

**Western State College of Colorado
Commencement on Saturday the Eighth of May Two Thousand Ten
at Ten O'Clock**

ADDRESS

**A New Nuclear Waste Approach: Recycling before Disposal
By Eric P. Loewen, Ph.D.**

Thank you and good morning. It's great to be with you. To President Helman and the Board of Trustees for their wisdom in running this institution; to the faculty for providing wisdom to the graduates in the classroom; to the family members for supporting a student at Western State College – welcome to you all!

To the graduates of Western State College, I salute you.

I want to also recognize the life and instruction of Professor Ted Violettt who taught at Western for 50 years, longer than anyone else in the history of this institution. Professor Violettt was my advisor. He was honored with emeritus status last September, and passed away on Sunday. Professor Violettt made a difference in my life.

The question for this day: where did you go to school? Graduates, you will be asked that question the rest of your life. In North Carolina, my current home, a native asked me:

'Where'd you go to school?' My answer has been and will always be:

“The Harvard of the West, Western State College, in Gunnison Colorado.”

This address is titled: “A New Nuclear Waste Approach: Recycling before Disposal.” Here on this football field today, the **first half** of this talk is about nuclear policy and how it relates to each of your majors. The **second half** is about you.

A year ago at the Harvard of the East, the commencement speaker was our Secretary of Energy, Dr. Steven Chu, a Nobel Laureate. He spoke about climate policy. Last week he and I testified before the Senate on future energy policy.

At the Harvard of the East in 1999, Alan Greenspan, then the Chairman of the Federal Reserve, addressed fiscal policy.

At the Harvard of the East in 1993, Colin Powell, then Chairman of the Joint Chiefs of Staff, spoke on military policy.

Today, at the Harvard of the West, Western State College, I will address the issue of nuclear waste because it affects every one of us. We are caught in a blender of historically new forces: clean energy needs, sustainable development, national economic

security, and how to address new climate policy. The longer these issues are debated, the more skeptical people become regarding a solution.

FIRST HALF

Energy. Abundant, economical energy can help solve many of society's issues: plentiful food, clean water, public health, and environmental preservation.

There are two fundamental energy sources in our universe, fusion and fission; all others are derived from them. Fusion is putting little atoms together which is done quite well on the sun – fusion drives all the chemical reactions that produce our fossil fuels, and fusion drives our renewables – wind, solar, and hydro.

Fission is splitting big atoms in half. Two billions years ago the earth had a natural fission reactor in a place we now call Gabon Africa. (Read a copy of the July 1976 issue Scientific American to learn more.) Since nuclear forces, not chemical reactions, are the fundamental energy sources of this universe, and if you are intellectually honest, sustainable energy on spaceship earth requires the expansion of nuclear power.

I began my career in nuclear power right here on this campus when I talked to a Navy recruiter my junior year. The Navy paid me \$1,000/month to complete my senior year. That amount today is \$3,500/month. Just think about what you could have done this past year with an additional \$3,500 a month! That's a heck of a lot of ski wax, lift tickets, and beverages.

Ralph Nader spoke at Taylor Hall my senior year to demonize nuclear power. The benefits of this small campus allowed me to talk to him one-on-one after his speech. It was because of that interaction that I have approached my career in this field with respect and curiosity to understand the emotions against nuclear power.

The biggest issue with nuclear power in the public mind starts with that big letter on that mountain, W-mountain – waste. What does society do with nuclear waste?

Policy Options

In 1982, while a junior on campus, the policy for nuclear waste was signed into law. It was amended in 1987. Yet, as a country, we have failed to implement that policy started before many of you were born – 28 years ago!

Why? Fundamentally it is difficult to make a decision with a large amount of uncertainty. Let us look ahead to the possibilities of the future, your future, with a better policy. Instead of letting Washington tell us to wait a few more decades for a solution, let's formulate it now.

There are three policy options for nuclear waste. I call them the three R's: Repository, or Reprocessing, or Recycling. I will briefly overview each one and then let you decide which is the best solution.

