

April 1, 1998

Mr. David W. Lui, P. Eng
Petroleum Engineering Consultant
Novagas Clearinghouse Ltd.
800 707 8th Ave SW
Calgary AB T2P 3V3

Dear Mr. Lui:

**Re: Applications For Acid Gas Injection
Norcen Caribou a-A30-G/94-G-7 (WA 10585)
Debolt Formation**

**Copies of Approval Letter to Industry (11)
RE: GEP, Salt Water Disposals, etc.**

<input type="checkbox"/>	G. Miltenberger
<input type="checkbox"/>	Data Management
<input checked="" type="checkbox"/>	R. Stefik
<input type="checkbox"/>	D. Richardson
<input type="checkbox"/>	P. Attariwala
<input type="checkbox"/>	G. Farr
<input type="checkbox"/>	S. Chicorelli
<input type="checkbox"/>	Resource Revenue
<input type="checkbox"/>	59240
<input type="checkbox"/>	Dally

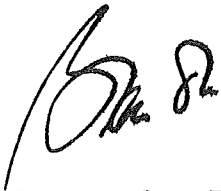
This refers to your Application wherein you requested approval of acid gas injection into the subject well.

Attached, please find Approval 98-16-001 for the Application, granted under section 100 of the Petroleum and Natural Gas Act.

It should be noted that the Ministry must be notified, in writing, of the date of commencement of acid gas injection into the well.

The acid gas injection Approval 97-16-001 for the well c-4-G/94-G-7 (WA 7961) into the Halfway formation granted on April 23, 1997 will be terminated once the well a-A30-G becomes effective.

