Session Summary

Arlon Tussing

Presenters in the energy session were in obvious agreement that increasing the use of natural gas, either in Northeast Asia or in North America, offers benefits in economic efficiency, energy security, and environmental quality. This is the case particularly where clean, low-carbon, zero-sulfur methane can displace high-polluting "black fuels" (such as coal, lignite, and heavy fuel oil) as primary energy for electricity generation and for heavy industry.

Alaska's former governor Steve Cowper, Chairman of the Forum's North American Committee, opened the energy session. He addressed the difficulties faced in organizing and financing a pipeline system to move natural gas from Arctic Alaska and Northwestern Canada into markets in the United States and Eastern Canada.

It has become fashionable in recent years to belittle the serious difficulties in selecting a pipeline route (or routes) and design, with the deceptively simplistic slogan, "let the market decide." First, Governor Cowper pointed out, it is likely that current price expectations for natural gas in its destination markets are too low to support the multi-billion dollar investment required for a 3,000 kilometer project on any route—especially if one keeps in mind the past volatility and the future uncertainties that surround prices of the natural-gas commodity. Second, the crucial decisions on market destinations, routing, and pipeline design will not be made by one single-minded profit-maximizing entity in a market uncorrupted by special-interest political pressures. Already, deliberations in both the United States and Canada tend to be focused on the demands of local and sectoral interests regarding potential construction payrolls, or access to intake and delivery points on the pipeline.

The political scramble over these issues threatens to overwhelm the shared interest the two nations have in the total cost and economic viability of the gas-transport system. The present outlook appears to be a host of separate, drawn-out struggles at the two national parliaments, and also before legislatures and administrative agencies in the separate states and provinces, over a venture that is already economically marginal. In light of the normal market uncertainties faced by such a gigantic international effort, Governor Cowper believes that it is

essential that the two national governments—jointly at the highest levels—resolve the framework issues regarding destination markets, routing, and pipeline design for Arctic gas, and in the course of that decision negotiate in advance a mutually acceptable sharing of procurement, construction payrolls, and costs.

The political complications of planning a transcontinental system to move natural gas from Arctic regions of Canada and Alaska into North American markets have obvious counterparts in the consideration of proposals to transport natural gas from Siberia or the Russian Far East through or to Mongolia, China, the Koreas, and Japan on any of several routes. The three speakers who followed Governor Cowper addressed the present situation in which East Asia still depends on clean-burning natural gas for a much smaller share of its primary energy than North America or Europe do, and where almost all of the natural gas that is internationally traded in the region is imported by tankers as LNG, rather than carried by overland pipelines.

Robert Smith of the East-West Center in Honolulu presented a paper, jointly prepared with Fereidun Fesharaki, on impending changes in the East Asian LNG market. Because of demands by lenders for long-term stability of costs and revenues in vertically integrated supply and transport projects, LNG has customarily been sold in large volumes under long-term take-or-pay contracts at fixed or formula prices. The two authors do not foresee a rapid shift of existing East Asian LNG sales away from this pattern to a "commodity" or "spot" pricing basis in the near future. "Spot" prices in this context are prices set in real-time markets for cargoes of a single vessel or less, as in international sales of crude oil and refined petroleum products, or for a term of 30 days or less, as are typical of natural-gas sales at the pipeline hubs of North America.

However, the first and second generations of LNG projects in East Asia are maturing, and their initial capital costs have been mostly amortized. As existing LNG-sales contracts supporting these projects expire, a small but growing share of remaining capacity comes back into the market, open for price renegotiation or as spot supply. Moreover, if the LNG trade in East Asia is to grow over time in competition with flexibly priced petroleum products and onshore pipeline gas, contract terms must shorten and become more flexible, even for new sales. These trends are now visible in the market.

The paper that I presented on behalf of myself and John Tichotsky, and the following presentation by Ken Asakura, deal with the consequences of Japan's lack of a gas-transmission infrastructure and the proposals for a remedy of this situation.

Dr. Asakura spent almost a decade of research and planning at the Mitsubishi Research Institute and at the Japan and Asian Pipeline Development Societies, and Dr. Tichotsky and I reviewed the continuing lag of natural-gas sales in Northeast Asia behind the rest of the world. A quantum expansion of natural-gas consumption in this region will almost certainly involve the construction of large-scale, long-distance international pipelines as well as additional LNG production and transport capacity. However, neither the primary gas resource nor the international pipelines nor the capital to finance them are critical obstacles to the growth of gas use in Northeast Asia. The key bottleneck is *the organization of effective demand*.

By effective demand, we mean an identified body of customers willing and able to pay for the volumes of gas to be produced and transported, connected by a distribution infrastructure in destination markets that is capable of delivering gas to those customers in their homes and factories. The steps necessary to mobilize effective gas demand in Northeast Asia differ profoundly from those in North America and Europe, and between the different economies of the region.

In China, until about 1998 and despite some of the world's worst air-quality conditions, government and industry planners did not begin to recognize natural gas as an acceptable substitute for domestic coal for electrical generation and heavy industry, or as fuel for urban space-heating. Since that time, China's gas consumption and its domestic production have expanded rapidly. This growth has fostered both the development of a domestic gas pipeline system and earnest planning for international pipelines to import gas from Russia and Central Asia. All sectors of China's gas industry nevertheless remain tiny by world standards.

