

Forecaster tells Edmonton Tornado story

The tragic Edmonton tornado of July 31, 1987 was the worst experienced in the city during 97 years of observations. The death toll was 27 and damage was estimated at \$250 million. Since that time several government reports have been written. The one we have selected for Zephyr readers was an account put together by Garry Atchison, the severe weather forecaster on that day. Mr. Atchison is a senior meteorologist who has been with the weather service for 23 years and has served at the Alberta Weather Centre since 1980.

The last ten days of July 87 were exceedingly hot and humid in Alberta. Record highs from 31 to 37C were set at several sites. The dewpoint temperatures... a basic measure of humidity which averages 10 degrees in an Alberta summer... were reaching the 17 to 21 range during the last week of July. The Alberta Weather Centre had issued severe thunderstorm watches and warnings almost every day for some regions of the province. Subsequent damage reports, confirmed the daily development of these storms with damaging winds, large hail, torrential downpours and record levels of lightning.

On Thursday, 30 July, two bands of severe thunderstorms developed late in the day and crossed the Edmonton region, with the first affecting the city while the later one passed to the north during the night. The daily count from the lightning detection system exceeded 40,000 cloud-to-ground strikes, a new record. Arrangements were being made to personally check a report of tornado damage from a weather watcher about 100 km out of Edmonton if Friday's workload would permit.

By Friday morning all watches and warnings had been terminated and skies were practically clear. At least one radio announcer scoffed at the 5 AM forecast of 80 percent probability of "thunderstorms at times heavy." After the 7 AM shift change, the day shift, which includes the severe weather forecaster, considered the possibility that the worst threat was over since the surface temperatures and dewpoints were both lower, and the cloud pattern over Saskatchewan suggested that the more dangerous tropical air mass had moved eastward; i.e. that Thursday's action had been related to a weak cold front. However the usual detailed analysis of the current state of atmospheric stability showed that good potential for severe thunderstorms remained.

The computer models looked reasonable in pushing a cooling upper trough into southern Alberta late in the day. This development would mean that the high level jetstream which started the day over eastern BC would shift into a south-north core over central Alberta by evening.

At the 10:15 AM forecast team consultation, the forecast of thunderstorms was confirmed for

most regions, with a large area of severe thunderstorm potential from the southeastern Peace River district to Medicine Hat, including Edmonton, Red Deer and Calgary.

By 11:15 AM, beeps from the lightning detection unit confirmed that thundershowers had formed over the southern Rockies. A Severe Weather Watch

was issued for the Calgary and Red Deer regions.

As the lightning developed northward, and weather radar and satellite imagery confirmed cumulonimbus development oriented NNW-SSE over the foothills north of Sundre, confidence rose that the severe thunderstorms forecast earlier were likely to materialize.

Though low level wind flows showed an increasing southerly flow, the radar showed motion of the cells from a southwesterly direction at the surprisingly high speed of 60 to 70 km/h. That would bring them near Edmonton.

By 1:40 PM as the radar echoes showed tops approaching 10 km and sustained echo strength at the second highest value, the weather watch was extended to Edmonton and adjoining regions.

continued on pg. 4



Photo: Rob den Hartigh

Photo of huge funnel cloud taken from the roof of the Edmonton building that houses AES Regional Weather Centre.

**Look out for special on
Calgary
Winter Olympics
in March issue**

AES, Indian Affairs Sign Major Training-on-the-Job Accord

ADMA Howard Ferguson and Don Allen, assistant deputy minister, Economic Development, Department of Indian and Northern Development (DIAND) signed a Memorandum of Agreement (MOA) in Ottawa on August 24.

It will be the first Training-on-the-job national agreement for either Environment Canada or for DIAND. The end result will be the hiring by AES of approximately 12 native meteorological technicians in all the AES Regions.

Because of the Agreement, AES will increase the number of natives employed in the Service as Weather Observers by the end of the program. Meanwhile DIAND will further its objectives to improve the employment and earning potential of Indian and Inuit workers.

The project is divided into five phases. Phase I, now completed, involves the selection of candidates by AES regional recruiting officers from a DIAND inventory. The target was to choose 16 recruits from the various regions.

If more than 12 successfully completed the training, extra jobs would be opened up for them. Things the recruiters looked for included language ability, successful completion of secondary school with good marks in mathematics and physics,

mobility and completion of the meteorological technician recruitment aptitude test.

Phase II, now underway involves sending all recruits to a weather office or weather station near their home. Their duties will be in support of day-to-day operations, under AES staff supervision. Recruits will try to familiarize themselves with procedures and assist in weather observing duties. The phase ends with an assessment of the candidates in the area of personal suitability.



Don Allen ADM, Indian Affairs and Northern Development and Howard Ferguson ADM, AES sign memorandum of agreement

Phase III (November 20, 1987 - February 19, 1988) will allow those who pass the suitability tests to take the Surface Weather Observing and Maintenance (SWOM) course at the Transport Canada Training Institute (TCTI) in Cornwall, Ontario.

Phase IV (February 22 - April 1, 1988) begins when successful SWOM graduates return home for a further assignment with a view to preparing them for additional TCTI training and assessing their qualifications for full-time AES employment. Duties will include participation in station weather watch programs, performance of unsupervised surface weather observations, maintaining weather displays or servicing meteorological instruments.

Phase V (April 4 - June 17, 1988) begins when trainees, after further assessment, take the Meteorological Technicians Qualification Course at TCTI. Upon reaching this stage, trainees assume AES training status.

Brenda Smith, from the office of the director general, Weather Services Directorate and occupying the position of National Program liaison officer of the Training-on-the-job program, told Zephyr "It appears that everything is on target. The recruits are now undergoing their initial training in the Regions."

Nurse Maudrie Retires

It wasn't your usual retirement gathering.

When Maudrie Crichlow, Public Health Nurse at AES Downsview for the past five years sat down with a "few friends" for tea in the Central Services Directorate boardroom one afternoon this summer, people from all parts of the building crowded in to say farewell to a very popular nurse.

Joe Boll, director of Finance and Administrative Services gave official thanks to Maudrie from AES and presented her with a gift. But there were dozens of unofficial well-wishers, and the tea was quite a sumptuous spread complete with retirement cake. Maudrie was born and educated in Trinidad. Upon graduating LCFAS a Registered Nurse she spent the next eight years nursing at Trinidadian Hospitals. Then in 1954 she emigrated to England. There she trained to become a British Registered Nurse and subsequently spent several years nursing in London hospitals.

In 1969 Maudrie emigrated once more — this time to Canada. After studying to become a Canadian Registered Nurse, she nursed at North York General Hospital and in 1971 joined Health and Welfare Canada. Her first assignment was to Baffin Island N.W.T.

