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dwelling unit is \$3.23 for Clark Howell Homes and \$3.20 for Capitol Homes.

Thus it can be seen why the Housing Authority of the City of Atlanta will include no boiler plant, in plans for any future projects, if district steam is available.

*Mr. Loucks:* Thank you, Mr. Harrison, for those very enlightening data.

*Chairman Dubry:* At luncheon today we mentioned that some of the men had come quite a distance to attend this meeting, because they came from the western states. But, now, I understand, we have two men here from Amsterdam, Holland, so I think they have the record of coming the longest distance to attend this meeting.

Will Mr. Lankester please stand? He represents these gentlemen in New York and is the President of the Holland Colombo Trading Society, Incorporated. I understand they are planning some district heating projects in Holland. (Applause.)

Will Mr. Vennik please stand? He is in the States to buy some pipe for these new projects. (Applause.)

Then we have a third gentleman, Mr. Beuker, who is with the operating company. He is going to give us a description of some of their problems. (Applause.)

. . . Mr. W. Beuker, Jr., Amsterdam, Holland, then read his prepared paper . . .

## DISTRICT HEATING IN THE PLANS FOR THE REBUILDING OF THE NETHERLANDS

W. Beuker, Jr., Amsterdam, Holland

As a representative of the central heating industry of the Netherlands, I feel indeed deeply honored to have this opportunity of addressing this meeting of pioneers in the field of district heating.

We have always considered American industry as the trailblazer in the field of central station heating and nowhere in the world has the science of this special branch of industry been more advanced than in your country. Although I have visited almost all of the district and central heating stations of Europe, I do not hesitate to state that what I have seen in your country is in a class by itself and commands all our respect for the technical achievements and the sound financing.

It will be impossible within the allotted time to discuss all the various technical and financial aspects or the problems of economy of fuel which are entirely different in my country and yours.

Five years of German occupation coupled with the bombing of our cities and villages have created an acute housing shortage and as soon

as materials will be available to start the building of new homes, factories and office buildings, the questions of district and central station heating will have to be solved. Up to the present time the Netherlands is far back in this development; as a matter of fact, there actually is only one town, viz. Utrecht, which has a central heating station. This station came into being because a power station was no longer necessary for the distribution of electric power and so became available as a central heating station. This station is now used for the production and distribution of heat, servicing a great many private houses and public buildings. As a heat carrier, hot water of 160 C (320 F) was chosen, because this way of packaging the heat does away with the necessity of a pumping station for pumping back the condensate.

The central station is owned by the Provincie (about the same as if it were owned by the State in your country). Technical results are very satisfactory, but as the financial results are coupled with the price policies of the sale of electrical current, it is extremely hard to judge these results.

As I said before, this is the only town in the Netherlands with a central station and the other installations are really very minor compared to here: 300 houses from one station or maybe 1000 from another; all small installations. But today we are witnessing a new spirit in the Netherlands, a spirit of going to work and rebuilding and consequently a heat distribution system that will come up to the latest standards is an important item in our program of reconstruction.

We have been working on these plans in the darkest days of the German occupation. While suffering from the presence of the enemy in our midst, suffering from air raids, round-up of slave labor for Germany, hunger and cold, we worked always in the greatest secrecy and in constant danger of being caught by the Germans. You will readily understand that speaking of these plans not only brings to mind the technical side, but also memories of these dark and cruel days of oppression in my country.

It would take up too much time to discuss all these plans, but I would like to mention some of them, which may be of interest and in some of which there are perhaps ideas, both technical and financial, which may be novel even for America.

Since the Netherlands have always been the big providers of vegetables, fruits and meat for a great part of Europe and as the economy will be based on an extensive export of these articles, everything will be done to improve the art of deep-freezing and cooling. It is well known that Amsterdam, our capital, is famous for its canals and is often called the Venice of the North.

One of our plans now calls for the combination of deep-freezing and cooling with the generation and distribution of heat, thereby utilizing the heat contained in the waters of the canals. We have designed a small-scale model installation for further study. If the results are as expected, or maybe better, we will build very large freeze and cooling cellars on a plot which borders on two canals. On top of these cellars a great number of homes or maybe two or three big apartment houses will be erected and the central station which will provide all buildings with heat will also provide the air-conditioning of the cooling cellars. In these cellars the temperature will be  $-20\text{ C}$  ( $-4\text{ F}$ ) at all times and the humidity will be rigidly controlled. The heat released during the cooling process will be stepped up to a higher temperature level by an installation called a heat pump. As far back as 1851, the famous English physicist, Lord Kelvin, published the underlying principles of a heat pump. Lord Kelvin found that if a gas is compressed, the temperature of the gas will rise and this is the principle which is used in the construction of the heat pump. Up to now the heat pump has been used mainly for cooling purposes and although the name heat pump may sound paradoxical for this purpose, essentially the name is right, because cooling is done by pumping heat out of the room to be cooled. In our plan mentioned before the heat is pumped not only out of the cooling cellars but also out of the canal water. The heat thus obtained is brought to working temperature and used for the heating of homes. When using a heat pump installation it is advisable to select a radiation or panel heating type of home heating installation. It is impossible to go into full details about this plan, but I would like to advise those who are interested in this novel idea to study the literature on this subject. Results obtained with this experimental district heating will show whether a heat pump installation which uses the heat, contained in the canals or rivers of a town, as a heat source, will be practical and economical. When judging these results, one will have to consider the price of electric current, which will prove to be the deciding economical factor.

Another novel project for district heating has been planned, utilizing oil as the heat-carrying medium. The central heat station will provide heating for private homes exclusively. We chose oil as a heat-carrying medium, because it has the advantage of high temperature without the disadvantage of high pressure. In each block of homes the high temperature of the oil is reduced to the normal temperature required for a warm water heating installation, but at the same time the high temperature of the oil is used for a separate low pressure steam installation in each block, which installation will supply the hot air for drying the laundry.

From the foregoing it will be noticed that no plans have been made for heating for industrial purposes. As a matter of fact all plans developed so far in the Netherlands have been made only with the subject of supplying heat in dwellings.

However, in Rotterdam, where the entire inner city has to be rebuilt, plans have been made for a combined power and heat station. Although these plans are in a rather advanced stage, it is my conviction that the last word on this subject has not yet been spoken.

Let me conclude this brief, and necessarily incomplete resume about the future of district and central station heating in the Netherlands with a few words about a novel idea in the exploitation of these stations. In America, as far as I have been able to ascertain, all stations are in the hands of private industry and the object is to sell heat at a profit. In the Netherlands, however, plans of the combined heating industry to build and run district and central stations as a joint venture are in an advanced stage, the object being to sell the produced heat *at cost*. The idea behind this plan is that the combined industry will not try to make a profit on heat, which might be considered as one of the essential necessities of life. On the one hand a profit will be made on the individual home installations, which will be installed by the individual members for their own account and on the other hand, work will be created by putting installations in tens of thousands of homes, which would not have installations, were heat to be sold at a profit. In a country which has been under enemy occupation and has been partly devastated, the price of the necessities of life is of course of far greater importance than in America.

May I thank you very much, also in name of the central heating industry of the Netherlands, for the opportunity you have given me to address this meeting.

*Chairman Dubry:* Thank you, Mr. Beuker. The next item on the program is the Report of the Commercial Relations Committee by Chairman A. T. Veness. Mr. Veness.