Wind Resource

A. Introduction

1. Motivation for Understanding Wind Resource

WIND TURBINE DESIGN

REALISTIC REPRESENTATION OF WIND TO "DRIVE" MODELS

RESOURCE ESTIMATION FOR SITING

WANT TO LOCATE TURBINES WHERE THEY WILL PRODUCE POWER

WIND FORECASTING FOR POWER PRODUCTION

WHEN A PLANT WILL PRODUCE POWER

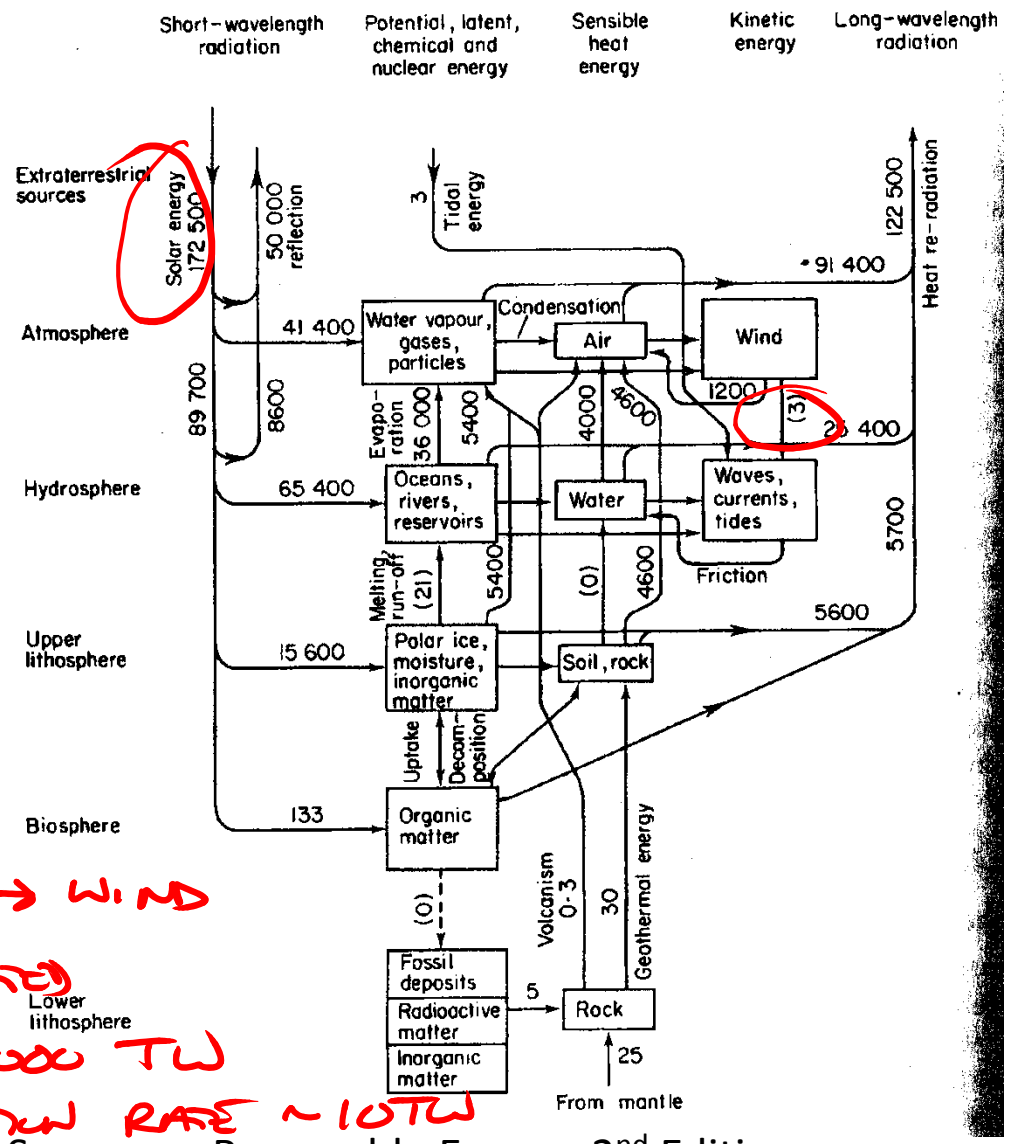
↳ BETTER ABLE TO PREDICT PLANT GENERATION → MORE MONEY

Wind Resource

UNITS OF TERAWATTS

A. Introduction

   2. Wind Resource – Where Does it Come From and How Does it Fit in the Bigger Picture?



Sorenson, Renewable Energy, 2nd Edition

SOLAR ENERGY DRIVES MOST OF OUR ENERGY RESOURCES

FOR WIND

SUN → UNEVEN HEATING → PRESSURE GRADIENTS → WIND → HEAT → RE-RADIATED

POWER IN WIND ~ 3000 TW

HUMAN ENERGY CONSUMPTION RATE ~ 10 TW

Wind Resource

B. Wind Motion

1. Macroscopic Motions

AT EQUATOR AIR RISES & CREATES LOW PRESSURE

Polar Easterlies

AT 30° N & S LATITUDE

Prevailing Westerlies

WARM AIR COOLS & SINKS

→ AIR FLOWS TO EQUATOR AS TRADEWINDS

Tradewinds

→ CORIOLIS TURNS WINDS EAST

Doldrums

Tradewinds

AT EQUATOR, TRADE WINDS MEET

WINDS PRIMARILY VERTICAL

→ DOLDRUMS

Prevailing Westerlies

Polar Easterlies