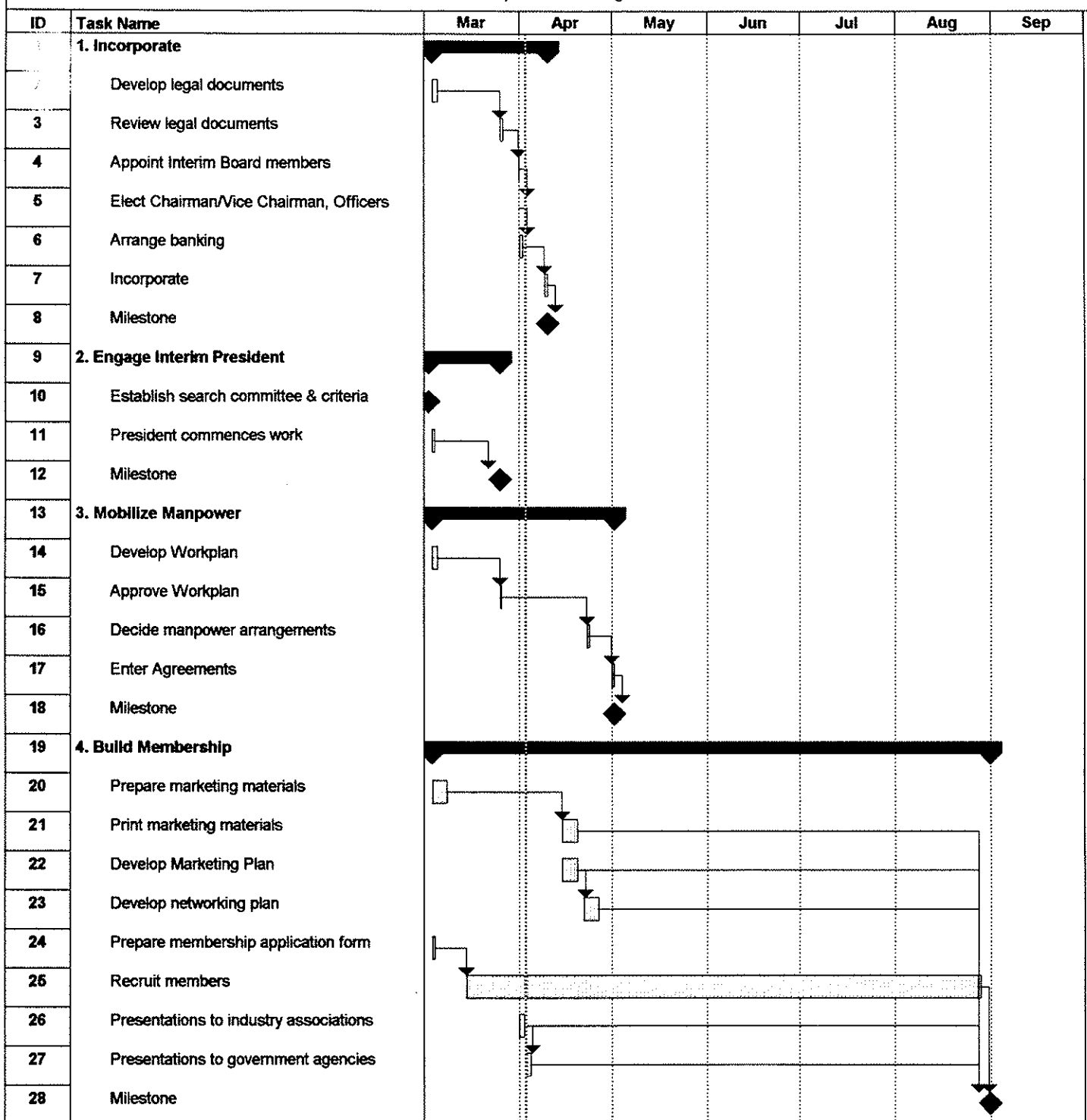
Eight major milestones are identified:

1. Incorporate
2. Engage interim President
3. Mobilize Manpower
4. Build Membership
5. Obtain Funding
6. Hold Board Meetings
7. Hold Committee Meetings
8. Arrange Office Facilities

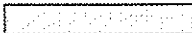
Several tasks are listed to achieve each milestone.

