TECHNICAL FEASIBILITY STUDY FOR THE DEVELOPMENT OF A LARGE CAPACITY WIND POWERED ELECTRICAL GENERATING SYSTEM

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This report describes a study to be undertaken at Montana State University with the support of the National Science Foundation. The major objective of this research effort is to investigate the engineering feasibility of developing a basic mechanical system necessary for extracting large amounts of power (on the order of 10 to 20 MW) from the wind using the concept of vertical airfoils moving along a closed horizontal track system. The research plan shows that this effort can be divided into four distinct phases, each with its own specific objectives. The accomplishment of these specific objectives will be major indicators of progress toward completion of the overall project objective. During this preliminary study, attention will be focused on those components necessary for the conversion of wind energy to mechanical energy, although the general characteristics and critical aspects of other components will also be considered. The four phases of this program may be briefly described in the following manner:

(1) the establishment of component specifications and interface requirements for major system components;
(2) the formulation of alternative sets of conceptual designs for major system components;
(3) the engineering analysis of various components and systems; and
(4) the re-examination of basic concept and identification of any desirable follow-up work.

DISCUSSION

Q: What power level are you talking about? What efficiencies are you talking about?
A: We really haven't looked at it in detail enough yet to come up with good numbers at all for this. We're shooting for a system though on the order of 10 megawatt system or so, and we estimate that we will be talking about a 5-mile-long track, 5- to 10-mile-long track, or so.

Q: At what efficiency?
A: Your guess is probably as good as mine on that. That was figured at about 30 or 40 percent or so, and that's a wild guess, really.

Q: I think you have given us a good run-down on potential problems and liabilities of this system, but I didn't see why you were considering this over the conventional rotor system.

A: We feel that the advantage in this scheme is that you can get a very large output from a single unit, whereas to get 10 to 20 megawatt output from the rotor type system requires a very large number of units from sizes that are available or conceivable now.

Q: Each one of your rolling stock pieces might be considered a separate unit?

A: Yes, it could be, that's right. But on this, to add capacity you simply increase the length of the track. When you add capacity, you don't increase the structural problems, some supporting base for the entire system, like you would with the rotor.

Q: I would like to ask you if you are familiar with the Madaras experiments, which were conducted by the Public Service Commission, Burlington, New Jersey in 1933 on this same type of scheme?

A: No, I'm not.

COMMENT: I think it will save you a lot of time if you become familiar with the Madaras experiments.

Q: I think that some of the questions and comments that you have just made save me repeating them. But I still have one nagging problem with what you have here in the slides. And that is I see a very substantial program of technological analysis which is devoted to, let's say, shedding light on a series of connected questions. But in each one of your approaches I sense what I consider the primary key question is always placed at the end as something of an appendage, and quite frankly that is economics. Why go through all this detailed, complex analysis if you can have established at once at least an estimated economics which show the scheme to be favorable. Would you comment on that, please?

A: Well, we felt that we should show it could technically be done first, and then, like most of the other units, cost is something you can sort of affect if it proves to be technically feasible and you went into production on this type of unit. So this was the logic in putting the cost at the end.

Q: In other words, you're going to undertake a very expensive technological feasibility evaluation program and then if it looks good, then you are going to look at economics. Why not look at economics first, because manpower is a pretty scarce resource?

A: First of all, it's not a very involved and expensive study to start with, and I didn't mean to imply that we are going to completely ignore economics during this first phase by any means. It's going to be looked at, but the economists that have been involved in the group that's been working on this are not going to be involved to a large extent during this preliminary study, although they will be used as consultants. This would come in after this one year period.

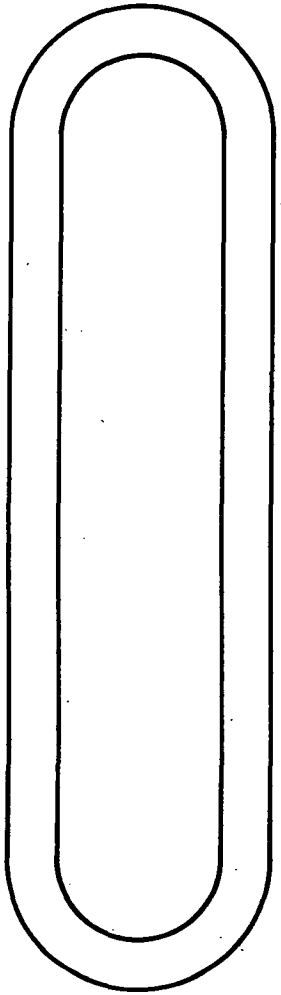

Figure 1. Anticipated Typical Track Arrangement

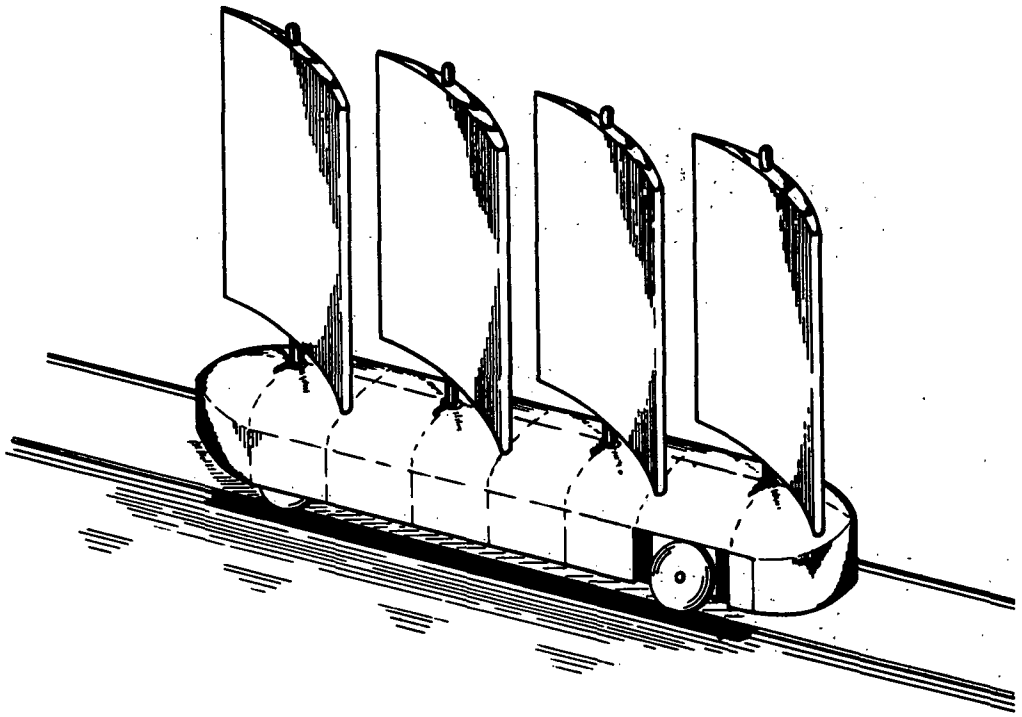

Figure 2. Anticipated Typical Airfoil Installation