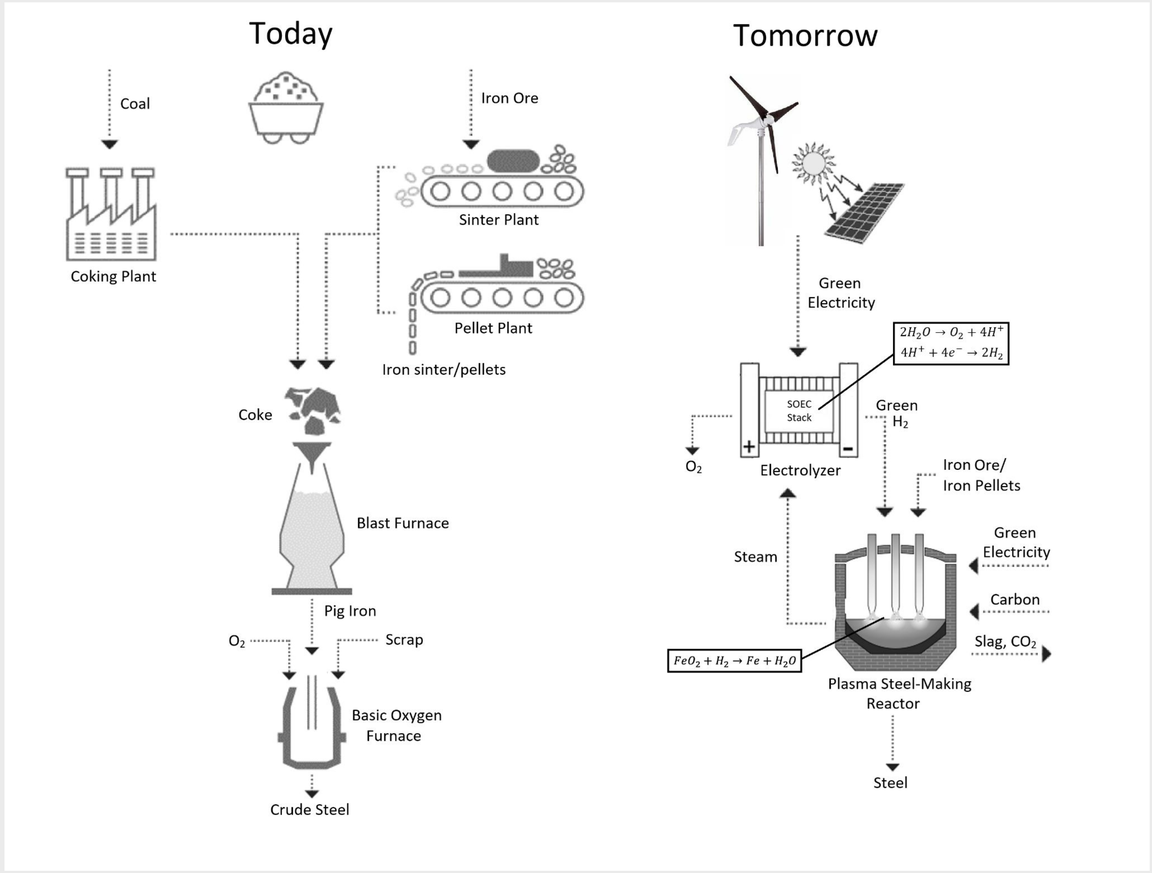
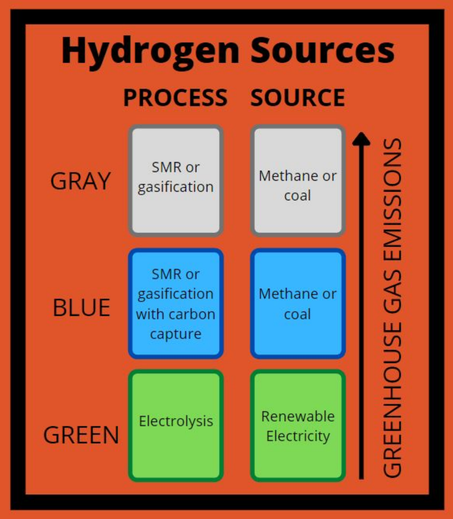
Hydrogen Plasma Steel Production: Hydrogen Sourcing

Steel production is responsible for 8% of CO2 emissions globally, one proposed method to help reduce this is to refine iron using a hydrogen plasma instead of coke, which would reduce the CO2 emissions by over 95%. Our design team is looking into some important factors of a potential plant: location, sizing, and how it will get access to the hydrogen needed for this process.