Estimates have been made on the length of time required to complete each task and are shown in the legend as "task duration". Tasks having predecessors are connected by lines and arrows. Achievement of milestones are shown by diamonds. Project management tools such as this chart will be used to plan, track, manage and communicate information on progress in establishing PTAC.

PTAC Workplan March - August 1996



Task



Milestone



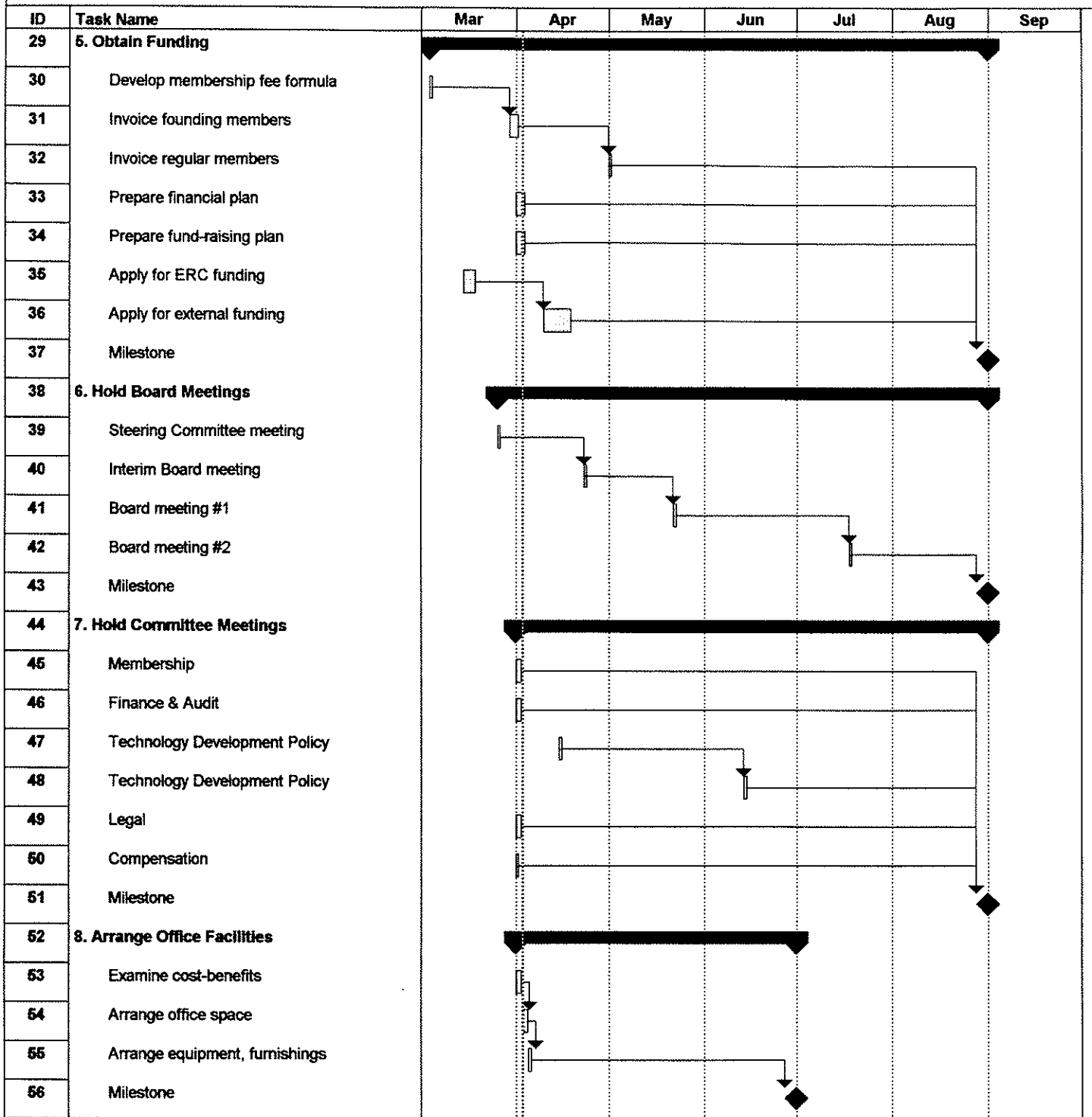
Progress



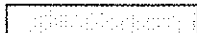
Summary



PTAC Workplan March - August 1996



Task



Milestone



Progress



Summary



Appendix

A1. Steering Committee Members

Eric Lloyd	Steering Committee Chairman
Celine Belanger	Alberta Energy & Utilities Board
Larry Bell	Crestar Energy Inc.
Mike Ekelund	Alberta Department of Energy
Glen Harms	Cobra Energy Consultants
Al Kiernan	AEC Oil and Gas
Mike Langley	Husky Oil Operations Limited
Derek Logan	Ryan Energy Technologies Inc.
Roy Mathew	NOWSCO Well Service Ltd.
Monte Montemurro	PanCanadian Petroleum Limited
Touraj Nasser	C-FER
Bruce Peachey	New Paradigm Engineering Ltd.
Dave Peterson	Amoco Canada Petroleum
Ken Putt	Petroleum Recovery Institute
Bill Svrcek	University of Calgary

A2. Background Documents

Collaborative Technology Development. Pooling Resources in the Conventional Oil and Gas Industry, March 1995. Todd Resources.

Petroleum Research Management Beyond 2000. Rich Kerr, Wascana Energy Inc. September 1994.

Workshop Report, Collaborative Technology Development in the Oil and Gas Industry. Prepared by Todd Resources and Pallister Management Consultants. November 28, 1995.

A3. Consultants

Murray Todd, P.Eng., Todd Resources

Murray Todd has served as consultant and principal advisor to the VP Breakfast Club and the PTAC steering committee throughout this project. Mr. Todd has worked in a variety of engineering, operations, and executive roles in his 40 year career in the oil industry. He has been involved extensively in the development and application of new technology in his work in Alaska, the Beaufort Sea, the Gulf of Mexico as well as conventional and heavy oil in Alberta. He has also had extensive experience with