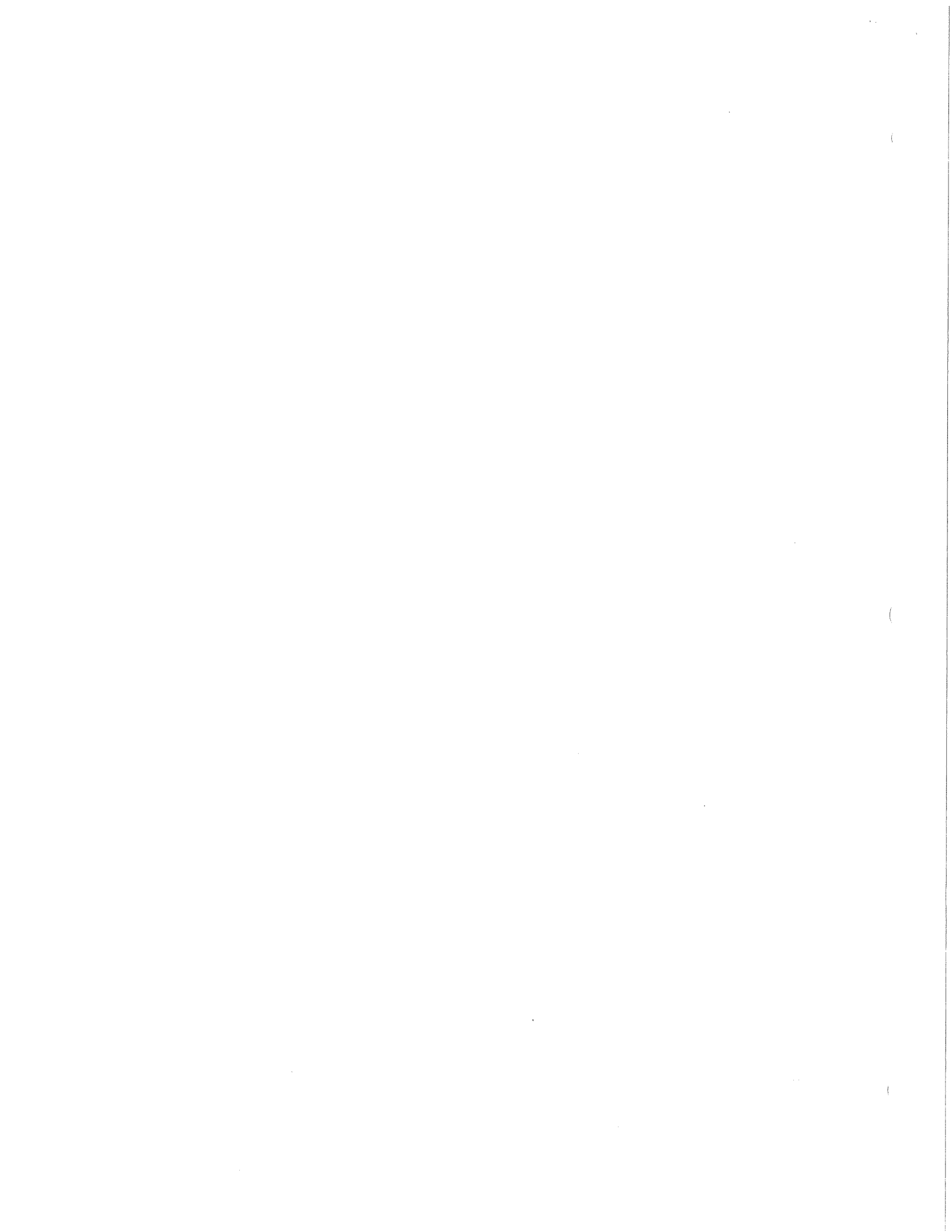
Yours sincerely,



Bou van Oort, P. Eng.
Director
Engineering and Operations Branch

PSA/mef

Attachment



APPROVAL 98-16-001

**PETROLEUM AND NATURAL GAS ACT
THE PROVINCE OF BRITISH COLUMBIA
MINISTRY OF ENERGY AND MINES
ENERGY AND MINERALS DIVISION**

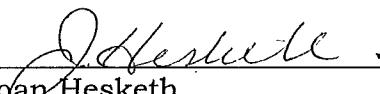
IN THE MATTER of a proposal by Novagas Canada Ltd. (the Operator) to inject acid gas into the Debolt formation in the well Norcen Caribou a-A30 1-G-7 (the well).

The Minister of Energy and Mines, pursuant to section 100 of the Petroleum and Natural Gas Act, hereby orders as follows:

1. The proposal of the Operator for the injection of acid gas (hydrogen sulphide and carbon dioxide) into the Debolt formation in the well, as such proposal is described in:
 - a) applications from the Operator to the Ministry dated April 28, 1997, June 16, 1997 and February 3, 1998,
 - b) an application for a Project Approval Certificate from the Operator to the Environment Assessment Office dated July 17, 1996,
 - c) applications for minor amendments to the Project Approval Certificate from the Operator to the Environment Assessment Office dated April 25, 1997 and May 29, 1997 and
 - d) supplementary information filed in support thereof,is hereby approved, subject to terms and conditions herein contained.
2. Acid gas shall be injected only into the approved well.
3. The wellhead injection pressure must not exceed 10,500 kPag.
4. The sandface injection pressure must not exceed 20,000 kPag.
5. The injection rate must not exceed $69 \times 10^3 \text{m}^3/\text{d}$ expressed at 101.325 kPaa and 15 degrees Celsius.
6. The cumulative volume injected must not exceed $380 \times 10^6 \text{m}^3$ expressed at 101.325 kPaa and 15 degrees Celsius.
7. The Operator must monitor the casing, conduct annular packer isolation tests and implement appropriate corrosion protection measures.
8. The Operator must monitor pressure in the offsetting wells and maintain the hydraulic isolation of the injection zone.

9. The Wellhead Emergency Shut-Off Device must be linked to H₂S detector heads at the wellhead and a Subsurface Safety Valve or Injection Check Valve must be installed in the tubing string to operate "fail-safe".
10. A barricade must be installed around the wellhead which is capable of withstanding vehicle collision.
11. All injection operations must be immediately suspended if any injection equipment, monitoring equipment or safety devices considered necessary for safe operation should fail.
12. The Operator must submit a progress report to the Energy and Minerals Division for each six-month period the project is in operation, determined from the first day of injection. The requirement may be amended at the request of the operator after the scheme has been in operation for a period of three years. The progress report is due within 60 days after the end of each period and must contain:
 - a) details of any workover or treatment program done on the well with reasons for the workover and results of the workovers,
 - b) a discussion of any changes in injection equipment and operations,
 - c) a general review of the operation of the project including identification of problems, remedial action taken and results of the remedial action on project performance,
 - d) a discussion of the overall performance of the project,
 - e) an evaluation of all monitoring done during the reporting period including corrosion protection, fluid analyses, logs and any other data collected,
 - f) a table showing monthly volumes of injected fluid, corresponding maximum wellhead injection pressures, maximum daily injection rates, average wellhead temperatures and hours on injection,
 - g) the volume-weighted average composition and formation volume factor for the injected fluid,
 - h) a plot showing monthly injection volume and average pressure versus time on an ongoing basis,
 - i) a table showing tonnes of sulphur and CO₂ disposed on a monthly and cumulative basis.