Returning to Toronto after two years Ms. Crichlow was assigned to the Post Office Department, to the Health and Welfare Regional Office, to the Toronto Taxation Office and to Government Services at a large federal building in North York. She came to AES in 1982.

At the ceremony Maudrie told her audience that she really found AES Downsview to be her home and all the people there like her family. "I regret I came here so late in my career", she concluded.

AES at Global Ozone Conference

On September 16, 24 nations signed a landmark agreement to protect the ozone layer. Environment Canada was proud to play a key role in both the development and the final signing of this historic accord. In the first agreement of its kind, participating nations pledged to reduce industrial chemicals which are threatening the earth's ozone layer. This fragile layer of gases in the upper atmosphere shields us from the damaging effects of the sun's ultra-violet rays, including skin cancer and crop loss.

The agreement was signed in Montreal at a diplomatic conference hosted by Environment Canada under the auspices of the United Nations Environment Program. Environment minister Tom McMillan signed the accord for Canada. Dr. Alex

Chisholm, of AES Research Branch in Downsview, was a key figure on the Canadian delegation, providing scientific expertise on the ozone layer. For over five years, Dr. Chisholm, together with Vic Buxton of Conservation and Protection and John Allen of External Affairs, made up a Canadian team that played a vital role in the lengthy international negotiations that led to the development of the final agreement.

The conference was a grand success, attended by more than 200 delegates from 62 countries and over 100 members of the media. AES participants included Dr. Wayne Evans, Dr. Jim Kerr and Lewis Poulin, all of Research Branch in Downsview. They staffed a display of AES high-tech instruments and were kept busy informing the world about our ozone research.



Maudrie Crichlow cuts her retirement cake

ZEPHYR

ZEPHYR is a staff magazine for employees of the Atmospheric Environment Service, Environment Canada, produced by the Communications Directorate of Environment Canada.

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Marine Weather Services in Atlantic Region

AES Atlantic region includes all or a portion of five provinces, has nearly 20,000 kilometres of coastline, experiences some of the stormiest weather in the Western Hemisphere and plays host to the fishing fleets of several nations.

Canada's other major commercial coastline is the British Columbia shore, shorter in length than its eastern counterpart and in many ways less convoluted; for example it only covers one province, has an overall length of perhaps 2,000 kilometres and has no ice problems.

Both Atlantic and Pacific regions are aware of the importance of good, accurate marine weather forecasting. Both regions have experienced their share of weather related marine accidents from the Ocean Ranger disaster off the coast of Newfoundland in 1983 to numerous fishing boat accidents in the Pacific. But because of the LeBlond report it is Pacific region that has so far received most of the resources and person years to enhance its marine weather services.

For the staff of the Maritimes and Newfoundland Weather Centres this is worrying. Currently there are no specialist marine weather personnel at the two Weather Centres. But when you are number two you try harder!



Jim Abraham, left, and Peter Bowyer pore over maps at a makeshift marine weather desk at the Atlantic Region Weather Centre

Now, says Maritimes Weather Centre supervisor Jim Abraham, the Atlantic Region is all set to branch out in several directions in order to gain a greater understanding of sea and coastal weather and to be able to forecast it more accurately.

For example, the Maritimes Weather Centre has been designated as Canada's Hurricane Centre. Incorporating the essentials of the U.S. Hurricane Centre in Florida, the Centre will pass on critical information on tropical storms to the other regions of Eastern Canada.

Also the Maritimes and Newfoundland Weather Centres are endeavouring to establish, some time this winter, specialized marine weather desks during daytime hours. At the moment, the prognostic personnel alternate with the public forecast staff to take on marine forecasting duties and produce four times a day marine forecasts for an enormous area — from the east Labrador Sea near Greenland to George's Bank about 100 km east of Cape Cod. In many ways adds Abraham, "Manning the new desks will be an adventure. We are prepared to initiate this project as soon as possible because we



Photo: Gordon Black

If peaceful scenes like this, taken at Port Dufferin, N.S., were the norm there would be no need for marine weather services in the Atlantic Region.

know it is important and we will expand the hours of coverage as resources are made available to do so."

Two other events are adding to Atlantic region's lustre as a marine weather bastion. Several of the sessions at the workshop on operational meteorology held October 14-16 in Halifax, N.S. highlighted marine weather. For example, T. Sutherland of the Ontario Weather Centre spoke on storm surges on Lake Erie and the use of the Weather Centre's storm surge model. F. Saunders, renowned professor emeritus at the Massachusetts Institute of Technology (MIT) introduced the topic of forecasting explosive cyclogenesis and J. Pearce of the Maritimes Weather Centre covered the subject as it applies to the East Coast. E. J. Oja of AES Pacific Weather Centre described the West Coast marine radio user contact program.

All in all the workshop was a first for the Atlantic region and according to Abraham a fitting start to a new era in marine weather for the region.

The final landmark in the Atlantic region's marine weather progress is the development by forecaster Al MacAfee of COMAR, a computer program that has the capability of turning alphanumeric symbols typed in by the operator into everyday language. This gives the forecaster more time to assess the marine weather situation — time that would otherwise be spent writing the forecast out in full.

Abraham says that the Maritimes Weather Centre is the first in Canada to have such a coded transfer system and it is significant that the breakthrough has come in the area of marine weather.

Commenting on marine meteorology in the Atlantic region, Paul Galbraith OIC Maritimes Weather Centre, stressed the importance of the Canadian Atlantic Storm Project (CASP) held south of Nova Scotia last year. "We benefited from the experimental forecasts made by AES scientists. We were also able to supply the CASP scientists with the storm predictions they needed to carry out their experiments." Paul added that the area south of Nova Scotia is ideal for mesoscale storm projects and is a good place to monitor "explosive deepeners". For this reason, roughly the same area has been chosen for another major Atlantic storm project — ERICA, scheduled for December 1988 and in which the U.S. would play the lead role. Canada and AES in particular would lend support with weather forecasts, aircraft and high technology meteorological equipment.

Phil Merilees Leaves AES for Director's Post at NCAR

Dr. Philip Merilees who for the past three years has held the position of director general, Atmospheric Research Directorate, at AES Downsview Headquarters, has resigned to become director of the Mesoscale and Microscale Meteorology Division, National Center for Atmospheric Research, Boulder, Colorado.

Dr. Merilees joined AES in 1977 as chief scientist for the Canadian Climate Centre. Before that he spent about a decade at McGill University's faculty of meteorology, rising to become chairman of the department in 1976. Earlier he had served two years as executive secretary of the Global Atmospheric Research Program (GARP). He also served on numerous national and international committees and was president of the Canadian Meteorological Society in 1974-75.

