W_t — Wind
S_t — Solar

W2H, W2E, S2E, S2I

$t = 1, \ldots, T$ "1 yr"

Electrolyzer

E2GS, E2I, E2F

G_S

GS2I, GS2F, Industry

G_S: gas storage — short-term

G_L: — — — long-term

F2H, Fuel Cell, F2I, Waste (≥ 24 hr)

GL2F, F2GL, G_L

GL2I (discounted w/ trans cost)

"Is ↑F2E necessary?"

Constraints:

generation:

group W_t & S_t

"Can long term stored liquid hydrogen be used in industry?"

$$\longrightarrow W2H_t + W2I_t + W2E_t \leq W_t$$

$$\longrightarrow S2E_t + S2I_t + S2H_t \leq S_t$$

$$\longrightarrow C_E \cdot (W2E_t + S2E_t) = E2F_t + \overline{E2GS}_t + E2I_t$$

$$\longrightarrow GS^t = \left[GS^{t-1} - GS2I_t + E2GS_t - GS2F_t \right] \cdot \text{leakage}$$

(daily refresh)

$$\longrightarrow GS^t = 0 \quad \text{if } t \bmod 96 = 0$$

needs another efficiency constant

$$\longrightarrow E2F_t + GS2F_t + \boxed{GL2F_t} = C_{xx} (F2H_t + F2I_t) + C_{xxx} \cdot F2GL_t$$

$$\longrightarrow GL^{t-1} - GL2F_t + F2GL_t - GL2I_t = GL^t$$

C_{xxx}

feed in scale

demand:

$$W2I_t + S2I_t + F2I_t \geq \underline{EI_t}$$ elect' demand at indust

$$\underline{G_x \cdot GL2I_t} + \underline{E2I_t} + \underline{GS2I_t} \geq GI_t$$ Gas demand

$$S2H_t + W2H_t + F2H_t \geq EH_t$$ elect at home

capacity constraint:

$$W_t = Capacity_W^{(4 \times st)} \times profile \nwarrow given \ TS$$

$$S_t = Capacity_S^{(10kW \times \cdots)} \times profile$$

(MW) $\frac{power}{4}$ = (MWh) energy

electricity

$$W2E_t + S2E_t \leq Capacity_E$$

$$E2F_t + GS2F_t + c \cdot GL2F_t \leq Capacity_F$$

$$GS_t \leq Capacity_{GS}$$

$$GL_t \leq Capacity_{GL}$$

objective: inventory: $\sum GL^t \cdot C\alpha$ + short-term?

transportation: $GL2I$

liquify: $F2GL$

gasify: $GL2F$

fixed setup cost : wind + solar

fuel-cell : Capacity ⟸ Fixed

electrolyzer   Capacity

decision vars :

capacity of wind

Capacity of solar

input
or
decision
var
{
capacity of electrolyzer

capacity of fuel cell   ⟸ 2-step
                            optimize.

capacity of storages

capacity of

all network flow!   GL, GS

To do:

find : decay rate

all associated cost

time related ⟶ maintainence cost for invention

transportation cost

capacity cost

in terms monetary value