Repository

Repository. This path was started 28 years ago. The U.S. has spent \$9B since then, and has collected another \$20B dollars from you, the electric rate payers.

Repository – which many people know as Yucca Mountain – was envisioned to safely store yesterday's and today's used reactor fuel for a long time.

What happened to this policy?

You graduates in Anthropology, Biology, Chemistry, Computer Information Science, Environmental Studies, Geology and Mathematics, you, the Hurst Hall heroes – your profession became involved in the policy process.

The Yucca Mountain storage requirement was originally 10,000 years. But then your profession asked: What about the transuranics with long half-lives? 'Transuranics' is the only new word you need to learn this morning. It defines elements larger than uranium, such as neptunium, plutonium, americium, and curium, which constitute only 1% of the nuclear waste. In a court of law, the 10,000-year storage requirement was changed to one million years.

It will take one million years for the waste that was destined for Yucca Mountain to be less radioactive than the fields that used to be marked radioactive just south of the Gunnison airport.

That's right. From 1958 to 1962 Gunnison operated a uranium processing plant. We joked about the radiation warning signs when I was a WSC student running around the south side of the airport. We laughed about the radiation giving us Incredible-Hulk-like powers, enabling us to become the national ski champions in 1980 and again in 1982. Due to ground water leakage, the radioactive soil was moved to a disposal cell from 1992 to 1995. Environmental cleanup and stabilization is complete. It is now safe. This shows us there are options for nuclear waste.

Gunnison did it – why can't the nation?

Those of you who studied sociology or philosophy may have studied intergenerational equality, which addresses ongoing moral issues between generations.

President Lincoln faced the intergenerational issue of slavery and fought the Civil War.

President Nixon faced the intergenerational issue of preserving the environment and started the Environmental Protection Agency.

Nuclear waste policy has and will transcend generations. What President will understand the basic technical issues and then lead with the correct policy?

Repository, or Reprocessing, or Recycling? I will briefly address Reprocessing next.

Reprocessing

Reprocessing is the second R – the next policy choice – a choice that has been implemented in the UK and France, and soon Japan. This technology was originally developed in the U.S. to produce plutonium for nuclear weapons.

Before I briefly provide a technical overview . . . parents please cover the ears of young children.

Used nuclear fuel from our current fleet of water-cooled reactors, is chopped and added to hot 8M nitric acid to dissolve virtually all uranium, transuranics, and most of the fission products. Gadolinium nitrate is added to prevent a criticality. In a ten-stage centrifugal contactor 30% tributyl phosphate in kerosene, extracts tetravalent plutonium and hexavalent uranium from the solution. Plutonium purification continues with hydrazine, di-nitrogen tetroxide, and more TBP. Pure plutonium is then mixed with, say, Colorado uranium to make into fuel for water-cooled reactors. The wastes from this process are placed in a borosilicate glass that needs to be safely stored for 10,000 years.

Parents, you may now uncover the ears of young children.

What is right about reprocessing? It immobilizes wastes in a glass block needing storage for about 10,000 years, and the plutonium fuel is used to make electricity. What is wrong about reprocessing? The economics are lousy.

You Accounting, Business Administration, Economics, Political Science, Politics and Government Majors – your profession got involved in the policy process.

Simply put, this second ‘R’ – reprocessing – is expensive, environmentally intrusive, and barely reduces the long-term radioactivity that must go into the ground. Reprocessing requires permanent government subsidies to operate. That is not sustainable policy.

Public policy must always consider the economics!

Repository, or Reprocessing, or Recycling. I will now address Recycling.

Recycling

Recycling, simply put, turns waste into watts. This American technology was developed at our national laboratories. This recycling process recovers uranium and transuranics using a molten salt bath, to produce fuel for a sodium-recycling reactor. The waste, from this reactor, just the fission products, is incorporated into rock and a chunk of metal requiring safe storage for just 300 to 500 years. Yes, there are a few isotopes (Cs-135, Tc-99, I-129) that have very long half-lives in the rock and metal waste; however, because of their low concentration, and low specific activities they pose a minimal dose risk. I will save additional scientific details for your next degree.