Dr. Merilees obtained a B.Sc. in Physics from Sir George Williams University, Montreal in 1960, a M.Sc. in Physics from Carleton University (Ottawa) and a Ph.D. in Meteorology from McGill in 1966.

A farewell reception was held for Dr. Merilees at AES Downsview on September 2. Jim Young, director of Air Quality Research acted as master of ceremonies. Both he and ADMA Howard Ferguson gave farewell speeches, summing up Dr. Merilees career.

About 80 people attended the reception from many divisions of AES as well as some former employees. Prominent among these was Barney Boville, former director of the Canadian Climate Centre.



Dr. Phil Merilees clears his office drawer on his last day at AES.

Summing up the expansion of marine weather services in the Atlantic region, AES regional director Dr. Des O'Neill said "We are committed to providing the best possible weather warning and forecast services to fishermen and other mariners operating off our coasts. Obtaining additional resources to complete the initiatives which have been undertaken is the number one priority of AES managers."

Tornado — continued

By 2:45 PM acceleration to 80 km/h and tops rising to 12 km were considered sufficient cause to refine the watch to a Severe Thunderstorm Warning for Edmonton city and the counties to the south and west.

Within minutes a citizen near Leduc reported seeing an apparent rope-like tornado touch down for 10 seconds and disappear. Considering the forecast severe instability and proximity to major population area, this prompted an immediate Weatheradio Alert for the tornado warning which was composed for hardcopy transmission at 3:07 PM. That no sooner done than off-duty briefer, Pat Kyle, reported a tornado on the extreme southeast of the city. While this was relayed by Weatheradio the first tornado warning update was issued about 3:30 pm.

By this time severe weather assistant Pat McCarthy, and others, were rushing back and forth to the roof of our office building, relaying visual reports of the tornado's size and direction. Like most other citizens we were mesmerized by this phenomenon and only reluctantly took cover in the basement as all power failed and the tornado passed about 2 km east of our location. Before doing so, we had been able to reach Prairie Weather Center in Winnipeg by phone to handover forecast responsibility to them.

We were back again within a half hour and, with emergency power, resumed forecast responsibility and issued further updates, maintaining tornado warning status until 7:00 pm as an equally severe thunderstorm complex approached and passed over the central and northern parts of the city. Wind gusts over 110 km/h, rain and more large hail added to the damage in and near the city.

By 8 PM all danger was over and warnings and watches were ended or running down. The cold front had indeed swept through, with a vengeance! By morning a cold intermittent rain settled in on the survivors and disaster response teams working their way through the wreckage.

Storm effects:

Destruction in the narrow swath swept by the tornado over the eastern edge of Edmonton was literally incredible for a city that had never experienced significant tornado damage before. During its one hour lifespan it skipped along a path 40 km long and varying in width from 100 to 1000m. Heavy trucks and empty rail cars were reported completely airborne. Mobile homes, houses, and industrial sheds and plants were totally destroyed. Hailstones the size of misshapen softballs penetrated some roofs like cannonballs.

After the survey, this storm was assigned a level 4 on the five point Fujita scale, a value rarely exceeded in TORNADO ALLEY of the mid-western US. In the past 97 years there have been only seven other documented tornado incidents in Edmonton and these had caused negligible damage.

Twenty seven deaths were recorded with permanent injury to at least one survivor. Damage was estimated at 250 million dollars including outright destruction and property damage, men and material costs for rescue and repair, and social assistance costs for individuals and business victims. The other severe thunderstorms that day contributed more hail, wind, and rain related losses to the total bill.

Basically the regular forecasts and watch-warning program worked well. The few radio stations with Weatheradio reacted fastest but mid-afternoon of the Friday preceding a long weekend is a poor time to reach listeners.

The heaviest workload came after the event. Supervisors up to the regional director spent the weekend and much of the next ten days answering a flood of media enquiries. With no previous experience some local commentators did not comprehend the virtual impossibility of predicting

the initiation of an individual tornado. We were pleasantly surprised though by many positive comments that began to get publicized from other meteorologists in Canada and the United States. This attention also provided the best demonstration that Weatheradio is by far the best way of disseminating tornado warnings and updates for the major urban centres which it serves. Those commercial radio stations who monitor Weatheradio were clearly in the forefront with the warnings and updates. Sales to the other broadcast media and local emergency response centres should escalate.



Photo: Lub Wojtow

The photo shows severe damage in an Edmonton industrial district right after the tornado hit.

Tom Taylor Tornado Hero

One of the heroes of the Edmonton tornado was Tom Taylor, a pharmacist from Leduc, Alberta about 24 km southeast of the afflicted city. Mr. Taylor had just come in from feeding his black retrievers in the kennel outside when he saw thick black rain clouds over his house. For fifteen seconds from the loft of his house which stands on an archeological site high on a hill, he saw a low hanging cloud to the southwest with a "snake-like" funnel pointing towards the ground. At the same time high winds were kicking up debris. Taylor, trained to be observant in his job (he sometimes files narcotics reports for the police), picked up the phone and called the Alberta Weather Centre informing them "things are pretty hectic right now". He told them that the cloud's funnel had just hit the ground. The time was approximately 2:55 pm. The Weather Centre, which had been expecting severe weather, immediately put out a tornado warning. Half an hour later, the full fury of the tornado pounded one of Edmonton's principal industrial districts.

Mr. Taylor spent most of his time in

the loft. He didn't have time to head for the basement. But if he had to do it all over again he would have used the below ground extension phone. His wife and children were in Edmonton. They felt the full force of the tornado. Little did they know that Mr. Taylor had been the very first person to spot the tornado and report it promptly to the Weather Centre.

Naturally AES staff were delighted with Mr. Taylor's prompt action. Says AES Western Region director Brian O'Donnell "It was on the basis of Mr. Taylor's report that the tornado warning was issued for Edmonton. His quick action resulted in more warning time for the citizens of the city." Mr. Taylor has now agreed to become a volunteer under AES's severe weather watch program.

Taylor says he has been interested in weather since he was a child. He has a close friend who works with the Alberta Hail Program. He listens to weather forecasts at least three times a day and has a Weatheradio Canada receiver. "I'm a country person. Call me a farmer with a weather eye if you wish".

Two Korean Officials Visit AES

This summer two Korean meteorological officials made separate visits to AES, both to the Downsview Headquarters and to some regional installations.

First came Dr. Jong-hon Bong, director general, Meteorological Research Institute of the Korean Meteorological Service (KMS). Between



ADM Howard Ferguson is seen greeting Korean visitors Dr. Jong-hon Bong and Mrs. Aesook Suh during their tours of AES Downsview Headquarters.

