Careful analysis shows there is no simple solution.
Is there another idea?
Is there another idea?

Sometimes the answer is right in front of you
Could we build a miniature sun on earth?

... to provide significant carbon-free energy for humankind.
Bringing star power to Earth

Use very high power lasers to create fusion – releasing city-scale energy output, safely and sustainably.
The fusion fuel — 40 kWhr from a milligram pellet of deuterium and tritium
One liter of heavy water has the energy of more than 2 million gallons of gasoline
Fusion energy is attractive, but needs to be timely

- Safe
- Sustainable
- Energy security
- Baseload
- Carbon-free
- Industrially attractive
- No geologic storage
The NIF facility is the culmination of many decades of US leadership and investment in this field.

NIF can demonstrate full-scale performance for a 1000 MWe plant.
NIF construction resulted in 375M worth of business for the SSEB States

- Strong vendor base in key technologies
- Sites well suited to construction of LIFE plants
- Substantial economic impact
National Ignition Facility (NIF)
NIF is running 24/7 with shot reliability of over 99%
The NIF laser is now operating above its original design specifications.
Target Chamber Dedication
June 1999
In the Target Chamber
Bringing star power to Earth

The program is focused on achieving “ignition” – the culmination of over 50 years work

Progress over the past 18 months:
Factor 60 improvement in fuel pressure. Factor 2-3 to go.
NIF can demonstrate full-scale performance for a power plant based on Laser Inertial Fusion Energy (LIFE)
International activity in this area

China - SG-III

USA - NIF Laser

UK - ORION

France - LMJ

Russia - ISKRA

EU - HiPER

Japan - FIREX

Korea
LIFE: A sustainable, carbon-free source of safe baseload electricity

- Security of supply (reducing our reliance on foreign oil imports)
- No enrichment, no reprocessing, and no high-level radioactive waste
- Global commercial competitiveness from a U.S.-led solution
- Compatibility with existing grid infrastructure
LIFE: An integrated approach to plant design

- Based directly on NIF performance
- Modular, factory built design for high plant availability
- Use of available materials and technologies
- Attractive safety bases enabling simplified licensing
The LIFE project is being guided by a board of senior utility executives

Donald Brandt — President and CEO, Pinnacle West Capital Corporation
Joseph Callan — Former Executive Director, U.S. NRC
David Christian — CEO, Dominion Generation; President, Virginia Power
Peter Darbee — CEO and President, Pacific Gas & Electric Company (Retired)
Brian Debs (Member in residence) — former SVP, Ontario Power Gen Corp.
William Fehrman — President and CEO, MidAmerica Energy Company
John Herron — President and CEO, Entergy Operations
Richard Kuester — CFO, Wisconsin Energy Corporation
Kenneth Nemeth — Executive Secretary, SSEB
Charles "Chip" Pardee — SVP and COO, Exelon Generation
Michael Sellman — CEO, Nuclear Management Company (Retired)
Michael Wallace — COO, Constellation Energy Group (Retired)
Industrial partners are being consulted

Construction / Engineering
Optics
Controls
Manufacturing
Semiconductor
Laser

30+ major vendors engaged to determine component availability, performance and cost
LIFE is economically viable over a range of plant sizes.

**Economic Performance as a Function of Plant Size**

- **Capital Cost**
- **Cost of Electricity**

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- Direct Capital Cost ($M)
- Cost of Electricity ($/MWh)
- Plant Electrical Capacity (MW)
A detailed LIFE delivery plan has been developed, with 1000 MW power production in less than 10 years.

2009 - Facility complete
2012 - Ignition

1,000 MW\text{th}

2020’s

400 MW to 1,600 MW\text{e}

2030’s
The macro-economic impact of LIFE is being independently assessed

Later this month: Report on the impact in the Southern States
Oxford Economics have calculated the impact of domestic LIFE rollout on GDP and new jobs

- 4 to 12 B$ annual federal and state tax revenue
- Substantial jobs impact in the high-tech sector

**Domestic Rollout GDP Impacts**
(average annual contribution to U.S. GDP over 2014-2050)

- **GDP impact**: $17 – 47 B$ / year

**Domestic Rollout Employment Impacts**
(number of U.S. jobs supported on average over 2014-2050)

- **Average jobs**: 155 – 425,000

Low / High scenarios are for 10 year or 5 year doubling times
High-skilled, Well-paying Jobs

- Some of the jobs that will be generated through the supply chain impacts will be high-tech/high-skilled and well-paying jobs.

- These jobs will be mainly clustered in the laser optic, semiconductor, and laser diode industries.

- This is reflected in the higher annual labor productivity and income compared to the manufacturing sector and US economy as a whole.

- In addition to the high-skilled manufacturing jobs, many of the on-site craft labor jobs will also require a high-skill level.

<table>
<thead>
<tr>
<th></th>
<th>Labor Productivity</th>
<th>Labor Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIFE Associated Jobs</td>
<td>$147,350</td>
<td>$86,890</td>
</tr>
<tr>
<td>Manufacturing Sector</td>
<td>$139,350</td>
<td>$76,000</td>
</tr>
<tr>
<td>U.S. Economy</td>
<td>$83,700</td>
<td>$51,990</td>
</tr>
</tbody>
</table>
Southern States Impacts

- The construction of the Market Entry Plant (MEP) will generate $3.0 billion of total GDP and an average of 6,600 total jobs annually of the 6-year construction period in the Southern States.

- The construction of an individual Nth of a kind 1.6GWe (NOAK 1.6GWe) plant will generate $3.3 billion in total GDP impacts and an average of 6,850 total jobs annually in the Southern States over the 6-year construction period.

- The construction an individual NOAK 1.6GWe LIFE plant outside of the Southern States will generate $925 million in total GDP and 9,500 total jobs-years due to spending at manufacturers located in the Southern States.

- The Southern States might be able to use their competitive advantage to develop large market shares in some of the key LIFE technologies.
Recent TV / documentary coverage of NIF and LIFE

- BBC with Steven Hawking
- National Geographic
- Horizon with Brian Cox
- Discovery Channel's NOVA

National Ignition Facility
Bringing Star Power to Earth

BBC

Discovery Channel
Achieving ignition on NIF can be a defining moment for the world’s energy future