

# Fission: Existing Nuclear & New Nuclear Technologies

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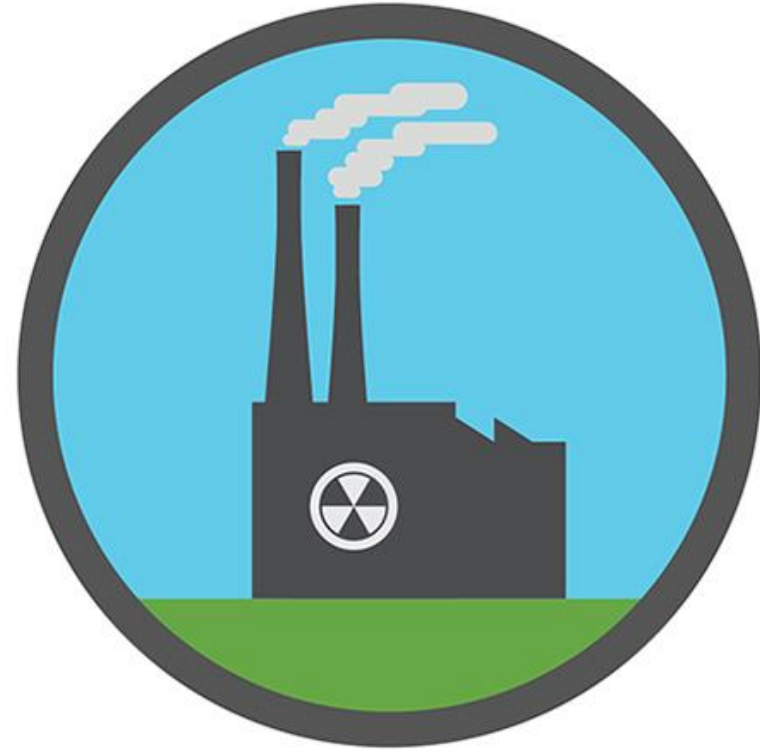
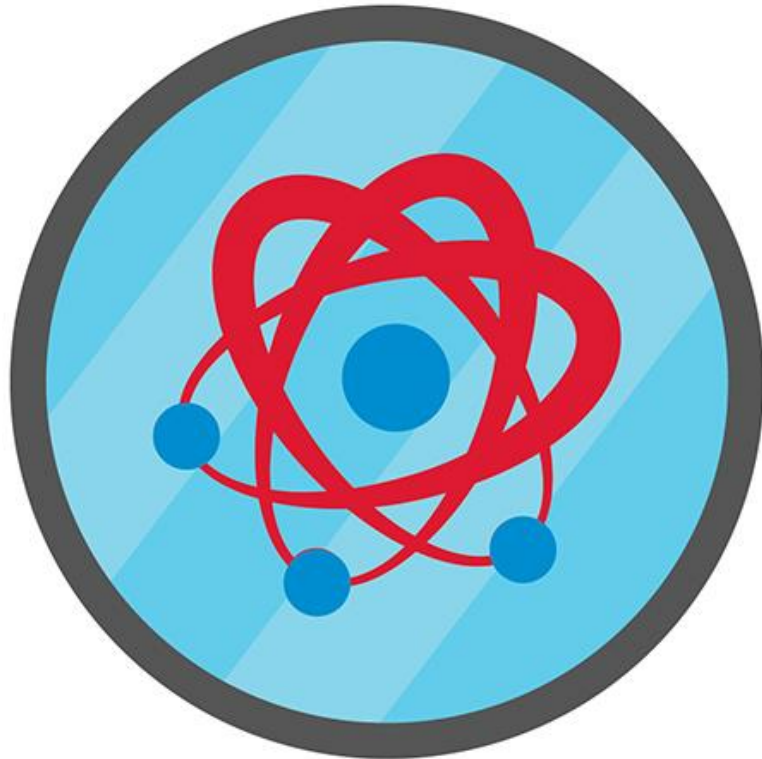
**Sr. Director for Ext. Strategy**

