

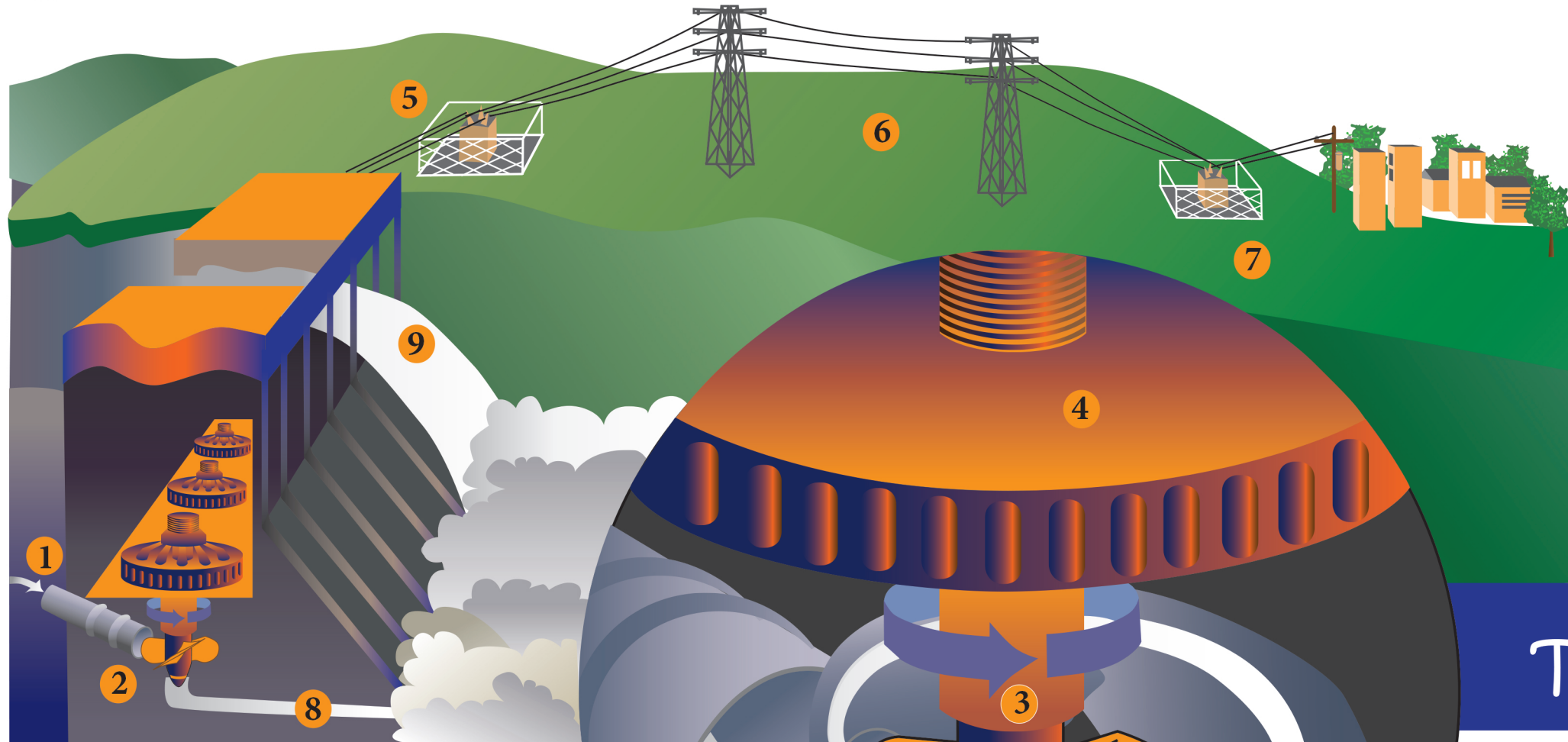
HYDROPOWER

Uses the force of falling water to generate electricity

FWEE
Foundation for
Water & Energy
Education
www.fwee.org



Partnering in the Renewable
Northwest Energy Future



WATER from a river or reservoir flows into a **1** PENSTOCK, a large pipe above or below ground, that is commonly used to direct the water flow. **2** TURBINE BLADES are pushed by the force of water exiting the penstock, causing them to transfer the energy of falling water to rotate the shaft. The **3** SHAFT connects the turbine to the generator, turning at the same speed as the turbine. Inside the **4** GENERATOR, the spinning shaft turns electromagnets (called a rotor) inside a stationary ring of copper (called a stator), moving electrons to produce electricity. **5** STEP UP TRANSFORMERS increase the voltage of electricity produced by the generator. **6** TRANSMISSION LINES carry high voltage electricity to substations in our communities. At **7** SUBSTATIONS (which house step down transformers), the voltage is decreased. Electricity is then **8** distributed to homes and businesses. **8** WATER FLOW used to turn the turbines returns to the river. **9** SPILLWAYS release water downstream that is not directed to the turbines to generate electricity.