13. The project shall be deemed to have commenced upon the initiation of acid gas injection into the well. The Manager, Regional Oil and Gas Operations, at Charlie Lake must be notified in writing 72 hours prior to the commencement of injection operations.
14. An emergency response plan procedure must be filed with the Manager, Regional Oil and Gas Operations prior to the commencement of injection operations.
15. The operations of the acid gas injection scheme will be subject to review by the Ministry. The Director of Engineering and Operations Branch or the Manager, Regional Oil and Gas Operations, may issue general guidelines regarding the operations of the acid gas injection scheme.
16. The approval or any condition of it may be modified or rescinded by the Director of Engineering and Operations Branch for non-compliance of the conditions or unsafe operations.



Joan Hesketh
Acting Deputy Minister
Ministry of Energy and Mines

DATED AT the City of Victoria, in the Province of British Columbia, this
30th day of March, 1998.

MINISTRY OF ENERGY AND MINES

- I. Prepared for Joan Hesketh, Acting Deputy Minister for DECISION
- II. Subject: Application by Novagas Canada Ltd. (previously known as Novagas Clearinghouse Ltd.) for approval of "Acid Gas Injection" under section 100 of the Petroleum and Natural Gas Act (P&NG Act).

III. Recommendation:

Your approval of this application is recommended.

IV. Background:

A Project Approval Certificate (PAC) under the Environmental Assessment Act (EAA) was granted to Novagas Clearinghouse Ltd. on November 13, 1996 to build and operate the Caribou gas processing plant. The PAC approval required injection of all acid gas (hydrogen sulphide and carbon dioxide) produced from the Caribou plant into the well c-4-G/94-G-7. Since a new pool discovery was made while re-completing the c-4-G well, a temporary approval for acid gas injection into the Halfway formation was granted. Requested amendment to the PAC was granted under the EAA allowing gas injection into a new well at a-A30-G/94-G-7. Novagas Canada Ltd. (NCL) subsequently applied for the approval of acid gas injection into the well a-A30-G under section 100 of the P&NG Act.

V. Discussion:

Acid gas injection into deep subsurface reservoirs is a relatively new development in the oil and gas industry. The accepted industry practice was to release acid gases to the atmosphere with or without prior removal of sulphur. Handling and storage of sulphur and venting of well carbon dioxide (a greenhouse gas) should be minimized for environmental reasons. Also, environmental legislation limits the amount of acid gas which can be incinerated. Under these circumstances, the injection of acid gas into a deep subsurface reservoir is operationally, economically and environmentally superior over traditional sulphur and carbon dioxide disposal operations.

The a-A30-G/94-G-7 well is completed in the Debolt formation which has no economic hydrocarbon potential due to water influx. No objections were received following publication of notices of the application in the BC Gazette. All safety concerns have been appropriately addressed. There are no equity or resource conservation issues. Four acid gas injection wells have been approved in the Province.

VI Options:

Option 1: Approval of acid gas injection, consistent with the Province's approval of the Caribou plant.

Option 2: Rejection of acid gas injection and require NCL to re-apply for a redesigned gas plant that emits sulphur and carbon dioxide into the atmosphere.

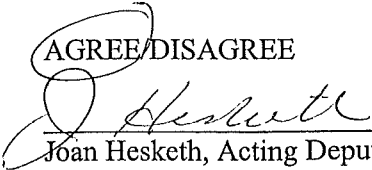
VII. Recommended Option:

Option 1.

Prepared by: P.S. Attariwala, P. Eng.
Engineering and Operations Branch
952-0311

March 25, 1998
EMD980110

AGREE/DISAGREE


Joan Hesketh, Acting Deputy Minister
Ministry of Energy and Mines

Joan
CB