**Energy Northwest**

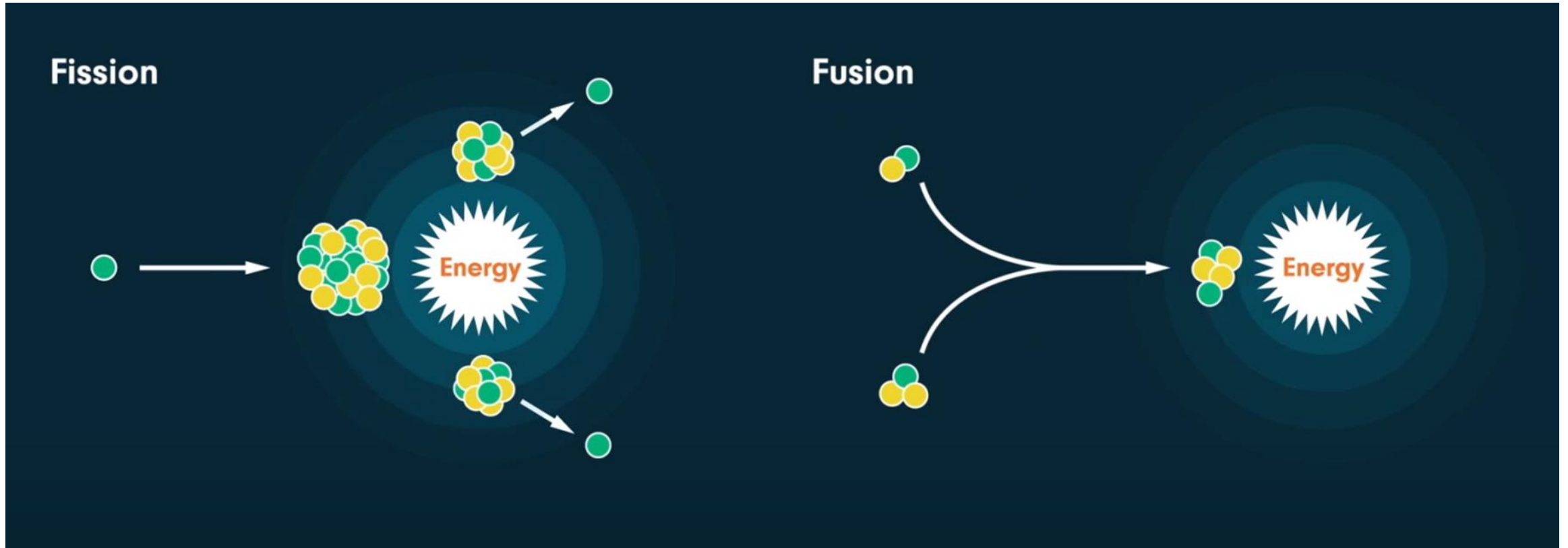
*Chelan PUD Energy Expo:  
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# Nuclear Energy 101