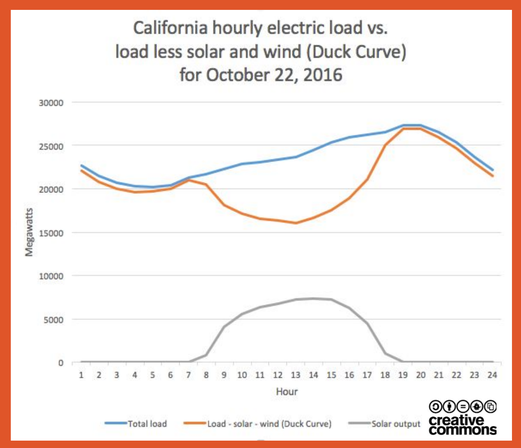


Types of Hydrogen

There are many ways to produce hydrogen, some are more environmentally friendly than others.



Energy Curtailment



There are periods of time where excess electricity is available, which can be used to cheaply run electrolyzers

Traditional Steelmaking Process:

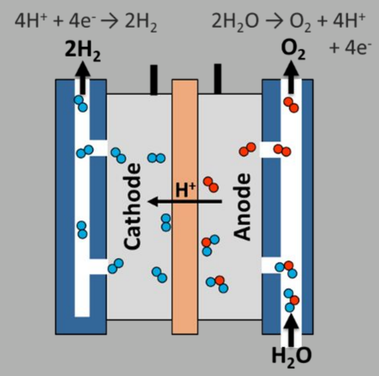
Use coke as the material to reduce the iron ore, which generates CO_2 as a byproduct

Hydrogen plasma Steelmaking Process:

Uses hydrogen to reduce the iron ore, generating water as a byproduct

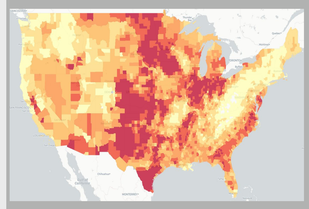
Hydrogen Production using Solid Oxide Electrolysis

The use of steam as feedstock reduces energy requirements to split water. For processes which generate waste heat, solid oxide cells present an opportunity to generate hydrogen at low costs.

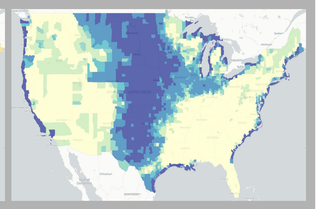


Green Energy Projections

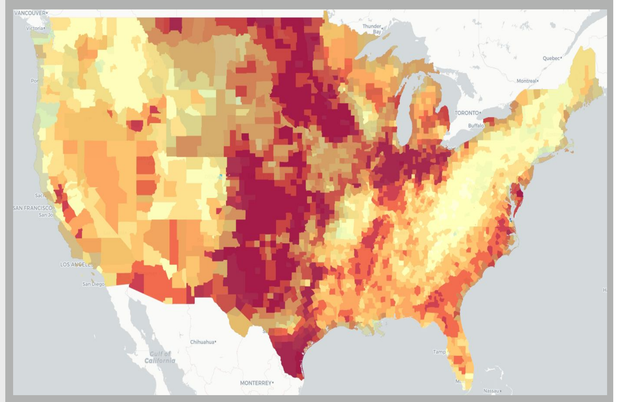
Maps of predicted renewable energy generation in the United States.



Solar Energy Predictions



Wind Energy Predictions



Solar + Wind Energy Predictions

Made by:
Jacob Alred
Jacob Makuch
Isaac Short

Oregon State University

NREL Transforming ENERGY