Russia is the world's biggest producer and exporter, and the second-biggest consumer (after the United States), of natural gas. This was already a reality during the Soviet Era, despite America's stubborn opposition to Western investment or credit for the Russian energy industry. However, natural gas facilities and activity in Russia are still almost wholly confined to the western third of the country. This situation reflects both the lack of development in eastern Russian generally. It stems from the chronic neglect by Moscow under both the czars and the Soviets. Eastern Russia—East Siberia and the Russian Far East—have thus far produced only small amounts of natural gas, carried by short pipeline systems for local consumption in the Sakha Republic (Yakutia) and Sakhalin.

Large international joint ventures are currently exploring and developing hydrocarbon deposits on the Sakhalin Shelf, but these efforts are driven mostly by high oil prices and an assured market for crude oil. This would occur in almost

any place in the world that hydrocarbon deposits might be discovered. Despite the fact that the Sakhalin fields are only about 1,000 kilometers from the northern shore of Hokkaido, a specific market for the gas to be produced from those fields beginning in 2002 has yet to be identified in Japan or elsewhere. For the first few years, the natural gas will be liquefied for sale as LNG, probably at spot prices on the global market.

Japan is, nevertheless, the world's second-largest economy, the seventh-largest consumer of natural gas, and by far the largest natural-gas consumer in East Asia. It imports almost two-thirds of the world's total LNG, but Japan's use of gas is nevertheless still very small in relation to its economy, or compared with Europe and America. Japan is most enigmatic as a potential market for additional natural-gas volumes from Sakhalin or anywhere else. Because it lacks a domestic natural-gas pipeline infrastructure, it is practically inaccessible to new supply.

The existing LNG import system leaves most of Japan's industrial and residential areas without access to natural gas, except by means of fragmented city gas companies, most of them very small and inefficient. This results in the existence of the world's highest prices of gaseous fuels delivered to residences for space and water heating, cooking, and the like, and in the world's highest prices for gas delivered to industry and for energy by and large. One reason for this is that Japan imports almost all of its gas supply as LNG at 22 unconnected marine terminals that are mostly established by electric companies adjacent to their own power stations and consume most of these imports.

Thus, even if a high-volume pipeline were built to Japan from Irkutsk, for example, or from Sakhalin, there would be neither a local pipeline network nor an existing industrial or residential market in place to receive the gas. .

The strategy advocated by Dr. Asakura and his colleagues is to build short high-pressure pipeline segments that link adjacent LNG terminals and thereby provide gas supplies at wholesale prices, a small margin above LNG import costs to industrial users, independent power producers [IPPs], and to city gas companies that serve residential, commercial, and public-service customers in the intervening territories. Based on the existing system of LNG import terminals and LNG imports, segments that are linked together into a national network could ultimately serve as intake points for new international gas pipelines to perhaps transport gas from Sakhalin and continental Asia to Wakkanai and Shimonoseki, respectively.

Mark A. Foster, an economic analyst and former public utility commissioner in Alaska, presented recent research conducted on optimal energy technology and organization for small "off-net" communities in Alaska. The findings of these

studies included a number of inferences about conditions in Alaska that are likely to be valid for remote settlements in other high-latitude jurisdictions, such as the Russian North and Far East, Mongolia, and northern China.

Common characteristics tend to include a high dependence on distillate fuel oil for electrical generation, space-heating, and transport fuels, supplemented by motor gasoline and propane. Liquid fuels tend to be delivered seasonally by sea-going and river ships or barges, supplemented sporadically by aircraft. Resulting real costs for fuel tend to be very high and unstable. However, fuel prices faced by households and others differ greatly between communities, and in any event diverge sharply from either marginal or fully allocated costs.

Among the inferences in the study is the following: The most promising and cost-effective measures for reducing cost and harmful environmental impacts, as well as enhancing the quality and reliability of energy delivered to the point of consumption, will most likely consist of incremental improvements to elements of the existing energy system, rather than the substitution of radically different fuel types or technologies.

The critical elements that relate to diesel-generated electricity include the following:

- cost and efficiency of fuel procurement, including sufficient storage capacity to optimize the volume in individual deliveries
- proper condition, maintenance, and operation of prime movers
- utilization of otherwise wasted exhaust heat
- interconnection of neighboring settlements, where appropriate, and control of distribution line losses
- conservation of delivered energy through selection of appropriate end-use appliances together with suitable building design and maintenance.

The Alaskan studies do not generate optimistic inferences about the present viability of unconventional energy technologies for small-scale use at high latitudes. The most promising of unconventional alternatives include imported petroleum liquids, wind turbines, and the production of natural gas from small accumulations. These approaches are subject to demanding thresholds of scale. The minimum entry cost for each technology in areas with physical and capital cost parameters similar to those of remote places in northern and western Alaska are on the order of $1 million per community served. In order even to consider such an investment, there is a required demand base per installation in the order of 1,000 households and their associated community facilities (schools, etc).

The following two issues, raised during the presentations, prompted vigorous discussion from the floor at the end of the session.

First, should long-term take-or-pay contracts remain an indispensable prerequisite for financing major international gas projects?

Second, is there a reasonable chance that North Korea could become a reliable participant, as a sponsor, host, or customer, for an international gas project that might include a pipeline from Sakhalin through Primorye or from East Siberia through North China and crossing North Korea en route to South Korea and possibly Japan?