Hard to believe? Fact: this process is used today at the Idaho National Laboratory to treat the used nuclear fuel from an old test reactor. (Please read the National Academy of Sciences report titled “Electrometallurgical Techniques for DOE Spent Fuel Treatment” published in 2001.)

These are just some of the benefits of a recycling reactor:

- It reduces required storage time of wastes from greater than 1 million years to just several hundred years;
- This used nuclear fuel can generate all U.S. electricity needs for more than 100 years; and
- Add in the current U.S. inventory of depleted waste uranium, and this process can meet ALL U.S. electricity needs for 1,000 years.

Now, some will say it would be impossible to recycle the majority of the 60,000 MT by focusing on this recycling approach alone. They will cite scale up issues, throughput capacities, transuranics recovery that needs demonstration, and a significant amount of technical uncertainty. A colleague of mine from one of our nation’s national laboratories even told me, “It would be highly unlikely that we could recycle our current inventory this century using this approach.” Here is how we think in North Carolina: the first century of flight began with a one-engine plane that traveled 110-feet, the second century of flight started with two-engine planes that can travel 10,000 miles! It took just 66 years from the Wright Brother’s first 110-foot flight to man’s flight to the moon and back. We can recycle in this century!

You English, Sociology, History, Spanish, and Psychology majors, and any student with a teaching certificate – your profession got involved in the policy process. People in your professions have asked, and continue to ask the questions – How can we educate our fellow Americans about this policy? How can we implement this policy?

Speaking of educators, will Mr. Pete Marta please stand?

Mr. Pete Marta did his best in his classroom. He was my high school Chemistry & Biology teacher. He was my single most important teacher because he put me on the “science” road to success.

Thank you Mr. Marta for teaching me and thousands of others in my hometown, Leadville!

For today’s graduating teachers, know that your legacy starts your first day, with your first student. Remember; each parent is sending their best student to your classroom. Do your best!

Please also teach the young about the three Rs: Reduce, Reuse and Recycle to live sustainably on earth. Please also teach your students about the three Rs of nuclear waste:

- Repository for one million years
- Reprocessing radioactive glass for ten thousand years, or
- Recycling a radioactive rock for 300 years, and lots of energy generation.

Recycling is the right policy for societal, environmental and economic reasons.

By way of this one societal issue, nuclear waste, good public policy requires input from all stakeholders. You, the graduates of Western State College with a liberal arts education – don't be afraid to get involved in policy development. Seek the truth then apply it.

SECOND HALF

In this second half of my address let's talk about you, with some advice that I learned from the great people who have crossed my path since I left Western, coupled with my mother's advice when I put pen to paper six-months ago: "Tell them what you would tell your own kids." These three suggestions, if implemented and followed, will improve your professional careers.

- Join a professional society
- Read, and
- Take care of your health

I will frame each suggestion individually.

1) Professional Societies

The difference between a job and a career is getting involved with a professional society. You earned a degree, not to get a job, but to pursue a career. Professional societies allow you to transcend the rank of your workplace by interacting with the diversity of individuals in your profession. It will accelerate your career.

Would Kellie Renée Egging and Randi Ellene Andersen please stand?

Kellie and Randi are the two graduates from WSC today with a major in Music. Do you realize, Kellie and Randi, that there are at least three professional societies you can join? The Acoustical Society of America, the American Musicological Society, and the Society for Music Theory.

Be assured that professional societies abound for all of you graduates today. These will do much for your professional development and the betterment of society.

Thank you Kellie and Randi. Please consider joining one of those professional societies and lead your class in being the first to join a Society post graduation.

