The efficiency figure is given so that direct comparison may be made with the monthly figures which are worked out on units generated; reducing the year's fuel cost to this basis, the result is .257d. per unit generated, the excess over the monthly figures being due to the running of the steam plant under very uneconomical conditions.

The above figures give the facts of the case, but would not be complete without some account of the running of the plant and the opinions formed by the engineers in charge of it.

So far as fuel costs are concerned, there is no doubt that in the special circumstances in Guernsey both gas and Diesel engines are very economical; anthracite peas for gas making can be bought at about the same price as small steam coal, and, in practice, this means that the fuel bill for steam working would be nearly double the cost for generation by gas. The fuel costs of the Diesel engines before the recent heavy rise in the price in oil were practically the same as for gas, but, at present prices, the cost of running the Diesel engines is so heavy, that it is fairly certain that no more engines of this type will be installed until oil prices fall.

Although the internal combustion engines have proved economical in fuel cost, it is certain that part, at least, of this saving must be set aside to pay for the heavier running costs in other directions; for instance, the lubricating oil bill amounts to over 10 per cent. of the fuel bill, and costs probably three times as much as the oil for a steam-driven station using reciprocating engines; while, if turbines are used, this item of expenditure becomes very small. The labor costs are highest for gas engines and lowest for Diesel engines, steam plant taking a position about midway between the two.

As compared with steam, the supervision charges are higher for both gas and oil engines. With internal combustion engines, the repair costs are one of the most serious items, and, in spite of all statements to the contrary, there is no doubt that quite a large amount of the saving in fuel must be spent on repairs.

After two of the gas engines had run for seven years and the third for three years, they had reached such a condition that repairs costing well over £2,000 were necessary to put them in good order, although large sums had been spent on repairs each year. This statement must, however, be qualified by explaining that these particular engines were of an early type, and there is no doubt that more modern engines could be maintained at a lower cost.

The Diesel engines have not been running sufficiently long to require much in the way of ordinary repairs, and for the greater part of the time all breakages have been covered by the makers' guarantees, but from the experience up to date it seems reasonably certain to expect that the repairs will be more costly than for steam plant, though it is hoped that the cost will not be so heavy as for the gas plant.

Reliability is a point of supreme importance for a public supply. Experience with the gas engines showed that internal combustion engines were not suitable for a public supply without the assistance of a large battery, and it is no exaggeration to say that without the battery it would have been quite impossible to maintain the supply with reasonable economy; there are so many things which may suddenly cause a gas engine to give up working, and it is impossible to guard against them. Therefore, either an extra set must always be running in parallel, thus increasing the fuel, oil and attendance charges, or a battery must be installed.

With this experience as a guide, it was decided that when Diesel engines were installed at Les Amballes station, it would be advisable to alter the battery arrangements, so that an output equivalent to the full load of one Diesel set could be available instantly if one of the running sets failed; this precaution has proved most useful; it allows the engines to be run at practically full load with safety, and it has saved a number of failures of supply that otherwise would have taken place.

It must not be assumed from the above remarks that the failures of gas or Diesel engines are always of a serious nature; the great majority of accidents that might cause an interruption to supply are quite trivial, and can be rectified in a few minutes, but they happen so suddenly that there is no time to run up a spare set. With the gas engines it may be a trifling defect in the ignition gear, or something causing pre-ignition or back firing. With the Diesel engine it may be a needle valve stuck open, or a compressor valve hung up; all of these defects may be of no importance, and the engine may be on load again in a few minutes, but unless a spare set is running, or there is a battery, they may cause an interruption to the supply.

Experience has shown that the gas engines are more subject to these little troubles than the Diesel engines, in fact, the Diesel engines have frequently run for several months without an involuntary stop, whereas the same cannot be said of the gas engines. On the other hand, the Diesel engine failures give less warning, and usually take longer to put right.

There is no doubt that, if a supply depends entirely on internal-combustion engines, more spare plant must be installed than in a steam-driven station. In the first place, internal combustion engines cannot be overlooked for emergency purposes, and of even more importance is the fact that a defective steam plant can often be run until the load falls at night, whereas a defect in an internal combustion engine must receive attention without delay. For instance, a leaky valve or a blowing joint on a steam engine can usually wait for attention, but on a gas engine, and more particularly on a Diesel engine, these defects may stop the set at once, and even if they do not do so it is generally advisable to shut down the set without delay to avoid the risk of serious damage, as the high temperature and high pressure of the gases cut the metal surfaces with surprising rapidity and may do much damage in a short time.

Another reason for having plenty of spare plant, particularly with Diesel engines, is the considerable degree of accuracy essential when making adjustments and repairs; this accuracy cannot be obtained on work carried out at night by a tired staff of men racing against time to get the plant on load again.

To sum up briefly, internal combustion engines can give a perfectly satisfactory supply, particularly if batteries are installed; but they are essentially different from steam plant, and must be installed and run with due regard to this fact.

Under favorable circumstances, these machines are economical, but it must not be forgotten that there are other expenses besides the fuel bill, and the fuel bill of the internal-combustion engine must show a handsome saving to justify the use of this class of plant.

Of the two, the Diesel engine appears to have certain advantages for central-station work, but, as long as the market for oil is subject to such severe fluctuations, the use of this engine is likely to be restricted to special cases.

The most useful field for the internal-combustion engine appears to be in small central stations; as the size of the station increases, the advantages of this type of plant decrease, until a point is reached where internal-combustion engines can only pay in exceptional circumstances, and at the present date this point appears to be reached when a