collaborative organizations serving as a founding member of C-FER (Centre for Frontier Engineering Research), a board member of the Arctic Institute, and board member and chairman of PITS (Petroleum Industry Training Service) for several years. He was also involved with APOA (Arctic Petroleum Operators' Association) when it was actively involved in research in the Canadian Arctic. He is a past chairman of the Independent Petroleum Association (now CAPP). Mr. Todd currently serves as President and CEO of Canada Hibernia Holding Company and also provides consulting services through Todd Resources

Ernie Pallister, P. Geoph., O.C., Pallister Management

Ernie Pallister's international offshore geophysical exploration work led to his organization of the early geophysical surveys in the Canadian Arctic. When the oil industry moved into offshore exploration drilling activity he applied his experience to the challenges of drilling in ice-infested waters and environmental preservation. Ernie has been active in the founding and management of several petroleum-related research and development organizations throughout Canada. Starting in mid-1995 Pallister Management served with Todd Resources in organizing the collaborative technology workshop and creating the PTAC Roadmap.

Jeff Pallister, CMC, B.Sc., B.A., Pallister Management

Jeff Pallister is a certified management consultant and vice president of Pallister Management. He has considerable experience gained from working on numerous consulting projects in industry and government since 1974. Jeff was active in organizing and facilitating the collaborative workshop involving oil and gas industry and R&D providers and subsequent development of the design of PTAC. Other recent assignments include assisting in the launch of a private sector council advising government, facilitating over 50 teams for business process redesign and quality improvement for various private companies, and organizing regional forums with industry and technology suppliers to identify opportunities and strategies. Jeff is currently President of the Calgary Council for Advanced Technology (CCAT) and is Division G Governor of Toastmasters International.