The Hydrologic Cycle Naturally Renewable Energy



- Rain and runoff from the snowpack fills rivers and streams.
- Electricity is generated at hydroelectric projects by using the force of falling water.
- Water passes through the turbines and returns to the river.
- The sun draws moisture (evaporation) from the ocean, forming clouds.
- The cycle begins again ...

The Benefits of Hydro

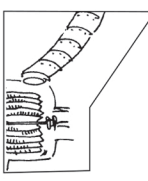
- Hydroelectric projects take an unpredictable resource — rainfall and snowpack—and turn it into a reliable source of electricity.
- Hydropower is a clean, low cost and renewable energy source.
- With normal precipitation, hydropower produces about two-thirds of the Northwest's electricity annually.*
- Hydroelectric projects can also support recreation, irrigation, flood control, transportation and habitat needs.

* Source: Northwest Power and Conservation Council

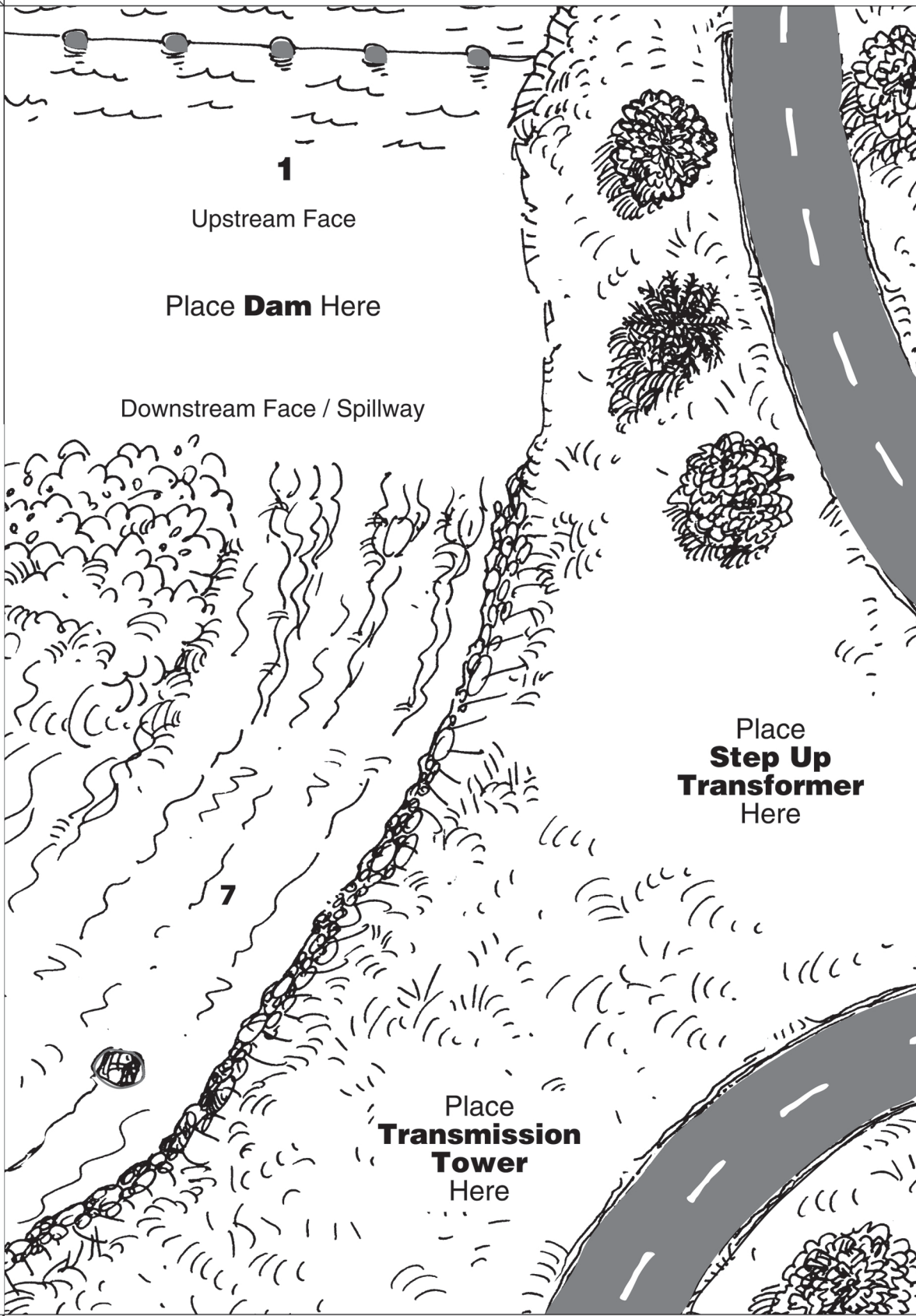


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Benefits of Hydro



Dam
Water from the **forebay (1)** behind the **dam (2)** flows through the **intake (3)** to a **turbine (4)** that turns a **generator (5)** to create electricity. From here, the electricity is sent to the **step up transformer (6)** to begin the journey to your home. Water used to turn the turbines returns to the **river (7)**.



