The seven secrets to cheap nuclear energy

By Michael Shellenberger

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Energy ministers and other policymakers often face a bewildering array of sales pitches from nuclear plant promoters, which has resulted in many countries making poor decisions, leading to long construction delays and large cost overruns in the United States, Finland, France, China, India and the United Kingdom, among others.

The good news is that there is overwhelming consensus among economists and energy experts about what it takes to make nuclear energy competitive. This consensus draws on construction and operation cost data from countries around the world over a period of more than 40 years.

Build national consensus around a long-term energy plan. Successful nuclear programmes require *decades,* not just a few years. This means they must enjoy strong national support across the political spectrum, so that nuclear plant construction is not interrupted by changes of government on the way to a country's goal of achieving 20, 40 or even 80 percent of its electricity from nuclear. Building that consensus requires establishing the *need* for nuclear energy for economic, security and environmental reasons. There also needs to be consensus around the relative safety of nuclear, since this is the top concern for all parties.

Engage the public. Like all technologies, nuclear energy must have popular support to survive and thrive. Most people, whether in developed or developing countries, know little about energy and are wary of nuclear despite the fact that it is the safest way to produce electricity. Public engagement is therefore not optional, but essential. Engagement efforts must be science based, informed by the best psychological, sociological and public opinion research available.

Standardize to a single design. What France and South Korea have proven is that for construction crews to reduce the time and cost of building reactors and power plants, they must gain experience — which only comes from repetition. While modest changes can be made to designs — such as moving to a larger reactor, or adding safety features — the core design must be the same.

Centralize construction with a single, experienced builder. A single person must have the authority to oversee all aspects of construction in a single institution. This person should have experience and the trust of policymakers, must be held accountable, and in turn, should have the authority to hold everyone involved in the project accountable. All parties must also be held accountable in order to control costs.

Civeaux nuclear power plant, France
(Photo: EDF)

Experienced managers overlooking the construction of multi-unit Shin-Kori nuclear power plant.
(Photo: M. Shellenberger)

Build as big as possible. Despite some recent enthusiasm for smaller plant designs, evidence shows that nuclear plants with higher output produce cheaper electricity than ones with lower output. This is mostly because the additional workers required to produce power from bigger reactors are outweighed by the higher output. This rule holds true even when larger reactors modestly increase the cost of construction — the higher output simply makes up for the higher building cost. Smaller plants may be more appropriate for smaller countries or those with lower electricity demand. But if these plants are pursued, buyer countries must understand they will come at the price of higher operating costs per unit of electricity produced.

Fix the price, and don't allow changes during construction. The key to low-cost construction is low risk — not the estimated total cost. It is better for countries to go with a slightly more expensive builder who has significantly more experience — and who agrees to a fixed price in exchange for a no-changes rule — than one who offers a lower price at a "cost-plus" basis. The key is to avoid disputes between buyer and builder since it is ultimately impossible to resolve who is right and who is wrong, and the construction delays will only hurt everyone. For this to work, transparency is required: the buyer must be able to check the books of the vendor.

Finance with low-cost loans. Some of the highest costs that result from construction delays are simply paying the interest on loans. Avoiding high costs requires both avoiding delays and low-interest financing, whether from the government, the ratepayers (in the form of a fee on electric bills), or an international development bank. The riskiest phase of the project is in the planning, with risk decreasing once construction has begun. Buyer countries should, therefore, have different financing for different phases.

These are the only seven secrets for cheap nuclear energy for which strong, supportive data is available. While nuclear plant promoters may talk about other elements, such as recycling the fuel, manufacturing more of the plant in factories and using non-light water designs, the advantage these bring is not at all clear cut.

Nuclear energy is facing significant challenges, but it can still achieve its goal of providing a growing share of cheap and clean electricity to the world.