June 25 and 29 he toured several directorates at AES Downsview, visited the King City Weather Radar and toured highlights of AES Pacific Region.

While visiting AES Dr. Bong expressed a strong interest in AES systems developments achieved in satellite receiving, weather radar and



radiometry. He used the occasion to explore the possibility of purchasing satellite observing systems developed in Canada. He also proposed the signing of a joint Korean-Canadian Memorandum of Understanding which would include exchange of visits, consultations on satellite systems, training of Korean meteorologists and joint research in atmospheric sciences. Lastly Dr. Bong invited Mr. Ferguson and an AES duty meteorologist to visit the Seoul Olympic Games in 1988.

The second Korean visitor was Mrs. Aesook Suh, research meteorologist, Satellite Meteorology, KMS who came to Canada to familiarize herself with satellite receiving and analysis systems here.

Her itinerary included a visit to Pacific Weather Centre, to the Downsview Headquarters building, especially to the satellite receiving facilities and to the Hydrometeorology Division, to the Ice Centre in Ottawa and to the Canadian Meteorological Centre. Mrs. Suh informed AES that KMS was engaged in a major development of satellite receiving systems. She also said that KMS will shortly purchase a CRAY supercomputer.

AES to Install New, Safer Towers

Wind towers are a key part of an observational weather network. In keeping with this, AES possesses nearly 600 wind towers. Over 300 of these are 10 metres tall, and the remainder are either taller structures up to 16 metres, or shorter ones mounted on lighthouses. All seemed to be working smoothly until about three years ago when Labour Canada carried out inspections and reported that these AES towers did not conform to applicable safety codes for climbing towers.

After considering the question, AES management came up with some solutions. First they would train staff to use safety equipment when climbing existing towers. Then they would order a complete new complement of towers containing new safety devices and other innovations to make the work of observers, technicians and other AES tower users easier and more convenient. The replacement structures would meet the safety code,

or would eliminate the need to climb towers to perform maintenance on the wind equipment mounted on the top. All inspectors have been trained in the use of safety equipment which will break the fall of anyone who falls while on the tower, and they are familiar with ways of rescuing people who have fallen and are suspended by a fall arrest system.

Bill Crowley of AES Implementation Division and a member of the AES Safety committee, says that "AES has an excellent safety record in climbing towers but that if an accident occurred on a tower which does not conform to the safety standards, it could be a very serious accident."

Part of the AES upgrading program will entail replacement of all existing towers by a variety of other towers. Existing equipment will be replaced by towers which permit the wind equipment to be

lowered to the ground for servicing and thus eliminate the need to climb towers.

Two people are currently required if a tower is climbed, because someone is needed to rescue the climber if he falls and is suspended by a fall arrest system. By eliminating the need to climb, only one person is required.

New towers are being installed in the next three year throughout AES. Meanwhile all tower users in AES regions have been given a day-long safety course in connection with the existing equipment.



AES staff test new safety harness on standard instrument tower



New bending tower allows instrument to be lowered to the ground

How Knowledgeable are you about DOE?

Besides being members of AES most Zephyr readers are also part of Environment Canada. Not all AES staff, however, are equally well informed about the department they work for or the major environmental connections that this link entails. With Environment Canada assuming a clearer corporate identity these days, the time seems ripe to test your skill with a quiz. When you have finished, please look up the answers on page 8 and see how you rate as a member of the DOE team.

Test yourself with this do-it-yourself quiz. Answers and score on page

- 1) When was Environment Canada set up?
a) 1914 b) 1971 c) 1981
- 2) Approximately how many employees does Environment Canada have?
a) 4,000 b) 10,000 c) 92,000
- 3) How many national (conservation) parks are there in the Environment Canada system?
a) 14 b) 26 c) 34
- 4) How many countries signed a Global agreement in Montreal to reduce industrial chemicals that are threatening the ozone layer?
a) 15 b) 24 c) 40
- 5) Which country was the first to ratify the Vienna Convention for the protection of the ozone layer in June 1986?
a) Sweden b) United States c) Canada
- 6) What is the value of the 1987 Wildlife Habitat Conservation stamp?
a) \$0.36 b) \$2.00 c) \$6.50
- 7) How many people worked in various locations in 1985-86 as part of the Centennial Parks Volunteer program?
a) 5,000 b) 10,000 c) 25,000
- 8) Under a revamped departmental reorganization last year a new service emerged:
a) Conservation and Protection b) Lands and Inland Waters c) Environmental Quality
- 9) The federal government undertook to pay the British Columbia government the following sum to save South Morseby National Park:
a) \$35 million b) \$106 million c) \$620 million
- 10) In March 1986, the Environment minister announced that lead would be eliminated from gasoline by:
a) 1988 b) 1992 c) 2000
- 11) Besides the Department of the Environment Act, how many acts are administered by Environment Canada?
a) 6 b) 11 c) 15
- 12) DOE's Environment Week is usually held during which month of the year?
a) March b) June c) October
- 13) The new Environmental Protection Act lists all chemicals in use in Canada up to December 1986. They number:
a) 9,500 b) 30,000 c) 124,000
- 14) What does PCB stand for?
a) Precalcinated Bicarbonates b) Phosphorescent Chemical Base c) Polychlorinated Biphenyls
- 15) Which is Canada's largest national park?
a) Banff b) Northern Ellesmere Island c) Wood Buffalo

The Environment, at the Heart of Energy Research

By Manon Cornellier

When Third World countries plan their energy future, they need to think hard about the environment, says *Energy Research*, a study published recently by the International Development Research Centre (IDRC) and United Nations University.

The authors, eleven researchers with the IDRC/UNU Energy Research Group, argue that developing countries must give as much priority to the environment as to social, economic and political factors in planning their energy needs.

For the Third World, they note, energy development is a vital part of overall development, energy problems go far beyond any oil crisis, and only a comprehensive approach makes sense.

Energy Research synthesizes more than 100 studies (to be published separately), presents current knowledge in the field, analyzes why research strategies succeed or fail, and selects the best of them.

Three integrating principles are proposed. Energy research:

- must be linked to research on the economy and society as a whole;
- must look at demand as well as sources; and
- must consider conservation equally important as production.

The researchers look at three major environmental problems — deforestation/desertification, acid rain, and the greenhouse effect — and call for more in-depth studies to confirm the link with energy sources.

New energy sources are important, say the authors, but they stress making better use of existing resources and finding ways to improve or replace them.

One promising path for the developing countries is undoubtedly research into energy conservation through improvements to existing, or even imported equipment.

A slight increase in the efficiency of, for example, boilers and engines can cut their consumption significantly. Using current forms of energy more frugally is often far cheaper than developing new supply sources.