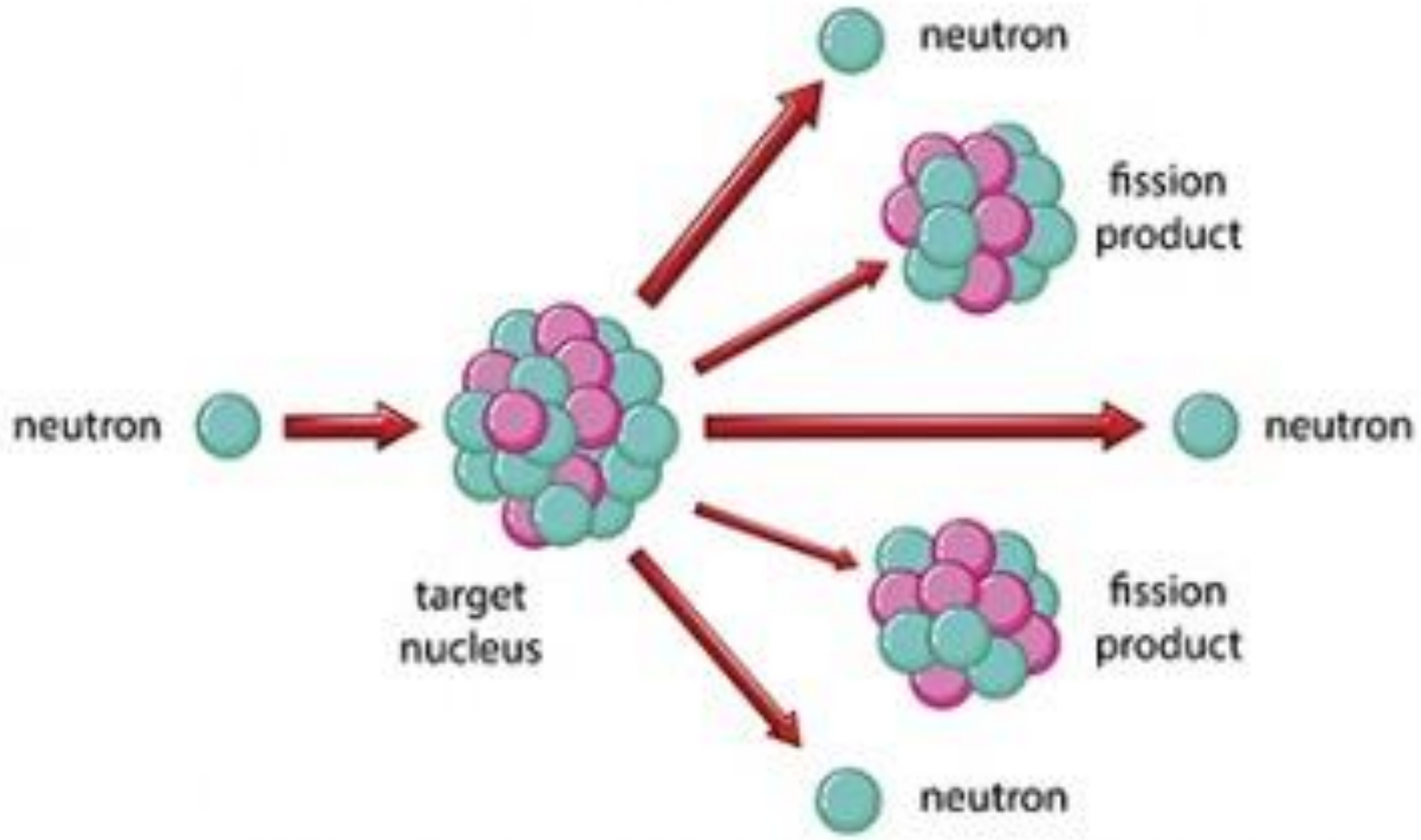
# Fission vs. Fusion



# How fission energy is created:

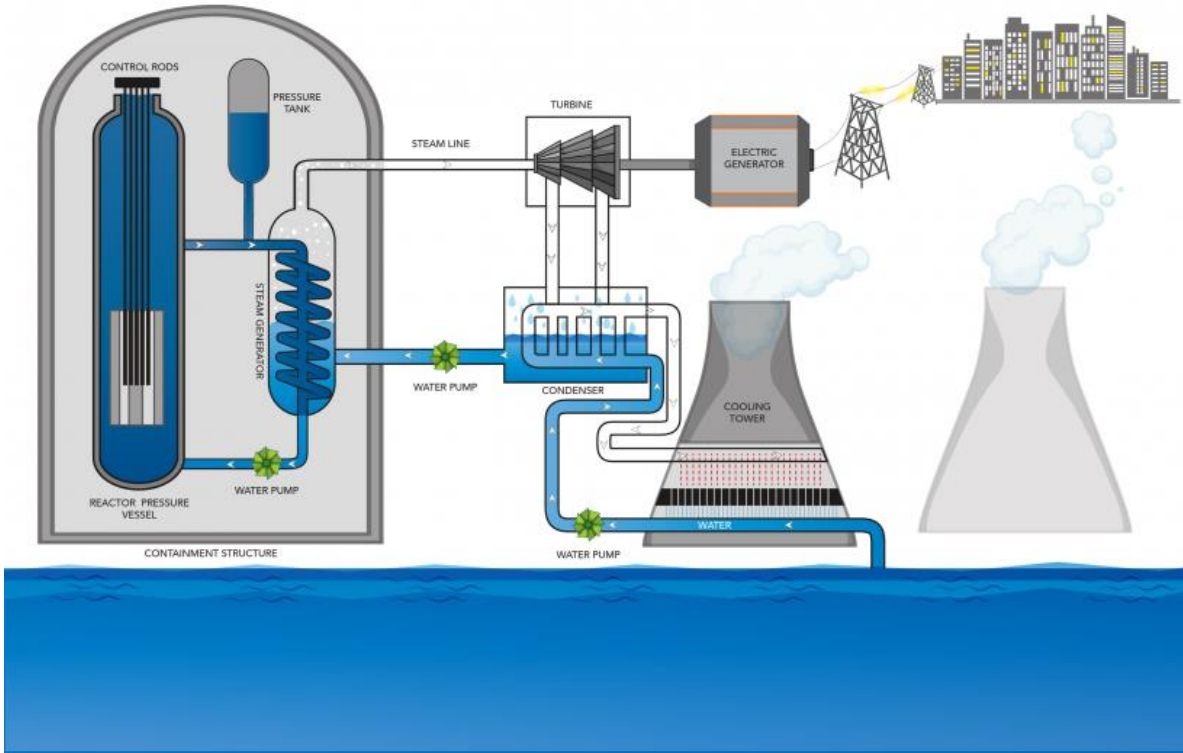
- **Fission occurs when a neutron slams into a larger atom, forcing it to excite and split into two smaller atoms... also known as fission products. Additional neutrons are also released that can initiate a chain reaction.**
- **Nuclear power plants use uranium for nuclear fuel, with water acting as both a coolant and a moderator. Control rods can then be inserted into the reactor core to reduce the reaction rate or withdrawn to increase it.**
- **When each atom splits, a tremendous amount of energy is released. The main job of a reactor is to house and control the nuclear fission process.**
- **The energy released by fission in the reactor heats water into steam. The steam is used to spin a turbine to produce carbon-free electricity.**

