

# Connection

Applied Compositional Thinking for Engineers



## Example: "distribution networks"

**General situation:** something is distributed via a network

**Specific example:** electric power distributed via a power grid.

- ▶ Toy model:



To model **connectivity**: arrows

Direction of arrows: flow of distribution



Which consumers are connected to which power plants? Look at **paths**:



We also might want to show which high voltage are connected to each other:

Note: there is also a way to make these relationships symmetric.



The information above can also be represented as directed graph:



For comparison, a representation of a power grid taken from Wikipedia:



# Binary relations

**Definition:** A (binary) **relation** from a set  $X$  to a set  $Y$  is a subset of  $X \times Y$

**Example:**





# Binary relations

**Example:**



...