But the climate must favor research, and encourage the training of researchers, information flow, independence, adequate infrastructure, relevant masterplans and appropriate funding.

The developing countries, prescribes the report, should focus on two areas: resources sensitive to market forces, and resources that are costly to use. From natural gas, through oil, solar energy and various other sources, to biomass, the possibilities are many.

Article published in Development.

November 2, 1978: A 5-day rainfall ended with amounts totalling 300 to 400 mm and producing serious flooding along the north BC coast. At Terrace mudslides broke the only natural gas line serving the area and destroyed valuable spawning grounds; residents were evacuated by boat.

AES Scientists Win Major Achievement Awards

Robert Vet, a quality assurance scientist with AES's Canadian Air and Precipitation Monitoring Network (CAPMoN) is this year's winner of the Jim Bruce Achievement Award.

At a special ceremony, held July 14, in the AES Downsview Auditorium, former ADMA Jim Bruce, now serving as director of Technical Co-operation of the World Meteorological Organization in Geneva, presented the Jim Bruce award personally to Mr. Vet.

Mr. Bruce praised Bob Vet for his outstanding contributions in the field of air pollution meteorology enabling him to help bridge the gap between atmospheric physics and chemistry in work culminating with the development of a tall stack plume dispersion model.

Mr. Bruce also praised Bob Vet for his work as consulting scientist with the Ontario Ministry of the Environment and for his activities at Concorde Scientific Corporation where he carried out wet and dry deposition studies in the Sudbury area.

Lastly Mr. Vet was lauded for representing AES, both nationally and internationally, helping to enhance global programs and contribute to Canadian efforts in negotiating transboundary air pollution agreements.

The Jim Bruce Achievement Award is given in recognition of outstanding contributions to AES



Jim Bruce, left, poses with Robert Vet soon after the latter received his J.P. Bruce Award for outstanding services to AES

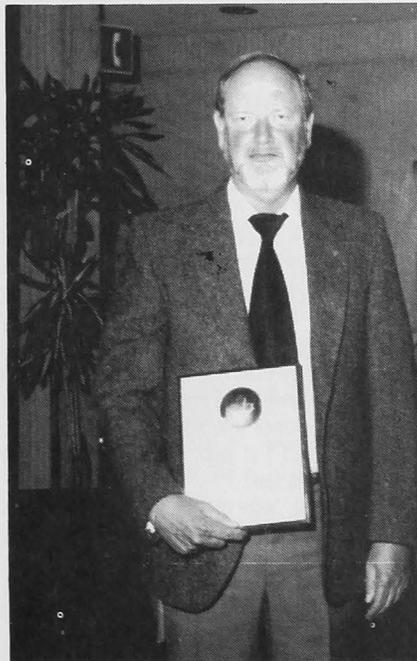
and its objectives. Bob Vet is only the second person to receive the Bruce Award; Jim Bruce was the first (in 1986).

On the same occasion Bob Vet was also the recipient of an AES Merit Award. In this case the presentation was made by ADMA Howard Ferguson.

Referring to Mr. Vet's work with CAPMoN, Mr. Ferguson said, "His efforts have resulted in a state-of-the-art monitoring network equal to or better than any other in the world . . . Mr. Vet is acting as the Canadian expert advisor to a number of other international networks".

The other Merit Award recipient was John O'Reilly who received his prize in recognition of his successful establishment of Environment Canada's Great Lakes Water Level Forecast Centre and the development and implementation of the high water level forecast program.

Mr. Ferguson added that John's efforts not only led to a technical success, they also resulted in services that regularly contribute to the safety and well being of a substantial number of Ontario residents. "During the early period" concluded ADMA, "John was the forecaster, the program developer, the researcher and the trainer — a Jack of all trades — and evidently a master of them all too".



John O'Reilly receives an AES Merit Award at the same ceremony

Satellite Data Lab Moves in With Computer



Alex Aldunate, left, Lynda Stirling and Dr. Don McKay attend transfer ceremony of satellite data equipment to the AES computer section.

All the weather satellite receiving equipment in the AES Downsview Building has been transferred from the third floor tracking station to the AS-9 in-house computer one floor above.

The object, according to Lynda Stirling, manager of computer operations for AES Downsview, is to gather all computer/communications equipment in one spot.

In the past the Aerospace Meteorology Division (ARMA) at Downsview has had both an operational and a research wing. Now it is purely a research section.

Ms. Stirling explains that the move will have definite advantages for weather satellite communications across the country. For example it will strengthen data links for weather modelling in connection with the CRAY computer at the Canadian Meteorological Centre (CMC) in Dorval, Quebec. Communications links between Downsview and the satellite tracking stations at Edmonton and Vancouver as well as with the new tracking station at the CMC will be improved.

Many AES staff in the building say they are sad to see the satellite operations lab go, but other employees regard the move as a sign of technological progress.

November 3, 1985: Remnants from Hurricane Juan slowly moved up the Mississauga Valley and reached Ontario. The storm produced many 24-hr precipitation records. Trenton recorded 60 mm of rain.

November 6, 1969: A freezing rainstorm lasting one week did significant damage to hydro lines between Québec and the new Manicouagan River power generator; 30 towers were downed.

November 7, 1969: The storm that began affecting Québec on the 6th saturated the Maritimes from the 7th until the 12th. For 144 hr, rain fell over NS, and PEI; Ingonish Beach was drenched in 364 mm of rain.

Corrections

An announcement about the appointment of two new AES regional directors appearing in the July-August Zephyr should have read: "Brian O'Donnell and Patrick Pender have been appointed directors of AES Western and Pacific regions respectively." Zephyr regrets any confusion the original announcement may have caused.

In an article on Canada Fitness Week in the July-August Zephyr, Terry O'Connor's name should have appeared on the list of people comprising the Committee.



Deputy minister G.A. Sainte-Marie, middle row, centre attended an Atmospheric Management Committee meeting at AES Downsview when she visited there in June. A number of important Atmospheric Environment issues were discussed. Seen in the picture, left to right, front row; Brenda O'Connor, director, Communications Directorate, Gordon Shimizu, DG, Central Services Directorate, J. G. Côté Inter-Governmental Affairs, second row; Phil Aber, regional director, AES Ontario Region, Howard Ferguson ADMA, Ms. Sainte-Marie, Pierre Martel, DG, Policy, Planning & Assessment, Avo Lepp, director, Human Resources Branch, back row; Jim McCulloch, DG, Canadian Climate Centre, Lloyd Berntsen, director, Training Branch, Joe Boll, director, Finance and Administration Branch, Brian O'Donnell, regional director, AES Western Region, Phil Merilees, DG, Atmospheric Research Directorate.