# Nuclear Fission

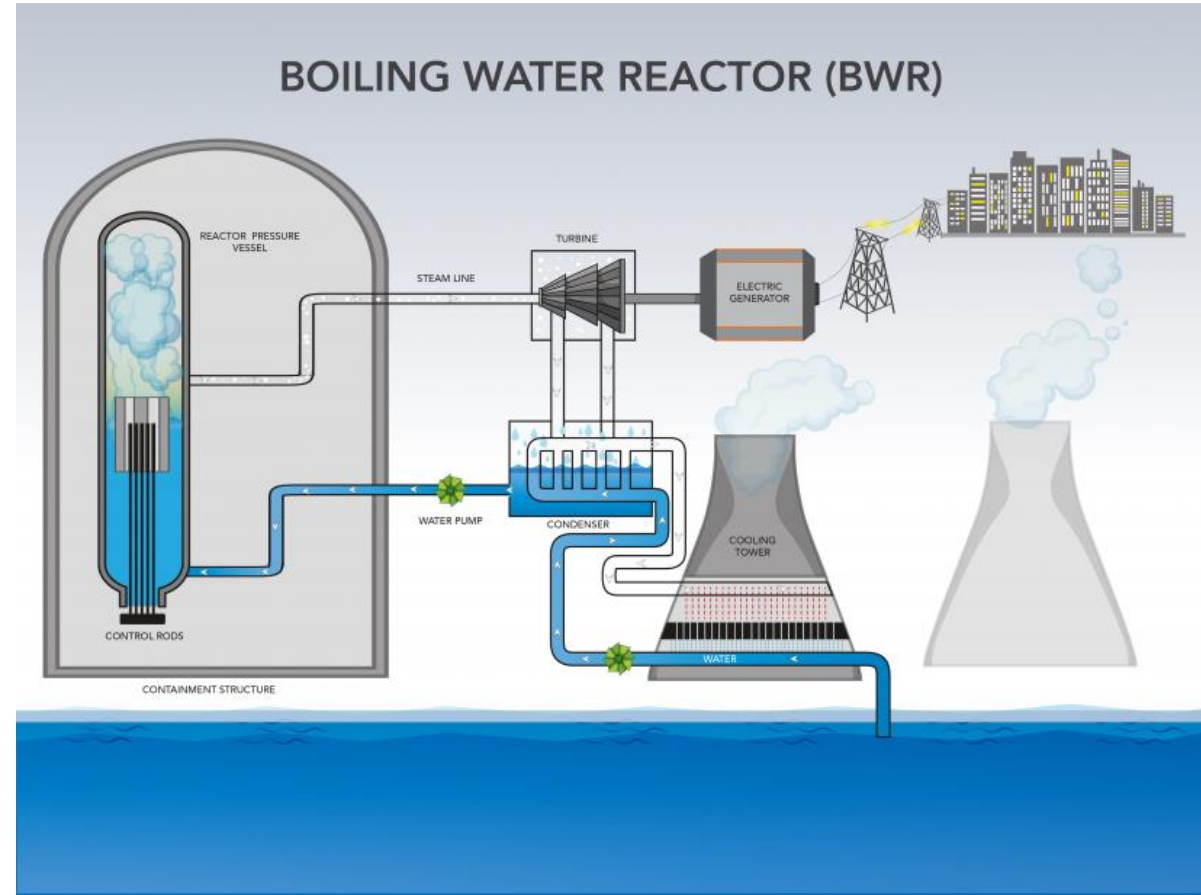


# Two Types of Nuclear Reactors in the U.S.

PRESSURIZED WATER REACTOR (PWR)



BOILING WATER REACTOR (BWR)





# Quick Facts on Nuclear Energy

- For over 60 years, domestic nuclear energy facilities have been powering the country with clean, carbon-free electricity.
- Nuclear energy provided 55% of America's carbon-free electricity in 2019, making it the largest domestic source of clean energy.
  - Accounts for 19% of all electricity generated in the U.S.
- Nuclear power plants do not emit greenhouse gases while generating electricity.
- Nuclear energy is the most reliable energy source in the U.S.
- Currently 93 commercial reactors help power homes and businesses in 28 states.


# Current State of Play: United States







# Advanced Small Modular Reactors (SMRs)

## SMALL MODULAR REACTORS






INCREASED SAFETY



LESS COST



SCALING SIZE

**BEST CHANCE FOR IMMEDIATE CONSTRUCTION**

*Image Courtesy of Third Way*

## Key Attributes:

- Evolutionary technology
- Small geographic footprint
- Flexible & Dispatchable
- On-line refueling
- Simple, scalable designs
- Passive safety
- Off-the-shelf parts and advanced construction techniques

# Technology Highlight – X-energy XE-100



- High Temperature Gas Reactor
- 1-12 Modules
- 80 MWe/module
- 60-year design life; 100+ year asset
- Continuous on-line refueling
- Fuel as a variable cost
- Walk-away-safe, meltdown proof
- Modularized components built off-site, transportable via rail/road
- Scalable design/technology

# Thank You