Upstream Face

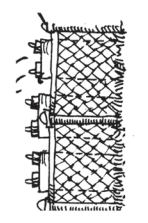
Place **Dam** Here

Downstream Face / Spillway

Place **Step Up Transformer** Here

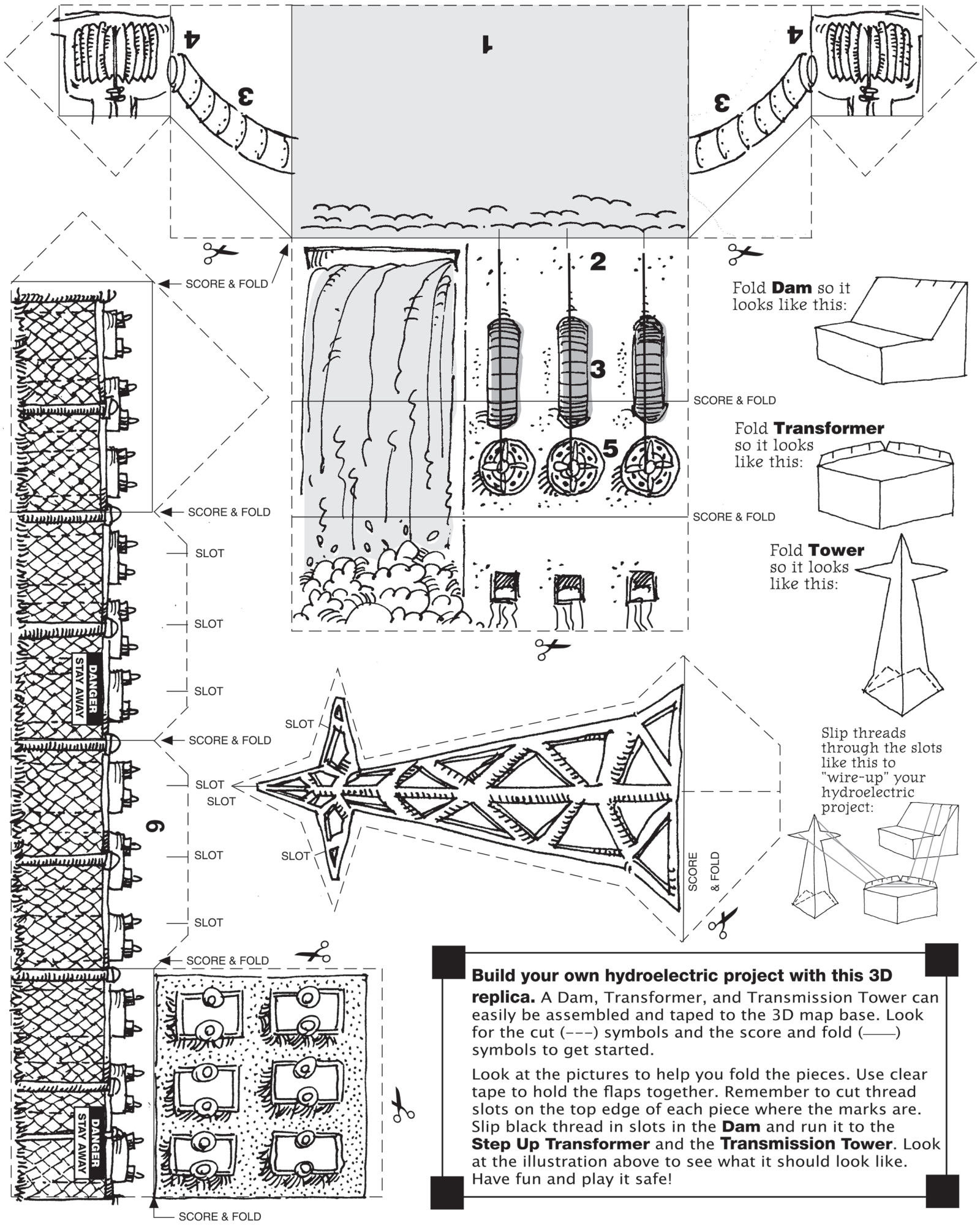
Place **Transmission Tower** Here

Step Up Transformer
A step up transformer increases the voltage of the electricity so it can make the journey from the dam to your community. Substations (which house step down transformers) reduce the voltage to make it available for homes and businesses.



Transmission Towers

Transmission towers carry the transmission lines that bring electricity to your community.



Fold **Dam** so it looks like this:

Fold **Transformer** so it looks like this:

Fold **Tower** so it looks like this:

Slip threads through the slots like this to "wire-up" your hydroelectric project:

Build your own hydroelectric project with this 3D replica. A Dam, Transformer, and Transmission Tower can easily be assembled and taped to the 3D map base. Look for the cut (---) symbols and the score and fold (—) symbols to get started.

Look at the pictures to help you fold the pieces. Use clear tape to hold the flaps together. Remember to cut thread slots on the top edge of each piece where the marks are. Slip black thread in slots in the **Dam** and run it to the **Step Up Transformer** and the **Transmission Tower**. Look at the illustration above to see what it should look like. Have fun and play it safe!