DOE Quiz Answers

1 b, 2 b, 3 c, 4 b, 5 c, 6 c, 7 a, 8 a, 9 b, 10 b, 11 c, 12 b, 13 b, 14 c, 15 c

Score:

14 - 15 right:

11 - 13 right:

8 - 10 right:

5 - 7 right:

2 - 4 right:

0 - 1 right:

you could represent the department anywhere very well informed about DOE

you know most of the basics your knowledge of DOE needs a little strengthening

you may be thinking too much in terms of AES you are completely out of touch with the DOE

AES Helps Newspaper Win International Award

Last June Fraser Hunter, officer-in-charge, Regina Weather Office received a phone call from George Crawford, manager, Community Relations, Regina Leader Post telling him that a recent series of public service announcements (PSAs) on weather which they had worked on together during the previous six months had won the newspaper an international award.

In addition George announced that the International Newspaper Promotion Association had selected the weather PSA for publication in their promotional trade magazine.

The winning PSA headed 'You don't have to like winter to live here', was run in the newspaper's second section on December 20, 1986. Mr. Crawford later presented framed copies of the announcement to AES Regina.



Photo: courtesy, Regina Leader Post

George Crawford of the Regina Leader Post, left, and Fraser Hunter, OIC Regina Weather Office display weather announcement.

Year, and I was presented with a silver tray as the 1978 Citizen.

We used our home, nearby motels, and campgrounds to arrange a Buckler family reunion in 1974, so successful that we repeated a few years later. Then we spend two years arranging an Archibald reunion for Phyllis' side of the family. This was attended by over 60 relatives. We had to hire the Town Hall for the banquet.

We both bowl five-pins, Phyllis twice a week and I, once. I curled steadily, as many as 80 games a winter, until two years ago. I quit while still at my peak form and took up swimming. I now swim a mile at a time, twice weekly, sometimes three times a week.

For 1981 we sold our Peachland home and moved into Kelowna. This was partly because I was tired of looking after the ranch, and partly because we were tired of driving into Kelowna to bowl, curl, attend church, hospital, etc. We purchased a condo unit, actually 3-bedroom penthouse with a wonderful view. I have been chairman of the Strata Council here for four years now. This was a learning experience for me and eventually I conducted six programs on Condominium Living on our local cable channel.

So you see retirement has been a busy and rewarding period in my life. Let me emphasize that retirement is a partnership affair. The saying that "a retiree's wife gets twice as much husband for half as much pay" is at least partly true. There have been no financial problems. We have had far more disposable income than at any time previous to retirement.

Syd Buckler is a retired AES meteorologist.

Story of a happy retirement

By Syd Buckler

I retired early at 59. Since I had worked for six to eight years in each of Winnipeg, Edmonton, Whitehorse, Toronto and Regina, my wife and I had no strong opinions about "home". We looked at The Island, cursed the ferry service, and settled in the Okanagan valley. The best climate in Canada is found here, between Penticton and Kelowna, and I can attest to this widely held opinion.

We bought a home on the beach-front in Peachland, about halfway between Kelowna and Penticton. It had four bedrooms because we expected (and had) lots of company. The lot had 13 fruit trees which to a Prairie boy represented Heaven. In a while I had my hands full, learning that although peaches allowed to ripen on the tree were next to nectar and ambrosia, pears had to be picked when they were hard as rocks. I lost my first pear harvest learning this fact. It also took a couple of years learning how to control Codling Moths and Peach Leaf Curl. We averaged 350 lbs. of pears and 220 lbs. of peaches in the eight years we lived there. We also had cherry, apple and apricot trees. I guess this is why most of our visitors came in August and early September.

My wife was and is an avid fisher-person. I was lukewarm. When we retired we set aside \$4,000 for fishing outfit. We bought a 16 foot Trihull. I priced a new outfit last summer just for curiosity and found it cost over \$11,000 in 1986 dollars.

The Marina operator in Peachland told us we used our boat more than any other owner in the marina. I kept a log of our success and in 13 years we have boated 2497 Kokanee. Kokanee are landlocked salmon and generally grow to 9 to 13 inches. We have also caught Rainbow Trout and Ling Cod, but pan-fried Kokanee beats trout anytime. I did catch a 24-inch Kokanee one summer and it was the largest reported that year. It won me an \$80.00 fishing rod and reel!

I got into "wine making". I made wine from peaches, cherries and grapes, about 20 gallons a year. One time when Rudy and Trudy Triedl were visiting, they praised my dry red so fulsomely that I was encouraged to enter samples in the Peachland Fall Fair. I won two ribbons, a second for dry white and a third for dry red. Then I ventured to the Summerland Fair. There my red came third again and my 1980 Riesling was judged "Best in the Show".

In moving from one city to another I had never put down roots enough to accept any civic responsibility (except on curling club executive, of course). But in Peachland I went to the town council and offered my services. I ended up as Peachland Observer at the Okanagan Basin Water Board, on the Regional Planning Advisory Committee, and the Airport Advisory Committee. Lastly I chaired a committee to rebuild our curling rink, but in 1979 the town council called me to appear at a regular meeting. They had decided to reinstate a previous custom of recognizing a Citizen of the

AES Scientist Draws Drinking Water from Fog in the Andes

We believe that AES research scientist Bob Schemenauer's expedition to northern Chile to conduct experiments in extracting drinking water from high altitude fog to be a unique project in a water-short world. Until now Dr. Schemenauer has received very little publicity for his work and it may interest readers to know that his work site is only about 100km away from the workplace of another key Canadian scientist, Ian Shelton discoverer of the first supernova in 383 years. Making the discovery from a small observatory at Las Campanas, Shelton took advantage of the same clear, dry atmosphere that Schemenauer used for his drinking water experiments.



Bob Schemenauer

On October 25, Dr. Robert S. Schemenauer, a physicist in the Cloud Physics Research Division (ARPP) flew down to Chile to conduct a project that wrings drinking water from fog.

In a world increasingly threatened with water shortages, Bob's project is aimed directly at an economic target — to produce water from fog in sufficient quantities to promote habitation and cultivation in arid locations. Northern Chile is very arid — at Arica, in Chile's farthest north, annual rainfall is 0.7mm, one of the most arid spots on the face of the earth. But northern Chile has lots of fog, and the concept of extracting water from this fog has been around for many years.

The high elevation fogs of northern Chile are called camanchacas. They are created by northern Chile's prevailing weather. Bob explains — "In the northern third of Chile and Peru, the weather is dominated by the Pacific anticyclone throughout the year. This produces a light southerly or southwesterly flow in the lower kilometre of the atmosphere and results in a stratus or stratocumulus cloud that extends a few hundred kilometres out over the ocean." The clouds form and drift in from over the ocean and envelope the coastal mountains. These camanchacas are a potentially rich source of water.