2) Read

Leaving campus today and joining the world of tweets, tweeters, 24-hour news cycle and instant internet information results in shallow awareness of even basic subjects. I challenge you with simply this: read one non-fiction book a month. Audio books count. Read or listen to one non-fiction book a month so that you can grow your wisdom. Yes, wisdom, beyond your age.

Read about leadership in Colonel David H. Hackworth's book titled, "About Face."

Learn from Pat Riley in "The Winner Within" about how he turned the LA Lakers into a winning basketball legacy.

Read "Prescription for the Planet" by Tom Brees to learn more about the recycling reactor I just described.

Read "Fossil Fools" by Joseph Shuster to understand why renewables can never replace fossil fuels, but how the recycling reactor I just described can. Shuster authored the handout many of you received coming in today.

You eight History majors graduating today, you already know about reading non-fiction books. To keep ahead of your classmates, add to your reading list your local newspaper, one national newspaper, like the Wall Street Journal, and, once a month, Esquire magazine!

A fitting quote, for Mountaineer Bowl comes from Lou Holtz, the revered Norte Dame football coach who said, "The only things that change you from where you are today to where you are going to be five years from now are the people you meet and the books you read."

3) Health

Good health does not take care of itself and is most often lost assuming it will.

Your health has two facets: mental and physical.

Regarding your mental health, become a meditator. Two years after leaving WSC, I paid for and completed the training for Transcendental Meditation. In the stressful confines of my Navy ship in the Persian Gulf, I would meditate twice a day. It gave me inner calm and peace while I watched a few shipmates self-destruct because of stress.

Regarding your physical health – and this campus is all about getting physical with outdoor activities – continue being physical!

Your performance in the future is determined not only by your mental abilities but by the health of the support system that carries around your brain. Exercise, eat well, meditate, and, yes, get your sleep.

Will the six Recreation, the 22 Outdoor Leadership & Resort Management and the 22 Exercise & Sport Science Majors please stand up.

You all have a special place in my heart. My roommate here at WSC, the brother I never had, Charlie Gardner, a Desert Storm veteran, and Marine for life was an Exercise & Sport Science Major. My sister, who started at WSC, but graduated from another Colorado school I will not mention, was a Recreation major. It is her son, my nephew Brett Sargent who is graduating today.

You are needed to keep the policy makers, and the people in the communities in which they live, healthy. Healthy people lead to open minds that prevent rash policy decisions.

Please give them a round of applause because they help us keep our health! Please be seated.

My advice:

- Professional Societies – join.
- Read – one non-fiction book a month.
- Health – meditate and move.

Closing

You are the graduates of the Harvard of the West, Western State College. I expect you to be leaders. And leaders like you lead collectively through people, via organizations, and organizations set policy. Today I discussed one public policy area – nuclear waste – that needs fixing. There are many others.

Now, will the two Music majors please stand again. Will the 18 Art majors and 11 Communication and Theatre majors please stand!

You are the tip of the arrow of a liberal arts education. You are the A in BA, Bachelor of Arts! The f-bomb in BFA, Bachelor of Fine Arts!

As the tip of the arrow can you lead the rest of your 203 classmates to stand with you? Will the 234 graduates now standing lead everyone else in attendance to stand?

Graduates, you know the question. Guests, can you help them with the answer? Let us all shout the answer to the question together!

“Where did you go to school?”

“The Harvard of the West, Western State College, in Gunnison, Colorado.”

Let’s wake up Gunnison! Where did you go to school?

“The Harvard of the West, Western State College, in Gunnison, Colorado.”

Please take your seats.

Ken McLennan, the ski coach when I attended WSC, is in attendance. On that fine man's desk was a sign that read "Don't tell me how good you are, show me."

"Don't tell me how good you are, show me."

You, the graduates of Western State College:

- Show yourselves that you can move beyond your personal barriers.
- Show your families that you will continue to learn and gain wisdom.
- Show President Helman and the Board of Trustees who are conferring your degree today the value of your liberal arts education.
- Show the world the value of your education from the Harvard of the West, Western State College in Gunnison, Colorado!

I wish you all very good lives!