The site selected for Camanchaca Project is an old abandoned iron mine called El Tofo beside a little village 60 km north of the city of La Serena (population 90,000). The El Tofo area is "arid and rocky with a sparse coverage of cacti and shrubs". Rainfall is less than 100 mm a year and so the village must truck its water in. El Tofo is 5 km from the coast and 780 m above sea-level. Experiments have shown that 600-800 m is the best height at which to intercept the camanchaca.

El Tofo is therefore an ideal location to test the economic targets of the Camanchaca Project. It has plenty of fog more or less year round and this fog has the essential quality of being pollution-free. Bob's background in cloud physics, cloud chemistry and in operating the chemistry of High Elevation Fog (CHEF) project in Quebec make him ideally suited to play a major role in this project.

Can the project provide El Tofo's neighbouring village with water from fog more cheaply than it can be trucked in? Can it provide water in an abundance sufficient to irrigate the surrounding

terrain and promote the growth of Chile's rural areas? The villagers, for economic reasons, truck in just enough water to meet their minimum daily requirements.

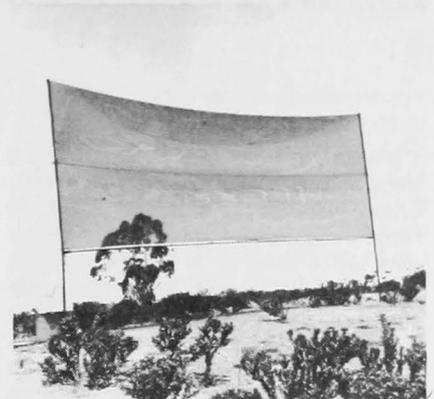
Bob mentions that on the small summit above El Tofo "is an anomalous grouping of eucalyptus trees" planted by the iron miners to provide shade many years ago. The miners kept the trees watered until they were 2 m tall, at which point the trees were able to extract their own water from the surrounding fog. The trees are now 10 m tall — and demonstrate what can be done for the entire terrain if adequately supplied with water.

The technique for collecting water from fog is simple and effective. It consists of nothing more than a broad rectangle of cheap, locally available nylon mesh stretched out between two wooden poles stuck in the ground. A flow of air has a tendency to evade and flow around solid objects. This is why the nylon cloth is a mesh. The interstices in the mesh allow the air to pass through. It leaves the strands of the mesh beaded with tiny drops of water. These merge into each other and form drops heavy enough to trickle down the strands of the mesh into the trough that forms the bottom boundary of the mesh. In a very dense fog, this mesh will drip water at the rate of 10 litres of water per square metre per day.

The Camanchaca Project will set up about 60 of these nylon meshes, each one containing 40 square metres of material. Most will be set up on a small summit between two major peaks.

The water-from-fog concept in Chile has been under study for some time. Dr. Schemenauer's colleagues are Humberto Fuenzalida, University of Chile, and Pilar Cereceda, Pontificia Universidad Católica de Chile. In their joint paper "A Neglected Water Resource: The Camanchaca of South America", they cite references dating back to 1966. A lot of meteorology, climatology, physics and other sciences have provided the practical pre-conditions for the Camanchaca Project.

It is not simply a case of going to El Tofo and setting up those meshes. Relevant meteorology must be studied concurrently. The annual harvest of water must be accurately computed. The engineering of the pipes and reservoirs for the water must be completed — and the costs of all this must be itemized to deliver a substantial estimation



This 40 m² nylon mesh fog water collector is installed on a ridge in northern Chile.

of the viability of the scheme. "A Neglected Water Resource" deals in detail with all aspects of the scheme.

The crew at the El Tofo site will include about 15 people — some of them Chilean university students. Present also will be two AES technicians from ARPP — Mohammed Wasey and Richard Poersch. They have packed up and shipped down some of AES's most advanced cloud physics and atmospheric sounding instruments and will be responsible for much of the on-site instrument operation.

Bob was also centrally involved in arranging the funding of the Camanchaca Project with the International Development Research Centre (IDRC) and acts as a liaison between the Chilean groups and IDRC in Ottawa.

Once the engineering aspects of the Camanchaca Project have been completed, the equipment can be operated and maintained by the villagers themselves.

Optimistically, if the project is a practical success, it will be the paradigm for similar projects world-wide, wherever there is a combination of aridity, mountains and clean fog.

November 15, 1983: A week of heavy rain in SW coastal British Columbia, resulted in Vancouver's water supply turning murky, the scenic highway to Squamish closing due to mud slides and several bridges washing away.

November 17, 1985: Heavy snow fell for most of the week across Labrador. By the 17th, 100 cm of snow had fallen. In a 2-day period Goose Bay exceeded its normal monthly total of 57 cm. Strong winds above 100 km/h disrupted the P.E.I. ferry service.

November 19, 1985: A blizzard swept across southern Manitoba, dumping 20 cm of snow. Winds of 60 km/h piled snow into deep drifts. In many rural areas school buses did not run because of whiteouts. Clean-up costs in Winnipeg alone exceeded \$1.5 M.

ZEPHYR BREEZES

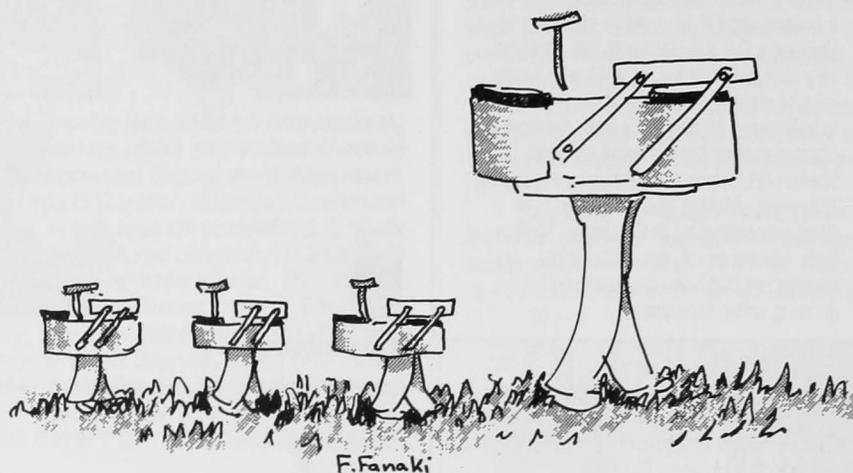
Plans are going full speed ahead to set up a special weather office for the Olympic Winter Games, Calgary 1988. Located at Calgary International Airport in a special building extension, the weather office will be staffed by 14 AES meteorological personnel. After a week's on-site training the olympic weather forecasters will become fully operational with 24 hour a day service during the period of the games, February 13-28. In addition to normal weather information, the office will provide specially tailored data on wind speed, temperature, precipitation (hopefully snow) and above all skiing conditions. The forecasts will be for all of the Olympic corridor from Canada Olympic Park near Calgary to the Canmore Nordic Centre near Banff. In charge of AES olympic weather services is Andre Lachapelle, who was a special forecaster at the 1984 Olympic Games in Los Angeles. The AES olympic coordinator is Bruce Thomson of Edmonton.



Under the watchful eye of Raoul the owl, Joyce Montagnese, Work Experience Coordinator for York Region Board of Education displays the Certificate of Appreciation she has just presented to Lloyd Berntsen, head of AES Training Branch, Downsview.

The award was a way of saying thank you to AES for giving temporary employment to two trainable retardedees. One worked in the Central Services Directorate administration; the other in the Canadian Climate Centre.

Ms. Montagnese said that thanks to their AES work experience, the two students were now working full time in a store. Both had attended integrated schools in York Region close to Metropolitan Toronto.



"A new generation of samplers." (Cartoon taken from the Air Quality Annual Report 1986-87).

There have been non-AES services in the Downsview Headquarters before but these have mostly tied in closely with AES operations. Now for a limited time only, office space has been given over to an environmental organization, so high up in the pecking order, it has little day-to-day contact with AES. The Canadian Council of Resource Ministers (CCREM) has moved from its mid-town Toronto Headquarters. According to executive director Richard Barrens, CCREM deals with a wide range of national and regional environmental issues.

Most recently CCREM has been involved with the National Task Force on Environment and Economy dealing with government policy on such matters as acid rain, forests and fisheries. CCREM also warns that Canada's economy is being put at risk by bad environmental decisions. The report was released at CCREM's annual meeting in Quebec City September 21-24. All provinces are represented on CCREM.

November 21, 1906: A storm packing 100 km/h winds sank a steam barge, The Resolute, off Toronto Island; 6 lives were lost.

November 22, 1984: A vigorous Pacific storm lashed the North Coast with winds in excess of 120 km/h and rainfalls of 100 mm. Terrace received more than 80 mm of rain in a 24-hr period.



Here is some late Environment Week news:

Hydrometeorology Research Division of the Canadian Climate Centre in Saskatoon held two "Laboratory Afternoons" between June 1 and 7. Participants were students in Water Resources Technology. In addition the National Hydrology Research Centre held a Visitors' Day in which AES participated.

Some 500 people attended during the day. The young family in the photo are viewing weather radar. Standing by to explain are Division staff Kristen Darlington (centre) and Don Bauer (right). In addition, Rick Lawford gave a slide presentation on Weather, Climate and Water Resources.

On page 4 in connection with the Edmonton tornado we mentioned the great resourcefulness of Mr. Tom Taylor who was the first to report the deadly funnel cloud and who subsequently enrolled as an AES severe weather volunteer.

Communications Directorate recently asked other AES regions whom they thought were outstanding volunteers in their areas. Two names come to mind. AES Atlantic Region mentioned Huntley Dingwell who is both an AES climate and severe weather observer. (He received a 15 year Achievement Certificate last year and it was noted that he was one of the few volunteers to type their reports). In addition Mr. Dingwell received a special Governor General's medal in 1966 after 30 years voluntary involvement with the New Glasgow fire department in addition to the temperature and precipitation readings he does for AES, he also takes wind readings with his own anemometer. Finally he is a CB radio enthusiast and has interests in woodworking and coin collecting.

AES Pacific Region mentions the volunteer work of Brother Maurus de Klerk, a member of the Seminary of Christ the King located at Westminster Abbey, Mission. AES regional director Pat Pender says that Brother Maurus is responsible for the upkeep of the grounds and has performed daily observing duties regularly since the climate station "Mission West Abbey" opened in October 1962.



Even at this unusual angle — it's easy for most AES people to guess that this is a photo of the weather statue outside the AES Downsview Headquarters building. The picture was taken by Mike Duffy who also took the photo of the launching of the ozone sonde balloon on the front page of the July/August issue.

July 4, 1980: Vancouver A established its all-time November maximum: 18.4° (48 yrs.)

November 5, 1975: The Winnipeg temperature of 23.9° was the highest November reading on record (113 yr).



Seen in the above photo Hans Teunissen, left, DOE Departmental coordinator, Greater Metro Toronto, Deedee Davies, publicity coordinator, Karl Vanek, Special Events coordinator, some of the many AES employees who attended the 1987 Federal/Provincial United Way Campaign Kick-off at Queen's Park on September 25.

A hydrological engineer from Ecuador arrived at AES Downsview last month minus papers, minus money, minus a knowledge of English and without any advance warning of his visit. P.T. Louie of the Hydrometeorological section of the Canadian Climate Centre hastily took over the accommodation and banking arrangements for the visitor and set up a tour of automatic weather stations in the Central Services Directorate part of the building. But it was soon found that the success of the tour depended on the urgent recruitment of a Spanish-English interpreter. These services were provided by a member of the AES Communications Directorate.

After leaving Downsview the hydro engineer left for a visit to Inland Waters in Ottawa. While in the Nation's Capital, he had the full-time services of an External Affairs interpreter.

November 20, 1981: Major storm approached Nova Scotia on the 20th bringing record rainfalls of 58.1 mm (21.4 mm in 1 hour) to Shearwater. A large gain freighter went aground necessitating helicopter rescue of 26 crewmen off Sable Island.



During a visit to the Meteorology Training Centre (MTC), TCTI, Cornwall, on September 2, Howard Ferguson, ADMA took time to recognize two significant achievements.

With the full staff of the MTC as his audience, Mr. Ferguson presented Doug Tesch with a Long Service Medal, recognizing the more than 36 years Doug has spent in forecast operation (with AES and DND) and in Training Branch.

Mr. Ferguson's second presentation was made to Ken Morris representing the staff of the MTC. This presentation was in the form of an AES Achievement Award earned by the staff "for the dedication and initiative displayed in developing a new program of meteorological training." Over the last 18 months Centre staff re-designed and re-developed 80% of the AES technical training program and all of the associated course materials. This was achieved while maintaining the ongoing training program at normal levels.

Shown in the photo are, left to right; Francis Bowkett, chief of Technical Training, Ken Morris, A/superintendent of MTC, Doug Tesch, Howard Ferguson, and Lloyd Berntsen, director of Training Branch.